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Cretaceous Compaction and Tectonic Subsidence of the Alberta Basin

by

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ABSTRACT

During the Cretaceous the Alberta part of the Western Canada Sedimentary Basin subsided due to loading by tectonic driving forces (an easterly migrating fold and thrust belt) and sedimentary fill. The crustal subsidence of the undeformed (Plains) area of the Alberta Basin due to tectonic forces can be estimated by accounting for changes in the thickness and load of the Cretaceous sedimentary column.

This requires the use of burial histories, quantitative reconstructions of the compaction of the Cretaceous sedimentary column in the basin. Compaction can be estimated by interpolating a curve between assumed initial (depositional) porosities and the average in-situ porosities of individual layers in the column (as measured by sonic logs). Since the actual burial history of any layer in the column can never be known precisely, probable maximum and minimum burial (compaction) curves were described. The changes in the maximum and minimum thickness and maximum and minimum load of the column over time were then estimated from these burial curves. These changes, in turn, were used to calculate and map the total subsidence and isostatic tectonic subsidence in the basin over certain intervals (from the Aptian to the middle Campanian).

These subsidence maps were superimposed on isopach maps (where available) of the same intervals. Over the Mannville Group interval (Aptian and early Albian) the subsidence maps and isopach maps have basically the same patterns. However, the maps show that estimates of subsidence based on present compacted thicknesses of the Upper and Lower Mannville Groups are too low. Subsidence was highest in the west and northwest areas of the basin during these times. Following deposition of the mainly continental Mannville Group, the basin was completely flooded and thick shales of the Colorado Group and Lea Park Formation were deposited. Maps covering these times (late Albian to middle Campanian) show definite discrepancies between isopach patterns and calculated subsidence patterns. Subsidence magnitudes estimated from the isopach maps are again too low. Deviations in patterns between isopach map contours and subsidence map contours are especially pronounced in the southern and central basin areas. Only by correcting for the cumulative effect of compaction can these discrepancies be seen. They

show the tendency of the subsidence map contours to bulge eastwards, crossing the isopach map contours; relatively higher subsidence rates existed in those areas in the past than are indicated on present (compacted) isopachs.

It is concluded that the actual structural development of the basin has been masked by Late Cretaceous to Paleogene sediment loading and subsequent compaction. The maps reveal only the large-scale basin structures. Increasing the study-well coverage may reveal ancient small-scale structures that are no longer observable on present isopach maps.

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LIST OF SYMBOLS AND ABBREVIATIONS

This list includes the symbols and abbreviations that appear repeatedly in the text, and the page on which they were first defined or used. Most of these symbols come from the program COMP in Appendix 1.

I. INTRODUCTION

A. PURPOSE OF STUDY

The purpose of this study was to determine the magnitudes and patterns of total and tectonic subsidence in the West Alberta Basin (Fig. 1) during the Cretaceous Period. The West Alberta Basin is the Alberta portion of the Western Canada Sedimentary Basin. In this study the West Alberta Basin will be referred to simply as the Alberta Basin. Total subsidence is the downward movement of the lithosphere underlying the basin. Tectonic subsidence is the negative vertical movement of the lithosphere caused by "driving forces" i.e. loads other than sediments and bodies of water covering the basin (Watts and Ryan, 1976). Maps of the changes in total and tectonic subsidence reveal the large-scale structural development of the Alberta Basin.

B. METHOD

Many recent papers on the development of sedimentary basins discussed practical methods of calculating total and tectonic subsidence (Watts and Ryan, 1976; Steckler and Watts, 1978; Sclater and Christie, 1980; Brunet and Le Pichon, 1982; Bond and Kominz, 1984; Guidish *et al.*, 1984; Sawyer, 1985). They all pointed out that by far the most important factor in these calculations is the reconstruction of the depositional history of sediments in a basin. Information from the sedimentary record can be used to deduce changes in the vertical motion of the lithosphere underlying a basin.

Therefore, the key to analyzing the subsidence history of the Alberta Basin during the Cretaceous is to estimate the depositional and burial histories of the Cretaceous sediments. The burial history of a sedimentary layer is a quantitative description of the thickness and density changes in this layer due to burial by overlying sediments and chemical compaction. Accounting for the effects of compaction is extremely important. In a study of the subsidence of the Paris Basin, Brunet and Le Pichon (1982) found that the compaction correction was as great as one-quarter the tectonic subsidence. In the Alberta Basin, shales, which are especially susceptible to compaction, make up a large amount of the total volume of Cretaceous sediments. Therefore, it is important to estimate their burial histories, as well as the burial histories of the other lithologies. The tectonic and total subsidence histories of the Alberta Basin depend on the accuracy of these burial histories.

The authors cited previously all used basically the same method of correcting for compaction. This method consists of plotting the porosities of sediments against the present depth of burial. Past thicknesses of sedimentary layers are estimated by sliding these layers up the porosity-depth curve. The decompaction method used in this study is described in detail in Chapter 3. The basic similarity between this method and the methods of previous authors is that the present porosities of rocks in the basin were used to estimate thickness and density changes. The method used in this study, however, is a modification of a decompaction procedure developed by Perrier and Quiblier (1974); it gives the evolution in thickness and density of a sedimentary column with respect to time, rather than depth. The advantages of this method are discussed in Chapter 3.

The decompaction method used in this study was computer-based, in order to handle the large amounts of information and the necessary calculations. The input data were: well log sonic transit times (used to calculate porosities); estimated shale volume, from gamma-ray logs; estimated ages of major formation tops and marker horizons, and the present thicknesses of these formations. In total, over 38,000 m of sonic log data from 43 wells (Fig. 1) were used. This information was processed with the FORTRAN program COMP given in Appendix 1. The results for each well, the burial histories and tectonic histories, are given in Appendix 2. Complete discussion and presentation of these results are contained in Chapters 5 and 6.

The study area is shown in Figure 1. The wells studied were chosen to give fairly uniform coverage of the basin. Information is not available from the deepest part of the basin, in the west, because this area was deformed during the Tertiary Period. Because of the deformation, simple decompaction methods may not apply. Sonic / gamma-ray logs are available for the interval from the Lower Mannville Group to the Belly River Group (Fig. 11) only in the westernmost wells. Because of erosion during the Tertiary Period, and because the upper sections of most wells are cased, sonic log data are available only up to the Lea Park Formation in the central area and only up to the Lower Colorado Group in the northeast area.

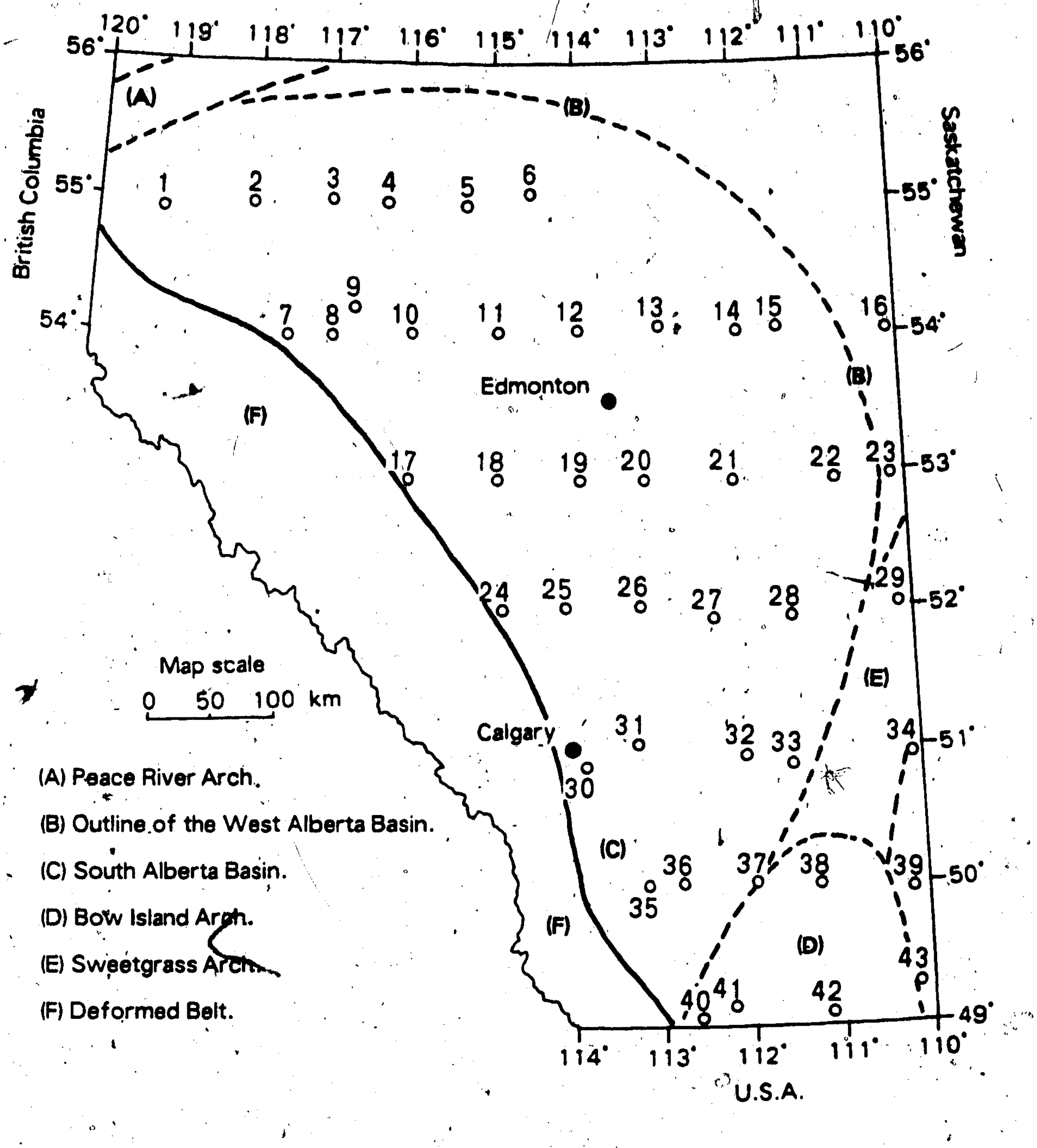


Figure 1: Location of wells used in this study and some features of the Alberta Basin.

C. OVERVIEW OF THE ALBERTA BASIN

This section gives a brief review of recent ideas about the development of the basin. The basin history is discussed in detail, with respect to the results of this study, in Chapter 6.

The tectonics of the Western Canada Sedimentary Basin are related to the evolution of the Western Cordillera. Models of the evolution of the Cordillera have been proposed by Price (1973, 1981), Dickinson (1981), Monger *et al*. (1982), and Chamberlain and Lambert (1985). Features common to these models are a lower to mid-Jurassic series of island arcs which amalgamated with easternmost units of Terrrane 1 of Monger *et al*. (1982) in mid-Jurassic time. Subsequently, these amalgamated units converged with the North American craton telescoping the intervening miogeocline, eventually producing the Rocky Mountains. This convergence resulted in thrusting which loaded the craton and created an isostatically induced depression, a foredeep trough, which migrated ahead of the overthrust belt in a northeasterly direction (Price, 1973, 1981).

The foredeep trough filled with clastic wedge deposits shed from the adjacent Cordillera. Actually, the Alberta Basin records a series of such foredeeps. As deformation progressed, generally from west to east, across the orogen in British Columbia the western sides of successive foredeeps were disturbed. Older foredeep deposits as well as underlying miogeoclinal sediments were thrust to the east and later eroded (Bally *et al*., 1966; Beaumont, 1981; Jordan, 1981). So the main depocentre of the basin migrated eastward over time, extending the area affected by the load of the thrust and fold belt.

Price (1973, 1980) estimated the amount of isostatic subsidence under the southern Canadian Rocky Mountains by constructing restored cross-sections using the transition between the Upper Jurassic Fernie Group and the Upper Jurassic to Lower Cretaceous Kootenay Group as the datum. The approximate amount of subsidence since the deformation of supracrustal rocks began (the difference between the depth to the basement in the late Jurassic, from restored sections, and the present depth) is about 8 km under the western Rockies and about 2 km under the western Interior Plains (Price, 1973).

According to Stott (1982), three main clastic wedges were deposited in the basin. The Upper Jurassic to Lower Cretaceous wedge (which is absent from the study area) and the Lower to Upper Cretaceous wedge correspond to phases of the Columbian Orogeny while the Late Cretaceous sediments correspond to the early stages of the Laramide Orogeny. The rates of sedimentation in the depression are good indicators of penecontemporaneous changes in direction and intensity of deformation in the Cordillera (Price, 1973; Stott, 1984).

Besides the foredeep depression, two other structural features also played a role in determining Cretaceous sedimentation patterns (Williams and Burk, 1964; Stelck, 1975). These features are the Peace River and Sweetgrass Arches, which act as boundaries for what Stelck (1975) called the West Alberta Basin (Fig. 1). All three features have existed since Late Paleozoic time (Williams and Burk, 1964). The Peace River and Sweetgrass Arches represent local variations in regional structural movements of the basin. The rise and fall of these structures cannot be explained strictly by thrust sheet loading (Porter *et al.*, 1982), although Beaumont (1981) thought the Sweetgrass Arch may have been reactivated in the Cretaceous due to loading in the Cordillera.

Another important factor in the development of the Alberta Basin was eustatic sea level variation. The entire basin was flooded periodically from the Albian to the Maastrichtian (Caldwell, 1984). The sedimentary record in the deeper (western) parts of the basin carries the record of both regional tectonism (crustal loading) and eustatic sea level changes, but the effects of sea level changes are masked by the larger effects of tectonic subsidence (Jeletzky, 1978; Caldwell, 1984). However, sea level changes played a greater role in determining the volume and distribution of sediment in the easterly areas of the basin; the areas farthest away from the supracrustal loads (Beaumont, 1981; Caldwell, 1984).

Lastly, development of the Alberta Basin was constrained by the mechanical and thermal properties of the underlying lithosphere (Beaumont, 1981; Beaumont *et al.*, 1982). Beaumont (1981), Jordan (1981) and Royden and Karner (1984) used theoretical models to describe the formation of foreland basins; the basic idea of these models is that flexure, the lateral transmission of bending stresses in a lithospheric plate, is controlled by certain geophysical parameters: the elastic thickness and flexural rigidity of the plate at any given time; the temperature distribution in the plate; the tendency of the plate to undergo viscous deformation (to sag) over time. Beaumont *et al.* (1982) concluded that the reason the Alberta Basin is so pronounced is because the underlying craton is old (>500 Ma) and cold (i.e. unaffected by any thermal events since the Precambrian), therefore it is capable of subsiding (transmitting bending stresses) over a broad area.

II. SUBSIDENCE CALCULATIONS

A. TOTAL SUBSIDENCE AND ISOSTATIC TECTONIC SUBSIDENCE

Watts and Ryan (1976) pointed out that the maximum thickness of sediments TZ that, based on isostasy, can accumulate in a water-filled depression is given by

$$TZ=W*(Pm-Pw)/(Pm-Ps) \quad (1),$$

where W is the initial water depth of the depression, Pw is the density of sea water (1030 kg/m^3), Pm is the density of the mantle (3300 kg/m^3), and Ps is the average sediment density (2400 kg/m^3). According to this equation the maximum thickness of sediments possible in the depression is only about 2.5 times the water depth. However, as an example, there are many hundreds of metres of Cretaceous sedimentary rock in the Alberta Basin, much of which was deposited in continental to shallow marine (<100 m water depth) environments (Jeletzky, 1978). Similar observations led Watts and Ryan (1976) to conclude that there must be some "driving force" that causes subsidence to exceed the amount produced solely by sediment loading.

The method of calculating tectonic subsidence used in this study is basically similar to the method introduced by Watts and Ryan (1976) and Steckler and Watts (1978). It consists of analyzing subsidence by constructing schematic columns which balance the changes in sediment thickness and density, water depths, and sea level changes, at different locations and times in the basin.

Figure 2 shows two columns, each at the same location, indicating the loads in the basin at the times T_1 and T_2. W is the water depth, DSL is the sea level change, TZ is the total thickness of the Cretaceous sedimentary column (corrected for compaction), and H is the thickness of the lithosphere and overlying fully-compacted miogeoclinal sediments (it was assumed that the Paleozoic rocks underwent minor, residual compaction during the Cretaceous). The average total subsidence (Z) of the basin between T_1 and T_2 is

$$Z=W_2-W_1+TZ_2-TZ_1-DSL \quad (2).$$

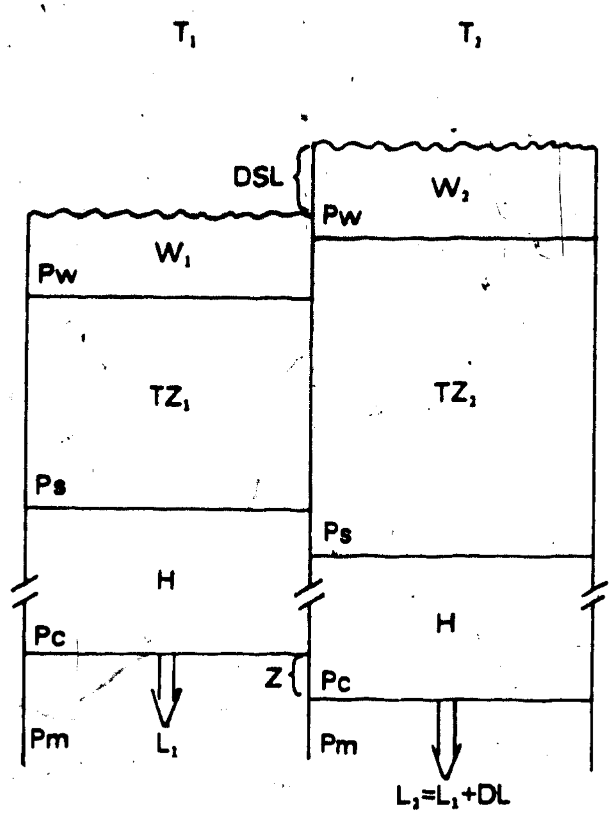


Figure 2: Schematic cross section through the basin illustrating subsidence calculations.

Assuming local isostatic equilibrium, the symbols L_1 and L_2 on Figure 2 represent the tectonic loads acting on the lithosphere producing subsidence beyond that due to local changes in sediment and water loads. The change in the tectonic load ($DL=L_2-L_1$) can be calculated by balancing the supracrustal loads

$$W_1 * Pw * g + TWT_1 + H * Pc * g + Z * Pm * g + L_1 = W_2 * Pw * g + TWT_2 + H * Pc * g + L_1 + DL \qquad (3).$$

$$DL = (W_1 - W_2) * Pw * g + TWT_1 - TWT_2 + Z * Pm * g \qquad (4).$$

TWT is the load of the Cretaceous sediments in Pascals (N/m^2). The average isostatic tectonic subsidence (ZTI) created by the tectonic load change is

$$ZTI = DL / Pm * g \qquad (5).$$

The thickness and density (H and Pc) of the lithosphere and overlying sediments are assumed to be constant. If this assumption is wrong DL will be overestimated/underestimated.

In fact, Equations 1, 3, 4, and 5 are not strictly correct because they do not take into account the flexural response of the lithosphere. This is discussed in a following section.

B. WATER DEPTHS AND SEA LEVEL CHANGES

The previous equations require at least an approximate knowledge of the average water depths W_1 and W_2. The stratigraphy of the basin is not known well enough to be able to define a specific depth of deposition for the formations in each study well.

The solution to this problem is to calculate subsidence only over periods of time when similar environments of deposition existed. Jeletzky (1978, Fig. 7) produced a graph of inferred depths of deposition for the Cretaceous in the Alberta-Liard Trough (the foredeep trough immediately adjacent to the Rocky Mountains). These depths were based on paleoenvironmental analyses of the predominant lithofacies in the trough at any particular time. According to Jeletzky (1978), water depth fluctuations were much larger over some intervals than others. For example, the Lower Mannville Group was deposited at or above sea level while the Second White Specks shale was deposited in over 200 m of water. Therefore, the uncertainty in subsidence will be large if it is calculated over the interval from the Lower Mannville to the Second White Specks. The uncertainty will be less if subsidence is calculated over the Lower Mannville interval. There probably were minor fluctuations in water depth over the Lower Mannville (due, for example, to changes in sediment supply), but these should be small. So, over intervals of similar depositional environments Equation 2 can be simplified to

$$Z=TZ_2-TZ_1-DSL \quad (6).$$

Figure 3 shows the specific intervals used in this study. The ages are based on information in Chapter 4. The three columns marked with X's represent three broad categories of depositional environments. Column 3 includes continental to transitional marine environments. Column 2 includes shallow marine (shallow neritic) environments. Column 1 includes deep neritic to bathyal environments. This figure was prepared with environmental and sedimentological interpretations from various sources: Williams (1963), Jeletzky (1971, 1978), Williams and Stelck (1975), Ogunyomi and Hills (1977), Speelman and Hills (1980), McLean and Wall (1981), Meijer Drees and Mhyr (1981), Putnam (1982), Finger (1983), Putnam and Pedskalny (1983), Walker (1983), Burden (1984), Caldwell (1984), Christopher (1984), Iwuagwu and Lerbekmo (1984), Stott (1984), Taylor and Walker (1984), Van Hultein and Smith (1984).

Referring to Figure 2, it can be seen that in order to calculate Z, the sea level change (DSL) must be known. In reality it is difficult to separate tectonic subsidence from eustatic sea level changes. Increases in either quantity will result in a deeper basin and allow more sediments to be preserved below base level. Equation 6 must be modified to calculate the combined effects of the tectonic load plus sea level change

$$Z+DSL=TZ_2-TZ_1 \quad (7).$$

Equation 4 must also be modified, since Z and DSL, individually, are unknown

EST. AGE (Ma)	CRETACEOUS FORMATIONS		ENVIRONMENT 1	ENVIRONMENT 2	ENVIRONMENT 3	SUBSIDENCE INTERVAL DWD=0	
75–78	Belly River Group				XXX	78 Ma - 75 Ma	
78–80	Lea Park Fm	Pakowki Fm		XXXXX		83 Ma - 78 Ma	80 Ma - 78 Ma
80–83		Milk River Fm (S. Alta)*			*XX	83 Ma - 80 Ma	
83–85	First White Speckled Shale		XX			85 Ma - 83 Ma	90 Ma - 83 Ma
85–90				XXXX		90 Ma - 85 Ma	
90–91	Second White Speckled Shale		XX			91 Ma - 90 Ma	98 Ma - 90 Ma
91–98	Fish Scale Zone			XXXXXXXXXXX			
98–103	Lower Colorado Group					103 Ma - 98 Ma	
103–108							
108–113	Upper Mannville Group			X	XXX X	113 Ma - 108 Ma	
113–120	Lower Mannville Group				XXXXX	120 Ma - 113 Ma	

Figure 3: Subsidence intervals analyzed in this study.

$$Z*Pm*g-DL=TWT_2-TWT_1 \quad (8).$$

This equation gives the average total load change minus the tectonic load change. Equation 5 is also modified to give

$$ZTI+DSL=[Z+DSL]-[(Z*Pm*g-DL)/Pm*g] \quad (9).$$

This gives the isostatic tectonic subsidence plus sea level change.

The previous three equations are based on the assumption that $W_2-W_1=0$. Figure 2, however, indicates an increase in sea level. (According to Vail *et al.* (1977), there was a general rise in sea level throughout the Cretaceous Period.) The water depth difference could still be zero if sedimentation kept pace with the rising sea level, and rising base level. However, the change in sea level would have to be larger than the uncertainty in water depth differences in order to be significant.

Jeletzky (1978) said that it is impossible to separate the changes in tectonic subsidence from changes in sea level in the Alberta Basin. However, Caldwell (1984) pointed out that Jeletzky (1978) based his opinion on evidence from the westernmost part of the basin, where the tectonic forces were the strongest. In the eastern parts of the basin sedimentation was due mainly to changes in sea level, so that area of the basin could carry a record of those changes (Caldwell, 1984). Since that portion of the basin is unlikely to feel the effects of thrust loads, ZTI=0. Therefore, DSL can be roughly estimated using Equation 9. However, the errors due to assuming no difference in water depth (i.e. no difference in loading by sea water) and in assuming a simple isostatic model for the lithosphere may overshadow the estimated value of DSL.

Actually, since major changes in DSL should be recorded in the sedimentary column at each well in this study, Z+DSL and ZTI+DSL will have to be corrected by the same amount at each well. Therefore, when considering subsidence DSL can be ignored as a basin-wide "constant" (Guidish *et al.*, 1984).

C. REGIONAL COMPENSATION: LITHOSPHERIC FLEXURE

Equation 9 can be re-written as

$$ZTl+DSL=[Z+DSL]-[(TWT_2-TWT_1)/Pm*g].$$

In fact this equation is not quite correct because it assumes complete local compensation of surface loads. If this were the case no foreland basin could form (Beaumont, 1981). As was discussed in chapter 1, the earth's lithosphere compensates for surface loads by flexing over a broad area. Equation 9 must be modified to remove not only local sediment loads but surrounding sediment loads as well

$$ZTF+DSL=[Z+DSL]-\Phi[(TWT_2-TWT_1)/Pm*g] \qquad (10).$$

The symbol Φ represents the flexural response function of the lithosphere (Watts *et al.*, 1982). In this way the subsidence due to thrust loads or other tectonic loads (such as a change in the density of the lithosphere) are isolated (Watts and Ryan, 1976; Bond and Kominz, 1984).

The flexural response of the lithosphere can be approximated by simple two-dimensional models. Hetenyi (1974) gave a solution for an elastic beam loaded by a rectangular load: the deflection of the beam under the centre of the load (c) is

$$Yc=(q/k)*(1-EXP(-l*a)*COS(l*a)) \qquad (11),$$

where a is the half width of the load, l is the flexural parameter, q is the load, and k is the buoyant response of the substratum. In this study

$$q/k=(TWT_2-TWT_1)/Pm*g.$$

Equation 11 predicts a curve with a decreasing amplitude of deflection with increasing distance from the load (Hetenyi, 1974). The first part of the equation (q/k) is equivalent to the subsidence produced by a local loading model. In fact, if the crust under the basin is faulted the strength of the lithosphere is reduced and local compensation can occur (Watts and Ryan, 1976). The second part of Equation 11 modifies the first part; it describes the subsidence (deflection) under the centre of the load (c) of a beam with a flexural parameter l. The flexural parameter determines the shape of the deflection (Walcott, 1970). Typical values of l range between 70 to 100 km (Turcotte, 1980).

From Equation 11, it can be seen that

(a) $Yc = q/k$ and $\Phi = 1$ when $a = n*pi/2*l$ $(n = 1,3,5,\ldots)$.

(b) $Yc < q/k$ and $\Phi < 1$ when $a < n*pi/2*l$ $(n = 1,3,5,\ldots)$.

(c) $Yc > q/k$ and $\Phi > 1$ when $3*pi/2*l > a < pi/2*l$.

In case (c) Equation 1 is refuted. However, depending on the value of l, under large loads the amplitude of the deflection stabilizes at the local value (q/k).

To summarize, subsidence in smaller basins is inhibited by flexure (if there is no faulting) because the bending strength supports the load. However, sedimentary basins can subside isostatically if the basin is considerably longer than the flexural parameter (Turcotte, 1980). This means that for relatively broad sediment loads Equation 9 is a fairly good estimate of Equation 10. Therefore, the flexural tectonic subsidence (ZTF) should usually be between the total average subsidence and the isostatic tectonic subsidence. Stated another way

$$0 < \Phi < or = 1 \quad (12).$$

It must be stressed that the previous conclusion is based on certain assumptions about the sediment load distribution. Equation 11 is a two-dimensional approximation of a three-dimensional problem. It is assumed that the sediment load is constant in the direction perpendicular to the section of the two-dimensional model, i.e. the basin approximates a long linear trough (Nadai, 1963). (Nor is the sediment load ever perfectly rectangular in shape.) Also, there is uncertainty about the previous sediment load distributions in the basin since the western area is deformed and, over most of the basin, large amounts of Upper Cretaceous sediments have been eroded (Beaumont, 1981).

An even more important problem, from the point of view of flexural modelling, is that the exact geophysical properties of the lithosphere in the geologic past are unknown, or at least uncertain (Beaumont, 1981). The flexural parameter is given by

$$l=[(Pm*g)/4*D]^{.25},$$

(Nadai, 1963). Where D is the flexural rigidity, or resistance to bending of the lithosphere. This variable controls the size of the depression. When D is very large l approaches zero and the depression is small; but when D is very small l becomes very large and compensation is local, so the depression is narrow and deep (Watts and Ryan, 1976).

Actually, the problem is more complicated than this. Watts *et al*. (1982) gave an excellent review of lithospheric flexure theories. They pointed out that most recent studies of basins have used either a viscoelastic or an elastic model of the lithosphere. In a viscoelastic model the elastic thickness of the lithosphere (that portion of the lithosphere that bends elastically) and the flexural rigidity appear to decrease over time; the lithosphere becomes less rigid with age. In elastic models, the elastic thickness and flexural rigidity are constant. The elastic thickness can, however, increase if the lithosphere was heated and is in the process of cooling. Watts *et al*. (1982) concluded that elastic models were suitable for explaining the development of sedimentary basins. Jordan (1981), in a study of foreland basin development in the western United States, agreed. However, Beaumont (1981) preferred a viscoelastic model for the Alberta Basin.

The object of this study was not to explain basin subsidence using a complex geophysical model, but to observe, by reconstructing sediment burial histories, the range and distribution of subsidence in the study area. Though Equation 9 is an oversimplification, the assumption expressed in Equation 12 still makes it possible to define approximate values of tectonic subsidence without making other (possibly mistaken) assumptions about the mechanical behaviour of the lithosphere.

III. THE DECOMPACTION METHOD

A. THICKNESS AND DENSITY CHANGES IN SEDIMENTARY ROCKS

This section examines the two main geological processes that result in thickness (TZ) and load (TWT) changes in the sedimentary column: physical and chemical compaction. This examination is necessary in order to incorporate these processes into a quantitative model that can be used to estimate the burial histories of sediments in the basin and the tectonic history of the basin itself. Subsidence rates based on present thicknesses and densities of sediments will be far too low.

Physical compaction

Physical compaction is the reduction of pore volume in a rock solely by closer packing of grains, deformation of grains, and expulsion of pore fluids in response to higher overburden loads (Rieke and Chilingarian, 1974). Compaction results in decreased thickness and increased density of sedimentary rock layers.

Rubey and Hubbert (1959) showed that the overburden load (the combined vertical stresses of overlying rock and fluids) at a given depth in a sedimentary column is supported in part by the rock grains and in part by the pore fluid. They called these two components of stress the effective stress and the pore pressure. The effective stress is the difference between the overburden load and the pore pressure. This stress is what actually compacts a sediment; the amount of compaction is measured by the porosity of the sediment (Rubey and Hubbert, 1959).

Porosity is commonly observed to decrease with increasing depth of burial (overburden load). But this is not always the case. Normal, or hydrostatic, pore pressure is the pressure at a given depth under a free-standing column of water. The occurrence of abnormal pore pressure (greater than hydrostatic) and, therefore, higher than normal porosity (undercompaction) occurs in deep areas of sedimentary basins where the rates of sedimentation were high (Magara, 1978). If loading is rapid, compaction may be delayed because the pore fluid cannot escape fast enough and will carry a greater portion of the load (Rubey and Hubbert, 1959). So, compaction may continue even after overburden loading has ended, in a disequilibrium situation. However, according to Magara (1978)

"If the fluid pressure is hydrostatic, the level of compaction, which is a function of the effective stress, will not change under the constant overburden load, not even for millions of years in the future, because equilibrium has already been reached."

In a simple uniaxial compaction model, where the surfaces of equal effective stress are more or less horizontal, surfaces of equal hydraulic potential will be horizontal (Chapman, 1983). In normally-pressured shales the hydraulic potential decreases vertically upward, so this is the usual direction of flow, although flow patterns are more complicated in overpressured areas (Magara, 1978). In alternating shale and sandstone or siltstone layers, fluids will move from the more compactable shales to the more permeable sand beds above or below, and then move laterally through those beds (Chapman, 1983). Permeable beds with surface connections, whether outcrops or unconformities, are the best paths (Magara, 1978). According to Chapman (1983), shales interbedded between such permeable beds often show lower porosities than thick shale sequences at the same depth. If a thick shale lies between two permeable beds, the edges are more compacted and have lower fluid pressures than the center (Chapman, 1983).

Magara (1978) pointed out a number of differences between Rubey and Hubbert's (1959) compaction model and actual subsurface conditions. For example, permeability decreases with deeper burial and subsurface flow is complicated by interfering water paths. This results in impeded fluid drainage at depth. He also concluded that overpressuring is caused primarily by compaction combined with the lack of a permeable bed or path (i.e. an unconformity) for fluid drainage, a high rate of sedimentation, and a thick accumulation of sediments. Overpressuring of Cretaceous rocks in the Alberta Basin may be lower now than in the past because uplift and erosion of the basin resulted in a decrease in temperature of pore fluids followed by minor expansion of the pore spaces.

Magara (1978) discounted the effect of lateral tectonic stresses on compaction of Cretaceous shales in Alberta. He examined hydrofracturing data (fracture pressure is a measure of horizontal tectonic pressure) and found that the present tectonic pressure in the Alberta Foothills is no greater than in other areas of the province. The sonic travel times of Cretaceous shales do decrease towards the foothills, but this is due to deeper maximum burial (Magara, 1978). In another study, Sarmiento (1961) compared the increase in well log velocities of Cretaceous sandstones in Wyoming with Cretaceous sandstones in Alberta. He found that the velocity gradient in the Cretaceous Wyoming sandstones was lower than in the Alberta sandstones and attributed this to greater tectonism in Wyoming.

Removal of overburden load due to erosion will result only in small increases in the bulk volume of underlying sediments (Magara, 1978). In order for large increases to occur, fluid must be forced back into the pores. This is often accomplished in reservoir fracturing operations, but the artificially produced pressures greatly exceed natural pressures (Chilingarian and Wolf, 1975). Most of the small increases in bulk density are due to the recovery of elastic grain deformations (Chilingarian and Wolf, 1975). Chilingarian and Wolf (1975) concluded that compaction of uncemented sands at loads of 21,000 kPa or less is irreversible.

Another factor in the physical compaction of rocks is the susceptibility of different lithologies to effective stress. The grain contacts in mudstone are simpler than those in sandstone and the grains are weaker, therefore mudstones or shales are more responsive to changes in overburden load than sandstones (Magara, 1978). The amount of compaction in shales can therefore be related to overburden pressure and, more practically, depth (except for undercompacted rocks) (Magara, 1978). Compaction of clays (which consist of packets of flat grains) results in increasing parallelism of the grains (Magara, 1978). According to Hunt (1979), this depends on the depositional orientation and the composition of the grains. Smectites, for example, show poor particle orientation, as do clays with large amounts of silt and carbonate minerals, which reduce parallel orientation (Hunt, 1979). Clay mineralogy also plays a role in compaction of mudrocks since smectite-illite layered clays and smectitic clays contain more water than illitic and kaolinitic clays and impede compaction (Blatt *et al.*, 1980). At great depths, elastic deformation of the clay particles themselves occurs (Anstey, 1977). Clay minerals have very great surface areas compared to sands and absorb a great deal of water on their surfaces (Chilingarian and Wolf, 1975). The rest of the pore spaces are filled with free water, which can be easily removed during compaction. Bound water is usually removed or released only in the very late (high pressure) stages of compaction (Chilingarian and Wolf, 1975)

Initially, sand compaction results from more efficient packing, grain sliding, and rotation and compression of soft minerals (clay, mica) (Chilingarian and Wolf, 1975). In uncemented quartz sands, physical compaction results in thickness decreases of only around 10 to 15 per cent (Blatt *et al*., 1980). According to Chilingarian and Wolf (1975), sand compaction depends on the original porosity and packing, grain shape, roundness, sphericity, composition, and size. They found that

> "Well-sorted, rounded, well-packed, clean quartz sands do not compact readily except when the applied loads are sufficient to break the sand grains. The load necessary to crush or fracture grains is not as high as one might expect, because pressures upon contact points may be considerably amplified above the average load pressure by mechanical advantage."

Brittle minerals such as feldspar, with sharp, irregular grains will shatter readily. Arkosic sands were found to compact readily, partly because of grain angularity (Chilingarian and Wolf, 1975). Also fine-grained ductile particles like shale and mica deform easily at low pressures and increase sand compressibility (Blatt *et al*., 1980).

Chemical compaction

The subject of chemical compaction is very broad. This study is not petrologic in nature; the idea of this section is simply to point out that there are numerous other processes other than simple mechanical compaction that can reduce porosity in sedimentary rocks.

Chemical compaction, as defined by Bond and Kominz (1984), who studied compaction of Paleozoic sediments in the Canadian Rocky Mountains, is the reduction of pore volume in a rock solely by cementation, pressure solution, recrystallization, and mineral transformations.

In general, six factors control the chemical compaction of sandstones. These are: the chemical composition of the sediment and pore fluid, the rate of flow of the fluid, time, temperature, and the effective pressure gradient (Stephenson, 1977; Selley, 1978). The problem with trying to develop a mathematical model of sandstone compaction is that these interdependent factors are difficult to quantify. Also, it may not be possible to determine the magnitudes of some of these factors, such as the pressure and geothermal gradients, because of uplift and erosion in the basin. It is therefore necessary to make some generalizations regarding chemical compaction in order to estimate changes in the thickness and density (load) of the Cretaceous sedimentary column.

The main generalization that can be made is that sandstone porosity decreases with depth (though there are exceptions to this). This is because an increase in depth implies an increase in age, an increase in pressure, and an increase in temperature (Stephenson, 1977). Age is important since cementation depends on the rate of flow of the cement-carrying pore fluids (Blatt, 1979). Also, flow rates are generally lower at greater depths (Blatt, 1979). With depth, effective pressure increases at quartz grain contacts, and as a result the silica dissolves, moves to areas of lower pressure, and is precipitated on grains as overgrowths (Hays, 1979). Abnormal pore pressure may preserve porosity by reducing the effective stress at grain contacts, thereby decreasing the amount of pressure solution (Selley, 1978). The formation of quartz overgrowths increases with greater effective pressure, but it also depends on the temperature and chemistry of the pore fluids (Blatt *et al.*, 1980). Higher temperatures result in increases in diagenetic processes (Selley, 1978). This is particularly important in mineralogically unstable sandstones where, with increasing temperature, feldspars and mafic grains are broken down to form authigenic clays which can reduce porosity (Selley, 1978).

However, exceptions to negative porosity gradients do occur. Porosity can actually be increased by moving fluids that dissolve unstable authigenic or detrital grains (Blatt *et al.*, 1980). Also, as noted before, abnormal pore pressures can reduce pressure solution. With regard to secondary porosity, Hays (1979) stated

> "In the most favorable case, porosity may actually increase with depth, or more likely, the slope of the porosity-depth curve may simply steepen, but continue to decline. At even greater depths, secondary porosity will be destroyed by compaction and cementation, but probably not as high a rate as primary porosity was destroyed, because most of the chemically and mechanically unstable grains had already reacted during earlier diagenesis, and because of bridging and keystone relations between rigid grains that developed during initial compaction."

From a study of the Cardium Formation and Viking Formation sandstones in the Alberta Basin, Thomas and Oliver (1979) found that the development of secondary porosity was only important locally in the Cardium sandstones where siderite cement was dissolved. Otherwise, increasing burial depth for both formations was accompanied by steady porosity loss due first to mechanical, then to chemical compaction.

As discussed before, most shales lose (pore) water through physical compaction. However, the transformation of smectitic shales to mixed layer smectite/illite clays results in the loss of bound water (Hunt, 1979; Plumely, 1980). At temperatures of 104° C to 110° C, the smectite structure is converted to the illite structure by the loss of interlayer water and the fixing of potassium (Plumely, 1980). Plumely (1980) believed that the total fluid plus solid volume remain constant, but as the clay structure collapses the increased pore fluid volume takes up a greater part of the total stress and the pore pressure increases. Gradually, the clay compacts and the pore fluid is expelled. The presence of bound water in smectitic clays also results in slower compaction than in other clays (Hunt, 1979). The interlayer (bound) water is not included in the porosity but in the grain volume - it becomes part of the pore volume when released, making up from 5 to 10 per cent of the bulk volume (Hunt, 1979). Chapman (1983) pointed out that overpressuring of shales may not always be caused by the smectite to illite transformation because, often, overpressuring occurs in depths shallower than the clay-mineral diagenesis depths (1800-2400 metres) suggested by Powers (1967). Magara (1978) agreed, but pointed out that if abnormal pressures already existed (caused, for example, by mechanical compaction) clay transformations could could increase those pressures. Again, such things are difficult to fit into a mathematical model.

Magara (1978) believed that, for the most part, shale compaction is governed by depth of burial (in normally pressured sections). Chapman (1983) concurred:

> "Mudstone compaction, like other sediment compaction, involves chemical and physicochemical processes as well as the physical, but these are not sufficiently well understood yet for general rules to be formulated. In confining ourselves to the physical processes, however, we believe that these are sufficient to explain the observed and deduced effects and that it is a valuable - even essential - simplification."

Summary

From the previous discussions of physical and chemical compaction, a number of conclusions can be made. In purely mechanical compaction the amount of solid material (detrital grains) remains constant, but the bulk volume (solids plus pore fluids) decreases due to loss of pore fluids. In purely chemical compaction the bulk volume is constant, but the ratio of solids to pore fluid generally increases with depth. These two generalizations are useful because they define the worst-case limits for a quantitative compaction model (Bond and Kominz, 1984).

B. POROSITY CHANGES WITH TIME AND DEPTH

Burial Paths

If porosity measurements of sedimentary rocks are graphed with respect to depth the result is a profile of decreasing porosity with increasing depth of burial. Magara (1981) pointed out that this is a static picture of the present porosity in the subsurface. A curve drawn through the porosity values indicates a trend of decreasing porosity (and increasing density) with present burial depth, but this curve may not necessarily represent the actual burial path of these rocks. As discussed in the previous two sections, the decrease in porosity with depth is caused by a complex combination of physical and chemical processes. Time, especially, is an important factor because it increases the chances of subjecting the rock to chemical processes, and increases the duration of the processes.

An example of the difference between a porosity-depth plot for a shale column and the possible burial histories of any layer in a column is shown in Figure 4, which is adapted from Magara (1980) and Plumely (1980). The shale layer A is undercompacted. The solid line connecting the porosity values does not represent the burial history of this layer because it is unlikely that a shale would follow a normal compaction trend and then suddenly rebound and increase in porosity (Magara, 1981). The burial path of the layer could be represented by any one of the three lines indicated. In the first path, compaction proceeds normally until the shale is suddenly sealed and compaction is impeded. In the second path, compaction is slightly inhibited compared to the normal trend. In the third path, compaction is normal, but the initial porosity is higher than in the other paths.

The process of working out the burial paths in a column of sediment becomes complicated if the column is composed of mixed lithological layers, since the compaction behaviour of any single layer of sediment depends also on the properties and behaviour of all the surrounding layers. Chapman (1983) and Magara (1978) pointed out that a shale layer surrounded by sandstone, at a given depth, may be slightly overpressured in the centre, but normally pressured at the top and bottom. This is because the sandstone (assuming it is fairly permeable and normally pressured) acts as a conduit for fluid movement during compaction (Chapman, 1983). The burial path of the center of the shale will be slightly steeper than the path for the top and bottom of the layer. (This assumes that other complications have not arisen such as cementing of the sandstone.)

Even in homogeneous lithologies there can be differences in compaction behaviour. Chapman (1983), in discussing shale porosity-depth plots, noted that

> "We cannot assume that a mudstone unit would have one history-of-burial curve; it is much more likely that the very top and bottom would have a history much like these curves, but that the centre's would be very different because pore-water expulsion from the centre would have been retarded."

Magara (1978) plotted the log of Cretaceous shale sonic travel times against depth and found that, over shallow to intermediate intervals (900-2400 m), the data points fell on a line with slope C. There was considerable scatter in the points, but generally C increased as the rate of burial decreased. He thought that slower sedimentation rates allowed more time for the flat shale grains to become more efficiently layered. Magara (1978) found that the slope of the normal compaction trend, the burial path, can change from well to well within a sedimentary basin.

Sclater and Christie (1980) examined the compaction history of sedimentary rocks in the North Sea, where the sedimentary column consists of mixed layers of different lithologies (sandstone, shale, shaly sandstone and chalk). They realized that a single porosity-depth relation could not describe the history of the entire column (in a given well section) because of the different burial histories of the lithologies comprising the layers in the column. So they constructed porosity-depth plots for each separate lithology, proposing that any given layer in the column followed the particular burial path for layers

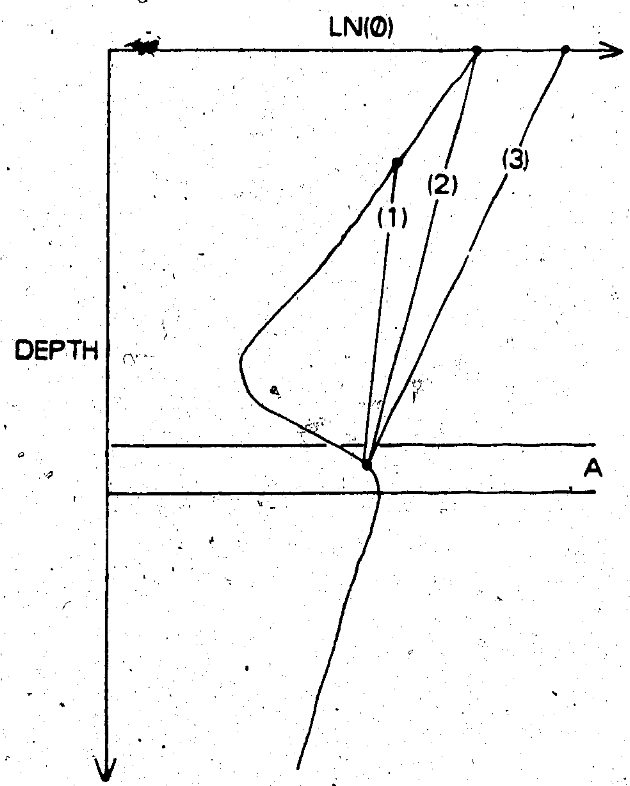


Figure 4: Porosity-depth plot for a column of shale .

of that lithology. But such plots show considerable scatter of points (Magara (1976, 1978) noticed this also), suggesting that even for layers of the same lithology the burial paths may be slightly different (or considerably different, depending on the degree of scatter).

Perrier and Quiblier (1974) suggested that, for purposes of estimating burial histories, it can be assumed that the shallow portion of the burial path of a given layer of ancient sedimentary rock should be similar to the burial path of a column of recent (homogeneous) sediment of the same lithology. But if this particular layer was buried in a mixed column of sediments, its compaction history may be quite different from the behaviour in a homogeneous column (because of all the interdependent processes that could occur). Compaction is not only a function of burial depth but also of the characteristics of the sediment in which the layer is buried. In addition, it is often difficult to find thousands or even hundreds of metres of recent sediment of a particular lithology in order to define the porosity at a given depth (Perrier and Quiblier, 1974; Bond and Kominz, 1980). The burial path of a layer of sediment reflects a change in porosity with depth and age. (Age and depth are not necessarily linearly related, either.) The burial path may not be smooth because large gaps in sedimentation, or erosion of part of the column, may result in periodic cessation of loading and compaction. Sedimentary rocks below an unconformity could have undergone some compaction by a load that was later removed. If they were overpressured, the rocks may have compacted slowly under their own weight (Magara, 1978).

So far, we have discussed only the physical aspects of burial paths, but chemical processes such as cementation and growth of authigenic minerals in sandstone may also reduce porosities and permeabilities. Permeability decreases complicate the migration of fluids necessary for compaction (Magara, 1978). So the chemical compaction of a given layer depends on, and in turn influences, the chemical and physical compaction of surrounding layers.

It may be impossible to know the exact burial history of any particular sedimentary layer. Thin section examinations could be helpful in identifying some of the processes that occurred, but such questions as the initial porosity of the layer, and the amount and rate of compaction at any time may still be unanswerable.

Burial curves

This section discusses mathematical descriptions of burial paths, burial curves.

Athy (1930) observed that the porosity of mudstones decreases exponentially with depth (z)

$$\emptyset=\emptyset_0*EXP(-C*z) \quad (13).$$

Later authors, most notably Rubey and Hubbert (1959), and Magara (1972, 1978) applied this equation in shale compaction studies. Maxant (1980) applied a number of density-depth functions to Cretaceous shale density measurements in the Alberta Basin. From among linear, exponential, hyperbolic, parabolic, and fourth degree polynomial functions, Maxant (1980) found the best fit with Athy's exponential function. Magara (1978) found that in the Gulf Coast area (normal) shale porosity showed an exponential decrease with depth over a depth interval of 2100 m. Sclater and Christie (1980) found an exponential relationship for normally-pressured shale in the North Sea Basin. There was considerable scatter in their porosity-depth plots, which they attributed to differences in silt content of the shale and to slight overpressuring.

Selley (1978) found that the porosity-depth relationship of sandstones from the North Sea Basin appear to be linear rather than exponential. Thomas and Oliver (1979) found that the decrease of porosity with depth of Viking Formation sandstones in Alberta was essentially linear but with scattered high porosities at shallow depths. On the other hand, they found no distinct trend for Cardium Formation sandstones. However, Sclater and Christie (1980) found that the decrease in sandstone porosity with depth could be expressed by an exponential curve. Bond and Kominz (1984) also supported an exponential curve for sandstones, as did Perrier and Quiblier (1974, Fig. 5). Sarmiento (1961) found that the log velocities of sandstones decrease exponentially with depth. This could be seen both in younger and older (more consolidated) sandstones. He found that the rate of decrease was considerably higher in younger (more unconsolidated) sandstones. In consolidated sandstones, porosity and travel time are linearly related, according to the time-average equation (Asquith, 1982). Bearing in mind that a correction factor must be applied to the unconsolidated rocks, it still appears that the behaviour of Sarmiento's samples is closer to exponential than linear.

Porosity-depth trends are rarely smooth and well defined. Maxant (1980) found that Upper Mannville Group densities increase regularly with burial depth and that the average density of the Upper Mannville increases towards the Foothills. For the Lower Colorado Group the data were scattered and there was no obvious dependence of density on depth. For the interval from the base of the Fish Scales to the First White Specks he found the same result. Oddly enough, for the Second White Specks to First White Specks interval, he found that the density actually decreased with depth. So, even in thick shale formations (the base of the Fish Scales to the Second White Specks and the Second White Specks to First White Specks) no dependence of density on depth was found. Maxant (1980) concluded that

> "This demonstrates that even thick rock sequences may depart significantly from a "normal" density for a particular depth, and that sometimes depth or lithological composition are not decisive factors in controlling density."

The porosity-depth plots calculated by Magara (1972, 1978), while still showing considerable scatter, usually do show a trend of decreasing shale porosity with depth. Perhaps this is because Magara plotted the points over larger depth intervals. Still, this scatter indicates a difference in compaction even in layers with the same lithology.

A major factor controlling the burial (compaction) history of a layer is the initial porosity of the layer, the starting point on the burial path/curve. The problem is that the initial porosity is never known. The range of porosities of recently deposited sand bodies is fairly wide, depending on the environment of deposition, grain size, and style of packing (Pryor, 1973). The depositional porosities of sandstones increase with better sorting, increasing grain size, looser packing, and lower clay content. Mudrocks also have a wide range of initial porosities (Rieke and Chilingarian, 1974).

In the present study, a burial curve is a curve extrapolated from the present (in-situ) porosity of any layer to the initial porosity of that layer. Each layer in a column of sediments may have started out with a slightly different initial porosity and may have had a slightly different history, but generally should follow a similar function. It is a simplification to assume that the burial path of a given layer of sediment can be described by a single smooth curve. In some cases, the history may not be represented by a single curve but, rather, by a series of curves. For example, in any column gaps in sedimentation and periods of erosion occur; in cases like this, sedimentation and compaction are not smooth functions of either depth or time, but there is no choice but to extrapolate across the "rough spots".

Even though it is not possible to define the precise burial path, it is possible to define certain limits of the burial history: an "envelope" containing numerous possible burial curves/paths. This was how Bond and Kominz (1984) determined the maximum and minimum effects of both chemical and physical compaction in order to decompact columns of old (Paleozoic) and severely compacted sedimentary rocks. They surveyed the literature for their compaction curve limits: i.e. maximum and minimum initial porosities and maximum and minimum exponential curve constants (C). They assumed that the maximum initial porosity coupled with the maximum C represented the maximum possible change in thickness and density, which was due to mechanical compaction and purely local grain solution and reprecipitation (conservation of initial grain volume, with reduction of pore volume). Therefore, the minimum initial porosity coupled with the minimum constant C represented the minimum possible change in density. For the minimum thickness and density change they assumed that all lithologies except shale were uncompactable: all other lithologies were assumed to have undergone porosity reductions and density increases solely by the addition of cement from an external source (conservation of initial thickness, increase in total solid volume), but remained equal to their present thickness. Bond and Kominz (1984) admitted this is a highly unlikely lower limit, considering the great amount of cement needed to fill the pore spaces.

C. DECOMPACTION METHODS

Decompaction

Decompaction is a quantitative method of reconstructing the thickness and density history of a sedimentary rock layer (Conybeare, 1967; Perrier and Quiblier, 1974; Sclater and Christie, 1980). The present in-situ porosity of a sedimentary rock indicates the maximum compaction state of the rock and, therefore, can be used to determine its original thickness and density (Magara, 1978). This assumes that compaction is a purely mechanical process involving the volume reduction of a layer of sediment through expulsion of pore fluids. As Bond and Kominz (1984) pointed out, another alternative is to assume that porosity reduction was accomplished solely by cementation with no change in thickness.

The literature contains many examples of decompaction methods. The simplest way to estimate the original thickness of a sediment is to multiply the present thickness by some compaction factor (Perrier and Quiblier, 1974). Magara (1978) pointed out that the total volume of fluid lost (compaction) since the deposition of a sedimentary layer can be estimated simply by assuming no change in the grain volume. The initial volume of sediments (V_0) can also be estimated using this equation

$$V*(1-\emptyset)=V_0*(1-\emptyset_0) ,$$

where $\emptyset_0$ is the initial porosity, and $\emptyset$ is the final porosity. However, this cannot be used to produce a continuous estimate of thickness change over time, so burial history curves, which show the reduction of porosity with depth were developed (Perrier and Quiblier, 1974). The burial history curves should be constructed from information in wells in the area of study. Composite or ideal burial curves, such as those used by Conybeare (1967), indicate the general trend of compaction (progressively smaller amounts of compaction with depth of burial) but are not specific to the area of study.

In the following sections of this study, the burial history of Cretaceous rocks in Alberta will be estimated. The burial history is calculated in two parts. In the first part, it is assumed that the total amount of solids in any layer has remained constant over time. In the second part, it is assumed that, for sandstones, the total thickness has remained constant, but the total amount of solids has increased due to cementation.

Constant grain volume

The fundamental assumption in the method of constant grain volume is that, as the sediment is compressed and the porosity reduced, the volume of mineral grains remains the same. If a relationship between porosity and depth of burial can be established, and the solid volume (or solid height, in one dimension) of a specific layer of sediment is known, then the total volume (or thickness) of that layer at any depth can be calculated (Conybeare, 1967; Perrier and Quiblier, 1974). Given an equation relating porosity and depth (such as Equation 13), and assuming that the solid grain height is constant, the solid grain height in a given layer where the top of the layer is A and the bottom of the layer is depth B (for an exponential function) is

$$HS=\int_A^B [1-EXP(-C*z)]dz \qquad (14)$$

(Perrier and Quiblier, 1974). To find the total thickness of this layer (B-A) at any particular depth (B), the previous equation is expanded to give

$$B-A=HS+(\emptyset_0/C)*[EXP(-C*B)-EXP(-C*A)],$$

which is solved numerically for A (Sclater and Christie, 1980). See Figure 5.

Sometimes, in the case of erosion (Fig. 5) or if logs were not run, porosity-depth equations are unavailable. It is best to use the present in-situ porosities, if possible, because they indicate the maximum level of compaction of the rocks, but the next best thing is to resort to composite curves based on the porosity-depth behaviour of recent sediments of fairly pure lithologies. Bond and Kominz (1984) and Perrier and Quiblier (1974) pointed out that it is often difficult to find thick deposits of homogenous recent sediments.

Porosity-depth curves of mudrocks are thought to be reliable indicators of the compaction history under overburden stress (Rubey and Hubbert, 1959; Magara, 1978). Porosity-depth curves of clean sandstones may not be so reliable because of the effect of cementation. Such plots reflect the present burial conditions (Magara, 1981).

There is still the question of how to unravel the compaction behaviour of mixed sediment layers. In wells consisting of layers of different lithologies, Sclater and Christie (1980) simply moved the layers up to shallower depths on the porosity-depth curves corresponding to the lithology of the layer. This procedure may be reasonable in a column of uniform lithology where all the sediments behave according to a single least-squares curve, but when the sediments are mixed together, they may not follow the same curve.

We know from examples that a shale unit deposited between two sandstone units and a shale unit deposited in a column of shale behave differently (Chapman, 1983). The center of the second shale may be partially overpressured. The rate of compaction may have been different, over time, in adjacent sandstones and shaly sandstones. Even a single shale curve may not apply to all shale layers in a column.

Variable grain volume

The assumption of constant grain volume is a simplification of a complex process. Perrier and Quiblier (1974) and Bond and Kominz (1984) rightly pointed out that the thickness and density changes in sedimentary rocks are not due solely to mechanical compaction, the simple squeezing out of interstitial water and rearrangement of grains. In fact, pore space may increase or decrease: grains may be partially dissolved and the dissolved material may reprecipitate locally or maybe carried away. Also, cements that are not local in origin may precipitate around the grains so that the solid volume may not be constant.

For the minimum thickness and density change in sandstone, Bond and Kominz (1984) assumed that the total thickness of sandstones had not changed and that the density increase was due solely to the precipitation of cement from an external source. Calculating the amount of solids (detrital grains and cement) at any depth is similar to calculating the solid grain height. The porosity at any depth is known from a porosity-depth curve, and the thickness (the distance between B and A in Equation 14) is constant. So the increase in HS with depth can be calculated from Equation 14. An assumed initial grain height (detrital grains) subtracted from HS gives the amount of cement at any depth. However, it must also be assumed that the original amount of detrital grains is constant and that cementation increases with depth; it is difficult to model a process whereby the porosity increases with depth.

Estimating thickness changes over time

So far, thickness changes have been discussed only with respect to depth of burial. Perrier and Quiblier (1974), however, developed a useful method of calculating the thickness changes in sedimentary rocks over time. This method gives the history of

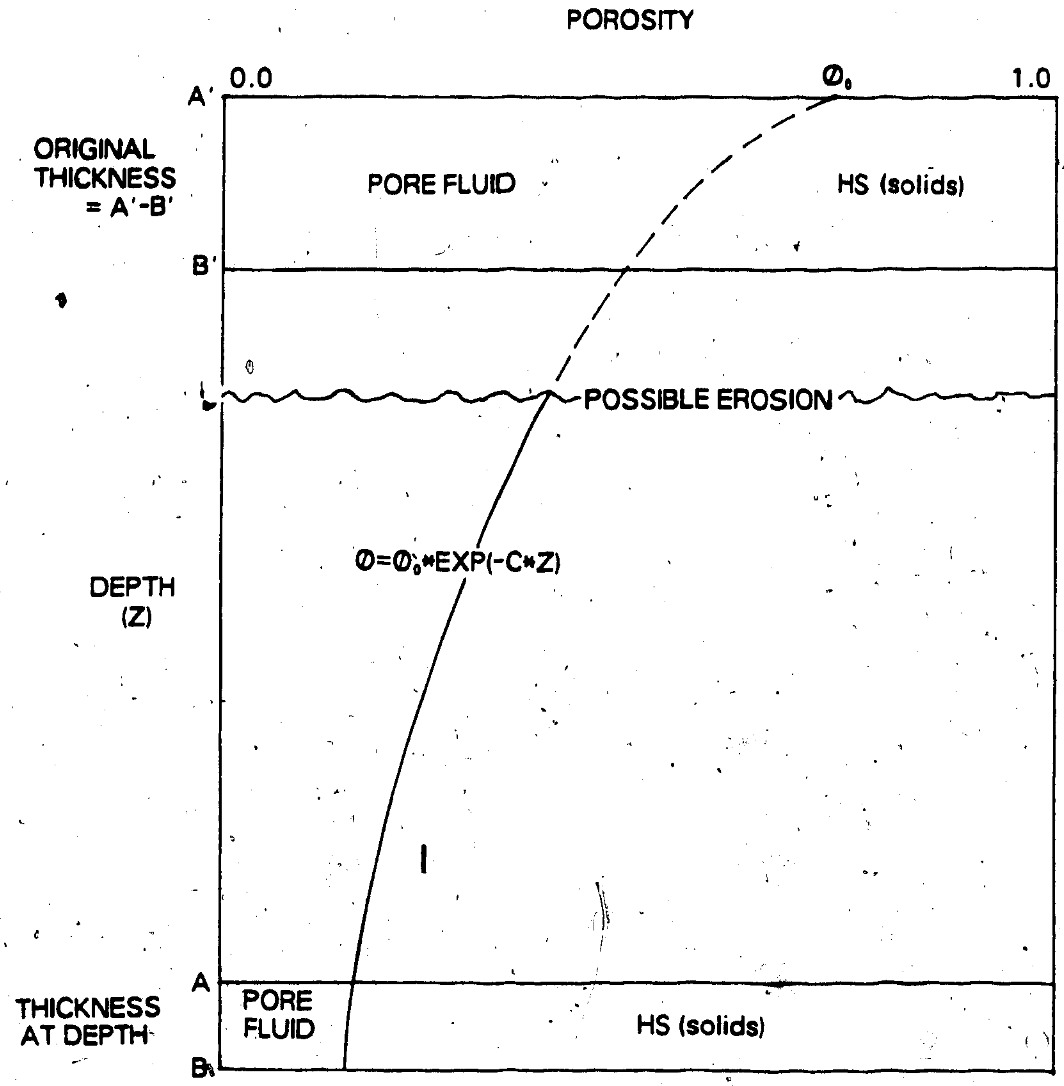


Figure 5: Sediment compaction calculations, assuming constant grain height.

incremental layers of the entire geologic column in an area. Porosity logs (sonic, density) were used to measure the amount of solid matter in a given layer within a stage (a given interval of sediment bounded by dated horizons). Their use of the term stage is unfortunate because it can be confused with the stratigraphic term. In this study, the word <u>interval</u> is used instead. The term interval could refer to a geologic formation, the interval between two stratigraphic markers, or a stage in the true sense (e.g. Coniacian Stage). Perrier and Quiblier (1974) divided each interval into a number of layers (they called them slices) which represent a certain fraction of the (constant) solid matter and time in the interval. The present solid grain height is then compared with porosity depth curves for recently deposited sediments in order to reconstruct the thickness of the layer during the early stages of compaction (i.e. using Equation 14). This was done for the first five steps of compaction, then a straight line was interpolated from the last initial step to the present thickness of the layer.

They also pointed out that the amount of solid material (grains) in a given layer gives a better idea of the actual amount of sedimentation because it is independent of compaction, whereas the total thickness is not. The simplest way to estimate the average rate of solid grain height sedimentation for an interval is to assume that the rate for each lithology in an interval is comparable. The time represented by any layer is the solid height of the layer divided by the average total sedimentation rate of the interval. This is a simplification because a continuous section of sediment probably does not have a linear time scale with respect to depth. However, the smaller the stage, the better the age estimate of each layer in the stage. Perrier and Quiblier (1974) suggested estimating layer duration times by assuming a ratio between the sedimentary rates for every different lithology in the interval. For example, the sedimentation rate of shale could be assumed to be half as much as sandstone, which is not necessarily true.

The major drawback of Perrier and Quiblier's decompaction method is that a linear interpolation is used between the first few calculated initial thicknesses and the final thicknesses of the layers. They admit that the actual compaction history is probably non-linear. In the following section it will be seen that if the relationship between porosity and depth is exponential (and there is much evidence for this) then the compaction behaviour of a layer over time is non-linear.

Another disadvantage of their method is the need for a porosity-depth curve (and mathematical relationship) for recent sediments of similar lithology as those in the layers being studied. Perrier and Quiblier pointed out that curves for recent sediments are not always available, especially curves of pure lithologies, since sediment layers are often mixed. In cases like this it is necessary to resort to a schematic or composite curve (i.e. Conybeare, 1967; Gretener and Labute, 1969) which may have a different slope and initial porosity from the sediments in the area of study.

As discussed in the method of volumes, the change in thickness of a layer of a particular lithology is calculated from the porosity curve of that lithology. Again, this may be a reasonable approximation in intervals of homogenous lithology, but the evidence shows that when lithologies are mixed, the behaviour is different from that in a single homogeneous column. So curves of recently deposited homogeneous lithologies provide only an approximate guide for the decompaction of a mixed column.

Even if porosity-depth information is available locally, it may not be complete because of surface erosion. Also, there is considerable scatter of points around empirical porosity-depth curves (Maxant, 1980) due to variations in silt and sand content, and slight overpressuring. A simple, smooth curve may therefore be geologically unrealistic.

A third drawback to Perrier and Quiblier's (1974) method is technical. Calculating initial thicknesses from recently deposited sediments (for a given number of steps), summing the thicknesses for those steps, calculating the slope of the interpolation line, summing all the slice thicknesses at specific times in the history of the basin: all these steps lead to a very cumbersome algorithm. Even if it is to be solved with a computer, the longer and more cumbersome the algorithm, the greater the chance for error, and the more inefficient and expensive the computer program.

Finally, the advantages of their method are that the present, in-situ porosity of the rock is used; the porosity can be estimated at any time without worrying about the depth of burial, and it can be used to extrapolate the compaction history across small unconformities (assuming that compaction of the column continues during the gap under its own weight and the weight of sediment later eroded) (Perrier and Quiblier, 1974).

D. A BURIAL-TIME DEPENDENT COMPACTION MODEL

Individual burial paths for each layer

One possible way to estimate the compaction history of a sedimentary column is to assume that each individual layer in the column has its own burial path. In the case of a column of ideally homogeneous layers, each layer would have exactly the same burial path. The initial porosity would be the same and the rate of water loss, the rate of sedimentation (loading), and the rate of any chemical process would be the same for each layer. In this ideal case, a single porosity-depth curve could be used to restore the thickness of any layer at any given depth. In reality, each layer may have a slightly different path. The problem is how to determine a mathematical function to estimate the burial curve for each layer.

The endpoints of the burial curve for any layer are the initial porosity / thickness and the present porosity / thickness. The present average in-situ porosity for any layer can be calculated from geophysical well logs. The problem in Western Canada is that the considerable amount of erosion during the Tertiary removed the record of the near surface porosities. Essentially, the top part of the burial path is missing. Even if it still existed, the surface porosities may not be representative of the initial porosities of each sedimentary layer below.

Attempts have been made to mathematically reconstruct the thickness of sedimentary rocks removed by analyzing shale porosities. (Maxant (1980) and Magara (1976, 1978)). The method consists of plotting the shale porosity (or density, or sonic travel time) against depth on semi-log paper and then extrapolating the normal compaction trend to an "average" surface porosity (Magara, 1976, used .62). The method is subjective (for example, in choosing the points that define the so called normal compaction trend) and the results are questionable. Estimates of erosion by Hacquebard (1977), Nurkowski (1984), Hitchon (1984), and England and Bustin (1985), based on coal rank, are considerably greater than both Magara's (1976) and Maxant's (1980) estimates, but agreement has not been reached on maximum values. Maximum estimates range from 3 km (Hitchon, 1984) to 9 km (England and Bustin, 1985).

If each layer in a sedimentary column had a different burial path, then it is likely that the surface porosities of each layer may have been different also. Pryor (1973) found that the surface porosities of recent sand bodies ranged from .56 to .17. This is comparable to the values presented in Perrier and Quiblier (1974, Fig. 13). Rieke and Chilingarian (1974, Fig. 55) gave a graph of porosities versus depth of shales, from various sources. Perrier and Quiblier (1974, Fig. 5) gave a similar graph, again, from numerous sources. Both of these graphs show a great deal of scatter of the porosity points, but from the depositional surface to about 1 metre below the surface, the observed porosities for shales all fall within the range .85 to .60. Sclater and Christie (1980) simply assumed that with increasing sand content, the water in pore spaces in the shales would be displaced by the sand grains. So, for shaly sandstone (50% shale) the surface porosity would be halfway between shale and sandstone. In this study, the surface porosities of shaly sandstones are assumed to range from .71 to .39 (Sclater and Christie used .56). The surface porosities used in this study, generally, have higher maximum values and cover a broader range of values than those in Bond and Kominz (1984).

The precise initial (surface) porosity of any given layer is unknown, but it is likely that the values fall somewhere between the ranges above. So now, maximum and minimum burial curves for each layer can be constructed by extrapolating the respective surface porosities for the lithology of a layer to the present in-situ porosity of that layer. This procedure results in two curves forming an envelope that should contain the true burial path/curve. See Figure 6. (Derivation of the equation for these curves follows in the next section).

It is possible that a particular layer within a column had a surface porosity higher or lower than the values used here. However, this will not make much difference to the decompaction estimate for the entire column. The use of maximum and minimum curves pessimistically assumes, for the maximum case, that every layer in the column started out with the highest initial porosity in the range, and, for the minimum case, that every layer started out with the lowest initial porosity in the range. It is improbable that each layer in the column followed either the maximum or minimum curve. It is more likely that the distribution of initial porosities will be fairly random.

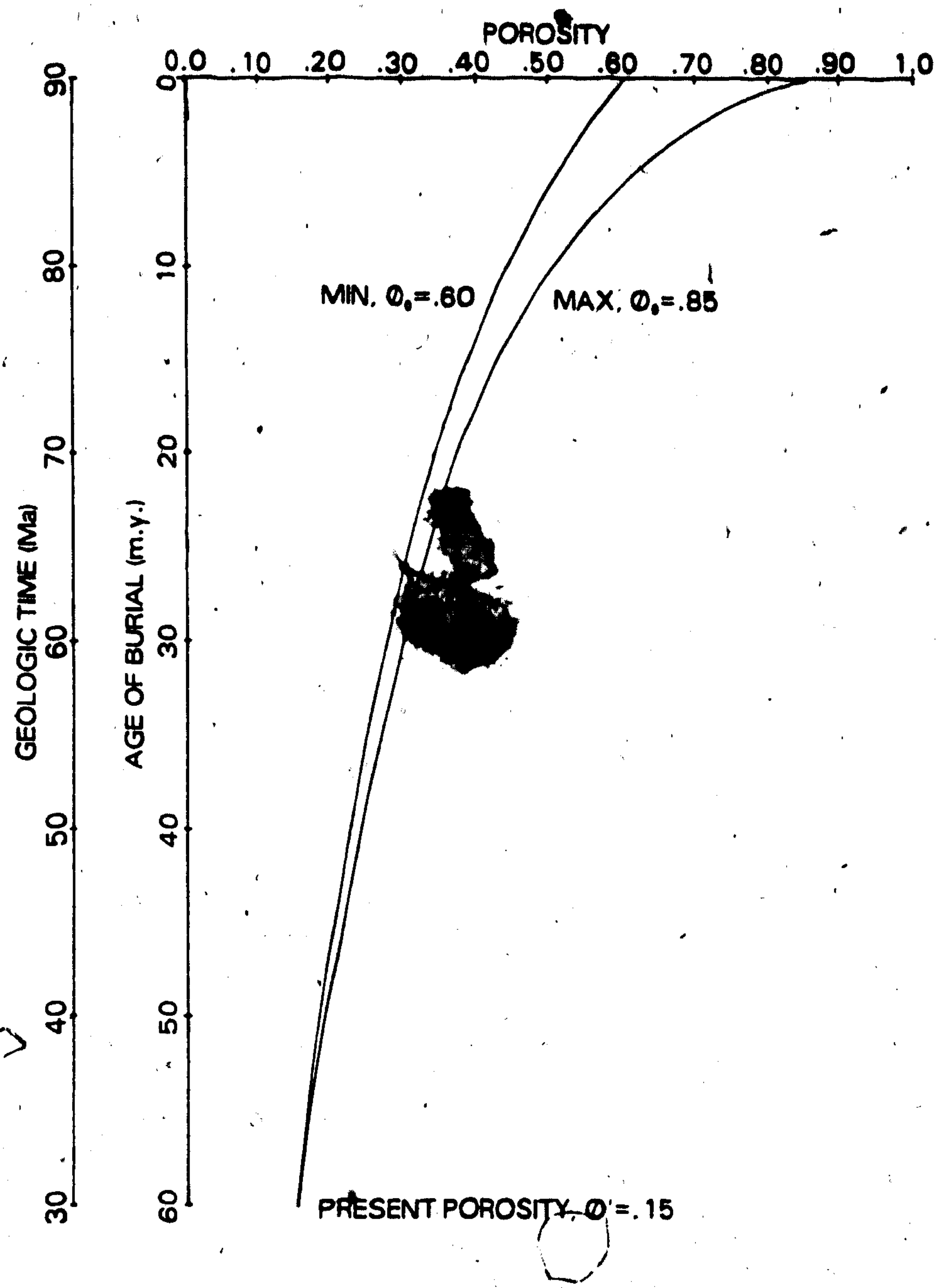


Figure 6: Maximum and minimum porosity-burial time curves .

The actual burial path should be between the maximum and minimum curves, but the actual path may not be as smooth as these curves. There may have been some perturbations in the burial history of a given layer which resulted in changes in the porosity gradient, but these can not be foreseen; only the burial path envelope can be described.

There remains the possibility that, at one time in its history, a layer may have crossed outside the boundary of the envelope (as it exists today) and later moved back inside. For this to occur there would have to be a fairly sudden change in the porosity gradient. Most plots of porosity versus depth generally show a gradual change with depth (even though there can be scattering of points). Sharp, sudden changes in slope are usually not seen (apart from the bumps caused by overpressured zones) (see Perrier and Quiblier (1974), Fig. 5, Rieke and Chilingarian (1974), Fig. 55).

A burial curve is simply a way of extrapolating between the present porosity and some surface porosity. As such, it can accommodate overpressured and normally pressured sections. The path of the overpressured section should fall within the range of the envelope. Since these sections may have leaked, the present porosities may have decreased slightly since the time of maximum burial (Magara, 1978). Still, the upper part of the envelope should suffice to describe the early burial history.

Now that the burial path, or, at least, the limits of the burial path, have been defined, the maximum and minimum burial curves must be described mathematically for each layer in a column of sedimentary rock. This can be done either by describing porosity as a function of burial depth or as a function of burial time. Developing a porosity-depth function requires knowledge of the maximum depth of burial of each layer. As mentioned previously, this is unknown because of Tertiary erosion. However, a porosity-burial time function can be developed and has certain advantages over burial depth methods.

The porosity-burial time equation

Figure 7 shows a column of sediment composed of ideally homogeneous layers, where each layer has the same burial path as that described by the exponential burial curve. This curve shows the behaviour of a layer as it is progressively buried under other layers that behave in exactly the same way with depth. The porosity-burial time equation is derived from the equation for the solid grain height, HS (Equation 14)

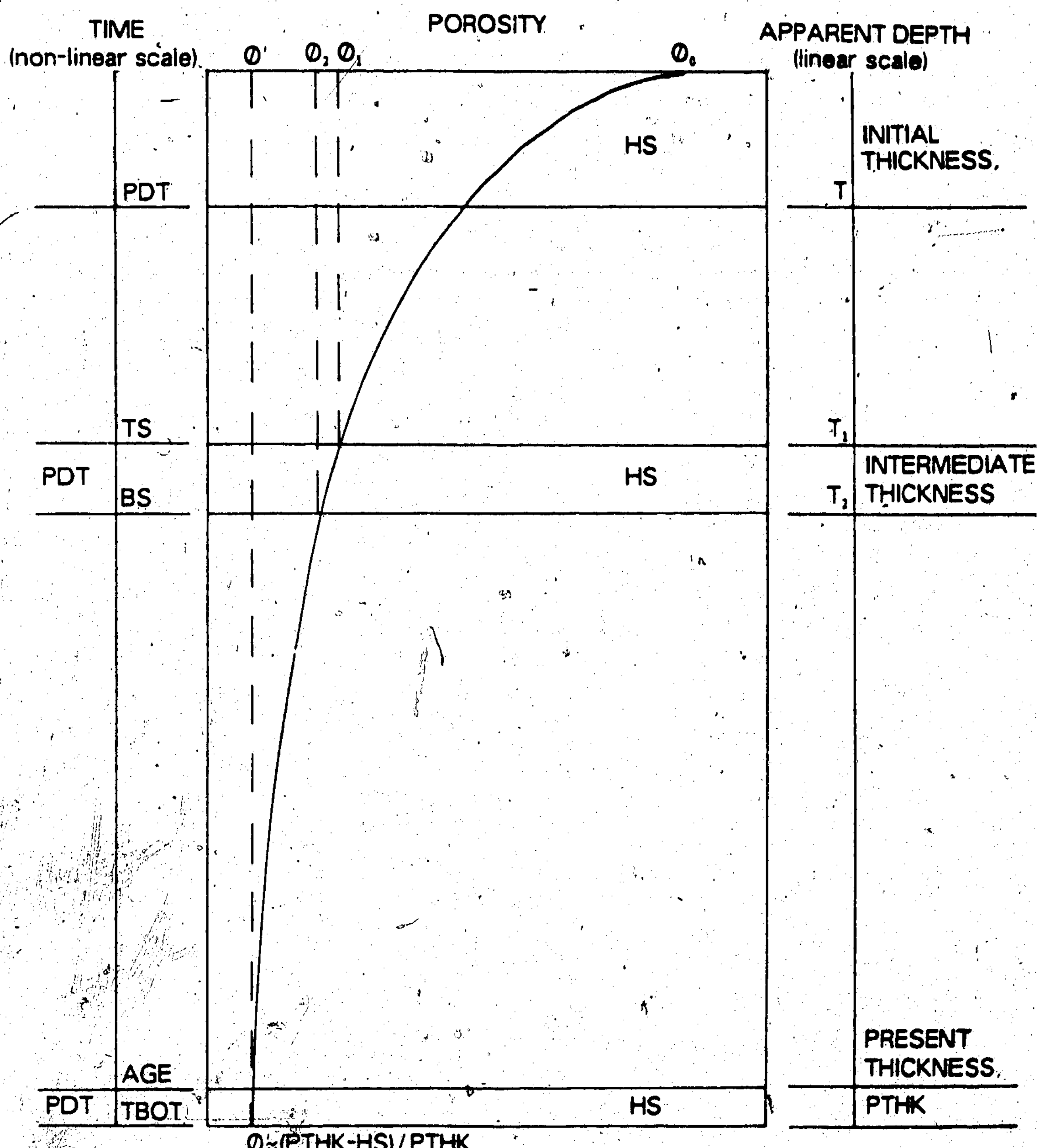


Figure 7: Compaction of an ideal homogeneous column of sediment with increasing depth of burial.

$$HS=\int_0^T [1-\emptyset(z)]dz,$$

where T is the initial thickness of the layer. This can be expanded to

$$HS=T+[\emptyset_0/C]*[EXP(-C*T)-1] \quad (15).$$

Assuming a constant average solid grain height sedimentation rate (R=HS/t) for each layer in the column

$$t=[T+(\emptyset_0/C)*EXP(-C*T)-(\emptyset_0/C)]/R \quad (16).$$

The porosity-depth equation (Equation 13) can also be written as

$$-C*T=LN(\emptyset)-LN(\emptyset_0).$$

Introducing this into Equation (16) gives

$$t=[\emptyset_0*EXP(LN(\emptyset)-LN(\emptyset_0)) -\emptyset_0+LN(\emptyset_0)-LN(\emptyset)]/C*R.$$

Or, solving for C*R,

$$C*R=[\emptyset_0*EXP(LN(\emptyset)-LN(\emptyset_0)) -\emptyset_0+LN(\emptyset_0)-LN(\emptyset)]/t \quad (17).$$

At greater depths (and times) the burial curve gradually flattens. The porosity does not change greatly over the thickness of the layer by the time it is fairly well compacted (see Figure 7). The average total porosity of the layer (which is very close to the porosity at the bottom of the layer) after a considerable period of compaction is

$$\emptyset=(PTHK-HS)/PTHK,$$

where PTHK is the present average layer thickness. Ideally, the layer should be infinitesimally thin. In practice, the compacted layers have a finite thickness: in this study an arbitrary thickness of ten feet was chosen. The reason why this thickness was chosen and the way in which the average in-situ porosities were calculated are discussed in Chapter 4.

The symbol TBOT stands for the time at which compaction (physical or chemical) ceased. Since the end points of the compaction curve $\emptyset_0$ and $\emptyset'$, and the time t (TBOT) are known, Equation 17 can be solved for C*R, which is constant for the curve in Figure 7.

Rearranging Equation 17 makes it possible to calculate the porosity at any given time along the burial curve. The porosity-burial time equation is

$$\emptyset=EXP[\emptyset_0*EXP(LN(\emptyset)-LN(\emptyset_0))-\emptyset_0+LN(\emptyset_0)-t*C*R] \quad (18).$$

For any porosity-burial time curve, neither C nor R have to be constant, but the product of these two variables does have to be constant. Equation 18 gives curves like those in Figure 6.

As discussed before, in reality the burial paths of each layer in a column of sediment may differ: the porosity of any particular layer at different depths may be different from that of adjacent layers. This is the real behaviour, with respect to depth, of the layers. Figure 7 represents the ideal behaviour of any one layer. The depth scale on Figure 7 does not refer to the actual depth of burial in nature. To make this distinction, it has been labelled "apparent depth." The apparent depth is only used relatively to calculate the thickness of a layer at any time. It should be noticed that the time scale is non-linear. If the time scale was linear, the curve would resemble those in Figure 6.

In reality, $\emptyset_0$ is unkown for any given layer. So for each layer consisting of one of the three predominant lithologies (shale, sandstone, and shaly sandstone), the maximum and minimum surface porosities are used instead. Equation 17 is then solved for the maximum and minimum values of C*R (corresponding to, respectively, the maximum and minimum initial porosities). The exact porosity at any time is unknown, but it should fall between the maximum and minimum curves (maximum and minimum C*R's) which are interpolated from the maximum and minimum initial porosities to the present porosity of the layer.

Layer deposition times and ages of layers

In order to calculate the maximum and minimum constants (C*R) of the porosity-burial time equation, it is necessary to know the present age of the top and bottom of each layer in the sedimentary column represented by a section of a well log. In this study approximate ages were assigned to formation tops and markers identified in well logs. This is discussed in detail in Chapter 4.

A subroutine in the program COMP calculates the present age at the top of each layer within a dated interval (formation or stage) and the time represented by each layer (PDT) within that interval. When calculating the age of each layer a linear time scale over each formation or stage is assumed. The average rate of solid grain height deposition (ARTOT) for each formation or stage in the column is simply the sum of the solid grain heights for each lithology in the interval (HSTOT) divided by the duration (in millions of years) of the interval

$$ARTOT=HSTOT/(ABS-ATS).$$

ABS and ATS are the age of the bottom and top of the interval, respectively. The average time of deposition of each layer (PDT), in millions of years, of a particular interval was calculated by dividing the solid grain height (HS) of each layer in the interval by ARTOT

$$PDT=HS/ARTOT.$$

The present age of the top of any layer is calculated by subtracting the present age at the top of the interval (ATS) minus the average times of deposition of each layer (PDT) between the top of the interval and the layer of interest. The present age of the top of the most recently deposited layer in any interval, M, is ATS(M). The present age of the top of the next (older) layer is

$$AGE(M,2)=ATS(M)+PDT(M,1).$$

The present age of the top of the following intervals is

AGE(M,J)=AGE(M,J-1)+PDT(M,J-1),

where J is the total number of layers in interval M. The present age of the bottom of any layer (TBOT) is simply

TBOT=AGE+PDT.

The porosity Ø' and age TBOT define the coordinates of one end point of the porosity-burial time curve.

In order to solve Equation 17 for the constant C*R, it is necessary to know the time between deposition and maximum compaction of the layer. For reasons to be discussed in Chapter 4, 30 Ma appears to best represent the time of maximum burial and, hence, maximum physical compaction in the Alberta Basin. Chemical compaction (cementation) is assumed to have continued up to the present day. In the case of physical compaction, t is TBOT-30 Ma. In the case of chemical compaction, t is simply TBOT.

Now that the constants C*R and the initial porosities are known, the porosity at any time along the burial curve can be calculated. In the program COMP (Appendix 1) these times are represented by the variable TMK. During computer modelling of porosity and thickness changes over time, a number of situations can occur. See Figure 8. In the first situation AGE+PDT (=TBOT) is less than or equal to TMK. Obviously, the thickness of the layer at this time is zero because it has not been deposited yet. In the next case AGE is greater than TMK. Two new variables must be introduced here. The variables TS and BS stand for the age, or duration of burial, of the top and bottom of the layer, respectively, at the time of interest, TMK. Here, TS is AGE-TMK and BS is TBOT-TMK. In some situations, however, TBOT may be greater than TMK while AGE is less than or equal to TMK; since TS cannot be negative it must be zero.

In modelling the deposition and compaction of a sedimentary column, it may be of interest to know the thickness of the column at a time that happens to fall in the middle of a layer. At this time, the layer is still being deposited, but that portion of the layer that has been deposited so far has compacted under its own weight. In this case TS=0 and BS=TBOT-TMK.

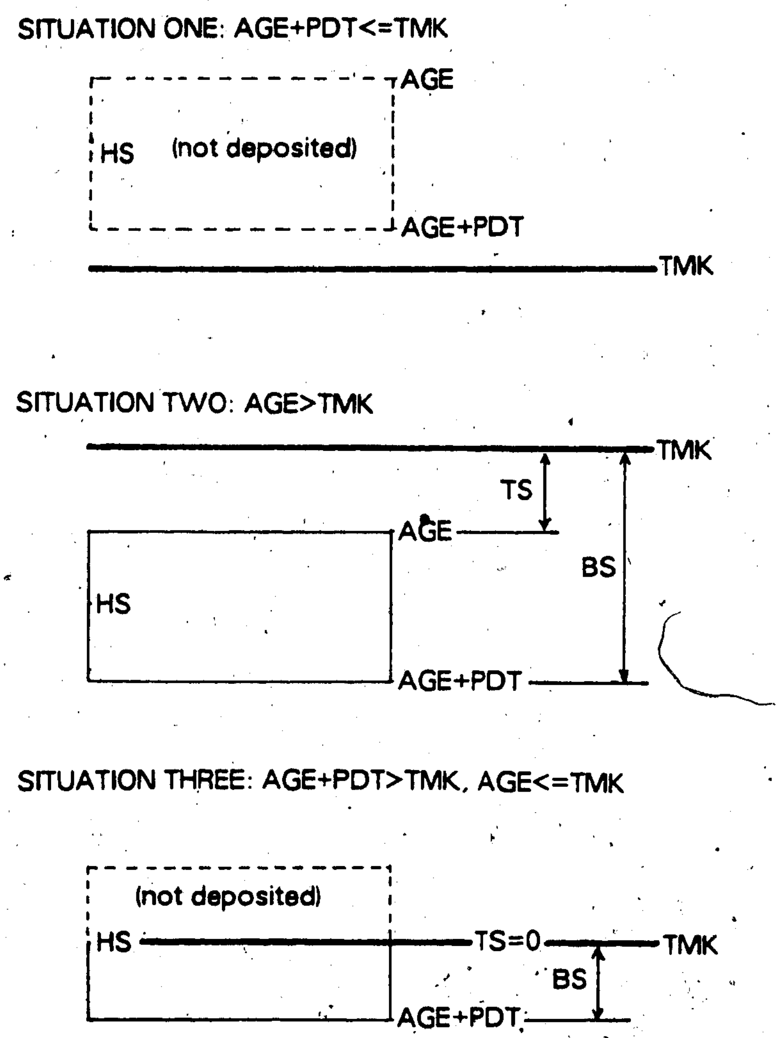


Figure 8: Procedure for modelling layer deposition.

It was stated previously that neither C nor R had to be known individually. However, in the case of a partially deposited layer, it is necessary to know the solid grain height deposited at time TMK. In order to get around this problem, it is best to solve Equation 17 for C, assuming that R for the layer is simply HS / PDT (which is equal to ARTOT).

Now, the porosities at the top ($\emptyset_1$) and bottom ($\emptyset_2$) of any layer at given times (TS and BS) along the maximum and minimum burial curves can be calculated. See Figure 7.

Calculating thickness and load changes, Part 1

The simplest way to calculate the thickness of a layer when the porosities at the top and bottom of the layer are known is as follows. Since C is known, from the porosity-depth curve, it can be used in the porosity-burial time equation (see Fig. 7). For the upper porosity

$$\emptyset_1=\emptyset_0*EXP(-C*T_1),$$

and for the lower porosity

$$\emptyset_2=\emptyset_0*EXP(-C*T_2),$$

where T_1 and T_2 are apparent depths for the layer, and are used only in a relative sense. The thickness of the slice (THCK) is T_2-T_1. Rewriting the porosity-apparent depth equations gives

$$LN(\emptyset_1)-LN(\emptyset_0)=-C*T_1,$$

and

$$LN(\emptyset_2)-LN(\emptyset_0)=-C*T_2,$$

and

$$THCK= T_2-T_1=[LN(\emptyset_0)-LN(\emptyset_2)-LN(\emptyset_0)+LN(\emptyset_1)]/C \qquad (19).$$

The equation is simpler to solve in this form, and is not reduced any further. The porosity-burial time equation is solved for $LN(\emptyset)-LN(\emptyset_0)$.

Solving the porosity-burial time equation requires finding the root of the equation. This can be done with a simple iteration process but results in an extremely inefficient computer program. A better way of finding the root is by using Newton's method (Swokowski, 1975). This method consists of using tangents to a function to solve for successively better approximations of the root. The basic equation is

$$y=x-[F(x)/F'(x)],$$

where x is the first estimate of the root and y is the (first) resulting approximation. For successive approximations x is replaced by y.

The porosity-burial time equation can be rewritten as

$$LN(\emptyset)-LN(\emptyset_0)=\emptyset_0 * EXP(LN(\emptyset)-LN(\emptyset_0))-\emptyset_0-t*C*R.$$

Let

$$x=LN(\emptyset)-LN(\emptyset_0)$$

and

$$B=-\emptyset_0-t*C*R,$$

then

$$x=\emptyset_0 * EXP(x)+B.$$

Now find the root of this equation (i.e. the value of x such that F(x) is zero). Let

$$F(x)=x-\emptyset_0*EXP(x)-B=0,$$

and

$$F'(x)=1-\emptyset_0*EXP(x),$$

so that

$$y=x-[x-\emptyset_0*EXP(x)-B]/[1-\emptyset_0*EXP(x)].$$

Again, x is the first estimate and y is the first approximation. The procedure is carried out for the top (t=TS) and bottom (t=BS) of each layer. The values $LN(\emptyset_1)-LN(\emptyset_0)$ and $LN(\emptyset_2)-LN(\emptyset_0)$ are put in Equation 19.

The in-situ vertical compressive stress or load of this layer is

$$S=Pbw*g*Z,$$

where Pbw is the average bulk water-saturated density (Rubey and Hubbert, 1959). The bulk water-saturated density is

$$Pbw=Pf*\emptyset+(1-\emptyset)*Pg$$

where Pg and Pf are the grain and fluid densities, respectively (Sclater and Christie, 1980). The fluid density was taken to be 1030 kg/m³ and the grain densities for shale, sandstone and shaly sandstone were taken as 2720 kg/m³ (Magara, 1978), 2650 kg/m³ and 2685 kg/m³ (Sclater and Christie, 1980) respectively.

The bulk water-saturated density is depth-dependent because the porosity is related to depth. The porosity-depth gradient within each layer was considerably higher when the layer was freshly deposited. So the equation for stress for the layer is

$$S=g*Pg*\int_{T_1}^{T_2}(1-\emptyset(z))dz+g*Pf*\int_{T_1}^{T_2}\emptyset(z)dz.$$

The apparent depths of the top and bottom of the layer are T_1 and T_2. The stress is then

$$S=g*Pg*HS+g*Pf*[(\emptyset_0/C)*EXP(-C*T_1)-(\emptyset_0/C)*EXP(-C*T_2)].$$

Since

$$THCK=HS+(\emptyset_0/C)*[EXP(-C*T_1)-EXP(-C*T_2)]$$

then

$$S=g*[HS*(Pg-Pf)+Pf*THCK],$$

where g is 9.81 m/s² and S is in Pascals (N/m²).

In calculating the thickness of sediments in the basin, the column of sediments was split into intervals bound by dated surfaces, and these intervals were further divided into layers. During deposition, each layer compacted under its own weight and the weight of the layers above it, but there is still a net increase in the thickness of the column because of further deposition (Perrier and Quiblier, 1974). Each interval gradually increases in thickness (STZ) and stress (STWT) during deposition; then the stage gradually begins to decrease in thickness and stress over time. Examples are given in Chapter 5. The history of any interval (STZ and STWT) is simply the combined history of each layer in the interval. As a layer decreases in thickness, the stress at the base of the layer also decreases because of the expulsion of pore water. The maximum thickness/stress was calculated using the maximum initial porosities and the minimum thickness/stress was calculated using the minimum initial porosities.

The maximum and minimum total subsidence estimates (Chapter 2) were calculated by taking the difference between the maximum and minimum cumulative thicknesses (TZ), for the maximum and minimum subsidence estimates, respectively.

Analyses of the thickness and stress changes in older units like the Nikanassin Formation and Fernie Group show that the magnitudes and rates of change are very small. See Appendix 2 (well 1). In the tectonic analyses, it was assumed that H, the thickness of the lithosphere and overlying "uncompactible" Paleozoic (and Triassic) sediments would remain constant, so these results are encouraging. The rates of change in older beds below should be even smaller. Also, errors in H should be smaller over shorter periods of time. Mossop (1972) examined differential compaction in the Redwater reef and estimated that compaction of the framework of the reef was about 13 per cent. So there is evidence to suggest that the Paleozoic carbonates as well as interlayered shales (McCrossan, 1961) do compact to some degree. However, 13 per cent is still a fairly small figure. McCrossan (1961) believed that draping of Cretaceous marker horizons over Devonian reefs below was evidence of post-Paleozoic compaction of the Devonian Ireton shale in Alberta, but he did not indicate the magnitude of compaction or, more importantly, the rate of compaction. Salt collapse is a major phenomenon in the Devonian of eastern Alberta, but again the rate of collapse is unknown. It is reasonable to assume that the rates of compaction in Paleozoic rocks were small relative to thickness increases due to sedimentation and thickness decreases due to compaction in the Alberta foredeep.

Calculating thickness and load changes, Part 2

So far, it was assumed that HS remained constant for all lithologies. In the discussion of chemical compaction, however, it became apparent that cementation is an important factor in reducing porosity in sandstones. In their decompaction method, Bond and Kominz (1984) decided that in the worst-case scenario for sandstone compaction the thickness change is zero and the decrease in porosity (and resultant increase in density) is brought about solely by the precipitation of cement from an external source.

The program COMP first calculates the thickness changes of all three lithologies, based on the assumption that HS remains constant. In the second part of the program, the maximum and minimum thickness changes are based on constant HS for shales and shaly sandstones, and constant total thickness PTHK, but variable HS, for sandstones. It was assumed that only sandstone layers containing less than about 33% shale were cemented. Assuming that a sandstone layer has not changed in thickness, the original solid grain height can be estimated based on the maximum and minimum porosities of the layer

$$HSO=PTHK*(1-\emptyset_0).$$

This is done in turn for the maximum porosity (.56) and the minimum porosity (.17). For shale and shaly sandstones the solid grain height calculated in the first part was used. Now, however, the total solid grain height will change because of the new sand grain height estimates (for the maximum and minimum cases). The rates of solid grain height deposition, AGE, and PDT were also recalculated.

In Part I it was assumed that compaction ceased when loading stopped around 30 Ma. Since, except for pressure solution, cementation is independent of stress, it is assumed that cementation continued until the present day. The form of the porosity-burial time curve is logarithmic and describes a smooth decrease in cementation and porosity with increasing depth and time. In reality, the change may not be as smooth as indicated, but it should fall within the max / min envelope. It is assumed that porosity does not increase with depth.

If the present porosity of a sandstone is greater than the minimum initial porosity (.17), then it is assumed that no compaction has taken place, for the minimum case. In most cases, the present porosity is less than or close to this value (.17). So, any interpolated porosity-time line would be virtually vertical. Therefore, any change in thickness or density over small time intervals would be negligible. Any attempts at modelling porosity increases with depth are hindered by not knowing which equation (linear, exponential) best expresses this change.

Figure 9 illustrates the basic idea of the constant total thickness/ variable HS model for sandstone. This diagram shows the sandstone consisting of three components: pore fluid HW, pore filling cement HC, and detrital grains HSO. To simplify the calculations, the program models the situation as if there were only two components: pore cement and pore fluid. So $\emptyset$ is the ratio of pore fluid to pore fluid and cement: PCW=(PTHK-HT) / (PTHK-HSO). Referring to Figure 9, HT is the total solid height HC+HSO, and HW is the height of the pore fluid. Cementation is assumed to be concurrent with deposition of the detrital grains. The amount of cementation (and density increase) is rapid

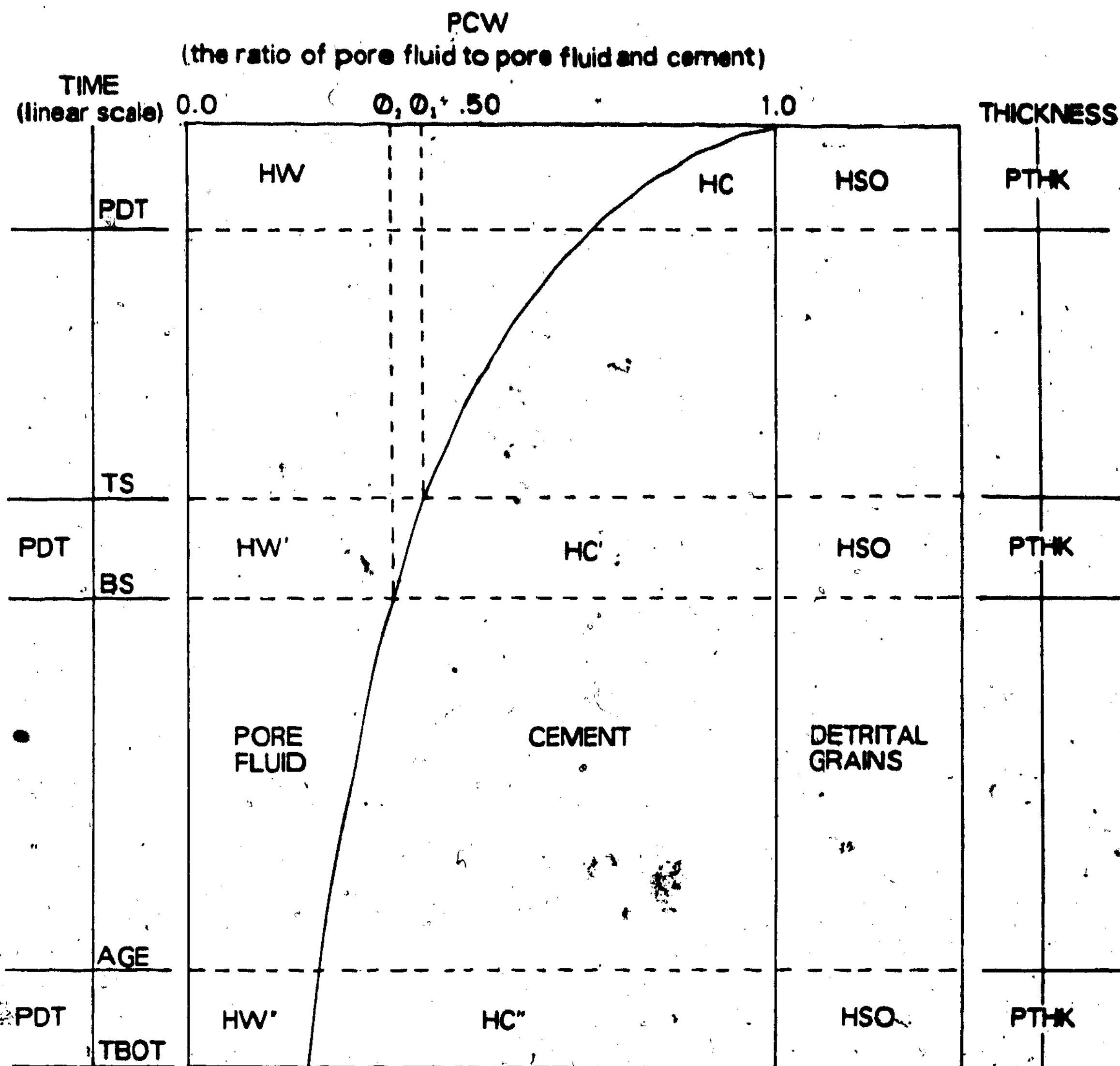


Figure 9: Procedure for modelling sandstone cementation.

at first, and then slows down. The detrital grain height (HSO) is assumed to be constant over time.

The object is to estimate the amount of cement and pore fluid at any time. This can be accomplished with the porosity-burial time equation (Equation 18). In the two component system (fluid/cement) $\emptyset_0$=1.0, so Equation 17 reduces to

$$C*R=[\emptyset-1.0-LN(\emptyset)]/t.$$

Where $\emptyset$ is PCW and t is TBOT. The constant C*R is then calculated, and then Newton's method is used to solve the following equations

$$x_1=LN(\emptyset_1)=\emptyset_1-1.0-t_1*C*R$$

and

$$x_2=LN(\emptyset_2)=\emptyset_2-1.0-t_2*C*R.$$

Referring to Figure 9, t_1=TS and t_2=BS. The amount of cement at the time BS can be estimated by applying the equation for the area of a trapezoid to estimate the area under the porosity-(apparent) depth curve

$$HC=[HWAC/2]*[2-EXP(x_1)-EXP(x_2)],$$

where HWAC is the height of water and cement. HWAC is assumed to be constant for the layer, only the ratio of cement to water increases. Therefore, the amount of pore water is the difference between HWAC and HC. The load of the layer (in kPa) is simply

$$WT=9.81\ m/s^2*(HSO*2650\ kg/m^3+HW*1030\ kg/m^3+HC*2685\ kg/m^3)/1000.$$

The cement is assumed to be a mixture of equal quantities of quartz (2650 kg/m³), shale (2720 kg/m³), and calcite (2710 kg/m³). The thicknesses and stresses are summed up as before. The only complication occurs in the case of partially deposited layers, where (BS-TS)/PDT is less than one. This factor is multiplied by the present thickness (PTHK) to get the thickness at the time of interest (THCK). It is also multiplied by HSO to get the partial solid grain height at the time of interest.

These calculations are then repeated for the minimum surface porosity (.17) case. In this case density increases over time are smaller since there is less original pore space to fill.

These calculations give the minimum expected change in [illegible] for a sandstone layer, where the pore space is completely replaced with cement[illegible]ity changes are greater for the constant HS calculations because much larger initial bulk densities were assumed. Also, water loss must be completed by 30 Ma. So, overall, porosity decreases due to physical compaction are greater than those due to chemical compaction, in this model.

E. SUMMARY

Now, if the present porosity, solid grain height, lithology, and age of a particular sedimentary layer are known, it is possible to estimate the range of changes in thickness and density of that layer over time. Summing the histories for each layer in a given interval gives the burial history of that interval (STZ and STWT), and summing the histories for each interval in a column gives the history of that column; the changes in TZ and TWT which are required in order to estimate the tectonic history (Chapter 1).

The results of the decompaction program COMP for the wells in Figure 1 are listed in Appendix 2.

The next chapter deals with the parameters needed for calculating thickness and density changes, namely: estimated interval ages, time of maximum burial, lithologies, porosities and solid grain heights.

IV. STRATIGRAPHY

A. NUMERICAL AGE ESTIMATES

Method and time scale

Since the decompaction method is time dependent, it is necessary to estimate the numerical ages of the Cretaceous and (where present) Jurassic formations encountered in each well. The drilled depths to each formation are listed in the Alberta E.R.C.B. Catalogue of Wells. Formations that were not listed (or were listed at depths that appeared doubtful) were picked by comparing the section of interest with the same section in logs from adjacent wells.

The numerical ages of Cretaceous stage boundaries were taken from the time scale of Harland *et al*. (1982). They based their ages on averages from numerous world-wide radiometric age determinations. Numerical ages from other references, such as Kauffman (1977) or Obradovich and Cobban (1975), were not used because of their reliance on single, scattered age determinations. In most cases, however, the Cretaceous stage dates of Kauffman (1977) are within 2 m.y. of those in Harland *et al*. (1982). The only exceptions are the Albian and Upper Campanian. Also, Kauffman (1977) made no numerical age estimates for the Aptian and Barremian stages.

The ages of the substage boundaries were estimated by assuming equal time intervals for the upper, middle and lower substages, which is the approach used by Kauffmann (1977, p. 83-84). Kauffman (1977) set up his time scale by assuming equal intervals for faunal zones when interpolating between Cretaceous K / Ar dates from ashes and bentonites in those zones. The numerous problems involved in trying to date faunal zones have been discussed at length by Jeletzky (1978). He observed that equal stage and zone calculations start with highly uncertain K / Ar ages and that too much faith is placed in these ages. Also, the fauna used as zonal indices may have extremely different evolutionary rates, so the zones may not be equal in duration (Jeletzky, 1978). Actually, for most stages (except the upper Campanian and the Albian) the calculated substage ages using the dates of Harland *et al*. (1982) are within 2 m.y. of those in Kauffman (1977). The substages as calculated from the time scale of Harland *et al*. (1982) are assumed to be more accurate than Kauffman (1977).

The ages of formation tops that do not correspond to stage or substage boundaries had to be estimated. The time scale of Harland *et al.* (1982) was superimposed on that of Kauffman (1977) which contains the stratigraphy and main zonal indices of the Western Interior Cretaceous Basin. Bearing in mind the observations of Jeletzky (1978), the ages of some of the formation tops were estimated by assuming equal intervals for the zones in that particular stage. The ages were rounded off to the nearest million years.

The diachronous nature of some formations will also result in inaccuracies in numerical ages. Kauffman (1977) stated that the time span of faunal zones in the Western Interior Basin averages 0.25 to 0.33 m.y. It must be noted, however, that some of his zones may range much higher. Through the Cenomanian to Santonian stages, the length of each substage averages about 1 m.y., assuming equal interval substages (Fig. 11). The Lower Santonian is the longest substage at 1.5 m.y., but it consists of only one zone (the *Scaphites depressus* mollusc zone; Kauffman (1977, p. 83)). This is exceptionally long; most of the zones are closer to Kauffman's (1977) estimate. So, if a formation is diachronous, and crosses only a few zones, the numerical age of the formation should be accurate to within a couple of million years - accurate enough for this study. This also depends on distance, since over large distances (greater Western Canada) a formation may be diachronous, but over lesser distances (the width of Alberta) it may appear synchronous.

In summary, there are certain to be errors in the numerical ages due to inaccuracies in dating and due to the diachronous nature of some formations, but the dates should be ± 2 m.y. in most cases and even ±1 m.y. in some cases. Exceptions to this are the uncertainties in dating the mid-Albian unconformity and the Jurassic formations. Except for the Cardium Formation, all ages were taken only to the nearest million years. Differences of less than a million years should not have a great effect on the decompaction program. The time scale of Harland *et al.* (1982) is not the ultimate authority and will, in all likelihood, be revised in the future. Thickness results can be updated simply by entering the new dates into the well files and running them through COMP. Also, it is not necessarily true that running COMP with revised and more accurate stage dates will result in more accurate decompaction results. This is because the ages of each layer in an interval are calculated assuming average HS sedimentation rates, which may not match the actual rates.

The time scales used in this study are shown in Figure 11 (the Cretaceous) and Figure 10 (the Jurassic). Age determinations for the Cretaceous are discussed in more detail than the Jurassic because of their greater importance to this study.

Jurassic and Early Cretaceous formations

The ages of the Jurassic formations were estimated using the Geotectonic Correlation Chart for Western Canada in Douglas *et al*. (1970) which was updated with recent geochronologic data from Harland *et al*. (1982). The Jurassic formations were dated and decompacted to see if it was reasonable to assume that pre-Cretaceous beds compacted negligibly during the Cretaceous and Tertiary. The Jurassic was not included in the discussion of tectonic subsidence because Jurassic rocks are present in relatively few wells in this study (only those close to the Foothills Belt), they have been eroded, and they contain a number of nonsequences. These gaps in sedimentation mean that the loading history was not smooth, therefore, reconstructed thickness estimates will be rough. For example, burial paths had to be extrapolated across an unconformity spanning the Tithonian to Barremian stages (148 Ma to 120 Ma).

The Nordegg Formation (the lowermost formation in the Fernie Group) was dated, but not decompacted. It was assumed to be incompactable because of its age and because it comprises limestone and calcareous shale (Douglas *et al*., 1970), a mixture that is generally less compactable than a noncalcareous shale (McCrossan, 1961).

The table of formations and ages for the Jurassic used in this study is shown in Figure 10. This figure is a modification of the Geotectonic Correlation Chart of Douglas *et al*. (1970) with numerical ages taken from Harland *et al*. (1982). The formations are those that are commonly recognized from logs by the E.R.C.B. Figure 10 gives the maximum age spans of Jurassic formations in the Alberta Foothills (where they attain their maximum thicknesses) as indicated in Douglas *et al*. (1970). The Jurassic thins to the east due to erosion, so the age spans there will be lower than shown on Figure 10. Therefore, the calculated average sedimentation rates will be too high in the western Plains.

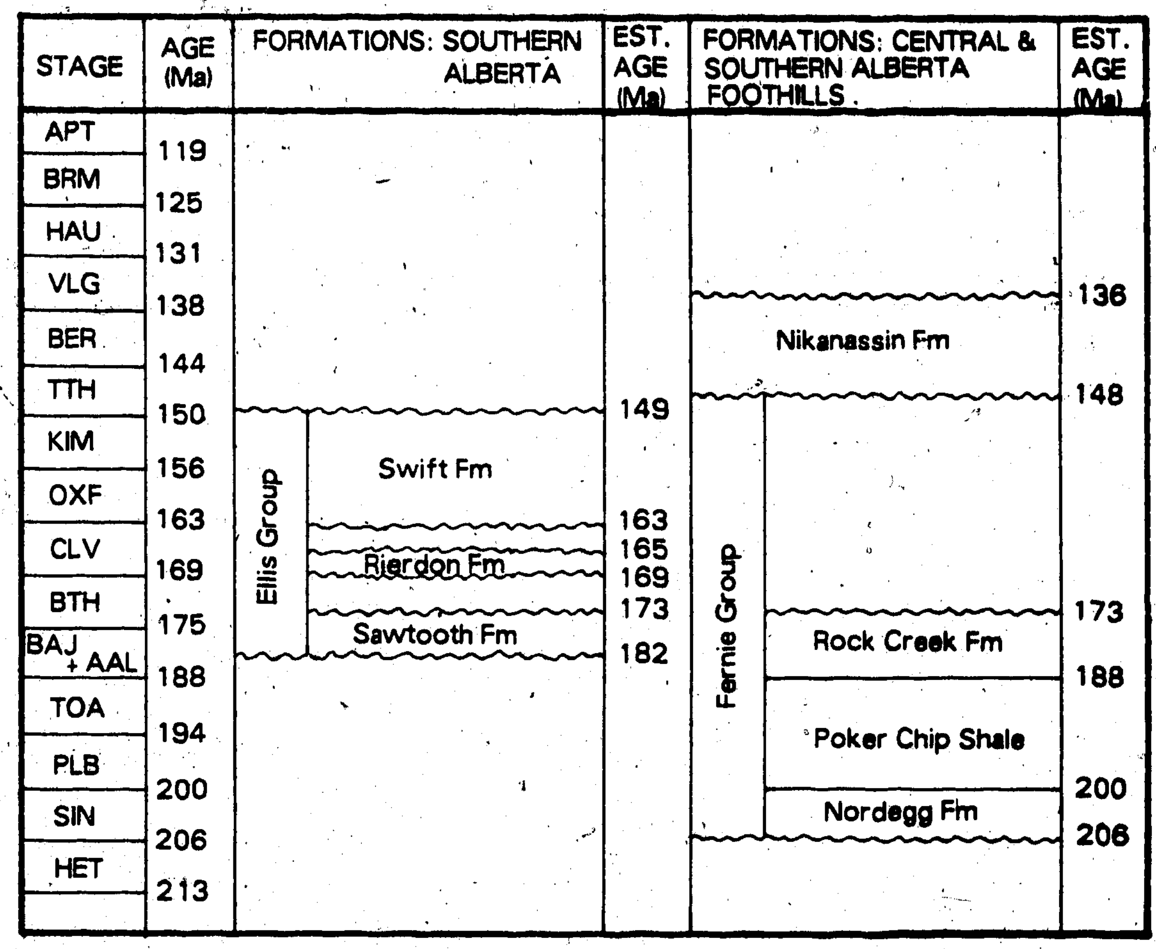


Figure 10: Jurassic and early Cretaceous stratigraphic column. (References in text).

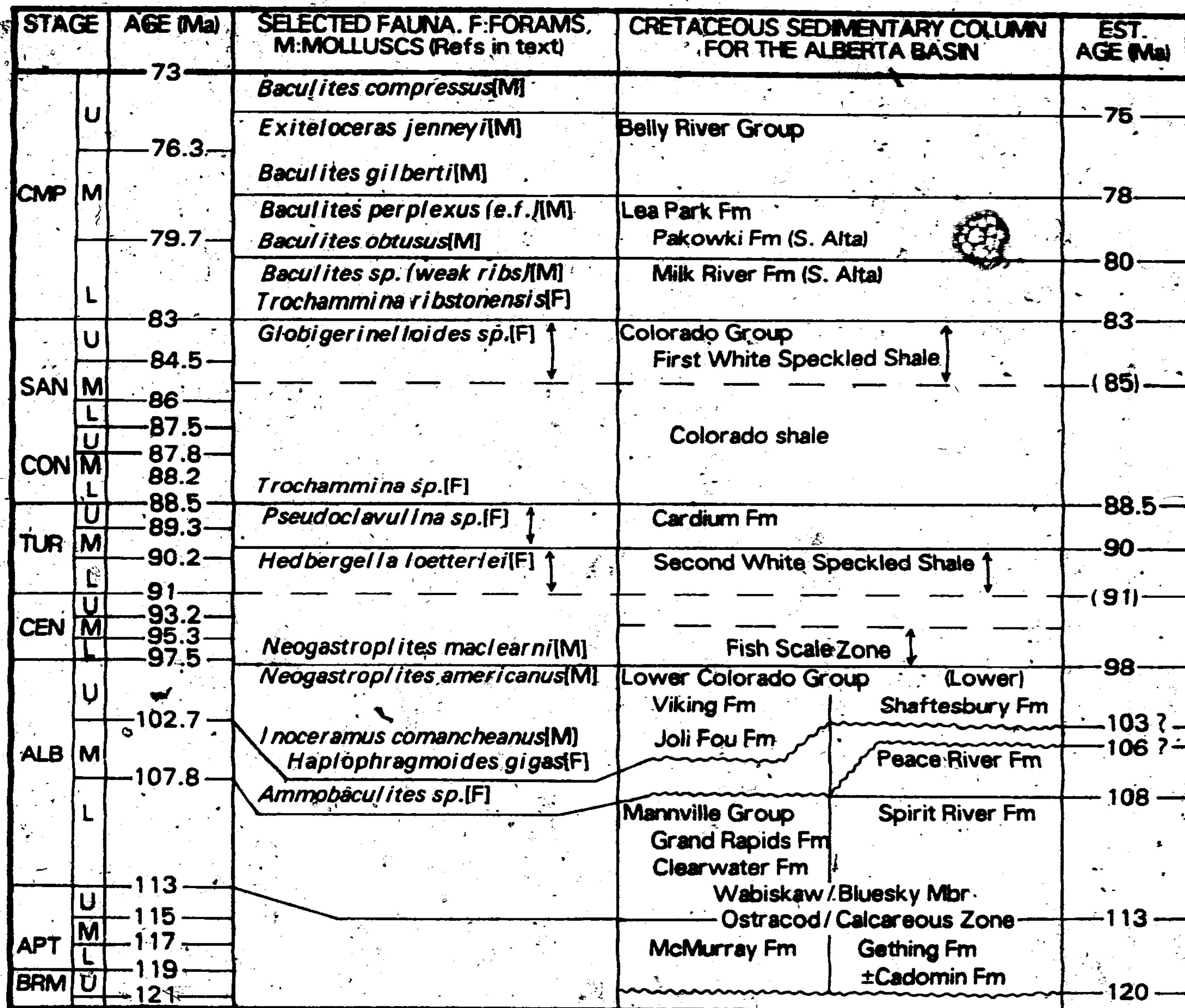


Figure 1.1: Cretaceous stratigraphic column for the Alberta Plains. (References in text).

Cretaceous formations

Figure 11 shows the Cretaceous formations and numerical ages used in this study. Information for Figure 11 was compiled from sources discussed in the following sections.

The Mannville Group

Rudkin (1964) indicates that the Lower Mannville Group of the Alberta Plains ranges in age from latest Neocomian to earliest Albian. The Cadomin Formation and the Cutbank Sandstone appear to be slightly older than the rest of the basal Mannville (Rudkin, 1964). Stott (1982) believes that the Bullhead Group (Gething Formation and Cadomin Conglomerate) in the Peace River area ranges from Barremian to Early Albian in age. He thinks these sediments formed an alluvial-deltaic complex that prograded northwards to the sea in Barremian to Aptian time. There is some recent faunal evidence that indicates the upper Bullhead Group is Early Albian in age (Stott (1982) in Caldwell (1984)), but the rest of the Gething and the Cadomin are dated, on the basis of floral remains, as Barremian and Aptian (Caldwell, 1984).

Caldwell (1984) thinks it is possible that the entire Gething Formation was deposited rapidly in the earliest Albian time. This opinion is based on bedding relationships and has not been verified by faunal evidence. Caldwell states

> "Whereas it is clear that the Bullhead Group is younger than Hauterivian and older than mid-Early Albian, it is equally clear that its precise age within this span is unknown."

Previously, Caldwell *et al*. (1978) had stated

> "The Gething is dated as Barremian, Aptian and possibly earliest Albian."

But according to Caldwell (1984)

> "Thus, although there is no reason why the Gething Formation should not be in part of Aptian age, there does not seem to be, at present, any compelling paleontological evidence for dating any part of the formation as older than early Albian. Certainly a Barremian to Early Albian age seems increasingly unlikely."

Burden (1984), on the contrary, identified pollen and spore assemblages that range from Barremian to Aptian in the lower McMurray Formation and Deville Formation (lowermost Mannville). He believed that the assemblage zone was probably Early Barremian in age. According to Burden (1984), the lower McMurray on the Steepbank River in northeastern Alberta may even be Late Valanginian or Hauterivian in age. Burden (1984, p. 250) discussed the history of floral-based age determinations of the Mannville Group in Alberta. Most recent reports put the base of the Lower Mannville Formation (in the central Plains of Alberta) somewhere between the Lower Aptian and Upper Barremian stages (Burden, 1984, Fig. 2).

Assuming the Upper Barremian substage lies between 121 Ma and 119 Ma, then the estimated age of the base of the Mannville is about 120 Ma. This is an average age: the Lower Aptian to Upper Barremian interval ranges from 121 to 117 Ma, so the ages of the Lower Mannville Group formations (Gething, McMurray, Deville) should not vary greatly from 120 Ma.

In the central Alberta Plains, the Lower Mannville consists of the McMurray and Deville Formations (Mclean and Wall, 1981). A unit known as the Ostracod Zone occurs in the upper part of the McMurray and is used as the boundary of the Upper and Lower Mannville (Finger, 1983). A correlative unit known as the Calcareous Member occurs in the upper part of the Gladstone Formation (Lower Blairmore) of southern Alberta (Taylor and Walker, 1984; Mclean and Wall, 1981). The precise age of the Ostracod Zone is uncertain. Finger (1983) states that it was facies controlled, and as such it is possibly "more or less diachronous across the Albian-Aptian boundary." Mclean and Wall (1981) concluded, from studies in the central foothills, that "An age slightly older than late Early Albian seems probable, although an Aptian age cannot be ruled out..." Burden (1984) decided, from his palynological studies, that the Ellerslie and Calcareous Members were Aptian to earliest Albian in age. Mclean and Wall (1981, Table 1.) correlate the top of the Lower Mannville with the top of the Gething, McMurray, and Gladstone Formations, and the top of the Ostracod Zone.

The estimated age of the top of the Lower Mannville used in this study is 113 Ma, the Albian-Aptian boundary according to Harland *et al*. (1982).

Upper Mannville Group to Lower Colorado Group

Deposition of the Mannville continued until around mid-Albian time when the sea retreated from Alberta (Caldwell *et al*., 1978). The retreat is marked by an unconformity: the top of the Upper Mannville (Grand Rapids Formation) in the Athabasca River district is Middle Albian, while the top of the Upper Mannville (Peace River Formation) near Peace River town is late Middle Albian (Caldwell *et al*., 1978). The Boreal sea advanced southward again in early late Albian times, and deposition of the Joli Fou Formation began (Caldwell *et al*., 1978). According to Stelck and Kramers (1980), the duration of the hiatus between the Upper Mannville and the overlying Joli Fou Formation is uncertain. They have documented the occurrence of an ammonite of Lower Albian age from the Grand Rapids Formation in northeastern Alberta (Stelck and Kramers, 1980). They also indicated that the top of the Grand Rapids is slightly older in central Alberta than in the Lower Athabasca River area. The Grand Rapids (Upper Mannville) can, therefore, be no younger than 108 Ma. This is also the age used for the Spirit River Formation (Stelck and Kramers, 1980, Fig. 3).

The age of the Joli Fou Formation is believed to be earliest Late Albian because it contains the bivalve *Inoceramus comancheanus* (Caldwell *et al*., 1978). Also, Mclean (1982) mentions that the Ma Butte Formation of the southern Alberta Foothills contains Middle to Late Albian flora. Mclean and Wall (1981) correlate the Ma Butte Fm., approximately, with the Joli Fou Formation and the lower part of the Bow Island Formation in the Alberta Plains. The bottom of the Joli Fou Formation should, therefore, lie close to the boundary of the Upper Albian substage (Caldwell, 1984, Fig. 8). The approximate age, to the nearest million year, should be 103 Ma.

Therefore, the duration of the hiatus in central Alberta, at most, is about 5 m.y. This is close to the duration estimated by Weimer (1984, p.10) for the eastern section of his diagrammatic cross section of the Western Interior Cretaceous Basin (U.S.A.). Weimer (1984) also attempted to date Cretaceous formations and unconformities. Unfortunately, he used a modified version of Obradovich and Cobban's (1975) time scale, which is different from the one used in this study. He also indicates an increase in the duration of the hiatus from east to west (approximately 5 m.y. to approximately 10 m.y.) with the Mannville Group equivalent bevelled down to the McMurray equivalent in the east. In contrast, in Alberta the Albian unconformity decreases in duration and is younger (stratigraphically higher) in the Peace River Plains than in the central and southern Alberta Plains (Caldwell *et al.*, 1978, Fig. 2 to 4). In the Peace River Plains, the lower Shaftesbury Formation correlates with beds in the Hasler Formation of the Peace River Foothills (Stott, 1982 in Caldwell, 1984). According to Caldwell (1984)

> "There is no obvious correlative of the Pelican or Viking Formation in the Rocky Mountain Foothills or the immediately adjacent Plains."

This means that the the Paddy Member, which is older than the Shaftesbury and Hasler Formations (according to Stott, 1982), cannot be correlated with the younger Pelican (Viking) Formation, as was done by Mclean and Wall (1981). The northern end of Fig. 3 in Caldwell *et al.* (1978) runs between wells 1 and 2 (of this study) in the Peace River Plains. Here, the unconformity truncates the Middle Albian Boulder Creek Member (Upper Commotion Formation) (Caldwell *et al.*, 1978; Caldwell, 1984) which correlates with the Paddy and Cadotte Members of the Peace River Formation, containing foraminifera belonging to the *Ammobaculites* sp. zone. The overlying Cruiser and Hasler Formations contain foraminifera belonging to the *Miliammina manitobensis* zone (which is immediately above the *Haplophragmoides gigas* zone) (Caldwell *et al.*, 1978). Stott (in Caldwell, 1984, Fig. 8) indicates that in the Peace River Plains the unconformity (between the Shaftesbury Formation and the Paddy Member) includes most of upper Middle Albian and some of lower Upper Albian time. The unconformity should, roughly, span from 105 to 102 Ma, in the Peace River plains. In wells 1 and 2, the hiatus was estimated to be slightly lower, stratigraphically. In these wells it was assumed to span from 103 to 106 Ma (Fig. 11).

A numerical age for the Viking Formation was not determined because of its proximity to the Joli Fou Formation. Mellon (1967) placed both the Viking and Joli Fou Formations in the *Haplophragmoides gigas* foraminiferal zone. In this study, dates are taken to the nearest million years, and it is difficult to resolve the dates of both formations in this zone, which may only be around 1 m.y. long. For thickness reconstructions of layers in the Lower Colorado Group (from the Albian unconformity to the base of the Fish Scale Zone), the formations were treated as a single unit.

According to Stelck and Armstrong (1981), the base of the Fish Scale Marker Bed does not fall directly on the Albian-Cenomanian boundary in Alberta, as is commonly assumed. They found that it lies between the latest Upper Albian *Neogastroplites maclearni* and *Neogastroplites americanus* zones at Fort St. John, B.C. and is approximately synchronous all the way across Alberta into the Lethbridge area. The approximate age of the base of the Fish Scales is taken as 98 Ma, or slightly older than the Albian-Cenomanian boundary which is 97.5 Ma according to Harland *et al*. (1982).

Upper Colorado Group

The next major formation identifiable on well logs is the Second White Speckled Shale. This shale contains the early Turonian foraminifer *Hedbergella loetterlei* and is correlated with the Bridge Creek Limestone Member and the Fairport Chalk Member of the Western Interior United States (Caldwell *et al*., 1978). These units are later Upper Cenomanian to mid-Middle Turonian in age (see Kauffman, 1977, p. 82). Therefore, the age of the top of the Second White Speckled Shale is about 90 Ma and the bottom is roughly 91 Ma. The bottom of the Second White Specks is difficult to separate from the rest of the Colorado Shale and was not used as a depth-time "marker".

The next datable formation is the Cardium Formation. Caldwell *et al*. (1978) placed the top of the Cardium between the *Trochammina* sp. and the *Pseudoclavulina* sp. foraminiferal zones. The boundary between these zones is close to the Coniacian -Turonian boundary which is 88.5 Ma according to Harland *et al*. (1982). The depositional edge of the Cardium Formation disappears towards eastern Alberta, but Cardium equivalents can be traced in some areas using log signatures.

According to Caldwell *et al*. (1978), the top of the First White Speckled Shale (the top of the Colorado Group) occurs between the top of the *Globigerinelloides* sp. zone and the base of the *Trochammina ribstonensis* zone, on the Campanian-Santonian boundary (83 Ma). They state that the First White

Speckled Shale is correlatable with "...some of the middle and upper parts of the Smoky Hill Shale Member of the Niobrara." This is approximately mid-Middle Santonian to lowermost Campanian (see Kauffman, 1977), or approximately 83 Ma to 85 Ma. But the base of this shale is difficult to identify on logs. Jeletzky (1971) believes that the boundaries of the First White Speckled Shale are strongly diachronous, but Caldwell *et al.* (1978) do not indicate that this is so, at least in Alberta. According to Caldwell *et al.* (1978), the Greenhorn lithofacies appears in the early Turonian in Canada, but in the late Cenomanian in the U.S. Likewise, the Niobrara is Santonian in Canada, but earliest Coniacian in the U.S. They indicate that the top of the First White Specks is separated from the Pakowki Formation by a disconformity or paraconformity in Saskatchewan and Manitoba.

Post Colorado SuperGroup

The Lower Campanian Milk River Formation is present only in southern Alberta and is equivalent to the lower Lea Park Formation in central Alberta (Meijer Drees and Mhyr, 1981). According to Williams and Baadsgaard (1975), the top of the Milk River Formation corresponds to the base of the *Baculites obtusus* zone. Based on even-interval faunal zones in Kauffman (1977, p. 83, the age is about 80 Ma. Using the same method, the age of the top of the Upper Campanian Pakowki Formation, or base of the *Baculites gilberti* zone (Williams and Baadsgaard, 1975), is approximately 78 Ma. The Pakowki Formation is the upper member of the Wapiabi Group in the north central Plains and is correlated with the top of the Lea Park Formation (Caldwell *et al.*, 1978; Jeletzky, 1971).

Williams and Baadsgaard (1975) place the top of the Judith River Formation (Belly River Group) in southern Alberta below the *Baculites compressus* zone (Upper Campanian). According to Caldwell *et al.* (1978) the top is between the *Baculites compressus* and the *Exiteloceras jenneyi* molluscan zones. Using the even interval method and Kauffman's (1977, p. 83) chart, the age, to the nearest million year, is 75 Ma.

Tertiary: Time of maximum burial

According to Taylor *et al.* (1964), the Upper Cretaceous rocks of the Alberta Plains were covered by thick deposits of Paleocene sediments (Paskapoo and Porcupine Hills Formations) shed from the Rocky Mountains during the first of two Laramide pulses. These sediments must have reached thicknesses greater than 1500 m in the Porcupine Hills area of southwestern Alberta (Taylor *et al.*, 1964). A second Laramide pulse from Eocene to Oligocene time deposited thick alluvial gravels, which rest unconformably on the Paskapoo (Eisbacher *et al.*, 1974; Taylor *et al.*, 1964).

Around Oligocene time regional uplifts occurred in the mountains and adjacent plains. According to Bally *et al.* (1966)

> "It appears that both mountains and plains were nearly base-levelled after deposition of the Upper Eocene and Oligocene gravels (Swift Current, Cypress Hills of Saskatchewan)."

Only a fraction of the great amount of Paleogene sediments that blanketed the plains remains today (Taylor *et al.*, 1964). Nurkowski (1984) estimates that at least 180 m of Oligocene conglomerates have been eroded from the tops of the Cypress Hills in the last 30 million years. The erosion estimate of England and Bustin (1985) for the Plains are even greater (up to 9 km). Hacquebard (1977) discussed the coalification history of Mannville coals and used the mid-Oligocene as the time of maximum burial depth of these coals. Nurkowski (1984) also believed that this represents the time of maximum burial of plains coals.

Hitchon (1984) believed that the second Laramide pulse in the Early Eocene resulted in later widespread erosion of the Paleocene sediments and that this time must represent the time of maximum burial. He ignores the fact that large amounts of Paleogene sediments could have provided additional sediment load.

Taylor *et al.* (1964) and Bally *et al.* (1966) indicated that since sometime in the Oligocene the Alberta Plains have been in a state of uplift and erosion. No significant sediment load, which may have compacted older sediment, has since been added. While part of the Paleocene sediments were eroded, reducing the load for a time, the addition of Eocene and Oligocene sediments (also eroded later) could have been significant in increasing the overburden load. Isolated Miocene and Pliocene fluvial gravels, reworked detritus from older Tertiary deposits (Taylor *et al.*, 1964), probably did not increase the overburden load.

Therefore, compaction is assumed to have ended around mid-Oligocene time (about 30 Ma). The time of maximum compaction may not be the same all over the Plains, but it is assumed here that the porosities and thicknesses of rocks in the basin are essentially the same today as they were 30 million years ago. This refers to shaly sediments only. As discussed in Chapter 2, sandstones may have undergone chemical changes (i.e. cementation) up to the present day.

Uncertainties in thickness estimates arising from error in choosing a maximum burial time should be negligible for shaly sediments. From the discussion of burial curves it was shown that the greatest porosity and thickness changes (reductions) occur early in the history of a layer. Burial curves tend to flatten with age and depth. So the curves of any given layer, extrapolated to the Tertiary will become fairly flat, that is the porosity will not change greatly. This is especially true for the minimum curve, which is always flatter than the maximum curve.

In Alberta, the effect of Pleistocene glaciation on compaction is insignificant because the weight of previously eroded sediments probably exceeds that of the glaciers (Magara, 1976; Maxant, 1980). In addition, glacial ice is less than half as dense as most sediments.

B. SOLID GRAIN HEIGHTS

Digitizing sonic logs

Copies of sonic/gamma-ray logs from E.R.C.B. files were used; these are marked in non-metric units. The locations of the wells from which the sonic logs were taken are shown on Figure 1.

The sonic log traces were digitized for each well and stored on magnetic tape for future use. The logs were digitized using the Textronix digitizing table at the Department of Geology and transferred to the University of Alberta's Amdahl 5860 computer.

The actual number of data points digitized varied for each log but averaged about three points per ten feet of log depth. Usually, only the major peaks on the log traces digitized. The number of points digitized depended on the fluctuations of the log traces. Often, especially in thick shale or mudrock sections, the log traces were fairly flat. They became peaked in sandy-shale sections. The reason for digitizing from peak-to-peak was in order to capture the major changes of the log traces and also in order to estimate the sonic travel times between peaks by using a linear interpolation method.

Determining lithologies

All the logs had a scale of 1inch= 100 ft., so for the sake of convenience, they were split into ten foot intervals (the smallest marked interval). Each ten foot interval was treated as a single homogenous layer and assigned to one of three broad lithological groups based on the predominant lithology in the interval as determined from the gamma-ray log.

The gamma-ray log is basically an indicator of shale content and can be used to estimate the volume of shale in the layer (Asquith, 1982). Asquith (1982, p. 91 and p. 103) gives equations for calculating the volume of shale, but they have to be applied with discretion. Often, glauconitic, micaceous, or arkosic sandstones can resemble shale or mudrock on a gamma-ray log. Also, organic marine shales have higher radioactive content (and higher gamma-ray readings) than continental shales (Heilander, 1983). In thick shale sections, the gamma-ray count can increase with depth due to compaction and, hence, increased density of radioactive elements. This can be confused with lithological changes.

The shale volume in each layer was roughly estimated using the gamma-ray log and whatever information was available in the literature about that particular formation. Layers containing less than 30 per cent shale were classed as sandstone. Layers containing from 30 to 60 per cent shale were classed as shaly sandstone. Layers containing more than 60 per cent shale were classed as shale or mudrock.

It was necessary to know the average lithology of the layer in order to have an estimate of the matrix transit time for the porosity calulations. It was also necessary to know the lithology in order to assign a maximum and minimum initial porosity for the layer (as discussed in Chapter 2).

Determining porosities

Rock porosities can be measured using various logs, but in this study sonic logs were used because they are the most common log available. Formation-density logs and Neutron logs are affected, to a greater degree, by hole conditions and are less reliable than sonic logs (Magara, 1978). Sonic logs automatically compensate for hole rugosity, but can be affected by very rough holes. The result is that the sonic transit (or travel) times (the time it takes for a compressional acoustic wave to travel one foot of formation) are too high (Heilander, 1983). The depth of investigation of the sonic log is very shallow: the wave penetrates only a few inches into the formation, which usually has been flushed by drilling fluid. The presence of unflushed gas and oil in the formation adjacent to the borehole results in sonic-derived porosities that are too high (Asquith, 1982). Magara (1978) pointed out that shale in the formation can become hydrated by the drilling mud if the hole was open for a long time before being logged. This results in shale transit times (and calculated porosities) that are too high (Magara, 1978). Transit times will also be higher in poorly consolidated (uncemented) rocks and rocks with low effective stresses (Heilander, 1983). The best way to correct the sonic-derived porosity is by comparison with other porosity logs, but in most wells the sonic log was the only available porosity log. Resistivity logs were available, but they often do not give very good results, particularly in shaly rocks (Magara, 1978).

Magara (1976) calculated a relationship for porosity and sonic transit time (TT) from sonic and density log measurements of Cretaceous shales in Alberta

$$\Phi = .00466 * TT - .317.$$

This equation is based on a shale matrix density of 2.72 g/cc and on water density of 1.02 g/cc (Magara, 1976).

The porosity of sandstones and shaly sandstones can be found by using an extended form of the time-average equation (Anstey, 1977, p. 2-45). This equation assumes that the time required for a sonic wave to pass through a rock is equal to the sum of the travel times through each component of the rock: fluid, sand grains, cement, and shale grains (Anstey, 1977). The travel times for the sandstone matrix and the fluid were taken as 55.5 microsec/ft. and 200 microsec/ft., respectively. The matrix time of Cretaceous shales in Alberta is around 68 microsec/ft. (Magara, 1978). In a shaly sandstone, composed of half shale and half sandstone, the matrix time is about 62 microsec/ft. These matrix times are entered in the time average equation

$$\Phi=(TTlog-TTmatrix)/(TTfluid-TTmatrix),$$

where TTlog is the travel time from the sonic log.

Calculating solid grain heights

Since the sonic logs were digitized from peak-to-peak, and the travel times were converted to porosities, the line interpolated between any two data peaks is analogous to a porosity-depth curve for that interval. The depth interval may be only a few feet, or it may be greater than ten feet, depending on the fluctuations of the log trace. The solid grain height over that interval may be estimated by using the equation for the area of a trapezoid

$$HS=((D_2-D_1)/2)*(2-\Phi_2-\Phi_1).$$

Where D_2-D_1 is the depth interval and Φ_2 and Φ_1 are the upper and lower porosities of the interval.

Often the digitized points did not fall on the boundaries of the layer. However, the decompaction program, COMP, automatically draws a straight line between every two data points and interpolates the sonic travel time at any boundaries that might fall between the points. In this way, travel times can be estimated at layer boundaries and at each stage boundary. The total solid grain height of each layer was calculated by summing up the solid grain height between each two porosity points in the layer. Some layers have only two points (one at each boundary) while others have more.

The average porosity of each layer was calculated by dividing the difference between the solid grain height and the present thickness of the layer by the present thickness (usually ten feet). This was assumed to be the average porosity of compactable layers in the mid-Oligocene. Most of the rocks in the basin are fairly well compacted. The porosities are low (usually less than 15 per cent) and will not vary greatly over ten foot intervals in the shale sections. Peaks in the sonic trace do occur, especially in shaly sandstones and sandstones, but the average porosities of adjacent layers are similar.

Sonic logs are often used for correlating formations in the subsurface. While details may vary, the sonic log signatures are often traceable over fairly large distances. A change in TT of 10 microsec/ft. in a shale (using Magara's (1976) equation) results in only about a 5 per cent change in porosity. So if the log traces are ± 10 microsec/ft., then HS will be similar in adjacent wells. Excluding major lithological and thickness changes, the solid grain height of a formation should also be similar across the subsurface. In the area of study the dip of the Cretaceous formations is very gentle, so drilled thicknesses should equal stratigraphic thicknesses.

V. MODEL RESULTS

A. INTERPRETATION OF THICKNESS AND LOAD CHANGES

Cumulative thickness and stress

The purpose of the decompaction program described in Chapter 3 was to estimate the maximum and minimum cumulative thickness (TZ) and load (TWT) of a given column of sediment at certain times. Subsidence rates were then calculated on the basis of the changes in the maximum thickness / stress and changes in the minimum thickness / stress over certain time intervals. This section discusses the burial history results, with examples from wells 16 and 37.

The cumulative thickness and cumulative stress results for well [illegible] on Figures 12 and 13. Figures 14 and 15 show the evolution of the maxim[illegible]um thicknesses of the Lo[illegible] Mannville Group and [illegible] Mannville Group, re[illegible]ly, at well 16. These thickness histories, added to[illegible] the burial history for the lower part of the column in Figure 12. The maxim[illegible]um interval thickness graphs, as indicated in Figures 14 and 15, have two point[illegible]mmon; they begin at zero thickness, dive[illegible] and then gradually converge and meet at the present thickness. The right-hand por[illegible] of these graphs, where deposition exceeds compaction resulting in a net increase in thickness, is not entirely smooth. This is because the curve is the sum of the max / min curves for individual layers. The lack of smoothness is due to [illegible] different assumed initial porosities for layers of different lithologies. On a smaller scale, the interval thickness graphs resemble the cumulative thickness graphs. The maximum interval thickness curve has a steeper rate of increase over the interval of deposition, and a steeper rate of decrease over the compactional interval, compared to the minimum curve. A constant, average HS sedimentation rate was assumed for each of these intervals, so the interval thickness has a fairly even increase. In reality, the actual curve may have been even less smooth.

Since the rate of decrease in porosity decreases over time, the rate of thickness decrease declines over time in Figures 14 and 15. In fact, thickness changes over relatively short periods of ti[illegible] (ca. 5 m.y.), especially in the older portions of the curve,

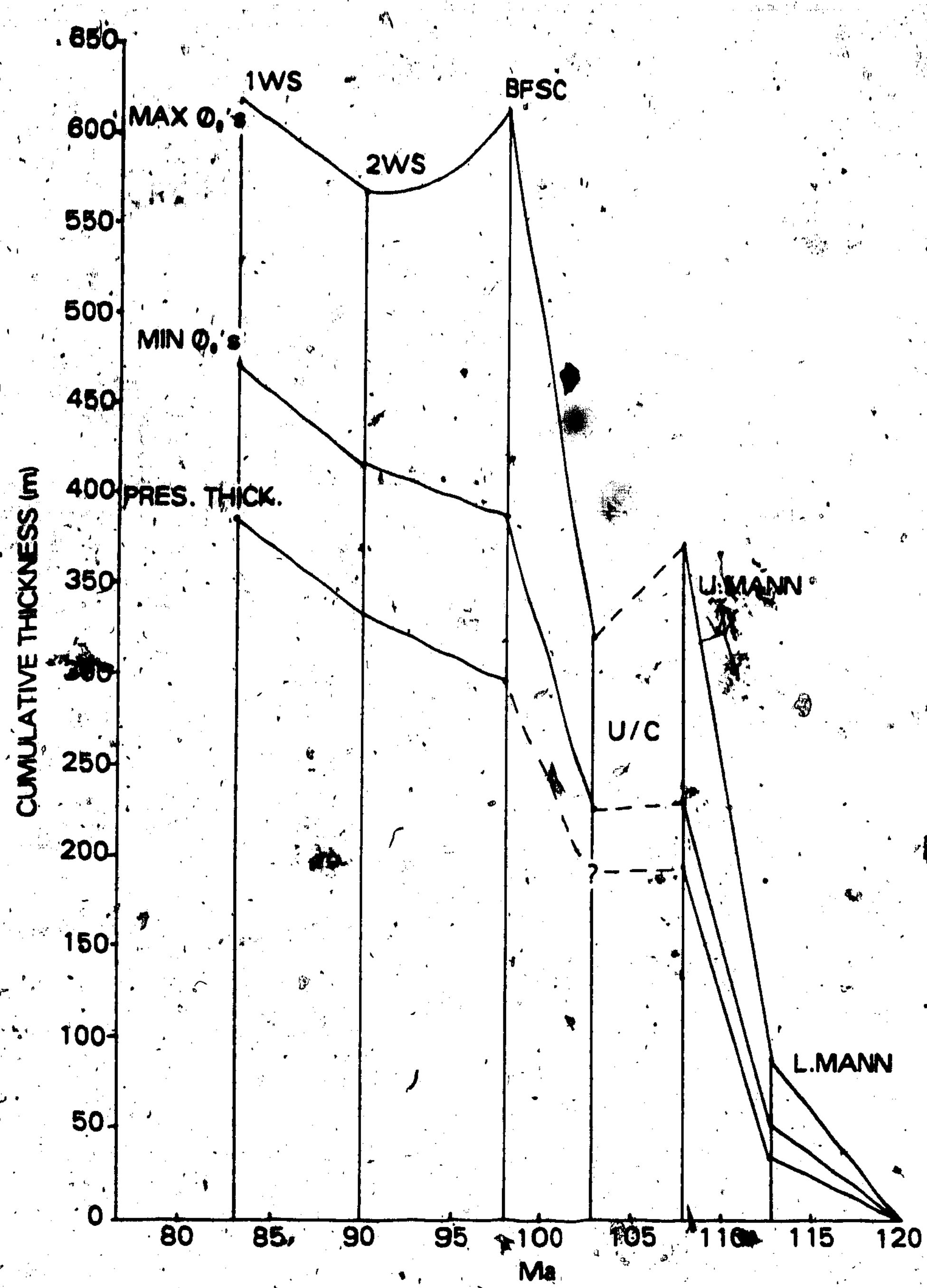


Figure 12: Cumulative thickness curves for well 16 (constant solid grain height).

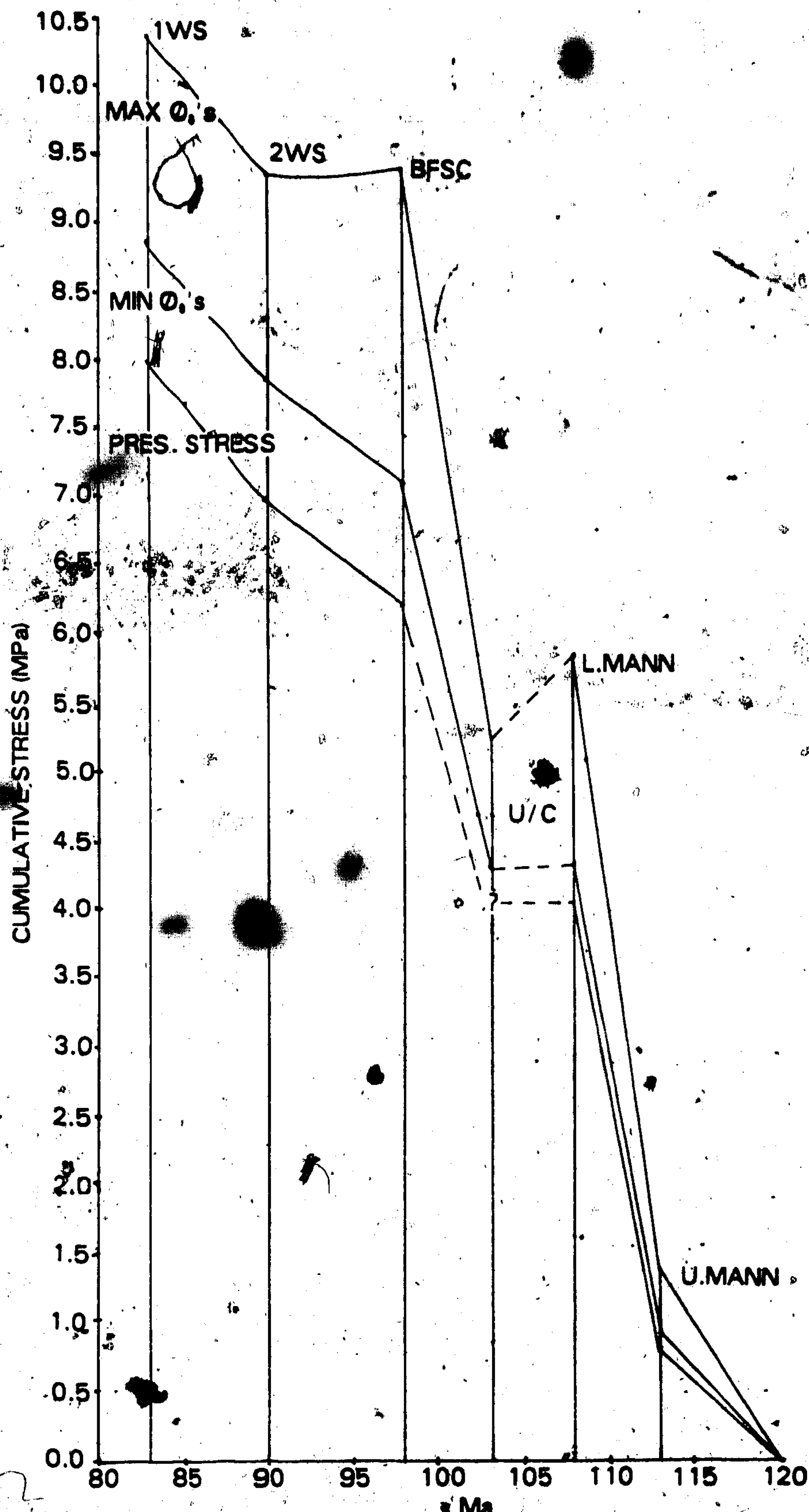


Figure 13: Cumulative stress curves for well 16 (constant solid grain height)

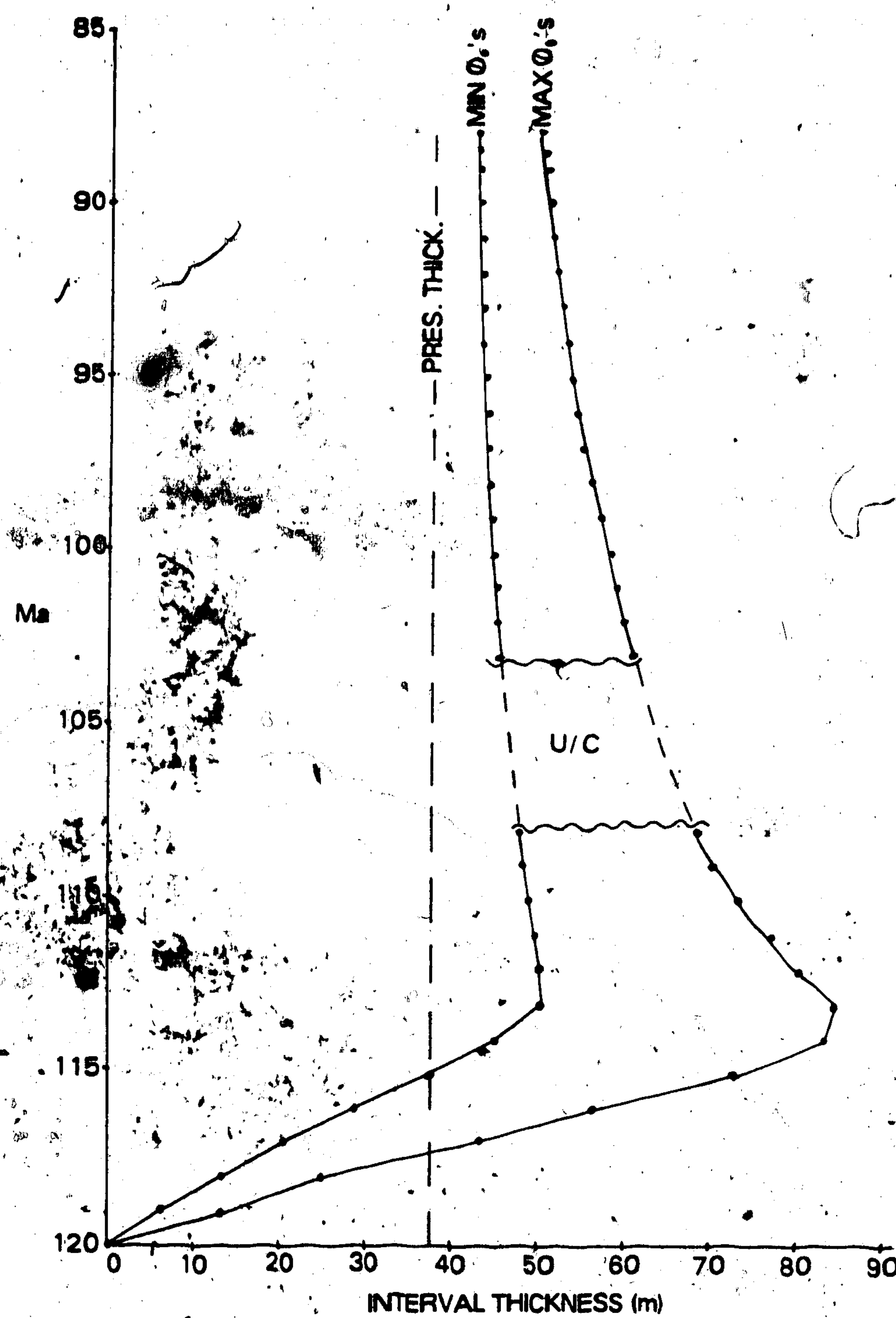


Figure 14: Interval thickness curves for the Lower Mannville Group at well 16 (constant grain height).

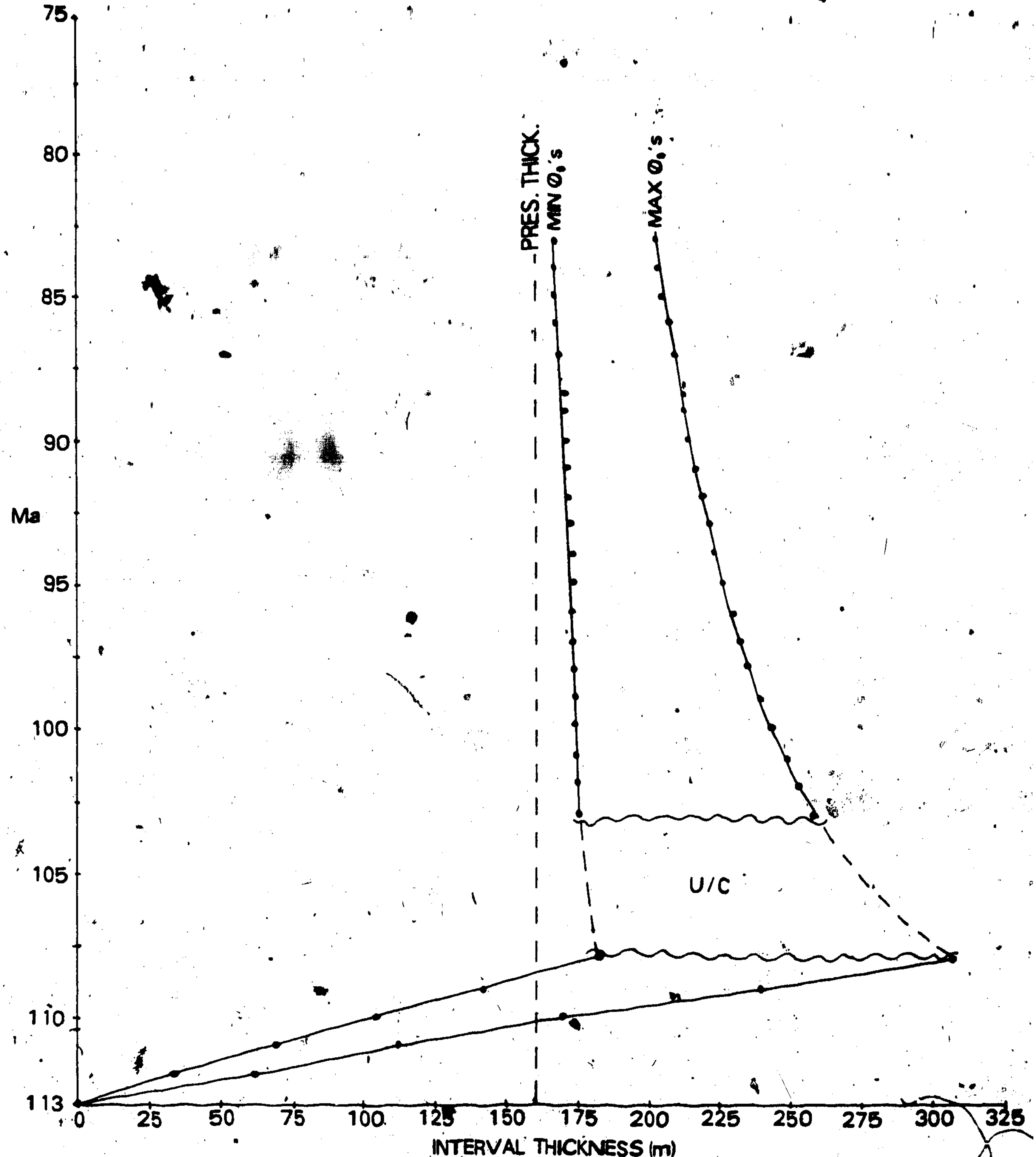


Figure 15: Interval thickness curves for the Upper Mannville Group at well 16 (constant grain solid grain height).

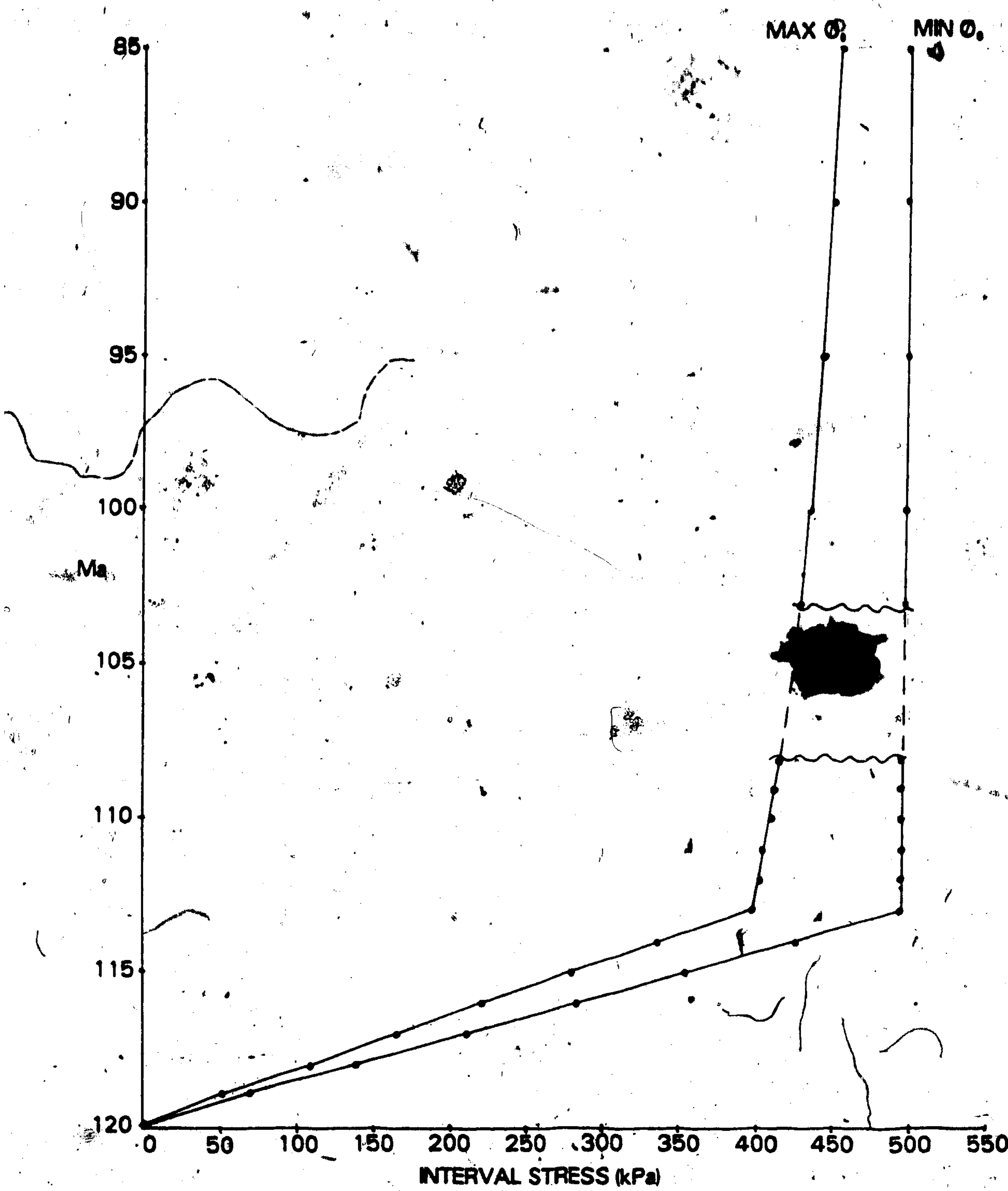


Figure 16: Interval stress curves for the Lower Mannville Group at well 37 (variable sandstone grain height).

are relatively small. So, thickness decreases in older beds appear to have less effect on the net thickness changes of the entire column over younger intervals. The previous assumption (Chapter 3) of an apparently uncompactable layer of Paleozoic sediments appears tenable on these grounds. (With the possible exception of rapid (?) occurrences such as salt collapse or dissolution).

Assuming an average HS sedimentation rate and a steady decrease in thickness over time, the actual path or curve for any interval should be somewhere between the maximum and minimum interval curves (STZ), and subparallel to these curves. If the burial path of the next sediment interval is also somewhere between its max / min interval paths, then the actual cumulative path will be subparallel to the sum of the max / min interval paths. It must be stressed that the ranges between the maximum and minimum curves cannot be used as error bars. Bond and Kominz (1984) also made this clear, with respect to their results. To paraphrase them, the actual path of thickness changes may lie along the maximum curve or the minimum curve, or on a curve between them which is nearly parallel to both. It is unlikely to lie exactly on either the maximum or minimum path because the distribution of surface porosities in modern sediments is fairly wide and random (Pryor, 1973). So the calculated thicknesses and stresses (TZ and TWT) are deliberately too high and too low for the maximum and minimum cases, respectively. Assuming extreme limits leaves a certain leaway or margin for natural variations in sediment compaction.

Figures 14 and 15 illustrate this idea. Over the interval 108 Ma to 113 Ma the maximum and minimum changes in thickness of the Upper Mannville Group are 307.4 m and 182.4 m, respectively, with the actual change being somewhere between these figures. Likewise for the Lower Mannville Group which changes by -16.9 m and -3.0 m, for the maximum and minimum cases, respectively. The maximum total subsidence rate is the change in the maximum thickness over the interval 108 Ma to 113 Ma: $TZ_{108}-TZ_{113}$=290.5 m. The change in the minimum thickness is 179.4 m. So the actual total subsidence is somewhere in the range: 290.5 m to 179.4 m. It is wrong to assume that the maximum and minimum changes were 307.4 m -3.0 m=304.6 m and 182.4 m -16.9 m=165.5 m because it is unlikely that the actual path corresponded exactly to the maximum or minimum curve. It is even more unlikely that the actual path would correspond to the maximum curve for one interval, and to the minimum curve for the next interval, or *vice versa.* This would result in an (impossible) maximum thickness change over the given interval, but also would result in underestimates of the total thickness during later periods in the column history. The object is to calculate the change in the maximum and minimum thicknesses, not the maximum and minimum thickness changes.

Figure 12 is the result of consistently summing up the maximum and minimum layer thicknesses over time to achieve a continuous thickness evolution. There is a general increase, over time, in the limits between the maximum and minimum curves. This divergence is caused by assuming a high maximum initial porosity (especially for shales) over periods of relatively high HS sedimentation rates.

Constant versus variable grain height

The differences between the results for constant and variable solid thicknesses were very slight (Appendix 2). Nevertheless, two tectonic history tables were calculated for each well, one for constant and one for variable HS. For the tectonic history estimates in Part I, it was assumed that the grain height for all lithologies was constant. For Part II, it was assumed that the grain height of all sandstones was variable. This was applied consistently for each interval in the column. There was no mixing of results (HS constant for one interval, variable for the next), even though this could result in larger and smaller changes in thickness. Over any interval of study the results from either tectonic history table which gave the highest maximum and lowest minimum changes were used to define the limits of subsidence over that interval. The burial histories and tectonic histories assuming variable sandstone grain height are in Appendix 2.

Normally, for constant HS, the maximum stress values are higher than the minimum values because of the greater (assumed) porosities and bulk densities. However, assuming variable sandstone HS, the minumum stress can be larger than the maximum stress, in columns with large amounts of sandstone. This has to do with the initial porosity assumption. If $\emptyset_i$=.17, little or no cement is needed to reduce the porosity of a layer to its present porosity. At $\emptyset_i$=.56 there is more cement to deposit, and the rate of cementation is proportionately faster. In the model, eventually the maximum stress will catch up with the minimum as the water (Pw=1030 kg/m^3) is replaced by cement (Pcem=2690 kg/m^3). An example of this, in well 37, is shown in Figure 16.

In well 37, the lithology of the Lower Mannville Group was interpreted as 100% sandstone. The interval thickness (and stress) results, assuming constant grain height, are similar to well 16. For variable sandstone grain height, of course, there is no change in thickness after deposition. (The assumption that sandstones are incompactable results in lower rates of change in thickness for intervals with large amounts of sandstone). However, the interval stress for variable sandstone grain height is unusual because it increases, rather than decreases, over time, illustrating that with a higher assumed porosity, the rate of cementation must be faster. Even so, the constant grain height column still undergoes greater stress changes because the water-filled bulk volume is much larger.

Compactional subsidence

Another thing that should be explained is the tendency for some cumulative burial history curves to decrease in thickness over certain periods. This can be seen on Figure 12 over the Second White Specks to base of the Fish Scales interval. Here compaction exceeds sedimentation, resulting in a net decrease in cumulative thickness. This decrease is due to a combination of low HS sedimentation rates and high initial porosities (it only appears in shale sections). This phenomenon was not observed in all wells. There are, however, some wells in which both the maximum and minimum cumulative thickness curves decrease. Generally, HS sedimentation was extremely low in these cases.

If Figure 12 is turned upside down it resembles Perrier and Quiblier's (1974) subsidence diagram for the North Sea. Turned upside down, and assuming deposition in a constant water depth, Figure 12 shows the apparent movement of the basement. From this perspective it appears as though there was a basement uplift (negative subsidence) over the Second White Specks interval. Perrier and Quiblier (1974) noticed a similar feature on their diagram; it appeared after a gap in sedimentation. They suggested that this was either a basement uplift or sea bottom subsidence (deepening water). It could, as they suggested, reflect an actual event, rather than solely being the fault of the modelling process. Assuming a constant sediment supply to a marine basin, the subsiding areas would be capable of preserving more sediment. Highs in the basin, at or near base level, would not be capable of preserving great thicknesses. Negative total subsidence figures may also be interpreted as stable areas, neither subsiding or rising. If the total subsidence rates are low or negative then the ZTI rates can also be negative.

Actually, in a simple uniaxial compaction model (Chapter 3) compactional subsidence should not occur since there is no increase in the effective stress (Rubey and Hubbert, 1959). In reality compaction is much more complicated and stress equilibrium is likely to occur gradually over time and depth rather than instantaneously, as is assumed in simple models (Magara, 1978).

Unconformities

A final thing to consider is the problem of gaps in the sedimentary column. Perrier and Quiblier (1974) simply assumed that compaction of a given column continued over a gap under its own weight. In Figure 14 the maximum and minimum thickness curves were extrapolated across the Lower Albian unconformity. If compaction was delayed across this gap the result in assuming gradual compaction will be an underestimated total thickness, especially in the maximum case. There will be less error for the minumum case since the thickness curve is generally flatter, so compaction across the hiatus in loading is minor. In Figure 15 (the Upper Mannville) the amount of sediment eroded is unknown, but the preserved sediments must have undergone compaction below the removed load. There may have been a delay until the previous overburden load was exceeded (Magara, 1978), and then compaction resumed. Again, the maximum thickness may be underestimated.

Since these curves flatten with time, the error in thickness changes will be negligible over later intervals.

B. MAPPING THE RESULTS

The results of this study were mapped over the intervals indicated in Figure 3. The following maps were produced: present total thickness, present total grain thickness, maximum and minimum total subsidence rates, and maximum and minimum tectonic rates.

The present total thickness maps were contoured using well log thicknesses plus information from maps in Rudkin (1964) and Williams and Burk (1964).

The total subsidence and isostatic tectonic subsidence values were used to estimate average subsidence rates. The largest maximum values and lowest minimum values from either the tectonic history for constant HS or variable HS were divided by the duration of the interval of interest to get the average high and low rates. These figures were plotted on the maps of the study area and very loosely contoured so that the general pattern of variation in maximum and minimum rates would stand out. In this way, regions of more or less the same rates could be more clearly distinguished. The true rate should then fall between the rates on these maps. The subsidence maps were superimposed on the present total thickness maps for the respective interval. In this way the present thickness and geometry of fill and the reconstructed subsidence can be compared and parallels or variations in general patterns of these maps can be seen more easily. Strictly speaking, the subsidence maps are maps of subsidence plus sea level change. However, since a major eustatic sea level change will be felt basin wide, the subsidence patterns should not vary much, so DSL was generally ignored.

Some of the dated study intervals were subdivided to examine subsidence changes within the interval. Unfortunately, the bottoms (depths) of these intervals are difficult to identify on logs and the ages of the bottoms are only roughly known. No TOT maps exist for these "sub-intervals." Instead, the subsidence during those sub-intervals is based on average sedimentation rates (HS) rates for the whole stage.

Detailed discussion of the maps along with the subsidence history (basin history from other sources) is contained in Chapter 6.

Reliability of results

In interpreting the results, consideration must be given to the meaning of the figures. There is no way of calculating exact quantitites whether they are subsidence rates, or reconstructed thicknesses or stresses. The numbers on the subsidence rate maps hold significance only as the most likely limits of subsidence based on the "best-fit" ages (Chapter 4); most likely maximum and minimum surface porosities (Chapter 3), average sedimentation rates, and the assumption of gradual, steady compaction which, for physical compaction, ceased at 30 Ma. The initial porosity, the end point of all the compaction curves, was deliberately overestimated (and underestimated) in order to define the largest likely envelope for changes in subsidence.

The actual rate of basement movement probably lies between the maximum Z and the minimum ZTI values. Even if an exact quantity cannot be established, the basic patterns of subsidence can be seen on the subsidence maps. The values on the maps should be used in a semi-quantitative way. The difference between the maximum and minimum Z and ZTI values indicate the uncertainty in these values. Generally, the smaller the differences, the better the subsidence estimates. On Figure 12, with respect to cumulative thickness estimates, the uncertainty is lowest during the Lower Mannville and much higher in the thick shale sections of the Upper Colorado.

Trying to account for flexure (in a sense, trying to reduce the size of the range between Zmax and ZTImin) could actually result in greater uncertainty because of the assumptions that have to be made about the geophysical properties of the lithosphere. In effect, a flexural model would remove the regional trend from the results over a given interval and leave behind local variations. Sawyer (1985) used both flexural and isostatic models in a study of the tectonic subsidence of the U.S. Atlantic Margin. He found that the flexural result removed the long wavelength component of sediment loading while the local loading model removed equal amounts of the long and short wavelengths. However, the general appearance of his results (plotted as a curve), i.e. the changes in slope, etc., were similar. Therefore, a flexural model would not improve the accuracy of the subsidence rates and would likely result in similar subsidence contour patterns.

The next largest error, after errors in the thickness change of the sedimentary column, is in water depth changes. Total subsidence and sea level change is given by

$$Z+DSL=DW+DTZ.$$

Tectonic subsidence plus sea level change is given by

$$ZTI+DSL=DW*(Pm-Pw)/Pm+DTZ-DTWT/Pm*g.$$

Assuming Pm=3300 kg/m³ and Pw=1030 kg/m³, then for example, over a 5 m.y. interval, if the long-term change in water depth is 10 m the rate of change is 2 m/Ma for Z and 1.38 m/Ma for ZTI. For 25 m, the change is 12.5 m/Ma for Z and 3.44 m/Ma for ZTI. For 50 m, 25 m/Ma and 6.88 m/Ma. So, changes less than 50 m are actually lower than the range between maximum and minimum subsidence rates in the maps in Chapter 6. Small errors in water depth changes are overshadowed by uncertainties in the thicknesses of the sedimentary column and can be ignored.

VI. BASIN HISTORY

This chapter brings together the results of this study with previously published information about history of the Alberta Basin.

A. APTIAN (120-113 Ma)

Regional Geological History

This section discusses the general history of the basin during deposition of the Lower Mannville Group (Gething and McMurray Formations).

Deposition during the Lower Mannville time followed a period of uplift, pedimentation and incisement of the Plains by northwesterly flowing rivers (McLean, 1977; Eisbacher; 1981). The topography of the sub-Cretaceous erosional surface consisted of ridges of resistant Mississippian and Devonian carbonates which extended from northeastern British Columbia to Alberta and Saskatchewan (Williams, 1963). The relief on this surface was between 100 and 200 m (Williams, 1963). The Lower Mannville is absent or thin over the ridges (Rudkin, 1964). Putnam (1983) pointed out that dissolution of the Devonian Elk Point and Duperow Formations in eastern Alberta created depressions that controlled sedimentation, as well. So, topography played a major role in determining the distribution and thickness of the Lower Mannville (Rudkin, 1964; Jardine, 1974).

Continental sedimentation was dominant in the study area during this time (Rudkin, 1964). The Mannville Group was deposited in rivers, lakes, and swamps, on wide floodplains that were very close to sea level (Williams, 1963). Filling of the river valleys was due to the the gradual rise in base level resulting from southward transgression of the boreal sea (Williams, 1963; McLean and Wall, 1981). To the north and northwest, the rivers became estuaries (Williams, 1963). According to Rudkin (1964), the facies of the Lower Mannville change from south to north grading from nonmarine to mixed marine and nonmarine to marine. The McMurray Formation makes up the Lower Mannville of central and northeastern Alberta. Carrigy and Kramers (1973) recognized fluvial, estuarine-deltaic, and brackish water-marine lithofacies in the McMurray. The Gething Formation (plus, to the far west, the Cadomin Conglomerate) makes up the Lower Mannville in northwest Alberta. The Gething Formation is dominantly alluvial-deltaic (Caldwell *et al*., 1978). The Gething formed an enormous delta in the Peace River area, where it attained its maximum thickness (Caldwell, 1984; Stott, 1984). These delta deposits grade northwards into the marine beds deposited in the Aptian boreal sea (Stott, 1984).

According to Caldwell *et al*. (1978), the Boreal sea may have transgressed as far south as northeastern British Columbia by Aptian time, but it probably did not reach the study area. The boreal sea, as recorded in the Gething Formation, only came as far south as Peace River (Stott, 1984). Williams and Stelck (1975) suggested that the Aptian flooding of the Gulf of Mexico and lower Mackenzie River valley areas represented a eustatic sea level rise.

This period was also marked by major tectonic movements. The basal conglomerate of the Blairmore Group, the Cadomin, is a pediment deposit, resulting from uplift of the main ranges of the Rocky Mountains in early Cretaceous time (Schulteis and Mountjoy, 1978; McLean, 1977). According to Rudkin (1964), the general westerly increase in the thickness of the Lower Mannville along the front of the Cordillera, and especially in the Peace River area, indicates greater subsidence there. Caldwell (1984) says that the deposition of great thicknesses (>750 m) of Gething sediments over a relatively short time (Aptian-earliest Albian ?) implies a sudden tectonic uplift of the Cordillera with subsequent erosion and rapid deposition. The Peace River Arch remained collapsed over this time, in fact the top of the arch filled with McMurray and Gething sandstones (Williams and Burk, 1964; Stelck, 1975).

During this time, sediments came into the basin from the south (U.S. western interior) via northwesterly flowing rivers; from the east (the emergent Canadian Shield); and from the west (the B.C. interior) (Rudkin, 1964; Jardine, 1974). Taylor and Walker (1984) examined the dispersal patterns of Cretaceous sediments and concluded that during the early Cretaceous, even during periods of relatively high clastic influx, the paleocurrents were aligned subparallel, rather than perpendicular, to the Cordillera.

All this indicates a northwest trend of paleoslopes, drainage, and sediment thickening, rather than a simple thickening trend perpendicular to the Cordillera as modelled by Beaumont (1981).

The present total thickness (TOT) and present solid thickness (HSTOT) (Fig. 17) reflect the complications of the sub-Cretaceous surface. The TOT map was completed with information from Rudkin (1964). It shows a general thickening towards the west and north, but with considerable variations due to topographic effects. Because of the considerable depth of burial, compaction of the Lower Mannville is severe. The HSTOT map is basically the same as the TOT map, except in the central region where the HSTOT values are slightly lower, reflecting fairly low porosity values. This map shows the present solid thickness. Reconstructed solid thicknesses, based on a surface porosity of .56 for sandstones, are a bit larger (Appendix 2). The locus of maximum sedimentation cannot be seen on Figure 17, but the trend indicates a locus to the northwest.

Stott (1984) estimated that the sedimentation rate of the Lower Blairmore in the Foothills was between 100 to 125 m/Ma. This is considerably higher than the figures for this study area.

Total Subsidence (Z)

The basic patterns of the present total thickness (TOT) and the total subsidence (Z) maps are similar (Fig. 18). Subsidence increases from the southeast to the northwest, following the pattern of sediment dispersal parallel to the Cordillera. However, the lows and highs in the central area correspond to topographical highs and lows, so they may not reflect true subsidence.

Since this is the first interval over which the thicknesses were reconstructed, Z is essentially the estimated thickness of freshly deposited Lower Mannville sediments (divided by 7). For example, the Lower Mannville is presently 129.5 m thick at well 3. However, the reconstructed thickness estimates range from 280 m to 196 m.

The highs from the maximum and minimum maps range from 40 to 28 m/Ma (wells 1, 2, and 7). The lows are around 3 m/Ma (well 43). The difference between maximum and minimum values for the same well range from 13 to 1 m/Ma, and average around 10 m/Ma. This is fairly low; the differences tend to increase over later intervals.

Tectonic Subsidence (ZTI)

Basically, the ZTI maps, Figure 19, are just a subdued version of the Z maps. The highs from the maximum and minimum maps range from 20 to 10 m/Ma. The lows are around 1 m/Ma. Differences between maximum and minimum values range from 9 to 0 m/Ma, but most average less than 5 m/Ma. Deeper areas of the basin, the west and northwest, probably experienced greater subsidence. These maps reinforce the idea of a low in the Peace River district. The creation of a regional low in that area was probably due to thrust load emplacement and a rise in base level, as noted before. Any ZTI value less than about 10 m/Ma is probably not significant, bec[illegible]ect of topography. Therefore, the only figures of real tectonic significance [illegible] in the northwest co[illegible] where estimates range from 20 to 10 m/Ma.

B. EARLY ALBIAN (113-108 Ma)

Regional Geological History

This section deals with the Upper Mannville Group and its correlatives in the Plains. These include, from oldest to youngest: the Ostracod or Calcareous Zone; the Bluesky, Glauconitic and Wabiskaw Members; the Clearwater and Moosebar Formations; and the Grand Rapids Formation (Upper Spirit River Formation).

As with the Lower Mannville drainage of the interior Plains was towards the northwest along a subdued version of the sub-Cretaceous surface (McLean and Wall, 1981). Topography still determined the pattern of sedimentation to some extent, with thicker deposits occupying the valleys, and higher sand/shale ratios on the ridges (Rudkin, 1964). The structure of the Mannville in eastern Alberta was controlled in part by differential compaction over relief on the sub-Cretaceous surface, and in part to collapse due to dissolution of the Devonian Elk Point evaporites (which occurred during and after Mannville time) (Jardine, 1974; Putnam, 1982).

The most important event in the basin during this interval was a major marine invasion of the Alberta Plains which began in the early lower Albian: the Clearwater transgression (Jeletzky, 1971; Caldwell, 1984). This was the first major inundation of the basin since the deposition of the Kootenay Group and Nikanassin Formation in the latest

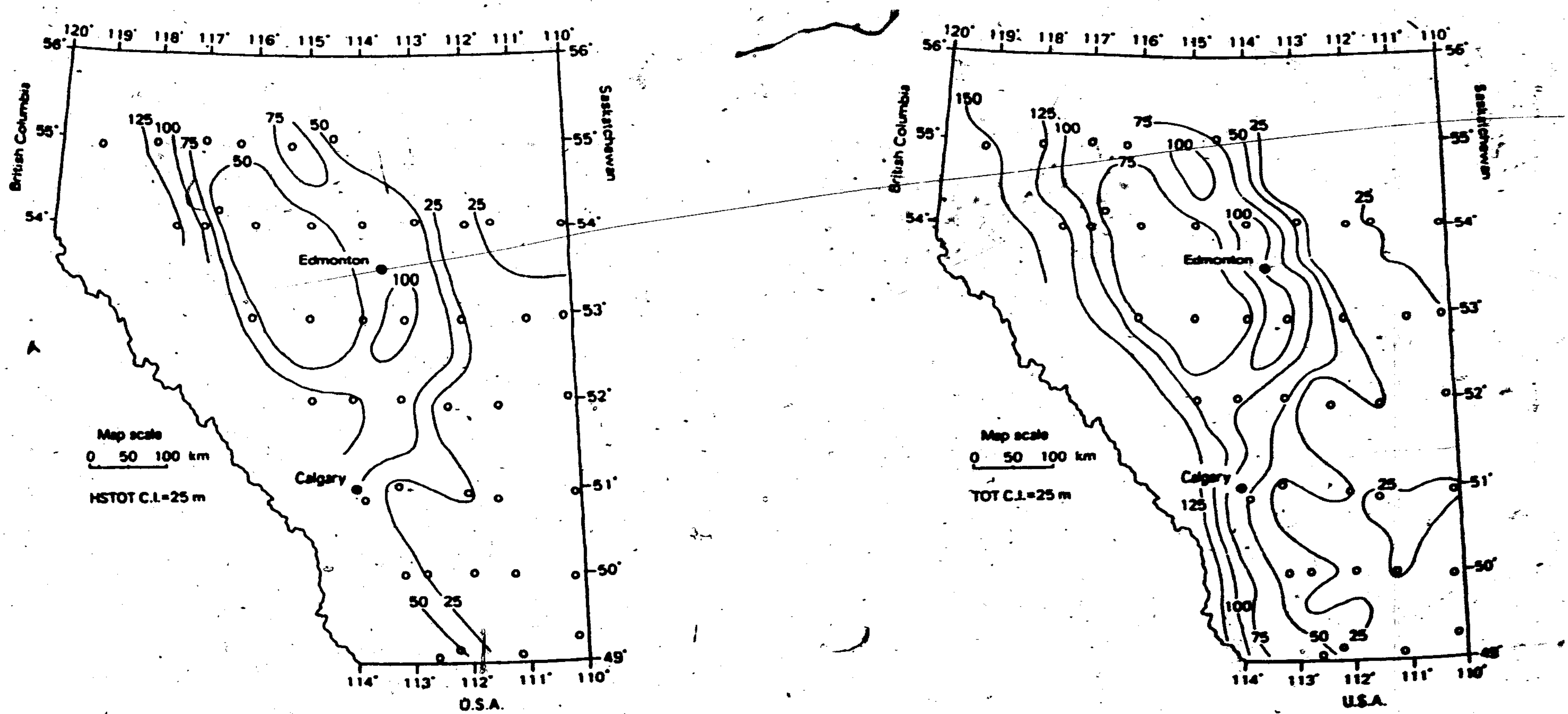


Figure 17: Present solid grain height (left) and total thickness (right) of the Lower Mannville Group.

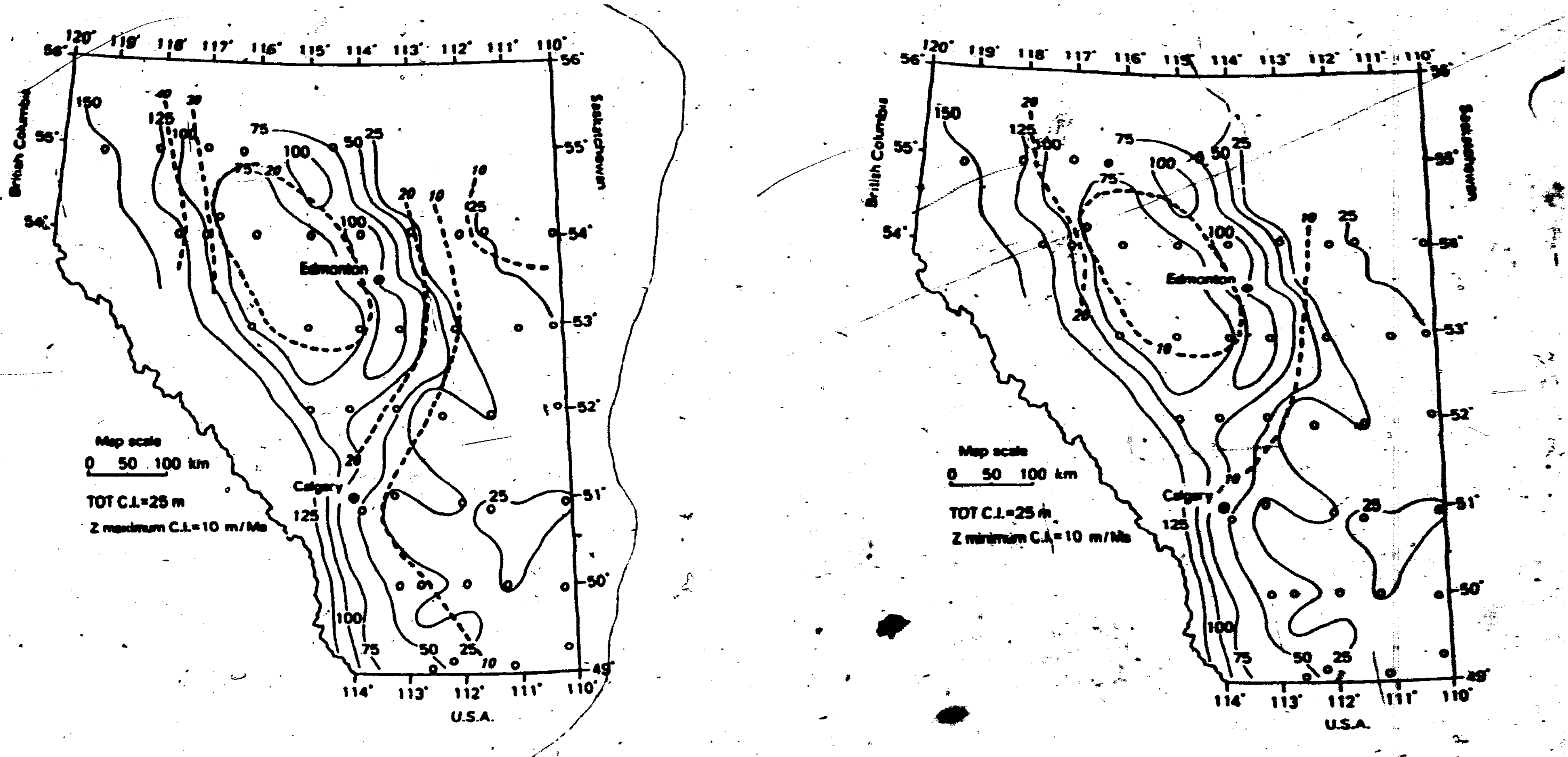
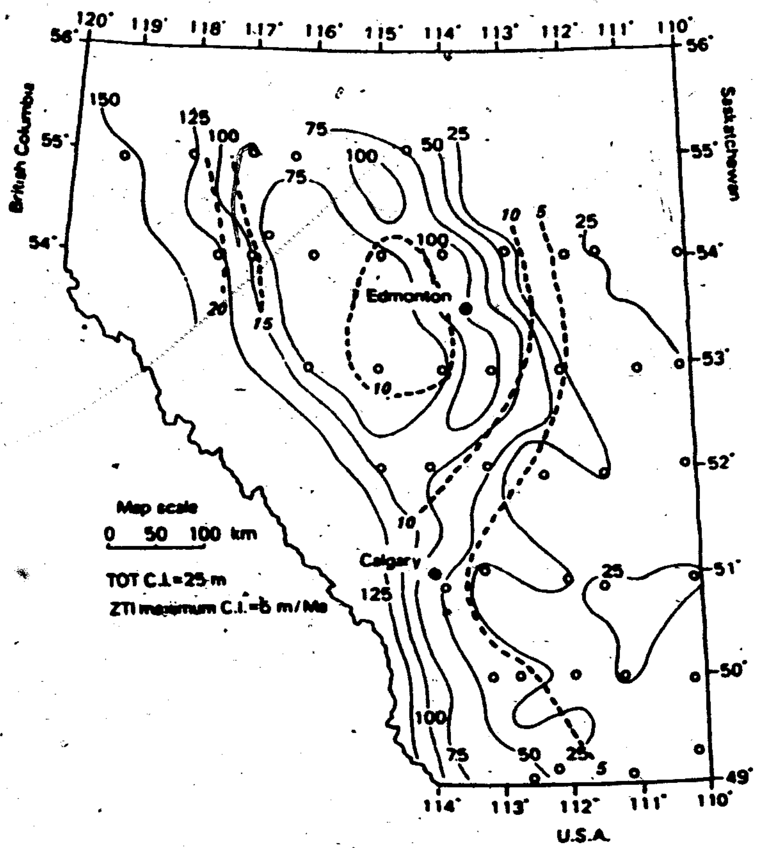


Figure 18: Maximum (left) and minimum (right) total subsidence over the Lower Mannville interval, superimposed on an isopach map of the Lower Mannville Group.



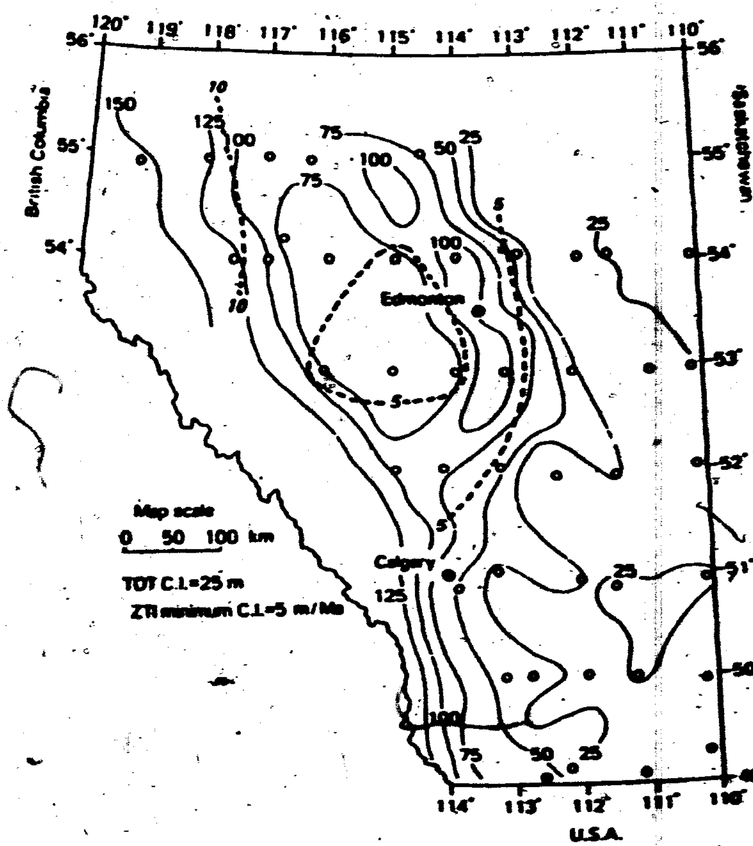


Figure 19: Maximum (left) and minimum (right) isostatic tectonic subsidence over the Lower Mannville interval, superimposed on an isopach map of the Lower Mannville Group.

Jurassic-earliest Cretaceous (Stott, 1984). Finger (1983) stated that the Ostracod Zone

> "...marks the initial subsidence of the Western Canada Basin which subsequently led to the southward transgression of the Moosebar-Clearwater boreal sea..."

The Ostracod Zone represents a series of marginal-marine facies (estuarine to lacustrine) which migrated south, ahead of the boreal sea (McLean and Wall, 1981; Finger, 1983). Stelck (1975) believes that the Peace River Arch may have blocked the transgression of the boreal sea through the early Albian, but by the earliest Middle Albian the sea crossed the arch and moved into the Athabasca area. The boreal sea moved southward along the early Cretaceous drainage systems down to around 52° N (McLean and Wall, 1981). Stott(1984) and Taylor and Walker (1984) believed that the sea may have moved even farther south, possibly into southeastern Alberta and Montana.

Caldwell (1984) suggested that during latest Gething time marine tongues surrounded a chain of islands which were a paleogeographic expression of the foreland bulge, an uplift that occurs adjacent to a lithospheric downwarping (Beaumont, 1981). When the tectonic loads were removed (eroded to form late Gething sediments), and/or sea level increased, the islands submerged. Whatever the cause, the Clearwater sea deepened and drowned the topography in Alberta. Open marine conditions expanded across the Prairies as far south as North Dakota (McLean and Wall, 1981; Caldwell, 1984). The sea was still fairly shallow, probably not exceeding 100 m in the northwest Foothills (McLean and Wall, 1981).

The sea withdrew quickly, leaving sandy nonmarine sediments of the Grand Rapids and Spirit River Formations (Caldwell, 1984). The probable cause of the regression is thought to be a major influx of northward encroaching sediment resulting from increased tectonic movements in western and southwestern Alberta in the lower to middle Upper Mannville (Williams, 1963; Caldwell, 1984).

Caldwell (1984) stated that it is uncertain what controlled the Clearwater transgressive-regressive couplet (although it appears that Cordilleran uplift may have aided the regression), but the fact that such a wide area beyond the foredeep was affected suggests eustatic control.

The short-lived Clearwater regression was followed by the relatively minor Hulcross transgression which only reached the Peace River area. Nonmarine conditions prevailed in central and southern Alberta (Caldwell, 1984; Stott, 1984). The Hulcross regression is marked by a disconformity across the top of the Grand Rapids and Peace River Formations (Caldwell *et al*., 1978).

According to Rudkin (1964), the loci of maximum subsidence and sedimentation were along the Cordilleran foredeep. Stott (1984) estimated that the sedimentation rate in the Foothills area during the Upper Blairmore was from 150 to 175 m/Ma; again, this is considerably higher than in the study area. The present thickness map (Fig. 20) shows a distinct thickening trend to the west and northwest. The HSTOT map shows a similar trend, but the thicknesses are lower by around 25 m. The topography is not as pronounced as it was in the Lower Mannville.

The discrepancies between the TOT and HSTOT maps are good examples of how compaction can obscure the record of subsidence. For instance, the present thicknesses in wells 16 and 35 (54° N, 110° W and 114° N, 50° W) are almost equal, 160.3 m versus 159.1 m. Judging from these figures it would appear that the total subsidence in both wells was about equal. However, the compaction suffered by sediments in well 35 was greater, so the reconstructed thicknesses (especially since well 35 contains a lot of shale) are greater, as are the estimates of subsidence (86 to 56 m/Ma for well 35 versus 58 to 36 m/Ma for well 16).

Total Subsidence (Z)

The subsidence over this interval is considerably higher than for the Lower Mannville. The foredeep trough appears to have expanded eastward. For the most part, there is parallelism between the Z maps and the TOT maps (Fig. 21). Subsidence is lowest in the southeast. It increases rapidly towards the Cordillera in the west, and to the Peace River area in the northwest, indicating probable loading by thrust sheets.

The highs from the maximum and minimum maps range from 124 to 84 m/Ma (well 1). The lows range from 18 to 11 m/Ma (well 39). The difference between maximum and minimum values ranges from 40 to 6 m/Ma, and averages around 20 m/Ma. These differences increase towards the northwest, where the sediments are thicker.

Tectonic Subsidence (ZTI)

Again, the ZTI maps (Fig. 22) resemble the TOT map. The resolution was not good enough to be able to contour at less than 10 m/Ma intervals, so there is less detail on the ZTI maps. Tectonic loading is indicated in the northwest. Loading apparently influenced the southwest area, as well. A broad central shelf extends from the southeast to the central area, and is characterized by little variation in subsidence rates.

The highs from the maximum and minimum maps range from 56 to 27 m/Ma (wells 1 and 2). The lows range from 9 to 4 m/Ma (well 39). The difference between maximum and minimum values for the same well range from 30 to 4 m/Ma, and average around 15 m/Ma. Differences increase to the northwest.

C. LATE ALBIAN (103-98 Ma)

Regional Geological History

This section deals with the Lower Colorado Group: the Joli Fou Formation; the Viking Formation and Bow Island Formation, and the Lower Colorado shale up to the base of the Fish Scales Zone.

The Joli Fou Formation and the Viking Formation represent the transgressive and regressive phases, respectively, of the so-called Kiowa-Skull Creek Marine Cycle (Caldwell, 1984). The middle Albian (*Gastroplites*) sea reached th[illegible]h parallel and was followed, in the late Albian, by the *Neogastroplites* sea which transgressed across the western interior of the United States, eventually connecting with the gulfian sea to form the Western Interior seaway (Jeletzky, 1971; Caldwell *et al.*, 1978). This transgression is believed to have been a global event and possibly represents a eustatic sea level increase (Kauffman, 1977; Caldwell, 1984). The seaway developed during a period of quiescence in the Cordillera (Porter *et al.*, 1982). Jeletzky (1978) indicated minor fluctuation of water depth in the foredeep, with average depths ranging from 50 to 100 m.

The development of the seaway is marked by shales of the Joli Fou Formation, which contain chert pebble conglomerates at the base, and disconformably overly the Mannville Group (Rudkin, 1964; Caldwell *et al.*, 1978). According to Stelck and Armstrong (1981), the Lower Colorado is transgressive from the Plains to the Foothills and pinches

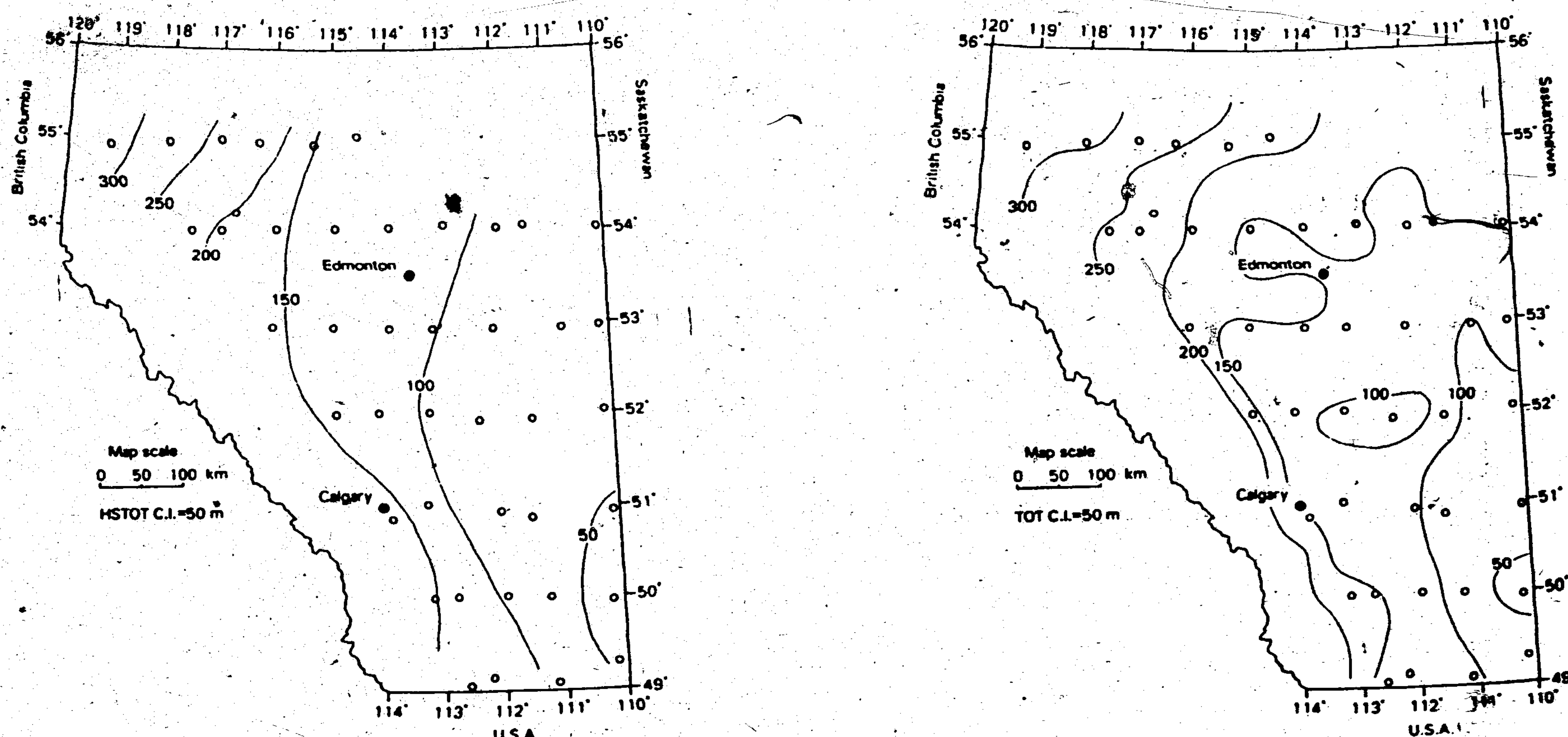


Figure 20: Present solid grain height (left) and total thickness (right) of the Upper Mannville Group.

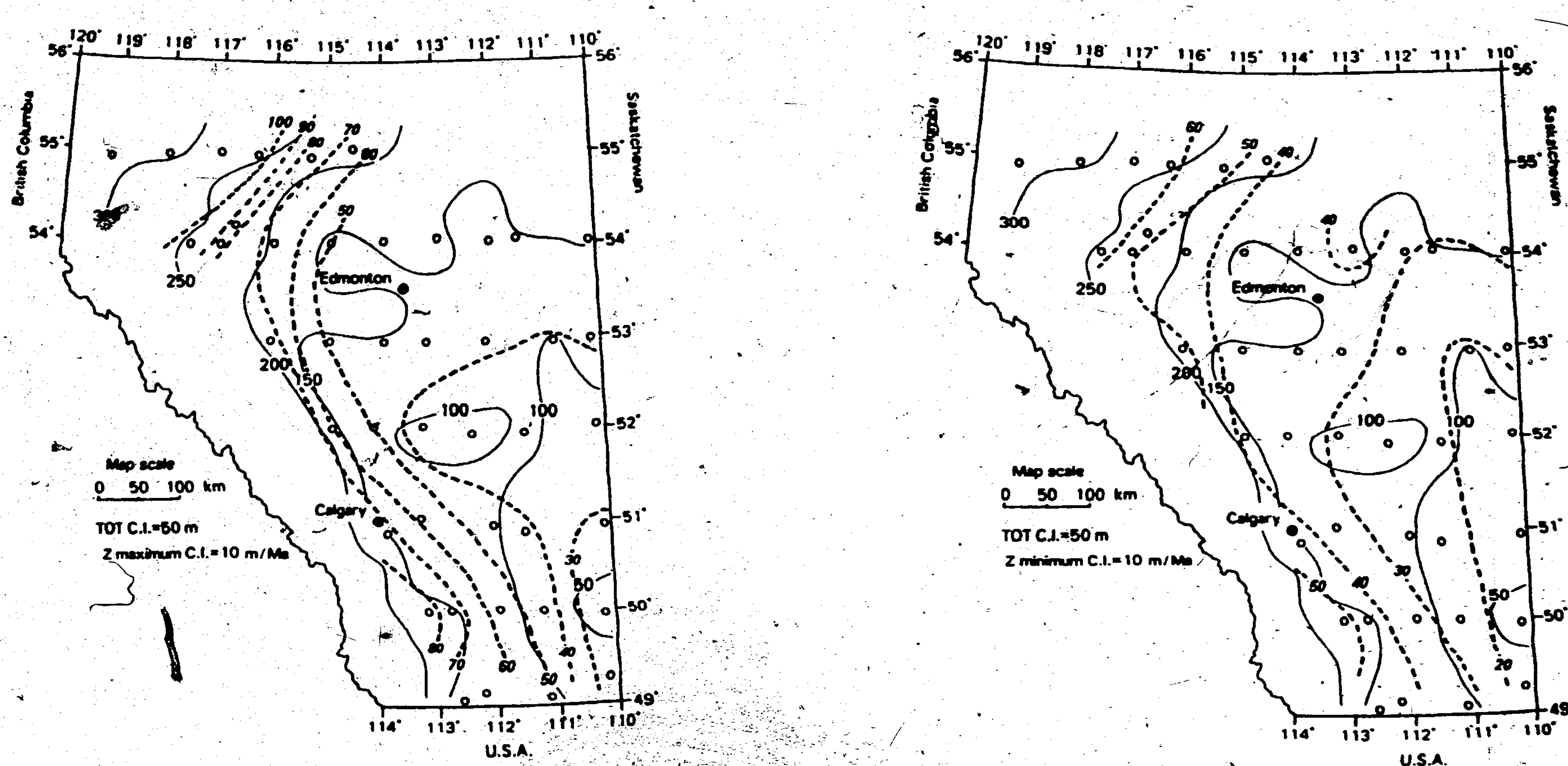


Figure 21: Maximum (left) and minimum (right) total subsidence over the Upper Mannville interval superimposed on an isopach map of the Upper Mannville Group.

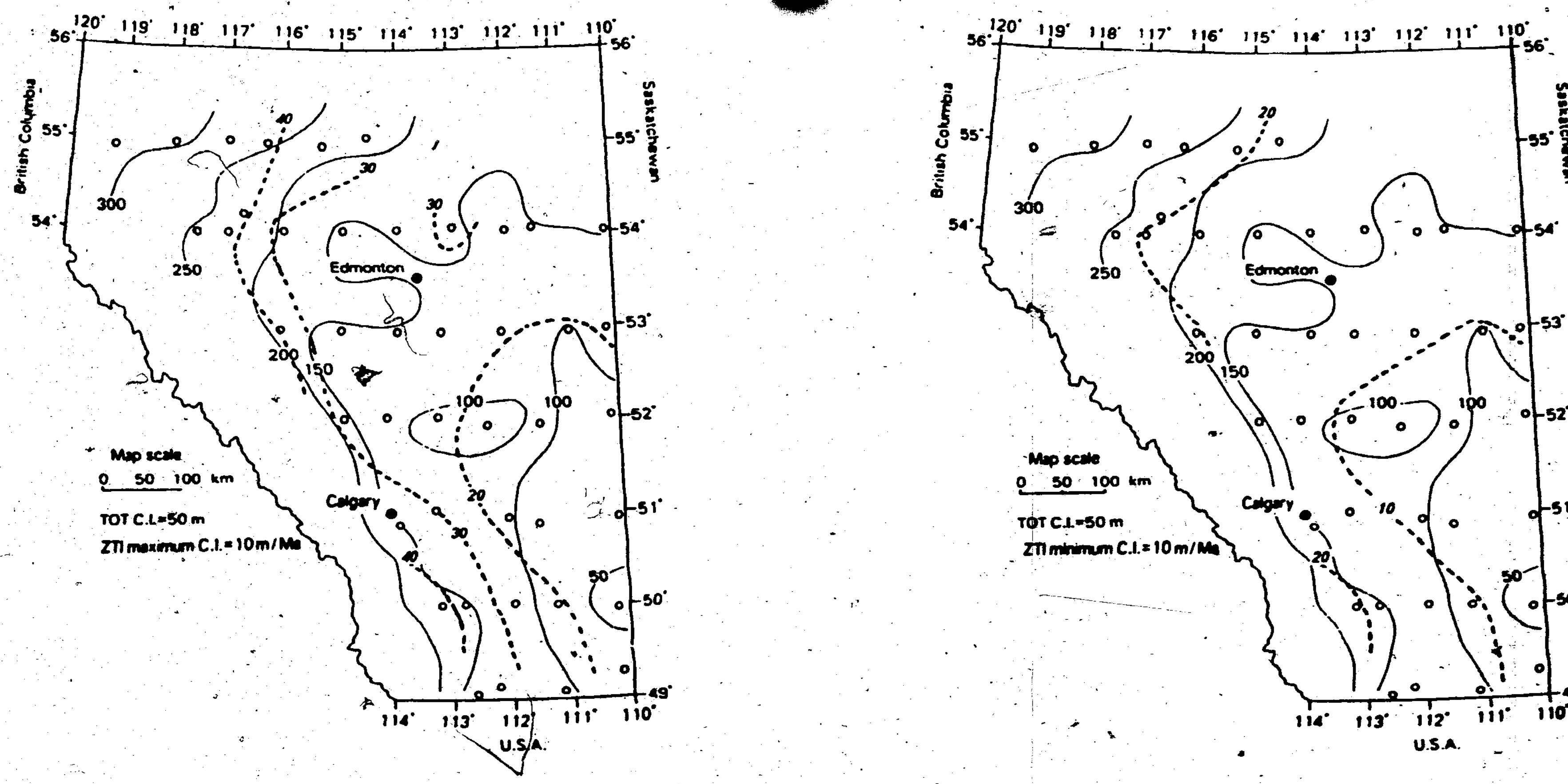


Figure 22: Maximum (left) and minimum (right) isostatic tectonic subsidence over the Upper Mannville interval superimposed on an isopach map of the Upper Mannville Group.

out before reaching the central foothills. As the Lower Colorado Group was being deposited under marine conditions on the Plains, the Upper Blairmore, the equivalent nonmarine facies, was being deposited in the southern Foothills (Rudkin, 1964; Stelck and Armstrong, 1981). Marine deposition took place over western Canada except in the Crowsnest Pass area which remained as a topographic high until flooded in the Turonian (Rudkin, 1964).

The absence of sandstone in the eastern portion of the basin indicates that the shield was flooded and no longer acting as a source of sediments (Rudkin, 1964). There are sandstones to the west (which thin and grade to siltstones eastwards) indicating some Cordilleran uplifts, and attendant foredeep subsidence (Rudkin, 1964). Following total flooding in the late Albian, there was a minor regression, represented by the bar sandstones of the Viking Formation which extend across the central area of the basin (Stott, 1984). Wave action and southeasterly ocean currents winnowed and carried sand from a major delta in the Peace River area (draining the B.C. interior) over the basin to form these bars (Rudkin, 1964). These bars do not form sheets, but rather lenses, which represent discrete pulses of sedimentation in the basin (Caldwell, 1984). The basic lithofacies pattern is more sand and shaly sand in the central area and, adjacent to the foothills, more shale to the north, south and east-northeast.

The end of this interval is marked by the *Neogastroplites* fauna, which also delineate the top of the Lower Cretaceous (Rudkin, 1964). The Late Albian actually saw the very beginning of an even greater transgression - the Greenhorn transgression. In the eastern Canadian Plains there is a hiatus , and some Late Albian to Early Cenomanian section is missing (Caldwell, 1984). However, sedimentation was continuous in the foredeep area. Expansion of the Greenhorn sea may have been curtailed in Late Albian time, in some areas, resulting in nondeposition and/or erosion.

The TOT map (Fig. 23) shows a thickening trend in the very southeast corner. Rudkin (1964) indicates a maximum isopach of around 213 m in north-central Montana. There is also a thickening trend to the northwest, the Peace River area, and northeastern B.C., where a maximum of 609 m was indicated by Rudkin (1964). The interesting thing about the TOT map is that the thickening trends in Alberta are parallel to the present strike of the Cordillera, rather than perpendicular. Another interesting feature is the shelf-like area of lower thicknesses in north-central Alberta. This area divides the basin into two sub-basins, one to the northwest and one to the southeast.

There is a subtle difference between the TOT and HSTOT contour patterns (Fig. 23). In the central and southeastern regions the trend of thickening is generally towards the south rather than the southeast, as is the case on the TOT map. The ratio of HSTOT values to TOT values also increases in this direction. Since this interval is basically shale, a reasonable explanation for this trend is compaction. A heavy influx of sediment in the Upper Cretaceous, following the trend of the present Foothills from approximately 53° N 116° W to somewhere around southeast Alberta, could have caused this compaction. While the TOT and HSTOT patterns are somewhat similar in the eastern parts of Alberta, there is a distinct bunching together of TOT contour patterns in the west-central to south-central areas. A wedge of sediments shed over the western Plains, and increasing in thickness to the south, could cause compaction of underlying sediments and create this pattern.

It can be seen that the present thickness over an interval is not necessarily the subsidence over the interval. For example, well 20 (53° N, 113° W) and 30 (51° N, 114° W) have the same present total thickness (98.1 m), but well 30 has a greater solid grain height (89.6 m versus 77.7 m). The expected reconstructed thickness should therefore be greater in well 30, as should the total subsidence. However, because of the compaction of underlying sediments, subsidence is actually greater at well 20.

Total Subsidence (Z)

It must be pointed out that this interval follows an unconformity. In the model, during the time gap sediments were assumed to continue to compact under their own weight and under the weight of sediments removed during the gap. If there was some delay in compaction, which later resumed, then compaction of lower intervals may be slightly underestimated (subsidence may have been greater). Errors may also arise from uncertainties in dating the duration of the gap.

The high Z values range from 110 to 60 m/Ma, and the lows range from 20 to 16 m/Ma (Fig. 24). The well-to-well differences range from 50 to 6m/Ma, and average around 20 m/Ma.

The Z minimum map (Fig. 24) shows the same general pattern as the TOT map. However, the Z maximum map does vary from the TOT map, especially in the central region of the basin. Whereas the TOT map contours have an easterly strike, the Z maximum contours actually cross the TOT contours (the 50 and 60 m/Ma contour lines run from north to south). In the northwest and southeast, the Z patterns are similar to the TOT pattern. It could be argued that this difference in patterns is due to extrapolating across the time gap. However, the deviation between TOT and HSTOT patterns supports the idea that the Z/TOT map differences are due to compaction.

Tectonic Subsidence (ZTI)

The highest ZTI values range from 60 to 28 m/Ma, and the lowest ZTI figures range from 10 to 6 m/Ma. The maximum to minimum differences range from 30 to 4 m/Ma and average around 10 to 15 m/Ma.

The minimum ZTI patterns (Fig. 25) are similar to the total subsidence pattern. There is a broad west-central area with little variation in subsidence (values range between 10 and 20 m/Ma). A shelf with low rates is present here as well.

The ZTI maximum contours cross the TOT map contours, running almost north-south in the central area. Again, to the north and south the rates increase, in agreement with thickening on the TOT map.

South of Calgary there are rapid increases in both Z and ZTI rates, as indicated by the closer spacing of the contour lines. The shelf-like region mentioned before extends along the trend of the Cordillera down to Calgary, on the ZTI max/min maps.

The increase in Z and ZTI towards the northwest could represent crustal loading in northeastern B.C. The increase in Z and ZTI towards the southeast is harder to explain since the increase is away from the Cordillera. Actually, the distribution of Viking Formation sandstones shown in Stott (1984) more or less parallels the shelf-like region on the Z and ZTI maps. Perhaps the ocean, encroaching from the east and south, depressed the lithosphere in the south and central area. The shelf could represent an area of shallower water that did not undergo as much subsidence.

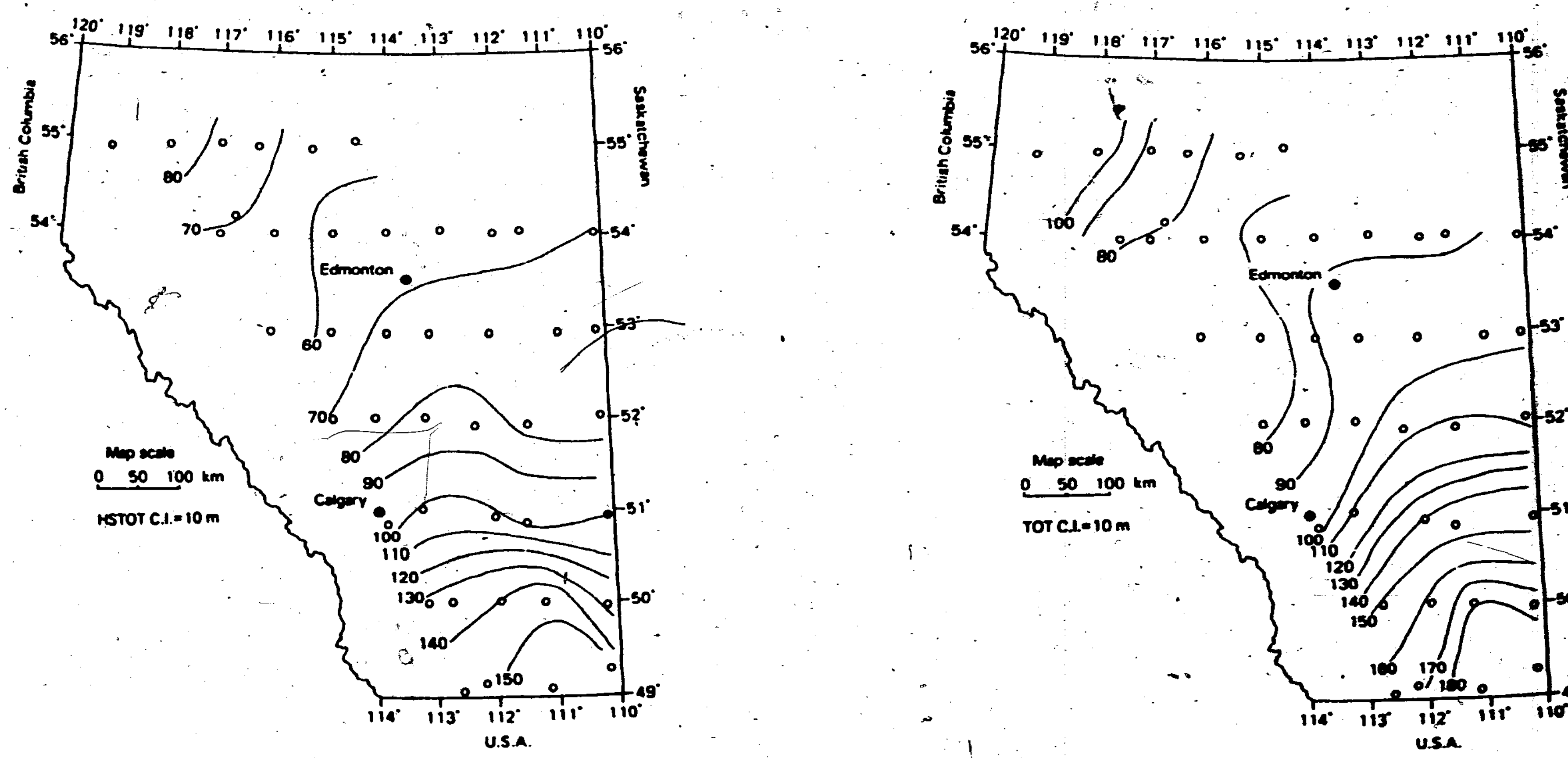


Figure 23: Present solid grain height (left) and total thickness (right) of the Lower Colorado Group.

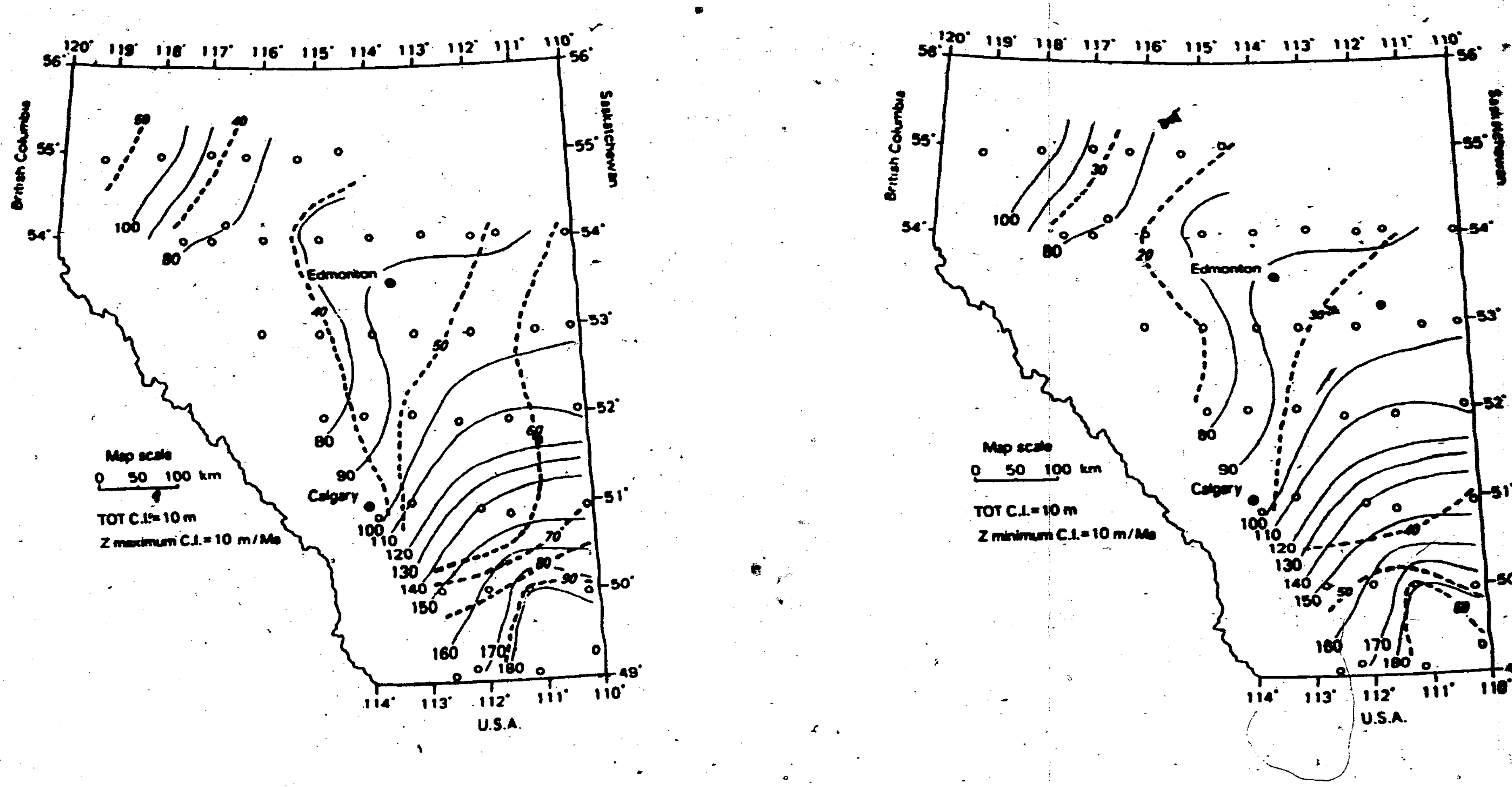


Figure 24: Maximum (left) and minimum (right) total subsidence over the Lower Colorado interval superimposed on an isopach map of the Lower Colorado Group.

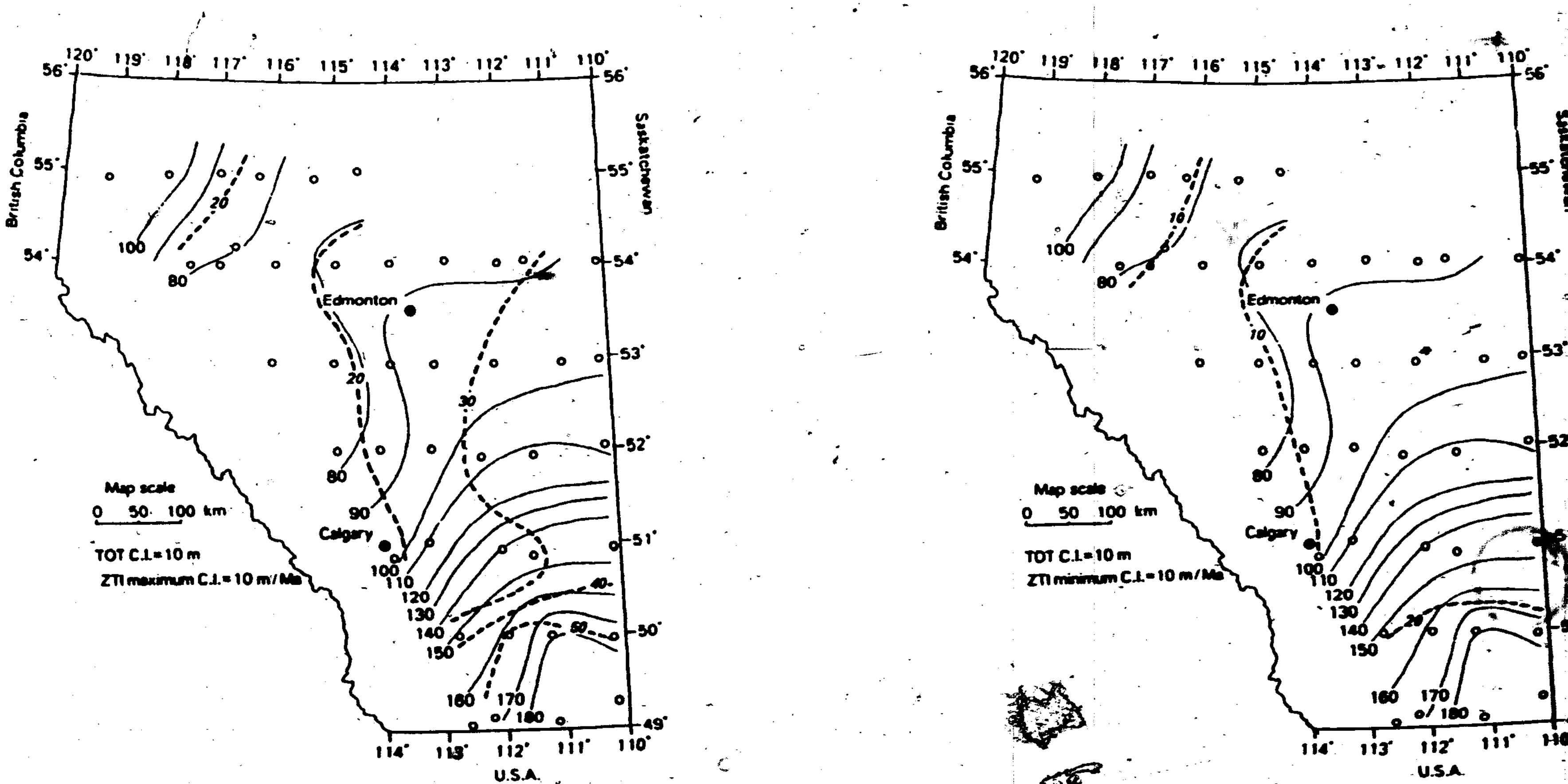


Figure 25: Maximum (left) and minimum (right) isostatic subsidence over the Lower Colorado interval, superimposed on an isopach map of the Lower Colorado Group.

D. LATEST ALBIAN TO EARLY TURONIAN (98-90 Ma)

Regional Geological History

This section deals with part of the Upper Colorado Group, between the base of the Fish Scales Zone and the Second White Speckled Shale.

Caldwell *et al*. (1978) suggested (on the basis of distribution of foraminiferal zones) that the Fish Scales bed may indicate brief emergence in places across the southern part of the basin. Rudkin (1964) suggested that the Fish Scales could be a lage deposit from a period of slow deposition. He thought that the interbedded sand (coarsening to the west) and missing parts of the Cenomanian could have been due to local emergence, or high energy, shallow water environments. More evidence for emergence lies in the fact that early Cenomanian ammonites have not been located in the western interior and may be absent (Caldwell *et al*., 1978).

Areas to the west were uplifted in the early Late Cenomanian, and unroofing of the Omineca batholith provided sediments for the Dunvegan Formation in the Peace River area (Williams and Stelck, 1975; Caldwell *et al*., 1978). This represents only a minor regressive phase of the Greenhorn transgression (Jeletzky, 1971; Caldwell, 1984). The uplifts had no effect on the rest of the Plains region (Jeletzky, 1971).

The early Cenomanian was a time of total flooding of the Plains, and even, partially, the Foothills area (Jeletzky, 1971; Stott, 1984). The lower Turonian transgression, an extension of the late Cenomanian transgression, covered the western Interior reaching depths as great as 300 m and stretching farther west than the present day Rocky Mountains (Jeletzky, 1971). The peak of the transgression of the Greenhorn sea is marked by the Second White Specks, limy shale and marl produced during periodic influxes of warm gulfian waters (Williams and Stelck, 1975).

The TOT map (Fig. 26) for the interval 98-90 Ma was prepared with additional information from Williams and Burk (1964), as were the rest of the TOT maps for the Upper Cretaceous. Basically, the HSTOT and TOT maps show the same pattern (though the HSTOT magnitudes are slightly lower): a northerly depositional strike. Thickening is from east to west and approaches a maximum of 1000 m in northeastern B.C. (Williams and Burk, 1964). In the south, a 75 m contour swings to the east, and another 75 m contour indicates a thin area that could be an expression of the Bow Island Arch (Williams and Burk, 1964). Subsidence was examined over three intervals: 98-90 Ma, 98-91 Ma; and 91-90 Ma. Since the results for 98-91 Ma were almost exactly the same as the results for 98-90 they were not mapped.

Total Subsidence (Z)

The results for the interval 98-90 Ma are discussed first. For the first time, negative subsidence figures begin to appear on the subsidence maps, in the south and east-central areas. The total subsidence highs range from 95 to 77 m/Ma, and the lows range from 5 to -9 m/Ma. The maximum and minimum differences range from 20 to 1 m/Ma, and average between 10 to 5 m/ Ma. Taking into account what is known about the history of the basin at that time, the negative numbers could be interpreted as uplifts or as periods of deepening, when sedimentation was slow and may have been exceeded by compaction. They could also mean an underestimate of surface porosities, since they appear on the Z minimum map (Fig. 27).

The TOT contours generally parallel the Z contours. Exceptions are the 10 and 20 m/Ma minimum contours and the 20 and 30 maximum contours. These have a northerly strike in the central region, but rotate to a northeast strike in the southern region. Perhaps this is a reflection of previous pattern changes in the area during the Lower Colorado. Due to the scarce coverage it is hard to be sure about the exact extent of this feature.

The analysis over the interval 91-90 Ma was based on an average HS sedimentation rate for the greater interval, 98-90 Ma, which may not necessarily apply for the smaller interval. However, the results turned out to be basically the same as the results for the 98-90 Ma interval (see Fig. 29).

Tectonic Subsidence (ZTI)

The ZTI maps (Fig. 28) are similar in pattern to the Z maps and the TOT map. A major pattern difference (a feature less well developed, but still present on the Z maps) appears in the south. There is an easterly trending low between the 5 and 0 m/Ma contours on the maximum map and the 0 and -5 m/Ma on the minimum map. This basically emphasizes that the rocks are thinner over this area, perhaps owing to a regional high. This has changed since Lower Colorado time, when this area recorded the highest amounts of subsidence. Subsidence is higher in the west and northwest, indicating possible loading in those areas.

Overall, the highs range from 40 to 28 m/Ma, and the lows range from -1 to -10 m/Ma. Differences between maximums and minimums range from 15 to 0, and average around 5 m/Ma.

Over the interval 91-90 Ma (Fig. 30), a similar pattern can be seen in the south, although the minimum values are somewhat smaller than the minimum values over the 98-90 Ma interval.

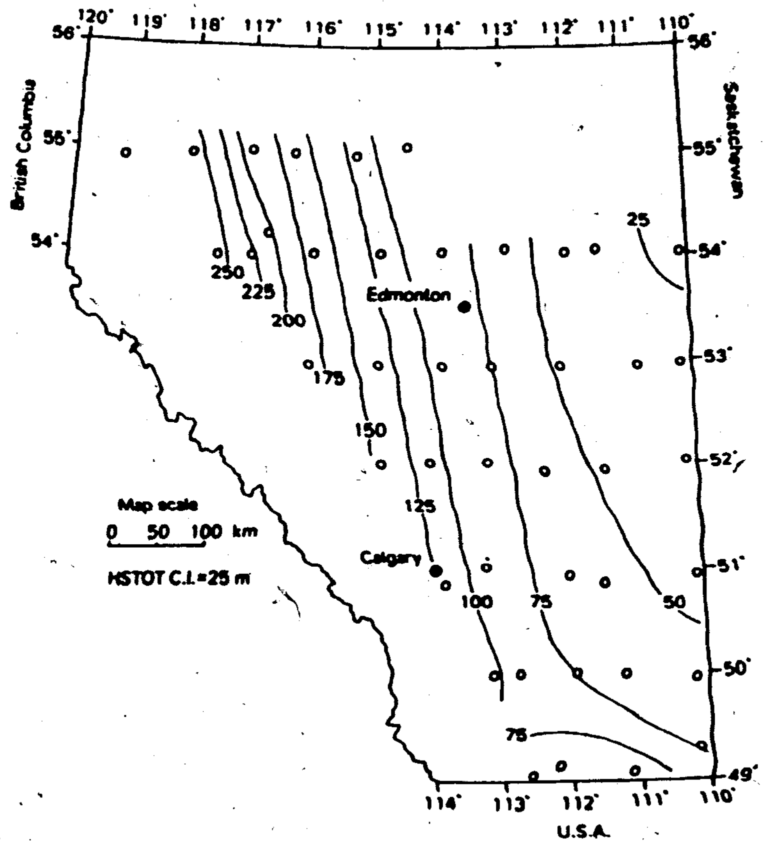
E. EARLY TURONIAN TO EARLIEST CAMPANIAN (90-83 Ma)

Regional Geological History

This interval covers the rest of the Upper Colorado Group, including the Cardium Formation.

The Greenhorn sea continued to occupy the basin until regression in the mid- to late Turonian (Williams and Burk, 1964; Jeletzky, 1971). A strong regression is marked along the western margin of the basin by the Cardium Formation, which was derived from a western source, as indicated by the increasing thickness , and sand content, and the change to brackish water (including coal-bearing facies) in that direction (Jeletzky, 1971).

According to Walker (1983), during Cardium deposition sediment was dispersed from the northwest to the southeast in water depths greater than about 50 m, in the western margin of the basin. The strike of the Cordillera at that time is believed to have been the same as the present strike (Stott, 1984). Western uplifts, sedimentary input, and a lowering of sea level probably caused eastward migration of the western shoreline (Jeletzky, 1971; Williams and Stelck, 1975). Caldwell *et al*. (1978) indicated that deposits of this age are missing in mid-Saskatchewan, and the First White Specks disconformably overly the Second White Specks. In fact, they suggested that the top of the First White Specks is a disconformity or a paraconformity. They reasoned that the regressive deposits of the Greenhorn sea, and Niobrara sea are missing over the eastern Plains because of "...relatively sudden withdrawals of the Gulfian waters."



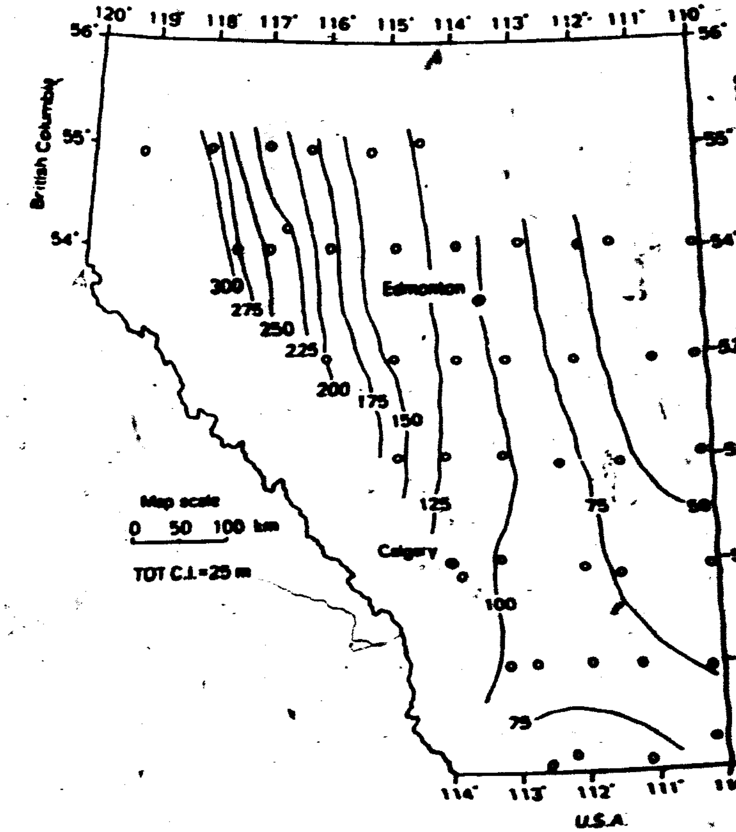


Figure 26: Present solid grain height (left) and total thickness (right) of the interval from the base of the Fish Scales to the top of the Second White Specks.

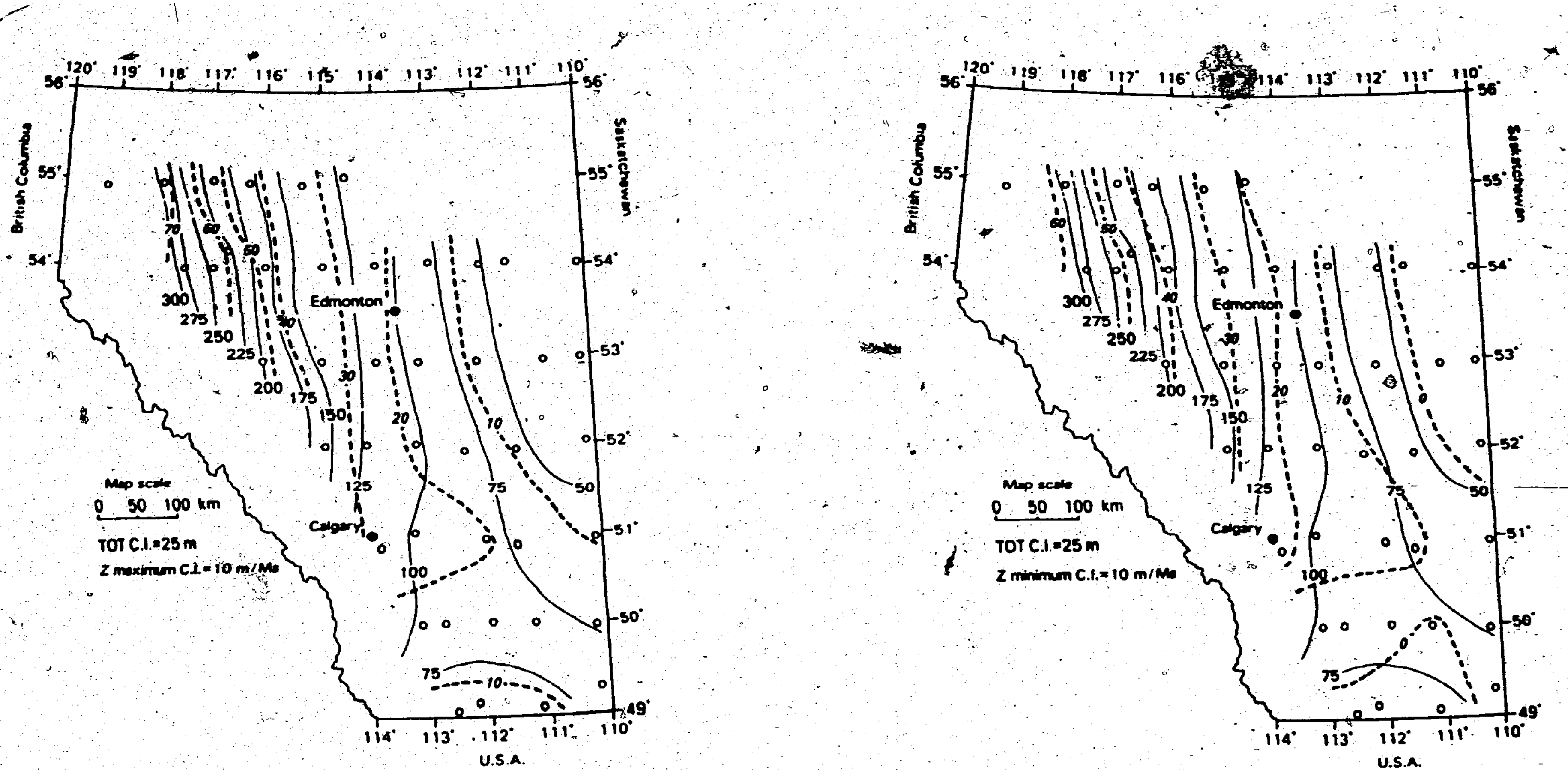


Figure 27: Maximum (left) and minimum (right) total subsidence over the interval between the base of the Fish Scales and the top of the Second White Specks superimposed on an isopach map of that interval.

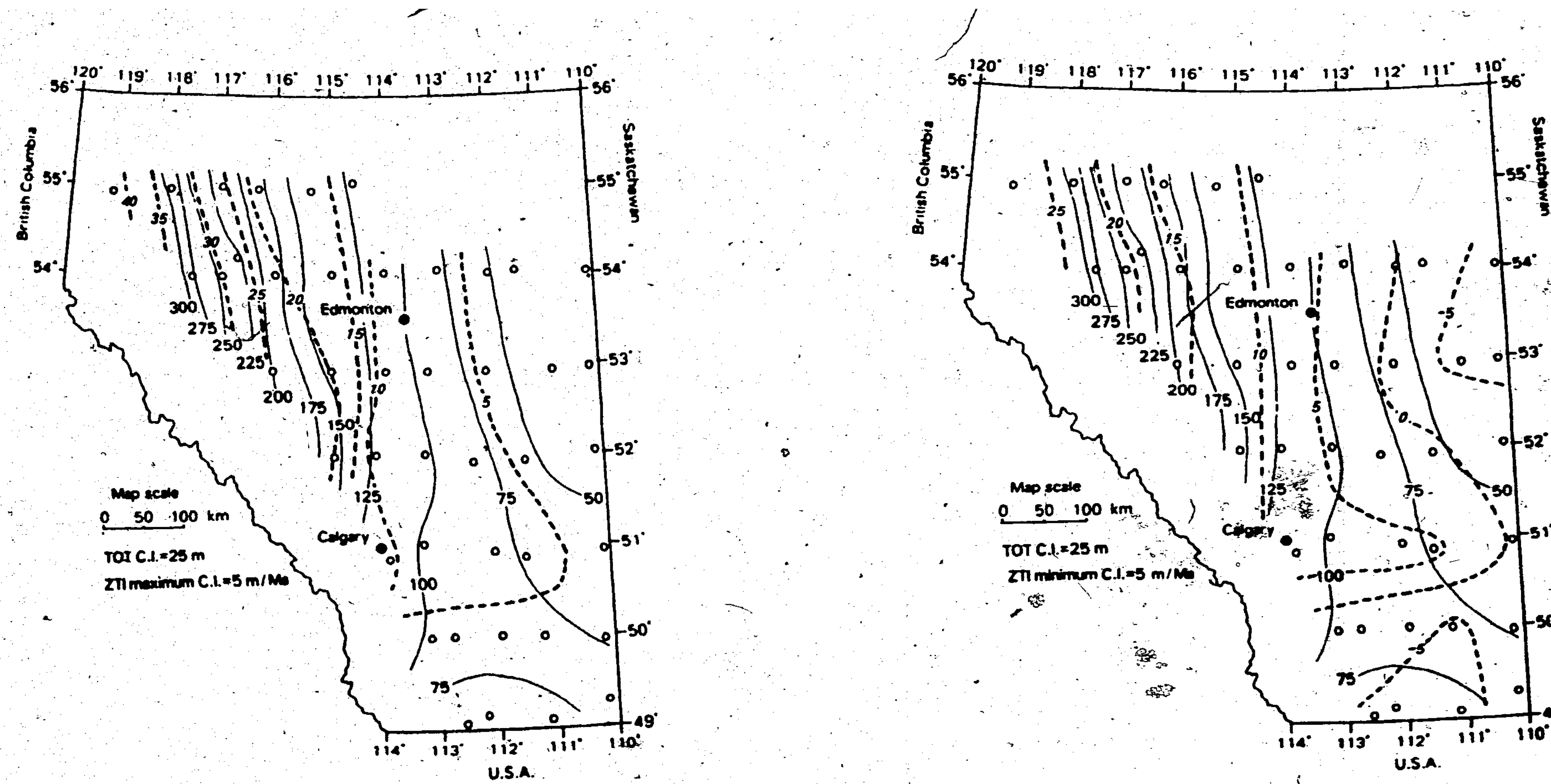


Figure 28: Maximum (left) and minimum (right) isostatic tectonic subsidence over the interval between the base of the Fish Scales and the top of the Second White Specks superimposed on an isopach map of that interval.

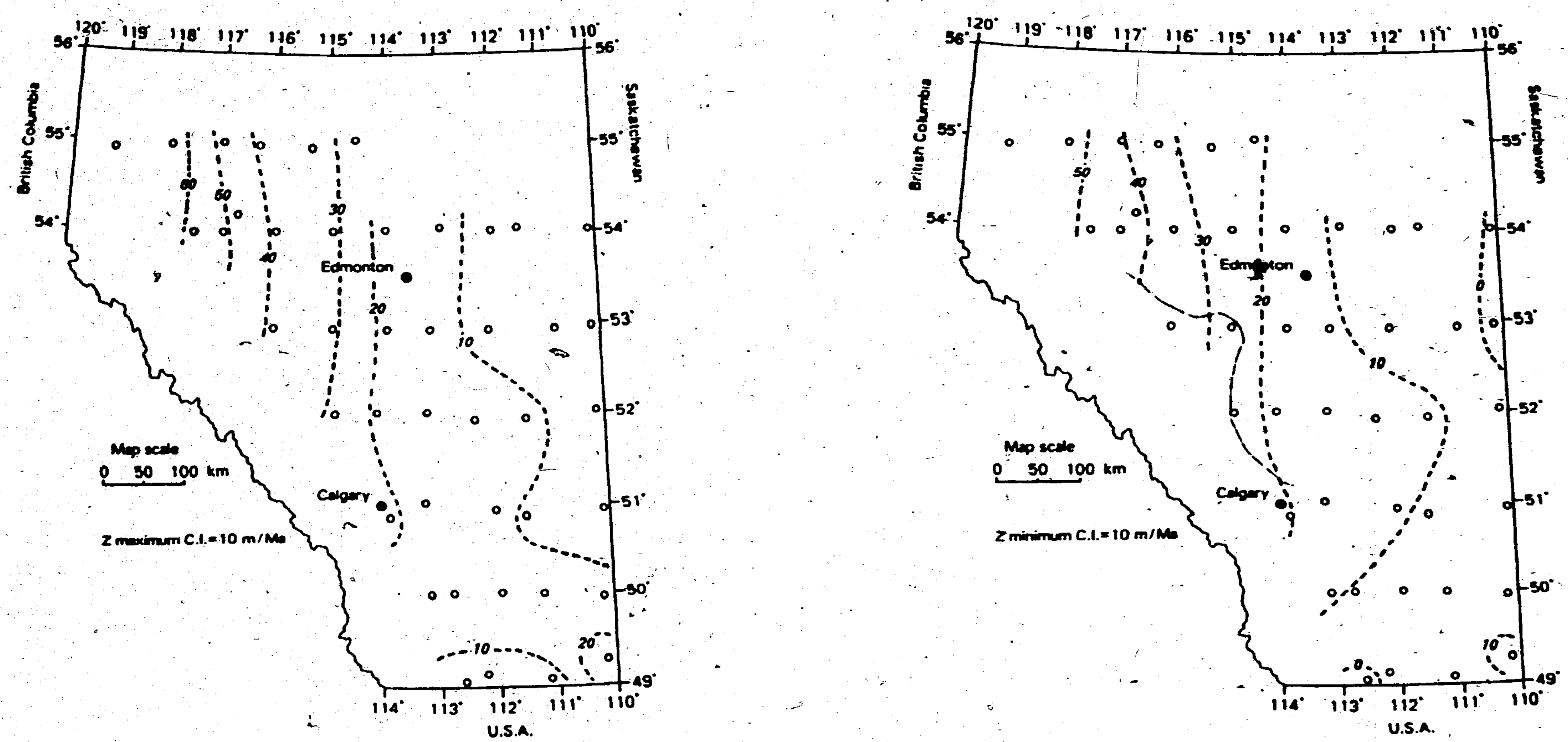


Figure 29: Maximum (left) and minimum (right) total subsidence over the Second White Specks interval (91-90 Ma).

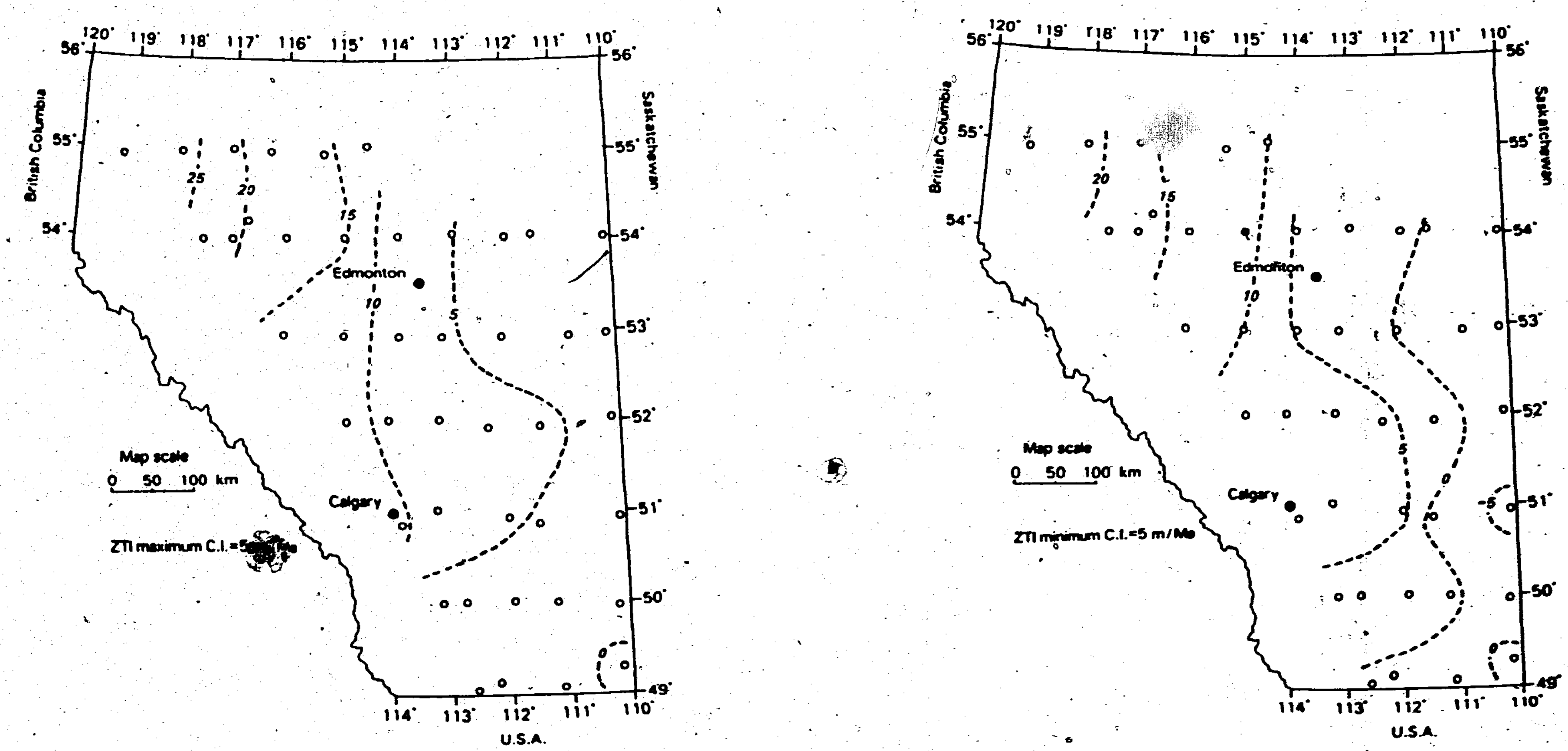


Figure 30: Maximum (left) and minimum (right) isostatic tectonic subsidence over the Second White Specks interval (91-90 Ma).

The Greenhorn regression was followed immediately by the Niobrara transgression, from the Coniacian to mid-Santonian (Jeletzky, 1971). This transgression was even greater than the Greenhorn. It saw the widespread deposition of limy shale, the First White Speckled Shale, across the Plains and into the Foothills, overstepping the early Turonian shoreline (Jeletzky, 1971). Open marine conditions (with water depths exceeding 300 m) prevailed in the basin from the Coniacian to earliest Campanian (Jeletzky, 1971). Chalk deposition in the basin indicates a reduction in the amount of clastic input, except for the Medicine Hat Sandstone in the south, and the Badheart Formation, which represents a minor regression in the northwest during the earliest Santonian (Jeletzky, 1971).

Jeletzky (1971) stated that the beginning of the Campanian-Maastrichtian regression started in the late Santonian along the Foothills. The regression was caused by a major uplift along the Foothills that developed south of 49° N and moved northward. The uplift produced the sands of the Chungo Member in the Foothills. The Chungo Member merges with the Milk River Formation on the Plains and the Lower Belly River Formation in the southern Foothills (Stott, 1984). This was the first of a series of pulses that eventually led to permanent uplift of the basin above sea level (Jeletzky, 1971). At this time the sea was still present in Saskatchewan and Manitoba (Jeletzky, 1971).

Williams and Burk (1964) pointed out that there is a change in the depositional strike from north to northwest between the Second White Specks and First White Specks intervals. Williams and Burk (1964) suggest that that parallelism between the latest Colorado isopach patterns and the present structural trend of the Cordillera implies mid-Colorado development of Laramide tectonism. Over this time the basin had more or less the same shape as Stelck's (1975) West Alberta Basin (Fig. 1), which approximates the outline of the post-Colorado formations which loaded (i.e. compacted) the area. The TOT and HSTOT maps (Fig. 31) differ in magnitude, but not pattern. Both thicken to the west and southwest.

Total Subsidence (Z)

For the interval 90-83 Ma, the differences in the contour patterns between the TOT map and the Z maps are noticeable, especially on the Z maximum map. Followed from northwest to southeast, the Z contours cross the TOT contours and bulge to the east and northeast. In a sense, the area of high subsidence is extended across the central and southern basin over a wider area than would be expected simply from observing the TOT map. In the northwest part of the basin the Z and TOT contours are more or less parallel. The bulge is more noticeable on the Z maximum map than the Z minimum map.

The highs range from 109 to 91 m/Ma, and the lows range from 8 to 7 m/Ma. Differences between maximum and minimum values range from 20 to 1 m/Ma, and average 10 m/Ma (fairly low). Two wells (25 and 31) gave rather high figures, which made interpretations around them difficult.

The same pattern, although with slightly lower magnitudes, can be seen on the Z maps for the interval 90-85 Ma.

The analyses for the interval 85-83 Ma gave some peculiar results. There is no TOT map to compare the results with because the bottom of the First White Specks is difficult to identify on well logs. Instead, the bottom was defined on the basis of estimated age (85 Ma) and an average HS sedimentation rate for the greater interval. The most peculiar features of the Z and ZTI maps are the northwesterly thinning trend , the islands or curls in the central region, and the low rates in the southwest (thinning ?). More points are needed to better define the contours in the central region.

Tectonic Subsidence (ZTI)

The same pattern described above for the 90-83 Ma interval map holds true for the ZTI maps (Fig. 33), only the magnitudes are smaller.

Overall, the highs range from 52 to 35 m/Ma, and the lows are around 3 m/Ma. The differences between maximum and minimum values range from 20 to 0 m/Ma, and average around 7 m/Ma.

Again, similar patterns are seen over the interval 90-85 Ma (Fig. 35), but the magnitudes are lower. The same is true for the 85-83 Ma ZTI patterns.

The bulge in the central and southern region that is so prominent on the 90-83 Ma Z and ZTI maps may be the result of the cumulative compaction correction for the large overburden increase in the central and southern basin in Belly River and Paskapoo time.

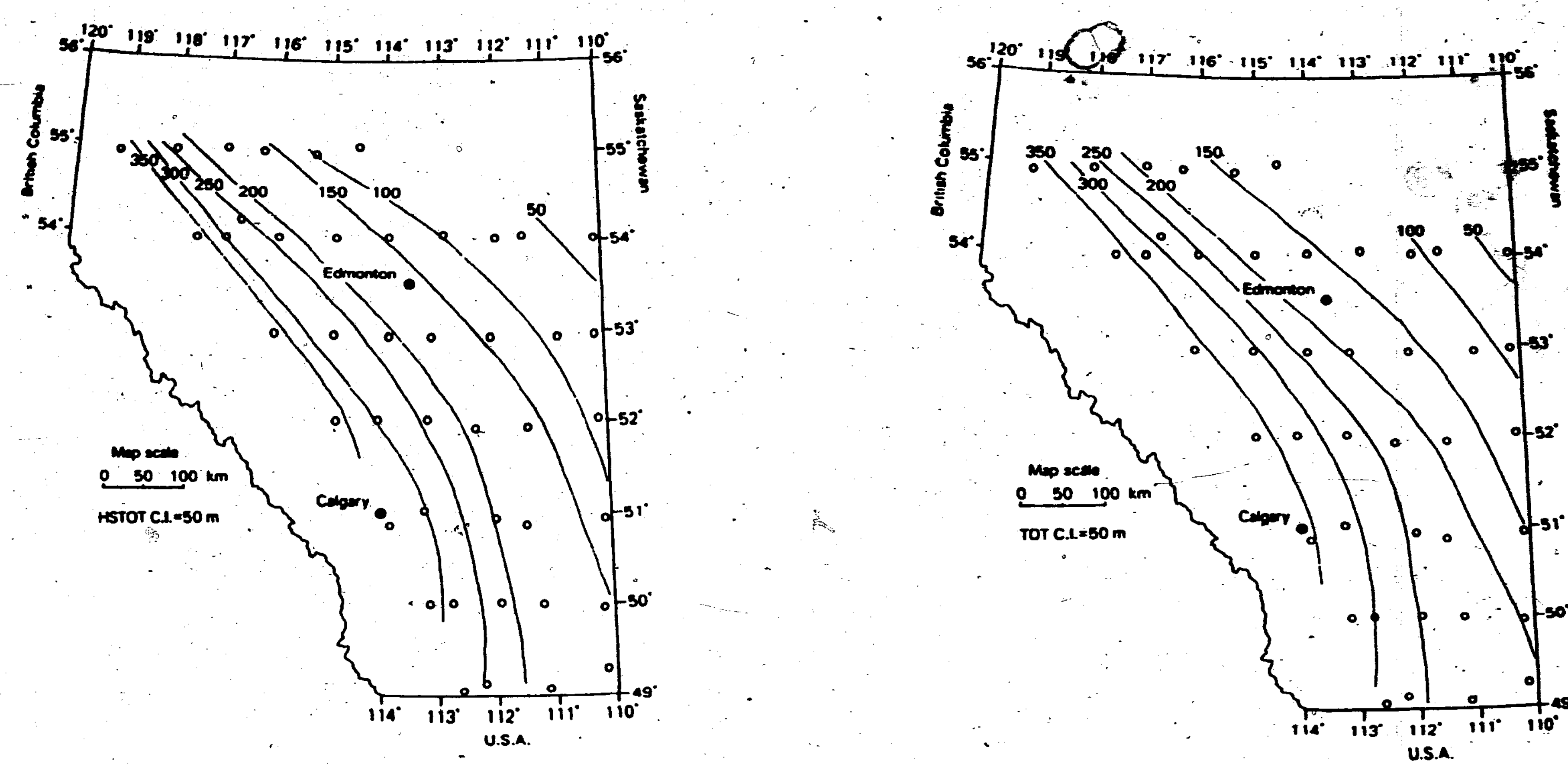


Figure 31: Present solid grain height (left) and total thickness (right) of the interval from the top of the Second White Specks to the top of the First White Specks.

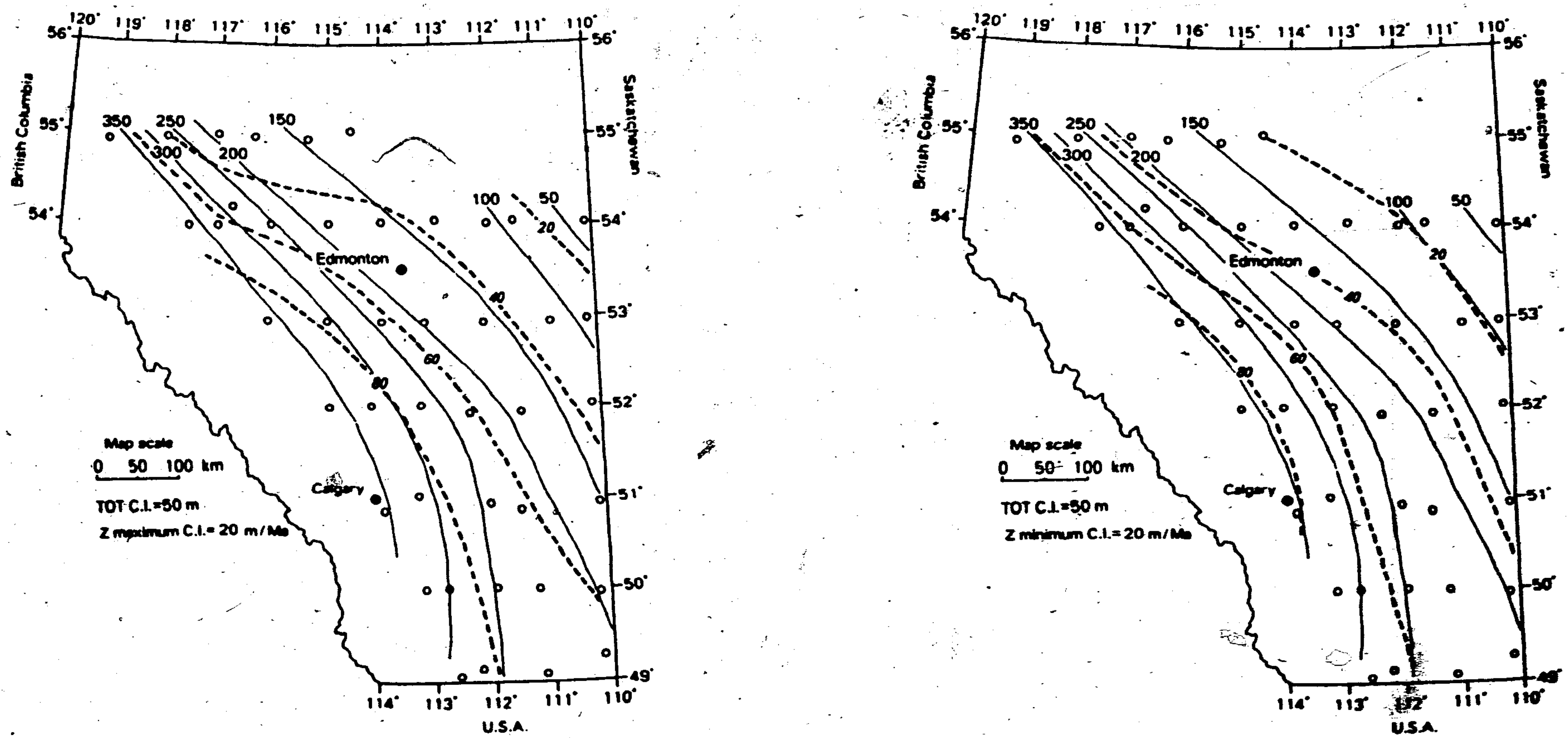


Figure 32: Maximum (left) and minimum (right) total subsidence over the interval from the top of the Second White Specks to the top of the First White Specks superimposed on an isopach map of that interval.

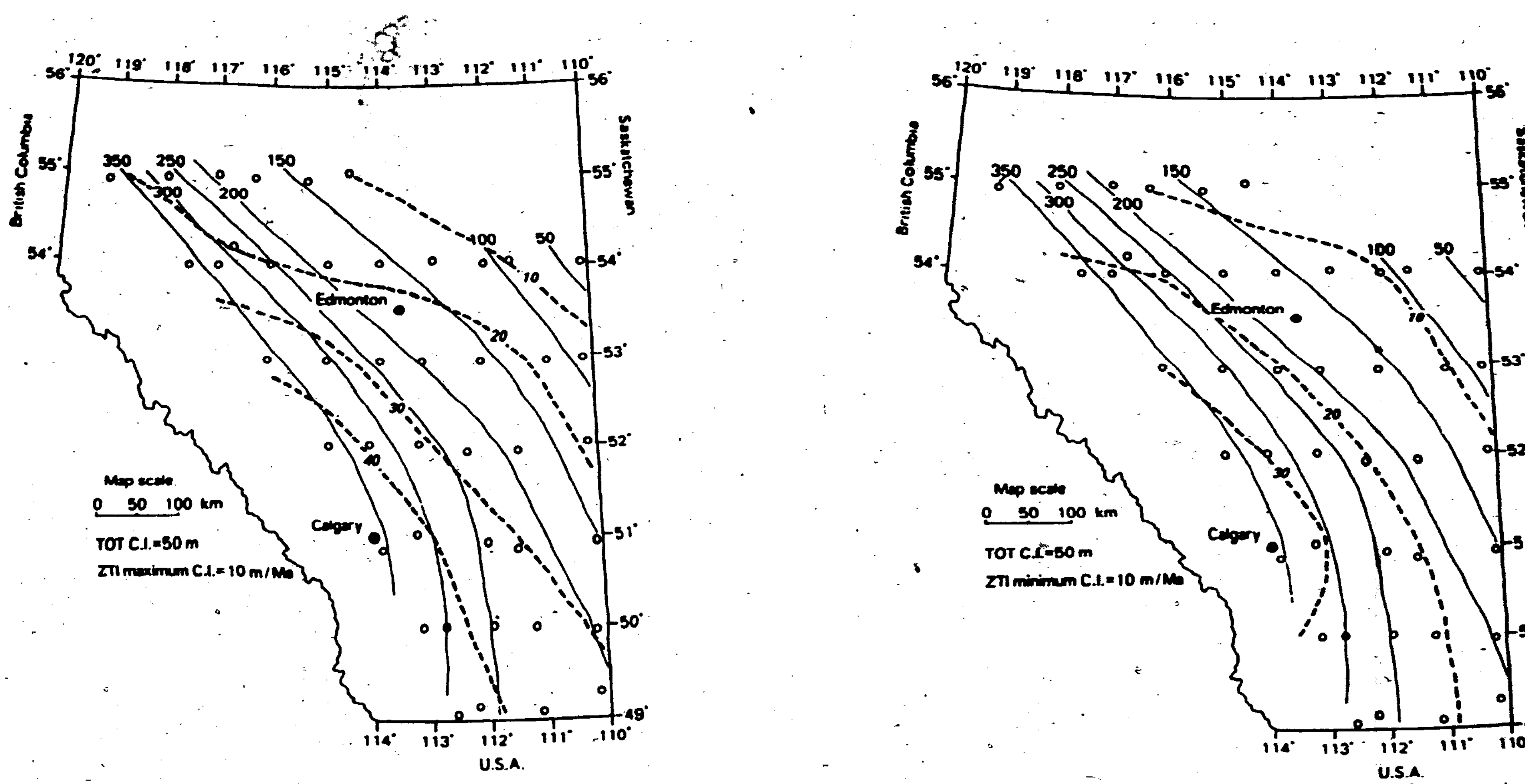


Figure 33: Maximum (left) and minimum (right) isostatic tectonic subsidence over the interval from the top of the Second White Specks to the top of the First White Specks superimposed on an isopach map of that interval.

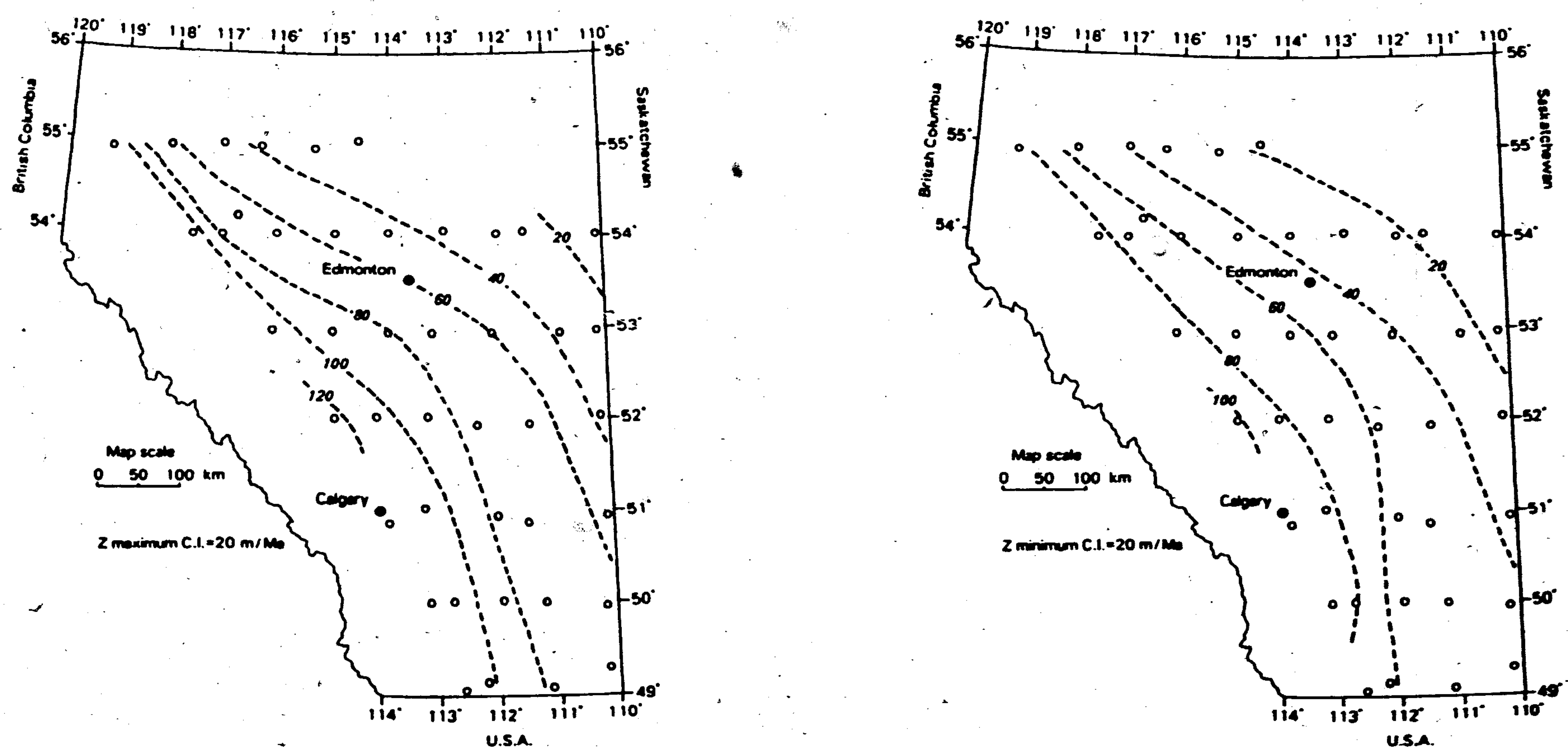


Figure 34: Maximum (left) and minimum (right) total subsidence over the interval from the top of the Second White Specks to the bottom of the First White Specks (90-85 Ma).

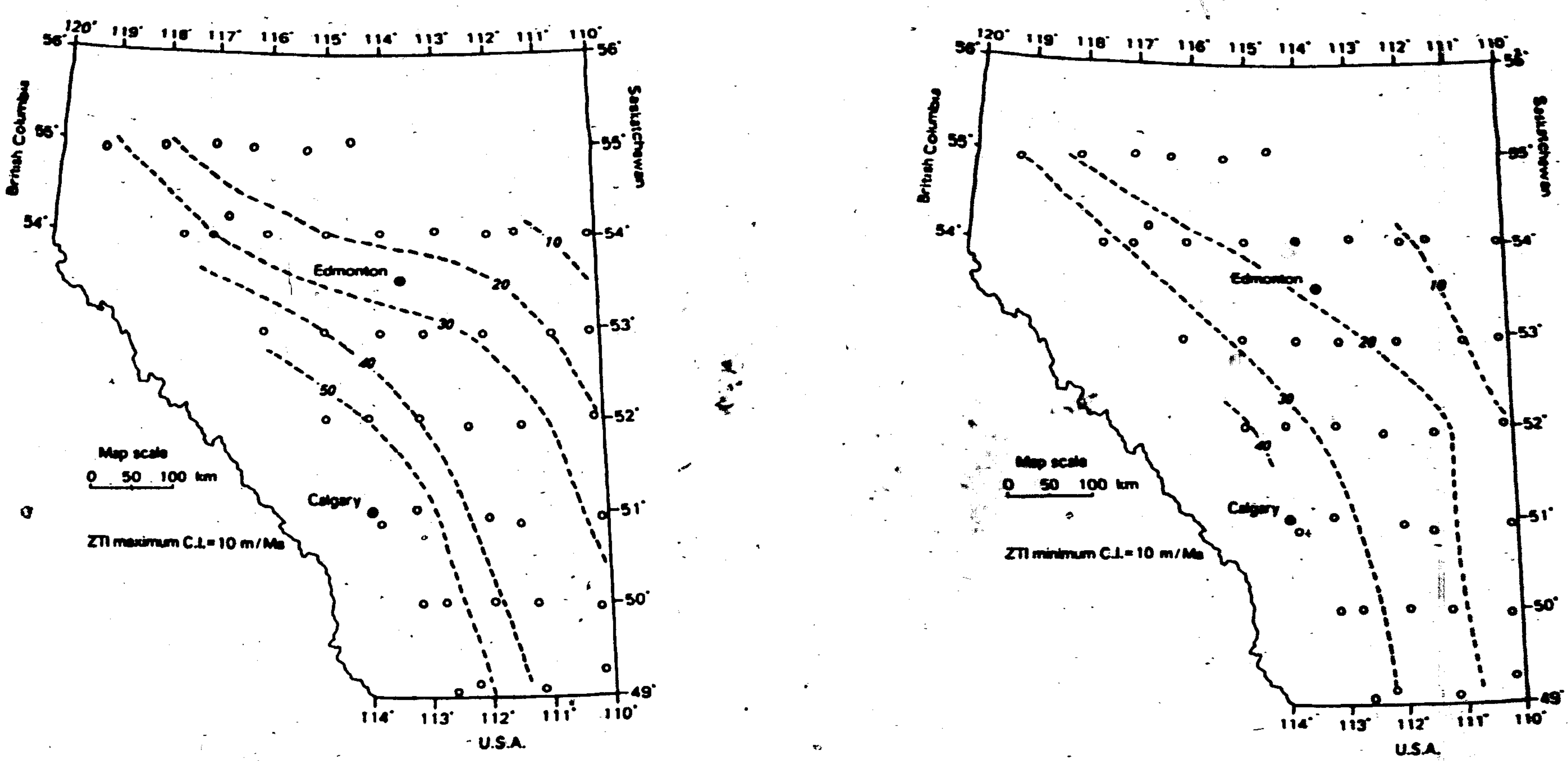


Figure 35: Maximum (left) and minimum (right) isostatic tectonic subsidence over the interval from the top of the Second White Specks to the bottom of the First White Specks (90-85 Ma).

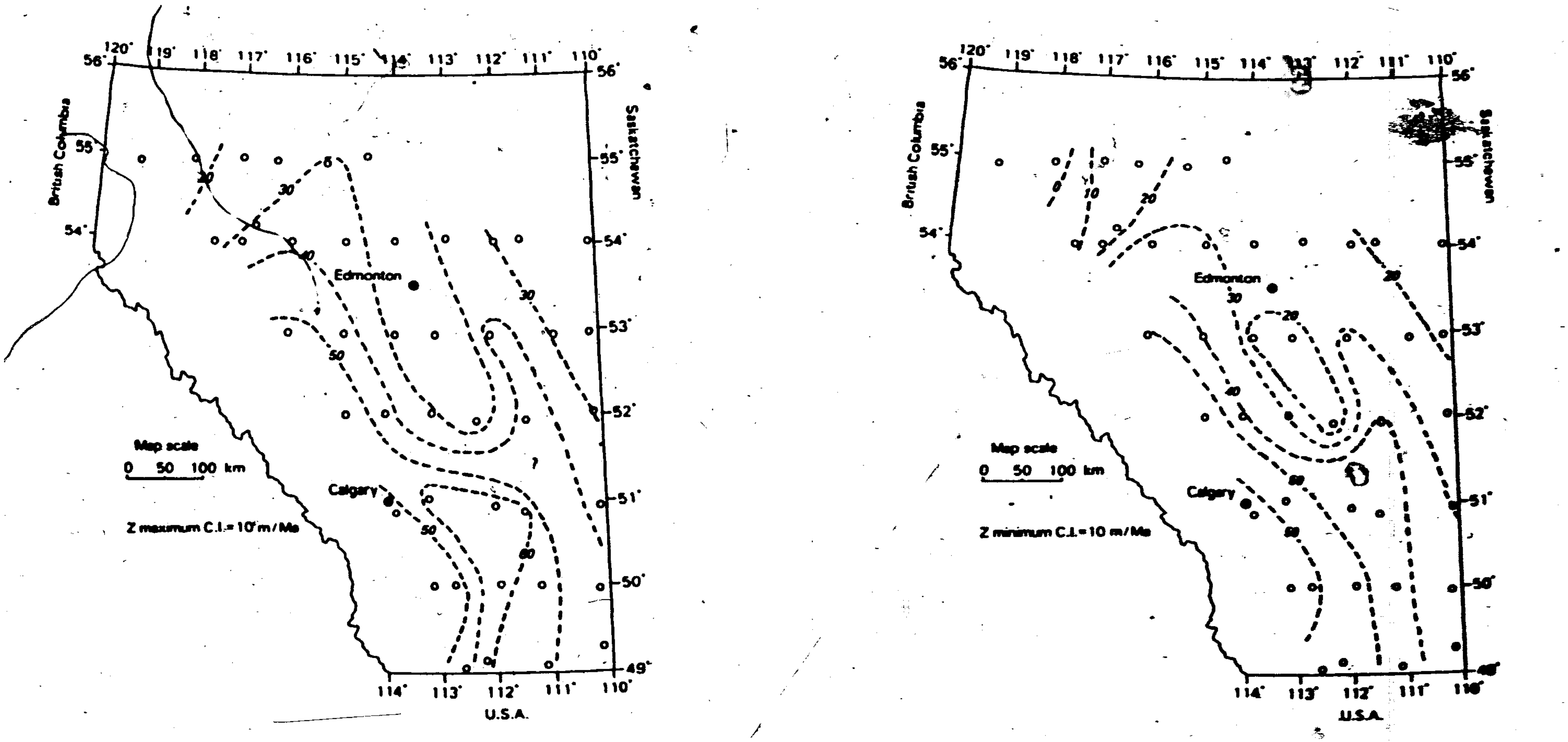


Figure 36: Maximum (left) and minimum (right) total subsidence over the First White Specks interval (85-83 Ma).

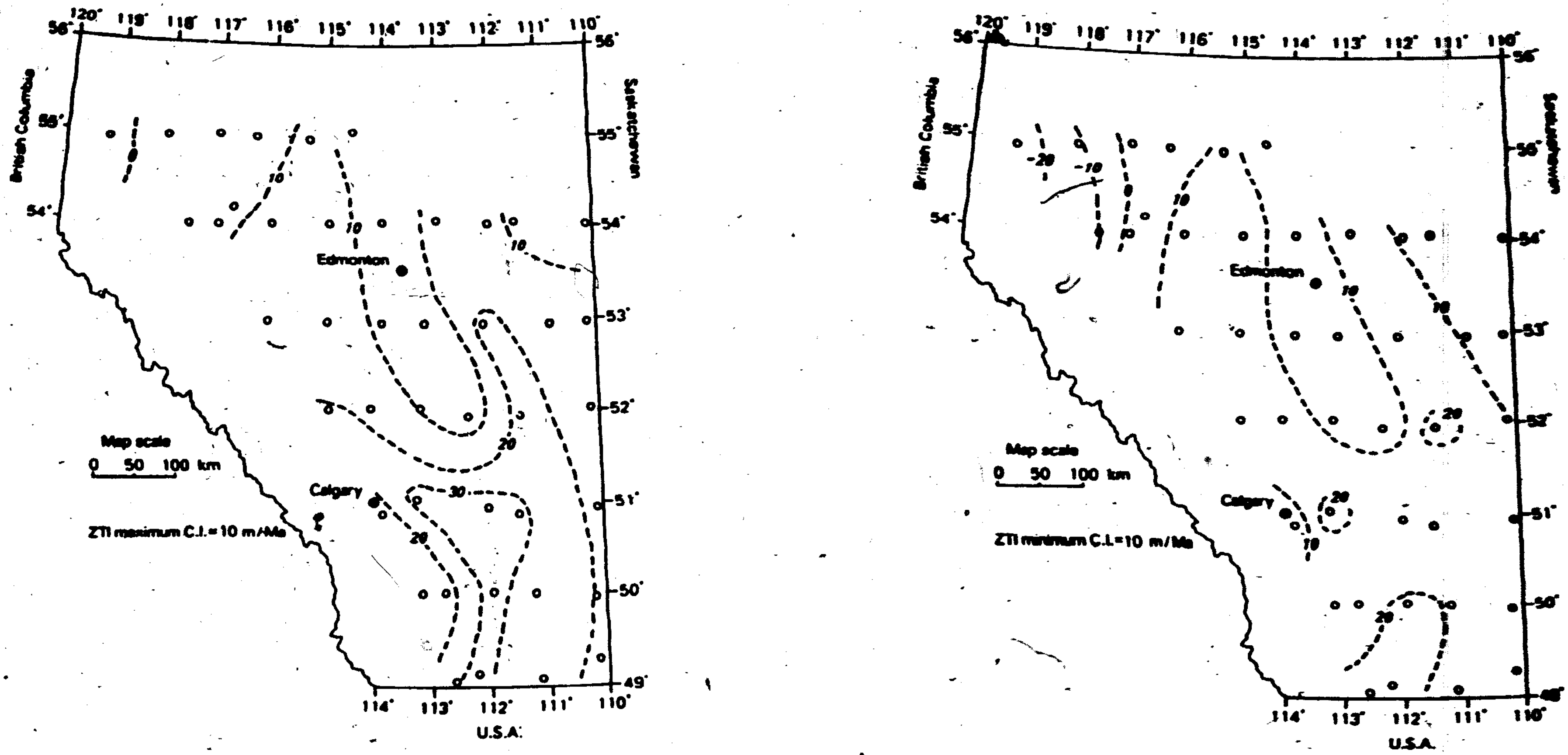


Figure 37: Maximum (left) and minimum (right) isostatic tectonic subsidence over the First White Specks interval (85-83 Ma).

F. EARLIEST TO MIDDLE CAMPANIAN (83-78 Ma)

Regional Geological History

As was mentioned previously, a regression began in the southern Alberta Foothills around late Santonian time, as marked in the Foothills (in the early Campanian) by the nearshore Chungo Member sandstones, which merge into the Milk River Formation on the southern Plains (Jeletzky, 1971; Stott, 1984). Deposition of the Milk River Formation, and parts of the Belly River Group, was probably above sea level, as indicated by coal beds (Williams and Burk, 1964). The Claggett sea still occupied the central and northern area of the basin, as recorded by shales of the Pakowki Formation, which interfingers with the Milk River Formation to the east (Jeletzky, 1971).

Northeasterly migration of the Milk River shoreline indicates an uplift somewhere to the south (Williams and Burk, 1964). The Sweetgrass Arch appears to have had an effect on deposition of the Milk River Formation (Stelck, 1975). The arch splits the formation in two; with thicker deposits on either side of the arch. Also, the arch acted as a high and winnowed the sediment, distributing sands to the north (Stelck, 1975).

In the early Campanian, the basin underwent an extensive transgression, advancing across the near shore deposits of the Chungo Member and Milk River Formations, depositing the Lea Park Formation shales (Williams and Burk, 1964; Jeletzky, 1971). The Milk River delta prevented the sea from crossing southern Alberta into Montana (Caldwell *et al.*, 1978). Also, a northwestern shoreline in northeastern B.C. suggests uplift in that area (Jeletzky, 1971). The Lea Park transgression was short-lived. It was terminated by tectonic movements which elevated the entire western orogen and caused the shoreline to retreat to eastern parts of the Plains (Jeletzky, 1971; Stott, 1984). The Belly River deltaic complexes began to grow in early Late Campanian as coarse-grained clastics poured from the Cordillera into the sea (Caldwell *et al.*, 1978). By Late Campanian the sea had been driven into Saskatchewan, ending the second last marine incursion into the basin.

The TOT map (Fig. 38) for this interval, 83-78 Ma, (Lea Park) turned out to be quite complicated, and because of the sparseness of points the contours are sketchy. Williams and Burk (1964) only contoured the Milk River interval, not the entire Lea Park interval, so there is no published map to compare with Figure 38. The general trend of the map is towards thickening in the southeast, and thinning towards the northwest. This may reflect the beginning of uplift in the Cordillera. Generally, the HSTOT map parallels the TOT map.

TOT maps were also constructed for the Pakowki (80-78 Ma) and Milk River (83-80 Ma) Formations, which are present only in southern Alberta. The Milk River map (Fig. 41) was prepared with additional information from Williams and Burk (1964). It shows the Milk River Formation generally thickening to the southwest. The HSTOT contours for the Milk River (Fig. 41) are offset and have a more southeasterly strike than the TOT contours, the result of greater compaction in the southwest. The Pakowki TOT map (Fig. 44) indicates easterly thickening, in the direction of the Lea Park sea. Thicknesses for this map were only available in southern Alberta wells.

Total Subsidence (Z)

In some ways the Z map for the total Lea Park interval (83-78 Ma) shows a greater resemblance to the Z and ZTI maps of the Upper Colorado (90-85 Ma) than to the Lea Park TOT map. Well 26 (52° N, 113° W) gave rather high rates , but the other wells all indicate a general decrease to the west and northwest.

Highs range from 59 to 48 m/Ma, and lows range from -4 to -25 m/Ma. The lows reflect areas of lower sedimentation rates over, possibly, uplifted areas. Differences between maximums and minimums are low, averaging less than 10 m/Ma.

Subsidence maps were also prepared for the intervals 83-80 Ma and 80-78 Ma. The present thicknesses of these intervals had to be approximated in the northern area, where the Milk River and Pakowki Formations are not observable on logs. The Milk River Z (Fig. 42) maps increase to the northeast, except for a local high in the southwest corner. The pattern has a strike similar to the present day Cordillera. The Pakowki Z (Fig. 45) maps have two lobes which enclose negative values. One lobe is in the northwest, trending to the southwest; and the other is in the southwest, trending northeast. They appear to represent two areas (perhaps uplifts) which had low sedimentation rates.

Tectonic Subsidence (ZTI)

For the Lea Park interval, the highs range from 29 to 19 m/Ma, and the lows range from -12 to -26 m/Ma. Differences between maximum and minimum values range from

14 to 1, and average around 10 m/Ma. The ZTI patterns (Fig. 40) are basically the same as the Z patterns.

The Milk River ZTI maps (Fig. 43) are also very similar to the Milk River Z maps.

On the Pakowki ZTI maps (Fig. 46), the bulges , noted on the Z maps, have coalesced to form a shelf of negative numbers, adjacent to the Cordillera. Again, this could be due to water depths decreasing to the west during Pakowki time because of an uplift to the west, or simply lower sedimentation rates.

G. MIDDLE TO LATE CAMPANIAN (78-75 Ma)

The Belly River Group is missing from much of the Plains. It can only be studied in the subsurface from well logs taken from the very western part of the basin.

The Belly River Group is a very thick wedge of alluvial sediments that marks the regression, to the east of the Lea Park sea (Williams and Burk, 1964). These sediments were deposited at, or near sea level, so they give a good estimate of the subsidence of the basin during the early Laramide Orogeny (Williams and Stelck, 1975; Stott, 1984). In the southern Alberta Plains, the Lower Belly River Group (Foremost Formation) marks the transition between the shallow marine Pakowki Formation below and the nonmarine Oldman Formation above (Ogunyomi and Hills, 1977). In the western Plains, the basal Belly River represents an upward coarsening shoreline environment (Iwuagwu and Lerbekmo, 1984). According to Ogunyomi and Hills (1977) the source area of the Foremost and Oldman Formations was somewhere to the southwest in Montana. Detritus was carried by rivers and deltas to the northeast, following the northeasterly regression of the Lea Park sea (Ogunyomi and Hills, 1977).

The area of maximum sedimentation first occurred in the south in Foremost time, and then shifted to the north during Oldman time (Williams and Burk, 1964). Belly River deltas spread as far north as the Peace River Arch (Stelck, 1975). So, in addition to being younger in the east, it is also younger in the north (Caldwell *et al*., 1978).

The thicknesses on the TOT map are too scarce to be contoured, but a westward thickening trend can still be seen. The HSTOT/TOT ratio for the Belly River Group is quite high. This indicates that a considerable load of sediments must have been deposited later.

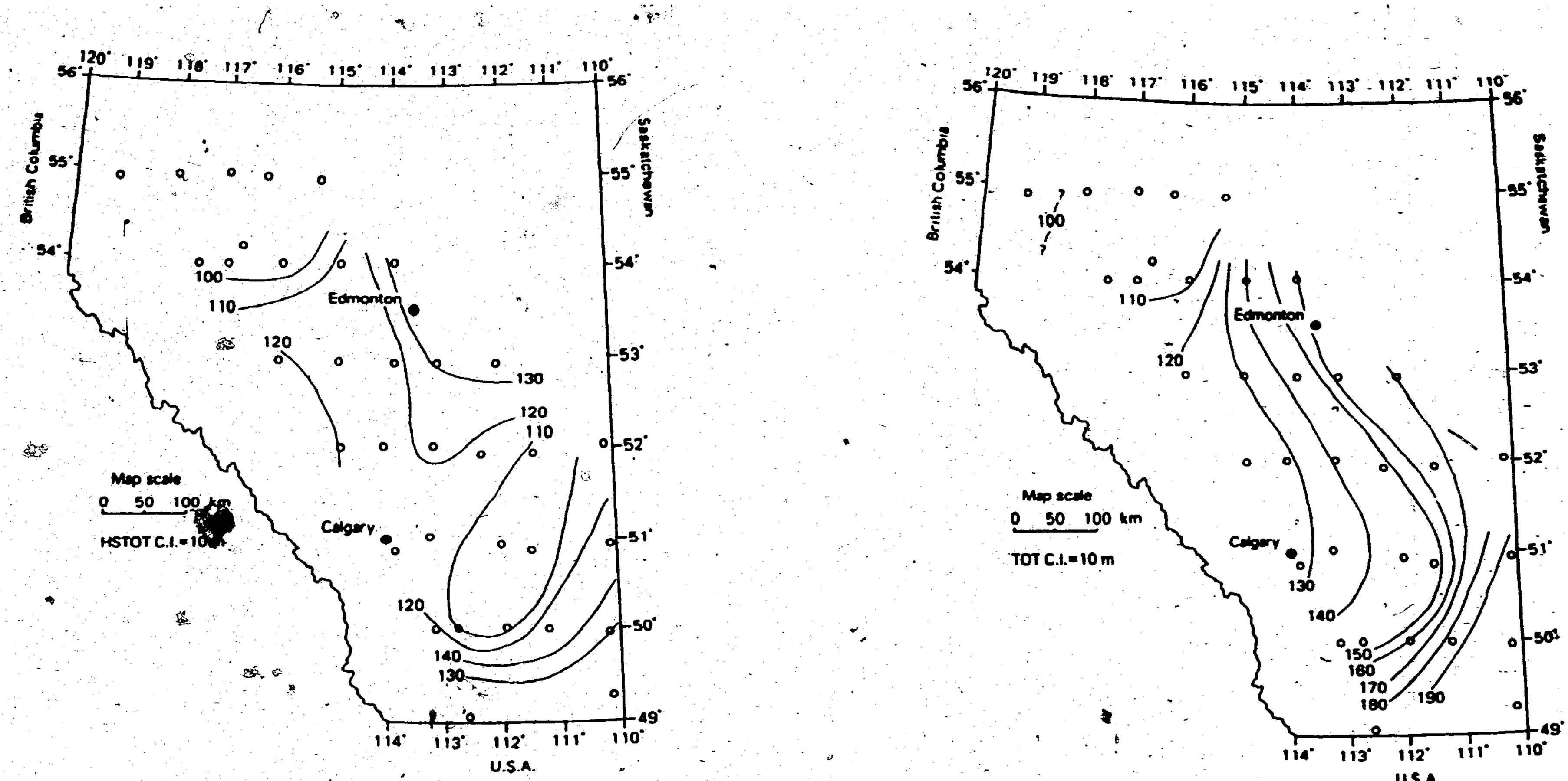


Figure 38: Present solid grain height (left) and total thickness (right) of the Lea Park Formation.

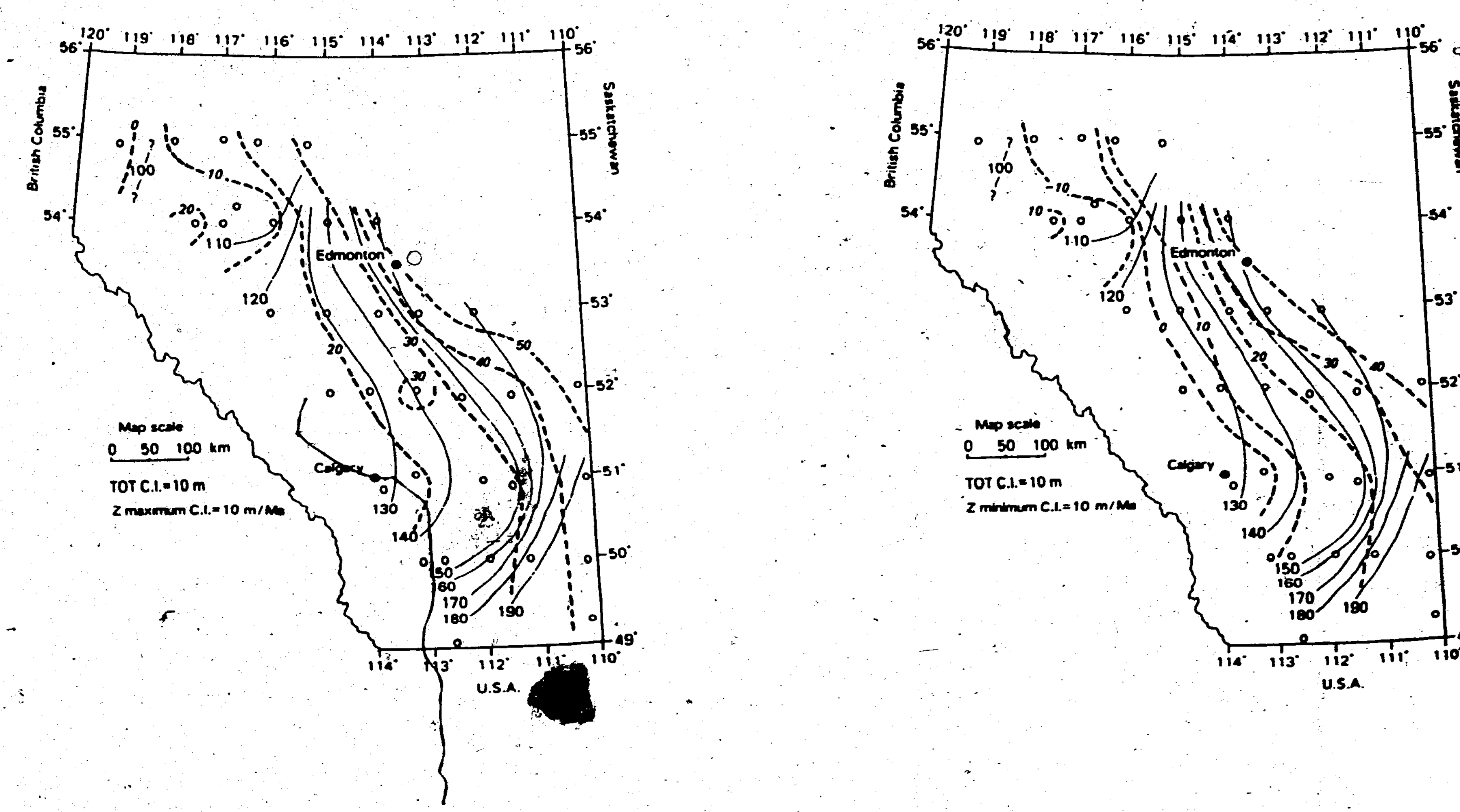


Figure 39: Maximum (left) and minimum (right) total subsidence over the Lea Park interval superimposed on an isopach map of the Lea Park Formation.

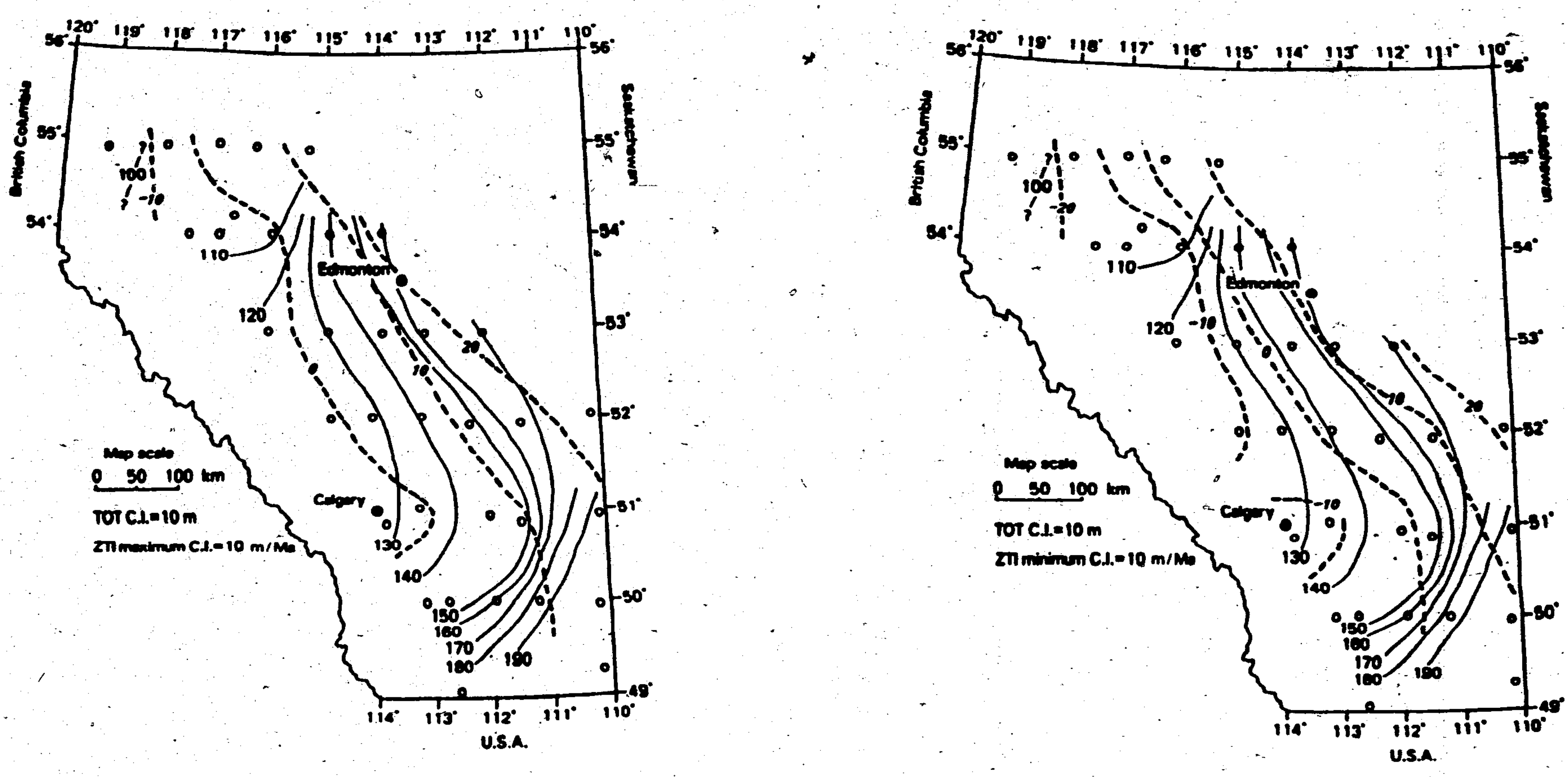


Figure 40: Maximum (left) and minimum (right) isostatic tectonic subsidence over the Lea Park interval superimposed on an isopach map of the Lea Park Formation.

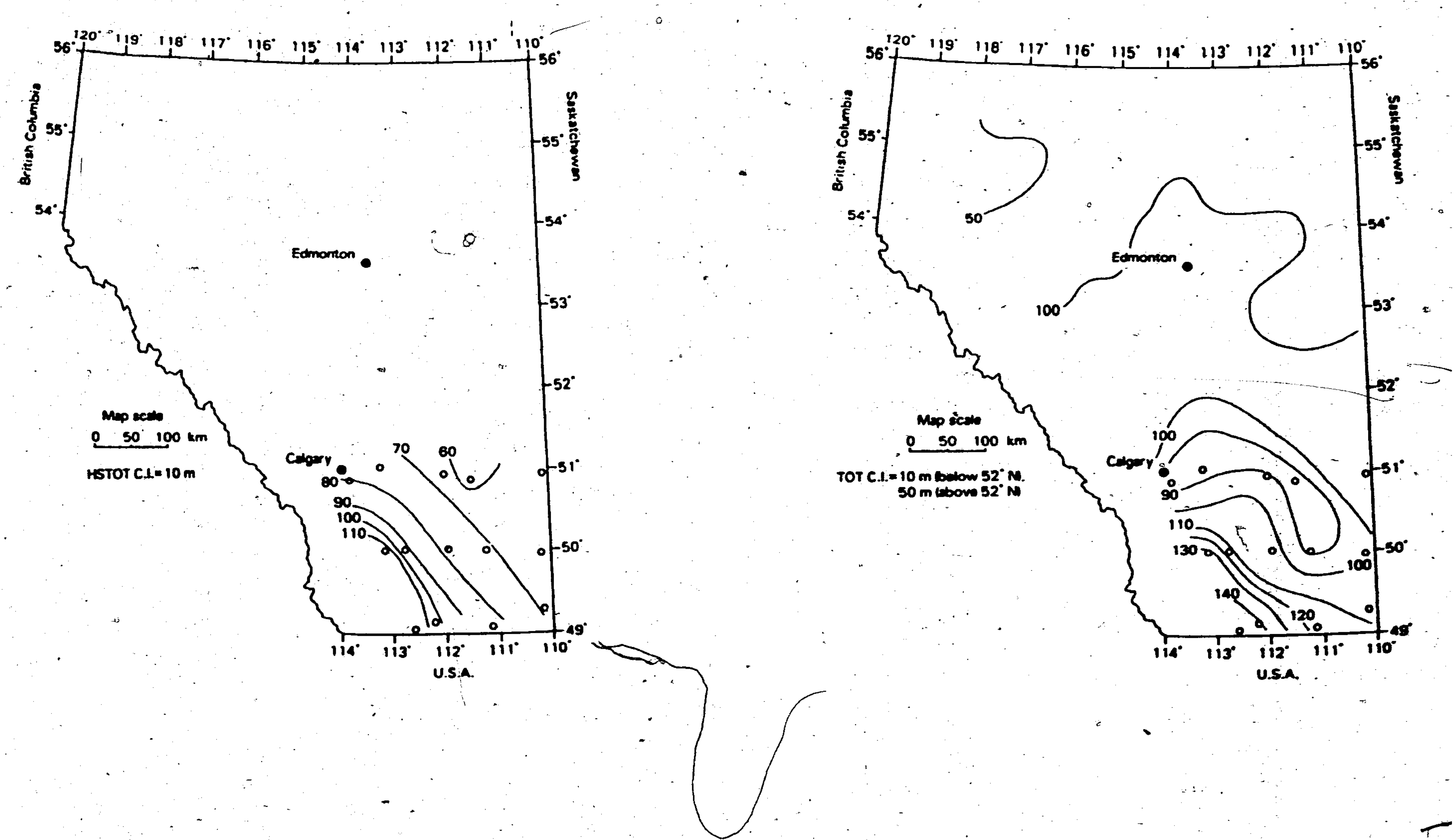
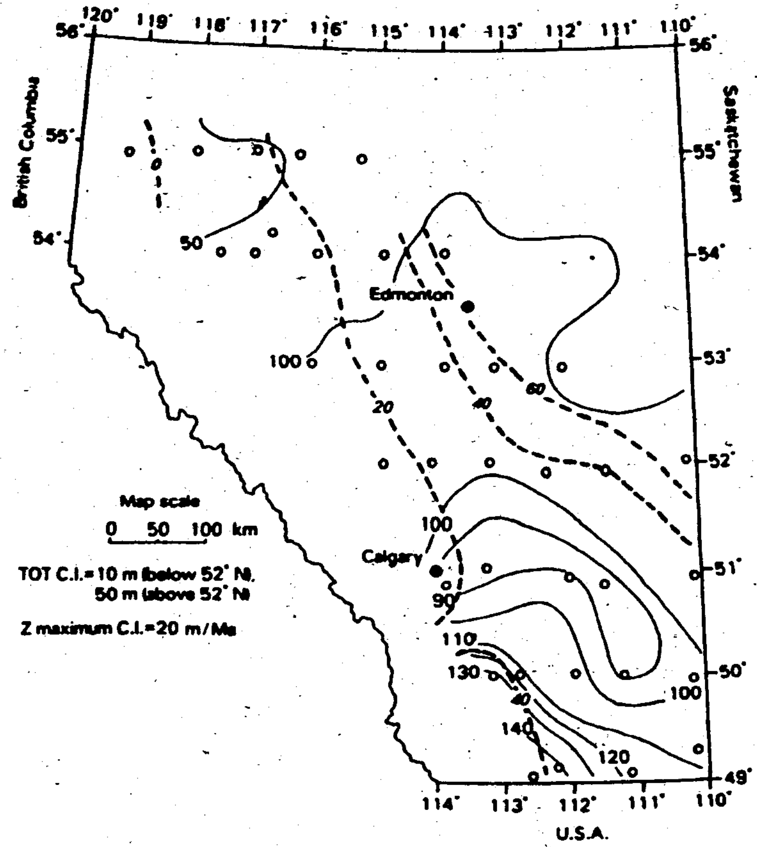


Figure 4.1: Present solid grain height (left) and total thickness (right) of the Milk River Formation (or equivalents).



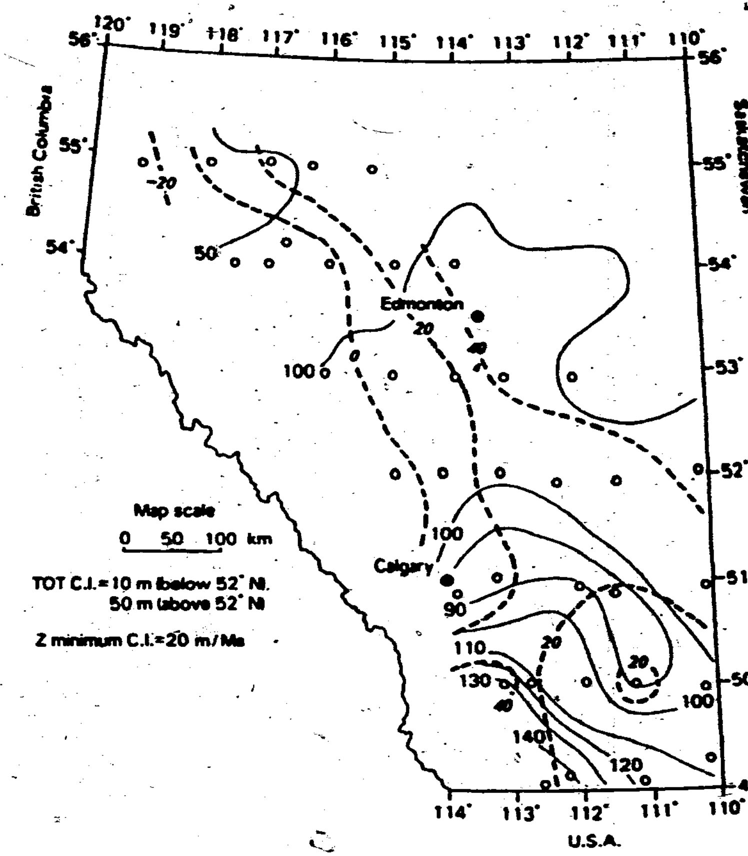


Figure 42: Maximum (left) and minimum (right) total subsidence over the Milk River interval superimposed on an isopach map of the Milk River Formation.

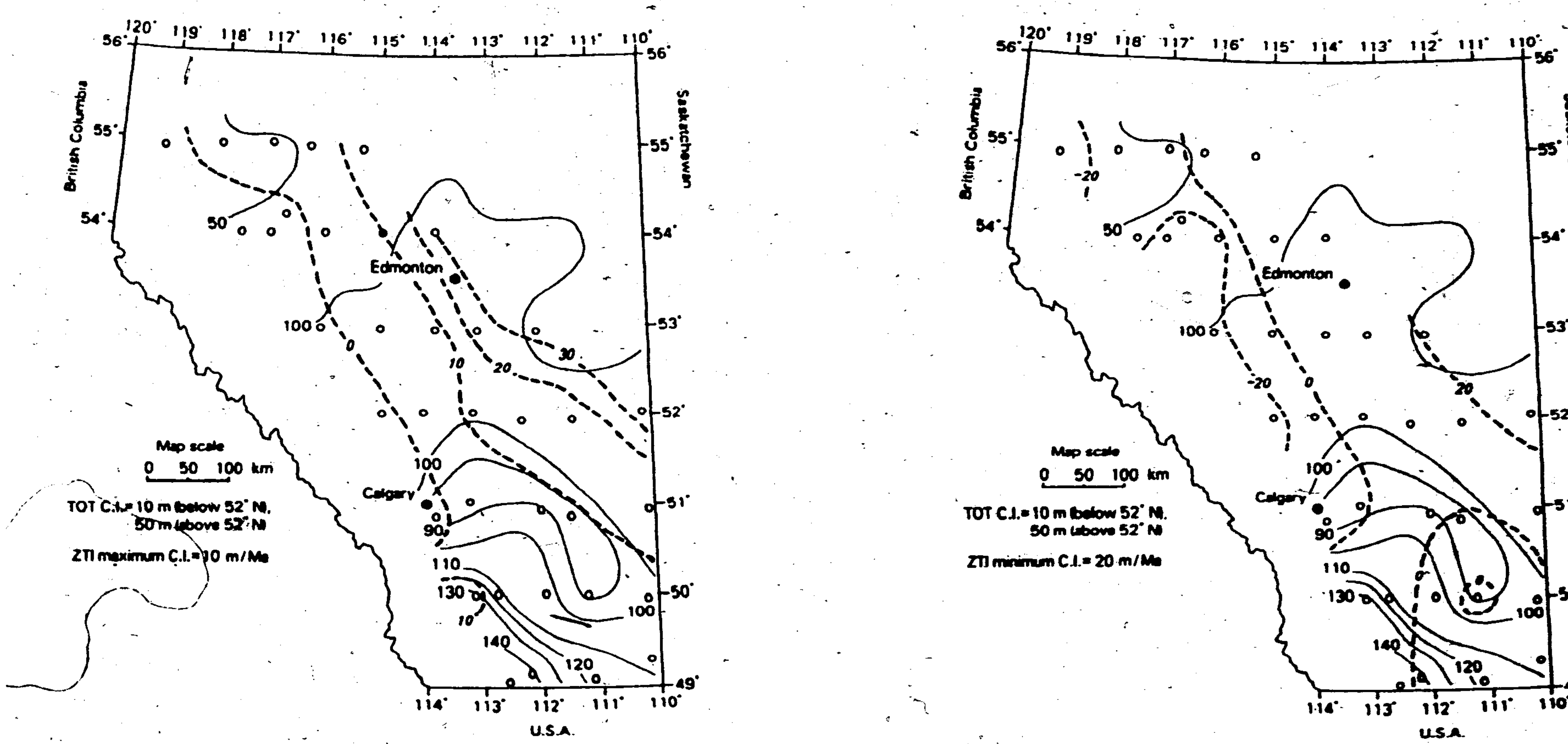


Figure 43: Maximum (left) and minimum (right) isostatic tectonic subsidence over the Milk River interval superimposed on an isopach map of the Milk River Formation.

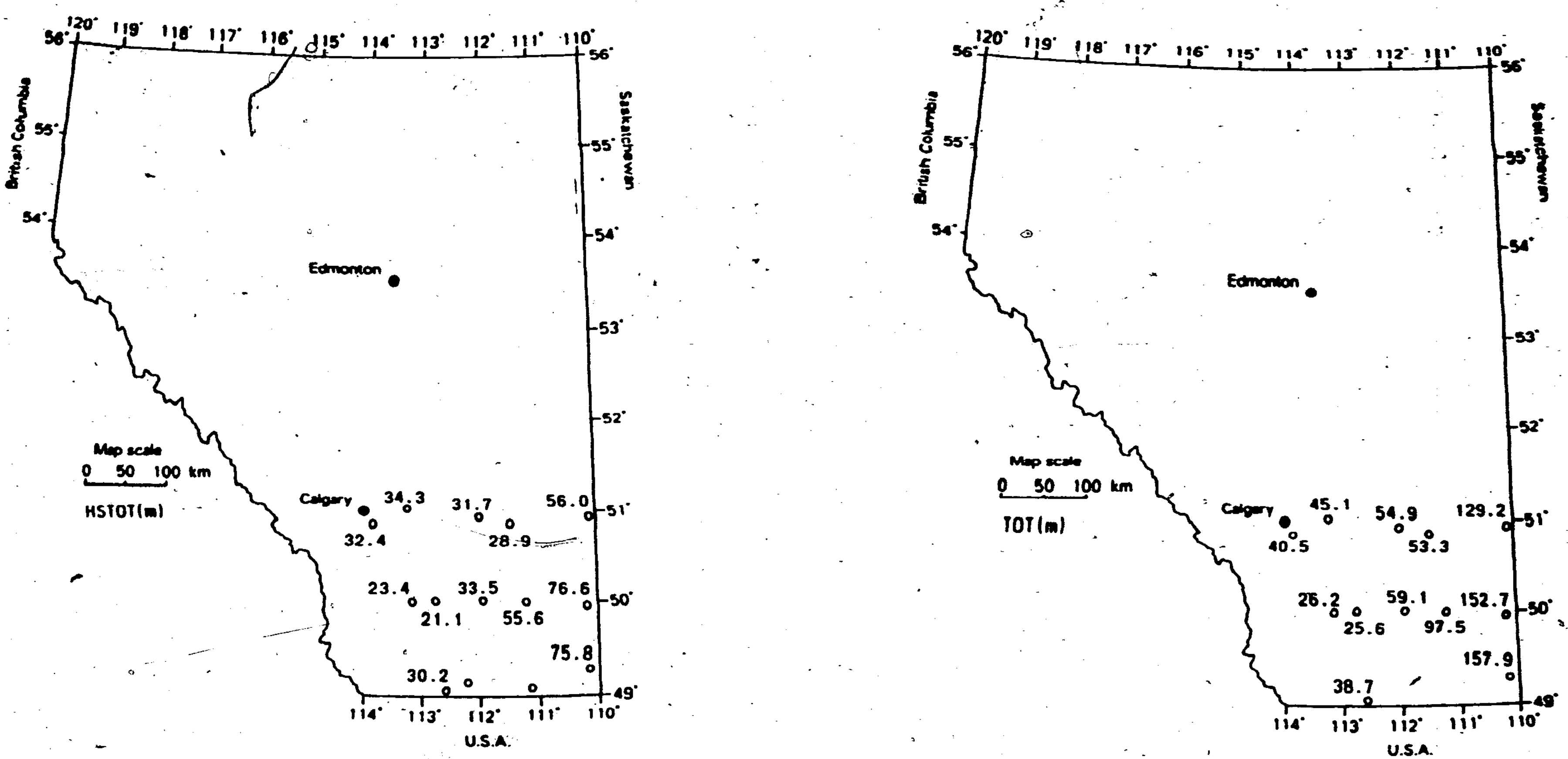


Figure 44: Present solid grain height (left) and total thickness (right) of the Pakowki Formation.

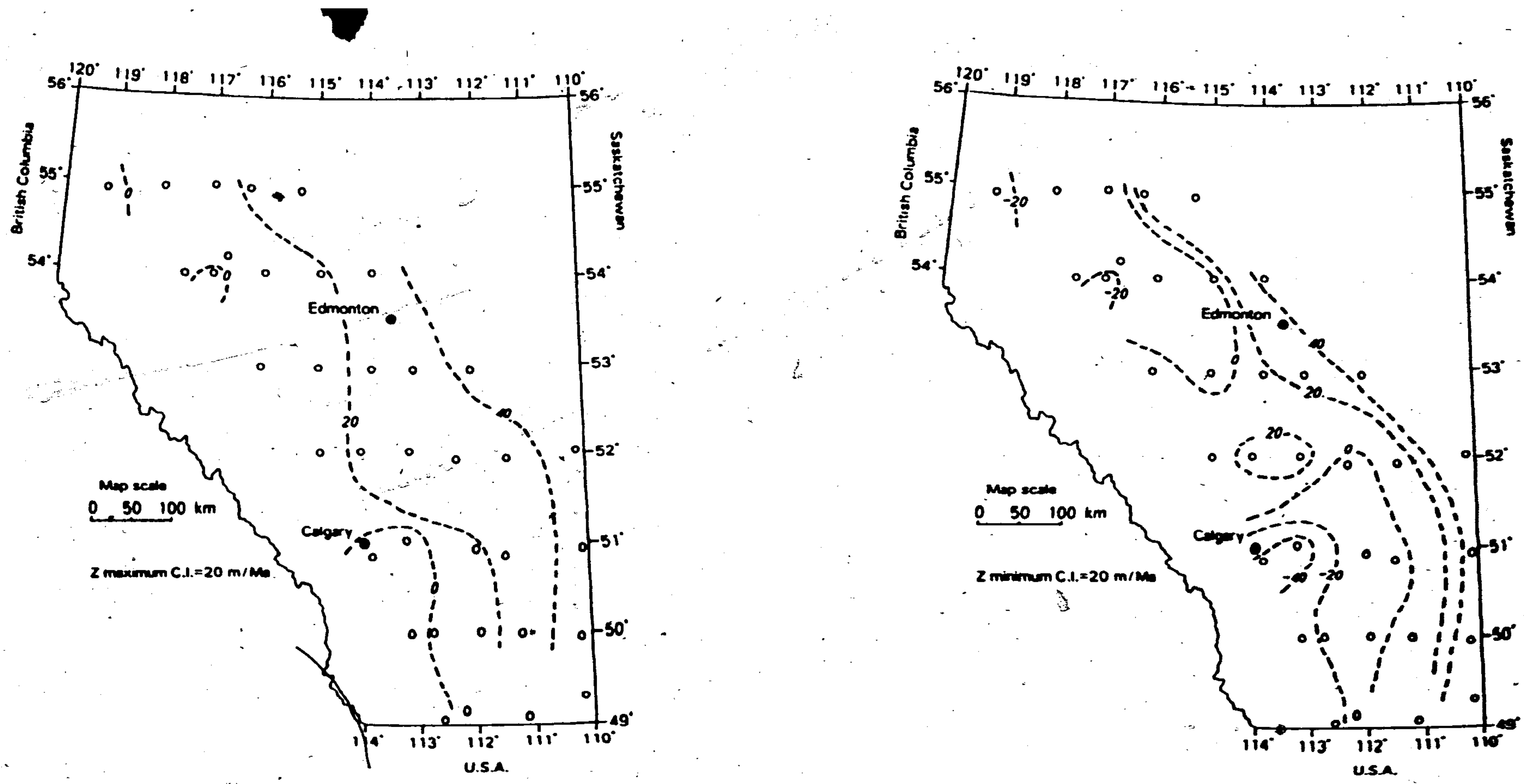


Figure 45: Maximum (left) and minimum (right) total subsidence over the Pakowki interval.

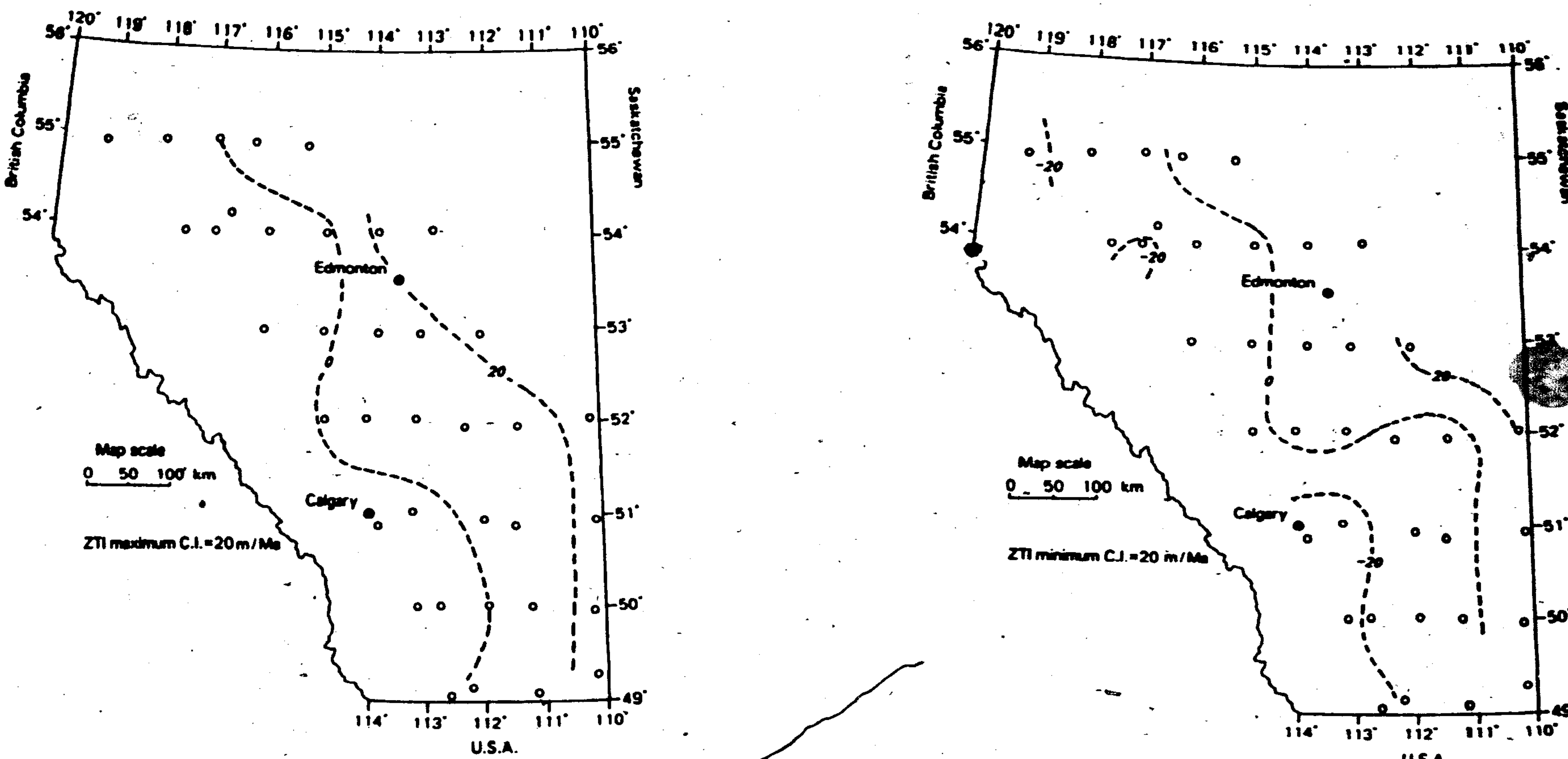


Figure 46: Maximum (left) and minimum (right) isostatic tectonic subsidence over the Pakowki interval .

Total and Tectonic Subsidence

Figures 48 and 49 record the highest subsidence rates yet, for the study area. Unfortunately, the points are too scarce to indicate any strange or anomalous patterns. The basic pattern is, as with the TOT and HSTOT maps, an increase from east to west.

H. SUMMARY

The Aptian was characterized by fairly low total subsidence rates in the study area. The only regions which underwent any significant tectonic subsidence were in the northwest. Sedimentation in the rest of the basin was probably controlled by topography.

Total subsidence during the early Albian was generally more than double that during the Aptian. Tectonic subsidence was greatest adjacent to the present trend of the Cordillera, and in the Peace River area (40 to 20 m/Ma). This reflects the effects of tectonic loading adjacent to this area, and, probably, the effects of sea level changes (the Clearwater transgression).

During the Late Albian the basin was split into two regions by a shelf-like area northwest of Edmonton. In central Alberta, the total subsidence values decrease from east to west, toward this shelf, indicating possible shallowing of the Lower Colorado sea over this feature. To the northwest, in the lower Peace River area, the total subsidence and tectonic subsidence values increase, probably due to distant thrust loads. The increase in subsidence values (highs from 60 to 26 m/Ma) to the southeast cannot be explained by thrust loads. It was probably due to the increase in sea level.

From the latest Albian to early Turonian the total and tectonic subsidence patterns have a northerly strike, oblique to the present trend of the Cordillera. Tectonic subsidence values increase fairly rapidly from east to west in the central region (reaching highs of 40 to 28 m/Ma), which probably indicates deformation in the Cordillera. However, the southern area of the basin appears not to have been affected by this. Instead, the low, and negative, subsidence values seem to indicate a high area during this time.

From the early Turonian to earliest Campanian the subsidence patterns spread out from a locus of subsidence along the west-central and southwest area of the basin, possibly indicating loading west of this area in the Cordillera. The total and tectonic subsidence values are comparable with the last interval (highs range from 52 to 35 m/Ma).

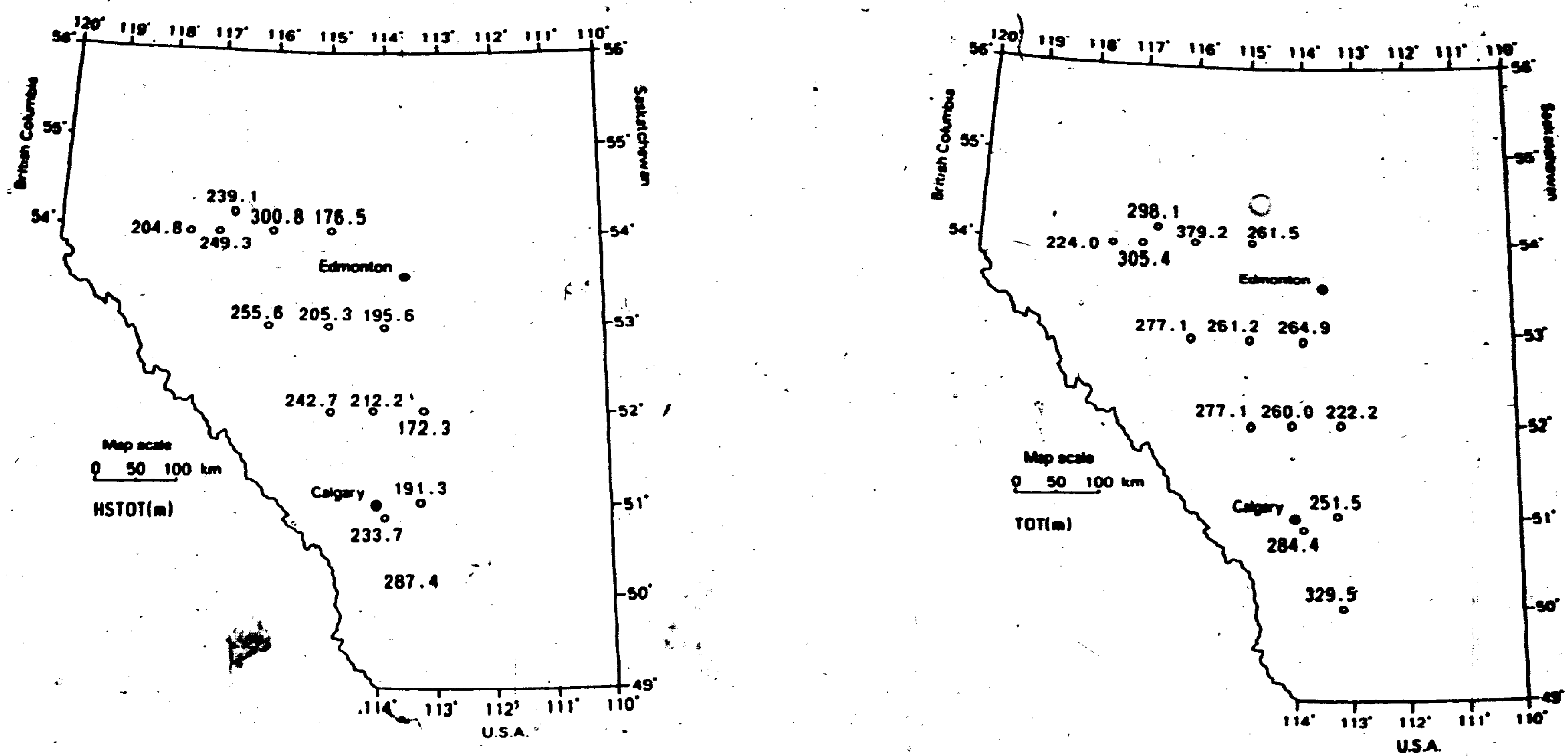


Figure 47: Present solid grain height (left) and total thickness (right) of the Belly River Formation.

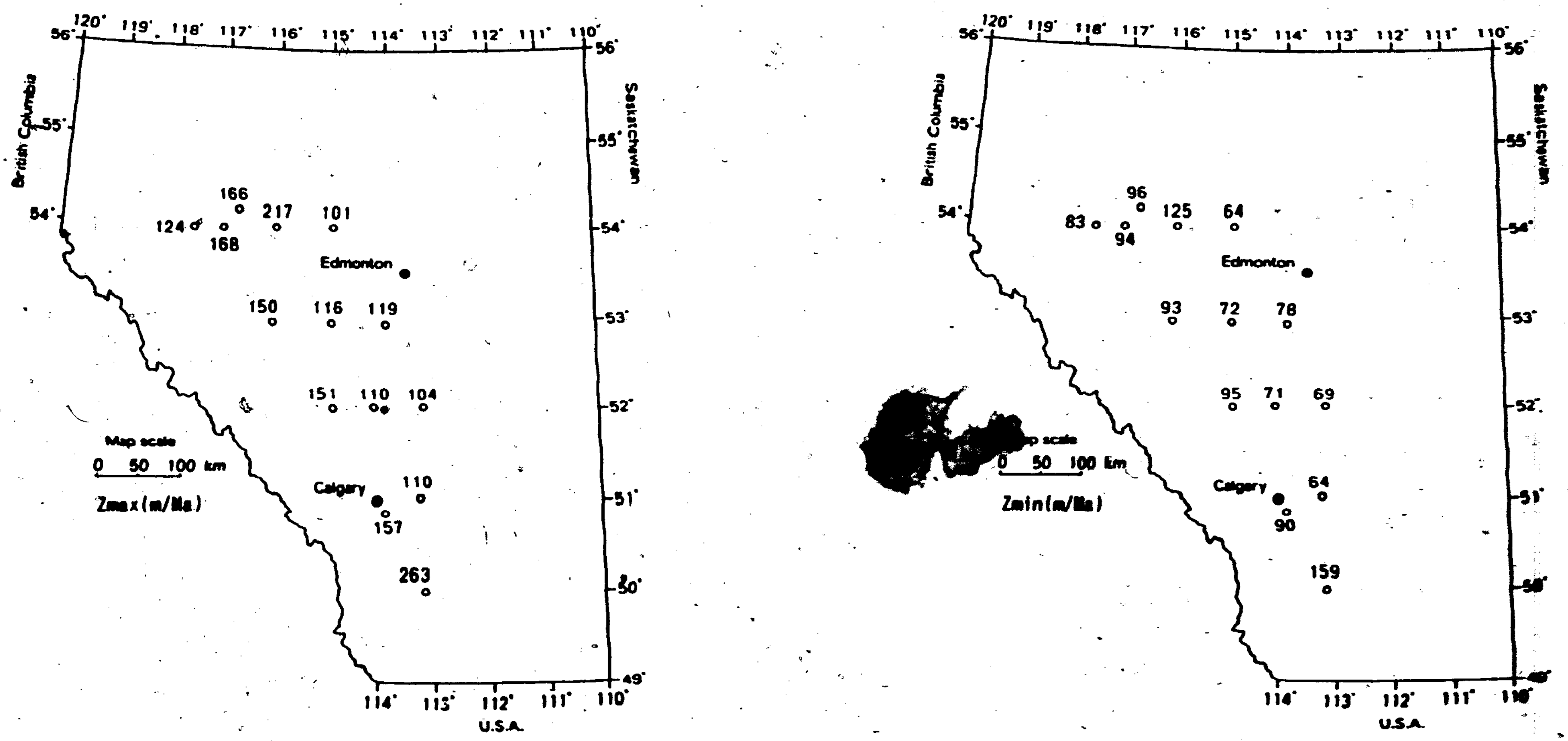


Figure 48: Maximum (left) and minimum (right) total subsidence values for the Belly River interval.

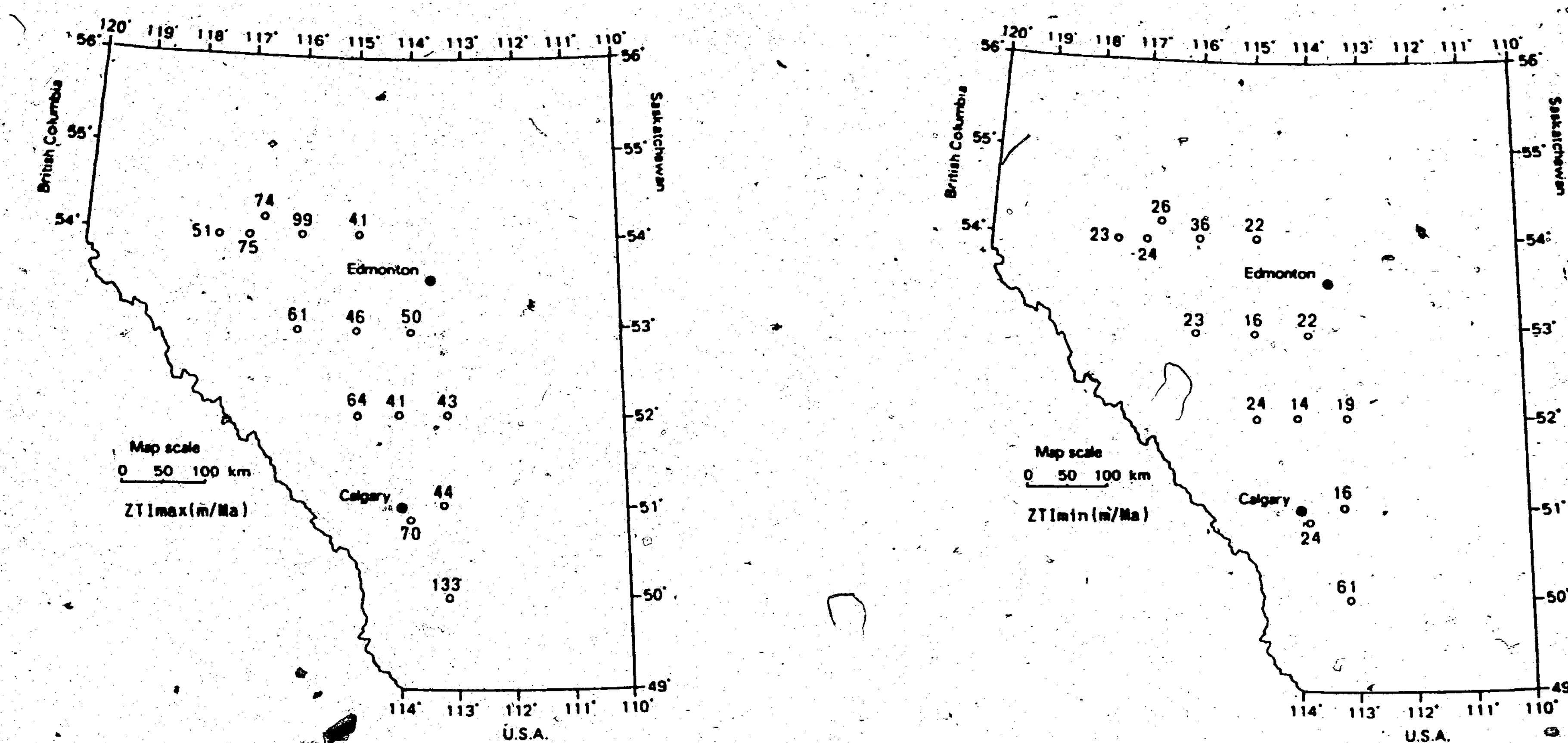


Figure 49: Maximum (left) and minimum (right) isostatic tectonic subsidence values for the Belly River Formation.

During the earliest to middle Campanian interval the subsidence patterns as observed over the early Turonian to earliest Campanian are reversed, and generally lower. Areas of negative subsidence appear, adjacent to the present trend of the Cordillera, while deeper areas appear in the northeast. This could be interpreted as the Lea Park sea onlapping the uplifted western edge of the basin.

Finally, in the middle to late Campanian the highest subsidence rates appear. While information is sparse, subsidence appears to parallel the present structure of the Cordillera, and the high subsidence rates imply considerable proximate tectonic loading.

VII. CONCLUSIONS

The results of this study show that estimated magnitudes of subsidence based on present compacted sediment thicknesses in the Alberta Basin will be far too low. Also, over certain intervals, such as the Colorado Group (late Albian to earliest Campanian) and the Lea Park Formation (earliest to middle Campanian), there is a definite discrepancy between the present (compacted) isopach patterns and the maximum and minimum subsidence contour patterns. In some instances the discrepancies are greater than others. Substantially increasing the well coverage would make the discrepancies more distinct and could very well reveal smaller-scale compaction-related structures not evident in these results.

The pattern variations discussed above are due to the fact that the present thickness and geometry of sediments in the Alberta Basin are the result of the continuous compaction evolution (burial history) of the entire Cretaceous column. Lithology also plays a large role in compaction; most of the observed pattern discrepancies occur over dominantly shale intervals.

The effects of compaction are most pronounced in the central and southern region of the basin. The decompaction method developed in this study essentially removed the major compaction effects brought on by loading by the intervals of interest (the Mannville Group to Belly River Group), and also due to latest Cretaceous to Tertiary overburden loading (Paskapoo Formation, etc.).

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IX. APPENDICES

A. APPENDIX 1

This appendix contains the decompaction program COMP. Comments are included, so the program is self-explanatory. For the input file, depths should be in feet, ages in millions of years, and sonic transit times in microsec/ft. An example of the input file (well file) follows COMP.

```
C                    ***COMP***
C  This program reads the well file and estimates the changes
C  in thickness and density of each formation in the well.
C  The program then calculates the point-wise loading history
C  at the well.
C
      INTEGER TE,START,STB,WELL,IFM1,IFM2
C
      REAL MK,MS
C
      DIMENSION WELL(20),IFM1(14),IFM2(14)
      DIMENSION PS(3),AGE(14,120),NIES(120),HS(14,120),POR(3000)
      DIMENSION HSTOT(14),HSSHSS(14),HSSS(14),HSSH(14),ARTOT(14)
      DIMENSION PDT(14,120),T(14),PTHK(14,120),BOUND(500)
      DIMENSION TOP(14),BOT(14),ATS(14),ABS(14),HST(14,120)
      DIMENSION LL(3000),LITH(14,120),D(3000),TT(3000)
      DIMENSION TTC1(3),TTC2(3),IV(2,14),MK(42),XIP(2,3)
      DIMENSION STZ(2,14,42),STWT(2,14,42),TZ(2,42),TWT(2,42)
C
      DATA STZ/1176*0./,STWT/1176*0./,HSTOT/14*0./,HSSHSS
     */14*0./,HSSS/14*0./,HSSH/14*0./,HST/1820*0./
      DATA TZ/84*0./,TWT/84*0./,HS/1820*0./,ARTOT/14*0./
      DATA JB,PW,ENDC/0,1030.,30./,PS/2720.,2650.,2665./
      DATA TTC1/.00466,.00582,.00723/,TTC2/.317,.384,.4487/
      DATA XIP/.65,.50,.50,.17,.705,.355/
      DATA IV/4,1,5,4,5,4,5,5,11,5,15,11,16,5,17,15,24,17
     *,25,17,25,24,35,30,42,30,42,35/
      DATA MK/75.,76.,77.,78.,79.,80.,81.,82.,83.,84.,85.
     *,86.,87.,88.,89.,90.,91.,92.,93.,94.,95.,96.,97.
     *,98.,99.,100.,101.,102.,103.,108.,109.,110.,111.
     *,112.,113.,114.,115.,116.,117.,118.,119.,120./
C
C Read the well name and location. Read the formation (or
C interval) name, top and bottom of the formation (in ft.),
C and the ages of the top and bottom of the formation (in
C millions of years).
C
      READ(5,33) WELL
   33 FORMAT(20A4,//)
      DO 1 I=1,14
      READ(5,2) IFM1(I),IFM2(I),TOP(I),BOT(I),ATS(I),ABS(I)
    2 FORMAT(1X,2A3,2(1X,F7.1),2(1X,F6.1))
      IF(TOP(I).EQ.0.0) GOTO 3
      NOS=I
    1 CONTINUE
    3 CONTINUE
C
C Read the digitized log (depths, sonic traveltimes,
C and lithologies). Interpolate sonic travel times at
C stage boundaries and every ten feet int
C
      READ(5,7)
    7 FORMAT(//)
      I=0
      DO 4 J=1,3000
      I=I+1
      READ(5,5) D(I),TT(I),LL(I)
    5 FORMAT(5X,2F10.3,2X,I1)
      IF(D(I).EQ.0.0) GOTO 6
      IF(I.GE.2) CALL ITP(D,TT,LL,I,NOS,TOP,BOT,BOUND,JB)

      TE=I
    4 CONTINUE
    6 CONTINUE
C
C Mark the start of the first stage.
C
      DO 15 I=1,50
      IF(D(I).EQ.TOP(1)) START=I
   15 CONTINUE
      DO 20 JB=1,10
      IF(BOUND(JB).EQ.TOP(1))STB=JB
   20 CONTINUE
C
C Calculate the solid grain height for each
C layer using the formula for the area of a trapezoid.
C Count the number of layers in each stage (NIES).
C
      I=START
      N=0
      DO 30 M=1,NOS
      DO 31 J=1,500
      LITH(M,J)=LL(I+1)
      LT=LITH(M,J)
      N=N+1
   32 CONTINUE
      DO 10 K=1,2
      NN=I-1+K
      POR(NN)=TT(NN)*TTC1(LT)-TTC2(LT)
      IF(POR(NN).LT.0.)POR(NN)=0.
   10 CONTINUE
      A=(D(I+1)-D(I))/6.5617
      HS(M,J)=HS(M,J)+A*(2.-POR(I)-POR(I+1))
      I=I+1
      IF(D(I+1).LE.BOUND(STB+N))GOTO 32
      PTHK(M,J)=(BOUND(STB+N)-BOUND(STB+N-1))*.3048
      IF(D(I+1).GT.BOT(M))GOTO 28
   31 CONTINUE
   28 NIES(M)=J
   30 CONTINUE
C
C Calculate the time of deposition of each layer (PDT),
C and the age at the top of each layer (AGE).
C
      DO 200 M=1,NOS
      JN=NIES(M)
      DO 200 J=1,JN
      H=HS(M,J)
      LT=LITH(M,J)
      HSTOT(M)=HSTOT(M)+H
      IF(LT.EQ.3)HSSHSS(M)=HSSHSS(M)+H
      IF(LT.EQ.2)HSSS(M)=HSSS(M)+H
      IF(LT.EQ.1)HSSH(M)=HSSH(M)+H
  200 CONTINUE
      DO 210 M=1,NOS
      JN=NIES(M)
      T(M)=ABS(M)-ATS(M)
      CALL AGEL(M,JN,ARTOT,HSTOT,T,PDT,HS,AGE,ATS)
  210 CONTINUE
      AT=ATS(1)
      DO 220 K=1,21
```

```
      IF(AT.LT.MK(K)) GOTO 225
 220  CONTINUE
 225  MTP=K-1
C
C Calculate the thickness and stress of each layer
C at each time "marker", assuming constant grain height.
C
      DO 101 M=1,NOS
      JN=NIES(M)
      R=ARTOT(M)
      AS=ASS(M)
      DO 102 K=MTP,42
      TMK=MK(K)
      IF(TMK.GE.AS) GOTO 101
      DO 103 J=1,JN
      AG=AGE(M,J)
      PD=PDT(M,J)
      TBOT=AG+PD
      IF(TBOT.LE.TMK) GOTO 103
      H=HS(M,J)
      PT=PTHK(M,J)
      LT=LITH(M,J)
      CALL TSBS(BS,TBOT,TMK,AG,TS)
      CALL TPPP(TP,TBOT,ENDC,R,PP,PT,H,A1)
C
C When L=1, calculate max. values. When L=2, calculate min. values.
      DO 105 L=1,2
      CALL THCKWT(L,LT,XIP,PP,A1,TP,TS,R,BS,THCK,WT,PD,PT,PG,PW,H)
C
C Stage thickness (m) and stage stress (kPa).
      STZ(L,M,K)=STZ(L,M,K)+THCK
      STWT(L,M,K)=STWT(L,M,K)+WT
 105  CONTINUE
 103  CONTINUE
C
C Cumulative thickness (m) and cumulative stress (kPa).
      DO 104 L=1,2
      TZ(L,K)=TZ(L,K)+STZ(L,M,K)
      TWT(L,K)=TWT(L,K)+STWT(L,M,K)
 104  CONTINUE
 102  CONTINUE
 101  CONTINUE
C
C Print out the burial history of the column
C and the history of each stage (assuming
C constant grain height). Print out the
C tectonic history of the column.
C
      WRITE(6,500) WELL
 500  FORMAT('S==SFONT=1200.BOLD.12.FIXED.PORTRAIT.1',/,5X,20A4,
     */,'S==SFONT=1200.MEDIUM.12.FIXED.PORTRAIT.1',/,' ',/,' ')
      WRITE(6,480)
 480  FORMAT(6X,'PART I: CONSTANT GRAIN HEIGHT',
     */,6X,29('-'),/,' ')
      WRITE(6,501)
 501  FORMAT(6X,'FORMATION   AGE (Ma)       SOLID GRAIN HEIGHTS (m)',
     *'  RATE HS    THICK')
      WRITE(6,502)
 502  FORMAT(6X,'OR INTERV  TOP  BOTTOM  SHALE/SHYSS/SANDS/TOTAL',
     *'  SED(m/Ma)  TOT(m)')


      DO 504 M=1,NOS
      THCKN=(BOT(M)-TOP(M))*.3048
      WRITE(6,503)IFMT(M),IFM2(M),ATS(M),ABS(M),HSSH(M),HSSHSS(M)
     *,HSSS(M),HSTOT(M),ARTOT(M),THCKN
 503  FORMAT(7X,2A3,3X,2(1X,F6.1),1X,4(1X,F6.1),3X,F6.2,4X,F6.1)
 504  CONTINUE
      CALL SHIST(1,MTP,MK,TZ,TWT,NOS,HSSS,IFM1,IFM2,STZ,STWT)
      CALL THIST(1,AT,MK,IV,TZ,TWT)
      WRITE(6,450)
 450  FORMAT('1')
      WRITE(6,500) WELL
      WRITE(6,530)
 530  FORMAT(6X,'PART II: VARIABLE SS GRAIN HEIGHT',
     */,6X,33('-'),/,' ')
      WRITE(6,535)
 535  FORMAT(6X,'FORMATION  INIT.SS   HSSS   ',
     *'HSTOT  RATE HS')
      WRITE(6,536)
 536  FORMAT(6X,'OR INTERV  POROSITY  (m)    ',
     *'(m)    SED(m/Ma)')
C
C Calculations for constant SS thickness, variable
C SS stress (density).
C
      DO 300 M=1,NOS
      IF(HSSS(M).EQ.0.0) GOTO 300
      JN=NIES(M)
C
C HST (for SS) is the present height of cement and detrital grains...
      DO 305 J=1,JN
      HST(M,J)=HS(M,J)
 305  CONTINUE
      DO 301 L=1,2
      HSSS(M)=0.
C
C HS (for SS) is the assumed constant grain height...
      DO 310 J=1,JN
      IF(LITH(M,J).NE.2) GOTO 310
      HS(M,J)=PTHK(M,J)*(1.-XIP(L,2))
      HSSS(M)=HSSS(M)+HS(M,J)
 310  CONTINUE
      HSTOT(M)=HSSHSS(M)+HSSH(M)+HSSS(M)
C
C Calculate new sedimentation rates based on new HSTOT...
      CALL ASEL(M,JN,ARTOT,HSTOT,T,PDT,HS,AGE,ATS)
      R=ARTOT(M)
      DO 325 K=MTP,42
      TMK=MK(K)
      IF(TMK.GE.ABS(M)) GOTO 327
      STZ(L,M,K)=0.0
      STWT(L,M,K)=0.0
      DO 350 J=1,JN
      AG=AGE(M,J)
      PD=PDT(M,J)
      TBOT=AG+PD
      IF(TBOT.LE.TMK) GOTO 350
      H=HS(M,J)
      HT=HST(M,J)
      PT=PTHK(M,J)
      LT=LITH(M,J)
```

```
      CALL TSBS(BS,TBOT,TMK,AS,TS)
      IF(LT.EQ.2) GOTO 355
C
C For shales and shaley sandstones...
      CALL TPPP(TP,TBOT,ENDC,R,PP,PT,H,A1)
      CALL THCKWT(L,LT,XIP,PP,A1,TP,TS,R,BS,THCK,WT,PD,PT,PG,PW,H)
      GOTO 370
C
C For sandstones...
  355 PP=(PT-HT)/PT
      X=(BS-TS)/PD
      THCK=PT*X
      IF(PP.GE.XIP(L,2)) GOTO 375
      HSO=H*X
      HWAC=THCK-HSO
      PCW=(PT-HT)/(PT-H)
      CR=(PCW-1.-ALOG(PCW))/TBOT
      CALL POROSI(1.0,TS,CR,1.0,0.0,X1)
      CALL POROSI(1.0,BS,CR,1.0,0.0,X2)
      HC=(HWAC/2)*(2-EXP(X1)-EXP(X2))
      HW=HWAC-HC
      GOTO 385
C
C For sandstone layers that are assumed to be uncemented
  375 HSO=HT*X
      HC=0.0
      HW=THCK-HSO
C
  385 WT=9.81E-3*(HSO*PG(2)+HW*PW+HC*PG(3))
C
  370 STZ(L,M,K)=STZ(L,M,K)+THCK
      STWT(L,M,K)=STWT(L,M,K)+WT
  350 CONTINUE
  325 CONTINUE
  327 WRITE(6,330)IFM1(M),IFM2(M),XIP(L,2),HSSS(M),HSTOT(M),ARTOT(M)
  330 FORMAT(7X,2A3,5X,F5.3,3X,2(1X,F5.1),3X,F6.2)
  301 CONTINUE
  300 CONTINUE
C
      DO 390 K=MTP,42
      DO 395 L=1,2
      TZ(L,K)=0.0
      TWT(L,K)=0.0
  395 CONTINUE
      DO 390 M=1,NOS
      DO 390 L=1,2
      TZ(L,K)=TZ(L,K)+STZ(L,M,K)
      TWT(L,K)=TWT(L,K)+STWT(L,M,K)
  390 CONTINUE
C
      CALL SHIST(2,MTP,MK,TZ,TWT,NOS,HSSS,IFM1,IFM2,STZ,STWT)
      CALL THIST(2,AT,MK,IV,TZ,TWT)
C
      STOP
      END
C
C Subroutine ITP interpolates sonic travel time values at stage
C boundaries and every ten feet interval.
C
      SUBROUTINE ITP(D,TT,LL,I,NOS,TOP,BOT,BOUND,JB)
      DIMENSION D(3000),TT(3000),LL(3000),TOP(14),BOT(14),BOUND(600)
      DO 1 M=1,NOS
      IF(D(I-1).LT.TOP(M).AND.D(I).GT.TOP(M)) GOTO 3
      IF(D(I-1).LT.BOT(M).AND.D(I).GT.BOT(M)) GOTO 2
      IF(D(I).EQ.TOP(M).OR.D(I).EQ.BOT(M)) GOTO 5
    1 CONTINUE
      C=(INT(D(I)/10.))-(INT(D(I-1)/10.))
      IF(C.NE.1.) GOTO 6
      CALL TRANS(D,TT,LL,I)
      D(I)=((INT(D(I-1)/10.))*10.)+10.
      GOTO 4
    2 CALL TRANS(D,TT,LL,I)
      D(I)=BOT(M)
      GOTO 4
    3 CALL TRANS(D,TT,LL,I)
      D(I)=TOP(M)
C
    4 TT(I)=(TT(I+1)-TT(I-1))/(D(I+1)-D(I-1))*(D(I)-D(I-1))+TT(I-1)
      JB=JB+1
      BOUND(JB)=D(I)
      I=I+1
      GOTO 6
    5 JB=JB+1
      BOUND(JB)=D(I)
    6 CONTINUE
      RETURN
      END
C
C Subroutine TRANS transfers array elements as
C boundaries are inserted in subroutine ITP.
C
      SUBROUTINE TRANS(D,TT,LL,I)
      DIMENSION D(3000),TT(3000),LL(3000)
      D(I+1)=D(I)
      TT(I+1)=TT(I)
      LL(I+1)=LL(I)
      LL(I)=LL(I-1)
      RETURN
      END
C
C Subroutine AGEL calculates the ages of the tops of each
C layer and the time (duration) of deposition of each
C layer.
C
      SUBROUTINE AGEL(M,JN,ARTOT,HSTOT,T,PDT,HS,AGE,ATS)
      DIMENSION ARTOT(14),HSTOT(14),T(14),HS(14,130),AGE(14,130)
     *,PDT(14,130),ATS(14)
      ARTOT(M)=HSTOT(M)/T(M)
      DO 1 J=1,JN
      PDT(M,J)=HS(M,J)/ARTOT(M)
    1 CONTINUE
      AGE(M,1)=ATS(M)
      DO 2 J=2,JN
      AGE(M,J)=AGE(M,J-1)+PDT(M,J-1)
    2 CONTINUE
      RETURN
      END
C
C Subroutine TSBS calculates the age of the top and bottom
C of each layer with respect to the indicated time TMK(K).
```

```
C
      SUBROUTINE TSSS(BS,TBOT,TMK,AG,TS)
      BS=TBOT-TMK
      TS=AG-TMK
      IF(TBOT.GT.TMK.AND.AG.LE.TMK)TS=0.
      RETURN
      END
C
C Subroutine TPPP determines the present porosity
C of any layer.
C
      SUBROUTINE TPPP(TP,TBOT,ENDC,R,PP,PT,H,A1)
      TP=(TBOT-ENDC)*R
      PP=(PT-H)/PT
      A1=ALOG(PP)
      RETURN
      END
C
C Subroutine THCKWT calculates the max and min thickness
C of any layer at any given time.
C
      SUBROUTINE THCKWT(L,LT,XIP,PP,A1,TP,TS,R,
     *BS,THCK,WT,PD,PT,PG,PW,H)
      DIMENSION XIP(2,3),PG(3)
      RHOI=XIP(L,LT)
      IF(PP.GE.RHOI) GOTO 1
      A=ALOG(RHOI)
      A2=A1-A
      C=(RHOI*EXP(A2)-RHOI-A2)/TP
      CALL POROSI(RHOI,TS,C,R,A,X1)
      CALL POROSI(RHOI,BS,C,R,A,X2)
      THCK=(X1-X2)/C
      GOTO 2
    1 THCK=PT*(BS-TS)/PD
    2 WT=9.81E-3*(H*(PG(LT)-PW)+PW*THCK)
      RETURN
      END
C
C Subroutine BHIST prints out the burial history of the
C column and each stage in the column.
C
      SUBROUTINE BHIST(N,MTP,TMK,TZ,TWT,NOS,NSSS,IFM1,IFM2,STZ,STWT)
      DIMENSION TMK(42),TZ(2,42),TWT(2,42),NSSS(14)
     *,STZ(2,14,42),STWT(2,14,42),IFM1(14),IFM2(14)
      IF(N.EQ.1) GOTO 2
      WRITE(6,1)
    1 FORMAT(' ',/,' ',/,6X,'BURIAL HISTORY FOR VARIABLE SS',
     *' GRAIN HEIGHT',/,6X,43('-'),/,' ')
      GOTO 4
    2 WRITE(6,3)
    3 FORMAT(' ',/,' ',/,6X,'BURIAL HISTORY FOR CONSTANT GRAIN',
     *' HEIGHT',/,6X,40('-'),/,' ')
    4 WRITE(6,5)
    5 FORMAT(7X,'TIME   CUMULATIVE THICK   CUMULATIVE STRESS')
      WRITE(6,6)
    6 FORMAT(7X,'(Ma)   in metres.',8X,'in kiloPa.')
      DO 8 K=MTP,42
      WRITE(6,7)TMK(K),TZ(1,K),TZ(2,K),TWT(1,K),TWT(2,K)
    7 FORMAT(6X,F6.1,3X,2(1X,F6.1),3X,2(1X,F7.1))
    8 CONTINUE
      WRITE(6,9)
    9 FORMAT(' ',/,' ',/,6X,'FORMATION  TIME  FORM OR INT  FORM',
     *' OR INTER',/,6X,'OR INTERV  (Ma)  THICK (m)    STRESS (kPa)')
C
      DO 15 M=1,NOS
      IF(N.EQ.1) GOTO 10
      IF(NSSS(M).EQ.0.0) GOTO 15
   10 WRITE(6,11)IFM1(M),IFM2(M)
   11 FORMAT(7X,2A3)
      DO 13 K=MTP,42
      IF(STZ(1,M,K).EQ.0.) GOTO 13
      WRITE(6,12)TMK(K),STZ(1,M,K),STZ(2,M,K),STWT(1,M,K),STWT(2,M,K)
   12 FORMAT(16X,F6.1,1X,2(1X,F6.1),1X,2(F7.1))
   13 CONTINUE
      WRITE(6,14)
   14 FORMAT(' ',/)
   15 CONTINUE
      RETURN
      END
C
C Subroutine THIST prints out the tectonic history of the
C column.
C
      SUBROUTINE THIST(N,AT,TMK,IV,TZ,TWT)
      DIMENSION TMK(42),IV(2,14),TZ(2,42),TWT(2,42),AA(2,14)
     *,AB(2,14),AC(2,14)
      IF(N.EQ.1) GOTO 2
      WRITE(6,1)
    1 FORMAT(' ',/,6X,'TECTONIC HISTORY FOR VARIABLE SS',
     *' GRAIN HEIGHT',/,6X,45('-'),/,' ')
      GOTO 4
    2 WRITE(6,3)
    3 FORMAT(' ',/,6X,'TECTONIC HISTORY FOR CONSTANT',
     *' GRAIN HEIGHT',/,6X,42('-'),/,' ')
    4 WRITE(6,5)
    5 FORMAT(6X,'INTERV.(Ma)  TOT SUBSID AND  TOTAL - TECTON  ',
     *'ISOST TECTON SUBSID')
      WRITE(6,6)
    6 FORMAT(6X,'TIME1 TIME2  SEA LEV CHG(m)  LOAD (kiloPa)   ',
     *'AND SEA LEV CHG (m)')
C
      DO 9 K=1,14
      DO 7 L=1,2
      IF(AT.GT.TMK(IV(2,K))) GOTO 9
      AA(L,K)=TZ(L,IV(2,K))-TZ(L,IV(1,K))
      AB(L,K)=TWT(L,IV(2,K))-TWT(L,IV(1,K))
      AC(L,K)=AA(L,K)-(AB(L,K)/(2.3*9.81))
    7 CONTINUE
      WRITE(6,8)TMK(IV(1,K)),TMK(IV(2,K)),AA(1,K),AA(2,K),
     *AB(1,K),AB(2,K),AC(1,K),AC(2,K)
    8 FORMAT(6X,2(1X,F5.1),1X,2(2X,F6.0),1X,2(2X,F6.0),2X,2(3X,F6.0))
    9 CONTINUE
      RETURN
      END
C
C Subroutine POROSITY uses Newton's method to solve the
C porosity-time equation...
C
      SUBROUTINE POROSI(RHOI,T,C,R,A,X)
      IF(T.NE.0.0) GOTO 1
```

```
      X=0.0
      GOTO 3
    1 B=-RHOI-T*C*R
      X=ALOG(.4)-A
      DO 2 I=1,25
      XT=X
      X=X-((X-RHOI*EXP(X)-B)/(1-RHOI*EXP(X)))
      IF(ABS(XT-X).LE.1.E-05) GOTO 3
    2 CONTINUE
    3 CONTINUE
      RETURN
      END
C
End of file
```

WELL#1. SULPETRO ETAL WAPITI 6-11-68-8W6
SF=248.2 TMAX=140.0 TMIN=40.0

FM:	TOP.	BOT.	ATS	ABS
WPBI	2883.0	3204.0	78.0	83.0
COLD	3204.0	3880.0	83.0	88.5
CARD	3880.0	4885.0	88.5	90.0
2WS	4885.0	5035.0	90.0	95.0
BFSC	5035.0	6452.0	95.0	105.0
CDT	6452.0	6611.0	105.0	108.0
SPRTR	6611.0	7708.0	108.0	113.0
GETH	7708.0	8130.0	113.0	120.0
NIK	8130.0	8495.0	138.0	148.0
FRN	8495.0	8723.0	148.0	200.0
	0.0	0.0	0.0	0.0

LDEPTH	TT	LITH
2871.778	75.832	2
2878.025	84.437	2
2882.025	77.452	2
2889.283	85.878	2
2893.322	81.122	2
2898.520	88.088	2
2904.720	82.588	2
------------	------------	-
8726.254	66.851	1
8731.402	72.988	1
8738.352	63.969	1
8742.618	63.948	1
8745.484	59.032	1
8747.598	63.940	1
8750.566	57.781	1
8757.723	58.594	1
8765.996	66.353	1
8774.102	62.240	1
8778.338	72.678	1
000000	000000000.000	0

B. APPENDIX 2

This section contains the results from the 43 wells used in this study. The results are given in two parts for each well: part I, which assumes constant grain height; and part II, which assumes variable sandstone grain height. Under the section heading "PART II: VARIABLE SS GRAIN HEIGHT", the solid grain heights for sandstone and the total grain heights are calculated on the basis of the indicated assumed initial sandstone porosity. Intervals containing no sandstone are not shown in section heading, but they are included in the calculations of the burial histories.

Complete results are only given for wells 1, 16, and 37 because they were used to illustrate various ideas in the text. Interval histories were not printed out for the other wells.

Note that for the burial and tectonic histories, the values for the maximum burial curves are on the left, and the values for the minimum burial curves are on the right.

WELL#1. SULPETRO ETAL WAPITI 8-11-68-8W6

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
WPBI	78.0	83.0	47.0	35.8	5.5	88.2	17.64	97.8
COLO	83.0	88.5	120.1	11.3	0.0	131.4	23.89	138.0
CARD	88.5	90.0	275.1	2.8	13.5	291.3	194.20	309.2
2WS	90.0	98.0	318.8	58.4	18.3	395.5	49.44	418.8
BFSC	98.0	103.0	117.0	0.0	2.9	119.8	23.96	128.8
CDT	106.0	108.0	24.4	0.0	21.9	46.3	23.12	46.8
BPRTR	108.0	113.0	87.2	114.8	117.8	318.4	63.68	334.4
BETH	113.0	120.0	62.8	36.2	24.8	123.8	17.68	128.8
NIK	138.0	148.0	38.4	40.0	28.8	107.2	8.93	111.8
PRN	148.0	200.0	58.4	5.2	0.0	64.6	1.24	68.2

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	2374.1	2188.0	51702.8	48832.8
79.0	2398.8	2188.2	51650.9	48833.0
80.0	2418.0	2202.2	51606.4	48615.2
81.0	2448.5	2207.8	51555.4	48182.0
82.0	2483.5	2208.8	51488.0	48873.8
83.0	2487.9	2213.3	51401.8	48818.8
84.0	2514.4	2208.2	51281.8	48178.3
85.0	2538.3	2201.9	51131.6	47762.8
86.0	2571.0	2203.8	51084.2	47331.4
87.0	2848.8	2318.8	51440.8	47083.8
88.5	2893.1	2258.2	54321.1	48808.0
89.0	2780.7	2083.8	50880.2	43848.1
90.0	2027.0	1884.1	38738.8	38073.4
91.0	1851.2	1883.7	38188.7	34887.0
92.0	1848.1	1813.3	36283.7	32831.1
93.0	1767.5	1447.8	34888.8	31470.4
94.0	1708.2	1382.8	33203.4	30008.0
95.0	1883.8	1289.2	31303.2	28328.3
96.0	1887.0	1240.2	30328.4	27028.8
97.0	1451.3	1147.3	28234.7	26182.8
98.0	1282.1	1048.1	26887.2	23322.8
99.0	1238.3	1008.8	24872.4	22850.4
100.0	1182.8	889.8	24023.8	21770.5
101.0	1148.4	828.8	23187.1	20868.8
102.0	1084.8	888.2	22108.8	20082.4
103.0	1008.8	842.3	20848.3	18287.4
106.0	1128.8	838.8	21488.8	18481.8
109.0	988.5	749.0	19072.8	18641.2
110.0	884.7	878.3	18880.8	14773.8
111.0	778.7	804.8	14744.8	12818.7
112.0	688.2	818.0	12818.0	11127.8
113.0	813.8	404.1	10010.2	8803.8
114.0	800.8	382.8	8824.7	8428.0
115.0	480.1	348.7	8822.3	7808.8
116.0	412.8	318.8	8188.3	7204.1
117.0	352.1	288.8	7258.8	6588.8
118.0	328.2	288.4	6788.8	6103.4
119.0	270.7	231.7	5872.8	5478.7
120.0	230.7	210.1	5138.4	4028.8

FORMATION OR INTERV	TIME (Ma)	FORM OR INT THICK (m)		FORM OR INTER STRESS (kPa)	
WPBI					
	78.0	217.8	152.5	3853.2	3003.3
	79.0	188.0	133.1	3180.7	2534.5
	80.0	172.3	108.2	2852.1	2014.3
	81.0	128.8	80.5	2048.2	1447.1
	82.0	83.1	42.1	1134.1	730.3
COLO					
	78.0	228.7	208.2	4485.4	4258.8
	79.0	240.7	213.1	4808.7	4327.8
	80.0	258.2	221.3	4762.7	4410.3
	81.0	277.2	231.2	4978.8	4510.1
	82.0	308.2	243.5	5288.4	4824.7
	83.0	374.0	259.8	5053.8	4787.3
	84.0	328.8	217.4	5128.8	4004.8
	85.0	273.3	172.3	4187.7	3188.5
	86.0	208.2	124.4	3102.8	2255.8
	87.0	138.8	78.3	2031.2	1420.1
CARD					
	78.0	441.3	412.8	9278.8	8888.2
	79.0	454.4	421.5	9410.7	8978.1
	80.0	469.8	431.5	9583.0	9180.0
	81.0	487.3	443.0	9743.8	9285.7
	82.0	506.8	456.2	9980.1	9420.1
	83.0	531.3	471.5	10320.7	9584.8
	84.0	556.3	488.5	10581.8	9756.8
	85.0	612.3	511.8	11006.4	9981.8
	86.0	673.8	538.2	11626.8	10287.2
	87.0	761.7	574.2	12588.0	10821.3
	88.5	1187.7	652.4	16517.1	11411.8
	89.0	908.7	480.8	12420.8	7880.7
2WS					
	78.0	560.8	527.8	12180.7	11850.0
	79.0	571.8	538.3	12301.2	11934.8
	80.0	583.8	548.4	12425.1	12018.3
	81.0	597.8	552.2	12584.2	12108.8
	82.0	613.2	562.8	12733.4	12208.2
	83.0	631.3	573.8	12904.3	12318.8
	84.0	652.2	585.3	13110.6	12438.8
	85.0	677.0	599.3	13368.8	12580.8
	86.0	707.1	615.1	13671.3	12741.1
	87.0	744.8	633.8	14062.2	12927.7
	88.5	826.8	667.8	14877.1	13274.8
	89.0	865.1	681.7	15277.0	13414.7
	90.0	895.0	714.7	15830.7	13740.0
	91.0	906.8	638.4	14834.3	13163.4

82.0	780.8	847.4	12853.0	10430.1
83.0	880.0	472.8	11070.6	8881.7
84.0	808.8	355.7	9481.8	7308.0
85.0	457.8	300.3	7104.8	5598.5
86.0	407.9	238.0	5884.4	4038.0
87.0	248.8	118.7	3330.1	3037.5

BFSC

78.0	158.0	162.2	3587.4	3523.1
79.0	158.5	163.7	3587.1	3538.8
80.0	150.8	165.3	3608.3	3558.1
81.0	162.9	157.1	3631.4	3573.0
82.0	165.4	160.0	3655.6	3592.2
83.0	168.3	161.1	3684.0	3612.8
84.0	171.5	163.3	3714.2	3636.2
[illegible]	174.6	165.7	3747.6	3650.8
[illegible]	[illegible]	168.3	3784.8	3686.2
[illegible]	[illegible]	171.2	3830.3	3718.2
[illegible]	[illegible]	176.1	3888.6	3758.5
[illegible]	192.1	177.0	3928.1	3782.7
90.0	198.1	181.8	3987.3	3832.2
91.0	205.2	188.3	4058.6	3888.4
92.0	212.8	191.1	4142.0	3918.6
93.0	222.6	198.8	4244.0	3973.8
94.0	236.1	203.3	4371.8	4030.4
95.0	253.3	210.9	4524.8	4118.4
96.0	274.4	220.0	4758.1	4208.1
97.0	307.7	231.0	5084.8	4318.7
98.0	371.8	244.6	5740.5	4458.3
99.0	312.7	158.0	4773.5	3832.7
100.0	250.4	153.4	3783.8	2774.3
101.0	182.7	104.6	2802.8	1898.8
102.0	100.8	52.7	1418.4	832.8

CBT

78.0	58.0	52.3	1318.2	1278.8
79.0	56.3	53.3	1320.1	1280.5
80.0	58.7	52.6	1324.3	1282.4
81.0	57.1	52.7	1328.8	1284.8
82.0	57.6	53.0	1333.6	1285.8
83.0	58.1	53.3	1338.8	1288.2
84.0	58.6	53.5	1344.0	1291.7
85.0	59.2	53.7	1348.6	1294.4
86.0	59.8	54.0	1355.0	1297.3
87.0	60.5	54.3	1362.5	1300.4
88.5	61.0	54.6	1373.6	1305.5
89.0	61.9	55.0	1377.8	1307.3
90.0	62.8	55.4	1385.8	1311.3
91.0	63.7	55.6	1395.1	1315.4
92.0	64.7	56.3	1405.1	1320.0
93.0	65.8	56.6	1416.0	1325.0
94.0	67.0	57.3	1428.1	1330.8
95.0	68.3	57.8	1441.5	1335.7
96.0	69.8	58.5	1458.5	1343.5
97.0	71.4	59.3	1473.4	1351.1
98.0	73.3	60.2	1492.5	1359.7
99.0	75.5	61.2	1514.6	1368.8
100.0	78.1	62.3	1540.3	1380.8
101.0	81.1	63.8	1570.8	1394.2
102.0	84.8	65.2	1608.1	1410.0
103.0	88.4	67.1	1655.0	1428.2

SPRTR

78.0	377.7	358.0	8890.8	8781.8
79.0	379.8	358.0	8912.8	8802.5
80.0	382.1	360.1	8938.0	8812.2
81.0	384.5	361.2	8960.4	8824.4
82.0	387.1	362.4	8988.4	8838.3
83.0	388.5	363.6	9113.4	8848.8
84.0	392.7	364.9	9142.8	8861.8
85.0	395.6	366.5	9174.0	8875.3
86.0	399.0	367.8	9208.5	8888.8
87.0	402.5	368.2	9241.5	8906.0
88.0	406.3	371.6	9289.7	8920.3
89.0	410.2	373.4	9319.6	[illegible]
90.0	414.5	374.2	9362.1	[illegible]
91.0	418.1	376.1	[illegible]	8975.4
92.0	424.1	378.2	[illegible]	8988.0
93.0	428.5	380.3	9518.2	9017.8
94.0	438.8	382.7	9574.8	9041.3
95.0	441.0	385.2	9640.1	9066.7
96.0	460.6	387.8	9711.8	9094.0
97.0	458.6	390.8	9780.8	9123.7
98.0	468.8	394.0	9878.4	9158.0
99.0	478.2	397.5	9978.3	9191.4
100.0	488.1	401.4	10088.8	9230.4
101.0	498.6	405.8	10212.6	9273.7
102.0	512.9	410.4	10357.0	9322.1
103.0	520.8	415.8	10528.8	9378.8
108.0	712.8	482.1	12370.0	9844.2
109.0	887.0	358.0	9882.1	7881.0
110.0	450.3	292.4	7870.1	6078.1
11[illegible].0	218.2	205.6	5280.8	4181.8
113.0	214.8	121.8	3245.1	2306.0

GETH

78.0	142.8	138.8	3457.8	3413.2
79.0	143.8	138.0	3465.0	3417.8
80.0	144.4	138.4	3472.3	3422.2
81.0	[illegible]	138.5	3479.8	3427.1
82.0	[illegible]	139.4	3487.8	3432.2
83.0	146.8	140.8	3495.6	[illegible]
84.0	147.8	141.5	3506.3	[illegible]
85.0	148.6	142.0	[illegible]	[illegible]
86.0	149.8	143.7	3524.7	[illegible]
87.0	150.8	143.3	3535.4	[illegible]
88.0	152.2	144.3	3552.4	[illegible]
89.0	[illegible]	144.7	3558.4	[illegible]
90.0	154.1	145.6	3571.1	[illegible]
91.0	[illegible]	146.2	3584.8	[illegible]
92.0	[illegible]	147.1	3598.0	[illegible]
93.0	[illegible]	147.8	3612.4	[illegible]
94.0	160.1	148.8	3628.6	[illegible]
95.0	161.8	149.8	3646.7	3626.2
96.0	163.7	151.0	3667.3	3638.1
97.0	166.8	152.1	3684.8	3650.1

98.0	168.0	183.4	3711.1	3863.2
99.0	170.4	184.7	3738.8	3878.7
100.0	173.1	186.1	3782.8	3881.2
101.0	176.0	187.7	3782.1	3806.0
102.0	179.2	189.4	3824.0	3824.1
103.0	182.8	191.2	3881.2	3842.7
108.0	208.8	172.8	4124.8	3771.2
109.0	214.8	177.8	4223.2	3807.8
110.0	228.3	181.7	4330.8	3840.7
111.0	243.2	186.8	4471.2	3880.4
112.0	282.7	182.8	4886.0	3858.2
113.0	284.8	188.8	4880.7	4023.7
114.0	280.2	177.8	4880.8	3887.8
115.0	238.2	144.1	3873.2	2821.8
116.0	188.3	112.1	3881.2	2210.8
117.0	127.0	78.8	2177.8	1887.7
118.0	111.2	61.2	1886.8	1182.7
119.0	42.0	22.8	784.4	888.7

NIK

78.0	118.8	115.7	2838.1	2007.0
79.0	119.1	115.8	2840.8	2008.4
80.0	119.4	116.0	2843.7	2009.8
81.0	119.8	116.2	2846.8	2011.3
82.0	119.8	116.3	2849.8	2012.8
83.0	120.2	116.5	2853.8	2014.8
84.0	120.8	116.8	2855.8	2016.1
85.0	120.8	116.8	2858.2	2017.7
86.0	121.2	117.0	2862.8	2019.8
87.0	121.8	117.1	2868.1	2021.2
88.0	122.1	117.4	2871.8	2024.0
89.0	122.2	117.5	2873.8	2026.0
90.0	122.7	117.7	2877.4	2029.8
91.0	123.1	117.8	2881.6	2029.8
92.0	123.5	118.1	2885.8	2030.8
93.0	123.8	118.3	2888.8	2039.0
94.0	124.4	118.5	2894.3	2035.1
95.0	124.8	118.7	2899.0	2037.4
96.0	125.3	119.0	3003.8	2039.7
97.0	125.8	119.2	3008.8	2042.0
98.0	126.3	119.4	3014.1	2044.8
99.0	126.8	119.7	3019.8	2047.0
100.0	127.4	119.9	3025.0	2049.7
101.0	128.0	120.2	3030.8	2052.4
102.0	128.6	120.5	3037.1	2055.2
103.0	129.2	120.8	3043.4	2058.1
108.0	132.8	122.4	3079.8	2074.8
109.0	133.7	122.8	3088.3	2078.2
110.0	134.8	123.1	3098.8	2082.0
111.0	135.4	123.5	3108.2	2086.1
112.0	136.4	124.0	3115.8	2090.3
113.0	137.4	124.4	3126.1	2094.8
114.0	138.8	124.8	3136.0	2099.2
115.0	139.8	125.3	3148.4	3004.0
116.0	140.8	125.8	3160.8	3009.1
117.0	142.1	126.4	3173.3	3014.4
118.0	143.4	126.9	3187.0	3020.0
119.0	144.9	127.5	3201.8	3025.8
120.0	146.4	128.1	3217.1	3032.2

FRN

78.0	73.7	73.2	1814.2	1809.0
79.0	73.8	73.3	1815.7	1810.3
80.0	74.0	73.5	1817.2	1811.5
81.0	74.2	73.8	1818.7	1812.9
82.0	74.3	73.7	1820.2	1814.2
83.0	74.5	73.8	1821.8	1815.8
84.0	74.8	74.0	1823.5	1817.0
85.0	74.8	74.1	1825.1	1818.4
86.0	75.0	74.3	1826.8	1819.9
87.0	75.2	74.4	1828.6	1821.3
88.0	75.4	74.7	1831.2	1823.8
89.0	75.5	74.7	1832.3	1824.4
90.0	75.7	74.8	1834.0	1826.0
91.0	75.8	75.1	1835.9	1827.6
92.0	76.1	75.2	1837.8	1829.3
93.0	76.3	75.4	1839.9	1831.0
94.0	76.5	75.6	1841.8	1832.7
95.0	76.7	75.7	1844.1	1834.5
96.0	76.9	75.9	1846.2	1836.3
97.0	77.1	76.1	1848.4	1838.2
98.0	77.3	76.3	1850.7	1840.0
99.0	77.6	76.5	1853.0	1842.0
100.0	77.8	76.7	1855.4	1844.0
101.0	78.1	76.9	1857.9	1846.0
102.0	78.3	77.1	1860.4	1848.1
103.0	78.6	77.3	1863.0	1850.3
108.0	80.0	78.5	1877.1	1861.9
109.0	80.3	78.7	1880.1	1864.5
110.0	80.6	79.0	1883.3	1867.0
111.0	80.9	79.2	1886.5	1869.7
112.0	81.2	79.5	1889.9	1872.4
113.0	81.6	79.8	1893.4	1875.3
114.0	81.9	80.1	1897.0	1878.2
115.0	82.3	80.4	1900.7	1881.2
116.0	82.7	80.7	1904.6	1884.2
117.0	83.1	81.0	1908.5	1887.4
118.0	83.5	81.3	1912.6	1890.7
119.0	83.9	81.6	1916.9	1894.1
120.0	84.3	82.0	1921.3	1897.6

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (k10Pa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-45.	-12.	88.	417.	-46.	-26.
82.0	79.0	-124.	-24.	211.	1217.	-130.	-82.
83.0	80.0	-78.	-11.	114.	780.	-82.	-38.
85.0	83.0	-38.	11.	300.	883.	-80.	-16.
89.0	85.0	500.	520.	11202.	11078.	157.	177.
90.0	89.0	471.	548.	11752.	12842.	108.	102.
91.0	90.0	75.	70.	1540.	1486.	28.	25.
98.0	91.0	858.	848.	12512.	11264.	282.	188.
102.0	91.0	842.	751.	17261.	15330.	408.	278.
103.0	95.0	273.	200.	4730.	4068.	128.	80.

113.0	105.0	832.	433.	11400.	8548.	288.	138.
120.0	105.0	805.	827.	16331.	13522.	400.	300.
120.0	113.0	203.	104.	4872.	3074.	132.	71.

WELL#1. SULPETRO ETAL WAPITI 6-11-68-8W6

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSBS (m)	HSTOT (m)	RATE HS SED(m/Ma)
WPBI	0.560	3.6	66.4	17.28
WPBI	0.170	6.6	69.6	17.52
CARD	0.560	6.7	284.5	108.70
CARD	0.170	12.6	290.5	103.00
2WS	0.560	6.0	387.3	48.41
2WS	0.170	16.2	394.4	48.31
DFSC	0.560	1.3	116.4	23.07
DFSC	0.170	2.5	116.6	23.01
CDT	0.560	10.6	34.6	17.41
CDT	0.170	16.7	44.1	22.06
SPRTR	0.560	54.9	258.0	51.32
SPRTR	0.170	103.5	305.2	61.04
BETH	0.560	18.1	106.1	15.02
BETH	0.170	30.4	119.4	17.06
HIK	0.560	17.4	87.6	7.32
HIK	0.170	32.9	103.2	6.00

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	2323.0	2176.0	50614.5	48558.2
79.0	2343.7	2163.3	50523.7	48353.7
80.0	2364.8	2168.7	50440.4	48120.7
81.0	2387.7	2183.6	50374.2	48898.8
82.0	2404.6	2184.3	50247.3	48580.0
83.0	2430.9	2188.3	50267.1	48301.1
84.0	2453.2	2180.8	50014.7	47856.0
85.0	2470.0	2186.1	49709.8	47620.8
86.0	2503.1	2166.8	49875.3	46961.1
87.0	2574.6	2198.6	49883.4	46744.3
88.5	2823.0	2241.6	53867.3	46541.5
89.0	2701.4	2068.7	49867.0	43168.0
90.0	1953.8	1648.8	38302.3	35716.6
91.0	1876.5	1678.2	36745.1	34224.2
92.0	1774.5	1495.7	34870.2	32582.0
93.0	1687.6	1429.6	33180.8	31096.4
94.0	1629.3	1364.5	31765.3	29628.6
95.0	1514.6	1280.5	29737.0	27039.5
96.0	1461.0	1220.7	28577.3	26634.2
97.0	1282.0	1127.5	26568.3	24783.1
98.0	1162.8	1028.2	24006.7	22016.7
99.0	1146.7	960.2	23126.7	22133.7
100.0	1065.6	948.1	22203.5	21343.0
101.0	1043.7	907.6	21255.5	20532.1
102.0	970.3	862.6	20182.1	19645.2
103.0	904.8	820.1	18881.2	18799.6
108.0	898.5	814.3	19042.0	17873.0
109.0	877.9	728.3	16926.9	16117.8
110.0	791.2	656.9	15150.2	14426.0
111.0	653.0	561.0	13258.3	12615.6
112.0	617.8	506.6	11696.9	10867.6
113.0	488.6	398.2	9237.0	8747.2
114.0	458.0	378.2	8938.1	8286.0
115.0	430.4	344.6	8307.1	7672.5
116.0	377.1	313.2	7552.5	7086.1
117.0	341.0	281.5	6928.1	6454.8
118.0	308.1	264.9	6216.6	6048.0
119.0	266.0	228.3	5629.2	5295.5
120.0	216.4	206.6	4648.1	4882.3

FORMATION OR INTERV	TIME (Ma)	FORM OR INT THICK (m)		FORM OR INTER STRESS (kPa)	
WPBI					
	78.0	212.7	152.4	3579.0	3002.7
	79.0	194.3	133.5	3106.2	2636.6
	80.0	169.0	109.5	2573.1	2047.4
	81.0	135.3	80.9	1953.2	1459.8
	82.0	78.4	42.3	1107.6	732.1
CARD					
	78.0	436.0	411.0	9159.0	8972.9
	79.0	447.6	420.7	9283.7	9062.3
	80.0	462.3	430.6	9430.2	9162.7
	81.0	479.7	442.2	9602.6	9279.1
	82.0	500.5	455.4	9811.3	9412.0
	83.0	528.3	470.6	10058.7	9567.1
	84.0	558.8	489.0	10304.0	9750.7
	85.0	602.3	511.0	10828.8	9972.6
	86.0	663.2	538.3	11640.4	10248.1
	87.0	758.7	573.3	12400.1	10601.5
	88.5	1154.0	661.6	16377.1	11380.9
	89.0	688.6	466.6	12166.3	7667.6
2WS					
	78.0	554.5	527.0	12071.0	11841.4
	79.0	565.1	534.4	12176.0	11918.7
	80.0	577.0	542.4	12295.0	11996.0
	81.0	590.3	551.3	12427.0	12080.1
	82.0	605.6	561.1	12579.4	12164.9
	83.0	623.1	572.0	12763.0	12264.6
	84.0	643.4	584.3	12957.2	12416.2
	85.0	667.7	598.1	13100.6	12566.1
	86.0	697.1	614.0	13403.0	12718.2
	87.0	734.0	632.4	13883.0	12904.2
	88.5	814.1	668.7	14687.6	13260.0
	89.0	853.0	690.5	15068.0	13380.7
	90.0	963.7	713.6	16376.0	13722.0
	91.0	897.0	638.5	14719.1	12766.9
	92.0	775.6	548.8	12720.2	10416.3
	93.0	577.5	471.6	10903.7	8864.0
	94.0	500.6	366.2	9316.0	7296.0
	95.0	463.2	300.5	7061.1	5465.5
	96.0	400.0	227.3	5658.6	4060.6
	97.0	341.5	118.3	3376.4	2034.2

SPSE

78.0	158.0	152.0	3562.0	3518.0
79.0	157.0	153.0	3571.0	3534.3
80.0	159.4	155.1	3582.5	3550.7
81.0	162.1	156.0	3574.0	3556.4
82.0	164.3	158.6	3599.3	3587.6
83.0	167.3	160.6	3655.1	3608.0
84.0	170.1	163.0	3686.0	3630.3
85.0	173.4	165.4	3727.0	3684.5
86.0	177.0	168.1	3784.0	3680.0
87.0	181.0	170.6	3806.6	3709.6
88.0	186.1	173.6	3878.4	3768.0
89.0	190.6	177.0	3962.3	3777.0
90.0	198.7	181.5	3982.1	3816.3
91.0	203.7	185.0	4031.6	3860.3
92.0	211.0	190.6	4114.6	3910.1
93.0	221.0	196.4	4214.6	3987.0
94.0	234.3	203.6	4338.3	4032.6
95.0	250.3	210.5	4500.1	4100.4
96.0	272.1	218.0	4759.1	4200.6
97.0	305.0	230.6	5062.3	4313.1
98.0	306.2	244.6	5580.8	4451.3
99.0	311.1	198.0	4720.0	3818.5
100.0	246.7	152.3	3710.4	2788.6
101.0	182.2	104.6	2080.2	1881.7
102.0	103.3	52.0	1472.3	930.5

EDT

78.0	81.1	80.0	1212.7	1251.0
79.0	81.3	81.0	1212.8	1253.1
80.0	81.5	81.3	1213.0	1254.4
81.0	81.7	81.4	1213.3	1255.6
82.0	81.9	81.5	1213.8	1257.3
83.0	82.1	81.7	1214.1	1258.9
84.0	82.4	81.9	1214.7	1260.7
85.0	82.8	82.2	1215.5	1262.6
86.0	82.9	82.4	1216.4	1264.7
87.0	83.3	82.7	1217.4	1267.0
88.0	83.6	83.1	1218.6	1270.6
89.0	84.0	83.3	1220.3	1272.3
90.0	84.4	83.8	1222.1	1275.3
91.0	84.9	84.0	1224.3	1278.5
92.0	85.4	84.4	1226.8	1282.3
93.0	86.0	84.9	1229.9	1286.4
94.0	86.5	85.4	1233.5	1291.0
95.0	87.3	85.9	1237.8	1296.1
96.0	88.2	86.6	1242.0	1301.8
97.0	89.2	87.3	1249.3	1308.5
98.0	90.3	88.1	1258.8	1316.0
99.0	91.8	89.0	1268.3	1324.7
100.0	93.3	90.1	1278.2	1334.6
101.0	95.3	91.3	1293.4	1346.8
102.0	97.8	92.9	1313.7	1361.3
103.0	71.3	64.7	1341.6	1378.1

SPRTR

78.0	356.0	351.2	6643.6	6646.2
79.0	358.2	352.1	6648.4	6654.4
80.0	360.6	352.9	6654.0	6660.8
81.0	362.0	353.6	6660.2	6668.7
82.0	363.5	354.7	6666.8	6676.5
83.0	365.1	355.7	6674.1	6683.8
84.0	366.6	356.6	6683.0	6692.1
85.0	368.0	357.9	6691.2	6701.2
86.0	370.5	359.1	6700.9	6710.6
87.0	373.6	360.3	6712.3	6721.2
88.0	376.1	362.4	6721.2	6733.1
89.0	377.2	363.1	6736.0	6744.2
90.0	379.5	364.6	6752.3	6758.8
91.0	382.6	365.3	6770.4	6770.7
92.0	385.8	367.0	6688.3	6788.6
93.0	388.2	368.6	6710.5	6801.6
94.0	393.0	371.6	6734.7	6818.4
95.0	397.1	374.1	6761.6	6836.6
96.0	401.6	376.4	6793.0	6859.5
97.0	406.9	378.1	6828.1	6882.7
98.0	412.3	381.9	6866.6	6906.2
99.0	418.6	385.1	6916.1	6936.6
100.0	425.1	390.0	6971.2	6966.0
101.0	434.6	393.5	9036.4	6993.4
102.0	444.5	395.6	9114.3	9043.6
103.0	456.3	402.0	9200.3	9090.0
[illegible]	504.4	440.3	10510.1	9501.6
109.0	478.0	387.2	8329.6	7607.2
110.0	361.3	282.3	6461.4	6873.5
111.0	271.0	188.0	4484.2	4007.7
112.0	136.7	116.2	2086.6	2107.6

SETH

78.0	138.2	136.7	3347.6	3378.2
79.0	138.7	137.1	3350.6	3370.6
80.0	139.2	137.5	3354.1	3382.3
81.0	139.7	138.0	3357.7	3388.0
82.0	140.3	138.4	3361.4	3390.0
83.0	140.8	138.9	3365.4	3394.3
84.0	141.5	139.4	3369.7	3398.6
85.0	142.1	139.9	3374.4	3403.3
86.0	142.8	140.4	3379.4	3408.3
87.0	143.6	141.0	3384.7	3413.5
88.0	144.6	141.6	3392.5	3422.0
89.0	145.3	142.2	3396.7	3425.0
90.0	146.1	142.9	3403.4	3431.3
91.0	147.1	143.6	3410.7	3438.0
92.0	148.2	144.4	3418.7	3445.1
93.0	149.3	145.2	3427.3	3452.7
94.0	150.5	146.1	3436.7	3460.9
95.0	151.8	147.0	3447.0	3469.6
96.0	153.2	148.0	3458.4	3479.0
97.0	154.7	149.1	3470.8	3489.1
98.0	156.4	150.3	3484.5	3500.1
99.0	158.3	151.6	3499.7	3511.0
100.0	160.3	153.0	3516.7	3524.7
101.0	162.5	154.5	3535.6	3538.7
102.0	165.0	156.3	3557.0	3554.0
103.0	167.8	157.7	3581.3	3570.3

108.0	189.4	168.8	3778.6	3668.8
109.0	190.4	173.2	3840.7	2732.6
110.0	208.2	177.3	3823.6	2781.0
111.0	219.8	182.1	4023.7	3006.0
112.0	232.0	187.8	4190.8	[illegible]
113.0	235.6	185.0	4467.7	3036.6
114.0	230.0	174.3	4148.3	2471.1
115.0	221.3	161.0	3580.4	2640.0
116.0	195.8	100.8	2743.4	2233.6
117.0	120.8	77.3	3110.0	1616.1
118.0	85.4	55.8	1408.8	1201.4
119.0	51.0	23.8	781.1	640.0

NIK

78.0	116.0	114.3	2848.3	2877.8
79.0	116.2	114.5	2848.5	2878.3
80.0	116.3	114.6	2848.8	2878.1
81.0	116.4	114.7	2849.0	2879.0
82.0	116.6	114.8	2849.1	2880.0
83.0	116.8	114.9	2849.4	2881.7
84.0	115.9	115.0	2849.7	2882.6
85.0	116.1	115.2	2850.0	2883.5
86.0	116.2	115.3	2850.4	2884.5
87.0	116.4	115.4	2850.9	2885.9
88.0	116.7	115.6	2851.5	2887.2
89.0	116.8	115.7	2851.8	2887.7
90.0	117.0	116.0	2852.4	2888.8
91.0	117.2	116.0	2852.9	2890.1
92.0	117.5	116.2	2853.6	2891.3
93.0	117.7	116.3	2854.4	2892.7
94.0	118.0	116.5	2855.3	2894.0
95.0	118.2	116.7	2856.1	2895.5
96.0	118.5	116.9	2857.0	2897.0
97.0	118.7	117.1	2858.0	2898.5
98.0	119.0	117.3	2859.1	2900.1
99.0	119.3	117.5	2860.3	2901.8
100.0	119.6	117.7	2861.6	2903.6
101.0	120.0	117.9	2863.0	2905.4
102.0	120.3	118.1	2864.5	2907.4
103.0	120.7	118.4	2866.1	2909.4
108.0	122.0	119.0	2875.5	2921.0
109.0	123.2	120.1	2878.1	2923.7
110.0	123.6	120.4	2881.0	2926.6
111.0	124.3	120.7	2884.0	2929.6
112.0	124.8	121.1	2888.2	2932.7
113.0	125.5	121.5	2891.6	2936.1
114.0	126.1	121.9	2895.7	2939.6
115.0	126.8	122.3	2900.0	2943.3
116.0	127.6	122.8	2904.6	2947.2
117.0	128.4	123.2	2909.6	2951.4
118.0	129.2	123.7	2915.1	2955.9
119.0	130.1	124.2	2921.2	2960.6
120.0	131.1	124.8	2927.6	2965.7

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-41.	-13.	174.	420.	-46.	-26.
83.0	78.0	-115.	-22.	347.	1268.	-126.	-61.
83.0	80.0	-74.	-10.	173.	828.	-78.	-35.
85.0	83.0	-32.	12.	467.	880.	-48.	-15.
90.0	85.0	517.	530.	11408.	11704.	182.	178.
90.0	83.0	485.	551.	11866.	12568.	118.	163.
91.0	90.0	75.	71.	1557.	1402.	27.	24.
98.0	91.0	585.	546.	12735.	11308.	202.	188.
103.0	91.0	884.	755.	17884.	15426.	431.	288.
103.0	98.0	299.	208.	5148.	4118.	140.	81.
113.0	108.0	530.	418.	8804.	8226.	227.	132.
120.0	108.0	781.	807.	14103.	13110.	343.	203.
120.0	113.0	281.	188.	4388.	3684.	110.	88.

WELL#2. AMOCO E-1 GEOHIST 7-9-88-1WB

PART 1: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
WPSI	78.0	83.0	30.2	33.1	20.8	83.3	16.63	111.6
SOLO	83.0	88.0	66.4	9.4	6.7	82.5	16.01	90.1
CARD	88.5	90.0	120.6	7.3	2.4	130.1	90.00	157.0
SHG	90.0	96.0	174.6	60.7	21.2	256.7	31.00	299.0
SPEC	96.0	105.0	96.7	0.0	0.0	96.7	13.34	77.1
SDY	106.0	108.0	30.0	3.6	22.0	54.2	27.11	47.2
SPRTN	108.0	112.0	66.1	65.6	122.0	253.6	53.20	301.6
SETN	112.0	120.0	71.6	38.1	20.1	120.1	17.10	120.5
PRN	146.0	200.0	47.6	0.0	0.0	47.0	0.81	54.3

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kilopa. s	
78.0	1858.0	1608.5	30973.5	24440.2
79.0	1867.0	1608.5	30855.7	24143.6
80.0	1885.6	1604.5	30744.4	23901.7
81.0	1897.5	1580.0	30801.6	23453.1
82.0	1880.0	1566.0	30297.4	23021.1
83.0	1880.6	1581.6	30067.0	22641.6
84.0	1883.0	1530.3	30646.0	22174.3
85.0	1867.1	1527.6	30438.5	21901.5
86.0	1906.7	1521.1	30492.4	21536.6
87.0	1900.0	1523.5	35773.5	21260.0
88.0	2113.7	1616.0	30800.0	20626.5
89.0	1908.0	1431.0	30645.5	20338.0
90.0	1635.1	1333.5	20608.1	30737.5
91.0	1886.3	1176.0	36471.6	26623.2
92.0	1478.3	1114.6	37234.0	23577.3
93.0	1378.7	1058.3	26600.0	22277.4
94.0	1337.6	1016.7	24880.6	21468.4
95.0	1384.4	960.6	33643.3	20460.6
96.0	1233.0	926.4	23870.3	18471.1
97.0	1160.0	872.6	21616.0	16614.2
98.0	1065.3	806.0	16706.0	17178.6
99.0	1033.4	782.6	18266.3	16738.3
100.0	1007.5	760.1	18703.9	15364.2
101.0	982.3	737.2	18316.7	15642.3
102.0	881.6	713.5	17767.6	15378.0
103.0	906.6	683.3	17100.3	14601.2
106.0	840.6	637.0	16085.0	13683.6
108.0	620.2	562.6	14672.6	11900.1
110.0	735.6	502.1	12700.6	10636.3
111.0	630.0	433.4	10882.0	8906.1
112.0	636.3	301.3	8971.0	7365.3
113.0	345.0	381.6	6350.7	6307.5
114.0	333.3	246.6	5600.7	4683.1
115.0	307.6	226.1	5331.6	4406.2
116.0	278.0	188.0	4727.6	3040.2
117.0	238.0	186.3	4058.6	3340.7
118.0	204.6	135.3	3461.6	2761.6
119.0	134.2	97.6	3406.5	2064.7
120.0	70.6	67.6	1801.6	1471.5

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-30.	11.	230.	636.	-27.	-6.
83.0	78.0	-35.	64.	1105.	1693.	-56.	-5.
83.0	80.0	8.	43.	877.	1280.	-22.	4.
85.0	83.0	-6.	24.	432.	740.	-20.	1.
90.0	85.0	282.	304.	5740.	6074.	86.	107.
90.0	83.0	355.	318.	6182.	6614.	66.	106.
91.0	90.0	70.	56.	1216.	1006.	32.	24.
98.0	91.0	800.	270.	8763.	7450.	220.	140.
103.0	91.0	640.	486.	11371.	8726.	287.	166.
103.0	98.0	148.	116.	2608.	2278.	68.	40.
113.0	106.0	602.	378.	10385.	8006.	261.	126.
120.0	106.0	676.	560.	15183.	12022.	411.	466.
120.0	113.0	277.	164.	4768.	3626.	130.	73.

WPS, AMOCO E-1 ECONOMY 7-5-85-1W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSGS (m)	HSTOT (m)	RATE HS SED(m/Ma)
WPS1	0.560	13.6	76.2	15.24
WPS1	0.170	26.1	86.4	17.88
EBLO	0.500	3.7	60.5	14.04
EBLO	0.170	[illegible].1	62.0	18.07
CARD	0.500	[illegible].3	134.1	66.40
CARD	0.170	3.5	135.9	60.10
SWO	0.500	12.1	240.6	20.62
SWO	0.170	22.0	257.2	22.15
CDT	0.560	12.1	44.3	22.10
CDT	0.170	22.6	66.0	27.61
SPRTR	0.500	63.0	206.0	41.30
SPRTR	0.170	115.0	262.6	63.60
GETN	0.560	13.4	107.4	15.34
GETN	0.170	26.3	110.3	17.04

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1707.4	1601.1	35845.7	34358.0
79.0	1706.4	1606.5	35480.5	34127.2
80.0	1808.7	1585.4	35356.4	33631.6
81.0	1821.5	1585.5	35317.9	33427.0
82.0	1816.6	1566.6	34886.2	33060.6
83.0	1811.2	1567.3	34558.0	32652.5
84.0	1812.5	1534.6	34995.1	32062.0
85.0	1815.0	1525.6	35115.1	31707.4
86.0	1821.0	1516.3	33005.6	31380.5
87.0	1800.1	1516.7	34316.6	31175.4
88.0	2021.4	1512.1	35360.7	30731.1
89.0	1910.0	1426.4	33305.0	30126.5
90.0	1830	1228.3	28098.0	28526.0
91.0	1666	1160.7	26482.6	24523.2
92.0	1592	1108.6	25064.2	23068.1
93.0	1388.7	1050.5	24013.2	22285.6
94.0	1265.5	1016.5	23141.3	21230.0
95.0	1168.7	962.7	22082.1	20305.0
96.0	1142.2	920.0	20080.2	19361.0
97.0	1082.7	867.2	19636.7	18303.6
98.0	900.7	790.4	18034.1	17064.0
99.0	922.5	777.0	17516.7	16616.6
100.0	894.9	754.3	16964.6	16174.6
101.0	872.5	731.3	18435.0	15710.0
102.0	828.8	707.0	15625.3	15264.0
103.0	787.0	682.6	15000.0	14773.5
104.0	816.7	630.0	14414.4	13352.7
105.0	798.5	557.0	13612.2	11703.1
110.0	648.6	487.0	11216.5	10335.0
111.0	558.5	420.5	9735.1	8802.0
112.0	488.7	380.1	8203.6	7230.7
113.0	328.4	360.4	6488.6	6309.2
114.0	308.0	343.0	6464.6	6035.0
115.0	265.5	223.0	4976.6	4485.6
116.0	255.7	197.0	4430.3	3036.5
117.0	224.8	187.0	3057.0	2222.5
118.0	194.8	134.6	3313.4	2709.2
119.0	138.3	97.2	2266.3	2092.4
120.0	70.8	67.6	1601.0	1471.5

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV TIME)	(Ma) TIMES	TOT SUBSID AND SEA LEV CHG(m)		TOTAL TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
88.0	75.0	-21.	6.	280.	328.	-20.	-11.
82.0	78.0	-34.	64.	1000.	1004.	-67.	-6.
83.0	80.0	-3.	46.	902.	1378.	-37.	0.
85.0	82.0	-5.	35.	460.	740.	-18.	1.
86.0	85.0	280.	204.	8017.	8081.	84.	107.
90.0	83.0	278.	318.	8488.	8824.	76.	108.
91.0	86.0	[illegible]	150.	1216.	1102.	30.	28.
95.0	91.0	507.	370.	8840.	7456.	224.	140.
103.0	91.0	861.	487.	11632.	8750.	310.	169.
102.0	88.0	176.	117.	2064.	2201.	62.	46.
113.0	108.0	480.	370.	8628.	7983.	227.	122.
120.0	108.0	748.	563.	12013.	11881.	347.	166.
120.0	113.0	260.	163.	4387.	3898.	190.	72.

WELL#3. (W.SENNST4) SKYE STAL SUNSET 6-35-55-20W5

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SKYGS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
WPSI	75.0	83.0	28.2	28.5	0.0	57.7	13.54	103.5
COLO	83.0	88.5	82.5	0.0	0.0	82.6	15.54	115.8
CARD	88.5	90.0	66.0	0.0	0.0	66.0	45.38	83.0
SWS	90.0	98.0	182.2	0.0	0.0	182.2	22.78	215.5
BFSC	98.0	103.0	58.0	5.8	5.3	78.1	15.61	94.8
MANN	106.0	113.0	38.5	76.8	133.[illegible]	248.0	40.70	304.5
GETH	113.0	120.0	34.5	2.4	7.8	45.1	6.44	52.7

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kiloPa.	
75.0	1478.8	1239.3	27763.0	26845.0
78.0	1480.3	1231.4	27870.0	25046.0
80.0	1487.6	1223.7	27541.5	24761.1
81.0	1495.0	1200.8	27333.7	24406.0
82.0	1482.5	1184.8	27048.0	24028.4
83.0	1483.4	1160.6	26601.1	23842.6
84.0	1477.8	1158.7	26376.1	23163.2
85.0	1484.8	1137.1	25871.1	22856.2
86.0	1485.5	1116.8	25580.6	22156.0
87.0	1485.1	1084.8	25301.3	21661.1
88.5	1480.5	1034.7	25227.2	20834.6
89.0	1421.0	1018.6	24174.5	20161.4
90.0	1280.3	924.6	21742.8	18390.4
91.0	1210.8	884.0	20824.4	17830.5
92.0	1185.2	844.8	20082.2	16864.7
93.0	1132.0	804.8	19270.6	18057.6
94.0	1077.4	763.3	18428.7	16244.7
95.0	1031.3	710.3	17811.1	14658.3
96.0	880.4	674.4	16896.3	13605.7
97.0	918.8	627.5	15738.2	12762.6
98.0	841.3	578.0	14627.5	11677.2
99.0	768.0	548.8	13830.8	11301.[illegible]
100.0	780.8	514.1	13110.6	10717.[illegible]
101.0	888.1	480.0	13227.4	10114.4
102.0	881.4	455.4	14708.3	9856.2
103.0	811.3	420.6	10813.7	9083.6
104.0	725.4	440.7	12072.4	8247.5
105.0	607.8	370.8	10080.6	7708.3
110.0	518.8	318.5	8408.6	6288.8
111.0	440.3	280.5	6818.8	5000.1
112.0	348.8	182.8	5078.5	3632.4
113.0	127.1	88.5	2127.0	1638.3
114.0	123.0	[illegible]	1804.0	1482.6
115.0	128.8	73.7	1682.3	1317.4
116.0	108.4	58.8	1540.3	1049.0
117.0	88.8	45.8	1285.6	820.5
118.0	64.8	31.1	880.1	638.2
119.0	38.7	16.8	606.8	307.4
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL LOAD	TECTON (kiloPa)	ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	-18.	17.	222.	684.	-28.	-1.
83.0	78.0	-15.	88.	863.	1703.	-48.	8.
83.0	80.0	4.	42.	740.	1118.	-16.	17.
85.0	83.0	28.	44.	830.	888.	3.	13.
90.0	85.0	208.	213.	4328.	4288.	78.	81.
90.0	83.0	227.	268.	5028.	5352.	81.	84.
91.0	90.0	48.	40.	818.	780.	29.	18.
98.0	91.0	370.	308.	6307.	5782.	172.	128.
103.0	91.0	500.	455.	10008.	8547.	281.	181.
103.0	98.0	230.	140.	3806.	2784.	110.	83.
112.0	103.0	584.	381.	9848.	7851.	281.	128.
120.0	106.0	725.	450.	12072.	8287.	382.	103.
120.0	113.0	137.	88.	2127.	1038.	71.	38.

WF3. (W.SSUNST4) SKYE ETAL SUNSET 6-35-81-20W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BPSC	0.550	5.4	70.1	14.82
BPSC	0.170	10.1	75.0	15.77
MANN	0.550	73.6	180.3	37.83
MANN	0.170	130.1	254.6	50.81
SETH	0.550	4.0	41.4	5.01
SETH	0.170	7.0	44.0	5.42

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1436.8	1238.6	26886.2	26334.1
79.0	1437.8	1230.6	25737.4	25035.6
80.0	1462.8	1221.0	25863.3	24746.4
81.0	1462.4	1206.8	25466.1	24205.3
82.0	1446.1	1184.2	25134.1	24014.0
83.0	1443.1	1180.0	25880.5	23827.3
84.0	1425.8	1156.1	25408.9	23136.0
85.0	1410.9	1138.4	24871.8	22643.8
86.0	1400.4	1115.1	24586.8	22141.6
87.0	1386.8	1086.2	24236.0	21868.1
88.5	1426.0	1064.0	24113.2	20816.8
89.9	1339.2	1018.1	23042.2	20086.6
90.0	1191.2	823.6	20674.3	18374.1
91.0	1143.3	886.1	19717.0	17813.8
92.0	1088.0	843.0	18848.0	18836.8
93.0	1048.5	803.2	17882.5	18040.8
94.0	1001.1	761.4	17087.1	15227.2
95.0	852.1	718.3	16232.6	14438.5
96.0	887.0	673.5	15270.3	13887.6
97.0	823.6	636.7	14263.0	12784.7
98.0	760.4	578.0	13382.4	11857.7
99.0	707.4	546.6	12310.6	11260.0
100.0	651.3	512.3	11683.4	10830.3
101.0	603.7	477.7	10710.5	10061.0
102.0	585.4	457.1	10063.8	9802.1
103.0	512.2	426.6	9246.3	9082.5
105.0	501.6	448.7	10597.8	9364.1
108.0	508.4	370.0	8384.5	7786.7
110.0	438.3	318.9	7018.7	6442.6
111.0	374.3	282.7	5783.7	5046.4
112.0	316.5	184.6	4487.4	3847.7
113.0	132.6	88.4	2029.1	1832.3
114.0	131.0	81.8	1820.2	1482.3
115.0	118.5	73.4	1726.1	1314.7
116.0	108.4	66.7	1618.3	1048.6
117.0	81.7	48.6	1138.3	816.8
118.0	58.5	31.0	828.3	537.0
119.0	33.7	15.6	478.3	288.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA.LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-15.	17.	273.	888.	-24.	-1.
83.0	79.0	-5.	55.	1085.	1707.	-40.	6.
83.0	80.0	10.	42.	822.	1116.	-18.	7.
85.0	83.0	32.	44.	888.	984.	5.	13.
88.0	85.0	220.	213.	4287.	4288.	84.	61.
90.0	88.0	252.	265.	5287.	5263.	89.	64.
91.0	90.0	48.	140.	-857.	780.	62.	16.
98.0	91.0	365.	301.	8736.	8768.	[illegible]	128.
103.0	91.0	531.	[illegible]	10471.	[illegible]	[illegible]	101.
103.0	98.0	236.	153.	2738.	3738.	123.	82.
113.0	108.0	466.	300.	7000.	7632.	223.	126.
120.0	108.0	602.	448.	9098.	6264.	283.	163.
120.0	113.0	133.	44.	2026.	1632.	70.	38.

WELL#4, TENN AS PRAIRIE RIVER 10-6-50-10W5
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PART I: CONSTANT GRAIN HEIGHT
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FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SMVSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
WPSI	75.0	82.0	82.2	0.0	0.0	82.2	17.82	105.5
COLO	83.0	88.5	90.6	4.0	0.0	95.5	17.36	100.7
CARD	88.5	90.0	22.7	25.0	15.3	65.0	43.31	81.1
SWS	90.0	96.0	157.0	5.2	0.0	162.2	20.40	181.7
SFSC	96.0	103.0	61.0	3.1	11.2	75.1	10.22	84.1
MANN	108.0	113.0	47.1	135.3	57.0	230.4	40.87	252.6
BSTN	113.0	120.0	65.3	5.0	6.4	78.8	10.40	78.6

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
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TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1301.3	1178.1	27181.3	24876.8
78.0	1360.7	1152.5	26653.2	24347.5
80.0	1358.2	1128.5	26127.6	23806.6
81.0	1336.2	1104.3	25607.5	23284.3
82.0	1313.6	1070.7	25110.4	22763.6
83.0	1286.7	1054.7	24614.0	22170.4
84.0	1280.2	1030.6	23583.6	21686.2
85.0	1250.7	1011.7	23500.6	21178.7
86.0	[illegible]	985.4	23182.3	20571.1
87.0	1217.4	864.8	22686.0	20114.7
88.5	1187.8	827.6	21031.6	19308.6
89.0	1146.9	800.4	21183.5	18702.5
90.0	1086.1	835.3	19586.6	17838.6
91.0	1022.3	804.0	18874.6	16898.8
92.0	984.1	771.6	18181.1	16033.6
93.0	946.6	738.0	17403.1	15343.3
94.0	912.3	705.4	16783.0	14873.5
95.0	886.7	676.4	16205.2	14080.8
96.0	840.7	630.5	15442.6	13210.7
97.0	808.1	602.1	14613.0	12612.6
98.0	746.4	562.6	13733.0	11861.3
99.0	713.1	536.0	13146.0	11268.5
100.0	675.5	507.1	12611.6	10600.6
101.0	624.2	476.5	11868.6	10351.6
102.0	564.6	446.0	11117.6	9727.4
103.0	563.6	432.3	10615.3	9268.7
108.0	726.6	485.3	13283.0	8681.3
109.0	603.0	399.1	10371.4	8211.4
110.0	524.0	344.7	8783.0	8062.1
111.0	458.0	306.3	7303.3	6046.6
112.0	361.5	217.0	6448.4	4187.8
113.0	188.5	139.7	3112.0	2510.5
114.0	163.6	113.3	2700.0	2181.2
115.0	148.3	98.5	2384.1	1913.1
116.0	132.4	88.3	2081.1	1665.6
117.0	120.2	66.3	1777.6	1282.7
118.0	84.6	48.1	1332.0	870.5
119.0	65.2	35.2	743.7	641.1
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT
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INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL LOAD (kiloPa)	TECTON	ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	43.	48.	1024.	1088.	12.	16.
83.0	78.0	115.	121.	2636.	2708.	33.	38.
83.0	80.0	71.	74.	1813.	1836.	23.	23.
85.0	83.0	36.	43.	824.	888.	7.	12.
90.0	88.0	181.	176.	4004.	3850.	67.	57.
90.0	83.0	227.	218.	4026.	4045.	74.	88.
91.0	90.0	36.	32.	712.	657.	16.	12.
98.0	91.0	274.	242.	6141.	4813.	118.	83.
103.0	91.0	455.	371.	8208.	7373.	203.	143.
103.0	98.0	186.	120.	3119.	2580.	88.	50.
113.0	108.0	527.	338.	8180.	7142.	285.	118.
120.0	108.0	727.	488.	12303.	8861.	348.	171.
120.0	113.0	188.	131.	3113.	2820.	83.	63.

WELL#4. TENN A1 PRAIRIE RIVER 10-8-88-18W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV.	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
CARD	0.550	8.4	58.0	38.87
CARD	0.170	17.7	68.3	44.22
SPEC	0.550	8.4	70.3	14.05
SPEC	0.170	10.1	75.0	15.00
MANN	0.550	28.2	200.5	40.10
MANN	0.170	63.1	225.5	45.10
SETH	0.550	4.0	68.4	8.78
SETH	0.170	7.8	72.0	10.20

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1370.0	1172.7	26644.2	24804.8
79.0	1354.2	1148.0	26126.0	24274.4
80.0	1330.8	1124.8	25562.1	23731.8
81.0	1307.1	1100.8	25040.7	23187.7
82.0	1283.3	1076.8	24530.1	22676.2
83.0	1254.6	1050.8	23902.6	22080.0
84.0	1228.8	1026.9	23346.4	21583.7
85.0	1216.7	1007.8	22827.0	21081.1
86.0	1197.2	984.1	22461.8	20584.8
87.0	1178.8	960.2	21946.4	20028.1
88.5	1148.0	923.2	21186.6	19214.7
89.0	1108.8	855.8	20485.4	18607.8
90.0	1031.3	831.7	19034.1	17231.7
91.0	988.1	789.2	18300.0	16872.3
92.0	952.4	765.7	17582.6	16538.1
93.0	915.4	734.1	16830.1	15242.3
94.0	878.8	700.3	16111.4	14570.8
95.0	851.4	670.2	15624.6	13944.6
96.0	810.0	634.2	14727.3	13210.0
97.0	765.4	598.6	13838.2	12600.6
98.0	701.5	558.8	12934.7	11740.2
99.0	687.8	529.7	12352.4	11248.7
100.0	633.5	502.2	11772.4	10891.2
101.0	595.7	474.0	11180.8	10273.6
102.0	558.6	444.2	10580.7	9633.1
103.0	520.3	428.4	9852.2	9108.3
105.0	857.4	404.0	11252.1	8847.8
108.0	555.7	384.8	9445.7	8148.0
110.0	461.3	340.8	8030.2	6848.0
111.0	410.4	285.3	6843.0	5584.6
112.0	223.6	216.0	6067.0	[illegible]
113.0	181.5	128.6	2980.4	[illegible]
114.0	158.5	112.7	2600.3	[illegible]
115.0	141.1	99.0	2243.7	[illegible]
116.0	128.3	85.6	2000.4	[illegible]
117.0	118.8	67.8	1672.1	[illegible]
118.0	68.4	48.8	1232.2	855.0
119.0	51.5	25.0	710.3	638.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	48.	48.	1063.	1073.	13.	15.
82.0	79.0	121.	122.	2742.	2714.	38.	38.
83.0	80.0	76.	74.	1678.	1642.	24.	23.
85.0	83.0	38.	43.	878.	898.	8.	12.
90.0	88.0	184.	178.	3883.	3858.	64.	67.
90.0	83.0	224.	218.	4869.	4858.	72.	80.
91.0	90.0	38.	32.	734.	658.	16.	12.
98.0	91.0	281.	242.	5278.	4632.	128.	93.
103.0	94.0	472.	371.	8443.	7378.	211.	143.
103.0	98.0	161.	128.	3072.	2844.	86.	80.
112.0	105.0	488.	384.	8272.	7047.	230.	117.
120.0	106.0	887.	484.	11252.	8847.	320.	169.
120.0	113.0	162.	130.	2980.	2800.	88.	83.

WELL#6: SHELL PONDERAY SWAN HILLS 12-7-68-[illegible]

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (MA) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
LP	78.0	82.0	77.5	0.0	0.0	77.5	15.60	105.6
COLO	82.0	85.5	69.7	0.0	6.3	76.0	13.82	105.6
CARD	85.5	90.0	8.7	6.4	5.5	21.6	14.43	41.1
SWS	90.0	98.0	112.3	7.3	3.2	122.8	15.35	151.6
SPBC	98.0	103.0	45.0	1.6	5.8	52.4	10.40	70.4
MANN	103.0	113.0	60.2	46.3	43.4	150.0	20.00	203.0
BETH	113.0	120.0	24.3	24.3	33.2	81.8	13.12	111.6

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
78.0	1307.5	1027.2	22026.5	20083.3
79.0	1280.3	1001.0	22401.8	19881.0
80.0	1252.0	974.5	21658.7	19040.3
81.0	1222.7	947.5	21231.0	18581.0
82.0	1188.0	919.8	20721.6	18003.1
83.0	1167.3	891.6	20022.3	17440.0
84.0	1112.3	867.6	19408.8	16988.72
85.0	1085.5	843.4	18947.0	16489.7
86.0	1074.6	823.5	18821.9	16088.1
87.0	1047.6	791.0	18100.7	15604.0
88.0	999.1	782.0	17266.8	14882.6
89.0	960.9	750.5	16890.4	14058.0
90.0	930.5	728.2	16532.0	14182.1
91.0	959.1	701.0	16290.4	13661.8
92.0	919.2	671.0	15504.8	13185.1
93.0	902.3	647.6	15186.0	12614.2
94.0	874.6	620.1	14871.6	12007.6
95.0	830.4	580.0	14066.4	11648.4
96.0	788.[illegible]	5[illegible].0	13372.6	10964.6
97.0	763.0	52[illegible].5	12968.0	10308.7
98.0	666.2	4[illegible]6.6	11627.9	9702.6
99.0	807.0	474.1	11403.0	9444.7
100.0	636.0	453.1	10906.2	9023.6
101.0	604.2	431.6	10400.0	8881.0
10[illegible].0	582.1	390.3	9807.5	8283.7
[illegible]	537.2	391.0	9357.3	7887.0
[illegible]	554.5	414.7	10409.7	8110.6
[illegible]	5[illegible]4.4	3[illegible]4.4	9402.3	7236.6
[illegible]	530.3	[illegible].6	8306.2	6287.3
[illegible]	470.6	[illegible].2	7320.7	5206.6
11[illegible].0	401.2	[illegible].0	6057.[illegible]	4261.6
113.0	281.0	153.2	41[illegible]	3034.6
114.0	220.6	127.6	[illegible]	2612.7
115.0	188.0	107.1	3080.8	2[illegible]10.0
116.0	141.0	76.3	2300.8	1[illegible]
117.0	88.0	55.0	1841.4	11[illegible]
118.0	65.6	35.0	1120.2	[illegible]
119.0	28.4	15.0	534.5	[illegible]57.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kilopa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	55.	63.	1057.	1044.	22.	20.
83.0	78.0	150.	135.	2003.	2853.	70.	63.
83.0	80.0	108.	83.	1636.	1508.	48.	33.
85.0	82.0	63.	46.	1075.	840.	28.	18.
90.0	85.0	85.	115.	2115.	2516.	30.	44.
90.0	83.0	157.	164.	3190.	3258.	56.	63.
91.0	90.0	31.	27.	543.	500.	15.	12.
98.0	91.0	283.	206.	4463.	3686.	125.	86.
103.0	91.0	422.	306.	6633.	5704.	206.	130.
103.0	98.0	159.	103.	2470.	1908.	83.	44.
113.0	108.0	380.	282.	5278.	5084.	186.	105.
120.0	108.0	641.	416.	10410.	8118.	320.	164.
120.0	113.0	262.	153.	4134.	3035.	134.	59.

WELLNO. SHELL PONDERAY SWAN HILLS 12-7-68-5W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
COLD	0.550	5.4	75.0	12.84
COLD	0.170	10.1	75.8	14.50
CARD	0.550	8.4	31.8	14.31
CARD	0.170	17.7	29.8	10.90
2WS	0.550	2.7	122.3	15.28
2WS	0.170	5.1	124.8	15.88
BFSC	0.550	4.8	51.1	10.22
BFSC	0.170	8.8	55.1	11.02
MANN	0.550	38.0	135.8	27.10
MANN	0.170	54.6	101.2	22.24
GETH	0.550	16.2	78.8	10.97
GETH	0.170	34.4	93.0	13.28

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1251.5	1025.7	22470.1	20053.[illegible]
79.0	1252.7	1000.5	21632.1	19570.[illegible]
80.0	1225.2	974.0	21375.0	19036.[illegible]
81.0	1194.4	946.8	20634.1	18540.1
82.0	1150.7	910.2	20205.6	17921.6
83.0	1117.1	881.1	19494.1	17458.2
84.0	1063.2	865.4	19036.0	16956.2
85.0	1058.2	844.5	18421.0	16613.6
86.0	1042.7	827.4	18081.3	16155.[illegible]
87.0	1016.6	801.8	17581.5	[illegible]
88.0	985.7	782.3	16710.4	14876.5
89.0	965.0	745.8	16401.4	14587.0
90.0	950.3	727.6	16252.6	14164.4
91.0	927.4	695.7	15741.0	13666.0
92.0	864.8	670.0	15037.0	13099.0
93.0	867.7	649.[illegible]	14505.6	12654.2
94.0	830.4	621.[illegible]	14076.[illegible]	12106.2
95.0	803.0	591.[illegible]	13466.4	11550.0
96.0	780.[illegible]	555.6	12740.5	10650.7
97.0	712.[illegible]	527.3	12024.1	10300.4
98.0	655.[illegible]	464.2	11164.8	9776.0
99.0	635.[illegible]	472.2	10733.7	9377.4
100.0	605.0	448.6	10232.7	8990.[illegible]
101.0	585.7	420.7	9723.7	8552.[illegible]
102.0	524.5	402.0	9135.4	8149.[illegible]
103.0	495.1	390.8	8850.6	7667.[illegible]
105.0	502.0	413.3	8575.0	8003.[illegible]
109.0	550.8	375.0	8734.5	7263.[illegible]
110.0	408.0	326.3	7726.4	[illegible]
111.0	432.4	261.5	5525.0	[illegible]
112.0	350.8	226.1	5443.4	[illegible]
113.0	233.5	151.7	3646.8	3006.5
114.0	185.8	138.7	3114.3	2560.5
115.0	175.0	108.8	2723.0	2153.6
116.0	133.3	77.0	2120.5	1647.7
117.0	85.5	55.1	1407.2	1168.5
118.0	61.8	38.4	1006.5	764.0
119.0	28.5	15.0	515.1	275.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TST SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG	
80.0	78.0	57.	52.	1055.	1045.	23.	[illegible]
82.0	78.0	166.	136.	2878.	2555.	73.	[illegible]
83.0	80.0	108.	83.	1551.	1510.	50.	33.
85.0	83.0	61.	47.	1072.	915.	20.	16.
89.0	85.0	57.	117.	2128.	2345.	31.	42.
90.0	88.0	154.	164.	2200.	2250.	55.	55.
91.0	90.0	32.	28.	552.	597.	15.	12.
95.0	91.0	271.	205.	4577.	3883.	130.	85.
103.0	91.0	432.	305.	7051.	5705.	213.	120.
103.0	95.0	161.	102.	2514.	1911.	[illegible]	44.
113.0	103.0	358.	252.	5650.	5045.	175.	105.
120.0	105.0	552.	413.	9577.	5013.	255.	163.
130.0	113.0	234.	152.	3057.	3007.	120.	55.

WELL#8, DOME SALETAN HONDO 12-36-70-4W5

PART 1: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
SOLO	83.0	85.5	40.6	7.3	0.0	48.0	5.64	71.6
CARD?	85.5	90.0	25.1	0.0	0.0	25.1	10.72	34.1
SWS	90.0	95.0	50.2	20.9	1.0	81.1	10.13	115.2
UFSC	95.0	103.0	25.8	13.7	3.9	46.3	9.26	71.6
MANN	103.0	112.0	0.0	46.2	90.6	136.8	25.26	190.5
GETH	112.0	120.0	0.0	4.4	36.2	40.6	5.70	64.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kilopa.	
83.0	887.3	654.2	14857.8	12803.4
84.0	880.0	636.2	14848.0	12307.2
85.0	860.8	621.8	14306.6	11099.6
86.0	830.4	606.8	14037.2	11693.5
87.0	830.8	593.8	13663.7	11408.9
88.0	826.4	560.3	13559.4	10840.5
89.0	759.1	551.0	13140.5	10632.6
90.0	734.0	514.0	12100.6	9860.4
91.0	707.8	493.4	11772.3	9408.2
92.0	687.0	479.1	11416.8	9275.3
93.0	683.8	461.2	11219.4	8970.3
94.0	663.0	442.0	10810.2	8587.1
95.0	644.2	422.4	10488.2	8214.4
96.0	615.5	400.9	10016.4	7830.3
97.0	583.0	377.0	9607.2	7417.4
98.0	548.0	353.5	9058.7	7008.8
99.0	519.8	331.7	8648.8	6630.0
100.0	471.0	308.0	7908.7	6278.4
101.0	437.5	288.9	7317.0	5908.0
102.0	390.4	271.3	6873.4	5576.7
103.0	373.3	253.8	6448.6	5237.8
104.0	405.9	254.3	6766.1	5245.7
105.0	346.8	214.6	5782.8	4485.8
110.0	277.0	174.0	4880.5	3540.4
111.0	221.4	136.0	3715.3	2832.2
112.0	158.0	94.2	2629.6	2005.0
113.0	91.3	56.8	1588.3	1510.9
114.0	70.8	47.3	1377.8	1040.1
115.0	53.1	38.1	1105.2	853.0
116.0	50.8	30.4	900.8	702.8
117.0	38.5	23.2	656.5	514.0
118.0	25.8	15.5	488.0	364.4
119.0	13.0	7.4	234.2	177.1
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	37.	32.	881.	604.	17.	14.
90.0	85.0	116.	108.	2117.	2033.	51.	48.
90.0	83.0	153.	140.	2768.	2637.	68.	59.
91.0	90.0	20.	[illegible]	417.	358.	14.	10.
95.0	91.0	181.	140.	2813.	2589.	74.	60.
103.0	91.0	334.	240.	5324.	4371.	170.	105.
103.0	95.0	173.	100.	2811.	1771.	96.	45.
112.0	103.0	314.	108.	6200.	4035.	153.	74.
120.0	103.0	405.	254.	8788.	5246.	196.	92.
120.0	112.0	91.	56.	1888.	1211.	43.	18.

WELL#S, SODC CALSTAN HONDO 12-36-70-4W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATI[illegible] OR INTE[illegible]V	UNIT.SS POROSITY	MASS (m)	NOTOT (Ma)	RATE SS SED(m/Ma)
2WS	[illegible].580	1.3	50.5	10.07
2WS	0.170	2.5	51.7	10.22
BFSC	0.580	3.7	48.1	8.02
BFSC	0.170	5.1	47.8	9.60
MANN	0.580	54.3	106.5	30.08
MANN	0.170	102.5	148.6	50.72
SETH	0.580	21.6	28.6	2.58
SETH	0.170	60.6	44.0	8.41

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
83.0	847.8	854.1	14272.8	12588.8
84.0	820.2	838.0	13944.8	12302.5
85.0	804.4	821.7	13584.3	11994.6
86.0	785.3	800.2	13206.6	11686.7
[illegible]	785.1	803.5	13132.3	11404.7
[illegible]	761.0	588.0	12767.1	10834.0
[illegible]	751.6	550.6	12337.8	10828.3
90.0	688.4	512.7	11368.3	9981.0
91.0	657.8	492.0	10928.7	9800.8
92.0	637.0	475.4	10554.4	9288.7
93.0	620.2	452.0	10280.8	8974.0
94.0	607.4	423.2	9908.6	8666.0
[illegible]	[illegible]	[illegible].7	9521.6	8216.7
96.0	[illegible]	[illegible].1	9080.1	7837.8
97.0	[illegible].6	357.0	8528.7	7612.1
98.0	489.7	353.2	7853.0	7002.5
99.0	440.2	330.0	7400.6	6827.1
100.0	408.3	308.1	6872.8	6287.0
101.0	363.7	288.2	6281.8	6088.6
102.0	333.4	271.2	5782.7	5678.4
103.0	308.1	253.1	5344.8	5230.0
108.0	320.2	252.8	5474.0	5237.1
109.0	276.4	215.1	4887.0	4467.0
110.0	218.0	172.2	3888.7	3817.0
111.0	171.6	135.8	2880.0	2846.[illegible]
112.0	118.0	95.4	1878.2	2020.3
113.0	82.5	55.0	1098.8	1208.0
114.0	64.7	48.2	850.0	1050.1
115.0	43.5	38.8	783.5	888.2
116.0	33.8	30.8	801.3	688.3
117.0	25.2	23.2	447.8	510.2
118.0	18.[illegible]	15.4	288.6	339.6
119.0	8.[illegible]	7.7	147.4	174.4
120.0	0.0	0.0	[illegible].0	0.0

TECTONIC HISTORY FOR VARIA[illegible] SS GRAIN HEIGHT

INTERV.([illegible] TIME)	T[illegible]	TOT[illegible] SEA[illegible]	[illegible]D AND [illegible]G(m)	TOTAL LOAD	TECTON (KiloPa)	ISOST AND SEA LEV CHG	TECTON SUBSID (m)
85.0	[illegible]	[illegible]	32.	888.	804.	18.	14.
90.0	85.0	123.	108.	2218.	2034.	64.	48.
90.0	83.0	162.	140.	2807.	2638.	73.	58.
91.0	90.0	26.	21.	437.	380.	14.	10.
98.0	91.0	172.	160.	2876.	2588.	80.	58.
103.0	91.0	382.	240.	5584.	4371.	170.	105.
103.0	98.0	180.	100.	2808.	1773.	88.	48.
113.0	108.0	284.	188.	4377.	4027.	128.	74.
120.0	108.0	326.	284.	6474.	6237.	167.	82.
120.0	113.0	63.	55.	[illegible]87.	1210.	28.	1[illegible].

WELL#7. CANKGE ETAL BERLAND 6-13-68-24W5

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
DR	75.0	78.0	90.3	47.0	67.0	204.8	68.28	224.0
LP	78.0	83.0	124.0	18.6	14.1	158.0	31.72	165.2
COLO	83.0	88.5	177.4	0.0	0.4	177.4	32.25	183.2
CARD	88.5	90.0	188.5	5.8	18.8	214.1	143.71	222.5
SWS	90.0	98.0	241.1	11.7	0.0	252.8	31.60	267.0
BFSC	98.0	103.0	66.1	14.8	5.3	86.0	13.60	73.8
MANN	104.0	112.0	88.0	87.1	94.4	210.5	43.80	236.8
BETH	112.0	120.0	62.8	35.0	28.6	127.4	16.20	133.0
PRN	168.0	200.0	88.7	0.0	4.2	83.0	1.23	73.2

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	2302.4	1990.0	47808.0	44626.0
76.0	2181.1	1907.0	46476.3	42004.5
77.0	2071.7	[illegible]	43172.0	40081.3
78.0	[illegible]	1738.8	40888.1	38640.8
79.0	[illegible]	1708.8	39832.1	37868.2
80.0	[illegible]	1707.8	39267.7	37288.7
81.0	[illegible]	[illegible]	38580.2	36475.3
82.0	1672.8	1640.0	37888.5	35708.8
83.0	1882.4	[illegible]	37312.1	34082.0
84.0	1838.2	[illegible]	36829.1	34071.0
85.0	1828.8	1888.8	36097.8	33261.8
86.0	1818.8	1880.4	35976.8	32457.8
87.0	1838.8	[illegible]	34828.8	31734.8
88.0	[illegible]	[illegible]	33861.3	30728.3
89.0	[illegible]	[illegible]	32282.4	29799.8
90.0	1328.8	[illegible]	28644.1	22076.0
91.0	1280.1	1037.1	26445.1	21140.0
92.0	1228.0	987.2	23250.3	20048.8
93.0	[illegible]	928.3	22208.8	19935.7
94.0	[illegible]	888.7	21002.0	18008.2
95.0	[illegible]	[illegible]	19844.3	17836.1
96.0	[illegible]	[illegible]	19007.7	16834.1
97.0	[illegible]	[illegible]	17730.4	15801.1
98.0	[illegible]	[illegible]	18091.3	14504.2
99.0	[illegible]	[illegible]	16017.8	14088.7
100.0	[illegible]	[illegible]	15081.8	13621.8
101.0	717.8	[illegible]	14422.8	13128.0
102.0	[illegible]	[illegible]	14088.0	12734.3
103.0	[illegible]	[illegible]	13484.8	12230.4
104.0	[illegible]	[illegible]	15264.4	[illegible]
105.0	[illegible]	[illegible]	13938.2	11862.0
110.0	[illegible]	370.1	12087.8	10142.8
111.0	[illegible]	311.8	10278.8	8787.4
112.0	[illegible]	300.0	9424.0	7487.8
113.0	371.1	284.0	[illegible]	6012.8
114.0	350.4	262.7	6490.7	5521.9
115.0	226.8	230.4	5887.0	4884.8
116.0	201.1	208.1	5215.8	4376.0
117.0	220.0	180.8	4281.4	3883.3
118.0	188.6	142.3	3616.8	3137.8
119.0	131.4	108.2	2724.7	2401.4
120.0	88.9	88.4	1847.8	1920.3

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma)	TIME	TOT SUBSID AND [illegible] (m)		TOTAL LOAD (kiloPa)	TECTON	ISOST TECTON SUBSID AND SEA LEV CHG (m)	
[illegible]	[illegible]	[illegible]	[illegible]	7057.	5808.	153.	72.
80.0	78.0	[illegible]	38.	1350.	1381.	-10.	-8.
82.0	78.0	[illegible]	118.	3298.	2778.	-27.	-1.
83.0	80.0	47.	82.	2078.	2427.	-17.	7.
85.0	83.0	18.	84.	1254.	1611.	-20.	4.
88.0	85.0	[illegible]	481.	10517.	10275.	181.	164.
90.0	83.0	584.	838.	11771.	11888.	181.	188.
91.0	90.0	40.	48.	898.	987.	18.	18.
98.0	91.0	482.	378.	8354.	7488.	204.	148.
102.0	91.0	808.	488.	10651.	8880.	271.	182.
103.0	98.0	187.	187.	2607.	2174.	87.	37.
113.0	108.0	488.	323.	8478.	6854.	224.	114.
120.0	108.0	788.	824.	13418.	10846.	354.	168.
130.0	113.0	283.	188.	4838.	4082.	130.	73.

WELLOT. CANKSE ETAL BERLAND 6-13-88-24W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSO (m)	HSTOT (m)	RATE HS SED(m/Ma)
BO	0.550	32.5	170.6	55.84
BR	0.170	63.3	200.5	85.84
LP	0.500	8.7	151.2	30.24
LP	0.170	12.6	187.1	21.42
CARD	0.560	9.4	203.7	130.70
CARD	0.170	17.7	212.0	141.34
BFSC	0.550	2.7	65.3	13.07
BFSC	[illegible]	6.1	67.7	13.54
MANN	[illegible]	28.6	181.8	28.36
MANN	0.170	50.6	215.7	43.14
[illegible]	0.560	13.8	171.8	15.98
[illegible]	0.170	26.1	123.5	17.60
FRN	0.500	4.0	63.6	4.33
FRN	0.170	7.6	87.2	1680

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	2207.6	1878.1	48065.3	44284.0
76.0	2111.6	1858.7	46030.6	42373.1
77.0	2021.5	1818.0	43177.4	40434.4
78.0	1893.3	[illegible]	38860.6	38480.3
79.0	1855.0	[illegible]	38000.3	37700.8
80.0	1860.5	[illegible]	38540.3	37130.4
81.0	1841.5	[illegible]	37705.6	36826.7
82.0	1835.0	1641.8	37224.2	35550.8
83.0	1820.2	1814.1	36657.7	34718.8
84.0	1803.0	1568.6	35846.5	33023.0
85.0	1787.2	1550.5	35278.0	33080.2
86.0	1770.6	1533.8	34658.1	32301.4
87.0	1765.0	1513.5	[illegible]	31883.0
88.5	1636.3	1494.7	[illegible]	30857.6
89.0	1612.8	1384.0	[illegible]	28267.1
90.0	1300.0	1070.5	24877.6	22856.4
91.0	1250.1	1031.1	23850.8	21888.2
92.0	1183.6	961.1	22761.1	20820.8
93.0	1126.2	930.0	21576.3	19807.0
94.0	1087.2	870.2	20434.7	18778.2
95.0	1004.0	826.1	19258.3	17609.9
96.0	963.3	770.6	18391.4	16604.3
97.0	888.0	710.8	16081.6	15547.9
98.0	774.7	654.0	15300.5	14257.1
99.0	745.6	630.6	14816.7	13840.3
100.0	715.6	607.1	14269.3	13489.9
101.0	673.8	582.0	13637.0	13062.3
102.0	658.5	566.8	13221.4	12818.4
103.0	621.6	540.0	12610.3	12171.2
108.0	768.3	601.0	16176.8	13682.2
109.0	718.7	540.7	12684.6	11388.6
110.0	620.6	472.2	11220.0	9983.9
111.0	520.2	405.4	9548.3	8807.6
112.0	454.7	354.3	8230.1	7288.7
113.0	343.1	280.5	6436.0	6330.6
114.0	324.1	260.2	5877.8	5447.8
115.0	308.7	238.7	5575.7	4932.2
116.0	275.5	206.4	4866.8	4324.4
117.0	227.1	189.5	4213.7	3853.2
118.0	167.8	141.7	3301.1	3087.8
119.0	130.7	108.3	2747.2	2478.0
120.0	87.7	85.5	1840.4	1821.2

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	314.	249.	6128.	5804.	125.	70.
80.0	78.0	32.	34.	1312.	1341.	-8.	-7.
83.0	78.0	73.	115.	3207.	3762.	-29.	-1.
83.0	80.0	[illegible]	[illegible]	1884.	2421.	-31.	8.
85.0	83.0	[illegible]	55.	1320.	1818.	-14.	5.
90.0	85.0	487.	450.	10365.	10243.	177.	164.
90.0	83.0	520.	525.	11675.	11882.	189.	168.
91.0	90.0	50.	48.	1018.	980.	19.	16.
98.0	91.0	478.	377.	8859.	7500.	211.	146.
102.0	91.0	628.	482.	11280.	9595.	281.	183.
103.0	98.0	153.	106.	2601.	2188.	70.	37.
113.0	108.0	443.	321.	7743.	6762.	204.	112.
120.0	108.0	858.	516.	12238.	10761.	321.	183.
120.0	113.0	255.	195.	4496.	[illegible]	117.	71.

WELL No.8 8 (H.B. KAYBOB 8-8-60-18W5)

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HE SED(m/Ma)	THICK TOT(m)
DR	75.0	76.0	7.7	123.3	99.1	230.1	70.00	208.1
LP	76.0	83.0	65.6	0.0	0.0	65.6	13.10	71.0
COLO	83.0	88.5	140.3	0.0	0.0	140.3	25.51	151.6
CARD	88.5	90.0	110.0	13.7	0.0	123.7	82.40	132.3
BWS	90.0	98.0	212.1	5.4	0.0	218.0	27.31	238.4
SPEC	98.0	103.0	57.3	5.4	13.0	75.3	15.26	83.6
MANN	103.0	113.0	86.3	70.5	62.4	183.6	30.71	217.0
BETH	113.0	120.0	35.7	0.0	10.1	43.8	6.20	40.1
FRN	146.0	200.0	67.0	0.0	0.0	67.0	1.10	63.4

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1800.0	1816.0	38050.6	35241.2
76.0	1811.2	1816.3	38028.7	33048.0
77.0	1862.0	1452.3	35130.3	30617.4
78.0	1483.1	1350.6	30230.5	28578.0
79.0	1488.4	1325.2	30477.0	28348.2
80.0	1502.4	1320.8	29907.3	28072.1
81.0	1513.6	1317.7	28783.2	27807.8
82.0	1531.2	1316.2	28733.3	27880.8
83.0	1505.0	1317.3	29487.4	27384.4
84.0	1547.7	1300.8	28200.0	28880.0
85.0	1528.1	1282.0	28801.6	26802.6
86.0	1517.2	1226.6	28108.7	26280.3
87.0	1512.8	1208.0	27732.4	24820.0
88.0	1474.5	1176.8	27034.8	23503.6
89.0	1488.6	1168.1	26100.0	22712.6
90.0	1168.5	931.7	21880.0	19085.8
91.0	1145.4	888.2	[illegible]	18232.1
92.0	1084.8	863.4	[illegible]	17310.6
93.0	1020.0	787.6	18841.0	16401.8
94.0	985.8	751.3	17622.0	15463.7
95.0	931.2	703.6	16628.3	14828.2
96.0	882.0	658.0	15032.0	13842.8
97.0	818.1	604.8	14782.0	12828.2
98.0	723.6	546.2	13242.3	11880.0
99.0	686.4	510.8	12768.8	11080.1
100.0	642.7	490.4	12063.2	10514.4
101.0	602.7	465.8	11417.0	10034.2
102.0	588.8	440.6	11004.2	9508.0
103.0	530.0	418.8	10312.0	9028.7
105.0	571.1	440.1	11578.3	9328.2
108.0	504.8	302.6	10318.0	8187.1
110.0	401.4	254.2	8828.2	6648.2
111.0	413.8	205.6	7107.7	5817.0
112.0	303.7	227.6	5086.4	4722.8
113.0	100.1	160.0	3578.8	3183.7
114.0	100.1	148.2	3480.8	3048.0
115.0	181.7	138.1	3318.2	2658.6
116.0	182.5	122.2	3028.2	2832.6
117.0	142.6	108.7	2738.7	2401.6
118.0	118.4	88.3	2327.1	2114.4
119.0	84.1	85.0	2013.1	1021.3
120.0	88.8	77.7	1768.3	1730.2

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
75.0	75.0	487.	288.	8870.	8782.	233.	78.
80.0	76.0	-8.	10.	313.	307.	-10.	-8.
83.0	78.0	-73.	13.	383.	1225.	-64.	-8.
82.0	80.0	-64.	3.	60.	718.	-88.	-25.
85.0	83.0	37.	65.	1170.	1263.	1.	-10.
88.0	88.0	241.	330.	7012.	8807.	124.	13.
90.0	83.0	278.	388.	8187.	8280.	128.	117.
91.0	90.0	65.	44.	870.	884.	18.	130.
98.0	91.0	420.	360.	7448.	8842.	180.	17.
102.0	91.0	807.	470.	10887.	8208.	280.	135.
105.0	98.0	188.	130.	3140.	2883.	80.	108.
113.0	108.0	481.	288.	7888.	8182.	234.	80.
120.0	108.0	801.	371.	8820.	7808.	287.	108.
128.0	113.0	110.	73.	1821.	1462.	53.	138.

WELL No.# 8 (M.B. KAYBOB 8-8-60-19W5)
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PART II: VARIABLE SS GRAIN HEIGHT
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FORMATION OR INTERV	INIT.SS POROSITY	MSSS (m)	MSTOT (m)	RATE MS SSS(m/Ma)
DR	0.000	83.1	104.1	84.89
DR	0.170	100.2	241.1	60.88
SPSC	0.000	8.7	88.4	12.88
SPSC	0.170	12.0	78.3	15.07
MANN	0.000	33.5	160.3	33.08
MANN	0.170	63.2	100.0	38.01
GETH	0.000	8.8	38.3	5.03
GETH	0.170	16.0	42.7	6.24

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT
****

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.*	
75.0	1882.2	1813.8	37160.7	38238.5
76.0	1728.8	1512.3	34887.5	32853.6
77.0	1808.7	1410.5	32137.0	30735.6
78.0	1470.4	1337.3	30750.1	28808.0
79.0	1472.7	1321.8	30881.2	28278.8
80.0	1477.8	1317.2	30404.3	27088.6
81.0	1488.0	1318.1	30288.1	27732.3
82.0	1804.4	1312.4	38184.8	27483.6
83.0	1838.1	1313.8	30310.8	27278.8
84.0	1848.8	1385.8	38732.0	38808.8
85.0	1488.7	1357.8	38085.3	38810.0
86.0	1488.8	1231.6	37488.1	38178.7
87.0	1884.7	1305.7	37082.6	34834.3
88.0	1830.0	1170.8	30848.8	33803.0
89.0	1483.7	1180.7	38415.7	33132.1
90.0	1180.7	827.3	30887.2	18882.6
91.0	1103.8	883.8	30070.4	18137.0
92.0	1053.1	838.8	18088.0	17323.0
93.0	885.8	783.8	18043.4	18303.1
94.0	838.1	748.3	17000.1	18381.6
95.0	883.0	888.8	18888.6	14421.8
96.0	833.7	883.7	18014.3	13838.3
97.0	783.8	800.8	13038.7	13818.3
98.0	804.8	842.7	12347.8	11478.8
99.0	831.0	814.8	11774.3	10878.0
100.0	883.8	485.8	11181.8	10408.3
101.0	848.8	480.7	10427.8	8888.3
102.0	838.3	441.8	10018.8	8488.0
103.0	480.3	413.8	8381.0	8834.8
105.0	884.8	443.8	10308.8	8217.3
108.0	837.8	388.1	8078.8	8047.2
110.0	448.8	330.4	7714.3	8858.8
111.0	373.8	383.4	8403.0	5732.1
112.0	330.3	338.7	5338.1	4884.1
113.0	178.0	180.4	3310.3	3171.8
114.0	179.8	168.0	3360.8	3030.3
115.0	184.8	138.0	3083.8	2854.3
116.0	180.8	133.1	2850.8	2838.4
117.0	138.8	108.0	2888.8	2307.8
118.0	118.8	88.3	2313.4	2111.0
119.0	91.8	84.8	1885.2	1800.4
120.0	80.8	77.7	1788.3	1730.2

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT
****

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	412.	287.	[illegible]	8727.	182.	[illegible]
80.0	78.0	-7.	10.	346.	510.	-18.	[illegible]
82.0	78.0	-86.	14.	630.	1236.	-81.	-34.
83.0	80.0	-80.	4.	93.	733.	-83.	-10.
85.0	83.0	38.	86.	1218.	1388.	2.	13.
88.0	85.0	348.	321.	7128.	8817.	126.	117.
90.0	83.0	387.	386.	8344.	8383.	130.	130.
[illegible]	90.0	47.	44.	887.	888.	18.	17.
[illegible]	91.0	438.	341.	7723.	8888.	200.	138.
[illegible]	91.0	833.	470.	10818.	9212.	288.	188.
[illegible]	98.0	184.	128.	3087.	2883.	88.	80.
[illegible]	108.0	418.	283.	8881.	8048.	204.	108.
120.0	108.0	814.	388.	8882.	7487	288.	138.
120.0	113.0	84.	73.	1881.	1642.	48.	28.

WELL/D. (W.[illegible]) [illegible] PAN AM FIMA PINE NW 11-16-88-20W5

PART II CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SNTSS	SANDS	TOTAL	RATE NE SED(m/Ma)	THICK TOT(m)
DR	75.0	78.0	13.3	65.6	177.7	240.3	82.11	308.4
LP	78.0	83.0	60.4	10.6	24.3	95.1	18.03	105.6
COLO	83.0	88.5	155.1	0.0	0.0	155.1	28.18	188.4
CARD	88.5	90.0	130.2	6.6	0.6	137.2	61.40	145.7
SWS	90.0	95.0	233.6	2.0	5.4	[illegible]	26.07	383.6
BFSC	95.0	102.0	55.5	17.0	13.5	86.0	12.30	73.5
MANN	108.0	113.0	0.0	65.5	87.3	152.7	28.64	208.8
BSTZ	113.0	120.0	11.6	55.1	30.0	97.0	13.86	100.7
FRN	148.0	200.0	5.5	11.0	8.4	26.7	0.61	24.1

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kiloPa.	
75.0	2066.2	1608.0	41437.7	37283.6
76.0	1868.0	1564.0	38038.0	34084.7
77.0	1723.2	1404.1	35128.1	32708.5
78.0	1650.6	1412.1	33340.0	30536.0
79.0	1808.3	1412.2	33143.0	30382.0
80.0	1034.7	1416.5	33161.0	30077.4
81.0	1034.0	1408.7	31005.0	30568.3
82.0	1030.0	1301.6	31630.3	30112.6
83.0	1087.3	1301.7	31483.0	30070.7
84.0	1035.0	[illegible]	30703.1	27000.2
85.0	1014.7	1310.3	30100.3	27118.0
86.0	1585.1	[illegible]	30475.6	26246.1
87.0	1800.2	1250.6	[illegible]	26524.7
88.5	1888.4	1221.6	28877.0	24480.1
89.0	1858.0	1161.4	27277.7	22071.1
90.0	1224.6	967.5	22345.5	19442.6
91.0	1162.7	808.6	21356.5	18487.6
92.0	1120.6	850.4	20354.6	17521.5
93.0	1071.5	790.3	19205.8	16817.2
94.0	1007.6	748.3	18185.7	15544.7
95.0	945.3	805.2	17082.3	14534.6
96.0	[illegible]	630.1	15865.3	13400.0
97.0	[illegible]	589.4	14030.1	12466.5
98.0	[illegible]	590.0	13216.5	11246.7
99.0	[illegible]	561.6	12710.4	10903.4
100.0	[illegible]	470.1	12343.6	10450.3
101.0	817.0	450.0	11701.1	10032.5
102.0	667.6	421.4	11117.1	9541.4
103.0	585.3	415.4	10044.1	9134.0
108.0	664.6	420.1	11884.6	9273.3
108.0	666.3	382.0	10383.6	8227.0
110.0	516.7	333.3	9603.6	7130.6
111.0	447.6	288.4	7723.3	6080.5
112.0	366.7	234.3	6336.7	5003.5
113.0	277.4	183.5	4003.3	3845.6
[illegible]	243.6	150.7	4274.5	3438.6
[illegible]	233.1	144.5	3842.3	3081.4
[illegible]	186.7	130.4	3288.0	2649.7
[illegible]	[illegible]	103.0	2777.6	2186.7
118.0	126.3	81.5	2177.3	1736.6
119.0	83.8	62.4	1640.5	1334.0
120.0	44.0	37.6	877.8	814.5

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	[illegible]	304.	5056.	5850.	224.	72.
80.0	76.0	-66.	-5.	150.	557.	-49.	-22.
83.0	78.0	-66.	30.	555.	1553.	-84.	-27.
83.0	80.0	-22.	35.	727.	1207.	-45.	-5.
88.0	83.0	42.	82.	1354.	1556.	1.	14.
90.0	85.0	300.	372.	7706.	7872.	141.	136.
90.0	83.0	423.	436.	8111.	8236.	141.	140.
91.0	90.0	61.	40.	964.	955.	20.	18.
95.0	91.0	472.	374.	8140.	7141.	221.	153.
102.0	91.0	618.	484.	10710.	8383.	288.	195.
103.0	95.0	148.	111.	2570.	2213.	67.	42.
113.0	100.0	357.	247.	6651.	5428.	176.	78.
120.0	108.0	521.	301.	10777.	8450.	285.	120.
120.0	113.0	233.	165.	3026.	3031.	112.	61.

WELLPS. (W.MOPAT?) NO PAN AM FINA FIKE NW 11-15-55-20W5

PART II: VARIABLE SS GRAIN WEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	MSSS (m)	MSTOT (m)	RATE MS DEP (m/Ma)
BR	0.550	56.0	107.7	55.80
BR	0.170	181.1	252.6	64.27
LP	0.550	12.8	83.4	18.05
LP	0.170	22.8	84.6	18.82
CARD	0.550	2.7	124.5	60.66
CARD	0.170	6.1	130.0	61.24
2WS	0.550	2.7	220.0	26.63
2WS	0.170	5.1	231.4	26.03
BFSC	0.550	6.7	60.0	12.00
BFSC	0.170	12.8	66.0	13.10
MANN	0.550	44.2	120.7	27.54
MANN	0.170	102.5	170.0	30.70
BSTZ	0.550	14.6	61.7	11.57
BSTZ	0.170	27.6	54.6	12.54
FRN	0.550	5.6	22.0	0.44
FRN	0.170	10.6	26.0	0.54

BURIAL HISTORY FOR VARIABLE SS GRAIN WEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
75.0	1880.5	1587.0	37525.0	35017.3
76.0	1725.5	1576.0	35200.7	34760.0
77.0	1622.5	1466.0	33120.0	32554.7
78.0	1520.0	1406.0	31262.2	30405.4
79.0	1550.0	1406.0	31105.6	30125.0
80.0	1571.6	1410.2	31105.7	30651.2
81.0	1575.7	1307.2	30804.3	30626.4
82.0	1566.7	1306.5	30621.7	30566.4
83.0	1512.2	1276.5	30563.7	28543.6
84.0	1560.7	1264.1	28870.0	27760.2
85.0	1556.4	1212.7	28162.4	26651.0
86.0	1548.6	1202.6	28501.0	26206.0
87.0	1547.1	1252.6	28042.5	25484.4
88.0	1500.0	1214.3	27005.5	24334.6
89.0	1505.4	1134.4	26130.0	23770.0
90.0	1175.0	940.5	21201.0	19301.6
91.0	1125.6	902.6	20275.2	18344.7
92.0	1070.4	843.3	19246.5	17286.2
93.0	1011.1	782.6	18175.0	16369.7
94.0	946.1	741.1	16594.3	15365.0
95.0	882.0	685.0	15665.7	14382.6
96.0	812.3	622.0	14652.1	13224.6
97.0	750.6	561.7	12544.6	12312.7
98.0	636.2	516.2	11852.5	11167.6
99.0	605.5	484.1	11378.5	10745.6
100.0	578.7	472.0	10892.6	10283.5
101.0	540.1	444.2	10362.1	9887.4
102.0	511.2	424.2	9749.1	9366.3
103.0	486.5	406.2	9274.5	8864.3
104.0	550.0	421.1	8875.0	8101.6
105.0	503.6	375.1	8810.0	8061.3
110.0	430.2	326.1	7565.0	6887.6
111.0	361.0	281.1	6560.6	5890.2
112.0	316.7	231.2	5460.0	4926.6
113.0	246.0	180.1	4280.1	3790.7
114.0	217.1	158.6	3761.7	3351.4
115.0	186.0	142.0	3425.1	2876.4
116.0	179.4	126.2	3004.6	2562.6
117.0	145.3	102.3	2467.6	2164.3
118.0	113.7	80.6	1942.3	1687.0
119.0	84.4	61.0	1482.1	1316.5
120.0	61.2	37.6	826.0	614.3

TECTONIC HISTORY FOR VARIABLE SS GRAIN WEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL · TECTON LOAD (kilopa)		ISOST TECTON AND SEA-LEV	SUBSID. CHG (m)
76.0	75.0	280.	282.	6563.	6812.	147.	71.
80.0	76.0	-35.	-4.	157.	864.	-60.	-21.
83.0	78.0	-76.	30.	876.	1663.	-97.	-27.
83.0	80.0	-41.	26.	522.	1206.	-66.	-6.
85.0	83.0	47.	63.	1421.	1562.	2.	15.
90.0	85.0	368.	372.	7671.	7670.	146.	136.
90.0	82.0	625.	636.	9262.	9241.	160.	150.
91.0	90.0	62.	46.	1013.	987.	21.	16.
96.0	91.0	462.	374.	6410.	7157.	232.	163.
102.0	91.0	-620.	464.	11005.	9350.	208.	168.
103.0	96.0	146.	119.	2585.	2203.	66.	42.
112.0	106.0	313.	241.	5565.	5311.	141.	77.
120.0	106.0	515.	383.	6046.	6287.	238.	127.
120.0	113.0	206.	142.	3461.	2876.	66.	50.

WELL#10. AMOCO A-1 GREAT 8-28-68-14W5

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV.	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
BR	75.0	76.0	10.2	88.8	101.7	200.6	100.27	270.2
LP	76.0	83.0	48.0	17.7	0.0	65.7	13.34	77.1
COLO	83.0	88.5	144.2	5.1	0.0	149.3	27.14	165.6
CARD	88.5	90.0	73.0	14.6	0.0	87.6	58.38	97.2
SWS	90.0	98.0	169.7	2.7	0.0	172.4	21.55	192.0
BFSC	98.0	103.0	37.6	8.2	13.4	59.2	11.84	66.1
MANN	108.0	113.0	6.7	113.1	36.0	155.8	31.12	172.7
LMANN	113.0	120.0	8.0	70.1	0.0	78.0	11.28	87.6

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1986.5	1624.7	37342.5	32874.7
76.0	1702.3	1380.8	33070.8	29618.2
77.0	1606.5	1203.3	29481.8	27024.1
78.0	1317.2	1189.4	25858.7	24270.7
79.0	1333.8	1148.6	25812.5	24043.3
80.0	1326.2	1139.4	25807.9	23721.2
81.0	1349.7	1136.2	25634.2	23497.2
82.0	1304.1	1132.0	25583.7	23208.1
83.0	1365.7	1127.6	25850.1	23039.1
84.0	1358.2	1088.5	24822.2	22108.8
85.0	1320.5	1081.2	24033.8	21312.6
86.0	1280.2	1014.7	23263.2	20489.4
87.0	1267.5	976.1	22588.4	19866.4
88.5	1238.2	919.0	21895.4	18350.1
89.0	1193.6	872.7	20582.6	17422.6
90.0	975.4	749.7	17483.1	16202.7
91.0	937.9	716.3	16768.8	14499.6
92.0	886.5	678.1	16000.6	13773.7
93.0	855.6	640.9	15205.6	13036.4
94.0	813.5	603.0	14420.4	12292.8
95.0	774.9	56[illegible]	13708.4	11568.1
96.0	727.6	524.6	12860.2	10807.2
97.0	670.3	481.0	11910.0	9988.0
98.0	592.4	438.2	10765.9	9187.3
99.0	563.8	412.2	10298.7	8789.2
100.0	529.2	388.2	9725.8	8300.8
101.0	491.4	365.7	9155.7	7868.9
102.0	483.5	354.9	8905.7	7605.7
103.0	450.5	334.8	8362.6	7163.6
108.0	556.0	352.0	9418.9	7357.8
109.0	498.5	308.7	8371.0	6403.2
110.0	438.6	268.1	7201.6	5490.7
111.0	365.3	219.6	5993.2	4621.6
112.0	290.1	173.6	4764.0	3577.1
113.0	203.1	125.0	3337.4	2548.8
114.0	178.2	108.4	3088.4	2380.8
115.0	152.7	91.7	2827.9	2212.1
116.0	126.5	75.1	2563.2	2049.1
117.0	100.2	58.6	2298.3	1877.6
118.0	77.2	42.4	1187.0	825.3
119.0	43.2	20.7	650.6	423.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	75.0	550.	374.	11368.	8604.	298.	109.
80.0	76.0	-8.	11.	348.	549.	-20.	-6.
83.0	76.0	-76.	23.	307.	1332.	-66.	-16.
83.0	80.0	-70.	12.	-62.	762.	-68.	-12.
85.0	83.0	76.	76.	1617.	1627.	25.	26.
90.0	85.0	345.	304.	8860.	8110.	143.	113.
90.0	83.0	420.	376.	8187.	7735.	166.	139.
91.0	90.0	38.	35.	724.	703.	15.	14.
98.0	91.0	348.	270.	6003.	5332.	150.	114.
103.0	91.0	487.	380.	8406.	7316.	228.	164.
103.0	98.0	142.	100.	2403.	1983.	68.	39.
113.0	108.0	353.	227.	6061.	4809.	165.	78.
120.0	108.0	556.	352.	9419.	7358.	285.	126.
120.0	113.0	203.	126.	3337.	2549.	100.	46.

WELL#10. AMOCO A-1 GRDAT 6-29-58-14W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
SR	0.550	107.3	218.4	72.12
SR	0.170	392.4	211.5	103.83
BFSC	0.550	6.7	53.5	10.50
BFSC	0.170	12.6	55.4	11.60
MANN	0.560	16.5	137.5	27.50
MANN	0.170	35.4	154.2	30.83

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1665.0	1522.5	24312.8	22626.6
76.0	1556.2	1376.5	21036.0	25704.5
77.0	1425.7	1260.4	26275.5	26861.2
78.0	1304.2	1146.8	25600.8	24240.1
79.0	1320.2	1147.3	25527.0	24012.0
80.0	1312.0	1127.0	26323.0	23640.2
81.0	1334.0	1125.0	26320.0	22464.5
82.0	1348.7	1130.3	25348.4	23174.6
83.0	1379.6	1128.8	25333.9	22005.0
84.0	1341.4	1087.8	24406.2	22074.0
85.0	1302.5	1048.4	23584.5	21277.0
86.0	1270.6	1012.0	22011.9	20453.1
87.0	1246.3	976.3	22225.0	19526.3
88.5	1216.7	917.1	21210.2	18320.6
89.0	1172.5	870.6	20270.4	17383.3
90.0	853.4	767.8	17075.4	15183.1
91.0	814.6	712.3	16234.9	14458.2
92.0	674.2	676.1	15686.2	13732.3
93.0	630.1	635.8	14746.0	12884.1
94.0	785.6	600.6	13860.3	12240.6
95.0	746.4	563.6	13205.8	11580.6
96.0	697.5	522.4	12232.2	10761.0
97.0	637.8	476.6	11361.3	9851.7
98.0	566.2	432.6	10153.0	9119.6
99.0	531.7	410.2	9736.8	8724.2
100.0	503.4	385.5	9253.8	8303.7
101.0	488.3	363.6	8747.0	7620.6
102.0	455.6	352.2	8386.8	7544.5
103.0	424.2	333.3	7897.8	7161.6
105.0	532.7	350.4	8826.0	7321.3
108.0	466.8	305.3	7623.9	6436.1
110.0	413.5	285.1	6842.4	5403.6
111.0	345.8	218.6	5713.6	4610.7
112.0	276.6	173.2	4547.7	3572.4
113.0	203.1	126.0	3337.4	2648.9
114.0	176.2	[illegible]	3086.4	2350.6
115.0	152.7	[illegible]	2827.8	2212.1
116.0	126.5	[illegible]	2503.2	2049.1
117.0	100.2	85.8	2298.3	1877.4
118.0	77.3	42.4	1187.0	835.3
119.0	43.2	20.7	650.8	423.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	461.	374.	8823.	8587.	216.	106.
80.0	78.0	-6.	11.	387.	551.	-10.	-6.
83.0	78.0	-76.	23.	387.	1336	-66.	-16.
83.0	80.0	-66.	12.	-11.	784.	-67.	-12.
88.0	83.0	77.	78.	1830.	1828.	28.	26.
90.0	88.0	369.	303.	6810.	6114.	146.	113.
90.0	83.0	426.	378.	8286.	7742.	171.	130.
91.0	90.0	38.	35.	746.	704.	15.	14.
98.0	91.0	350.	278.	6182.	5330.	165.	115.
103.0	91.0	481.	370.	8437.	7308.	230.	162.
103.0	98.0	132.	100.	2288.	1068.	63.	39.
113.0	108.0	330.	225.	5501.	4772.	150.	78.
120.0	105.0	523.	350.	8838.	7321.	250.	124.
130.0	113.0	303.	125.	3337.	2648.	100.	46.

WELL#11. TIPCO ETAL PADDLER 11-1-58-7W5

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
BR	75.0	78.0	0.0	18.1	157.4	175.5	58.50	261.5
LP	78.0	83.0	58.3	32.8	23.0	114.1	22.82	142.8
COLO	83.0	88.5	108.1	3.6	0.0	111.7	20.31	127.1
CARD	88.5	90.0	46.8	5.1	0.0	52.0	34.67	58.3
2WS	90.0	98.0	131.8	0.0	0.0	131.8	16.47	180.6
BFSC	98.0	103.0	54.4	0.0	17.8	72.2	14.43	82.8
MANN	108.0	113.0	33.7	25.1	51.7	110.4	22.08	130.5
LMANN	113.0	120.0	36.0	0.0	0.0	36.0	5.15	37.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1471.2	1198.1	28007.2	25227.2
76.0	1382.6	1117.2	25001.8	23521.7
77.0	1287.4	1045.5	23860.7	21830.8
78.0	1187.3	975.8	22124.7	20180.4
79.0	1167.1	961.7	21782.0	19718.1
80.0	1159.7	945.8	21427.7	19168.5
81.0	1152.5	918.6	20802.1	18851.5
82.0	1114.4	884.9	20122.4	17803.4
83.0	1069.6	849.3	19276.2	17047.3
84.0	1037.4	818.6	18614.7	16413.9
85.0	1004.8	788.0	17863.6	15813.4
86.0	982.8	762.5	17408.1	15180.3
87.0	958.2	732.6	16840.2	14550.1
88.5	927.7	686.3	15988.7	13548.3
89.0	887.9	657.2	15418.6	12987.8
90.0	790.3	586.9	13838.4	11882.6
91.0	761.2	559.6	13174.6	11240.0
92.0	721.6	532.2	12524.0	10611.2
93.0	688.7	504.0	11947.9	10061.3
94.0	658.2	478.3	11323.9	9495.6
95.0	627.8	445.6	10738.0	8895.2
96.0	593.2	416.0	10115.8	8318.0
97.0	554.9	383.1	9455.8	7720.6
98.0	506.4	349.7	8675.8	7101.9
99.0	463.2	320.6	8018.4	6574.6
100.0	418.5	290.7	7324.0	6051.3
101.0	380.0	259.4	6622.8	5508.4
102.0	342.9	244.3	6100.3	5104.5
103.0	287.7	217.0	5281.8	4577.3
108.0	258.0	226.3	6001.8	4771.9
109.0	221.9	208.0	5328.7	4175.7
110.0	262.0	171.7	4382.1	3440.2
111.0	242.1	147.8	3781.0	2826.7
112.0	188.6	107.8	2850.2	2058.7
113.0	107.7	73.4	1985.6	1339.0
114.0	98.4	64.1	1514.0	1158.4
115.0	84.4	54.7	1287.4	998.9
116.0	71.7	44.9	1073.1	802.6
117.0	58.6	34.9	803.5	653.3
118.0	45.0	24.9	656.9	444.5
119.0	28.2	12.4	417.9	278.9
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	304.	220.	5883.	5037.	122.	66.
80.0	78.0	-0.	30.	887.	1004.	-22.	-1.
83.0	78.0	87.	127.	2848.	3143.	9.	29.
83.0	80.0	58.	97.	2181.	2139.	31.	30.
85.0	83.0	65.	69.	1282.	1234.	28.	21.
90.0	85.0	224.	203.	4348.	4130.	80.	78.
90.0	83.0	280.	282.	5638.	6204.	115.	87.
91.0	90.0	29.	27.	404.	444.	15.	13.
98.0	91.0	248.	210.	4408.	4138.	107.	82.
103.0	91.0	463.	343.	7883.	6863.	220.	137.
103.0	98.0	218.	133.	3384.	2526.	113.	58.
113.0	108.0	280.	183.	4318.	3433.	117.	57.
120.0	108.0	358.	235.	6002.	4772.	173.	88.
120.0	113.0	108.	73.	1888.	1339.	56.	32.

WELL#11. TIPCO ETAL PADDLER 11-1-66-TW5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
SR	0.500	102.6	121.7	40.57
SR	0.170	193.6	212.7	70.69
LP	0.500	14.1	105.2	21.04
LP	0.170	26.6	117.7	23.53
BFSC	0.500	8.4	63.6	12.70
BFSC	0.170	17.7	72.1	14.42
MANN	0.500	27.0	86.7	17.33
MANN	0.170	53.8	111.4	22.28

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kiloPa.	
75.0	1[illegible].7	1105.4	25520.7	25214.5
76.0	1206.3	1115.2	23006.4	23448.0
77.0	1163.1	1044.3	22005.0	21806.0
78.0	1133.3	975.1	21455.0	20177.0
79.0	1121.3	964.9	21067.5	19751.5
80.0	1132.3	946.5	20756.3	19246.1
81.0	1114.6	922.7	20234.0	18575.0
82.0	1082.2	886.1	19552.5	17800.6
83.0	1046.1	846.8	18827.6	17036.2
84.0	1012.6	819.0	18151.4	16402.4
85.0	979.0	789.3	17506.0	15801.5
86.0	955.9	764.9	16810.0	15166.5
87.0	931.3	732.0	16326.8	14547.4
88.0	907.8	686.7	15446.0	13536.6
89.0	887.4	656.5	14870.6	12974.7
90.0	740.6	586.2	13089.8	11670.6
91.0	718.0	550.1	12565.1	11328.7
92.0	686.8	531.6	11912.4	10587.7
93.0	654.4	503.3	11312.3	10047.4
94.0	621.1	474.6	10882.5	9451.7
95.0	587.7	445.0	10045.5	8880.0
96.0	550.7	414.3	9334.3	8300.5
97.0	508.4	382.3	8695.8	7704.6
98.0	455.7	348.0	7862.0	7068.4
99.0	410.0	319.6	7280.5	6586.6
100.0	370.8	289.8	6682.9	6036.7
101.0	336.0	266.7	6027.7	5490.4
102.0	306.1	243.7	5436.6	5076.8
103.0	281.1	216.4	4974.7	4864.6
105.0	311.0	235.5	5223.1	4787.4
108.0	281.7	205.4	4626.6	4172.0
110.0	242.6	173.5	3906.0	3450.7
111.0	216.2	148.7	3406.5	2831.0
112.0	155.0	108.0	2462.1	2040.0
113.0	107.7	73.4	1886.5	1336.0
114.0	86.4	64.1	1814.0	1188.4
115.0	84.4	54.7	1287.4	990.8
116.0	71.7	44.0	1073.1	802.6
117.0	50.6	34.0	863.5	653.3
118.0	45.0	24.0	656.0	444.5
119.0	[illegible]	12.4	417.0	276.0
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	75.0	193.	220.	40[illegible]3.	5037.	57.	65.
80.0	78.0	-0.	27.	561.	[illegible]	-20.	-2.
82.0	78.0	65.	125.	2626.	3142.	5.	20.
83.0	80.0	60.	100.	1064.	2210.	26.	31.
85.0	82.0	67.	50.	1323.	1236.	26.	21.
90.0	85.0	230.	203.	4436.	4131.	93.	76.
90.0	83.0	208.	263.	5756.	5305.	120.	47.
91.0	90.0	31.	27.	685.	444.	16.	13.
95.0	91.0	262.	210.	4723.	4140.	116.	62.
103.0	91.0	467.	243.	7870.	5662.	223.	137.
103.0	95.0	205.	133.	3157.	[illegible]	106.	65.
112.0	103.0	203.	182.	3067.	[illegible]	94.	57.
120.0	103.0	311.	235.	5222.	[illegible]	150.	80.
120.0	112.0	106.	73.	1686.	[illegible]	58.	22.

WELL#12. (W.PBUS12) PLACID BUSBY 6-11-58-27W4

PART 1: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHYSS	/SANDS	/TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
LP	78.0	83.0	131.2	0.0	0.0	131.2	26.23	100.0
COLO	83.0	88.5	92.0	0.0	0.0	92.0	16.73	100.1
CARD	88.5	90.0	52.1	0.0	0.0	52.1	34.75	60.7
2WS	90.0	95.0	54.2	0.0	0.0	[illegible]	11.77	110.8
BFSC	95.0	103.0	61.0	2.5	0.5	[illegible]	12.81	75.0
GRDRP	105.0	113.0	30.7	44.7	50.5	[illegible]	20.06	164.6
MCM	113.0	120.0	43.1	14.0	12.7	[illegible]	10.11	70.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1350.6	1066.1	24170.1	21397.6
79.0	1302.7	1023.1	23275.4	20450.4
80.0	1250.6	970.2	22304.2	19552.4
81.0	1195.1	934.6	21351.9	18667.2
82.0	1137.1	885.0	20316.1	17758.7
83.0	1080.9	840.2	19067.8	16840.7
84.0	1034.6	818.5	18630.2	16324.3
85.0	1010.7	791.2	18000.9	15791.2
86.0	990.5	765.7	17846.4	15286.0
87.0	976.2	741.9	17115.6	14788.0
88.5	955.0	704.2	16658.0	13940.4
89.0	912.6	655.5	15705.9	12927.7
90.0	772.3	594.4	13755.1	11957.6
91.0	757.6	575.1	13480.6	11610.5
92.0	736.4	557.1	13048.2	11207.7
93.0	718.5	537.6	12673.5	10844.2
94.0	700.3	518.3	12272.5	10434.5
95.0	681.7	498.4	11810.0	10056.1
96.0	662.7	477.0	11505.4	9627.5
97.0	641.3	455.5	11106.8	9230.9
98.0	615.3	434.7	10587.1	[illegible]
99.0	584.3	405.9	10113.5	[illegible]
100.0	550.4	384.5	9559.6	[illegible]
101.0	513.0	356.3	9006.5	7402.3
102.0	468.2	331.3	8268.1	6906.4
103.0	415.1	305.2	7533.7	6423.0
105.0	485.5	326.3	8277.3	6626.4
108.0	459.3	303.6	7574.6	6003.2
110.0	400.4	255.3	6643.7	5056.0
111.0	341.0	210.1	5403.0	4170.1
112.0	273.0	166.6	4383.1	3377.6
113.0	195.0	127.4	3160.0	2446.9
114.0	175.8	110.0	2814.7	2180.2
115.0	142.9	92.0	2302.3	1793.4
116.0	130.3	82.0	2070.5	1628.3
117.0	118.0	65.5	1713.8	1184.2
118.0	92.4	47.7	1270.8	818.2
119.0	53.7	24.5	737.6	443.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	100.	87.	1865.	1735.	42.	33.
82.0	78.0	200.	228.	5102.	4457.	132.	86.
83.0	80.0	190.	139.	3237.	2722.	89.	58.
85.0	83.0	50.	49.	1058.	1050.	17.	17.
90.0	85.0	238.	197.	4245.	3824.	107.	79.
90.0	83.0	288.	246.	5303.	4873.	124.	95.
91.0	90.0	15.	18.	314.	348.	5.	8.
98.0	91.0	141.	141.	2623.	2627.	54.	54.
102.0	91.0	342.	271.	5817.	5198.	150.	110.
103.0	95.0	201.	129.	3093.	2309.	108.	56.
113.0	108.0	301.	198.	5217.	4150.	139.	89.
120.0	108.0	489.	325.	8377.	6628.	240.	121.
120.0	113.0	185.	127.	3160.	2447.	100.	52.

WELL#18, (W.PBUS(B)) PLACID BUSBY 6-11-58-27W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTBS (m)	RATE HS SED(m/Ma)
BFSC	0.550	0.4	53.8	12.76
BFSC	0.170	0.8	54.2	12.84
GRSNP	0.550	23.1	106.5	21.70
GRSNP	0.170	52.8	137.0	27.86
MCM	0.550	6.7	84.7	8.25
MCM	0.170	13.8	70.7	10.10

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1330.5	1065.8	23701.2	21203.1
79.0	1282.4	1022.8	22664.8	20445.6
80.0	1220.8	970.0	21901.7	19657.6
81.0	1176.3	924.1	20827.0	18682.3
82.0	1114.8	887.7	19868.6	17703.8
83.0	1037.2	840.0	18627.3	16838.6
84.0	1010.8	815.3	18035.4	16310.3
85.0	986.5	780.8	17342.2	15786.1
86.0	884.4	758.4	17066.3	15281.8
87.0	847.3	761.8	16618.2	[illegible]
88.0	837.4	702.8	16066.7	[illegible]
89.0	883.7	668.2	15287.7	13322.1
90.0	742.3	586.2	13320.6	11881.8
91.0	730.1	575.3	13689.0	11813.8
92.0	700.8	555.0	[illegible]	11201.3
93.0	665.2	527.8	11070.0	10838.2
94.0	668.3	516.0	11056.[illegible]	[illegible]
95.0	646.2	468.1	11273.[illegible]	[illegible]
96.0	628.0	477.6	10846.[illegible]	[illegible]
97.0	603.0	456.2	10425.2	9223.4
98.0	576.4	434.4	9921.6	8708.0
99.0	541.0	408.5	9365.5	8344.1
100.0	506.8	384.0	8807.8	7875.1
101.0	467.5	357.7	8188.7	7392.6
102.0	420.8	330.9	7681.3	6606.1
103.0	386.6	304.6	6700.6	6418.3
105.0	435.8	324.8	7345.6	6617.6
108.0	403.7	294.3	6636.3	5868.0
110.0	386.4	266.8	5584.3	5076.7
111.0	311.1	211.8	5000.3	4177.6
112.0	245.4	168.0	3075.1	3331.2
113.0	185.8	127.3	2862.4	2444.7
114.0	166.4	100.8	2661.1	2148.2
115.0	135.8	92.5	2181.3	1761.4
116.0	120.8	82.6	1916.8	1500.0
117.0	110.2	68.5	1817.1	1103.3
118.0	84.7	47.6	1102.6	818.6
119.0	49.1	24.5	661.8	443.0
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	101.	87.	1880.	1738.	43.	33.
83.0	78.0	294.	226.	5164.	4457.	134.	86.
83.0	80.0	192.	139.	3274.	2722.	91.	55.
85.0	83.0	52.	49.	1065.	1050.	18.	17.
89.0	85.0	243.	197.	4322.	3824.	110.	78.
90.0	83.0	295.	249.	5407.	4874.	128.	95.
91.0	90.0	16.	18.	332.	348.	6.	6.
98.0	91.0	161.	141.	2867.	2828.	60.	64.
103.0	91.0	360.	271.	6186.	5197.	160.	110.
103.0	98.0	210.	130.	3221.	2370.	110.	56.
113.0	108.0	251.	197.	4382.	4173.	116.	85.
120.0	105.0	437.	325.	7345.	6617.	210.	120.
120.0	113.0	186.	127.	2862.	2445.	84.	62.

WELL#13. WINDFALL RADWAY 15-33-58-20W4

PART 1: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
COLO	83.0	90.0	99.7	0.0	0.0	99.7	14.28	130.5
SWS	90.0	95.0	59.0	0.0	0.0	59.0	7.30	76.5
BFSC	95.0	103.0	82.7	1.0	2.1	85.8	13.18	85.0
MANN	108.0	113.0	38.0	45.1	43.4	128.5	25.80	173.4
MCM	113.0	120.0	2.9	13.6	43.5	60.3	8.62	76.3

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	988.2	727.1	16860.3	14134.2
84.0	930.5	701.7	16071.0	13666.6
85.0	905.6	675.1	15607.7	13140.4
86.0	875.5	650.0	14885.6	12666.4
87.0	840.4	623.6	14410.2	12150.3
88.5	797.1	582.6	13544.0	11370.1
89.0	770.5	568.6	13258.9	11156.5
90.0	727.0	540.1	12488.6	10591.3
91.0	721.2	528.3	12307.6	10358.9
92.0	713.4	516.1	12105.7	10113.1
93.0	703.6	503.0	11880.3	9858.0
94.0	694.4	491.1	11682.7	9628.3
95.0	686.3	478.4	11463.6	9382.7
96.0	678.1	465.6	11282.4	9134.3
97.0	671.0	452.5	11058.3	8840.9
98.0	656.1	420.4	10896.9	8604.6
99.0	630.6	411.8	10341.7	8135.2
100.0	588.5	383.3	9692.3	7616.4
101.0	543.7	354.3	8908.6	7082.6
102.0	487.7	326.5	8333.3	6804.0
103.0	432.6	296.9	7438.6	6066.4
105.0	833.0	308.5	8380.6	6104.3
108.0	475.6	270.4	7456.4	5380.7
110.0	355.6	221.1	6225.6	4450.6
111.0	282.1	168.4	4775.6	3325.8
112.0	206.2	122.5	3473.9	3028.1
113.0	146.5	86.5	2448.4	1830.4
114.0	120.3	71.7	2073.0	1562.6
115.0	100.8	59.7	1725.3	1311.6
116.0	82.2	47.6	1388.6	1040.4
117.0	62.0	35.7	1068.3	783.1
118.0	45.1	24.6	780.4	551.9
119.0	27.1	12.6	434.3	287.7
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	80.	61.	1073.	866.	27.	21.
90.0	85.0	162.	135.	3019.	2587.	66.	57.
90.0	83.0	241.	187.	4092.	3543.	115.	78.
91.0	90.0	7.	12.	181.	233.	1.	5.
98.0	91.0	53.	89.	1402.	1764.	10.	34.
103.0	91.0	288.	231.	4889.	4283.	128.	98.
103.0	98.0	235.	142.	3487.	2520.	128.	64.
113.0	108.0	377.	223.	6006.	4365.	104.	60.
120.0	108.0	523.	310.	8351.	6194.	266.	118.
120.0	113.0	146.	86.	2445.	1830.	71.	30.

WELL#13. WINDFALL RANWAY 10-22-56-20W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
DPSC	0.500	1.3	88.1	13.01
DPSC	0.170	2.5	86.2	13.25
MANN	0.500	26.0	112.1	23.42
MANN	0.170	40.1	128.2	27.04
MCM	0.500	25.5	42.0	5.00
MCM	0.170	40.1	64.6	6.22

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK IN metres.		CUMULATIVE STRESS IN KILOPA.	
83.0	840.5	727.0	16000.3	14433.4
84.0	800.5	701.0	15535.0	13857.1
85.0	878.0	676.0	14857.7	13146.6
86.0	847.0	650.0	14400.3	12864.5
87.0	813.7	623.5	13628.5	12157.4
88.0	782.6	582.6	13037.1	11377.8
89.0	761.7	568.7	12830.0	11154.3
90.0	681.6	540.1	11465.0	10580.6
91.0	663.5	528.3	11055.6	10386.5
92.0	674.0	518.0	11436.2	10110.5
93.0	663.5	503.6	11108.6	9885.0
94.0	653.1	481.0	10873.0	9826.4
95.0	643.6	476.3	10761.7	9381.3
96.0	633.6	465.4	10626.2	9133.5
97.0	626.2	462.4	10266.5	8846.0
98.0	620.5	430.3	10102.6	8593.0
99.0	581.6	411.3	9522.2	8081.6
100.0	530.4	365.6	8855.7	7612.1
101.0	494.2	352.5	8190.3	7074.2
102.0	444.4	325.7	7448.6	6603.5
103.0	378.5	306.6	6534.7	6063.1
105.0	466.7	305.5	7264.6	6191.2
108.0	411.1	273.6	6436.3	5440.7
110.0	344.0	222.3	5363.6	4813.7
111.0	248.3	167.4	3980.7	3513.5
112.0	186.1	121.5	2955.4	2868.0
113.0	100.6	86.5	1845.1	1820.5
114.0	86.6	71.6	1621.0	1546.3
115.0	73.7	56.4	1281.0	1266.7
116.0	60.5	46.1	1022.5	1051.6
117.0	46.1	38.4	756.5	758.9
118.0	33.7	25.3	537.4	542.1
119.0	16.7	14.3	321.6	281.6
120.0	0.0	-0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (KILOPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	62.	51.	1103.	955.	28.	21.
90.0	85.0	187.	136.	3103.	2557.	81.	57.
90.0	83.0	249.	187.	4205.	3543.	110.	78.
91.0	90.0	8.	13.	180.	233.	2.	5.
96.0	91.0	63.	56.	1653.	1784.	15.	24.
103.0	91.0	305.	231.	5121.	4284.	147.	90.
103.0	96.0	242.	143.	3566.	2530.	132.	64.
113.0	108.0	347.	223.	5420.	4352.	180.	88.
120.0	108.0	457.	300.	7265.	6101.	232.	116.
120.0	113.0	110.	86.	1845.	1820.	63.	30.

WELL#16. MIRAD DOWNING 10-18-88-10W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHVSS	/SANDS	/TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
COLO	83.0	90.0	83.2	0.0	0.0	83.2	11.88	114.8
2WS	90.0	98.0	38.8	0.0	0.0	38.8	4.81	53.0
BFSC	98.0	103.0	49.2	6.7	3.7	59.7	11.93	83.2
GRORP	108.0	113.0	13.3	25.1	[illegible]	[illegible]	17.08	134.4
MCM	113.0	120.0	3.8	0.0	1.9	5.7	0.82	7.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK. in metres		CUMULATIVE STRESS in kiloPa,	
83.0	718.8	518.3	11728.4	8873.2
84.0	690.6	482.8	11288.3	8568.2
85.0	659.8	469.4	10758.9	8021.7
86.0	630.1	448.1	10288.8	8405.0
87.0	588.5	422.4	9773.4	7883.0
88.5	550.0	385.8	8861.8	7303.1
89.0	530.7	373.3	8880.5	7080.4
90.0	482.2	347.7	7980.8	6801.8
91.0	478.1	330.4	7880.5	6480.4
92.0	[illegible]	331.1	7880.8	6301.3
93.0	[illegible]	333.7	7880.8	6153.3
94.0	487.2	314.3	7382.7	5846.0
95.0	481.7	308.0	7283.4	5787.8
96.0	467.1	307.0	7143.6	5839.2
97.0	444.4	288.4	7049.4	5687.0
98.0	447.1	278.6	6987.7	5277.1
99.0	405.8	283.1	6358.8	4818.0
100.0	358.3	225.0	5885.7	4340.1
101.0	[illegible]	188.7	4980.7	3870.6
102.0	[illegible]	178.8	4637.3	3488.1
103.0	214.3	148.3	3830.8	2894.3
108.0	280.1	182.8	3092.3	3008.3
109.0	211.3	134.4	3340.1	2471.8
110.0	174.8	97.1	2883.0	1807.3
111.0	108.7	84.1	1740.8	1288.9
112.0	88.8	35.4	943.4	730.0
113.0	18.7	11.4	282.3	208.8
114.0	18.8	10.3	288.8	198.1
115.0	[illegible]	9.3	288.8	187.8
116.0	14.8	7.7	211.1	141.8
117.0	11.9	5.9	183.4	122.9
118.0	8.8	4.0	181.7	103.7
119.0	4.8	2.0	88.8	40.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	58.	46.	973.	882.	38.	30.
89.0	85.0	179.	122.	2708.	2220.	92.	53.
90.0	83.0	238.	168.	3758.	3072.	120.	73.
91.0	90.0	6.	8.	120.	142.	2.	4.
98.0	91.0	29.	50.	873.	1183.	2.	23.
102.0	91.0	281.	181.	4208.	3484.	131.	83.
103.0	98.0	232.	131.	3332.	2313.	120.	60.
113.0	108.0	233.	141.	3730.	2707.	118.	55.
120.0	108.0	280.	152.	3092.	3008.	127.	60.
120.0	113.0	17.	11.	262.	208.	8.	5.

WELL#16. MIKAS DOWNING 10-16-55-16W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSB (m)	HSTOT (m)	RATE NS SED(m/Ma)
SPSE	0.050	2.7	56.0	11.72
SPSE	0.170	8.1	61.0	12.20
GROUP	0.050	31.9	68.3	13.88
GROUP	0.170	60.2	67.8	10.52
MGM	0.050	1.3	8.8	0.74
MGM	0.170	2.6	6.3	0.81

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	700.8	515.2	11423.6	8873.0
84.0	672.0	492.8	10856.3	8269.1
85.0	641.8	488.4	10434.6	8621.8
86.0	610.8	446.0	9936.8	8408.7
87.0	578.4	423.4	9436.7	7863.8
88.0	538.0	398.0	8909.8	7303.0
89.0	508.2	373.3	8383.6	7060.4
90.0	480.2	347.7	7884.0	6601.4
91.0	453.8	338.4	7464.6	6488.7
92.0	440.1	331.1	7318.1	6391.2
93.0	430.0	322.7	7103.7	6142.3
94.0	432.4	314.2	6984.9	6047.0
95.0	426.2	306.7	6844.3	5787.0
96.0	420.8	307.1	6712.3	5627.1
97.0	417.2	288.4	6600.4	5487.9
98.0	418.0	278.8	6509.4	5277.2
99.0	378.0	262.8	6008.7	4809.4
100.0	333.1	234.8	5240.6	4238.8
101.0	278.7	198.1	4504.7	3852.8
102.0	243.0	178.4	3868.3	3480.8
103.0	185.3	148.3	3188.6	2883.6
106.0	215.0	162.4	3428.8	3008.3
108.0	182.0	128.7	2854.2	2488.0
110.0	152.0	100.2	2335.8	1872.3
111.0	88.8	84.7	1867.1	1320.1
112.0	60.8	35.8	828.8	726.6
113.0	18.7	11.2	343.0	208.3
114.0	18.4	10.4	288.8	184.8
115.0	16.4	8.8	210.3	180.0
116.0	13.2	8.8	198.0	140.6
117.0	10.7	6.5	171.7	120.1
118.0	7.9	4.4	143.1	107.9
119.0	4.3	2.2	83.6	42.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
86.0	83.0	58.	40.	689.	552.	26.	20.
90.0	85.0	182.	122.	2841.	2220.	84.	53.
90.0	83.0	241.	166.	3830.	3072.	122.	73.
91.0	90.0	7.	6.	120.	142.	3.	4.
99.0	91.0	35.	60.	855.	1162.	5.	23.
103.0	91.0	265.	181.	4308.	3408.	136.	83.
103.0	99.0	224.	132.	3363.	2314.	130.	60.
112.0	106.0	200.	141.	3155.	2707.	102.	65.
120.0	106.0	218.	152.	3426.	3005.	110.	60.
120.0	112.0	16.	11.	244.	208.	8.	6.

WELLPIS. MIRAS OWLSEYE 10-28-84-10W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHVSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
COLO	83.0	90.0	57.6	0.0	0.0	57.6	6.22	83.3
SWB	90.0	95.0	32.3	0.0	0.0	32.3	6.03	45.7
DPSC	95.0	105.0	82.2	1.7	0.0	83.9	12.70	88.6
GRDRP	108.0	113.0	11.0	37.1	44.8	93.0	18.72	130.6
MCM	113.0	120.0	10.5	0.5	10.6	21.2	4.40	41.6

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma).	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	686.4	507.3	11400.5	9990.2
84.0	668.7	492.1	11108.7	9410.8
85.0	650.8	476.7	10878.0	9117.1
86.0	632.3	461.2	10550.2	8821.3
87.0	613.3	445.8	10240.4	8564.6
88.0	581.6	421.4	9712.0	8094.6
89.0	560.7	412.3	9503.1	8011.8
90.0	541.5	396.6	9061.6	7817.6
91.0	536.6	390.3	8993.3	7603.6
92.0	530.3	384.1	8894.2	7387.1
93.0	524.9	377.6	8830.8	7258.7
94.0	532.6	371.6	8764.0	7124.6
95.0	532.0	365.3	8982.6	6990.7
96.0	584.0	359.3	8932.6	6897.7
97.0	540.4	353.0	[illegible]	6734.3
98.0	563.5	347.0	[illegible]	6680.0
99.0	513.0	318.0	8081.0	6120.3
100.0	484.0	290.1	7408.6	5605.7
101.0	410.7	260.6	6685.4	5080.6
102.0	381.4	230.7	5907.2	4866.7
103.0	306.7	201.3	5012.9	4048.1
105.0	345.5	205.4	5506.1	4101.2
108.0	290.2	174.1	4872.0	3489.3
110.0	238.1	143.7	3844.3	2880.1
111.0	188.3	112.4	3046.8	2271.0
112.0	142.4	83.0	2272.0	1861.8
113.0	80.5	54.3	1410.5	1055.2
114.0	80.1	47.6	1200.6	930.7
115.0	72.3	41.1	1118.0	780.0
116.0	50.7	31.1	811.0	613.7
117.0	39.3	24.3	825.4	474.3
118.0	23.3	18.3	498.4	347.1
119.0	25.0	10.8	348.4	208.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma). TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	38.	31.	624.	573.	16.	13.
90.0	85.0	109.	80.	1784.	1500.	54.	34.
90.0	83.0	145.	111.	2418.	2073.	70.	47.
91.0	90.0	3.	8.	66.	123.	0.	2.
95.0	91.0	-15.	43.	326.	913.	-26.	15.
103.0	91.0	242.	180.	3980.	3448.	118.	83.
103.0	95.0	257.	148.	3654.	2533.	144.	68.
113.0	105.0	256.	152.	4088.	3046.	120.	68.
120.0	108.0	345.	208.	5505.	4101.	175.	80.
120.0	113.0	89.	54.	1411.	1055	48.	23.

WELLP16. MIKAS OWLSEYE 10-33-58-10W4
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PART II: VARIABLE SS GRAIN HEIGHT
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FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
GRDRP	0.580	20.3	78.2	15.84
GRDRP	0.170	56.3	106.4	30.62
MGM	-0.080	8.7	27.1	3.07
MGM	0.170	12.8	33.1	4.72

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT
****

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	655.1	507.3	11181.0	8880.4
84.0	640.0	493.1	10880.5	8610.7
85.0	631.4	478.7	10541.1	8117.0
86.0	613.3	461.2	10206.4	8821.4
87.0	592.5	445.4	9816.4	8554.3
88.0	580.0	421.4	9348.6	8004.5
89.0	547.7	413.3	9330.0	8012.1
90.0	516.0	396.8	8855.4	7617.0
91.0	515.9	390.3	8500.9	7403.6
92.0	512.2	384.1	8491.2	7357.1
93.0	509.3	377.6	8435.0	7256.7
94.0	507.3	371.5	8336.0	7124.8
95.0	505.5	365.3	8365.0	6959.8
96.0	507.7	350.3	8183.0	6857.7
97.0	513.6	353.0	8157.0	6734.4
98.0	534.7	347.0	8183.1	6580.8
99.0	483.3	316.0	7856.7	6130.5
100.0	438.0	300.1	6907.6	5805.7
101.0	366.2	250.6	6170.0	5060.8
102.0	326.6	230.7	5376.6	4588.8
103.0	263.1	201.2	4486.5	4046.1
108.0	208.8	206.8	4881.1	4101.4
109.0	255.1	174.1	4083.0	3470.2
110.0	213.0	140.0	3428.5	2828.0
111.0	187.8	113.1	2871.8	2250.1
112.0	127.2	84.3	2000.5	1663.4
113.0	81.1	54.3	1274.7	1085.5
114.0	73.4	47.4	1105.3	835.7
115.0	66.0	30.8	1012.5	788.3
116.0	40.5	20.0	720.4	601.5
117.0	30.3	23.3	580.8	441.8
118.0	21.3	16.1	444.1	320.8
119.0	21.7	11.6	318.4	212.8
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT
****

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
88.0	83.0	37.	31.	641.	573.	17.	13.
90.0	88.0	112.	80.	1842.	1500.	56.	34.
90.0	83.0	140.	111.	2483.	2073.	72.	47.
91.0	90.0	3.	6.	88.	123.	0.	2.
98.0	91.0	-5.	43.	408.	813.	-23.	15.
103.0	91.0	252.	180.	4134.	3445.	128.	83.
103.0	98.0	282.	146.	3727.	2833.	140.	88.
112.0	108.0	225.	152.	3608.	3048.	114.	58.
120.0	108.0	306.	208.	4881.	4101.	188.	80.
120.0	112.0	61.	64.	1278.	1086.	42.	22.

WELLF16. D.A.SOUTHERN 130-3-88-10W

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV.	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHTSS	SANDS	TOTAL	RATE NB SED(m/Ma)	THICK TOT(m)
COLD	83.0	90.0	31.0	0.0	0.0	31.0	4.40	47.0
SWB	90.0	98.0	34.6	0.0	0.0	18.0	5.07	38.0
DFSC	98.0	103.0	68.0	1.8	0.0	70.7	14.03	101.0
MANN	108.0	113.0	10.8	30.0	60.2	97.0	10.87	150.3
LMANN	113.0	120.0	10.3	13.1	3.0	27.8	7.00	50.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK IN METRES		CUMULATIVE STRESS IN KILOPA.	
83.0	810.0	472.3	10300.1	8805.0
84.0	811.0	464.0	10320.8	8790.8
85.0	804.3	457.1	10008.4	8506.3
86.0	897.1	440.4	9958.1	8404.1
87.0	889.7	441.8	9818.0	8332.0
88.5	870.4	430.4	9580.3	8074.4
89.0	878.8	428.8	9508.8	7990.8
90.0	887.4	418.7	9330.0	7833.7
91.0	887.8	414.4	9332.0	7772.8
92.0	880.2	410.2	9383.8	7803.8
93.0	871.3	408.8	9353.8	7803.7
94.0	876.3	401.7	9217.1	7473.3
95.0	879.1	397.8	9321.1	7307.2
96.0	868.8	393.8	9238.0	7306.8
97.0	887.0	380.8	9318.3	7314.3
98.0	818.8	308.8	9420.2	7003.8
99.0	873.8	358.4	8788.4	6804.7
100.0	821.8	323.3	8027.3	6033.0
101.0	403.2	29[illegible].8	7188.1	5443.2
102.0	300.7	2[illegible].1	6274.4	4804.1
103.0	318.0	273.3	6248.8	4381.0
10[illegible].0	378.0	220.0	5833.7	4305.3
10[illegible].0	300.8	188.1	4880.4	3082.0
110.0	243.8	153.7	3808.7	2838.8
111.0	187.3	118.4	2880.0	2303.3
112.0	142.8	84.4	2307.0	1830.8
113.0	88.4	60.8	1308.4	853.9
114.0	82.7	48.1	1238.0	848.8
115.0	73.3	37.3	1088.4	808.8
116.0	58.0	28.1	841.2	580.2
117.0	42.8	20.8	830.8	407.8
118.0	28.4	13.8	413.2	284.3
119.0	12.8	6.3	218.4	148.7
120.0	0.0	0.0	0.0	0.0

FORMATION OR INTERV	TIME (Ma)	FORM OR INT THICK (m)		FORM OR INTER STRESS (kPa)	
COLD					
	83.0	134.1	73.7	1878.2	1288.0
	84.0	118.0	63.8	1684.3	1094.7
	85.0	103.4	53.6	1431.1	938.7
	86.0	88.4	43.1	1183.8	788.1
	87.0	67.0	33.8	940.0	684.1
	88.5	38.0	18.8	504.3	390.3
	89.0	28.7	11.1	360.8	188.8
SWB					
	83.0	68.8	53.1	1103.8	833.3
	84.0	71.8	53.7	1128.8	840.0
	85.0	74.6	53.4	1158.8	847.0
	86.0	77.0	54.1	1184.0	854.4
	87.0	82.1	54.8	1238.8	863.3
	88.5	80.3	56.2	1320.0	874.0
	89.0	93.0	56.8	1385.0	870.3
	90.0	103.1	57.8	1448.4	868.7
	91.0	93.6	50.8	1338.2	803.8
	92.0	83.6	43.9	1188.7	788.8
	93.0	73.0	38.0	1024.1	688.7
	94.0	61.4	28.7	838.1	818.8
	95.0	48.8	22.5	678.3	411.1
	96.0	34.8	15.1	488.2	280.1
	97.0	18.7	7.8	271.8	189.7
DFSC					
	83.0	163.7	138.8	2828.8	2583.8
	84.0	167.3	138.3	2851.8	2587.7
	85.0	171.2	138.7	2800.8	2583.3
	86.0	178.4	141.2	2843.8	2587.7
	87.0	180.1	142.8	2881.0	2613.8
	88.5	188.1	145.3	3071.4	2838.3
	89.0	191.0	148.2	3101.3	2840.3
	90.0	197.8	148.0	3188.7	2888.8
	91.0	204.8	150.0	3280.8	2888.4
	92.0	213.3	152.0	3338.1	2707.0
	93.0	223.1	154.3	3428.8	2728.8
	94.0	234.8	158.4	3543.8	2781.8
	95.0	248.0	158.8	368[illegible]	2778.3
	96.0	268.8	161.4	3887[illegible]	2803.3
	97.0	280.8	164.2	4100.[illegible]	2830.0
	98.0	324.1	167.1	4448.2	2850.7
	99.0	278.8	138.1	3742.8	2323.3
	100.0	218.9	103.0	2884.2	1773.3
	101.0	188.3	68.3	2083.1	1183.4
	102.0	84.2	38.0	1002.0	804.3
MANN					
	83.0	203.8	188.4	3840.8	3282.8
	84.0	205.3	168.7	3858.2	3286.0
	85.0	206.8	169.0	3872.4	3288.2
	86.0	208.8	169.3	3889.3	3292.2
	87.0	210.3	169.8	3707.0	3295.8
	88.5	212.1	170.2	3738.1	3301.2
	89.0	214.1	170.3	3744.8	3302.8
	90.0	216.1	170.7	3784.8	3306.7
	91.0	218.2	171.1	3788.2	3310.8

92.0	220.4	171.6	3808.3	2314.6
93.0	222.7	171.9	3832.0	2316.9
94.0	225.3	172.4	3856.8	2323.6
95.0	227.6	172.9	3883.3	2326.4
96.0	230.6	173.3	3911.6	2333.2
97.0	233.5	173.8	3941.6	2336.2
98.0	236.8	174.4	3974.1	2344.0
99.0	240.2	175.0	4009.1	2348.8
100.0	244.0	175.6	4047.5	2356.3
101.0	248.2	176.2	4089.6	2362.8
102.0	252.8	176.9	4130.4	2369.5
103.0	258.1	177.7	4180.3	2377.6
105.0	307.4	183.4	4868.0	3424.0
108.0	238.0	141.1	3711.6	2723.6
110.0	170.1	104.1	2872.8	2008.6
111.0	110.8	69.3	1773.0	1353.6
112.0	62.2	34.7	852.7	674.6

LMANN

83.0	47.5	41.2	823.1	860.1
84.0	47.9	41.4	827.1	861.6
85.0	48.3	41.6	831.2	863.1
86.0	48.7	41.7	835.6	864.6
87.0	49.2	41.9	840.2	866.3
88.0	49.8	42.1	847.4	868.0
89.0	50.2	42.2	849.9	869.7
90.0	50.7	42.4	855.1	871.6
91.0	51.2	42.6	860.6	873.4
92.0	51.8	42.8	866.3	875.3
93.0	52.4	43.0	872.3	877.3
94.0	53.0	43.2	878.6	879.4
95.0	53.7	43.4	885.3	881.6
96.0	54.4	43.6	892.4	883.9
97.0	55.1	43.9	1000.0	886.3
98.0	55.9	44.1	1007.9	888.8
99.0	56.7	44.4	1016.5	891.5
100.0	57.6	44.6	1025.8	[illegible]
101.0	58.6	44.9	1035.4	897.2
102.0	59.7	45.2	1046.1	900.3
103.0	60.8	45.6	1057.6	903.6
105.0	65.5	47.5	1135.7	923.5
108.0	70.7	48.0	1167.9	928.4
110.0	73.3	48.5	1183.9	933.7
111.0	76.4	49.1	1215.2	939.6
112.0	80.3	49.8	1254.3	945.9
113.0	85.4	50.6	1306.4	952.9
114.0	82.7	46.1	1228.9	846.6
115.0	73.3	37.3	1058.4	695.6
116.0	55.9	28.1	841.2	500.2
117.0	42.5	20.5	630.6	407.9
118.0	25.4	12.6	413.2	284.3
119.0	12.0	6.2	218.4	149.7

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	14.	16.	274.	258.	5.	6.
88.0	85.0	37.	38.	750.	775.	13.	14.
90.0	88.0	61.	54.	1033.	1062.	10.	21.
91.0	90.0	-9.	4.	13.	61.	-1.	2.
98.0	91.0	-48.	29.	-105.	680.	-46.	6.
103.0	91.0	240.	151.	4076.	3492.	123.	63.
103.0	98.0	266.	162.	4181.	2811.	169.	78.
113.0	108.0	291.	170.	4517.	2395.	151.	75.
120.0	105.0	375.	230.	5624.	4348.	186.	88.
120.0	113.0	85.	50.	1305.	853.	45.	21.

WELL#18. B.A.SPUTINOW 13C-3-58-1W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	MSSS (m)	MSTOT (m)	RATE MS SED(m/Ma)
MANN	0.550	30.8	88.5	17.71
MANN	0.170	88.2	118.8	23.18
LMANN	0.550	2.7	26.0	3.71
LMANN	0.170	5.1	28.4	4.05

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa	
83.0	505.8	473.2	10180.3	[illegible]
84.0	588.5	464.8	10024.3	[illegible]
85.0	581.4	457.1	9888.1	8608.1
86.0	583.8	449.4	9741.8	8483.9
87.0	570.2	441.8	9588.6	8321.7
88.5	555.4	430.3	9353.1	8074.0
89.0	551.6	426.5	9278.0	7988.8
90.0	552.8	418.6	9101.1	7832.0
91.0	552.8	414.4	9042.3	7772.5
92.0	553.8	410.1	9023.5	7682.0
93.0	555.5	405.9	9002.3	7583.4
94.0	558.3	401.7	8989.7	7472.5
95.0	562.7	397.6	8957.8	7398.8
96.0	568.6	393.5	8968.4	7287.6
97.0	580.6	389.5	9043.9	7214.4
98.0	599.2	385.6	9149.1	7091.6
99.0	555.5	355.4	8470.8	6564.0
100.0	503.1	323.2	7732.0	6022.8
101.0	444.3	290.4	6865.6	5442.8
102.0	377.4	257.1	5885.0	4862.8
103.0	289.1	223.2	4929.6	4280.8
105.0	353.7	229.6	5481.8	4347.1
108.0	282.3	191.0	4578.3	3670.4
110.0	229.5	150.7	3817.9	2918.6
111.0	177.1	117.1	2794.6	2244.3
112.0	135.7	85.6	2103.1	1650.7
113.0	83.5	50.3	1274.0	951.7
114.0	82.4	45.7	1197.5	849.1
115.0	68.4	39.3	1020.0	758.2
116.0	52.2	29.7	803.4	576.8
117.0	38.6	21.6	602.3	420.6
118.0	24.3	13.2	402.0	289.8
119.0	12.3	6.5	210.7	152.5
120.0	0.0	0.0	0.0	0.0

FORMATION OR INTERV	TIME (Ma)	FORM OR INT. THICK (m)		FORM OR INTER STRESS (kPa)	
MANN					
	83.0	192.7	168.4	3460.6	3283.2
	84.0	194.0	168.7	3471.8	3286.1
	85.0	195.3	169.0	3483.8	3289.1
	86.0	196.7	169.3	3496.3	3292.2
	87.0	198.1	169.6	3509.3	3295.4
	88.5	200.4	170.1	3530.5	3300.8
	89.0	201.2	170.3	3538.0	3302.6
	90.0	202.9	170.7	3553.4	3306.2
	91.0	204.7	171.1	3569.7	3310.5
	92.0	206.6	171.5	3587.0	3314.3
	93.0	208.6	171.9	3605.5	3318.6
	94.0	210.7	172.3	3625.2	3323.1
	95.0	213.0	172.8	364[illegible].2	3328.1
	96.0	215.4	173.3	[illegible]	3332.8
	97.0	218.0	173.8	3693.5	3338.7
	98.0	220.9	174.4	3720.1	3343.6
	99.0	224.0	175.0	3749.4	3349.6
	100.0	227.4	175.6	3781.5	3355.7
	101.0	231.1	176.2	3817.3	3362.0
	102.0	235.4	176.9	3857.8	3369.7
	103.0	240.2	177.7	3903.6	3377.1
	105.0	257.2	182.4	4380.4	3424.4
	108.0	223.5	142.0	3453.3	2742.6
	110.0	158.2	102.3	2488.2	1867.0
	111.0	102.6	65.0	1614.7	1305.8
	112.0	55.2	36.2	883.3	714.0
LMANN					
	83.0	46.3	41.3	803.2	860.0
	84.0	46.7	41.4	806.7	861.4
	85.0	47.1	41.5	810.4	862.9
	86.0	47.5	41.7	814.3	864.5
	87.0	47.9	41.9	818.3	866.1
	88.5	48.6	42.1	824.6	868.6
	89.0	48.8	42.2	827.0	869.5
	90.0	49.3	42.4	831.8	871.3
	91.0	49.8	42.6	836.8	873.2
	92.0	50.3	42.7	841.7	875.1
	93.0	50.9	42.9	847.2	877.1
	94.0	51.5	43.2	852.9	879.2
	95.0	52.1	43.4	859.0	881.4
	96.0	52.7	43.6	865.5	883.6
	97.0	53.4	43.8	872.4	886.0
	98.0	54.2	44.1	879.6	888.5
	99.0	55.0	44.3	887.7	891.1
	100.0	55.9	44.6	895.2	893.9
	101.0	56.8	44.9	1005.4	896.8
	102.0	57.8	45.2	1015.4	899.8
	103.0	58.9	45.5	1028.2	903.1
	105.0	65.5	47.0	1101.2	922.7
	108.0	66.7	47.9	1123.0	927.6
	110.0	71.3	48.5	1146.7	932.6
	111.0	74.5	49.0	1180.1	938.5
	112.0	78.8	49.8	1218.9	944.8
	113.0	83.8	50.3	1274.0	951.7
	114.0	82.4	45.7	1197.5	849.1
	115.0	68.4	39.3	1020.0	758.2
	116.0	52.2	29.7	803.4	576.8
	117.0	38.6	21.6	602.3	420.6

118.0	24.2	13.2	402.0	289.9
118.9	12.3	6.6	210.7	182.5

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma)		TOT SUBSID AND		TOTAL - TECTON		ISOST TECTON SUBSID	
TIME1	TIME2	SEA LEV CHG(m)		LOAD (kiloPa)		AND SEA LEV CHG (m)	
85.0	82.0	14.	16.	282.	288.	8.	8.
88.0	85.0	39.	38.	788.	778.	14.	16.
90.0	83.0	53.	64.	1068.	1063.	20.	21.
91.0	90.0	-0.	4.	19.	81.	-1.	2.
95.0	91.0	-48.	28.	-64.	881.	-44.	8.
103.0	91.0	254.	101.	4153.	3402.	128.	63.
103.0	98.0	300.	182.	4216.	2812.	170.	78.
113.0	108.0	270.	179.	4188.	3308.	140.	75.
120.0	108.0	354.	230.	6482.	4347.	188.	88.
130.0	113.0	64.	50.	1274.	852.	48.	21.

WELL#17. NE TEXACO BRAZR 10-21-46-14W5

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
BR	75.0	78.0	40.9	117.5	95.3	255.6	85.20	337.1
LP	78.0	83.0	120.9	0.0	0.0	120.9	24.18	134.4
COLO	83.0	88.5	229.0	0.0	0.0	229.0	41.64	240.5
CARD	88.5	90.0	142.5	0.0	0.0	142.5	95.01	147.6
2WS	90.0	98.0	186.3	0.0	0.0	186.3	23.28	200.8
BFSC	98.0	103.0	37.2	8.4	5.2	50.8	10.16	55.2
MANN	108.0	113.0	55.3	78.5	44.0	177.8	35.57	191.4
LMANN	113.0	120.0	12.1	35.9	20.0	68.0	9.72	71.9
RKCK	173.0	188.0	0.0	0.0	23.4	23.4	1.56	24.7
FRN	188.0	200.0	13.6	0.0	0.0	13.6	1.14	14.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma).	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	2050.1	1734.8	41628.7	38338.0
76.0	1995.2	1633.8	38703.0	35550.8
77.0	1774.6	1546.0	35028.3	33716.2
78.0	1808.4	1446.2	32041.0	31282.0
79.0	1598.8	1428.1	32446.0	30713.5
80.0	1593.8	1413.0	31907.3	30170.1
81.0	1587.4	1390.3	31637.8	29635.8
82.0	1590.5	1386.9	31305.9	29118.7
83.0	1644.3	1376.5	31250.4	28584.5
84.0	1595.6	1323.5	30109.9	27361.5
85.0	1545.7	1270.1	28933.8	26148.5
86.0	1495.7	1215.6	27765.0	24934.2
87.0	1456.7	1163.5	26654.1	23672.2
88.5	1466.5	1058.6	25505.6	21858.6
89.0	1342.7	994.3	23987.0	20166.6
90.0	985.8	790.6	18478.5	16504.5
91.0	949.3	754.7	17738.0	15771.9
92.0	910.8	717.7	16973.9	15022.7
93.0	868.0	679.6	16170.1	14266.1
94.0	[illegible]	640.2	15379.6	13487.3
95.0	[illegible]	599.0	14451.3	12655.4
96.0	[illegible]	556.7	13576.6	11849.6
97.0	[illegible]	511.4	12593.2	11014.7
98.0	[illegible]	463.1	11338.8	10107.1
99.0	[illegible]	445.5	10980.3	9787.2
100.0	537.6	427.4	10533.0	9419.7
101.0	519.9	414.4	10218.4	9152.6
102.0	504.5	398.6	9889.6	8801.6
103.0	477.9	384.1	9416.9	8472.0
108.0	618.9	419.8	10844.3	8631.9
109.0	555.0	370.0	9644.7	7776.6
110.0	465.2	304.8	8037.5	[illegible]
111.0	383.9	251.1	6555.7	5418.2
112.0	324.5	212.6	5595.7	4464.9
113.0	201.4	144.4	3734.5	3159.1
114.0	182.7	128.5	3302.6	2855.2
115.0	167.5	113.6	3082.4	2547.1
116.0	135.7	94.6	2624.3	2211.1
117.0	113.1	80.6	2250.2	1922.9
118.0	93.1	67.9	1884.2	1609.5
119.0	66.4	54.3	1473.6	1321.1
120.0	44.1	41.5	1043.6	1017.2

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	481.	280.	8565.	7057.	182.	72.
80.0	78.0	16.	32.	945.	1113.	-14.	-8.
83.0	78.0	-35.	69.	1651.	2698.	-88.	-15.
83.0	80.0	-51.	36.	707.	1586.	-72.	-13.
85.0	83.0	88.	105.	2358.	2436.	25.	31.
90.0	85.0	580.	480.	10454.	9844.	237.	162.
90.0	83.0	668.	585.	12812.	12080.	[illegible]	213.
91.0	90.0	37.	36.	740.	733.	[illegible]	13.
98.0	91.0	384.	282.	6389.	5665.	167.	117.
103.0	91.0	471.	371.	8319.	7300.	214.	145.
103.0	98.0	107.	78.	1920.	1635.	48.	28.
113.0	108.0	416.	275.	7110.	5873.	188.	100.
120.0	108.0	575.	378.	9801.	7515.	272.	137.
120.0	113.0	157.	103.	2661.	2142.	74.	37.

WELL#17. HB TEXACO BRAZR 10-21-48-14W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.560	48.6	308.5	88.51
BR	0.170	88.3	247.0	62.34
BFSC	0.560	2.7	48.6	8.67
BFSC	0.170	5.1	50.6	10.16
MANN	0.560	21.6	158.3	31.08
MANN	0.170	40.5	174.3	34.88
LMANN	0.560	9.8	67.5	6.21
LMANN	0.170	18.0	85.0	8.42
RKCK	0.560	10.8	10.8	0.72
RKCK	0.170	20.6	20.8	1.37

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1857.2	1721.7	38788.0	36064.6
76.0	1828.0	1623.7	37216.8	35720.9
77.0	1723.4	1630.0	36078.8	33569.0
78.0	1804.2	1441.6	32812.9	31205.1
79.0	1683.7	1424.3	32105.6	30634.0
80.0	1677.3	1400.1	31848.8	30086.6
81.0	1660.3	1386.3	31274.3	29562.2
82.0	1681.7	1362.0	30980.0	29031.2
83.0	1626.6	1373.3	30001.4	28487.2
84.0	1670.2	1310.3	30707.7	27271.9
85.0	1626.4	1268.7	28616.5	26086.8
86.0	1476.6	1212.0	27334.6	24840.4
87.0	1436.8	1158.0	26208.3	23678.4
88.5	1432.0	1081.0	25125.6	21780.4
89.0	1318.7	980.4	23208.8	20086.2
90.0	880.6	765.6	17083.2	18401.8
91.0	823.0	748.6	17224.6	15868.9
92.0	863.3	712.6	16461.1	14818.3
93.0	840.2	674.2	15635.6	14168.2
94.0	787.3	634.7	14804.5	13374.9
95.0	748.1	603.4	13853.0	12540.6
96.0	684.2	550.9	12862.1	11732.0
97.0	632.3	505.5	11841.0	10864.5
98.0	567.2	457.0	10882.8	9884.0
99.0	526.2	430.6	10288.5	9062.0
100.0	501.4	421.2	9888.6	9282.4
101.0	479.9	408.1	9498.2	9023.8
102.0	468.5	382.3	9148.4	8670.0
103.0	436.4	377.6	8679.5	8338.0
105.0	659.1	412.4	9850.2	8679.2
108.0	488.8	363.6	8723.7	7636.2
110.0	427.9	288.5	7673.7	6437.0
111.0	330.4	246.0	5941.7	5282.8
112.0	288.4	208.1	5032.9	4381.4
113.0	178.3	140.6	3356.0	3088.9
114.0	161.6	128.3	3076.4	2784.8
115.0	183.0	111.3	2838.6	2486.2
116.0	123.4	92.5	2361.6	2147.9
117.0	103.7	78.4	2077.0	1634.5
118.0	84.2	66.1	1728.7	1862.1
119.0	61.4	52.6	1317.7	1287.2
120.0	40.2	40.1	881.6	880.1

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	383.	280.	7176.	6850.	141.	60.
80.0	78.0	17.	32.	867.	1116.	-13.	-2.
82.0	78.0	-31.	68.	1711.	2708.	-84.	-16.
83.0	80.0	-48.	37.	744.	1581.	-71.	-12.
85.0	83.0	100.	107.	2386.	2440.	27.	31.
88.0	85.0	568.	460.	10833.	8858.	238.	182.
90.0	83.0	665.	567.	12816.	12055.	288.	213.
91.0	90.0	38.	26.	758.	735.	14.	13.
98.0	91.0	378.	283.	6872.	5663.	173.	117.
103.0	91.0	487.	372.	8545.	7328.	223.	148.
103.0	98.0	111.	78.	1873.	1548.	50.	28.
113.0	108.0	381.	272.	6484.	5593.	180.	89.
120.0	105.0	518.	372.	6885.	7680.	244.	135.
120.0	113.0	128.	101.	2384.	2087.	64.	38.

WELL#18. PETROCON ETAL PEMBINA 7-7-48-7W5
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PART 1: CONSTANT GRAIN HEIGHT
....

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
BR	75.0	76.0	1.1	32.0	172.2	205.3	66.43	261.2
LP	76.0	82.0	82.9	17.8	15.0	116.4	23.26	132.0
COLO	82.0	88.5	136.8	20.2	0.0	160.0	26.00	170.6
CARD	88.5	90.0	110.2	13.3	2.7	126.2	84.11	134.4
2WS	90.0	98.0	144.5	1.0	0.0	145.5	16.16	157.0
BFSC	98.0	103.0	14.1	34.2	13.7	62.0	12.40	71.0
MANN	108.0	113.0	0.0	48.5	55.5	108.4	21.68	110.2
OSTZ	113.0	120.0	2.6	11.0	15.0	29.4	4.21	36.4
RKCK	173.0	188.0	0.0	1.2	13.6	14.8	0.98	21.0
PKCSN	188.0	200.0	0.0	1.1	0.0	10.2	0.85	11.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
....

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1565.3	1366.0	32976.4	28753.0
76.0	1552.6	1287.3	30542.1	27661.7
77.0	1437.4	1216.6	28207.3	26066.7
78.0	1338.0	1161.2	25166.0	24307.6
79.0	1352.4	1146.5	29006.6	23017.1
80.0	1365.6	1127.0	26647.7	23336.3
81.0	1335.6	1086.7	25076.7	23061.5
82.0	1310.6	1072.6	24474.6	22007.1
83.0	1304.4	1040.1	23643.2	21333.0
84.0	1285.0	1005.3	23076.2	20462.6
85.0	1220.6	953.7	22103.1	19567.6
86.0	1189.6	928.8	21364.8	18718.0
87.0	1158.6	895.2	20860.5	17669.5
88.5	1103.0	845.0	20176.3	16855.4
89.0	1080.4	782.5	18633.1	15830.6
90.0	784.3	587.3	13755.0	11886.7
91.0	738.0	558.1	13170.4	11372.5
92.0	704.6	528.0	12676.7	10780.1
93.0	876.0	487.0	12003.4	10194.6
94.0	643.7	454.2	11344.1	9530.2
95.0	605.3	420.7	10676.1	8801.1
96.0	561.0	393.4	9806.3	8212.0
97.0	508.1	355.1	9102.8	7547.6
98.0	438.6	315.3	8051.4	6807.2
99.0	406.5	283.5	7827.6	6385.6
100.0	383.8	274.1	7136.4	6028.7
101.0	347.5	263.2	6644.7	5591.7
102.0	324.0	227.3	6121.4	5245.4
103.0	281.1	218.7	5855.6	4823.6
108.0	350.3	226.3	6153.6	4901.2
109.0	300.4	194.5	5323.6	4283.2
110.0	250.4	163.4	4454.3	3876.6
111.0	204.9	136.8	3672.3	2875.3
112.0	155.3	106.5	2633.5	2341.3
113.0	107.6	78.8	1964.6	1862.1
114.0	102.6	75.1	1867.3	1679.5
115.0	93.2	66.6	1714.9	1487.1
116.0	83.0	62.4	1614.8	1306.6
117.0	72.6	58.4	1381.8	1198.2
118.0	65.0	50.7	1200.3	1084.9
119.0	58.8	44.5	1083.2	938.8
120.0	40.6	35.8	812.0	782.8

TECTONIC HISTORY FOR CONSTANT-GRAIN HEIGHT
....

INTERV:(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND, SEA LEV CHG (m)	
76.0	75.0	347.	218.	8784.	5448.	138.	47.
80.0	76.0	-18.	24.	647.	970.	-34.	-6.
82.0	76.0	24.	106.	2252.	2876.	-36.	13.
83.0	80.0	51.	81.	1705.	2005.	-2.	18.
85.0	83.0	84.	82.	1780.	1785.	29.	26.
90.0	85.0	458.	276.	8405.	7891.	107.	142.
90.0	82.0	540.	489.	10188.	9368.	225.	189.
91.0	90.0	28.	29.	585.	594.	10.	11.
98.0	91.0	288.	243.	5118.	4558.	139.	102.
103.0	91.0	445.	339.	7816.	6648.	210.	137.
103.0	98.0	147.	97.	2496.	1993.	70.	35.
113.0	108.0	242.	146.	4180.	3219.	113.	47.
120.0	108.0	310.	191.	5342.	4139.	145.	63.
120.0	113.0	67.	44.	1183.	920.	32.	16.

WELL#18. PETROGEN ETAL PEMBINA 7-7-48-7W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY.	NSSS (m)	NETOT (m)	RATE NS SED(m/Ma)
GR	0.550	87.0	130.1	43.37
GR	0.170	162.8	216.1	72.02
LP	0.550	0.0	108.5	31.80
LP	0.170	15.0	117.4	23.40
CARD	0.550	1.3	124.6	83.22
CARD	0.170	2.5	128.0	84.02
BFSC	0.550	6.7	58.0	11.01
BFSC	0.170	12.8	61.0	12.20
MANN	0.550	20.2	77.6	15.58
MANN	0.170	55.2	103.7	20.74
OSTZ	0.550	0.0	23.3	3.33
OSTZ	0.170	16.7	31.2	4.45
RKCK	0.550	5.0	10.0	0.87
RKCK	0.170	10.7	17.0	1.10

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK IN METRES.		CUMULATIVE STRESS IN KILOPA.	
75.0	1606.8	1301.0	29027.4	28585.8
76.0	1617.1	1282.2	28208.3	27752.3
77.0	1351.0	1211.2	26790.7	25836.4
78.0	1305.8	1147.1	25585.2	24224.4
79.0	1321.1	1142.8	25320.1	23844.5
80.0	1316.3	1124.2	24912.8	23366.2
81.0	1298.7	1098.4	23358.8	22813.4
82.0	1283.6	1088.7	23082.2	21821.7
83.0	1277.0	1041.8	22400.4	21240.3
84.0	1220.3	1000.7	22513.1	20357.8
85.0	1100.8	958.0	21573.3	19470.3
86.0	1185.7	923.7	20748.1	18818.2
87.0	1120.5	880.3	19920.0	17780.3
88.0	1157.7	838.6	18808.0	16840.2
89.0	1048.1	757.3	18171.8	15514.2
90.0	720.8	682.1	13100.1	11880.5
91.0	690.6	582.6	12490.7	11283.5
92.0	668.6	522.8	11870.6	10878.6
93.0	638.2	481.4	11209.3	10080.5
94.0	601.8	456.8	10578.8	9413.0
95.0	551.3	422.6	9578.3	8781.0
96.0	514.5	387.4	9073.8	8080.6
97.0	480.6	340.0	8220.3	7431.3
98.0	385.6	308.0	7120.4	6877.8
99.0	365.1	287.4	6848.7	6208.8
100.0	326.7	268.5	6303.8	6000.3
101.0	308.6	247.3	5820.8	5450.2
102.0	272.9	231.4	5213.6	5001.8
103.0	241.1	212.0	4880.3	4708.6
105.0	260.8	210.8	5009.4	4784.8
108.0	241.7	180.1	4384.4	4013.4
110.0	206.3	158.4	3887.6	3518.4
111.0	185.5	132.8	2887.6	2887.4
112.0	131.1	105.2	2408.0	2287.4
113.0	92.4	79.3	1798.8	1688.0
114.0	87.4	73.5	1828.8	1588.4
115.0	80.3	67.2	1502.3	1448.5
116.0	72.3	60.3	1371.8	1282.4
117.0	63.4	54.6	1220.6	1131.1
118.0	57.4	48.4	1084.8	1022.6
119.0	52.1	44.3	966.1	918.6
120.0	38.6	35.5	744.4	782.6

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
75.0	75.0	106.	218.	4352.	5441.	64.	47.
80.0	75.0	-10.	33.	821.	958.	-30.	-7.
83.0	78.0	30.	106.	2136.	2084.	-27.	12.
83.0	80.0	28.	63.	1513.	2026.	-7.	20.
85.0	83.0	80.	83.	1821.	1770.	30.	26.
90.0	85.0	481.	377.	8470.	7810.	190.	142.
90.0	83.0	647.	460.	10300.	9360.	229.	170.
91.0	90.0	30.	28.	808.	587.	11.	11.
95.0	91.0	316.	244.	5361.	4886.	149.	102.
102.0	91.0	450.	340.	7800.	8858.	218.	137.
103.0	95.0	144.	95.	2430.	1872.	88.	38.
113.0	103.0	188.	141.	3303.	2007.	88.	48.
120.0	105.0	244.	184.	4285.	4002.	112.	81.
120.0	113.0	56.	44.	862.	905.	26.	16.

WELL#19. GARVEY DOBB ETAL BELEN 1-13-47-28W4
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PART I: CONSTANT GRAIN HEIGHT
****

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHYSS	/SANDS	/TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
BR	73.0	76.0	0.0	44.7	150.9	195.6	65.20	264.0
LP	76.0	81.0	16.1	94.8	1.6	112.4	22.48	142.0
COLO	81.0	86.5	104.6	0.0	0.0	104.6	19.02	118.0
CARD	86.5	88.0	111.3	0.0	0.0	111.3	74.20	123.4
2WS	88.0	96.0	95.6	0.0	0.0	95.6	11.95	108.2
BFSC	96.0	103.0	35.6	28.1	7.6	71.3	14.26	88.3
MANN	103.0	113.0	0.0	64.1	55.1	119.2	23.84	138.1
OSTZ	113.0	120.0	3.0	27.6	23.1	53.9	7.70	67.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
****

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
73.0	1587.2	1248.8	30110.8	28702.3
76.0	1450.5	1155.8	27685.6	24610.3
77.0	1339.1	1080.8	25540.4	23031.2
78.0	1230.8	1013.3	23306.3	21187.5
79.0	1210.8	984.0	22651.6	20880.0
80.0	1188.4	968.0	22241.0	20044.2
81.0	1146.0	946.8	21488.5	18633.0
82.0	1128.1	927.8	20907.1	18873.0
83.0	1120.6	911.5	20535.1	18320.4
84.0	1112.0	887.8	20062.4	17818.7
85.0	1098.2	863.8	19866.1	17219.8
86.0	1084.0	840.6	19130.8	16671.6
87.0	1062.3	818.4	18601.8	16134.4
88.5	1161.2	787.4	18013.7	15337.7
89.0	1025.6	707.7	17140.8	13818.8
90.0	898.8	636.6	12570.3	10887.6
91.0	881.6	621.0	12244.8	10623.4
92.0	866.2	501.8	11908.3	10240.9
93.0	651.0	482.0	11632.1	9814.7
94.0	632.0	461.2	11140.6	9423.2
95.0	612.0	438.5	10767.3	9024.6
96.0	588.5	417.1	10312.1	8881.2
97.0	563.6	394.0	9846.4	8132.4
98.0	538.2	370.3	9309.2	7882.8
99.0	487.0	330.7	8778.7	7190.6
100.0	445.1	307.8	7995.5	6607.8
101.0	395.4	280.8	7268.6	6104.5
102.0	366.5	251.2	6761.3	5687.3
103.0	326.4	233.4	6081.6	5142.1
108.0	302.5	241.5	6780.0	5223.6
109.0	336.6	206.6	5793.6	4478.7
110.0	280.6	171.8	4880.6	3780.2
111.0	222.0	138.7	3878.5	3018.4
112.0	173.4	108.6	3088.1	2382.6
113.0	123.4	78.3	2114.3	1630.0
114.0	105.8	64.8	1814.0	1308.8
115.0	88.2	53.2	1548.4	1102.6
116.0	74.0	43.2	1282.4	851.6
117.0	56.4	32.3	962.1	698.4
118.0	33.3	18.8	610.5	461.2
119.0	17.0	9.3	312.4	234.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT
****

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	73.0	350.	237.	5724.	5615.	149.	86.
80.0	76.0	45.	44.	1145.	1143.	0.	0.
82.0	78.0	101.	102.	2851.	2858.	13.	13.
83.0	80.0	57.	57.	1708.	1715.	4.	4.
85.0	82.0	33.	48.	987.	1110.	4.	13.
90.0	85.0	490.	324.	8892.	6232.	184.	122.
90.0	83.0	433.	372.	7858.	7342.	187.	145.
91.0	90.0	15.	18.	331.	365.	6.	7.
98.0	91.0	142.	151.	2846.	2930.	55.	60.
103.0	91.0	355.	288.	6163.	5480.	105.	116.
103.0	98.0	243.	137.	3217.	2550.	110.	56.
113.0	108.0	270.	185.	4848.	3585.	127.	54.
120.0	108.0	304.	241.	5780.	5224.	185.	80.
120.0	113.0	123.	78.	2114.	1630.	56.	30.

WELL#10. GARVEY ERAS ETAL BOLEN 1-12-47-20W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.550	89.7	134.4	44.80
BR	0.170	160.2	213.0	71.31
LP	0.550	0.6	111.5	22.31
LP	0.170	1.6	112.4	22.48
BFSC	0.550	6.7	70.4	14.08
BFSC	0.170	12.6	76.3	15.27
MANN	0.550	26.2	92.2	18.45
MANN	0.170	53.1	117.2	23.44
OSTZ	0.550	10.0	41.5	6.04
OSTZ	0.170	20.5	51.2	7.33

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1446.5	1346.2	27705.6	25822.1
76.0	1351.5	1156.6	25650.4	24055.4
77.0	1270.7	1064.1	24400.3	22875.0
78.0	1213.0	1010.1	23501.4	21120.6
79.0	1181.0	990.7	22417.6	20082.0
80.0	1164.7	966.5	21621.4	19974.0
81.0	1128.1	941.4	21006.7	19361.9
82.0	1107.9	924.3	20451.2	18800.4
83.0	1106.5	906.0	20100.6	18255.2
84.0	1048.5	884.0	19836.3	17740.8
85.0	1073.0	860.2	19103.3	17142.2
86.0	1059.0	838.6	18850.0	16502.0
87.0	1088.9	814.5	18304.0	16053.4
88.5	1124.2	783.6	18488.4	15284.1
89.0	996.0	703.0	15907.2	13834.0
90.0	957.0	635.4	13022.0	10861.6
91.0	851.5	616.6	11672.4	10634.3
92.0	634.7	497.0	11312.6	10156.0
93.0	616.1	477.6	10908.2	9722.0
94.0	597.6	456.7	10510.1	9320.5
95.0	575.0	435.0	10102.6	8920.3
96.0	550.0	412.5	9521.6	8483.0
97.0	524.0	389.3	9126.3	8032.3
98.0	497.2	366.5	8647.1	7501.6
99.0	453.6	333.3	8005.5	7017.5
100.0	401.0	297.5	7200.0	6404.4
101.0	340.1	270.0	6434.3	5976.3
102.0	316.1	249.0	5851.6	5410.0
103.0	276.6	231.0	5252.5	5021.4
105.0	226.0	236.4	5077.0	5097.9
108.0	253.2	200.1	4832.4	4403.4
110.0	233.4	188.3	4053.5	3938.3
111.0	180.1	133.5	3345.5	3033.0
112.0	143.3	103.3	2808.0	2288.6
113.0	103.6	73.4	1783.3	1870.6
114.0	90.0	62.4	1558.5	1388.7
115.0	76.1	51.4	1321.5	1141.6
116.0	60.7	41.6	1073.0	895.6
117.0	48.0	31.3	851.5	711.1
118.0	36.6	17.6	618.0	414.1
119.0	13.5	6.6	242.4	206.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	75.0	236.	236.	4714.	5501.	80.	86.
80.0	76.0	47.	45.	1170.	1146.	11.	9.
82.0	76.0	104.	102.	2591.	2566.	14.	14.
83.0	80.0	56.	55.	1721.	1718.	3.	5.
85.0	83.0	36.	46.	897.	1113.	5.	13.
90.0	85.0	405.	325.	7070.	8241.	168.	132.
90.0	83.0	440.	373.	8077.	7384.	191.	145.
91.0	90.0	19.	19.	282.	307.	6.	7.
95.0	91.0	184.	181.	3025.	2942.	61.	60.
103.0	91.0	373.	350.	6420.	5603.	176.	119.
102.0	96.0	210.	136.	3306.	2860.	114.	55.
113.0	105.0	225.	182.	3005.	3516.	105.	53.
120.0	105.0	336.	336.	5976.	5996.	153.	78.
120.0	113.0	103.	73.	1783.	1580.	46.	26.

WELL#20. BEST STAL BITTERN 10-12-46-22W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
LP	76.0	83.0	87.2	42.1	0.0	129.3	26.07	186.1
GOLO	83.0	88.5	78.2	0.0	0.0	78.2	14.40	84.5
CARD	88.5	90.0	91.4	0.0	0.0	91.4	80.94	108.1
2WS	90.0	98.0	75.2	0.0	0.0	75.2	9.41	88.0
BFSC	98.0	103.0	42.2	30.5	4.0	77.7	15.54	88.1
MANN	108.0	113.0	30.1	55.5	22.5	108.1	21.82	132.5
LMANN	113.0	120.0	17.0	45.4	38.8	101.2	14.46	128.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
76.0	1340.3	1083.6	24431.6	21636.1
79.0	1326.1	1061.0	23886.6	21486.8
80.0	1304.0	1026.8	23217.7	20413.7
81.0	1282.1	988.0	22372.6	19881.6
82.0	1206.7	942.1	21391.0	18717.7
83.0	1130.1	884.8	20161.3	17768.4
84.0	1118.0	870.4	19838.8	17388.4
85.0	1108.2	854.0	19488.2	16947.8
86.0	1101.0	838.0	19183.7	16616.0
87.0	1104.4	822.6	18880.7	16133.2
88.5	1188.6	788.1	18217.6	15404.8
89.0	1088.9	731.4	17836.5	14328.8
90.0	774.4	682.3	13730.3	11888.0
91.0	764.3	677.8	13498.9	11818.0
92.0	757.0	663.4	13290.8	11333.5
93.0	748.3	648.0	13020.7	10887.8
94.0	736.8	632.0	12773.7	10704.0
95.0	724.2	618.5	12478.0	10386.0
96.0	710.6	498.7	12173.3	10031.8
97.0	697.2	481.4	11873.0	9884.0
98.0	687.1	463.8	11610.2	9384.3
99.0	630.1	430.3	10847.8	8788.8
100.0	573.8	388.7	9974.7	8178.7
101.0	520.0	370.3	9277.5	7673.7
102.0	482.2	340.6	8651.8	7170.8
103.0	443.4	321.2	7872.2	6838.5
105.0	535.6	330.3	8808.6	6821.5
108.0	511.3	310.4	8240.2	6210.3
110.0	453.4	272.4	7308.1	5477.2
111.0	380.7	230.0	6183.0	4871.4
112.0	323.1	198.3	5384.8	4002.7
113.0	273.3	182.1	4388.2	3273.7
114.0	247.3	139.0	3940.8	2858.8
115.0	197.8	112.2	3164.8	2303.0
116.0	150.8	87.4	2481.0	1842.8
117.0	117.3	68.2	1890.0	1383.7
118.0	87.0	42.7	1387.6	930.7
119.0	34.8	16.5	587.0	432.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	76.0	38.	57.	1214.	1424.	-1.	13.
83.0	76.0	210.	180.	4270.	4053.	76.	84.
83.0	80.0	174.	132.	3056.	2826.	60.	50.
85.0	83.0	31.	27.	575.	536.	-0.	11.
90.0	85.0	336.	288.	5747.	5050.	157.	110.
90.0	83.0	358.	303.	6422.	5887.	167.	121.
91.0	90.0	10.	14.	240.	281.	3.	6.
98.0	91.0	77.	114.	1868.	2263.	19.	44.
102.0	91.0	331.	257.	5826.	4078.	147.	103.
103.0	98.0	244.	142.	3737.	2718.	128.	58.
113.0	108.0	263.	177.	4411.	3848.	128.	68.
120.0	108.0	530.	330.	8807.	6622.	264.	128.
120.0	113.0	273.	162.	4308.	3274.	137.	81.

WELL#20. BOSS STAL BITTERN 10-13-40-22W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE NS SED(m/Ma)
LP	0.500	0.7	130.1	26.03
LP	0.170	1.3	130.7	26.14
DFSC	0.500	2.7	76.5	15.06
DFSC	0.170	8.1	77.8	15.57
MANN	0.500	12.4	80.1	10.01
MANN	0.170	25.3	110.0	22.10
LMANN	0.500	22.4	85.2	12.18
LMANN	0.170	43.0	105.4	15.06

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK (in metres)		CUMULATIVE STRESS (in kiloPa)	
78.0	1332.5	1063.4	24008.4	21634.1
79.0	1300.7	1061.2	23544.6	21221.8
80.0	1284.7	1036.6	23604.4	20416.4
81.0	1243.3	980.1	23011.0	19581.6
82.0	1166.4	942.1	21021.4	18716.7
83.0	1105.4	886.6	19783.3	17761.6
84.0	1097.2	876.2	19447.6	17306.4
85.0	1087.1	867.6	19066.6	16843.6
86.0	1070.1	830.7	18751.7	16511.6
87.0	1080.7	833.4	18856.6	16120.2
88.0	1141.7	797.8	18774.7	15490.4
89.0	1031.6	731.1	17176.8	14332.2
90.0	748.1	601.0	13278.3	11862.6
91.0	737.0	577.7	13021.8	11612.5
92.0	728.0	583.2	12700.2	11330.0
93.0	710.1	547.6	12612.0	10882.8
94.0	708.5	531.6	12361.0	10700.1
95.0	682.6	516.3	11837.1	10363.4
96.0	678.0	486.4	11016.1	10026.7
97.0	662.3	461.3	11306.6	9886.7
98.0	651.5	463.7	11010.1	9348.4
99.0	601.7	430.0	10284.0	8782.5
100.0	541.5	386.3	9384.4	8188.7
101.0	482.6	370.1	8628.8	7886.6
102.0	484.5	348.3	8036.6	7174.6
103.0	407.2	320.0	7287.4	6832.9
108.0	403.3	336.8	6086.9	6614.7
109.0	461.7	313.7	7487.4	6320.4
110.0	416.7	272.0	6657.0	5458.0
111.0	342.0	230.1	5800.0	4660.5
112.0	308.6	198.1	4788.8	3988.7
113.0	240.4	183.0	3678.6	3388.5
114.0	221.1	138.5	3488.0	2781.3
115.0	178.0	100.2	2648.6	2288.6
116.0	135.5	88.5	2221.5	1774.2
117.0	104.0	68.3	1872.0	1348.0
118.0	77.0	46.0	1220.6	940.7
119.0	38.0	19.2	807.5	433.0
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	38.	57.	1232.	1420.	-0.	13.
83.0	78.0	213.	180.	4313.	4053.	80.	84.
83.0	80.0	175.	122.	3081.	3033.	80.	81.
85.0	83.0	22.	27.	684.	638.	1.	11.
90.0	85.0	338.	266.	5800.	5050.	100.	110.
90.0	83.0	361.	302.	6607.	5608.	180.	121.
91.0	90.0	13.	14.	254.	281.	3.	8.
98.0	91.0	86.	114.	2012.	2263.	22.	44.
103.0	91.0	330.	287.	5755.	4880.	152.	102.
103.0	98.0	244.	143.	3743.	2717.	120.	58.
113.0	108.0	253.	177.	4217.	3548.	122.	67.
120.0	108.0	403.	330.	8086.	6815.	243.	128.
120.0	113.0	240.	162.	3878.	3288.	121.	61.

WELL#21, QUINTANA PURED WAVY LAKE 7-4-88-15W4

PART 1: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
LP	78.0	83.0	132.5	0.0	0.0	132.5	26.51	160.5
COLO	83.0	86.0	144.2	0.0	0.0	144.2	20.60	170.0
3WS	90.0	95.0	46.3	0.0	0.0	46.3	8.04	56.7
BFSC	95.0	102.0	78.6	0.0	0.0	78.6	15.70	95.7
MANN	108.0	113.0	21.6	30.3	35.4	87.2	17.44	109.4
LMANN	113.0	120.0	6.1	8.7	10.1	25.0	3.70	33.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in KiloPa.	
78.0	1238.6	932.8	21044.4	17984.3
79.0	1161.5	886.4	20032.0	17061.2
80.0	1124.0	839.4	19021.2	16148.3
81.0	1065.8	791.8	17982.2	15224.2
82.0	1000.2	742.5	16867.1	14283.0
83.0	927.0	683.0	15687.3	13238.5
84.0	884.5	656.1	15026.0	12716.0
85.0	837.0	616.8	14107.4	11904.8
86.0	791.4	581.3	13316.8	11185.4
87.0	744.0	542.8	12408.3	10462.0
88.5	683.0	491.8	11168.6	9326.0
89.0	628.1	450.3	10637.0	8940.5
90.0	541.5	410.4	9412.0	8148.1
91.0	537.5	408.1	9274.4	7987.5
92.0	533.5	399.7	9147.4	7708.7
93.0	528.5	391.2	9015.1	7627.6
94.0	524.7	382.7	8884.7	7420.6
95.0	521.7	374.2	8743.5	7283.2
96.0	520.7	365.8	8612.0	7047.3
97.0	523.4	357.6	8580.2	6884.6
98.0	525.7	349.5	8552.3	6671.5
99.0	461.0	317.0	7886.7	6108.7
100.0	442.5	303.7	7094.6	5490.1
101.0	383.1	249.5	6334.6	4884.0
102.0	328.0	213.7	5432.4	4280.1
103.0	248.6	178.5	4344.0	3610.5
108.0	310.6	187.3	4973.7	3725.0
109.0	265.6	156.5	4274.0	3178.6
110.0	220.6	131.2	3818.5	2612.3
111.0	167.8	97.7	2687.1	1978.0
112.0	128.0	71.4	1904.4	1436.6
113.0	86.0	41.4	1081.9	836.6
114.0	68.5	35.0	961.0	733.6
115.0	50.7	30.0	848.9	648.5
116.0	44.0	26.3	704.4	610.7
117.0	37.5	21.3	585.4	431.9
118.0	32.6	16.6	472.1	308.1
119.0	20.5	8.0	308.7	182.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (KiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	115.	83.	3023.	1808.	53.	26.
83.0	78.0	312.	240.	5347.	4626.	147.	67.
83.0	80.0	107.	147.	2324.	2817.	64.	60.
85.0	83.0	90.	74.	1890.	1624.	41.	30.
90.0	85.0	305.	203.	4605.	3756.	150.	87.
90.0	83.0	365.	276.	6265.	5161.	181.	116.
91.0	90.0	4.	6.	136.	181.	-0.	3.
95.0	91.0	2.	50.	722.	1206.	-21.	10.
102.0	91.0	280.	221.	4820.	4348.	137.	97.
103.0	95.0	267.	173.	4206.	3052.	157.	76.
113.0	108.0	244.	148.	3882.	2880.	124.	67.
120.0	108.0	311.	187.	4974.	3730.	157.	72.
120.0	113.0	87.	41.	1082.	637.	33.	16.

WELL#21, QUINTANA PUBCO NAVY LAKE 7-4-48-10W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
MANN	0.500	18.0	75.7	15.88
MANN	0.170	24.1	90.9	16.18
LMANN	0.500	8.0	21.7	3.10
LMANN	0.170	11.1	30.0	2.48

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1228.5	932.0	20685.7	17884.2
79.0	1171.0	880.4	19838.0	17061.1
80.0	1112.2	830.4	18821.0	16146.1
81.0	1084.3	781.6	17788.6	15224.1
82.0	986.8	742.0	16876.0	14283.6
83.0	916.0	682.6	15480.1	13328.5
84.0	873.5	650.1	16005.6	12710.0
85.0	834.1	616.0	15877.7	11004.4
86.0	778.2	581.3	13082.4	11108.2
87.0	730.3	542.6	12288.2	10482.6
88.5	646.4	481.6	10805.1	9328.5
89.0	612.6	460.3	10380.4	8980.7
90.0	620.4	416.4	9147.0	8148.0
91.0	621.6	408.1	9002.0	7867.4
92.0	617.3	390.7	8887.1	7788.6
93.0	611.6	381.3	8720.6	7627.4
94.0	607.4	382.7	8557.6	7420.6
95.0	603.6	374.2	8437.7	7253.1
96.0	602.3	366.4	8307.0	7067.1
97.0	604.3	357.6	8235.7	6884.6
98.0	616.0	340.5	8217.0	6871.3
99.4	470.6	317.0	7532.1	6108.6
100.0	421.3	283.7	6738.1	5488.9
101.0	371.1	240.6	6007.6	4683.6
102.0	306.1	212.7	5083.6	4283.6
103.0	226.0	176.6	3853.2	3818.3
108.0	263.4	197.2	4512.3	2728.4
109.0	242.4	156.5	3838.2	3152.6
110.0	206.4	132.3	3270.0	2024.0
111.0	181.6	87.6	2441.1	1876.7
112.0	116.8	70.2	1780.6	1426.3
113.0	80.8	41.2	955.3	838.4
114.0	61.5	36.2	620.9	727.7
115.0	44.6	31.2	744.7	648.4
116.0	40.1	26.7	600.5	614.4
117.0	36.0	21.7	487.1	436.2
118.0	30.3	17.1	448.0	312.0
119.0	17.5	9.4	232.3	195.9
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	115.	83.	2034.	1600.	52.	38.
83.0	78.0	310.	240.	5378.	4626.	147.	97.
83.0	80.0	186.	147.	3342.	2817.	88.	60.
85.0	83.0	91.	74.	1602.	1424.	41.	30.
90.0	85.0	286.	203.	4730.	3758.	152.	87.
90.0	83.0	380.	276.	6332.	5181.	183.	118.
91.0	90.0	5.	8.	148.	181.	0.	3.
98.0	91.0	8.	58.	784.	1298.	-18.	19.
103.0	91.0	387.	231.	5040.	4348.	141.	87.
103.0	98.0	381.	173.	4285.	3052.	158.	78.
113.0	108.0	328.	146.	3687.	2800.	118.	87.
120.0	108.0	283.	187.	4512.	2728.	144.	72.
120.0	113.0	88.	41.	855.	838.	28.	18.

WELL032. HUSKY D.H. WAINWR 6-3-45-8W4
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PART I: CONSTANT GRAIN HEIGHT
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FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHYSS	/SANDS	/TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
COLO	83.0	90.0	80.1	0.0	0.0	80.1	11.44	114.3
JWG	90.0	95.0	28.2	0.0	0.0	28.2	5.65	38.5
BFSC	95.0	103.0	71.1	0.0	0.0	71.1	14.22	96.8
MANN	103.0	113.0	10.1	5.0	15.3	30.4	7.06	40.7
LMANN	113.0	120.0	5.0	2.8	8.4	16.3	2.39	22.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
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TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	645.4	452.7	10321.3	8304.1
84.0	617.7	421.4	9805.3	8008.6
85.0	588.0	408.8	9352.3	7571.6
86.0	556.6	385.0	8805.3	7100.3
87.0	523.6	362.7	8349.5	6721.6
88.0	486.3	327.1	7800.6	6073.6
89.0	447.4	318.0	7320.1	5881.5
90.0	385.3	300.4	6817.7	5417.6
91.0	388.2	268.4	6487.3	5327.0
92.0	387.1	286.3	6360.0	5300.0
93.0	386.4	278.2	6326.7	5112.4
94.0	386.4	270.1	6384.8	4988.6
95.0	387.6	265.1	6300.0	4868.6
96.0	401.6	260.2	6316.8	4786.3
97.0	410.3	255.4	6233.4	4657.5
98.0	428.0	250.7	6340.1	4548.6
99.0	380.4	218.0	5826.0	4004.0
100.0	327.6	188.7	4880.8	3454.4
101.0	270.4	153.7	4074.0	2855.7
102.0	202.6	118.0	3127.1	2201.3
103.0	121.0	85.3	2060.5	1688.0
108.0	140.5	85.0	2250.3	1736.6
109.0	128.5	78.1	2031.3	1528.3
110.0	122.4	70.2	1880.0	1330.5
111.0	103.1	56.0	1553.5	1005.0
112.0	78.5	43.1	1108.7	848.0
113.0	53.3	30.5	702.5	552.3
114.0	41.4	24.0	652.0	506.6
115.0	38.6	21.0	613.1	435.0
116.0	27.1	15.6	480.0	343.2
117.0	21.3	11.8	358.1	283.6
118.0	16.8	8.4	247.3	184.4
119.0	8.8	4.8	145.1	82.8
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT
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INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	57.	45.	640.	633.	28.	18.
90.0	85.0	188.	118.	2885.	2184.	100.	82.
90.0	83.0	246.	163.	3814.	2077.	128.	71.
91.0	90.0	1.	5.	80.	80.	-9.	2.
95.0	91.0	-30.	35.	127.	770.	-34.	11.
103.0	91.0	277.	200.	4408.	3020.	141.	88.
103.0	95.0	307.	165.	4280.	2850.	175.	77.
113.0	103.0	88.	59.	1483.	1174.	43.	23.
120.0	103.0	140.	80.	2286.	1720.	71.	35.
120.0	113.0	52.	30.	703.	552.	26.	12.

WELL#22. HUSKY D.H. WAINWR 6-8-45-6W4
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PART III: VARIABLE SS GRAIN HEIGHT
....

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
MANN	0.550	9.8	20.7	5.92
MANN	0.170	18.6	36.3	7.87
LMANN	0.660	4.0	13.9	1.86
LMANN	0.170	7.6	17.6	3.60

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT
....

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	638.2	452.8	10303.6	8383.4
84.0	610.3	431.4	9751.3	8000.1
85.0	580.4	408.3	9247.7	7871.0
86.0	546.6	385.6	8757.0	7188.6
87.0	518.6	362.7	8307.4	6721.1
88.5	488.7	337.0	7382.6	6073.1
89.0	438.7	314.0	7070.1	5861.1
90.0	390.4	290.4	6363.6	5416.6
91.0	386.0	285.3	6306.0	5327.1
92.0	387.5	280.3	6218.1	5200.1
93.0	388.5	275.3	6169.4	5111.5
94.0	386.2	270.1	6082.5	4986.0
95.0	387.2	265.0	6032.1	4888.0
96.0	390.0	260.1	6023.[illegible]	4784.5
97.0	393.3	255.3	6046.4	4687.0
98.0	416.5	250.6	6147.8	4547.7
99.0	366.6	218.0	5438.9	4004.0
100.0	318.7	185.7	4677.1	3483.4
101.0	257.8	153.6	3865.0	2694.6
102.0	188.0	110.6	3010.0	2200.3
103.0	107.8	85.3	1636.8	1888.6
108.0	128.1	66.0	1898.2	1734.6
109.0	118.1	70.8	1802.1	1538.6
110.0	106.8	71.6	1632.5	1382.7
111.0	93.8	50.0	1383.0	1106.0
112.0	67.8	43.1	1014.8	848.0
113.0	47.2	30.6	711.4	682.5
114.0	28.8	23.6	622.0	481.4
115.0	34.7	20.6	517.3	387.4
116.0	24.4	14.6	412.8	235.9
117.0	18.0	11.6	288.6	223.0
118.0	14.4	8.9	225.2	170.0
119.0	8.7	4.9	134.1	85.8
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT
....

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
86.0	83.0	86.	45.	988.	832.	28.	18.
90.0	85.0	190.	118.	2884.	[illegible]	101.	52.
90.0	83.0	248.	163.	2640.	[illegible]	128.	71.
91.0	90.0	1.	5.	86.	[illegible]	-0.	2.
95.0	91.0	-28.	35.	161.	[illegible]	-33.	11.
102.0	91.0	281.	200.	4472.	[illegible]	143.	88.
102.0	98.0	309.	188.	4311.	[illegible]	176.	77.
112.0	108.0	78.	60.	1285.	1172.	28.	23.
120.0	103.0	125.	80.	1006.	1738.	63.	38.
120.0	113.0	47.	30.	711.	583.	25.	12.

WELL#23. ANDERSON ETAL MCLAUGHLIN 10-23-46-2W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
COLO	83.0	90.0	54.1	6.4	0.0	60.4	8.64	85.1
2WS	90.0	95.0	25.8	1.7	0.0	27.5	3.44	81.6
BFSC	95.0	103.0	52.7	3.0	0.0	55.8	13.13	93.6
MANN	105.0	113.0	21.6	38.2	16.2	76.0	15.21	190.4
LMANN	113.0	120.0	0.0	4.8	8.6	13.4	1.92	10.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	852.0	481.5	10582.2	8857.0
84.0	830.8	444.3	10237.5	8355.8
85.0	807.5	427.0	9871.3	8047.8
86.0	582.3	409.3	9452.4	7703.8
87.0	554.8	391.5	9041.4	7353.3
88.5	508.1	364.3	8321.3	6888.5
89.0	502.3	357.6	8230.7	6764.2
90.0	473.7	340.6	7780.0	6434.8
91.0	478.1	336.4	7754.1	6341.9
92.0	474.9	331.1	7707.4	6253.6
93.0	474.1	325.8	7630.2	6132.1
94.0	474.4	320.7	7588.3	6018.4
95.0	478.4	315.4	7585.1	5923.5
96.0	480.5	310.1	7528.0	5807.0
97.0	488.2	305.2	7538.3	5890.4
98.0	502.9	300.1	7820.1	5571.4
99.0	457.3	270.6	6849.0	5083.3
100.0	407.7	240.7	6235.1	4548.2
101.0	358.0	211.0	5533.8	4047.0
102.0	298.4	181.0	4702.9	3517.2
103.0	225.2	150.3	3767.1	2970.1
105.0	249.8	156.5	4370.4	3033.0
108.0	231.5	125.0	3854.0	2478.2
110.0	179.0	97.2	2773.8	1947.3
111.0	131.0	71.3	2057.1	1453.4
112.0	82.0	47.5	1422.9	973.8
113.0	34.2	20.0	880.3	418.7
114.0	28.3	16.9	487.5	372.1
115.0	22.2	13.7	394.4	308.9
116.0	17.0	10.9	300.3	248.6
117.0	12.8	8.2	232.1	188.1
118.0	8.8	5.6	184.2	122.2
119.0	4.3	2.8	78.0	61.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
85.0	83.0	45.	35.	711.	800.	23.	18.
90.0	85.0	134.	66.	2091.	1813.	88.	37.
90.0	83.0	178.	121.	2802.	2222.	92.	52.
91.0	90.0	-2.	4.	26.	92.	-3.	1.
95.0	91.0	-27.	38.	134.	771.	-31.	12.
103.0	91.0	247.	188.	3087.	3372.	124.	83.
103.0	95.0	274.	150.	3853.	2501.	155.	89.
113.0	105.0	258.	137.	3418.	2816.	135.	66.
120.0	105.0	290.	157.	4378.	3033.	164.	83.
120.0	113.0	34.	20.	580.	417.	17.	7.

WELL#23. ANDERSON ETAL MCLAUGHLIN 10-22-48-2W4

PART II: VARIABLE SS GRAIN WEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
MANN	0.550	9.4	70.2	14.05
MANN	0.170	17.7	76.5	15.71
LMANN	0.550	5.4	10.2	1.45
LMANN	0.170	10.1	14.8	2.13

BURIAL HISTORY FOR VARIABLE SS GRAIN WEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
83.0	644.4	481.4	10446.4	8854.2
84.0	622.7	444.3	10088.1	8383.6
85.0	599.3	428.6	9728.1	8042.9
86.0	573.9	400.1	9306.1	7700.6
87.0	546.9	381.3	8880.1	7390.3
88.5	490.5	364.1	8163.8	6886.4
89.0	483.0	357.8	8070.0	6757.2
90.0	464.1	340.3	7816.6	6430.5
91.0	488.3	330.3	7585.4	6330.8
92.0	484.6	331.0	7533.0	6281.4
93.0	482.6	326.6	7451.8	6126.7
94.0	483.5	320.4	7384.8	6010.8
95.0	485.2	316.2	7366.4	6024.8
96.0	480.0	308.8	7330.0	5803.4
97.0	476.3	304.8	7330.8	5884.6
98.0	460.6	300.0	7414.5	5567.7
99.0	444.5	270.3	6737.3	5058.3
100.0	394.5	240.6	6017.0	4544.3
101.0	346.4	211.6	5300.1	4062.0
102.0	284.3	180.8	4471.0	3511.1
103.0	214.6	180.0	3527.8	2864.7
105.0	271.7	156.2	4060.4	3027.2
108.0	216.1	124.4	3299.0	2469.7
110.0	166.4	98.5	2862.4	1936.0
111.0	120.0	71.1	1852.7	1424.8
112.0	83.6	48.4	1270.3	970.6
113.0	27.6	20.0	455.0	416.7
114.0	23.1	16.5	304.6	388.0
115.0	18.5	13.1	314.6	301.6
116.0	13.7	10.3	284.3	218.8
117.0	9.0	7.7	174.2	183.3
118.0	6.6	5.1	115.3	107.8
119.0	3.3	2.6	57.1	52.1
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN WEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV. CHG (m)	
85.0	83.0	45.	35.	716.	610.	23.	18.
90.0	85.0	136.	86.	2112.	1613.	70.	37.
90.0	83.0	180.	121.	2831.	2224.	93.	52.
91.0	90.0	-2.	4.	30.	91.	-3.	1.
98.0	91.0	-24.	28.	171.	772.	-30.	13.
103.0	91.0	252.	166.	4058.	3376.	126.	62.
103.0	98.0	276.	150.	3887.	2603.	156.	70.
113.0	105.0	244.	136.	3634.	2611.	132.	56.
120.0	105.0	272.	156.	4059.	3027.	145.	63.
120.0	113.0	28.	20.	455.	417.	14.	7.

WELL#24. SINCLAIR ETAL RICINUS 7-30-35-TW5
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PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHYSS	/SANDS	/TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
BR	75.0	78.0	42.6	81.5	107.8	232.7	80.88	277.1
LP	78.0	83.0	119.3	0.0	0.0	119.3	23.88	125.8
COLO	83.0	88.5	244.4	0.0	0.0	244.4	44.44	258.7
CARD	88.5	90.0	128.0	2.8	10.8	138.7	83.16	148.8
2WS	90.0	98.0	148.3	0.0	0.0	148.3	18.20	188.6
SPSC	98.0	103.0	48.4	16.9	5.0	70.4	14.07	75.8
MANN	108.0	113.0	11.8	87.4	40.1	139.3	27.87	153.3
LMANN	113.0	120.0	35.4	26.9	18.4	82.7	11.82	100.0
FRN	146.0	200.0	11.8	2.8	8.8	23.5	0.45	24.7

BURIAL HISTORY FOR [illegible]T GRAIN HEIGHT

TIME (Ma)	CUMULATIVE TH[illegible] in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	2101.7	1728.8	41087.8	37270.4
76.0	1927.2	1818.7	38018.3	34878.1
77.0	1782.2	1527.2	35242.8	32887.0
78.0	1648.1	1442.3	33557.4	30477.8
79.0	1638.9	1423.4	32074.1	29888.8
80.0	1626.3	1405.4	31574.8	29342.7
81.0	1628.5	1380.8	31191.0	28788.7
82.0	1639.8	1378.8	30938.8	28380.2
83.0	1682.7	1388.4	30928.3	27733.1
84.0	1628.1	1308.5	29683.8	26404.3
85.0	1570.0	1242.3	28358.8	25047.8
86.0	1512.0	1177.2	27008.8	23824.3
87.0	1447.8	1110.3	25846.5	22238.7
88.5	1309.1	1009.7	23919.7	20076.4
89.0	1283.1	877.2	23093.2	18487.8
90.0	928.3	728.8	18946.9	14907.8
91.0	907.3	888.3	18472.8	14359.8
92.0	878.7	858.2	18880.8	13734.1
93.0	853.8	837.1	18328.2	13138.1
94.0	823.3	803.9	14887.0	12470.8
95.0	777.7	568.8	13834.4	11832.8
96.0	728.3	532.8	13112.8	11187.3
97.0	887.0	498.3	12103.8	10488.8
98.0	881.1	488.1	11112.5	9779.3
99.0	561.5	442.5	10808.5	9408.7
100.0	558.0	428.8	10403.4	9085.8
101.0	528.8	404.1	9898.3	8538.8
102.0	488.2	378.1	8301.4	8058.8
103.0	454.9	350.8	8880.1	7528.2
108.0	588.4	372.9	9727.3	7781.5
109.0	497.0	327.8	8881.1	8888.7
110.0	484.1	294.1	7687.1	8070.0
111.0	382.8	282.2	8802.7	8194.8
112.0	332.4	214.2	8872.3	4377.4
113.0	273.8	174.9	4494.8	3408.8
114.0	226.8	152.4	3948.8	3108.7
115.0	202.1	132.8	3400.8	2887.8
116.0	178.4	115.4	3075.9	2328.8
117.0	182.4	98.8	2818.2	1870.0
118.0	123.8	74.8	2058.9	1881.2
119.0	74.2	48.1	1337.8	1084.8
120.0	30.0	28.4	885.9	889.8

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TRT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	454.	288.	8800.	8793.	181.	76.
80.0	78.0	22.	37.	883.	1138.	-8.	2.
83.0	78.0	-38.	78.	1828.	2745.	-88.	-9.
83.0	80.0	-88.	39.	848.	1810.	-78.	-11.
88.0	83.0	113.	124.	2871.	2888.	33.	41.
90.0	88.0	842.	818.	11414.	10140.	288.	202.
90.0	83.0	764.	840.	13884.	12828.	322.	244.
91.0	90.0	21.	28.	473.	848.	8.	11.
98.0	91.0	318.	238.	8358.	4881.	181.	98.
103.0	91.0	482.	348.	7892.	8834.	209.	137.
103.0	98.0	138.	109.	2832.	2283.	58.	38.
113.0	108.0	288.	199.	8233.	4283.	133.	87.
120.0	108.0	838.	348.	9041.	7082.	289.	128.
120.0	113.0	243.	147.	3808.	2828.	128.	88.

WELL#34. SINCLAIR ETAL RICINUS 7-30-36-TW5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.550	55.1	180.6	53.28
BR	0.170	104.0	238.7	75.55
CARD	0.550	5.6	134.2	89.46
CARD	0.170	10.1	138.9	92.62
BFSC	0.550	2.7	65.0	13.60
BFSC	0.170	5.1	70.4	14.08
MANN	0.550	20.1	110.3	22.66
MANN	0.170	37.9	127.2	27.43
LMANN	0.550	10.7	75.1	10.72
LMANN	0.170	20.3	84.6	12.08
FRN	0.550	4.0	16.7	0.38
FRN	0.170	7.5	22.3	0.43

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1853.4	1717.1	39012.5	37055.3
76.0	1838.4	1598.2	36444.5	34852.9
77.0	1728.7	1510.1	34208.4	33484.0
78.0	1527.8	1439.6	32164.1	30428.3
79.0	1617.6	1420.5	31655.5	30842.1
80.0	1504.3	1402.6	31140.5	28287.7
81.0	1603.3	1287.1	30740.2	28743.0
82.0	1614.4	1373.9	30459.6	28222.1
83.0	1587.2	1303.6	30441.1	27673.4
84.0	1601.3	1302.8	28165.9	26343.1
85.0	1541.6	1230.3	27838.5	24984.6
86.0	1482.3	1174.2	26453.6	23559.6
87.0	1416.3	1107.2	25088.5	22173.1
88.5	1357.0	1005.5	23304.5	20006.7
89.0	1247.7	923.6	21451.7	18435.3
90.0	903.5	724.2	18480.5	14557.2
91.0	882.0	685.6	18000.4	14308.0
92.0	852.3	665.7	15373.0	13680.9
93.0	826.1	634.5	14818.9	13063.6
94.0	784.7	601.2	14164.1	12416.6
95.0	747.6	565.0	13301.4	11766.3
96.0	604.2	529.9	12549.4	11108.3
97.0	624.6	483.3	11509.5	10408.2
98.0	557.5	455.1	10507.4	9717.0
99.0	527.3	439.5	9957.0	9320.6
100.0	522.7	425.5	9786.5	9022.0
101.0	501.3	401.0	9263.4	8471.1
102.0	481.0	378.6	8502.7	7988.0
103.0	417.1	367.2	7925.5	7455.5
105.0	515.0	370.0	8550.5	7570.0
108.0	454.1	324.3	7651.6	5700.3
110.0	411.2	300.5	6959.4	6019.6
111.0	380.5	260.2	6005.4	5150.2
112.0	306.7	211.6	5141.3	4305.2
113.0	255.3	174.4	4211.1	3457.5
114.0	226.1	151.2	3726.2	3087.9
115.0	191.7	131.4	3212.6	2690.5
116.0	170.9	114.7	2603.1	2305.5
117.0	153.0	98.5	2453.2	1958.2
118.0	114.7	75.0	1891.6	1559.7
119.0	65.0	49.2	1225.5	1078.7
120.0	28.4	27.6	654.5	557.8

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	75.0	358.	277.	5550.	5530.	144.	72.
80.0	76.0	24.	37.	1013.	1138.	-8.	2.
82.0	78.0	-20.	78.	1713.	2752.	-82.	-8.
83.0	80.0	-53.	39.	700.	1014.	-75.	-11.
85.0	82.0	115.	124.	2513.	2580.	35.	41.
89.0	85.0	536.	515.	11339.	10127.	285.	302.
90.0	83.0	753.	838.	13052.	12818.	322.	343.
91.0	90.0	32.	28.	480.	540.	7.	11.
98.0	91.0	335.	240.	5403.	4891.	186.	88.
103.0	91.0	408.	348.	8078.	6851.	215.	137.
103.0	98.0	140.	108.	2582.	2250.	61.	39.
113.0	103.0	250.	198.	4840.	4191.	116.	88.
120.0	103.0	467.	342.	8205.	7021.	224.	128.
120.0	113.0	228.	147.	3957.	2830.	118.	60.

WELL#35. HOMESTEAD PAYNE SUN INNIS 3-35-35-1W5

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
BR	75.0	78.0	2.6	80.5	128.6	212.2	70.73	260.0
LP	78.0	83.0	117.6	0.0	0.0	117.6	23.51	126.6
COLO	83.0	88.5	180.7	0.0	0.0	180.7	32.85	183.6
CARD	88.5	90.0	120.3	0.0	0.0	120.3	80.20	128.6
2WS	90.0	98.0	104.0	0.0	0.0	104.0	13.00	117.7
BFSC	98.0	103.0	68.5	0.0	5.5	74.0	14.80	83.6
MANN	108.0	113.0	22.9	42.4	47.2	112.5	22.50	128.6
LMANN	113.0	120.0	23.8	27.6	36.3	87.7	12.53	93.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1748.8	1433.4	34185.8	31006.0
76.0	1636.2	1361.6	31884.6	28182.0
77.0	1518.1	1286.3	29502.8	27280.6
78.0	1417.5	1216.5	27446.2	26436.3
79.0	1394.6	1193.5	26840.3	24811.1
80.0	1376.6	1170.2	26288.4	24197.7
81.0	1352.7	1147.2	25766.9	23660.0
82.0	1334.0	1124.6	25260.7	23036.7
83.0	1307.4	1102.2	24655.4	22331.4
84.0	1318.4	1080.3	23086.8	21376.3
85.0	1277.3	1014.2	23016.6	20387.8
86.0	1240.2	968.7	22074.0	19330.3
87.0	1211.5	922.2	21256.0	18323.6
88.5	1206.6	861.4	20381.0	16790.8
89.0	1087.2	767.5	18841.2	15310.9
90.0	736.0	587.9	13860.0	12124.8
91.0	725.6	569.8	13312.6	11736.6
92.0	712.6	550.1	12888.6	11347.3
93.0	695.8	520.6	12587.5	10906.1
94.0	675.5	504.1	12166.5	10465.4
95.0	654.6	488.0	11721.4	10016.2
96.0	620.0	463.3	11285.9	9611.8
97.0	598.1	440.4	10723.6	9130.2
98.0	574.7	417.8	10287.6	8681.6
99.0	533.5	390.1	9830.1	8188.6
100.0	499.3	362.6	9025.5	7654.8
101.0	462.1	334.6	8415.3	7126.0
102.0	431.8	306.4	7881.5	6633.9
103.0	392.0	278.1	6895.3	6018.6
108.0	450.0	254.0	7702.0	6207.6
109.0	390.3	257.7	6841.1	5500.6
110.0	358.3	233.3	6281.1	4906.8
111.0	290.3	189.2	5116.1	4095.0
112.0	254.1	163.0	4382.9	3442.7
113.0	202.7	131.6	3467.8	2780.0
114.0	182.7	114.4	3105.5	2415.4
115.0	145.0	91.2	2485.7	1942.2
116.0	120.1	76.2	2110.6	1597.2
117.0	96.3	56.7	1648.3	1207.7
118.0	66.9	38.0	1101.2	764.4
119.0	30.4	18.2	523.9	380.5
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	331.	215.	5750.	5573.	123.	43.
80.0	78.0	41.	46.	1161.	1238.	5.	10.
83.0	78.0	90.	115.	2857.	3114.	-18.	18.
83.0	80.0	18.	87.	1398.	1876.	-24.	8.
85.0	83.0	80.	80.	1873.	1863.	22.	28.
90.0	85.0	635.	426.	8267.	6233.	240.	172.
90.0	83.0	619.	515.	11230.	10187.	271.	200.
91.0	90.0	13.	18.	337.	388.	3.	8.
98.0	91.0	181.	152.	3045.	3055.	57.	57.
103.0	91.0	364.	295.	6417.	5720.	165.	118.
103.0	98.0	213.	143.	3372.	2685.	109.	90.
113.0	108.0	246.	182.	4328.	3457.	115.	55.
120.0	108.0	461.	294.	7784.	6208.	210.	102.
120.0	113.0	203.	132.	3488.	2761.	96.	47.

WELL#26. HOMESTEAD PAYNE SUN INNIS 3-28-36-1W5

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE NS SED(m/Ma)
DR	0.550	58.8	152.2	50.74
DR	0.170	130.6	213.2	71.07
BFSC	0.550	2.7	71.2	14.24
BFSC	0.170	5.1	73.6	14.71
MANN	0.550	24.1	80.4	17.88
MANN	0.170	65.5	110.8	22.15
LMANN	0.550	17.4	66.8	8.83
LMANN	0.170	32.9	84.3	12.04

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1814.0	1427.4	31856.6	30678.5
76.0	[illegible]	1356.0	30181.3	29046.7
77.0	[illegible]	1263.7	28484.4	27178.4
78.0	[illegible]	1214.0	27066.3	25358.5
79.0	1375.[illegible]	1180.2	26430.4	24732.3
80.0	[illegible]	1165.3	25870.5	24117.2
81.0	1342.0	1143.2	25327.4	23606.5
82.0	1333.4	1120.7	24817.0	23081.2
83.0	1326.0	1080.0	24431.5	22236.0
84.0	1305.0	1055.0	23823.2	21280.8
85.0	1263.0	1000.8	22626.8	20267.5
86.0	1214.5	964.2	21567.0	19227.6
87.0	1185.0	917.0	20733.2	18220.0
88.0	1178.3	846.8	19817.0	18863.1
89.0	1068.4	782.7	17978.8	16212.1
90.0	708.7	583.0	13007.1	12023.8
91.0	694.1	564.0	12708.2	11633.4
92.0	670.6	544.8	12361.6	11241.5
93.0	651.4	524.2	11930.6	10798.0
94.0	640.3	502.7	11490.5	10364.6
95.0	618.6	480.4	11018.3	9905.2
96.0	588.1	457.8	10553.5	9486.3
97.0	555.0	434.6	9958.6	9011.6
98.0	520.8	411.8	9463.8	8560.5
99.0	489.3	384.2	8930.8	8067.7
100.0	454.8	356.6	8212.0	7532.1
101.0	417.7	338.5	7624.8	6983.1
102.0	381.7	303.2	7016.6	6510.6
103.0	312.1	280.0	6020.8	5882.8
108.0	281.7	257.3	6545.8	6067.2
109.0	340.0	251.4	5857.4	5351.8
110.0	306.0	227.0	5267.8	4780.5
111.0	264.8	183.4	4483.0	3880.6
112.0	212.9	158.3	3667.6	3331.3
113.0	186.8	137.8	3014.0	2886.5
114.0	156.3	111.4	2837.5	2364.0
115.0	125.7	88.5	2181.4	1877.7
116.0	105.8	73.4	1783.8	1547.2
117.0	85.6	54.5	1411.0	1160.2
118.0	64.8	35.0	930.6	742.5
119.0	35.0	15.8	461.5	380.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	315.	313.	4786.	5520.	57.	42.
80.0	75.0	42.	40.	1186.	1241.	5.	10.
83.0	78.0	84.	116.	3627.	3123.	-17.	19.
83.0	80.0	22.	67.	1435.	1682.	-22.	8.
85.0	83.0	62.	66.	1805.	1887.	23.	26.
90.0	85.0	644.	427.	9480.	8244.	252.	172.
90.0	83.0	820.	516.	11364.	10211.	275.	201.
91.0	90.0	15.	16.	380.	390.	4.	8.
98.0	91.0	104.	153.	3244.	3073.	54.	55.
102.0	91.0	352.	266.	5887.	5741.	175.	118.
103.0	98.0	216.	143.	3442.	2868.	111.	80.
113.0	108.0	213.	169.	3721.	3206.	55.	64.
120.0	108.0	302.	287.	6848.	6087.	178.	100.
120.0	113.0	188.	126.	2015.	2058.	78.	45.

WELL#26. KMS ELNORA 7-2-35-22W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
GR	75.0	76.0	25.7	70.3	60.4	172.3		
LP	76.0	83.0	128.2	0.0	0.0	128.2	57.42	222.2
COLO	83.0	88.5	131.7	0.0	0.0	131.7	25.63	143.0
CARD	88.5	90.0	88.4	0.0	17.6	106.0	23.85	146.1
2WS	90.0	98.0	88.6	0.0	0.0	88.6	70.00	116.0
BFSC	98.0	103.0	73.7	0.0	13.2	86.9	12.00	107.0
MANN	106.0	113.0	10.3	35.8	36.3	82.4	17.26	97.5
OSTZ	113.0	120.0	3.0	24.6	27.3	54.8	16.48	87.5
							7.63	61.6

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1523.7	1288.7	30688.1	27182.8
76.0	1482.0	1212.6	28148.8	26418.8
77.0	1383.2	1148.7	26208.4	23840.0
78.0	1320.5	1090.7	24840.7	22318.2
79.0	1287.6	1056.3	23906.1	21568.2
80.0	1252.0	1021.3	23142.1	20810.8
81.0	1215.8	986.0	22328.9	20007.1
82.0	1182.3	950.4	21570.6	19233.4
83.0	1143.4	913.5	20726.4	18404.6
84.0	1116.0	880.8	20074.1	17708.7
85.0	1083.7	847.3	19360.2	16981.5
86.0	1056.7	813.6	18862.4	16208.0
87.0	1034.6	780.0	18088.1	15485.5
88.5	1030.0	720.2	17488.3	14357.7
89.0	901.0	553.6	15516.8	13018.8
90.0	859.3	517.1	11695.9	10460.4
91.0	642.7	500.0	11572.7	10130.5
92.0	633.6	482.8	11291.6	9785.6
93.0	620.2	464.1	10817.2	9340.1
94.0	603.5	444.6	10855.2	8950.0
95.0	585.8	424.5	10202.1	8574.1
96.0	563.7	403.4	9761.7	8146.4
97.0	542.1	382.9	9320.7	7721.4
98.0	527.7	362.0	8873.6	7300.2
99.0	478.8	327.1	8107.0	6867.1
100.0	426.7	291.3	7294.5	6038.3
101.0	386.0	262.6	6718.2	5468.4
102.0	347.6	231.3	6016.5	4836.2
103.0	259.2	190.2	4820.4	4132.1
106.0	305.5	186.1	5297.6	4213.5
109.0	283.0	180.3	4847.8	3808.7
110.0	262.6	158.7	4247.7	3298.7
111.0	220.8	136.3	3870.3	2815.9
112.0	190.5	112.1	3088.3	2306.1
113.0	128.1	77.4	2178.1	1864.6
114.0	114.0	67.0	1946.0	1462.7
115.0	94.5	54.4	1603.7	1109.0
116.0	78.1	43.7	1307.6	860.6
117.0	59.3	32.4	989.8	718.2
118.0	38.3	21.0	653.8	468.6
119.0	17.5	9.4	346.8	288.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	75.0	313.	209.	5047.	4663.	130.	56.
80.0	76.0	60.	89.	1489.	1506.	22.	23.
83.0	76.0	177.	177.	3014.	3014.	56.	56.
83.0	80.0	109.	108.	2418.	2408.	34.	33.
85.0	83.0	50.	86.	1376.	1443.	17.	22.
90.0	85.0	424.	330.	7444.	6492.	105.	130.
90.0	83.0	484.	307.	8820.	7026.	212.	151.
91.0	90.0	17.	17.	333.	338.	6.	7.
98.0	91.0	115.	136.	2599.	2830.	35.	51.
103.0	91.0	284.	310.	5743.	5908.	175.	125.
103.0	98.0	268.	172.	4144.	3188.	140.	74.
113.0	106.0	177.	121.	3122.	2548.	61.	42.
120.0	106.0	306.	186.	5208.	4212.	142.	66.
120.0	113.0	128.	77.	2178.	1865.	61.	28.

WELL#26. KMG ELNORA 7-2-35-23W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.550	40.4	143.3	47.76
BR	0.170	75.1	179.1	59.68
CARD	0.550	8.4	97.8	65.21
CARD	0.170	17.7	106.1	70.75
BFSC	0.550	6.7	80.4	15.98
BFSC	0.170	12.6	86.3	17.27
MANN	0.550	20.6	66.8	13.32
MANN	0.170	38.7	84.8	15.85
OSTZ	0.550	13.7	41.3	5.90
OSTZ	0.170	26.6	53.4	7.63

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1547.7	1284.0	29110.4	27144.4
76.0	1419.4	1208.5	28084.6	25319.6
77.0	1330.8	1144.4	26302.7	23738.7
78.0	1292.6	1088.9	24101.6	22280.3
79.0	1258.7	1054.3	23348.8	21528.3
80.0	1221.7	1018.3	22862.3	20770.1
81.0	1184.1	984.0	21728.6	19966.4
82.0	1140.1	948.2	20851.6	19190.4
83.0	1108.6	911.5	20076.5	18381.2
84.0	1078.5	878.6	19398.0	17663.1
85.0	1048.5	846.1	18648.7	16916.0
86.0	1018.5	811.6	17628.6	16161.6
87.0	992.2	777.6	17301.6	15448.1
88.5	902.6	726.6	15880.0	14308.8
89.0	872.6	651.2	14807.2	13087.7
90.0	626.9	614.8	11343.9	10422.2
91.0	611.1	497.7	10990.2	10082.3
92.0	600.7	480.4	10687.6	9716.8
93.0	585.8	461.7	10299.0	9289.9
94.0	567.2	442.1	9913.2	8908.5
95.0	547.6	421.0	9823.4	8521.6
96.0	522.5	401.1	9053.2	8091.6
97.0	499.4	380.2	8686.6	7880.7
98.0	481.4	359.3	8183.6	7244.2
99.0	436.7	324.5	7485.1	6812.5
100.0	389.1	269.0	6724.4	6083.4
101.0	347.8	260.2	5980.0	5386.6
102.0	302.4	228.6	5291.5	4790.0
103.0	320.0	187.9	4148.1	4085.8
105.0	255.8	185.7	4443.6	4180.3
108.0	235.6	177.3	4048.6	3704.1
110.0	210.6	154.7	3633.3	3241.3
111.0	181.7	131.5	3011.1	2705.0
112.0	152.1	107.4	2522.1	2218.7
113.0	103.1	75.8	1763.0	1629.8
114.0	92.0	65.8	1545.5	1402.8
115.0	75.7	53.2	1274.1	1183.4
116.0	62.6	42.8	1053.8	940.2
117.0	48.0	31.7	791.4	701.5
118.0	32.5	20.6	552.0	456.2
119.0	16.5	9.3	271.3	257.0
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	268.	206.	5009.	4664.	100.	56.
80.0	78.0	71.	70.	1530.	1510.	24.	23.
82.0	78.0	184.	177.	4025.	3819.	60.	58.
83.0	80.0	112.	108.	2488.	2408.	38.	33.
85.0	82.0	63.	66.	1430.	1445.	18.	22.
89.0	85.0	417.	330.	7303.	6494.	101.	130.
90.0	85.0	460.	307.	8733.	7039.	210.	151.
91.0	90.0	18.	17.	254.	240.	7.	7.
95.0	91.0	130.	138.	2808.	2838.	43.	51.
103.0	91.0	281.	310.	5641.	5987.	180.	124.
103.0	95.0	281.	171.	4035.	3156.	137.	74.
113.0	103.0	153.	120.	2851.	2531.	70.	42.
120.0	103.0	255.	198.	4444.	4180.	118.	67.
120.0	113.0	103.	76.	1763.	1620.	48.	26.

WELL#37. CS SULPETRO FARRELL 6-12-34-17W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
LP	75.0	83.0	71.5	14.0	26.4	111.8	22.32	167.2
COLD	83.0	88.5	91.0	0.0	0.0	91.0	16.54	107.2
CARD	88.5	90.0	88.0	0.0	0.0	88.0	58.35	110.8
2WS	90.0	98.0	72.0	0.0	0.0	72.0	9.01	88.8
BFSC	98.0	103.0	71.1	4.1	9.5	84.7	16.95	104.8
MANN	108.0	113.0	24.8	23.0	10.1	57.7	13.54	61.7
LMANN	113.0	120.0	5.5	0.0	7.8	13.4	1.91	18.2

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kiloPa	
75.0	1094.1	894.3	19878.5	17087.8
79.0	1105.4	888.5	19848.9	15436.2
80.0	1094.0	861.3	19176.7	18817.2
81.0	1055.6	821.5	18622.4	18157.3
82.0	1027.1	795.0	17767.2	15411.6
83.0	976.4	750.4	16876.2	14865.8
84.0	990.8	735.8	16430.1	14174.1
85.0	944.7	714.2	16020.3	13601.7
86.0	934.4	691.8	15815.8	13166.8
87.0	930.8	680.7	15324.3	12664.5
88.5	876.8	637.2	15371.9	11622.8
89.0	852.0	567.3	13673.4	10665.8
90.0	564.3	421.8	9611.1	8188.0
91.0	552.8	407.8	9280.4	7913.5
92.0	542.3	393.4	9089.1	7584.8
93.0	530.7	376.8	8851.2	7214.3
94.0	517.5	363.5	8550.3	6883.8
95.0	503.7	348.1	8264.8	6715.7
96.0	480.2	332.6	7075.8	6391.8
97.0	476.4	316.8	7085.7	6072.7
98.0	455.0	301.0	7452.5	5755.5
99.0	427.6	268.5	6781.0	5164.2
100.0	367.7	231.5	5898.8	4820.6
101.0	320.1	200.3	5129.7	3918.4
102.0	285.9	166.1	4268.8	3280.2
103.0	174.0	125.0	3076.0	2545.4
108.0	228.1	128.2	3801.9	2894.2
109.0	202.0	116.0	3182.7	2203.7
110.0	168.2	87.4	2378.0	1764.0
111.0	116.1	67.0	1628.8	1352.2
112.0	81.7	45.8	1286.0	924.0
113.0	29.7	20.1	517.1	420.2
114.0	26.8	18.3	487.4	401.2
115.0	24.2	16.4	410.4	340.8
116.0	22.3	14.6	361.9	284.7
117.0	22.8	13.0	323.7	227.8
118.0	17.2	8.0	300.8	168.7
119.0	10.1	4.8	148.4	83.7
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	-1.	43.	907.	1141.	-22.	8.
83.0	75.0	118.	148.	2987.	3292.	33.	43.
83.0	80.0	117.	102.	2300.	2152.	45.	35.
88.5	83.0	34.	48.	858.	974.	7.	15.
90.0	88.5	380.	283.	8408.	6523.	182.	122.
90.0	83.0	414.	338.	7287.	6487.	180.	137.
91.0	90.0	12.	14.	231.	258.	4.	8.
98.0	91.0	84.	107.	1928.	2168.	24.	40.
103.0	91.0	378.	262.	8304.	6324.	184.	117.
103.0	98.0	205.	178.	4377.	3188.	180.	77.
113.0	108.0	108.	118.	3088.	2274.	101.	48.
120.0	108.0	228.	138.	3602.	2894.	118.	63.
120.0	113.0	30.	30.	617.	420.	14.	7.

WELL#27. SS SULPETRO FARRELL 6-12-34-17W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
LP	0.550	10.1	104.3	20.86
LP	0.170	24.2	120.2	24.07
BFSC	0.550	5.4	60.5	16.11
BFSC	0.170	10.1	65.3	17.08
MANN	0.550	10.7	60.3	11.66
MANN	0.170	20.2	66.6	13.76
LMANN	0.550	4.0	9.6	1.40
LMANN	0.170	7.6	13.4	1.81

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK IN metres.		CUMULATIVE STRESS in kilopa.	
78.0	1073.1	883.2	18463.0	17843.6
79.0	1057.7	853.5	18270.5	17540.4
80.0	1054.2	873.1	18080.1	17017.3
81.0	1041.9	837.6	18138.6	16301.8
82.0	1007.5	789.6	17447.3	15401.7
83.0	985.0	759.1	16847.3	14650.1
84.0	947.0	738.5	16100.7	14187.4
85.0	931.3	713.0	15774.3	13665.0
86.0	920.4	681.5	15361.6	13156.7
87.0	915.4	680.3	15001.6	12577.4
88.0	863.3	636.0	15086.3	11815.6
89.0	666.3	605.0	13303.3	10668.4
90.0	545.0	431.3	9321.3	8181.6
91.0	536.0	407.3	9060.4	7005.6
92.0	524.5	383.0	8708.6	7865.9
93.0	513.3	376.3	8620.4	7206.5
94.0	495.2	363.1	8216.4	6965.7
95.0	483.4	347.7	7837.7	6704.6
96.0	457.0	333.1	7614.0	6382.6
97.0	453.0	316.4	7306.0	6064.4
98.0	444.8	300.6	7050.0	5747.1
99.0	405.7	267.6	6410.7	5172.6
100.0	352.1	230.5	5571.5	4806.1
101.0	302.4	190.0	4793.3	3863.7
102.0	244.1	165.0	3952.5	3273.6
103.0	156.3	126.4	2777.3	2670.9
106.0	203.3	126.6	3327.3	2863.0
108.0	182.3	115.6	2812.0	2287.4
110.0	130.1	85.3	2066.0	1769.3
111.0	101.5	66.6	1606.6	1334.0
112.0	73.8	43.6	1125.0	902.0
113.0	23.0	20.0	400.1	415.6
114.0	21.2	18.1	385.3	387.2
115.0	20.0	16.2	316.6	316.6
116.0	20.3	14.6	300.5	273.1
117.0	16.6	13.0	266.3	227.4
118.0	12.8	9.0	170.3	166.6
119.0	7.4	4.8	121.3	83.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	6.	30.	767.	925.	-15.	1.
83.0	78.0	103.	144.	2605.	3264.	20.	43.
83.0	80.0	96.	114.	2030.	2356.	25.	41.
85.0	83.0	25.	48.	673.	974.	6.	15.
90.0	85.0	283.	283.	6463.	6523.	164.	122.
90.0	83.0	416.	336.	7226.	6498.	192.	137.
91.0	90.0	12.	14.	241.	266.	5.	6.
98.0	91.0	91.	107.	2030.	2150.	29.	40.
103.0	91.0	370.	262.	6303.	5326.	185.	117.
103.0	98.0	288.	175.	4274.	3167.	155.	77.
113.0	106.0	180.	115.	2627.	2287.	83.	46.
120.0	106.0	203.	136.	3227.	2664.	103.	53.
120.0	113.0	23.	20.	400.	417.	11.	7.

WELL#26. TURBO ETA[illegible]VOST 8-8-84-10W6

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
LP	78.0	83.0	40.1	36.0	33.2	110.2	22.02	172.2
COLO	83.0	90.0	157.8	0.0	0.0	157.8	22.51	196.1
SWS	90.0	98.0	31.0	28.0	0.0	59.0	6.35	72.6
SPSC	98.0	103.0	26.8	48.8	2.3	77.8	15.57	115.6
MANN	106.0	113.0	0.0	26.8	56.3	82.1	16.42	108.4
LMANN	113.0	120.0	6.0	0.0	13.0	19.0	2.83	25.3

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
78.0	1118.4	858.4	19422.7	18806.0
79.0	1108.2	837.8	18858.0	16262.4
80.0	1104.7	809.8	18808.0	15820.5
81.0	1071.1	776.7	17821.8	14858.8
82.0	1058.2	748.8	17507.5	14301.8
83.0	1022.3	707.4	16850.5	13408.8
84.0	956.6	653.6	15707.0	12718.6
85.0	911.5	618.8	14640.0	11662.2
86.0	853.0	573.3	13650.1	11024.8
87.0	790.7	526.8	12603.5	10184.6
88.5	688.8	463.8	11202.0	8817.4
89.0	648.1	420.8	10858.5	8648.0
90.0	543.8	370.1	9233.6	7838.7
91.0	526.2	363.0	8887.3	7327.3
92.0	510.5	352.1	8708.0	7107.0
93.0	503.0	343.6	8528.1	6910.4
94.0	496.0	336.6	8370.0	6741.9
95.0	493.5	327.8	8214.0	6526.8
96.0	485.6	310.6	8140.5	6371.0
97.0	484.1	307.1	7824.7	6136.1
98.0	472.8	304.2	7681.3	5878.6
99.0	434.1	265.7	7063.0	5361.7
100.0	376.7	233.2	6231.6	4761.8
101.0	307.2	190.7	5280.1	4173.7
102.0	262.5	176.3	4558.5	3678.3
103.0	214.2	148.1	3798.8	3108.6
108.0	240.4	168.1	4082.8	3129.0
109.0	203.3	124.4	3448.5	2648.1
110.0	155.5	102.6	2782.8	2185.8
111.0	120.3	78.4	2087.4	1644.1
112.0	81.7	54.3	1430.4	1152.4
113.0	48.1	31.2	788.0	638.7
114.0	41.4	27.8	714.1	574.7
115.0	37.0	24.2	632.8	504.0
116.0	33.2	21.0	523.6	390.8
117.0	31.0	17.9	483.2	331.7
118.0	27.2	13.5	368.7	250.3
119.0	16.4	8.8	233.1	137.1
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	12.	56.	818.	1269.	-13.	17.
83.0	78.0	94.	158.	2742.	3307.	9.	54.
83.0	80.0	82.	102.	1924.	2128.	23.	37.
85.0	83.0	111.	89.	1840.	1018.	54.	30.
90.0	85.0	368.	243.	6006.	4344.	104.	108.
90.0	83.0	479.	331.	7448.	5980.	248.	147.
91.0	90.0	18.	13.	245.	201.	10.	7.
98.0	91.0	94.	59.	1300.	1458.	13.	24.
103.0	91.0	312.	217.	5180.	4228.	153.	86.
103.0	98.0	258.	148.	3882.	2769.	138.	63.
113.0	108.0	194.	117.	3277.	2493.	83.	40.
120.0	108.0	240.	148.	4082.	3130.	115.	51.
120.0	113.0	48.	31.	788.	637.	22.	12.

WELL#28. TURBO STAL PROVOST 6-5-34-10W4
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PART II: VARIABLE SS GRAIN HEIGHT
****

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
LP	0.550	27.0	104.0	20.79
LP	0.170	50.8	127.8	25.57
SPSC	0.550	1.3	78.0	15.37
SPSC	0.170	2.8	78.1	15.61
MANN	0.550	33.4	59.2	11.48
MANN	0.170	63.0	88.8	17.77
LMANN	0.550	7.8	14.8	3.08
LMANN	0.170	14.7	21.8	3.06

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT
****

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1085.1	885.8	18851.3	18882.7
79.0	1078.2	848.8	18407.8	18417.7
80.0	1070.1	833.8	18074.4	18888.7
81.0	1041.8	783.8	17388.8	15241.8
82.0	1037.8	757.1	17037.1	14421.1
83.0	881.7	708.8	16288.3	13488.4
84.0	848.1	883.0	15371.2	12708.1
85.0	867.3	618.3	14401.3	11873.2
86.0	827.8	573.8	13307.7	11014.8
87.0	784.7	838.1	12387.8	10188.0
88.0	681.8	465.3	10806.0	8808.8
89.0	630.3	427.8	10172.3	8436.1
90.0	514.8	378.4	8733.3	7826.0
91.0	488.4	382.4	8462.7	7328.8
92.0	470.7	351.8	8188.1	7088.4
93.0	471.0	343.3	7870.8	8807.7
94.0	463.7	338.2	7704.8	6720.8
95.0	458.1	327.2	7820.8	6837.2
96.0	460.0	318.1	7530.6	6388.0
97.0	448.8	308.8	7281.2	6123.4
98.0	432.8	283.8	7038.8	5888.0
99.0	385.0	264.8	6308.3	5347.1
100.0	337.3	233.8	5564.8	4788.8
101.0	268.3	188.8	4887.8	4187.2
102.0	218.8	174.7	3841.4	3382.8
103.0	170.1	148.4	3082.3	3088.0
104.0	188.7	147.3	3181.0	3113.1
108.0	157.2	123.8	2878.1	2833.8
110.0	127.3	100.8	2180.7	2057.7
111.0	84.0	74.3	1833.8	1878.7
112.0	81.7	82.3	1078.4	1087.8
113.0	38.8	31.3	813.4	838.3
114.0	33.7	28.0	842.8	883.8
115.0	30.0	24.8	478.2	487.8
116.0	28.8	21.8	428.8	412.0
117.0	27.3	18.8	388.7	338.8
118.0	20.2	14.7	318.1	282.0
119.0	11.3	7.8	181.8	143.1
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT
****

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	10.	42.	777.	804.	-14.	11.
82.0	78.0	88.	158.	2585.	3304.	8.	84.
83.0	80.0	78.	117.	1808.	2400.	20.	42.
85.0	83.0	112.	88.	1885.	1815.	55.	30.
90.0	85.0	372.	243.	5078.	4347.	107.	108.
90.0	83.0	485.	331.	7843.	8862.	252.	147.
91.0	90.0	10.	13.	201.	200.	10.	7.
98.0	91.0	82.	88.	1437.	1480.	18.	24.
102.0	91.0	328.	217.	8400.	4231.	188.	88.
103.0	98.0	284.	148.	3083.	2771.	141.	83.
113.0	108.0	180.	118.	2848.	2477.	71.	38.
120.0	108.0	188.	147.	3181.	3113.	88.	81.
120.0	113.0	28.	31.	813.	838.	17.	12.

WELL#35. BRL HUSKAD ETAL 6606 7-17-35-1W6

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHYSD	/SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
LP	75.0	83.0	117.0	0.0	0.0	117.0	23.40	100.0
COLO	83.0	90.0	87.6	0.0	0.0	87.6	12.86	110.3
2WS	90.0	95.0	33.6	0.0	0.0	33.6	4.30	40.0
SPEC	95.0	108.0	60.1	0.0	6.6	77.0	15.54	106.6
MANN	108.0	112.0	4.8	18.9	36.5	60.2	12.04	80.3
LMANN	112.0	120.0	5.0	0.0	7.0	12.0	1.72	18.3

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1072.3	762.7	17243.3	14104.7
78.0	1012.2	717.6	16246.0	13256.1
80.0	951.7	670.6	15269.6	12424.1
81.0	887.1	623.2	14203.6	11527.7
82.0	817.0	574.7	13108.8	10660.0
83.0	726.8	524.6	11623.0	9760.6
84.0	700.0	500.7	11330.3	9316.6
85.0	660.5	476.4	10630.1	8864.4
86.0	636.9	451.6	10282.4	8622.0
87.0	606.0	426.6	9747.0	7947.4
88.0	561.1	388.0	8856.0	7236.7
89.0	526.0	374.7	8586.6	7026.6
90.0	476.3	347.8	7816.0	6614.1
91.0	473.6	340.0	7732.0	6601.6
92.0	470.6	334.2	7626.0	6348.7
93.0	467.5	327.5	7586.3	6180.6
94.0	465.0	320.7	7427.1	6060.2
95.0	462.8	314.0	7346.6	5833.0
96.0	455.2	307.4	7301.0	5656.6
97.0	471.1	300.6	7250.0	5550.8
98.0	466.1	294.4	7356.0	5420.5
99.0	430.1	261.1	6505.6	4827.5
100.0	365.1	222.0	5652.4	4296.6
101.0	326.6	193.0	4865.4	3523.6
102.0	255.0	156.5	4025.0	3011.0
103.0	188.7	117.4	3845.6	2347.1
108.0	186.7	110.6	3037.4	2368.4
109.0	159.2	100.9	2697.6	2006.5
110.0	131.5	82.6	2122.3	1627.6
111.0	101.4	61.6	1620.6	1226.6
112.0	56.4	42.3	1062.4	816.1
113.0	31.3	23.0	511.0	427.0
114.0	26.6	18.5	482.0	370.5
115.0	25.2	16.0	411.5	318.1
116.0	24.6	14.6	362.4	260.6
117.0	24.1	12.2	357.7	237.0
118.0	17.8	8.3	283.5	167.2
119.0	6.6	4.2	141.6	64.4
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		1MOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	122.	92.	1979.	1661.	60.	40.
82.0	75.0	344.	238.	6420.	4345.	177.	104.
83.0	80.0	223.	148.	3441.	2666.	117.	64.
85.0	83.0	59.	48.	864.	871.	28.	21.
90.0	85.0	163.	126.	3023.	2374.	100.	56.
90.0	83.0	252.	177.	4006.	3246.	126.	77.
91.0	90.0	3.	7.	83.	122.	0.	3.
95.0	91.0	-12.	47.	376.	871.	-24.	17.
102.0	91.0	207.	224.	4887.	4044.	158.	88.
102.0	95.0	218.	177.	4612.	3073.	160.	82.
112.0	108.0	184.	87.	2526.	1641.	78.	37.
120.0	108.0	186.	118.	3037.	2368.	82.	46.
120.0	113.0	31.	23.	511.	427.	16.	10.

WELL#20. SRL UNIGAS ETAL 0000 7-17-38-1W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE NS SED(m/Ma)
BFSC	0.550	6.7	75.8	15.16
BFSC	0.170	12.6	81.7	16.34
MANN	0.550	24.5	48.2	8.55
MANN	0.170	46.3	70.0	14.00
LMANN	0.550	5.4	10.4	1.48
LMANN	0.170	10.1	15.1	2.16

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1080.0	782.7	16897.0	14104.8
79.0	983.4	717.0	15885.5	13286.1
80.0	838.5	670.8	15004.6	12424.0
81.0	871.5	623.2	13838.7	11537.7
82.0	800.8	574.7	12838.5	10880.9
83.0	713.3	524.8	11842.1	9758.3
84.0	682.5	500.7	11041.4	9318.8
85.0	651.8	475.4	10542.8	8888.4
86.0	616.7	451.8	9888.1	8421.8
87.0	586.3	426.8	9428.2	7947.3
88.0	521.8	386.0	8861.8	7228.8
89.0	501.3	374.7	8258.8	7028.8
90.0	468.0	347.8	7478.4	6514.1
91.0	452.7	340.8	7388.1	6391.7
92.0	440.1	334.2	7271.0	6248.8
93.0	446.4	327.5	7230.7	6180.7
94.0	442.3	320.8	7051.5	6088.3
95.0	440.3	314.1	6860.8	5833.3
96.0	440.0	307.4	6604.0	5886.7
97.0	445.0	300.9	6871.5	5580.2
98.0	458.8	294.4	6834.4	5420.8
99.0	408.8	257.2	6156.7	4778.8
100.0	344.5	210.0	5285.8	4128.8
101.0	303.1	193.4	4584.1	3848.0
102.0	228.8	167.4	3817.1	3028.7
103.0	142.5	117.3	2461.4	2346.7
105.0	157.8	110.4	2876.4	2367.8
108.0	135.8	101.2	2191.7	1886.2
110.0	112.8	82.3	1785.8	1804.2
111.0	87.8	62.8	1377.8	1232.7
112.0	57.8	43.1	814.4	835.4
113.0	28.0	32.8	465.2	426.3
114.0	28.8	20.5	408.0	383.8
115.0	24.2	18.2	385.8	327.8
116.0	22.2	16.8	332.7	288.4
117.0	21.2	13.8	288.7	238.5
118.0	15.4	10.5	238.4	188.7
119.0	8.5	8.3	127.8	95.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	123.	22.	1982.	1881.	61.	40.
83.0	78.0	347.	238.	5455.	4345.	178.	104.
83.0	80.0	224.	146.	3452.	2885.	117.	84.
85.0	83.0	80.	48.	1000.	871.	30.	21.
90.0	85.0	188.	128.	3084.	2374.	101.	56.
90.0	83.0	288.	177.	4084.	3245.	131.	77.
91.0	90.0	3.	7.	82.	122.	0.	3.
98.0	91.0	-7.	47.	452.	871.	-21.	17.
103.0	91.0	310.	224.	4835.	4048.	158.	88.
103.0	98.0	317.	177.	4483.	3074.	179.	82.
113.0	105.0	130.	87.	2121.	1942.	84.	37.
120.0	108.0	158.	118.	2578.	2388.	78.	48.
120.0	113.0	26.	23.	465.	426.	14.	10.

WE[illegible] [illegible]NDEX CHE[illegible] [illegible]-15-23-29W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
BR	75.0	78.0	14.8	58.6	160.3	233.7	77.92	284.4
PAN	78.0	80.0	0.8	5.0	26.6	32.4	16.19	40.8
MR	80.0	83.0	36.9	43.5	0.0	80.4	26.81	87.5
COLO	83.0	88.5	198.9	2.8	1.7	203.4	36.98	214.9
CARD	88.5	90.0	124.7	5.7	0.0	130.4	86.93	130.9
2WS	90.0	98.0	114.5	11.0	0.0	125.5	15.69	132.3
BFSC	98.0	103.0	29.1	43.9	16.8	89.8	17.96	88.1
MANN	108.0	113.0	5.7	83.4	84.2	173.3	34.66	187.8
LMANN	113.0	120.0	9.1	13.2	16.1	38.4	5.49	40.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1848.7	1488.1	38712.7	33048.8
76.0	1557.2	1377.9	33525.8	30704.2
77.0	1523.4	1208.1	30865.3	28889.4
78.0	1377.4	1213.1	28205.3	28545.8
79.0	1398.2	1217.0	28188.8	28358.0
80.0	1434.2	1223.3	28282.3	28131.3
81.0	1402.9	1189.9	27644.0	25492.8
82.0	1411.2	1186.8	27194.1	24947.4
83.0	1428.8	1169.7	26887.7	24271.8
84.0	1389.1	1128.5	26826.8	23267.0
85.0	1344.5	1075.2	24850.1	22129.8
86.0	1288.7	1023.9	23776.2	20888.2
87.0	1261.6	971.8	22768.2	19825.1
88.5	1241.7	883.5	21847.1	19128.4
89.0	1109.5	804.2	19812.3	18827.7
90.0	774.3	617.8	14784.8	13183.1
91.0	753.5	594.2	14380.8	12770.2
92.0	728.9	569.5	13693.2	12261.8
93.0	689.8	543.0	13233.4	11885.7
94.0	688.1	527.1	12870.9	11244.8
95.0	664.0	501.8	12367.4	10749.3
96.0	643.2	475.5	11832.7	10238.2
97.0	611.9	446.8	11616.5	9848.9
98.0	589.2	415.9	10584.8	9088.4
99.0	549.5	392.7	10143.8	8557.9
100.0	506.1	382.7	9424.1	7975.3
101.0	482.1	331.6	8857.6	7340.4
102.0	420.9	305.7	7982.6	6819.0
103.0	376.8	278.5	7312.7	6219.1
108.0	471.1	282.4	6185.6	6360.1
109.0	402.8	248.3	6939.0	5367.3
110.0	332.5	198.4	5587.4	4212.9
111.0	246.8	148.9	423[illegible]	3346.8
112.0	171.5	102.1	2821.9	2219.7
113.0	81.3	53.6	1440.1	1180.7
114.0	72.8	47.5	1284.0	1028.3
115.0	66.4	41.5	1126.4	877.4
116.0	55.6	34.6	932.1	708.7
117.0	45.2	24.9	789.0	584.1
118.0	28.7	13.7	461.7	350.8
119.0	12.3	8.9	241.0	186.3
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	471.	273.	6507.	5503.	209.	72.
80.0	78.0	-57.	-10.	-67.	414.	-55.	-23.
83.0	78.0	-48.	43.	1348.	2274.	-90.	-27.
83.0	80.0	9.	54.	1408.	1880.	-35.	-4.
85.0	83.0	61.	94.	2008.	2142.	18.	28.
90.0	85.0	570.	457.	10085.	8846.	259.	181.
90.0	83.0	651.	552.	12083.	11088.	278.	209.
91.0	90.0	21.	24.	384.	413.	9.	11.
98.0	91.0	167.	178.	3798.	3704.	70.	64.
103.0	91.0	377.	316.	7186.	6551.	155.	113.
103.0	98.0	188.	137.	3372.	2847.	85.	49.
113.0	108.0	390.	338.	6728.	5188.	142.	78.
120.0	108.0	671.	392.	8195.	6360.	219.	98.
120.0	113.0	81.	54.	1440.	1161.	37.	19.

WELL#30. ANDEX CHESTERMERE 6-15-22-28W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.550	57.2	150.8	53.52
BR	0.170	164.4	237.5	79.26
PAK	0.550	14.6	20.6	10.26
PAK	0.170	27.6	33.6	18.82
COLO	0.550	1.3	201.0	38.54
COLO	0.170	2.5	202.2	38.76
BFSC	0.550	6.0	61.0	16.21
BFSC	0.170	15.3	88.2	17.83
MANN	0.550	40.2	129.3	28.87
MANN	0.170	76.8	155.0	33.00
LMANN	0.550	9.1	28.4	4.05
LMANN	0.170	17.2	36.4	5.21

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1650.3	1477.6	33465.0	32854.6
76.0	1525.6	1357.8	31154.3	30476.2
77.0	1423.9	1287.6	29150.7	28462.6
78.0	1327.6	1208.6	27248.8	26411.4
79.0	1357.2	1211.0	27358.1	26200.6
80.0	1405.6	1216.5	27880.9	25990.2
81.0	1374.3	1183.0	25940.6	25247.9
82.0	1301.4	1162.7	25650.2	24795.0
83.0	1358.0	1162.4	26214.0	24118.6
84.0	1355.6	1117.9	25212.3	23102.3
85.0	1309.8	1067.5	24183.2	21871.6
86.0	1283.8	1015.0	23058.1	20827.0
87.0	1225.0	953.7	22030.7	19970.8
88.5	1203.9	885.2	20584.3	17958.6
89.0	1070.7	795.5	18644.6	16358.1
90.0	723.8	609.2	13088.1	13007.1
91.0	710.8	585.4	12548.0	12581.8
92.0	684.0	580.4	13028.8	12095.8
93.0	648.4	534.3	12329.5	11498.0
94.0	638.1	517.8	11928.7	11050.2
95.0	611.1	492.1	11400.0	10548.7
96.0	587.2	465.5	10898.3	10033.4
97.0	552.6	438.3	10430.0	9638.7
98.0	502.6	405.4	9439.0	8850.3
99.0	485.8	382.2	8895.8	8343.4
100.0	441.4	352.4	8285.1	7760.8
101.0	396.7	321.5	7624.4	7128.0
102.0	355.2	295.6	6824.8	6575.6
103.0	313.5	268.4	6081.3	6011.8
105.0	270.8	251.0	5536.4	5118.7
108.0	324.4	238.6	5525.2	5148.4
110.0	258.4	188.4	4515.8	4104.6
111.0	188.4	142.8	3425.2	3151.6
112.0	137.0	97.8	2371.8	2115.0
113.0	84.5	61.3	1154.8	1109.6
114.0	57.7	45.4	1008.1	984.6
115.0	51.1	39.8	914.0	845.5
116.0	44.1	32.9	748.6	650.6
117.0	36.7	23.6	620.2	487.8
118.0	21.1	12.8	407.4	328.3
119.0	9.2	6.3	183.1	142.7
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	333.	271.	8237.	6483.	140.	71.
80.0	78.0	-79.	-10.	-432.	421.	-85.	-23.
83.0	78.0	-68.	44.	1035.	2282.	-100.	-28.
85.0	80.0	12.	54.	1487.	1871.	-34.	-4.
88.0	83.0	88.	95.	2051.	2148.	22.	29.
90.0	85.0	575.	456.	10197.	8084.	261.	181.
90.0	88.0	601.	553.	12248.	11112.	283.	210.
91.0	90.0	23.	24.	417.	417.	10.	11.
98.0	91.0	208.	180.	4110.	3738.	81.	64.
102.0	91.0	357.	317.	7458.	6578.	187.	114.
103.0	98.0	180.	137.	3348.	2838.	88.	48.
112.0	108.0	318.	230.	5482.	5008.	146.	75.
120.0	108.0	360.	281.	8838.	6118.	175.	92.
120.0	112.0	84.	51.	1185.	1110.	28.	17.

WELL#37. PANCANADIAN PCP STRATHMORE A10-6-24-24W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
BR	75.0	78.0	8.3	17.4	155.6	181.3	63.75	251.6
LP	78.0	80.0	0.0	18.1	16.2	34.3	17.14	45.1
MR	80.0	83.0	77.4	5.4	0.0	82.7	27.58	88.0
COLO	83.0	90.0	308.0	0.0	0.0	308.0	44.00	338.3
2WS	90.0	98.0	77.0	2.7	0.0	79.7	9.96	88.0
BFSC	98.0	103.0	65.1	22.4	15.4	103.0	20.59	114.8
MANN	108.0	113.0	8.0	68.3	40.8	117.0	23.40	134.6
LMANN	113.0	120.0	0.0	5.2	4.7	9.9	1.42	11.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1520.9	1328.6	31595.1	28584.8
76.0	1488.4	1248.6	28155.1	25723.7
77.0	1382.0	1183.5	27159.0	25082.8
78.0	1300.9	1123.8	26224.1	23431.7
79.0	1328.5	1128.5	26226.0	23223.8
80.0	1377.9	1135.4	26451.2	23001.0
81.0	1354.7	1104.4	24784.8	22385.7
82.0	1354.4	1078.9	24313.8	21830.8
83.0	1385.0	1049.7	23950.8	20754.8
84.0	1280.3	978.8	22405.7	19346.4
85.0	1210.7	904.8	20048.1	17855.8
86.0	1121.3	827.4	19304.8	16334.8
87.0	1018.5	747.4	17546.9	14787.5
88.0	858.7	621.0	16862.8	12440.4
89.0	781.6	575.7	13768.0	11808.9
90.0	610.9	480.8	11225.4	9908.8
91.0	598.9	465.9	10971.7	9527.2
92.0	595.7	455.1	10744.1	9323.3
93.0	587.2	440.5	10514.4	9033.7
94.0	575.8	425.5	10215.9	8897.8
95.0	564.1	410.1	9950.1	8403.8
96.0	551.6	394.8	9654.8	8058.3
97.0	544.4	379.2	9400.5	7731.5
98.0	548.0	363.4	9249.7	7404.2
99.0	473.0	319.8	8175.7	6828.1
100.0	428.0	288.8	7491.4	6004.8
101.0	370.7	248.2	6504.1	5266.0
102.0	338.0	221.0	5813.4	4851.7
103.0	289.4	180.2	4868.0	3867.9
108.0	325.7	188.1	5337.8	3848.0
109.0	264.7	152.8	4378.8	3249.5
110.0	221.3	123.1	3564.8	2572.7
111.0	186.4	88.8	2821.1	1837.8
112.0	86.2	48.8	1433.3	1035.8
113.0	23.1	13.8	382.8	298.5
114.0	20.7	12.1	358.8	261.9
115.0	18.4	10.5	312.0	232.2
116.0	16.1	8.9	288.7	216.8
117.0	12.8	6.8	213.3	162.9
118.0	8.8	4.6	172.9	130.1
119.0	4.8	2.3	89.4	66.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	329.	205.	6376.	5123.	132.	47.
80.0	78.0	-77.	-12.	-227.	431.	-70.	-25.
83.0	78.0	-84.	74.	1273.	2887.	-103.	-9.
83.0	80.0	13.	88.	1500.	2238.	-33.	17.
85.0	83.0	154.	145.	3002.	2809.	52.	56.
90.0	85.0	900.	424.	8724.	7947.	289.	178.
90.0	83.0	754.	589.	12725.	10888.	381.	234.
91.0	90.0	11.	14.	254.	282.	3.	6.
98.0	91.0	84.	104.	1722.	2223.	1.	35.
103.0	91.0	341.	287.	6204.	5759.	146.	109.
103.0	98.0	287.	183.	4582.	3838.	146.	74.
113.0	108.0	303.	174.	4045.	3848.	150.	82.
120.0	108.0	328.	188.	5338.	3948.	181.	88.
120.0	113.0	23.	14.	303.	289.	11.	6.

WELL#31. PANCANADIAN PCP STRATHMORE A10-6-24-24W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.550	87.3	122.0	60.88
BR	0.170	183.4	208.1	88.70
LP	0.550	9.4	27.5	13.74
LP	0.170	17.7	35.6	17.80
BFSC	0.550	6.9	85.6	18.12
BFSC	0.170	18.2	102.7	20.54
MANN	0.550	20.4	85.7	18.38
MANN	0.170	38.5	114.8	22.98
LMANN	0.550	2.4	7.8	1.08
LMANN	0.170	4.6	8.7	1.39

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1482.6	1325.7	28806.5	26615.3
76.0	1387.7	1244.3	27080.4	26524.5
77.0	1314.2	1161.4	25600.6	25006.3
78.0	1271.0	1121.8	24663.2	23308.6
79.0	1300.3	1127.8	24744.2	23107.0
80.0	1361.0	1133.6	25111.1	22984.5
81.0	1327.1	1102.6	24628.2	22218.5
82.0	1358.0	1077.0	23849.8	21482.4
83.0	1348.6	1047.8	23574.3	20728.1
84.0	1370.2	978.5	22108.0	19308.7
85.0	1180.6	902.6	20548.6	17818.4
86.0	1099.8	825.3	18888.7	16202.8
87.0	988.7	745.3	17113.8	14758.3
88.0	834.4	618.8	14368.9	12308.6
89.0	788.5	573.6	13320.2	11882.8
90.0	584.8	478.4	10743.3	9863.0
91.0	573.7	464.9	10460.8	9581.3
92.0	567.2	452.6	10223.4	9278.4
93.0	557.2	438.3	9971.7	8885.7
94.0	544.5	423.1	9651.7	8648.7
95.0	531.1	407.7	9270.5	8354.0
96.0	518.7	392.1	9038.4	8017.3
97.0	507.5	378.8	8764.3	7879.2
98.0	506.2	360.6	8584.1	7350.0
99.0	441.6	317.3	7606.3	6574.6
100.0	389.6	286.3	6672.3	6052.8
101.0	340.2	248.8	6030.8	5214.2
102.0	300.7	218.6	5167.4	4800.8
103.0	226.1	177.7	4127.8	3616.8
108.0	283.5	185.4	4632.2	3880.0
109.0	228.6	150.8	3748.8	3164.6
110.0	180.2	121.2	3018.5	2528.5
111.0	142.0	87.8	2247.3	1811.2
112.0	75.0	46.3	1247.3	1018.5
113.0	18.7	13.8	318.3	293.8
114.0	18.8	12.0	277.5	258.4
115.0	15.2	10.3	241.8	218.6
116.0	12.7	8.7	212.1	178.6
117.0	9.6	6.7	182.7	151.7
118.0	6.7	4.8	171.3	120.3
119.0	3.8	2.2	78.8	58.8
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	182.	208.	4165.	5118.	64.	47.
80.0	78.0	-30.	-12.	-448.	432.	-78.	-28.
83.0	78.0	-75.	74.	1088.	2671.	-108.	-8.
83.0	80.0	15.	88.	1537.	2238.	-32.	17.
85.0	83.0	158.	146.	3029.	2811.	92.	85.
86.0	85.0	605.	424.	9803.	7052.	302.	179.
90.0	83.0	781.	589.	13832.	10862.	384.	234.
91.0	90.0	12.	14.	272.	283.	4.	8.
98.0	91.0	88.	104.	1808.	2230.	8.	38.
102.0	91.0	348.	287.	6342.	5788.	148.	109.
103.0	98.0	278.	183.	4427.	3534.	141.	74.
112.0	108.0	285.	172.	4318.	3600.	132.	81.
120.0	108.0	284.	185.	4632.	3800.	140.	85.
120.0	112.0	18.	14.	318.	204.	9.	4.

WELL#32. JORACE ET AL VERGER 6-11-23-18W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
LP	78.0	80.0	0.0	0.0	31.7	31.7	15.84	54.5
MR	80.0	83.0	5.3	60.6	0.0	65.9	21.96	83.3
COLO	83.0	90.0	65.4	84.7	33.4	183.5	26.21	245.1
2WS	90.0	98.0	60.2	4.2	2.1	66.5	8.32	80.2
BFSC	98.0	103.0	10.7	44.7	46.5	101.9	20.37	140.6
MANN	108.0	113.0	0.0	9.3	76.8	86.2	17.24	110.3
LMANN	113.0	120.0	0.0	0.0	24.7	24.7	3.52	30.5

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1143.1	884.2	20821.6	17804.3
79.0	1137.2	842.7	20326.4	17361.3
80.0	1136.4	822.2	20050.2	16878.9
81.0	1102.3	793.8	19382.6	16288.4
82.0	1078.4	768.3	18727.8	15804.0
83.0	1054.2	734.8	18148.4	14822.6
84.0	950.7	680.1	16663.3	13969.6
85.0	927.1	648.4	16016.8	13202.0
86.0	865.5	609.4	15186.2	12394.7
87.0	812.8	588.2	14016.2	11518.6
88.5	732.7	507.7	12586.6	10311.1
89.0	698.4	485.0	12038.7	9850.4
90.0	639.7	438.6	10778.3	8817.4
91.0	608.4	421.3	10585.4	8694.4
92.0	601.8	406.6	10343.8	8392.3
93.0	594.6	394.5	10115.9	8094.2
94.0	578.4	377.7	9827.8	7798.4
95.0	560.9	360.4	9527.4	7501.5
96.0	541.4	342.7	9186.1	7184.4
97.0	520.9	324.6	8836.5	6852.3
98.0	497.5	305.5	8433.3	6493.5
99.0	423.0	265.4	7350.7	5788.9
100.0	367.0	234.1	6456.4	5113.5
101.0	330.8	206.3	5891.0	4524.0
102.0	297.3	174.9	4702.1	3656.5
103.0	220.4	144.0	3891.4	3218.4
108.0	242.7	144.4	4218.8	3223.4
109.0	201.2	121.6	3562.2	2727.0
110.0	163.4	97.3	2884.3	2218.1
111.0	127.1	75.7	2238.2	1718.2
112.0	90.0	52.6	1601.8	1228.3
113.0	52.2	30.5	919.8	700.6
114.0	46.2	26.2	817.8	626.8
115.0	38.0	21.9	686.1	502.1
116.0	30.7	17.4	552.0	418.6
117.0	23.2	13.0	438.8	336.7
118.0	15.6	8.8	285.2	214.0
119.0	7.9	4.3	167.3	130.5
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	7.	42.	572.	926.	-11.	13.
83.0	78.0	69.	129.	2473.	2881.	13.	40.
83.0	80.0	62.	87.	1900.	1953.	23.	27.
85.0	83.0	127.	87.	2130.	1721.	61.	33.
90.0	85.0	306.	212.	5240.	4285.	145.	79.
90.0	83.0	433.	299.	7370.	6005.	206.	112.
91.0	90.0	12.	16.	193.	223.	6.	8.
98.0	91.0	111.	116.	2152.	2201.	44.	46.
103.0	91.0	388.	277.	6504.	5475.	184.	109.
103.0	98.0	277.	162.	4442.	3274.	140.	60.
113.0	108.0	190.	114.	3287.	2523.	88.	38.
120.0	108.0	243.	144.	4217.	3223.	112.	45.
120.0	113.0	52.	31.	920.	701.	24.	8.

WELL#33. JORACE ET AL VERGER 6-11-23-15W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
LP	0.550	24.1	24.1	12.07
LP	0.170	45.5	45.5	22.77
COLO	0.550	21.5	171.6	24.61
COLO	0.170	60.5	180.6	27.23
2WS	0.550	1.3	65.6	8.22
2WS	0.170	2.5	66.0	8.27
BFSC	0.550	28.2	83.5	10.70
BFSC	0.170	53.1	106.5	21.80
MANN	0.550	43.2	52.5	10.51
MANN	0.170	81.5	90.6	18.16
LMANN	0.550	12.4	12.4	1.02
LMANN	0.170	25.3	28.3	3.61

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
78.0	1082.3	863.8	19195.8	17706.0
79.0	1083.1	842.5	19061.3	17330.3
80.0	1058.2	821.7	18621.0	16867.2
81.0	1031.6	783.4	18113.9	16257.2
82.0	1002.0	755.7	17414.1	15594.7
83.0	977.5	724.4	16704.6	14813.0
84.0	878.1	677.5	15394.0	13805.4
85.0	857.6	651.1	14724.4	13266.7
86.0	781.0	617.7	13873.3	12558.7
87.0	734.7	570.6	13075.1	11624.1
88.5	667.7	511.0	11290.0	10330.5
89.0	626.9	467.0	10772.0	9886.6
90.0	651.6	438.1	9566.5	9008.4
91.0	537.4	420.7	9243.0	8883.7
92.0	528.1	408.5	9038.6	8367.5
93.0	516.0	394.7	8786.6	8050.8
94.0	487.6	377.7	8455.7	7704.6
95.0	477.1	360.3	8068.6	7495.5
96.0	454.4	343.5	7700.4	7161.2
97.0	430.5	324.1	7318.6	6843.5
98.0	403.0	305.1	6854.7	6483.6
99.0	327.6	263.6	6906.3	5728.5
100.0	288.5	230.9	6127.8	5037.2
101.0	264.3	201.1	4388.4	4437.4
102.0	185.0	171.2	3882.1	3778.7
103.0	182.4	143.4	2840.7	3307.6
106.0	157.6	143.7	2814.0	3200.9
109.0	132.6	130.0	2363.5	2704.0
110.0	102.1	96.1	1867.2	2170.7
111.0	78.2	74.2	1417.1	1872.6
112.0	64.4	52.4	985.3	1190.1
113.0	30.5	30.5	550.9	899.4
114.0	26.1	26.1	477.4	595.0
115.0	21.6	21.6	385.5	499.0
116.0	17.4	17.4	314.6	389.7
117.0	13.1	13.1	234.5	300.6
118.0	8.7	8.7	155.0	201.5
119.0	4.4	4.4	78.7	101.2
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-5.	42.	377.	930.	-16.	13.
83.0	78.0	88.	120.	2414.	2863.	11.	40.
83.0	80.0	91.	87.	2037.	1954.	28.	27.
85.0	83.0	120.	83.	2080.	1857.	56.	32.
90.0	85.0	306.	215.	6156.	4347.	147.	81.
90.0	83.0	438.	306.	7218.	6006.	203.	113.
91.0	90.0	14.	15.	325.	326.	7.	8.
98.0	91.0	134.	116.	2488.	2200.	58.	48.
103.0	91.0	385.	277.	6493.	5476.	184.	108.
103.0	98.0	251.	162.	4005.	3276.	127.	60.
113.0	108.0	127.	113.	2254.	2511.	58.	38.
120.0	108.0	158.	144.	2814.	3210.	71.	45.
120.0	113.0	30.	20.	560.	609.	13.	8.

WELL#33. WAINOCO CESSFORD 6-3-22-11W4
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PART I: CONSTANT GRAIN HEIGHT
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FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHVSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
PAK	78.0	80.0	0.0	0.0	28.8	28.8	14.40	53.3
MR	80.0	83.0	0.0	38.6	14.1	52.7	17.56	80.5
COLD	83.0	90.0	106.3	67.3	0.0	173.6	24.80	236.4
2WS	90.0	98.0	46.8	5.5	0.0	52.3	6.54	88.4
BFSC	98.0	103.0	4.9	66.0	27.7	98.6	19.72	142.0
MANN	108.0	113.0	2.5	34.7	42.6	79.8	15.97	102.4
LMANN	113.0	120.0	0.0	0.0	21.4	21.4	3.05	27.4

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
****

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1088.7	828.7	19225.4	18818.1
78.0	1062.1	809.1	19069.0	18211.1
80.0	1082.1	786.8	18710.5	15758.4
81.0	1085.3	768.2	18278.6	15277.3
82.0	1054.6	748.3	17650.2	14782.6
83.0	1050.2	728.7	17647.3	14298.0
84.0	988.8	683.0	16634.0	13431.3
85.0	943.1	642.8	15673.4	12630.6
86.0	913.0	603.3	14844.1	11828.7
87.0	838.6	551.2	13868.2	10880.9
88.5	805.0	471.5	11742.5	9478.1
89.0	666.4	451.5	11243.6	9087.7
90.0	577.2	402.3	9011.6	8144.6
91.0	574.9	383.7	9700.2	7959.3
92.0	569.4	382.2	9820.1	7728.4
93.0	558.3	368.2	9438.1	7518.6
94.0	545.0	355.8	9182.3	7281.0
95.0	532.6	342.0	8828.4	7003.1
96.0	517.0	328.0	8609.8	6781.6
97.0	502.6	313.6	8427.8	6518.3
98.0	463.0	298.8	8095.5	6224.1
99.0	418.6	263.3	7146.5	5578.9
100.0	362.4	231.8	6238.6	4917.6
101.0	324.0	205.8	5864.6	4361.6
102.0	286.5	174.7	4870.0	3721.7
103.0	213.0	142.4	3783.2	3050.6
108.0	243.8	144.5	4087.1	3082.3
109.0	211.4	122.7	3520.6	2824.2
110.0	172.9	98.7	2859.5	2120.2
111.0	137.1	77.2	2271.6	1697.1
112.0	89.6	61.5	1523.4	1130.4
113.0	46.7	27.5	800.6	617.5
114.0	39.5	23.7	711.6	552.2
115.0	33.2	20.0	608.3	475.3
116.0	26.8	15.3	502.0	395.1
117.0	20.2	11.6	386.2	280.6
118.0	13.5	7.9	282.3	204.7
119.0	6.8	4.0	118.1	86.8
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT
****

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	5.	40.	808.	863.	-11.	13.
83.0	78.0	27.	100.	1578.	2321.	-22.	28.
83.0	80.0	22.	60.	1072	1458.	-11.	16.
85.0	83.0	117.	85.	1974.	1868.	55.	35.
90.0	85.0	368.	241.	5762.	4495.	168.	102.
90.0	83.0	483.	326.	7736.	6153.	244.	136.
91.0	90.0	2.	9.	122.	180.	-1.	3.
98.0	91.0	92.	85.	1855.	1725.	40.	42.
103.0	91.0	281.	281.	6007.	4800.	175.	100.
103.0	98.0	260.	165.	4312.	3174.	136.	68.
113.0	108.0	188.	117.	3286.	2465.	87.	41.
120.0	108.0	244.	145.	4087.	3082.	118.	48.
120.0	113.0	46.	28.	801.	617.	21.	8.

WELL#33. WAINOCO CESSFORD 6-3-22-11W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSBS (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.550	23.5	23.5	11.73
PAK	0.170	44.3	44.3	22.14
MR	0.550	9.6	46.4	18.12
MR	0.170	16.5	57.1	18.03
BFSC	0.550	17.4	66.3	17.67
BFSC	0.170	32.9	103.6	20.76
MANN	0.550	24.6	81.8	12.36
MANN	0.170	46.3	83.5	16.71
LMANN	0.550	12.1	12.1	1.72
LMANN	0.170	22.6	22.6	0.26

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1030.4	828.6	18300.8	18017.0
79.0	1038.5	808.5	18180.8	18176.4
80.0	1044.1	788.6	18036.6	15754.6
81.0	1038.2	767.8	17830.3	15273.0
82.0	1020.7	747.8	17261.0	14788.3
83.0	1026.1	726.6	17067.7	14288.1
84.0	958.7	682.9	16028.7	13628.4
85.0	908.6	642.7	15057.9	12037.4
86.0	878.3	603.2	14308.7	11823.4
87.0	801.6	551.1	13332.2	10976.7
88.0	656.5	471.3	11068.5	9476.2
89.0	627.1	451.4	10548.0	9065.6
90.0	536.0	402.2	9104.0	8142.4
91.0	532.1	383.5	9048.5	7965.0
92.0	535.1	382.2	8886.4	7728.6
93.0	512.2	368.1	8838.0	7512.6
94.0	496.1	356.7	8385.6	7258.7
95.0	482.9	342.0	8083.6	7000.7
96.0	466.2	327.9	7825.5	6778.2
97.0	444.8	313.5	7521.2	6613.0
98.0	428.7	298.7	7153.0	6231.5
99.0	370.1	281.6	6308.6	5525.7
100.0	318.3	228.2	5446.4	4856.6
101.0	276.4	203.6	4727.0	4209.9
102.0	223.6	172.4	3896.4	3662.4
103.0	172.0	142.3	3080.1	3057.5
104.0	182.6	144.3	3232.4	3078.0
105.0	164.7	123.0	2773.4	2528.2
110.0	134.1	88.5	2207.5	2114.2
111.0	104.0	77.0	1700.5	1882.5
112.0	63.3	51.0	1104.5	1132.2
113.0	27.4	27.4	488.6	615.5
114.0	23.6	23.3	426.0	525.6
115.0	18.5	18.6	352.7	434.5
116.0	15.7	15.7	280.8	348.6
117.0	11.6	11.6	208.7	263.0
118.0	7.6	7.6	136.6	175.3
119.0	3.8	3.8	68.6	87.6
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		IBOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-5.	40.	352.	882.	-16.	13.
82.0	78.0	11.	100.	1323.	2221.	-28.	28.
83.0	80.0	18.	60.	871.	1458.	-14.	18.
85.0	83.0	119.	68.	2010.	1558.	57.	35.
88.0	85.0	273.	241.	5604.	4405.	182.	102.
90.0	88.0	482.	326.	7874.	6154.	248.	136.
91.0	90.0	4.	9.	145.	188.	-1.	3.
98.0	91.0	105.	66.	1886.	1734.	47.	42.
103.0	91.0	380.	251.	5860.	4666.	176.	100.
103.0	98.0	255.	158.	4073.	3174.	128.	56.
113.0	106.0	165.	117.	2733.	2483.	81.	41.
120.0	108.0	183.	144.	3232.	3078.	93.	48.
120.0	113.0	27.	27.	500.	616.	12.	8.

WELL#34. CDN RES ETAL EMPRESS 10-17-23-1W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYES	SANDS	TOTAL	RATE HB SED(m/Ma)	THICK TOT(m)
PAK	75.0	80.0	0.0	1.0	55.0	56.0	28.02	120.2
MR	80.0	83.0	0.0	52.0	13.8	66.2	22.06	128.3
COLO	83.0	90.0	103.7	1.0	0.0	105.8	15.08	148.1
2WS	90.0	98.0	40.1	3.1	3.6	46.8	5.85	85.5
BFSC	98.0	103.0	51.7	44.2	4.1	100.0	20.01	144.8
MANN	108.0	113.0	8.9	26.8	14.7	50.4	10.08	87.7
LMANN	113.0	120.0	2.2	0.0	15.8	18.1	2.73	31.1

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
75.0	1031.5	833.0	17586.6	15851.2
78.0	887.2	770.6	16781.6	14502.5
80.0	848.7	718.4	15840.3	13862.5
81.0	806.9	676.3	15189.2	12839.6
82.0	883.4	637.8	14878.5	12105.0
83.0	860.9	600.0	13881.1	11436.0
84.0	831.6	580.4	13471.6	10834.6
85.0	783.6	550.7	13836.7	10380.7
86.0	784.6	520.6	12186.1	9818.3
87.0	713.3	488.9	11504.0	9338.7
88.5	648.4	442.1	10431.0	8386.4
89.0	817.1	435.7	10028.3	8104.4
90.0	550.9	392.5	9089.6	7498.8
91.0	554.6	384.9	9054.1	7337.4
92.0	550.2	375.5	8906.8	7141.3
93.0	542.7	384.0	8783.5	6987.3
94.0	534.0	354.2	8586.3	6738.6
95.0	527.4	343.4	8413.1	6583.1
96.0	518.6	332.0	8221.7	6336.8
97.0	513.1	321.0	8040.2	6108.2
98.0	512.4	310.8	7937.8	5888.1
99.0	471.8	278.3	7213.1	5337.9
100.0	375.9	228.1	5835.9	4452.1
101.0	330.8	187.2	5121.6	3773.5
102.0	287.5	157.1	4071.3	3055.7
103.0	183.7	112.4	2773.8	2258.0
104.0	198.1	115.8	3121.7	2289.7
108.0	188.6	98.4	2868.6	1948.4
110.0	141.4	82.3	2249.0	1851.6
111.0	104.8	63.9	1700.9	1387.4
112.0	73.4	47.7	1213.3	852.5
113.0	47.0	33.3	778.6	641.0
114.0	42.1	30.6	710.3	588.7
115.0	37.4	26.3	637.5	514.6
116.0	31.9	22.0	503.2	402.8
117.0	16.8	15.7	330.9	302.7
118.0	12.4	10.8	216.1	200.0
119.0	6.2	5.5	128.3	115.0
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	82.	117.	1717.	2088.	29.	53.
83.0	75.0	171.	223.	3848.	4215.	57.	93.
83.0	80.0	89.	106.	1888.	2147.	28.	40.
85.0	83.0	67.	58.	1144.	1088.	32.	28.
90.0	85.0	243.	158.	3737.	2862.	127.	68.
90.0	83.0	310.	215.	4881.	3837.	158.	95.
91.0	90.0	-4.	8.	48.	161.	-5.	3.
98.0	91.0	42.	74.	1117.	1438.	8.	30.
103.0	91.0	381.	272.	6280.	5081.	107.	118.
103.0	98.0	340.	198.	5164.	3843.	180.	86.
113.0	108.0	151.	82.	2342.	1848.	70.	32.
120.0	108.0	198.	118.	3122.	2280.	102.	48.
120.0	113.0	47.	33.	780.	641.	23.	13.

WELL#34. CDN RES ETAL EMPRESS 10-17-23-1W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.550	55.1	57.0	28.62
PAK	0.170	105.7	105.7	53.37
MR	0.550	12.1	54.6	31.61
MR	0.170	22.6	75.2	35.07
2WS	0.550	2.7	45.8	6.73
2WS	0.170	5.1	48.3	8.03
SFBC	0.550	2.7	58.6	18.72
SFBC	0.170	5.1	101.0	20.20
MANN	0.550	8.7	44.4	8.66
MANN	0.170	16.4	52.1	10.43
LMANN	0.550	12.3	14.6	2.06
LMANN	0.170	23.3	25.8	3.64

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	1012.6	832.0	17287.4	15560.6
78.0	972.0	773.7	16509.7	14630.2
80.0	932.3	715.0	15588.6	13578.3
81.0	891.6	686.0	14887.3	12707.3
82.0	880.1	641.4	14347.6	12153.7
83.0	848.6	606.8	13765.6	11435.3
84.0	816.6	580.4	13250.2	10834.2
85.0	780.7	550.2	12800.5	10370.1
86.0	741.4	519.0	11852.0	9612.0
87.0	699.8	488.5	11205.1	9242.6
88.5	630.3	441.0	10163.6	8384.6
89.0	602.6	425.6	9768.2	8102.9
90.0	538.6	393.3	8848.4	7408.6
91.0	540.0	380.6	8807.9	7303.3
92.0	532.9	377.7	8632.7	7201.0
93.0	526.3	367.1	8475.3	6979.4
94.0	517.4	355.0	8384.5	6767.5
95.0	508.7	344.7	8090.3	6566.3
96.0	501.9	333.4	7933.6	6340.0
97.0	495.4	321.5	7765.3	6110.0
98.0	494.6	311.4	7643.6	6007.0
99.0	465.3	278.9	6927.4	5333.6
100.0	361.4	228.0	5568.4	4400.4
101.0	313.1	187.6	4840.0	3612.6
102.0	239.3	157.6	3780.3	3000.6
103.0	146.6	112.5	3482.9	2256.2
105.0	177.6	115.6	2786.9	2200.0
108.0	141.6	95.2	2307.9	1924.1
110.0	134.6	82.9	1953.8	1836.2
111.0	91.0	64.4	1471.3	1291.9
112.0	62.9	47.7	1044.5	947.0
113.0	37.6	33.3	835.3	841.6
114.0	34.3	30.0	552.0	646.0
115.0	31.3	24.6	480.6	451.2
116.0	21.7	17.8	361.1	380.3
117.0	14.2	13.2	244.6	241.0
118.0	9.5	8.8	182.5	187.5
119.0	4.7	4.4	81.2	78.5
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	80.	117.	1881.	2072.	28.	53.
82.0	78.0	155.	223.	3592.	4215.	64.	83.
83.0	80.0	65.	108.	1901.	2143.	28.	40.
86.0	83.0	66.	58.	1186.	1089.	32.	28.
90.0	85.0	246.	156.	3784.	2879.	126.	90.
90.0	83.0	312.	217.	4920.	3930.	160.	95.
91.0	90.0	-4.	6.	38.	134.	-6.	2.
98.0	91.0	45.	78.	1184.	1455.	8.	30.
102.0	91.0	303.	274.	6315.	5106.	168.	118.
103.0	98.0	348.	190.	5151.	3861.	188.	85.
113.0	105.0	140.	87.	2182.	1848.	73.	32.
120.0	108.0	178.	118.	2787.	2280.	92.	45.
120.0	113.0	38.	33.	626.	642.	18.	14.

WELL#35. UTEXCAN ET AL CLARESHOLM 6-30-12-28W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NO SED(m/Ma)	THICK TOT(m)
DR	75.0	78.0	177.2	61.2	49.0	287.4	95.80	320.5
PAK	78.0	80.0	23.4	0.0	0.0	23.4	11.71	26.7
MR	80.0	83.0	77.8	33.5	13.5	124.8	41.61	133.2
COLO	83.0	86.5	108.8	0.0	0.0	108.8	30.70	176.3
CARD	86.5	90.0	100.1	35.8	0.0	135.4	38.69	148.7
2WS	90.0	98.0	103.2	2.7	0.0	105.9	13.24	118.2
BFSC	98.0	103.0	95.6	31.6	5.4	132.6	26.51	143.3
MANN	108.0	113.0	98.6	47.2	6.2	152.1	30.42	159.1
LMANN	113.0	120.0	3.0	0.0	16.8	19.8	2.83	31.3
SWFT	149.0	163.0	17.8	0.0	0.0	17.8	1.28	18.0
RIER	163.0	168.0	34.6	0.0	0.0	34.6	6.86	36.9

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	2250.1	1774.7	42082.1	37748.2
76.0	1971.2	1598.1	38107.2	34626.2
77.0	1740.5	1453.5	34340.0	31384.6
78.0	1470.8	1296.7	29884.7	28207.0
79.0	1481.3	1288.8	30001.8	28054.5
80.0	1536.2	1304.5	30261.2	27800.0
81.0	1446.5	1254.2	28707.8	26744.3
82.0	1452.5	1220.7	28118.3	25826.5
83.0	1362.2	1185.0	26635.5	24440.6
84.0	1351.6	1127.7	25810.9	23889.1
85.0	1320.1	1089.2	25076.1	22683.5
86.0	1298.0	1040.0	24244.9	21748.0
87.0	1270.8	1006.2	23510.0	20868.6
88.5	1288.5	949.5	22097.0	19423.4
89.0	1128.4	890.1	20821.4	17610.8
90.0	789.1	681.0	15608.7	14802.5
91.0	787.5	686.0	15277.1	14149.5
92.0	777.5	650.9	15081.2	13601.5
93.0	755.8	635.1	14710.5	13309.0
94.0	758.6	621.3	14613.4	13024.1
95.0	751.1	605.3	14140.8	12687.1
96.0	740.8	588.7	13799.4	12282.5
97.0	733.1	572.4	13628.0	11912.5
98.0	740.7	556.9	13351.5	11494.2
99.0	678.0	507.0	12204.1	10687.2
100.0	611.0	452.4	11102.7	9890.8
101.0	547.8	417.8	10129.4	8817.0
102.0	472.2	367.4	8902.4	7643.2
103.0	373.7	320.6	7860.4	6923.3
108.0	534.1	366.8	9080.7	7410.7
109.0	462.5	312.8	7897.5	6384.7
110.0	387.9	260.9	6620.8	5340.0
111.0	312.0	211.3	5352.0	4325.6
112.0	233.2	155.0	4065.2	3274.9
113.0	106.4	89.5	2258.2	2088.5
114.0	100.2	85.8	2188.7	2041.2
115.0	95.5	82.6	2094.3	1986.3
116.0	90.8	79.9	2001.4	1892.0
117.0	86.1	77.1	1909.3	1818.4
118.0	81.7	74.3	1820.0	1748.3
119.0	78.8	71.7	1748.7	1673.3
120.0	67.4	65.8	1547.2	1530.6

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
78.0	75.0	780.	476.	12867.	9540.	388	183.
80.0	78.0	-66.	-8.	-276.	308.	-57.	-17.
83.0	78.0	88.	132.	2320.	3767.	-18.	18.
83.0	80.0	154.	140.	3606.	3459.	43.	33.
86.0	83.0	58.	78.	1889.	1768.	8.	21.
90.0	86.0	527.	408.	9380.	8180.	237.	158.
90.0	83.0	583.	484.	10940.	9938.	248.	177.
91.0	90.0	12.	18.	319.	353.	2.	4.
98.0	91.0	47.	109.	2028.	2858.	-16.	27.
103.0	91.0	414.	345.	7917.	7228.	189.	122.
103.0	98.0	367.	236.	5881.	4571.	185.	95.
113.0	108.0	426.	279.	8822.	6322.	217.	118.
120.0	108.0	487.	303.	7534.	5850.	234.	121.
120.0	113.0	30.	24.	712.	558.	17.	5.

WELL#20. UTEXCAN ET AL CLARESHOLM 6-30-12-26W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HDSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
BR	0.550	25.5	263.0	67.05
BR	0.170	65.1	285.5	55.40
MR	0.550	6.7	116.0	30.32
MR	0.170	12.6	123.0	41.30
BFSC	0.550	2.7	125.8	26.06
BFSC	0.170	5.1	[illegible]	26.43
MANN	0.550	4.0	147.0	20.58
MANN	0.170	7.6	161.5	30.20
LMANN	0.550	6.0	11.0	1.55
LMANN	0.170	16.2	16.2	2.00

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
75.0	2105.5	1770.7	41573.0	37881.6
76.0	1949.1	1604.6	37020.1	34344.5
77.0	1730.0	1450.3	33048.7	31287.0
78.0	1682.7	1304.1	30040.7	28154.0
79.0	1673.1	1296.0	30602.6	27999.1
80.0	1615.4	1301.0	28576.3	27042.6
81.0	1530.0	1251.0	28416.3	26882.3
82.0	1427.3	1234.3	27674.2	25783.0
83.0	1374.9	1183.3	26477.6	24404.5
84.0	1342.4	1126.0	26066.3	23522.6
85.0	1317.8	1087.4	24006.6	22646.2
86.0	1287.4	1047.2	24029.3	21710.6
87.0	1201.5	1006.3	23328.0	20810.4
88.0	1288.8	944.5	22474.6	19302.6
89.0	1118.4	856.0	20328.2	17709.5
90.0	785.6	675.5	15401.7	14480.4
91.0	776.5	663.5	15165.0	14105.3
92.0	760.0	648.7	14860.4	13757.5
93.0	753.0	632.6	14468.5	13364.0
94.0	746.1	618.1	14173.7	12877.0
95.0	737.6	602.5	13600.1	12519.6
96.0	728.3	588.3	13626.1	12214.1
97.0	717.6	570.0	13258.1	11802.0
98.0	723.6	554.6	13082.1	11443.3
99.0	680.7	504.7	12008.3	10527.0
100.0	604.3	480.0	10888.9	9540.0
101.0	521.5	415.4	9400.7	8720.0
102.0	480.7	365.2	8886.4	7706.5
103.0	380.7	318.3	7308.3	6970.5
108.0	513.6	306.3	6741.4	7356.1
109.0	442.7	310.4	7956.5	6322.5
110.0	374.0	256.6	6367.2	5206.5
111.0	306.4	209.1	5008.7	4273.7
112.0	217.4	152.6	3767.1	2220.3
113.0	90.4	87.5	1902.1	2048.0
114.0	85.3	84.1	1918.2	1968.6
115.0	83.5	81.4	1854.0	1809.0
116.0	80.6	78.6	1704.3	1830.3
117.0	78.4	76.2	1730.6	1762.1
118.0	76.5	73.7	1886.6	1805.1
119.0	74.5	71.4	1868.6	1820.8
120.0	67.4	65.6	1647.3	1630.6

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
76.0	75.0	743.	477.	11827.	9508.	273.	163.
80.0	76.0	-63.	-8.	-228.	311.	-55.	-17.
83.0	78.0	79.	121.	3160.	2750.	-10.	15.
83.0	80.0	142.	128.	3287.	3436.	37.	32.
85.0	83.0	57.	76.	1971.	1765.	5.	21.
90.0	85.0	820.	408.	8415.	6185.	236.	156.
90.0	83.0	898.	484.	10046.	8944.	247.	177.
91.0	90.0	12.	15.	327.	364.	-2.	4.
95.0	91.0	63.	110.	2112.	2063.	-12.	27.
103.0	91.0	417.	348.	7957.	7228.	171.	122.
103.0	95.0	304.	230.	6648.	4565.	163.	65.
113.0	103.0	423.	278.	6760.	6312.	215.	115.
120.0	103.0	446.	300.	7104.	5627.	224.	120.
120.0	113.0	23.	22.	468.	518.	0.	6.

WELL#36. DANNER ET AL IRONSP 7-8-12-21W4
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PART I: CONSTANT GRAIN HEIGHT
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FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
PAK	78.0	80.0	21.1	0.0	0.0	21.1	10.53	28.8
MR	80.0	83.0	54.2	13.0	21.5	88.7	29.56	108.4
COLO	83.0	88.5	140.7	0.0	0.0	140.7	25.58	158.4
CARD	88.5	90.0	124.4	0.0	0.0	124.4	82.93	138.7
2WS	90.0	98.0	80.5	0.0	0.0	80.5	10.06	88.6
SPEC	98.0	103.0	73.5	40.5	19.0	133.0	28.60	184.2
MANN	105.0	113.0	55.1	40.7	50.5	146.3	20.28	197.3
LMANN	113.0	120.0	30.2	3.9	0.0	34.1	3.48	37.1

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
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TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1386.8	1175.4	26586.6	26381.2
79.0	1401.8	1172.5	26404.8	24176.4
80.0	1421.0	1171.5	26523.8	23063.5
81.0	1381.4	1141.3	26035.6	23210.5
82.0	1300.2	1116.0	25254.0	22463.8
83.0	1343.5	1071.5	24264.0	21510.0
84.0	1312.1	1026.5	23556.4	20773.0
85.0	1288.3	1001.6	22637.1	19870.5
86.0	1261.4	958.1	22187.2	19203.0
87.0	1242.3	930.7	21851.6	18402.6
88.5	1275.1	878.2	21235.7	17238.2
89.0	1130.7	789.7	19128.1	15683.8
90.0	755.3	601.8	13625.0	12373.5
91.0	748.2	589.1	13713.8	12106.3
92.0	740.2	578.1	13448.7	11798.7
93.0	732.6	562.0	13232.7	11510.3
94.0	728.3	549.6	12978.2	11200.3
95.0	718.0	536.1	12718.7	10881.7
96.0	711.2	522.0	12516.5	10612.0
97.0	711.0	510.0	12330.0	10201.5
98.0	723.7	497.3	12268.8	9880.7
99.0	657.5	450.8	11278.3	9184.2
100.0	618.0	412.1	10348.0	8288.9
101.0	528.6	358.3	9007.6	7272.6
102.0	445.8	309.3	7717.5	6337.0
103.0	343.9	259.5	6350.7	6301.0
105.0	442.6	285.2	7248.5	5557.0
108.0	408.8	252.7	6443.3	5685.5
110.0	330.1	202.4	5197.3	3907.3
111.0	278.1	160.0	4188.0	2893.4
112.0	180.3	102.5	2708.0	1921.1
113.0	74.4	48.2	1180.2	898.6
114.0	72.7	45.3	1112.4	836.2
115.0	65.3	38.6	950.9	681.6
116.0	56.0	31.7	808.7	583.6
117.0	45.8	24.3	650.9	442.3
118.0	34.2	15.8	497.0	319.1
119.0	18.3	8.4	255.9	148.4
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT
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INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-31.	4.	38.	388.	-32.	-8.
83.0	78.0	47.	104.	2205.	2855.	-24.	15.
83.0	80.0	78.	100.	2259.	2477.	0.	24.
88.5	83.0	88.	70.	1427.	1848.	14.	22.
90.0	88.5	530.	400.	8912.	7597.	255.	165.
90.0	83.0	568.	470.	10330.	9142.	289.	167.
91.0	90.0	7.	13.	311.	287.	1.	4.
98.0	91.0	24.	92.	1445.	2128.	-20.	28.
103.0	91.0	404.	329.	7403.	6707.	174.	122.
103.0	98.0	380.	238.	6018.	4582.	194.	88.
113.0	105.0	368.	236.	6008.	4781.	180.	80.
120.0	105.0	442.	285.	7248.	5657.	218.	110.
120.0	113.0	74.	49.	1150.	898.	38.	22.

WELL#36. DANNER ET.AL IRONSF 7-9-12-21W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
MR	0.550	13.4	81.2	27.08
MR	0.170	25.3	93.1	31.04
BFSC	0.550	5.4	128.5	25.69
BFSC	0.170	10.1	133.2	26.64
MANN	0.550	28.8	122.5	24.51
MANN	0.170	50.6	146.3	29.27

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1358.1	1174.2	25975.7	24358.6
79.0	1364.7	1171.4	25869.0	24158.3
80.0	1367.5	1170.3	25651.0	23970.3
81.0	1364.5	1140.7	25088.8	23181.8
82.0	1357.5	1117.7	23701.5	22488.0
83.0	1323.5	1070.4	23862.8	21483.1
84.0	1301.4	1038.4	23182.8	20748.5
85.0	1283.7	1000.4	22428.9	19948.8
86.0	1238.0	984.8	21766.4	19178.8
87.0	1218.8	928.5	21118.6	18278.8
88.5	1250.3	877.8	20781.8	17213.4
89.0	1106.4	788.5	18863.7	15857.8
90.0	728.0	600.8	13443.2	12347.0
91.0	720.7	587.8	13218.0	12078.2
92.0	711.7	574.7	12932.2	11782.0
93.0	702.7	561.5	12807.8	11601.2
94.0	694.3	548.2	12421.8	11171.4
95.0	685.6	534.7	12144.4	10892.4
96.0	677.4	521.4	11918.7	10882.0
97.0	670.7	508.8	11718.9	10268.8
98.0	657.2	488.8	11626.7	9849.4
99.0	621.4	448.0	10834.1	9042.2
100.0	574.9	411.1	9838.1	8241.8
101.0	487.7	357.2	8347.6	7247.0
102.0	408.4	298.0	7107.1	6353.1
103.0	398.3	288.2	6840.3	6388.0
105.0	388.6	283.7	6487.3	5823.4
108.0	373.4	251.6	5828.8	4838.0
110.0	302.1	201.3	4709.7	3882.1
111.0	245.5	155.5	3701.4	2878.4
112.0	189.8	100.1	2525.8	1884.8
113.0	74.6	49.2	1160.2	895.5
114.0	72.7	45.3	1113.4	838.2
115.0	65.3	38.8	950.0	681.8
116.0	56.0	31.7	809.7	563.8
117.0	46.8	24.3	660.8	443.3
118.0	34.2	16.6	487.0	310.1
119.0	18.3	8.4	255.8	145.4
120.0	0.0	0.0	0.0	0.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-28.	4.	84.	389.	-31.	-8.
83.0	79.0	38.	104.	2083.	2866.	-28.	15.
83.0	80.0	64.	100.	2009.	2477.	2.	23.
85.0	83.0	80.	70.	1453.	1846.	15.	22.
90.0	85.0	536.	490.	8887.	7800.	257.	165.
90.0	83.0	565.	470.	10438.	8145.	272.	187.
91.0	90.0	6.	13.	228.	286.	1.	4.
98.0	91.0	34.	82.	1588.	2130.	-18.	28.
102.0	91.0	412.	330.	7575.	6710.	178.	122.
103.0	95.0	378.	238.	5885.	4660.	184.	98.
112.0	108.0	324.	235.	5337.	4728.	158.	88.
120.0	108.0	308.	284.	8487.	5823.	198.	110.
120.0	113.0	74.	48.	1160.	895.	38.	22.

WELL#37. ASHLAND HAYS 10-25-12-15W4
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PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
PAK	78.0	80.0	0.0	9.5	24.0	33.5	16.74	50.1
MR	80.0	83.0	38.1	27.8	11.4	77.3	25.76	103.8
COLO	83.0	90.0	198.8	9.5	0.0	208.3	29.75	248.8
2WS	90.0	98.0	72.7	2.4	0.0	75.1	9.39	85.0
BFSC	98.0	103.0	81.6	48.0	9.4	139.0	27.80	185.7
MANN	108.0	113.0	23.1	55.0	10.2	88.2	19.65	111.3
LMANN	113.0	120.0	0.0	0.0	18.2	18.2	2.60	21.3

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1282.2	1041.8	23311.4	21188.0
79.0	1289.9	1030.0	23147.8	20824.1
80.0	1289.7	1017.7	22953.4	20407.2
81.0	1271.2	985.8	22572.0	19801.0
82.0	1270.3	969.8	22186.1	19127.2
83.0	1235.0	926.6	21339.3	18242.4
84.0	1171.9	876.4	20237.8	17282.3
85.0	1103.4	822.9	19026.3	16192.3
86.0	1058.4	775.5	18116.6	15268.2
87.0	988.1	720.8	16880.1	14189.6
88.5	884.4	634.0	14922.3	12894.2
89.0	819.3	604.0	14204.8	12029.4
90.0	701.8	541.7	12502.8	10885.5
91.0	693.2	526.9	12273.8	10614.1
92.0	684.5	515.9	12052.5	10347.6
93.0	683.6	504.6	11886.1	10057.1
94.0	675.2	491.1	11652.1	9782.3
95.0	670.1	477.8	11429.7	9487.0
96.0	657.1	464.4	11224.3	9178.3
97.0	671.9	451.1	11139.7	8908.5
98.0	689.6	437.7	11137.7	8588.5
99.0	585.2	377.1	9866.8	7853.3
100.0	519.3	326.3	8526.4	6596.6
101.0	431.2	274.6	7160.0	5578.5
102.0	347.9	224.4	5678.4	4629.1
103.0	238.5	171.7	4295.6	3620.2
108.0	311.9	184.2	5036.6	3746.4
109.0	261.1	150.7	4214.0	3058.1
110.0	202.7	116.3	3313.3	2440.9
111.0	164.2	88.8	2629.5	1867.9
112.0	90.6	50.7	1522.1	1117.2
113.0	37.7	22.1	688.7	512.5
114.0	32.6	19.0	586.9	447.0
115.0	27.8	15.8	484.7	376.4
116.0	22.3	12.7	389.9	302.6
117.0	17.0	9.6	305.3	230.3
118.0	11.5	6.4	207.2	155.8
119.0	5.9	3.3	106.1	79.2
120.0	0.0	0.0	0.0	0.0

FORMATION OR INTERV	TIME (Ma)	FORM OR INT THICK (m)		FORM OR INTER STRESS (kPa)	
PAK					
	78.0	63.8	55.3	1361.8	1134.6
	79.0	47.0	30.8	767.3	604.7
MR					
	78.0	206.0	139.2	3344.1	2868.6
	79.0	220.5	142.3	3489.8	2700.7
	80.0	240.8	148.0	3895.7	2737.3
	81.0	196.8	108.5	2852.8	1962.8
	82.0	133.0	82.4	1821.9	1190.1
COLO					
	78.0	448.1	379.3	7077.1	7251.6
	79.0	470.9	385.8	8207.4	7348.3
	80.0	491.3	396.6	8494.4	7468.7
	81.0	536.4	408.7	8883.6	7579.4
	82.0	568.9	422.6	9390.5	7710.6
	83.0	577.0	436.8	10268.7	7862.6
	84.0	602.3	381.1	9071.6	6638.5
	85.0	520.9	321.6	7728.9	5718.7
	86.0	461.1	268.7	6861.0	4728.4
	87.0	371.4	205.8	5257.6	3664.3
	88.5	216.4	109.6	2983.5	1856.4
	89.0	157.0	72.3	2101.2	1244.6
2WS					
	78.0	126.3	116.6	2520.8	2422.1
	79.0	129.2	118.2	2549.8	2440.1
	80.0	132.4	120.3	2582.0	2459.6
	81.0	136.0	122.4	2618.0	2480.7
	82.0	140.0	124.6	2658.8	2502.7
	83.0	144.6	127.1	2705.3	2526.6
	84.0	149.9	129.9	2759.2	2556.5
	85.0	155.2	132.9	2822.7	2587.1
	86.0	163.6	136.3	2890.0	2621.2
	87.0	173.1	140.1	2982.7	2659.6
	88.5	193.0	146.8	3194.5	2727.6
	89.0	202.4	149.4	3280.6	2753.7
	90.0	231.2	155.2	3580.4	2812.7
	91.0	210.5	137.9	3220.5	2496.3
	92.0	188.2	120.0	2869.5	2180.0
	93.0	171.3	103.5	2522.5	1837.1
	94.0	144.1	84.3	2118.5	1513.0
	95.0	116.1	64.5	1684.5	1142.0
	96.0	83.6	44.0	1152.6	761.1
	97.0	48.3	22.7	671.0	412.1
BFSC					
	78.0	226.2	203.1	4567.4	4323.6
	79.0	228.4	204.0	4589.2	4350.3

80.0	232.8	208.5	4633.6	4307.8
81.0	236.4	208.2	4670.5	4386.2
82.0	240.3	210.2	4708.0	4405.8
83.0	244.8	212.3	4752.7	4428.5
84.0	249.1	214.4	4798.0	4448.5
85.0	254.1	216.4	4840.4	4471.8
86.0	258.6	218.2	4904.5	4498.8
87.0	265.8	221.0	4988.3	4523.4
88.5	276.0	226.2	5088.4	4567.2
89.0	279.7	227.7	5108.1	4582.0
90.0	288.2	231.0	5193.3	4616.2
91.0	297.7	234.8	5290.1	4652.8
92.0	308.8	238.6	5402.2	4692.2
93.0	321.8	242.0	5534.3	4735.7
94.0	337.7	247.6	5693.5	4784.0
95.0	357.3	253.0	5891.8	4837.9
96.0	383.0	258.0	6151.3	4898.7
97.0	418.5	265.0	6520.0	4967.9
98.0	491.4	273.8	7148.8	5048.2
99.0	373.1	211.8	5827.4	3908.4
100.0	300.8	161.6	4434.2	3027.2
101.0	208.9	106.5	3008.6	1993.5
102.0	117.0	54.6	1657.8	1027.2

MANN

78.0	130.5	125.6	3075.7	2865.8
79.0	137.7	125.2	2997.1	2871.3
80.0	138.8	126.7	2999.2	2877.0
81.0	140.1	127.3	3011.9	2882.8
82.0	141.4	127.9	3025.3	2888.8
83.0	142.8	128.5	3038.2	2895.1
84.0	144.3	129.2	3054.0	2901.6
85.0	145.8	129.9	3069.8	2908.4
86.0	147.5	130.6	3086.2	2915.4
87.0	149.2	131.3	3103.8	2922.7
88.5	152.0	132.4	3131.8	2934.3
89.0	153.0	132.8	3142.0	2938.3
90.0	155.1	133.6	3163.0	2946.7
91.0	157.3	134.5	3186.6	2955.3
92.0	159.7	135.4	3209.8	2964.5
93.0	162.3	136.4	3236.8	2974.1
94.0	165.1	137.4	3264.0	2984.1
95.0	168.1	138.4	3294.4	2994.8
96.0	171.3	139.5	3327.8	3005.0
97.0	174.8	140.7	3363.9	3017.6
98.0	178.9	141.9	3403.9	3030.5
99.0	183.3	143.3	3448.1	3044.0
100.0	188.2	144.7	3497.4	3058.4
101.0	193.6	146.3	3552.9	3073.9
102.0	199.5	147.9	3616.1	3090.7
103.0	207.1	149.7	3688.6	3108.9
105.0	277.9	152.1	4404.3	3224.5
108.0	220.6	128.7	3575.5	2686.1
110.0	167.4	94.3	2968.0	1928.6
111.0	128.2	66.8	1878.8	1355.7
112.0	54.0	28.6	861.3	604.6

LMANN

78.0	25.3	21.7	844.6	508.7
79.0	25.4	21.7	845.8	508.8
80.0	25.6	21.7	847.5	508.9
81.0	25.7	21.7	849.1	509.0
82.0	25.9	21.6	850.7	509.1
83.0	26.0	21.6	852.4	509.2
84.0	26.2	21.6	854.2	509.3
85.0	26.4	21.6	856.0	509.4
86.0	26.5	21.6	857.9	509.5
87.0	26.8	21.6	859.9	509.6
88.5	27.1	21.6	863.0	509.7
89.0	27.2	21.6	864.0	509.8
90.0	27.4	21.8	866.3	509.9
91.0	27.6	21.8	868.6	510.0
92.0	27.9	21.9	871.0	510.1
93.0	28.1	21.9	873.5	510.2
94.0	28.4	21.9	876.1	510.3
95.0	28.7	21.9	878.9	510.4
96.0	29.0	21.9	881.8	510.5
97.0	29.3	21.9	884.8	510.6
98.0	29.6	21.9	888.0	510.7
99.0	29.9	21.9	891.3	510.8
100.0	30.2	21.9	894.9	510.9
101.0	30.6	22.0	898.6	511.1
102.0	31.0	22.0	902.5	511.2
103.0	31.4	22.0	906.7	511.3
105.0	33.0	22.0	932.2	511.8
108.0	34.6	22.0	936.8	512.0
110.0	35.2	22.1	945.3	512.2
111.0	36.0	22.1	952.7	512.3
112.0	36.6	22.1	960.8	512.4
113.0	37.7	22.1	969.7	512.6
114.0	32.8	19.0	885.0	447.8
115.0	27.8	15.8	484.7	378.4
116.0	22.3	12.7	[illegible]	302.8
117.0	17.0	9.6	[illegible]	230.3
118.0	11.5	6.4	[illegible]	155.8
119.0	5.9	3.2	[illegible]	79.2

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma)		TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (KiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
TIME1	TIME2						
80.0	78.0	-18.	24.	356.	779.	-28.	0.
83.0	78.0	17.	113.	1072.	2044.	-44.	22.
83.0	80.0	35.	80.	1514.	2165.	-15.	22.
86.0	83.0	132.	106.	2313.	2050.	60.	42.
90.0	85.0	402.	281.	5523.	5307.	200.	117.
90.0	83.0	533.	387.	8536.	7357.	280.	158.
91.0	90.0	9.	13.	228.	271.	2.	4.
98.0	91.0	3.	81.	1136.	3025.	-32.	29.
102.0	91.0	465.	357.	7676.	6904.	208.	141.
103.0	98.0	481.	266.	6842.	4869.	240.	112.
113.0	108.0	274.	182.	4387.	3234.	138.	82.
120.0	106.0	312.	184.	5037.	3748.	155.	88.
120.0	113.0	38.	22.	870.	513.	17.	8.

WELL#37. ASHLAND HAYS 10-28-12-15W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.550	10.4	28.1	14.04
PAK	0.170	35.7	45.3	22.68
MR	0.550	8.0	73.8	24.85
MR	0.170	15.2	81.1	27.03
BFSC	0.550	5.4	125.0	28.89
BFSC	0.170	10.1	130.7	27.84
MANN	0.550	8.4	88.4	17.58
MANN	0.170	17.7	85.7	10.35
LMANN	0.550	8.4	8.4	1.34
LMANN	0.170	17.7	17.7	2.53

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1222.5	1060.5	22770.5	21150.4
79.0	1234.2	1028.6	22670.8	20795.6
80.0	1251.0	1016.3	22505.4	20378.0
81.0	1252.5	988.6	22238.2	19648.6
82.0	1251.3	971.3	21804.6	19130.9
83.0	1221.2	927.1	21070.3	18213.7
84.0	1157.5	876.0	19950.0	17223.0
85.0	1088.4	821.5	18738.6	16182.3
86.0	1042.8	775.0	17510.3	15237.6
87.0	958.9	718.3	16572.6	14186.3
88.5	847.2	632.4	14589.2	12581.6
89.0	801.7	602.4	13878.0	11856.7
90.0	683.5	549.1	12182.4	10852.0
91.0	674.0	527.2	11921.3	10580.0
92.0	694.5	514.1	11687.2	10312.7
93.0	652.8	502.8	11487.3	10021.6
94.0	653.4	488.3	11258.8	9755.9
95.0	647.3	476.0	11021.3	9448.7
96.0	643.2	462.5	10789.4	9138.3
97.0	646.8	448.2	10886.4	8869.7
98.0	653.1	435.7	10671.6	8549.7
99.0	563.9	374.7	9238.6	7509.0
100.0	484.9	326.1	8086.6	6524.9
101.0	407.8	272.4	6732.3	5523.4
102.0	321.0	222.6	5444.0	4589.1
103.0	216.4	189.5	3895.7	3575.7
104.0	279.3	181.7	4509.3	3686.8
105.0	232.4	148.7	3760.3	3051.1
[illegible]	170.8	114.8	2809.1	2387.5
[illegible]	137.8	87.3	2216.1	1793.6
[illegible]	76.7	48.9	1285.3	1129.8
[illegible]	21.3	21.3	387.5	486.3
[illegible]	18.3	18.3	338.9	425.1
[illegible]	15.2	15.2	280.8	354.3
[illegible]	12.2	12.2	222.7	282.0
[illegible]	9.1	9.1	165.3	211.4
[illegible]	6.1	6.1	108.4	139.8
[illegible]	3.0	3.0	53.2	68.1
120.0	0.0	0.0	0.0	0.0

FORMATION OR INTERV	TIME (Ma)	FORM OR INT THICK (m)		FORM OR INTER STRESS (kPa)	
PAK					
	78.0	71.8	65.3	1162.4	1134.6
	79.0	38.4	32.0	646.2	603.4
MR					
	78.0	189.6	130.1	3237.7	2868.8
	79.0	214.9	142.2	3380.6	2899.8
	80.0	234.4	145.8	3582.9	2738.0
	81.0	190.6	112.8	2759.4	2037.6
	82.0	128.1	85.6	1721.2	1131.0
BFSC					
	78.0	222.8	203.1	4504.8	4233.5
	79.0	225.6	204.7	4534.6	4250.2
	80.0	229.1	205.4	4568.8	4287.7
	81.0	232.6	208.3	4501.2	4368.3
	82.0	235.2	210.2	4638.3	4408.8
	83.0	240.4	212.3	4678.6	4438.5
	84.0	244.6	214.4	4723.5	4446.5
	85.0	249.6	216.7	4770.0	4471.6
	86.0	254.9	219.2	4822.3	4486.8
	87.0	260.7	221.8	4860.1	4523.4
	88.5	270.7	226.2	4979.5	4587.2
	89.0	274.4	227.7	5018.6	4582.9
	90.0	282.5	231.0	5088.0	4616.3
	91.0	291.0	234.6	5101.2	4652.6
	92.0	302.7	[illegible]	5209.3	4682.2
	93.0	316.5	[illegible]	5427.2	4735.6
	94.0	330.9	[illegible]	5581.7	4784.1
	95.0	350.2	253.6	5778.0	4837.8
	96.0	375.5	259.0	6028.7	4908.6
	97.0	411.5	[illegible]	6390.3	4986.1
	98.0	472.6	273.8	7008.7	5048.3
	99.0	368.6	211.5	5537.6	3984.9
	100.0	266.3	161.5	4328.5	2987.1
	101.0	204.2	105.3	2847.7	1860.9
	102.0	112.1	84.8	1808.1	1030.6
MANN					
	78.0	132.5	124.8	2890.4	2848.1
	79.0	133.5	126.3	2888.0	2853.2
	80.0	134.5	125.8	2008.1	2858.3
	81.0	135.6	126.4	2017.6	2862.7
	82.0	136.7	127.0	2027.7	2869.3
	83.0	137.9	127.6	2038.3	2878.2
	84.0	138.1	128.2	2048.6	2881.2
	85.0	140.6	128.8	2061.6	2887.5

86.0	141.6	128.5	2974.2	2004.0
87.0	143.3	130.2	2987.7	2006.6
88.0	145.7	131.3	3000.7	2011.6
89.0	146.6	131.7	3017.6	2016.4
90.0	148.6	132.5	3034.1	2023.2
91.0	150.3	133.3	3051.6	2031.4
92.0	152.4	134.3	3070.6	2040.0
93.0	154.6	135.1	3091.7	2048.0
94.0	157.0	136.1	3114.3	2058.5
95.0	159.6	137.1	3138.7	2068.6
96.0	162.5	138.3	3165.6	2078.2
97.0	165.6	139.3	3195.2	2090.5
98.0	168.1	140.6	3227.6	2102.5
99.0	173.0	141.8	3266.3	2116.3
100.0	177.3	143.3	3306.3	2128.1
101.0	182.1	144.6	3351.7	2143.9
102.0	187.7	146.4	3404.6	2160.0
103.0	194.1	148.3	3466.7	2177.4
108.0	237.0	150.4	4062.4	3106.3
109.0	211.0	127.4	3346.3	2563.6
110.0	158.4	93.5	2456.3	1800.4
111.0	118.6	66.0	1610.6	1287.0
112.0	85.4	28.6	862.3	633.1

LMANN

78.0	21.3	21.3	463.4	500.9
79.0	21.3	21.3	462.4	500.8
80.0	21.3	21.3	461.4	500.7
81.0	21.3	21.3	460.4	500.6
82.0	21.3	21.3	459.4	500.6
83.0	21.3	21.3	458.3	500.5
84.0	21.3	21.3	457.2	500.4
85.0	21.3	21.3	456.1	500.3
86.0	21.3	21.3	454.9	500.2
87.0	21.3	21.3	452.7	500.1
88.0	21.3	21.3	451.9	500.0
89.0	21.3	21.3	451.3	499.9
90.0	21.3	21.3	450.0	499.8
91.0	21.3	21.3	448.7	499.7
92.0	21.3	21.3	447.3	499.6
93.0	21.3	21.3	445.9	499.5
94.0	21.3	21.3	444.5	499.4
95.0	21.3	21.3	443.0	499.3
96.0	21.3	21.3	441.5	499.2
97.0	21.3	21.3	439.9	499.1
98.0	21.3	21.3	438.3	499.0
99.0	21.3	21.3	436.6	498.9
100.0	21.3	21.3	434.8	498.7
101.0	21.3	21.3	432.9	498.6
102.0	21.3	21.3	431.0	498.4
103.0	21.3	21.3	429.0	498.3
108.0	21.3	21.3	417.0	497.5
109.0	21.3	21.3	414.0	497.3
110.0	21.3	21.3	410.8	497.1
111.0	21.3	21.3	407.2	496.9
112.0	21.3	21.3	403.0	496.6
113.0	21.3	21.3	397.5	495.3
114.0	18.3	18.3	338.9	425.1
115.0	15.2	15.2	280.6	354.3
116.0	12.2	12.2	222.7	282.9
117.0	9.1	9.1	165.3	211.4
118.0	6.1	6.1	108.4	139.9
119.0	3.0	3.0	53.2	69.1

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma)		TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
TIME1	TIME2						
80.0	78.0	-28.	24.	181.	780.	-34.	0.
83.0	78.0	1.	113.	1706.	2046.	-51.	22.
83.0	80.0	30.	88.	1525.	2165.	-17.	22.
85.0	83.0	133.	106.	2332.	2061.	81.	42.
90.0	85.0	406.	281.	5578.	5310.	262.	117.
90.0	83.0	538.	287.	8806.	7382.	283.	160.
91.0	90.0	9.	12.	241.	272.	2.	4.
98.0	91.0	11.	82.	1248.	2030.	-28.	26.
103.0	91.0	450.	288.	8028.	7004.	211.	141.
103.0	98.0	448.	266.	6778.	4874.	238.	113.
113.0	108.0	288.	180.	4112.	3200.	131.	82.
120.0	108.0	278.	182.	4508.	3881.	140.	88.
120.0	113.0	[illegible]81.	21.	387.	488.	8.	8.

WELL#38. BVX WINNIFRED 7-18-12-BW4
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PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE MS SED(m/Ma)	THICK TOT(m)
PAK	78.0	80.0	2.0	31.8	21.8	55.6	27.82	57.8
MR	80.0	83.0	55.4	14.8	0.0	70.3	23.77	81.3
CDLG	83.0	90.0	183.3	0.0	0.0	183.3	26.16	223.1
2WS	90.0	98.0	84.3	4.6	0.0	88.9	8.61	83.6
BFSC	98.0	103.0	109.0	31.4	8.0	148.4	20.86	161.1
MANN	103.0	113.0	34.3	38.1	5.2	79.6	14.93	86.6
LMANN	113.0	120.0	4.4	6.6	6.3	16.2	2.78	26.6
SAW	172.0	182.0	0.0	0.7	3.8	4.5	0.50	6.2

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
78.0	1304.3	1057.2	23498.9	20589.3
79.0	1282.8	1026.8	22852.6	20288.9
80.0	1279.0	995.3	22342.6	19478.4
81.0	1263.8	980.8	21816.6	18756.6
82.0	1221.8	929.1	21008.7	18081.1
83.0	1189.3	891.8	20286.6	17254.6
84.0	1136.2	846.2	19318.3	16305.1
85.0	1081.8	799.7	18322.3	15472.3
86.0	1028.1	751.9	17327.6	14696.9
87.0	961.4	702.7	16232.6	13818.0
88.5	883.3	626.0	14610.3	12213.9
89.0	812.2	589.8	13685.0	11736.3
90.0	705.7	545.0	12335.5	10711.4
91.0	695.4	532.4	12131.8	10484.9
92.0	695.4	523.9	11981.7	10216.8
93.0	584.6	514.3	11818.3	9997.3
94.0	589.5	502.8	11603.2	9718.6
95.0	567.6	491.6	11457.3	9478.8
96.0	589.0	480.5	11344.2	9236.7
97.0	633.4	489.8	11271.6	8980.0
98.0	722.5	489.0	11384.7	8701.6
99.0	609.6	394.5	9748.0	7574.0
100.0	583.3	349.8	8799.7	6842.9
101.0	489.4	288.1	7371.3	5539.4
102.0	351.8	223.3	5581.8	4384.0
103.0	212.6	169.3	3755.0	3213.7
108.0	285.5	174.4	4488.9	3366.1
109.0	248.6	148.9	3872.0	2884.9
110.0	214.3	125.1	3312.8	2411.8
111.0	172.1	97.0	2622.0	1882.4
112.0	117.8	65.8	1846.0	1322.5
113.0	82.4	38.3	1012.7	789.2
114.0	52.0	32.8	876.8	684.4
115.0	47.7	29.0	798.5	609.8
116.0	37.8	23.4	658.7	511.0
117.0	28.1	18.5	518.0	417.7
118.0	22.0	14.1	389.8	309.2
119.0	14.2	9.7	274.4	229.3
120.0	6.4	6.4	138.8	128.6

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	25.	62.	1152.	1623.	-10.	15.
83.0	78.0	116.	185.	3237.	3744.	16.	50.
83.0	80.0	90.	103.	2085.	2222.	26.	35.
85.0	83.0	107.	92.	1837.	1783.	48.	37.
90.0	85.0	376.	256.	5987.	4781.	181.	106.
90.0	83.0	483.	347.	7823.	6543.	239.	145.
91.0	90.0	9.	12.	204.	227.	3.	5.
98.0	91.0	-26.	74.	787.	1783.	-50.	19.
103.0	91.0	484.	374.	8377.	7271.	228.	150.
103.0	98.0	510.	300.	7610.	5488.	278.	130.
113.0	108.0	223.	139.	3478.	2597.	116.	55.
120.0	108.0	279.	169.	4353.	3240.	146.	69.
120.0	113.0	56.	33.	877.	643.	29.	13.

WELL#35. SVX WINNIFRED 7-16-12-9W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.550	18.2	50.2	25.08
PAK	0.170	30.5	84.5	32.27
BFSC	0.550	5.4	165.8	29.16
BFSC	0.170	10.1	150.6	30.11
MANN	0.550	2.7	72.1	14.42
MANN	0.170	5.1	74.5	14.69
LMANN	0.550	5.4	16.3	2.33
LMANN	0.170	10.1	21.0	3.00
SAW	0.550	1.9	2.6	0.21
SAW	0.170	3.5	4.3	0.45

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa:	
78.0	1255.2	1057.0	23164.5	20895.3
79.0	1258.3	1027.5	22581.4	20258.3
80.0	1271.4	985.1	22204.0	19472.6
81.0	1236.6	950.2	21472.1	18752.6
82.0	1213.6	938.0	20610.0	18047.2
83.0	1180.6	881.7	20108.7	17250.7
84.0	1126.8	846.0	19161.2	16264.0
85.0	1072.7	799.5	18160.5	15486.1
86.0	1015.7	751.7	17181.0	14582.8
87.0	951.7	702.5	15690.4	13613.7
88.5	843.0	625.6	14320.1	12209.5
89.0	801.7	580.4	13702.0	11731.8
90.0	694.8	544.8	12146.8	10706.0
91.0	695.1	532.2	11936.7	10480.4
92.0	683.6	523.7	11750.1	10214.3
93.0	682.3	514.0	11509.7	9982.7
94.0	676.8	502.8	11387.2	9711.8
95.0	674.2	491.4	11223.2	9472.1
96.0	675.3	480.2	11111.2	9231.8
97.0	683.7	461.4	11027.0	8985.2
98.0	706.7	456.8	11109.7	8669.8
99.0	597.8	393.7	9526.5	7563.2
100.0	540.2	341.2	8585.9	6634.4
101.0	481.3	286.6	7184.3	5476.0
102.0	345.6	222.3	5634.6	4370.3
103.0	204.0	150.0	3604.5	3207.8
106.0	274.7	174.1	4307.8	3359.6
109.0	230.1	148.7	3737.2	2895.6
110.0	205.0	124.0	3146.3	2370.0
111.0	163.5	96.8	2493.3	1860.4
112.0	107.0	65.6	1794.1	1310.7
113.0	55.3	36.2	865.8	767.3
114.0	45.6	32.6	750.7	683.4
115.0	42.0	28.5	705.6	603.7
116.0	34.4	22.0	586.2	405.9
117.0	24.5	17.5	425.7	374.7
118.0	19.1	14.0	342.4	307.1
119.0	13.4	9.8	226.0	211.6
120.0	6.5	6.3	118.3	124.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	14.	62.	961.	1523.	-16.	15.
83.0	78.0	104.	156.	3058.	3746.	10.	50.
83.0	80.0	91.	103.	2097.	2222.	26.	35.
85.0	82.0	108.	92.	1946.	1783.	46.	37.
90.0	85.0	376.	255.	6014.	4761.	182.	108.
90.0	83.0	486.	347.	7980.	6544.	240.	145.
91.0	90.0	10.	12.	210.	227.	3.	5.
96.0	91.0	-22.	74.	830.	1784.	-47.	19.
103.0	91.0	481.	374.	6332.	7273.	224.	150.
103.0	96.0	503.	300.	7502.	5489.	271.	130.
113.0	103.0	219.	136.	3412.	2582.	114.	56.
120.0	106.0	285.	160.	4189.	2236.	140.	66.
120.0	113.0	50.	33.	778.	643.	26.	13.

WELL#39. ASHLAND CONVNT WALSH 7-11-11-2W4

PART 1: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	/SHYSS	/SANDS	/TOTAL	RATE MS SED(m/Ma)	THICK TOT(m)
PAK	78.0	80.0	0.0	5.1	71.5	76.6	38.31	152.7
MR	80.0	83.0	1.0	50.2	11.7	63.0	20.99	85.1
COLO	83.0	90.0	137.3	16.4	0.0	153.8	21.97	189.8
2WS	90.0	98.0	56.2	0.0	1.8	58.1	7.26	78.9
BFSC	98.0	103.0	58.5	38.8	30.3	128.6	25.88	176.3
MANN	108.0	113.0	5.0	9.8	18.4	33.2	6.65	48.8
LMANN	113.0	120.0	0.0	5.1	10.4	15.5	2.22	21.6
RIER	165.0	169.0	8.5	5.2	16.0	29.8	9.20	50.0
SAW	173.0	182.0	0.0	2.6	30.5	33.0	3.67	39.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kiloPa.	
78.0	1269.1	1017.9	22585.7	20027.0
79.0	1214.5	949.2	21417.4	18736.9
80.0	1159.5	883.5	20241.7	17440.5
81.0	1132.1	860.7	19631.6	16868.9
82.0	1119.6	837.1	19157.1	16390.2
83.0	1125.1	815.0	18672.8	15736.6
84.0	1053.7	772.4	17913.7	14970.2
85.0	1034.4	738.6	17280.0	14290.5
86.0	980.0	698.6	16446.6	13511.7
87.0	933.4	655.4	15497.1	12968.6
88.0	834.6	598.6	13981.6	11449.6
89.0	797.1	563.2	13404.4	11041.4
90.0	702.6	514.8	12059.9	10191.5
91.0	700.2	503.9	11925.9	9942.4
92.0	691.3	491.4	11716.4	9896.0
93.0	682.4	479.7	11510.4	9652.3
94.0	675.1	465.9	11318.1	9204.5
95.0	667.2	452.9	11121.2	8955.4
96.0	662.4	439.8	10958.9	8709.9
97.0	662.6	428.6	10838.5	8453.9
98.0	672.0	413.2	10780.2	8173.6
99.0	587.6	364.6	9331.5	7179.1
100.0	444.2	296.6	7865.5	6156.1
101.0	398.3	280.2	5787.8	5362.2
102.0	305.3	213.2	5428.8	4499.1
103.0	217.2	157.5	4097.6	3596.0
108.0	238.1	169.6	4308.8	3817.5
109.0	217.8	156.9	4003.7	3389.0
110.0	194.5	145.2	3657.0	3169.1
111.0	176.8	135.1	3371.7	2862.7
112.0	160.7	128.2	3114.6	2756.5
113.0	148.9	118.0	2852.6	2641.3
114.0	143.0	113.4	2704.6	2495.8
115.0	138.0	110.7	2714.7	2428.7
116.0	135.0	107.8	2637.5	2383.4
117.0	130.9	104.9	2561.2	2298.3
118.0	126.1	101.8	2477.5	2231.9
119.0	119.4	98.3	2377.2	2194.0
120.0	112.5	94.6	2257.4	2078.4

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	109.	134.	2324.	2577.	38.	55.
83.0	78.0	144.	203.	3693.	4286.	30.	70.
83.0	80.0	35.	69.	1369.	1711.	-8.	16.
85.0	83.0	91.	78.	1623.	1478.	41.	31.
90.0	85.0	332.	224.	6190.	4089.	171.	97.
90.0	83.0	423.	300.	6813.	5577.	212.	128.
91.0	90.0	2.	11.	134.	218.	-2.	4.
98.0	91.0	28.	91.	1137.	1769.	-7.	38.
103.0	91.0	463.	336.	7628.	6346.	241.	140.
103.0	98.0	455.	245.	9991.	4578.	248.	104.
113.0	108.0	91.	54.	1457.	1076.	46.	20.
120.0	108.0	123.	75.	2052.	1539.	62.	27.
120.0	113.0	34.	21.	595.	463.	16.	7.

WELL#39 ASHLAND CONVNT WALSH 7-11-11-3W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.560	82.0	88.0	23.86
PAK	0.170	114.6	123.7	61.66
MR	0.560	6.0	59.3	10.76
MR	0.170	15.2	66.4	22.14
2WS	0.560	1.3	57.6	7.10
2WS	0.170	2.5	68.7	7.34
SFSC	0.560	18.8	118.0	23.28
SFSC	0.170	38.4	123.6	26.71
MANN	0.560	11.4	28.3	6.26
MANN	0.170	21.5	36.4	7.26
LMANN	0.560	6.0	11.1	1.59
LMANN	0.170	11.4	16.5	2.36
RIER	0.560	10.7	20.5	7.27
RIER	0.170	20.2	30.0	6.75
SAW	0.560	15.6	16.4	2.04
SAW	0.170	20.9	22.4	2.60

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres..		CUMULATIVE STRESS in kiloPa.	
75.0	1216.0	1017.5	21673.7	20017.7
78.0	1171.5	951.7	20648.5	18787.6
80.0	1128.3	883.0	19627.1	17430.6
81.0	1100.7	857.4	19060.6	16822.1
82.0	1080.2	835.6	18627.6	16284.3
83.0	1065.8	814.5	18343.0	15728.2
84.0	1033.5	771.6	17269.0	14968.1
85.0	1003.1	738.0	16690.4	14240.4
86.0	956.7	688.0	15871.1	13500.5
87.0	900.1	654.9	14905.6	12677.2
88.5	789.0	568.2	13335.4	11434.6
89.0	761.7	552.6	12780.0	11020.3
90.0	666.5	516.1	11419.0	10149.3
91.0	661.2	504.6	11259.7	9863.6
92.0	651.1	492.0	11031.6	9696.5
93.0	641.0	479.2	10806.7	9450.0
94.0	633.4	466.2	10584.2	9201.1
95.0	623.1	462.9	10375.0	8949.5
96.0	616.7	439.7	10188.5	8701.6
97.0	614.0	426.3	10029.7	8444.2
98.0	621.4	412.6	9951.3	8161.6
99.0	620.5	351.4	8650.1	7100.9
100.0	411.2	292.4	7043.1	6086.7
101.0	393.6	260.1	6170.1	5385.6
102.0	272.2	211.7	4970.9	4444.9
103.0	189.6	188.6	3920.0	3581.4
108.0	205.7	166.6	3764.3	3601.5
109.0	190.2	158.6	3542.0	3360.5
110.0	167.0	142.6	3178.1	3125.6
111.0	152.6	133.4	2954.2	2910.1
112.0	138.0	123.9	2897.2	2712.2
113.0	126.6	115.2	2489.4	2524.1
114.0	123.6	112.4	2427.5	2400.5
115.0	120.5	109.7	2367.0	2396.7
116.0	117.6	107.0	2307.6	2336.3
117.0	114.2	104.2	2251.7	2274.4
118.0	109.4	101.3	2201.5	2217.6
119.0	104.5	97.5	2117.5	2147.4
120.0	98.4	93.6	2014.4	2050.2

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	93.	134.	2047.	2576.	28.	55.
83.0	78.0	122.	203.	3330.	4269.	18.	71.
83.0	80.0	30.	69.	1284.	1711.	-10.	16.
85.0	83.0	83.	78.	1653.	1478.	42.	31.
90.0	85.0	327.	224.	5271.	4100.	174.	97.
90.0	83.0	428.	300.	6924.	5578.	216.	128.
91.0	90.0	5.	9.	160.	186.	0.	4.
98.0	91.0	40.	92.	1308.	1622.	-1.	36.
102.0	91.0	471.	338.	7640.	6402.	235.	140.
103.0	98.0	632.	246.	8231.	4560.	238.	104.
113.0	108.0	79.	84.	1285.	1077.	40.	20.
120.0	108.0	105.	75.	1740.	1542.	53.	27.
120.0	113.0	27.	21.	478.	486.	13.	7.

WELL#40. HOL TWIN RIVER 10-25-1-20W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE HS SED(m/Ma)	THICK TOT(m)
PAK	78.0	80.0	0.0	25.5	4.7	30.2	15.11	38.7
MR	80.0	83.0	46.6	46.3	32.8	125.7	41.89	146.3
COLO	83.0	90.0	260.5	0.0	0.0	260.5	37.21	281.3
2WS	90.0	98.0	63.7	0.0	0.0	63.7	7.96	88.0
BFSC	98.0	103.0	125.3	15.8	7.2	148.3	29.67	163.7
MANN	108.0	113.0	58.4	30.5	30.1	119.1	23.82	129.8
LMANN	113.0	120.0	18.5	2.5	12.1	33.5	4.79	37.8
RIER	165.0	169.0	46.5	0.0	0.8	48.3	12.34	52.4

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
78.0	1405.6	1199.2	27600.5	25761.7
79.0	1420.9	1199.1	27705.0	25552.6
80.0	1449.0	1200.5	27816.4	25301.3
81.0	1377.4	1186.8	26446.3	24214.8
82.0	1366.2	1133.5	25893.2	23310.8
83.0	1325.0	1071.5	24626.2	21957.4
84.0	1282.5	1014.0	23273.5	20702.5
85.0	1186.1	954.8	21887.5	19568.5
86.0	1129.2	893.4	20707.1	18324.7
87.0	1046.8	828.9	19267.6	17085.6
88.5	915.0	727.3	17003.6	15107.5
89.0	866.1	691.4	16202.1	14457.5
90.0	716.1	614.8	14067.9	13024.1
91.0	717.6	604.5	13868.0	12857.0
92.0	716.8	602.3	13632.2	12655.5
93.0	717.5	595.7	13079.7	12449.2
94.0	719.0	589.9	13662.6	12248.8
95.0	723.5	584.5	13562.7	12009.2
96.0	731.5	579.8	13446.0	11812.0
97.0	748.7	578.3	13476.8	11734.8
98.0	759.2	574.8	13331.2	11562.8
99.0	722.1	521.3	12584.5	10555.7
100.0	649.3	467.1	11383.3	9913.0
101.0	582.5	413.7	10207.7	8901.6
102.0	475.9	349.5	8637.9	7330.9
103.0	351.4	259.9	6486.4	6237.0
106.0	464.1	320.5	7986.7	6545.9
108.0	430.7	286.8	7304.6	5852.0
110.0	350.4	238.0	6072.3	4947.4
111.0	283.7	200.5	5141.3	4189.2
112.0	232.1	158.1	4088.0	3356.3
113.0	159.4	119.1	2944.7	2567.7
114.0	139.3	109.1	2772.0	2486.0
115.0	123.4	100.8	2494.6	2287.1
116.0	119.4	96.4	2366.7	2135.5
117.0	113.2	89.4	2231.5	1991.1
118.0	85.1	78.1	1966.3	1783.4
119.0	79.1	68.5	1655.3	1589.0
120.0	64.8	63.1	1472.3	1484.6

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG (m)		TOTAL · TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	-43.	-2.	53.	472.	-45.	-16.
82.0	78.0	80.	126.	3341.	3624.	-23.	10.
83.0	80.0	133.	129.	3287.	3352.	21.	26.
85.0	83.0	130.	117.	3532.	2399.	52.	43.
90.0	85.0	478.	340.	7930.	6534.	233.	138.
90.0	83.0	808.	457.	10461.	8933.	286.	181.
91.0	90.0	0.	8.	98.	157.	-3.	1.
98.0	91.0	-72.	34.	238.	1304.	-79.	-8.
103.0	91.0	365.	310.	7101.	6930.	146.	114.
103.0	98.0	437.	285.	6863.	5328.	225.	120.
113.0	108.0	308.	201.	5052.	3978.	152.	78.
120.0	108.0	359.	257.	5524.	5091.	198.	100.
120.0	113.0	83.	56.	1472.	1113.	46.	22.

WELL#60. HOL TWIN RIVER 10-35-1-20W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSB (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.550	3.7	26.2	14.10
PAK	0.170	5.1	30.5	15.20
MR	0.500	17.4	110.3	35.76
MR	0.170	32.8	125.7	41.81
BPSC	0.550	4.0	145.2	28.03
BPSC	0.170	7.5	145.7	28.75
MANN	0.500	14.5	103.6	20.78
MANN	0.170	27.5	116.0	23.37
LMANN	0.550	5.4	27.8	3.88
LMANN	0.170	12.1	33.5	4.70
RIER	0.550	0.3	48.1	12.25
RIER	0.170	0.5	48.3	12.32

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.-		CUMULATIVE STRESS in kiloPa.	
78.0	1304.7	1185.6	27126.3	25727.8
79.0	1376.1	1186.7	27040.8	25501.5
80.0	1406.4	1188.1	27085.4	25252.3
81.0	1345.5	1154.8	25813.5	24140.6
82.0	1358.0	1131.5	25374.8	23270.5
83.0	1312.0	1080.4	24251.3	21815.0
84.0	1347.0	1011.8	22085.4	20720.1
85.0	1181.0	952.6	21700.4	19515.0
86.0	1113.4	881.3	20355.7	18280.4
87.0	1022.3	836.7	18985.6	17020.3
88.5	897.4	728.0	16866.7	15080.8
89.0	846.1	689.0	15861.3	14410.8
90.0	888.3	612.4	13714.7	12876.7
91.0	898.1	608.1	13802.6	12817.5
92.0	888.3	589.7	13452.4	12804.8
93.0	865.1	583.2	13285.1	12387.3
94.0	866.8	587.2	13143.7	12185.6
95.0	858.0	581.7	13077.2	12044.6
96.0	708.6	577.1	13000.7	11856.4
97.0	732.8	573.5	13012.3	11677.8
98.0	761.4	571.7	13241.7	11504.3
99.0	858.6	518.0	12115.4	10403.3
100.0	524.3	485.4	10884.8	9484.6
101.0	552.8	411.4	8572.8	8451.3
102.0	440.7	347.0	8162.3	7277.4
103.0	328.1	287.1	8305.1	6180.1
108.0	428.0	317.3	7300.8	6480.7
109.0	306.1	284.5	6741.0	5706.7
110.0	323.5	230.0	5063.5	4684.6
111.0	280.3	195.0	4720.1	4122.4
112.0	323.0	155.7	3905.4	3383.1
113.0	144.5	115.0	2757.7	2557.2
114.0	131.6	105.5	2824.8	2484.8
115.0	116.8	100.2	2350.2	2255.6
116.0	112.4	95.0	2228.3	2085.7
117.0	107.0	80.8	2136.5	1989.6
118.0	92.6	79.5	1857.5	1701.7
119.0	77.7	68.6	1505.4	1535.8
120.0	64.8	63.0	1489.5	1484.1

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHS(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	76.0	-42.	-1.	71.	475.	-44.	-15.
83.0	78.0	53.	127.	2575.	3812.	-30.	8.
83.0	80.0	84.	128.	2604.	3338.	8.	28.
85.0	83.0	121.	117.	2551.	2401.	62.	43.
90.0	85.0	463.	360.	7088.	8538.	235.	138.
90.0	83.0	613.	457.	10537.	8040.	287.	181.
91.0	90.0	1.	8.	112.	158.	-2.	1.
95.0	91.0	-63.	34.	381.	1313.	-74.	-6.
103.0	91.0	273.	310.	7308.	6037.	150.	114.
103.0	95.0	438.	288.	5547.	5324.	225.	120.
113.0	108.0	281.	188.	4612.	3823.	130.	76.
120.0	108.0	381.	254.	5800.	5027.	170.	90.
120.0	113.0	80.	56.	1288.	1103.	40.	21.

WELL#41. AQUIT TOTAL WARNER 10-34-3-17W4
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PART 1: CONSTANT GRAIN HEIGHT
****

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
MR	80.0	83.0	3.5	41.9	55.3	100.7	33.57	140.5
COLO	83.0	90.0	243.3	0.3	0.0	243.5	34.78	378.2
2WS	90.0	98.0	80.5	0.0	0.0	59.5	7.44	88.8
BFSC	98.0	103.0	77.5	37.3	12.3	127.1	25.42	148.1
MANN	108.0	113.0	40.8	68.1	15.1	124.1	24.81	142.6
LMANN	113.0	120.0	14.0	13.5	23.2	50.6	7.28	57.0
RIER	155.0	183.0	13.4	2.6	0.4	16.5	4.14	18.0

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT
****

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
80.0	1388.4	1133.7	25581.5	23387.7
81.0	1358.1	1008.8	25087.3	22634.5
82.0	1340.5	1073.5	24631.8	21933.7
83.0	1303.8	1048.2	24005.0	20787.0
84.0	1285.8	987.2	22782.5	19634.8
85.0	1227.3	926.5	21488.0	18448.1
86.0	1153.3	863.8	20184.2	17237.4
87.0	1085.6	798.8	18728.5	16018.4
88.5	927.8	807.0	16424.8	14102.8
89.0	873.8	861.3	15614.0	13488.0
90.0	728.4	584.8	13830.0	12118.8
91.0	724.1	578.8	13392.8	11921.5
92.0	721.8	570.0	13374.1	11743.4
93.0	718.1	581.7	13118.8	11528.4
94.0	718.9	583.4	13080.4	11308.1
95.0	720.1	545.2	12888.8	11089.7
96.0	723.8	537.1	12804.3	10918.5
97.0	734.3	529.5	12770.2	10708.4
98.0	750.3	522.2	12888.1	10470.5
99.0	688.8	475.0	11878.0	9817.3
100.0	613.8	423.4	10880.1	8859.4
101.0	547.0	378.1	9480.0	7782.9
102.0	474.7	333.6	8387.9	6844.9
103.0	380.3	288.0	6959.4	6027.2
105.0	455.5	310.2	8052.8	6352.0
108.0	427.4	289.8	7082.1	5489.7
110.0	382.4	233.5	6181.0	4887.0
111.0	321.7	182.7	5187.0	3863.1
112.0	245.8	148.6	4023.1	3019.8
113.0	153.2	100.5	2542.4	2109.3
114.0	144.1	90.5	2483.5	1915.2
115.0	118.4	79.8	2078.1	1642.2
116.0	98.5	84.7	1771.1	1426.5
117.0	84.8	54.5	1480.7	1152.4
118.0	64.4	39.1	1054.8	899.8
119.0	38.7	30.4	814.7	731.4
120.0	32.8	21.8	590.3	481.0

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT
****

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
83.0	80.0	23.	87.	1847.	2401.	-34.	10.
85.0	83.0	138.	120.	2517.	2348.	60.	47.
90.0	85.0	501.	340.	7088.	6329.	285.	144.
90.0	83.0	637.	488.	10475.	8678.	314.	191.
91.0	90.0	2.	8.	137.	197.	-2.	2.
98.0	91.0	-38.	55.	807.	1462.	-62.	12.
103.0	91.0	344.	290.	6433.	5804.	145.	108.
103.0	98.0	380.	234.	5626.	4452.	187.	97.
113.0	108.0	338.	210.	5410.	4143.	188.	82.
120.0	108.0	488.	288.	7853.	5781.	233.	111.
120.0	113.0	131.	79.	2142.	1818.	66.	28.

WELL#41. AOUIT TOTAL WARNER 10-34-2-17W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
MR	0.560	30.2	80.5	35.88
MR	0.170	55.3	112.7	37.56
SFSC	0.560	5.7	121.8	24.21
SFSC	0.170	13.0	127.5	35.50
MANN	0.560	6.0	117.0	23.38
MANN	0.170	15.2	124.1	24.82
LMANN	0.560	12.1	39.6	5.08
LMANN	0.170	22.6	80.3	7.10
RIER	0.560	0.3	18.4	4.11
RIER	0.170	0.6	18.7	4.17

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres		CUMULATIVE STRESS in kiloPa.	
80.0	1330.6	1121.8	24883.0	23371.4
81.0	1318.8	1101.8	24373.6	22488.0
82.0	1310.8	1076.2	23657.0	21888.3
83.0	1347.7	1045.2	23600.0	20780.1
84.0	1300.2	985.6	23447.6	19617.6
85.0	1210.0	935.5	21102.3	18430.8
86.0	1138.4	863.8	19827.8	17210.6
87.0	1048.2	787.7	18381.6	16000.2
88.8	908.0	698.1	16080.3	14084.0
89.0	853.4	680.6	15242.0	13450.1
90.0	705.4	588.8	13145.8	12008.4
91.0	702.1	577.5	12804.8	11801.7
92.0	588.7	591.1	12882.1	11723.2
93.0	685.3	580.7	12802.7	11507.0
94.0	684.0	582.4	12537.7	11288.0
95.0	684.1	544.1	12307.5	11068.1
96.0	600.6	530.1	12338.0	10886.8
97.0	705.0	528.4	12370.4	10684.5
98.0	730.4	521.2	12306.0	10457.1
99.0	670.4	473.8	11384.3	9591.0
100.0	584.8	421.7	10085.2	8631.0
101.0	520.0	377.8	9022.8	7757.4
102.0	483.3	331.8	7961.0	6487.0
103.0	386.8	287.0	6884.6	6005.8
105.0	460.0	308.1	7982.6	6226.1
108.0	308.1	280.3	6857.8	5481.0
110.0	260.6	233.4	5717.5	4573.1
111.0	288.0	182.1	4748.6	3085.9
112.0	223.1	146.1	3637.3	3002.1
113.0	121.4	99.6	2280.6	2093.7
114.0	122.1	80.0	2131.0	1901.8
115.0	103.0	75.7	1838.3	1830.0
116.0	84.8	64.2	1582.4	1382.1
117.0	73.2	64.2	1321.0	1184.5
118.0	59.5	36.7	1107.9	890.1
119.0	35.1	30.1	723.3	689.2
120.0	22.4	21.6	488.2	481.0

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
82.0	80.0	-17.	67.	1183.	2491.	-54.	10.
85.0	82.0	136.	120.	2538.	2350.	50.	47.
90.0	85.0	505.	340.	8017.	6231.	257.	144.
90.0	82.0	642.	460.	10654.	8681.	316.	191.
91.0	90.0	3.	6.	151.	108.	-1.	2.
98.0	91.0	-28.	56.	620.	1448.	-46.	12.
102.0	91.0	345.	201.	6460.	5808.	146.	108.
103.0	98.0	274.	234.	5611.	4451.	164.	97.
[illegible]3.0	105.0	330.	300.	5273.	4134.	168.	82.
110.0	105.0	438.	288.	7065.	5737.	218.	110.
120.0	113.0	100.	76.	1701.	1603.	54.	28.

WELL#42. GRABINS CMG BLACK BUTTE 10-1-1-0W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
MR	80.0	83.0	31.0	22.0	31.8	84.8		
COLO	83.0	90.0	183.8	7.0	0.0	190.8	38.18	118.7
2WS	90.0	98.0	61.7	0.0	0.0	61.7	-27.23	228.0
BFSC	98.0	103.0	126.0	12.4	16.8	155.1	7.71	71.0
MANN	105.0	113.0	29.3	29.2	27.8	86.2	31.23	188.0
LMANN	113.0	120.0	2.6	7.4	2.8	12.7	17.26	107.6
SWFT	141.0	153.0	5.2	0.0	7.0	12.3	1.81	14.6
RIER	155.0	159.0	16.3	12.8	11.6	34.7	0.88	14.0
SAW	173.0	182.0	0.0	8.8	0.0	8.8	8.84	43.6
							0.74	8.8

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kiloPa.	
80.0	1310.8	1061.8	23644.4	21328.5
81.0	1283.5	1031.7	23134.5	20650.0
82.0	1304.0	1008.7	22085.9	19872.6
83.0	1282.0	981.0	21888.5	18848.2
84.0	1188.2	916.0	20858.0	18040.8
85.0	1183.2	873.1	20017.4	17188.0
86.0	1087.2	824.2	18878.8	16217.3
87.0	1032.0	773.5	17880.8	15277.5
88.0	920.2	684.8	16088.7	13807.0
89.0	878.0	687.4	15388.2	13273.0
90.0	787.4	611.3	13824.3	12248.8
91.0	784.7	602.0	13702.0	12084.2
92.0	781.6	584.1	13644.0	11849.9
93.0	780.0	585.7	13408.1	11834.9
94.0	782.6	577.6	13281.6	11422.8
95.0	787.0	568.0	13208.9	11208.7
96.0	778.2	561.0	13188.0	11000.4
97.0	785.2	554.7	13224.5	10794.2
98.0	636.0	548.0	13494.8	10884.0
99.0	732.5	481.6	11947.3	9414.1
100.0	636.5	420.3	10488.5	8283.0
101.0	588.9	383.6	9278.0	7205.6
102.0	432.1	301.5	7386.9	6066.1
103.0	391.6	229.6	5822.0	4796.0
108.0	367.5	241.6	6102.3	4916.6
109.0	323.6	214.0	5474.8	4367.6
110.0	260.4	186.3	4756.0	3806.8
111.0	233.0	158.0	3982.6	3223.7
112.0	183.6	128.8	3261.1	2876.0
113.0	118.3	94.0	2270.6	2034.2
114.0	115.2	92.6	2214.2	1986.6
115.0	115.0	91.0	2212.0	1980.1
116.0	110.6	87.6	2130.2	1885.1
117.0	103.5	83.7	2006.0	1806.8
118.0	98.5	81.0	1882.8	1781.4
119.0	94.0	78.2	1880.7	1710.5
120.0	88.6	75.5	1784.2	1631.3

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL · TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
83.0	80.0	88.	100.	1858.	2350.	-3.	28.
[illegible]	83.0	100.	88.	1888.	1759.	43.	34.
[illegible]	85.0	388.	282.	6193.	4941.	186.	109.
[illegible]	88.0	488.	351.	8052.	6700.	228.	144.
91.0	90.0	3.	8.	122.	182.	-1.	3.
98.0	91.0	-71.	65.	207.	1479.	-78.	5.
103.0	91.0	483.	373.	8178.	7288.	210.	146.
109.0	98.0	534.	318.	7072.	5788.	288.	140.
113.0	109.0	248.	147.	3922.	2863.	128.	68.
120.0	109.0	278.	189.	4428.	3285.	142.	86.
120.0	113.0	30.	19.	807.	403.	14.	7.

WELL#43. SBASIN, CMG BLACK BUTTE 10-1-1-9W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
MR	0.550	21.5	74.5	24.84
MR	0.170	40.5	83.5	31.17
BFSC	0.550	10.8	146.2	29.64
BFSC	0.170	20.5	157.8	31.57
MANN	0.550	16.1	74.5	14.90
MANN	0.170	30.4	88.8	17.76
LMANN	0.550	1.3	11.8	1.55
LMANN	0.170	2.5	12.7	1.82
SWFT	0.550	3.0	8.1	0.65
SWFT	0.170	7.3	12.8	0.80
RIER	0.550	6.0	28.7	7.42
RIER	0.170	12.6	35.5	8.88

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK (in metres)		CUMULATIVE STRESS (in kilopa)	
80.0	1271.0	1061.8	22730.0	21324.4
81.0	1250.7	1032.6	22514.5	20585.8
82.0	1271.0	1013.4	22346.6	20018.1
83.0	1231.5	961.8	21487.3	19045.5
84.0	1173.1	916.5	20454.4	18030.8
85.0	1130.4	873.1	19504.1	17186.1
86.0	1073.6	826.2	18546.9	16216.5
87.0	1007.5	773.5	17460.7	15276.8
88.0	896.1	694.8	15626.7	13807.0
89.0	850.1	657.4	14650.5	13273.2
90.0	740.0	611.2	13241.7	12246.1
91.0	726.1	602.8	13203.2	12083.5
92.0	732.1	594.0	13020.3	11848.2
93.0	730.0	585.7	12872.0	11634.3
94.0	730.4	577.8	12720.8	11432.1
95.0	734.2	580.7	12636.0	11208.7
96.0	740.6	563.0	12550.0	11000.1
97.0	757.8	554.8	12601.2	10784.0
98.0	765.8	546.1	12532.6	10584.7
99.0	690.6	461.0	11302.5	9405.4
100.0	607.1	415.5	9826.2	8275.1
101.0	536.0	353.3	8744.4	7181.4
102.0	410.6	290.1	6985.3	5851.0
103.0	376.2	228.8	6010.0	4794.7
106.0	337.5	241.6	5676.1	4915.5
109.0	298.8	214.4	5028.5	4367.6
110.0	287.4	186.5	4386.6	3807.5
111.0	216.5	156.7	3896.6	3216.0
112.0	167.1	125.8	2955.4	2617.3
113.0	116.6	94.8	2130.3	2034.1
114.0	108.1	92.8	2074.9	1951.3
115.0	107.4	91.0	2048.8	1938.8
116.0	101.6	87.8	1957.3	1888.7
117.0	95.7	83.7	1870.4	1808.1
118.0	91.4	81.0	1826.5	1781.5
119.0	86.6	78.2	1745.2	1710.8
120.0	81.8	75.5	1642.7	1631.3

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL LOAD (kilOPa)	TECTON	ISOST TECTON SUBSID AND SEA LEV CHG (m)	
83.0	80.0	30.	106.	1852.	2370.	-11.	26.
85.0	82.0	101.	88.	1893.	1759.	43.	24.
88.0	85.0	300.	262.	5282.	4841.	187.	109.
90.0	83.0	452.	351.	6156.	5700.	240.	144.
91.0	90.0	4.	9.	136.	182.	-4.	3.
95.0	91.0	-58.	54.	271.	1478.	-71.	9.
103.0	91.0	480.	373.	8114.	7269.	209.	148.
103.0	95.0	510.	319.	7744.	5700.	280.	140.
113.0	103.0	227.	147.	3545.	2881.	117.	88.
120.0	105.0	286.	185.	4023.	3284.	131.	85.
120.0	113.0	30.	18.	488.	402.	14.	7.

WELL#43. EMG PCEAS BAIN 6-4-4-2W4

PART I: CONSTANT GRAIN HEIGHT

FORMATION OR INTERV	AGE (Ma) TOP	BOTTOM	SOLID GRAIN HEIGHTS (m) SHALE	SHYSS	SANDS	TOTAL	RATE NS SED(m/Ma)	THICK TOT(m)
PAK	75.0	80.0	0.0	0.0	75.8	75.8	37.92	157.8
MR	80.0	83.0	0.0	51.8	17.6	69.4	23.12	107.0
COLO	83.0	90.0	132.4	19.1	0.0	151.5	21.64	200.3
2WS	90.0	98.0	68.8	6.0	0.0	74.8	9.35	88.0
BFSC	98.0	103.0	76.7	52.6	23.2	152.5	30.50	204.8
MANN	108.0	113.0	7.6	16.1	23.4	47.1	9.42	68.5
LMANN?	113.0	120.0	0.0	2.7	8.2	10.9	1.56	15.8
RIER	165.0	169.0	11.3	7.2	30.8	49.3	12.32	66.0
SAW	173.0	182.0	0.0	0.0	31.7	31.7	3.52	38.7

BURIAL HISTORY FOR CONSTANT GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK in metres.		CUMULATIVE STRESS in kilopa.	
75.0	1362.3	1123.1	24789.2	22140.2
79.0	1330.4	1063.5	23836.9	20838.9
80.0	1280.5	983.8	22825.2	19528.8
81.0	1253.5	957.3	21873.2	18879.6
82.0	1234.5	931.8	21335.3	18274.6
83.0	1223.9	906.6	20833.4	17827.6
84.0	1192.2	870.1	20088.4	16836.1
85.0	1184.3	837.0	19456.0	16260.0
86.0	1112.8	786.8	18867.3	15482.4
87.0	1056.0	755.9	17750.6	14898.8
88.5	965.6	690.1	16267.7	13483.8
89.0	930.4	667.5	15752.0	13066.2
90.0	844.4	621.4	14493.5	12341.2
91.0	825.1	605.3	14179.1	11856.0
92.0	827.0	594.8	14019.9	11874.6
93.0	820.0	590.1	13798.2	11371.0
94.0	808.4	584.1	13831.4	11052.8
95.0	801.8	548.0	13320.0	10789.8
96.0	784.9	531.8	13094.0	10442.6
97.0	782.6	515.1	12830.9	10118.4
98.0	807.8	488.4	12884.7	9780.1
99.0	680.8	427.4	11135.7	8576.4
100.0	558.2	384.1	9378.2	7414.6
101.0	482.6	314.6	8134.8	6425.6
102.0	380.7	265.0	6353.6	5315.1
103.0	258.5	199.9	4822.5	4250.3
108.0	285.8	203.2	5119.1	4263.8
109.0	247.3	184.2	4813.8	3875.0
110.0	228.2	170.5	4243.5	3581.3
111.0	208.0	156.8	3802.4	3385.4
112.0	188.3	143.4	3530.2	3077.2
113.0	152.8	129.2	3016.7	2748.4
114.0	149.0	123.9	2959.1	2705.8
115.0	148.2	121.9	2931.7	2685.6
116.0	143.5	119.5	2884.5	2625.7
117.0	140.8	117.2	2812.3	2573.3
118.0	136.1	115.0	2753.8	2519.7
119.0	135.4	112.9	2691.5	2484.4
120.0	130.8	110.5	2618.1	2413.8

TECTONIC HISTORY FOR CONSTANT GRAIN HEIGHT

INTERV.(Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	75.0	102.	139.	2234.	2811.	33.	66.
83.0	75.0	158.	216.	3826.	4813.	37.	77.
83.0	80.0	57.	77.	1892.	1901.	4.	19.
85.0	83.0	70.	70.	1377.	1377.	27.	27.
90.0	85.0	310.	216.	4663.	4009.	157.	82.
90.0	83.0	380.	285.	6340.	5386.	184.	119.
91.0	90.0	19.	16.	314.	283.	10.	7.
98.0	[illegible]	14.	107.	1284.	2188.	-22.	39.
103.0	97.0	589.	406.	8357.	7708.	280.	167.
103.0	98.0	561.	288.	8082.	5610.	302.	138.
113.0	108.0	133.	77.	2103.	1537.	88.	30.
120.0	108.0	155.	93.	2500.	1870.	78.	35.
120.0	113.0	22.	16.	387.	323.	10.	6.

WELL#43. CMG PCBAS BAIN 6-4-6-2W4

PART II: VARIABLE SS GRAIN HEIGHT

FORMATION OR INTERV	INIT.SS POROSITY	HSSS (m)	HSTOT (m)	RATE HS SED(m/Ma)
PAK	0.550	69.5	69.5	34.73
PAK	0.170	131.0	131.0	65.52
MR	0.550	13.1	53.6	21.26
MR	0.170	22.8	74.5	24.84
BFSC	0.550	16.6	144.1	28.81
BFSC	0.170	27.6	157.1	31.43
MANN	0.550	14.8	38.4	7.68
MANN	0.170	27.6	51.5	10.30
LMANN?	0.550	5.4	6.1	1.16
LMANN?	0.170	10.1	12.6	1.83
RIER	0.550	16.6	27.3	6.33
RIER	0.170	35.4	53.0	13.40
SAW	0.550	15.7	15.7	1.74
SAW	0.170	20.6	20.6	3.20

BURIAL HISTORY FOR VARIABLE SS GRAIN HEIGHT

TIME (Ma)	CUMULATIVE THICK (in metres)		CUMULATIVE STRESS (in kiloPa)	
78.0	1234.1	1122.6	23011.7	22126.2
79.0	1285.8	1062.6	22966.1	20814.2
80.0	1243.1	983.2	21881.2	19813.8
81.0	1216.7	957.6	21368.1	18974.6
82.0	1201.7	932.0	20748.1	18278.9
83.0	1186.7	908.8	20326.4	17611.9
84.0	1163.1	868.6	19667.4	16821.3
85.0	1124.2	836.2	18820.0	16233.6
86.0	1081.8	787.0	18108.8	15488.9
87.0	1026.0	755.2	17188.0	14882.6
88.5	832.0	680.3	15678.4	13487.0
89.0	896.3	666.7	15154.7	13078.7
90.0	809.2	630.6	13879.7	12222.9
91.0	788.8	604.6	13547.8	11840.6
92.0	789.5	594.1	13370.8	11686.6
93.0	761.2	579.4	13127.4	11364.1
94.0	759.3	563.3	12843.7	11034.3
95.0	758.6	547.1	12620.3	10750.6
96.0	750.6	530.7	12361.6	10423.2
97.0	748.6	514.2	12171.6	10097.1
98.0	759.7	487.6	12080.4	9740.8
99.0	642.0	424.3	10422.9	8492.8
100.0	518.7	350.1	8720.8	7331.4
101.0	448.2	311.2	7477.2	6363.9
102.0	330.1	260.7	5807.8	6231.6
103.0	224.8	198.8	4271.6	4227.9
108.0	248.7	202.0	4482.3	4269.3
109.0	220.7	181.6	4074.7	3884.7
110.0	197.7	169.4	3668.8	3626.0
111.0	180.6	168.3	3383.0	3360.3
112.0	162.4	143.6	3100.8	3101.2
113.0	132.1	124.9	2642.6	2719.7
114.0	128.7	122.3	2546.6	2666.4
115.0	126.5	120.3	2541.4	2616.3
116.0	124.2	118.1	2496.9	2576.0
117.0	122.0	116.0	2452.8	2532.4
118.0	119.9	113.9	2409.2	2487.6
119.0	117.2	110.6	2360.3	2441.4
120.0	113.6	108.0	2304.4	2363.8

TECTONIC HISTORY FOR VARIABLE SS GRAIN HEIGHT

INTERV. (Ma) TIME1	TIME2	TOT SUBSID AND SEA LEV CHG(m)		TOTAL - TECTON LOAD (kiloPa)		ISOST TECTON SUBSID AND SEA LEV CHG (m)	
80.0	78.0	91.	130.	2051.	3813.	28.	58.
83.0	78.0	138.	217.	3586.	4814.	26.	77.
83.0	80.0	47.	77.	1538.	1802.	-0.	19.
85.0	83.0	71.	70.	1405.	1378.	28.	27.
90.0	85.0	316.	216.	5040.	4911.	159.	92.
90.0	83.0	388.	285.	6446.	6289.	187.	119.
91.0	90.0	20.	18.	332.	282.	10.	7.
95.0	91.0	26.	107.	1459.	2200.	-18.	39.
103.0	91.0	564.	408.	9276.	7712.	277.	187.
103.0	96.0	526.	300.	7818.	6613.	293.	128.
113.0	108.0	117.	77.	1639.	1540.	60.	30.
120.0	108.0	139.	93.	2174.	1876.	68.	36.
120.0	113.0	18.	10.	338.	336.	8.	6.