system. This interpretation is based on the presence of lateral accretion beds and multi-story sand bodies in outcrops along the Grand Hogback. It is supported by fining-upward trends in cores and gamma ray logs from the wells of the U.S. Department of Energy's Multi-Well Experiment being conducted near Rifle, Colorado.

Paleochannel depths, recognized from the heights of fining-upward trends in cores, can be converted to channel widths using Leeder's 1973 formula. The resulting channel widths are used to calculate meander belt amplitudes (sandstone body widths) from relationships derived from Leopold and Wolman's 1960 empirical data.

These numbers can be compared with sandstone body widths derived by two other methods. (1) Point-bar dimensions measured in outcrops can be used to calculate channel widths, which are then converted to meander-belt amplitudes as described above. (2) The MWX-2 well is offset from MWX-1 by 135 ft (41 m) at the surface, allowing for positive well-to-well correlation of sandstones. The percentage of sandstones which are penetrated by both wells is used as a probability to derive an average sand body width.

These last two methods give compatible results. The first method described, however, predicts comparatively narrow widths, suggesting that channel depths derived from fining-upward sequences in cores are not fully representative of ancient channel depths due to incomplete preservation. A preservation potential factor may be added to Leeder's formula for working with ancient sediments, so that the formula gives comparable results to the other two methods.

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Distinguishing Diagenetic Environments of Equant Calcite Cementation: Example from Lower Cretaceous Pearsall Formation in South Texas

Equant calcite is the most common cement in limestones. It occludes more pore space, and hence has more control over reservoir quality than any other carbonate cement. It is important, therefore, to be able to delineate the environments of precipitation of equant calcite cements. The Lower Cretaceous Pearsall formation in south Texas has a history of equant calcite cementation that began early in the shallow-subsurface meteoric environment and is continuing today in the deep-subsurface basinal environment. Trace-element analysis of Mg^{+2} and Fe^{+2} along with morphological characteristics of the Pearsall equant calcite cements delineate environments of precipitation.

Cements precipitated in the early, shallow-subsurface meteoric environment are generally very fine to medium-crystalline equant (less commonly bladed) calcites. The very fine to fine-crystalline calcite cement generally rims grains and is gradational into the medium-crystalline equant calcite cement that fills intergranular and moldic porosity. Early cements commonly have irregular crystal boundaries as seen in thin section.

Late, deep-subsurface precipitated cements are generally coarse to very coarse-crystalline equant calcites. Commonly they have straight crystal boundaries and form one or several large crystals in a pore space. There is generally a sharp change in crystal size with the fine to medium-crystalline equant calcites precipitated in the shallow-subsurface meteoric zone.

Trace-element analysis (electron microprobe) shows a statistically valid difference of Mg^{+2} and Fe^{+2} content between the early and late equant calcite cements. The early calcite cements have a higher Mg^{+2} content (1.8 $\pm$0.3 mole % $MgCO_3$) and a lower Fe^{+2} content (785 $\pm$184 ppm) than the late calcite cements (1.3 $\pm$0.3 mole % $MgCO_3$ and 2.618 $\pm$1,952 ppm Fe^{+2}). Also, semiquantitative probe analysis, due to low count rate, indicates that the early calcite cement is richer in Sr^{+2} (738 $\pm$286 ppm) than the late calcite cement 472 $\pm$189 ppm).

Magnesium in the fine-crystalline rim cement shows a pronounced trace-element distribution pattern. In the incipient crystal growth next to the grain, a high Mg^{+2} peak usually occurs, followed by a decrease in Mg^{+2} in the late rim cement and coarser equant calcite cement. This initial high Mg^{+2} peak is attributed to early meteoric diagenesis as described by Benson in 1974 in meteoric cements from Barbados. The Fe^{+2} trace-element distribution pattern shows an opposite trend from that of the magnesium. The early cements show low Fe^{+2}, whereas the late cements are Fe^{+2} rich, indicating a reducing environment of precipitation for the late cements.

Early, shallow-subsurface equant calcite cements can be distinguished from late, deep-subsurface equant calcite cements by relative position in pores, crystal size, straightness of crystal boundaries, gradation between crystal sizes, and by trace-element content and distribution patterns. These parameters may be valid environmental indicators of equant calcite precipitation in other limestone formations.

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Eocene-Oligocene Sea Level Changes as Reflected in Alabama Outcrop Sections

Outcrops at Little Stave Creek and St. Stephens Quarry in southwestern Alabama contain continuous sections across the Eocene-Oligocene boundary. The sequence of lithologic and biologic changes recorded across the boundary in Alabama can be best explained by a rising sea level. From the base to top, the sequence consists of: silty glauconitic marl (Pachuta); glauconite marl (Shubuta); thin glauconitic clay (unnamed); glauconitic clay and marl (Red Bluff) interbedded with silty limestone (Bumpnose); and grading upward into a carbonaceous clay (Forest Hill). The last occurrence of the planktonic foraminifera *Globorotalia cerroazuleisis cocoaensis* occurs just below the top of the Shubuta marl. The last occurrence of the calcareous nannofossil *Discoaster saipanensis* is within the Pachuta. Lithologic and paleontologic studies indicate that the Pachuta-Shubuta units represent a deepening-upward sequence. As water depths increased, the locus of terrigenous deposition moved updip or shoreward of the sections at Little Stave Creek and St. Stephens Quarry, resulting in the production of a compressed marine sequence capped by a nondepositional marine hiatus. During and after the period of deepest water, renewed terrigenous deposition resulted in a shallowing upward sequence (Red Bluff, Bumpnose, and Forest Hill).

We suggest that: (1) the changes in water depth and sedimentation in the Alabama sections occurred as a result of a rapid rise in relative and eustatic sea level (Pachuta, Shubuta), reaching a maximum during the time of deposition of the unnamed blue clay, followed by a period of less rapid relative rise and slow eustatic fall (Red Bluff, Bumpnose, Forest Hill); and (2) the decrease in sedimentation rates (and hence a decrease in stratigraphic resolution) caused by a rapid rise of eustatic sea level may also account for the apparently synchronous first and last appearances of a number of microfossil lineages at the Eocene-Oligocene boundary in Alabama and elsewhere.