AAPG Search and Discovery Article #90007©2002 AAPG Annual Meeting, Houston, Texas, March 1-13, 2002

AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Defining High-Resolution Sequence Stratigraphy with Graphic Correlation and Composite Standards

The resolution of sequence stratigraphy has improved dramatically since its inception and it continually demands higher resolution biostratigraphic models. Stratigraphic models are comprised of ordered sequences of biostratigraphic events (bioevents) through time that are commonly known in industry as tops, bases or abundance events of index or marker species. The goal of higher resolution has been to recognize more and more reliable bioevents within a given interval of time.

These models operate on the assumption that reliable bioevents occur most often at the same point in time. Through careful study, biostratigraphers develop empirical models of sequenced bioevents that are most reliable in a given basin, often discarding so-called less reliable events. Further, stochastic models have been developed to rank and correlate bioevents using average bioevents and their ranges to improve and quantify reliability. Unfortunately, these approaches do not take into consideration the effects of sequence architecture on the truncation of bioevent ranges, the very reason for creating a high-resolution stratigraphic model. Expecting and modeling only pre-determined reliable tops overlooks significant range truncation patterns that are intuitively expected at various surfaces and boundaries of depositional units from the scale of sequences to facies. Graphic correlation creates regional composite standard sections that order bioevents from broad geographic areas overcoming most of the effects of sequence architecture and tectonics. Then, local composite standards allow the recognition of truncation patterns that define local sequence architecture. These patterns fit well with previously developed numerical models that predict the effect of sequence architecture on bioevent ranges.