ARE SEISMIC/DEPOSITIONAL SEQUENCES CHRONOSTRATIGRAPHIC UNITS?

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Sequence Stratigraphic Analysis is claimed to be a "new globally valid system of stratigraphy ... a precise methodology to subdivide, correlate and map sedimentary rocks" (Vail et al., 1991, p. 622). Sequence stratigraphic units, such as depositional sequences, depositional systems tracts, and parasequences, are time-equivalent rocks of specific durations controlled by cyclical changes in sediment supply related to eustasy. These units are bounded by regionally extensive unconformities with erosion beneath and onlapping strata above, or by physical surfaces separating either different patterns of stratal geometry or shoaling-up facies units. According to this school, precise correlations are based upon inferred time relations within depositional models.

Several key concepts of sequence stratigraphy have their origins in early geological studies. For many years geologists have separated time-equivalent strata by regional unconformities related to changes in climate or sea level, e.g., J. Woodward, 1695 and T. C. Chamberline, 1909. Stratal surfaces, such as bentonites and limestone markers, have been used in place of fossils for time correlations since the first wells were drilled. Stratigraphic models have strongly influenced how we correlate strata since the time of William Smith.

Two developments are, indeed, new and have sparked the current resurgence in stratigraphic research. One is the seismic technology to test the physical continuity of strata on a regional scale (50-100 km), and to test the stratal geometry of genetically related depositional packages. The second is the chart of global coastal onlap events and eustasy (Haq et al., 1988).

Some key research problems are: (1) how to identify unique, time-significant stratal surfaces; (2) how to test their physical continuity; (3) how to test the time relations within depositional models; and (4) how to identify the unique, time-significant global events recorded in the stratigraphic record. These stratigraphic concepts can be tested by graphic correlation, which is a powerful technique of high precision, quantitative stratigraphy. Its application in Cretaceous sections of the Gulf Coast and Oman, and in the Plio-Pliestocene of the Gulf Coast aids the distinction between synchronous surfaces and diachronous boundaries.

Vail, P. R., Audemard, F., Bowman, S. A., Eisher, P. N., and Perez-Cruz, C., 1991. The stratigraphic signatures of tectonics, eustasy and sedimentology - an overview, p. 617-659. In G. Einsele, W. Ricken, and A. Seilacher (eds.), Cycles and Events in Stratigraphy, Springer-Verlag, Berlin.