

Log Correlation: The Real Significance of Sequence Stratigraphy to Subsurface Geological Work.

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ABSTRACT

Many industry geologists believe sequence stratigraphy to be of little importance to their day-to-day work, partly because most sequence stratigraphic presentations emphasize esoteric theory and jargon. The real significance for exploration geologists lies in how it allows a completely different approach to well-log correlations. Many geologists still use a layer-cake approach, pushing all correlations through everywhere, a method almost guaranteed to produce errors.

Correlatable surfaces are recognized by an abrupt lithologic change reflecting an abrupt change in deposition, commonly as a result of transgression. These surfaces also generate most seismic reflections. Each correlated surface represents the surface of the sediment and is a time line. Because sediments in the same depositional system have related patterns of thicknesses and lithologies, correlation patterns therefore should show consistency. A few simple rules for correlation can be applied: on a properly hung stratigraphic section, 1) correlations should slope seaward; 2) marine regressive cycles are continuous and their number changes only at the shoreline; 3) units should fine offshore; 4) unit thicknesses should not vary randomly; 5) where superimposed units show complementary thickening and thinning, the correlation between them is misplaced. Units may terminate proximally by onlap, distally by downlap.

Sequence stratigraphic theory can be boiled down to 2 points: 1) Unconformities are the single most important control on clastic reservoir facies, and 2) unconformities occur very commonly in non-marine, shoreline, and shallow marine facies. They can be inferred on well-log sections where reasonable correlations cannot be made, particularly where anomalous lowstand sands or channels occur. Channels or incised valleys can be recognized where they interrupt a regional pattern, but this simple criterion breaks down in many units where channels cut into other channelized bodies, making their true nature difficult to recognize.

In conclusion, without the simple but far-reaching concept of numerous breaks in the stratigraphic record, reasonable correlations and interpretations cannot be made on well-log or seismic sections.