A SPECTRUM OF SHELF SANDS AND SANDSTONES

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ABSTRACT

A wide variety of processes have operated on the seabed of the shelves of the world in the past including perhaps storms, permanent currents, wind induced alongshore currents, wave modified currents, subtidal tidal currents and turbidity currents. These processes generated sand bodies with different geometries which commonly contain different sedimentary structures or different sequences of sedimentary structures. On ancient shelves the most common sedimentary structures observed in vertical sections of sandstones are planar-tangential to planar-tabular cross beds, horizontal to subhorizontal lamina-tions, current ripples, wave rippleswave modified current ripples and burrowed and bioturbated (>75% burrowed) sandstones. This sequence is in approximate order of decreasing energy (fluid power). Where consistent vertical sequences of sedimentary structures are observed, one of the most common reflects upward increase in depositional energy. However, a sequence reflecting upward increasing energy and consequent increase in grain size is not unique to shelf sandstones; a similar coarsening upward pattern is reflected in subsurface log patterns in both river- and wave-dominated deltas and in beach/barrier dominated shorelines.

Ancient sandstone examples used to characterize a variety of these processes, geometries, and shelf locations include the "Gallup" (Tocito), Shannon, Fales and Frontier Sandstones from the Cretaceous of the Western Interior. In addition modern Atlantic shelf and North Sea systems are dis-cussed.

Shelf sandstones may be classified on the basis of their position on the shelf (shoreface-attached, inner shelf, middle shelf, outer shelf) and on the basis of whether they are deposited during a transgression, regression, or a stillstand. Both vertical and lateral sequences of lithologies vary with position on the shelf, processes of deposition, and position within a transgression-regression spectra. On the middle and outer shelf, shelf sandstones are almost always surrounded by shale.

On the inner shelf, and where attached to the shoreface, shelf sandstones overlie a variety of lithologies (sandstone, siltstone and shale) dependant in part on whether they were deposited during a transgression, regression or stillstand. Lithologies deposited lateral to shelf sandstones also vary with the position of the sand body within the spectra of trans-gression-regression. Vertical and lateral sequences of lithologies are probably the most variable on the inner shelf.

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