

Evolution of Shallow Marine Sedimentary Bodies: A Perspective

Snedden, John W.¹, Ronald J. Steel² (1) ExxonMobil Upstream Research Company, Houston, TX (2) University of Texas-Austin, Austin

One conceptual consideration which is lacking in current sedimentary research is the recognition that many shallow marine sand bodies are of composite origin, having evolved from an initial state to their final depositional form prior to preservation and burial. Because the associated sedimentary clues (physical, biogenic, textural) give mixed signals and do not entirely reflect either state, there is room for considerable interpretational variation. This explains much of the debate surrounding enigmatic sand bodies like the Shannon of Wyoming, Tocito of New Mexico, and Cardium of Canada. The variability in the evidence exceeds that expected from simple passive reworking.

We advocate that many shallow marine sand bodies (deltas, shelf ridges, shorelines, etc.) “evolve” in an active, even predictable fashion, as a function of the need to adjust to changing boundary conditions, as supply, accommodation, coastal morphology and dominant process changes. There is mounting evidence from modern sediments and ancient strata that sand body evolution is as important as the processes which initiate deposition of a sand body. To some extent this is reflected in a recent acceptance that base level as well as process molds facies models and changes in coastline type. Sand body evolution is accompanied by significant changes in sedimentary characteristics like shape, orientation, internal stratification, dimensions, micro-and macrofauna, biogenic structures, and texture.

Such evolution can occur within a single progradational episode, for example, as a function of changing hydrodynamics, or during a complete base-level cycle as a transition from lowstand to transgression, highstand to transgression, or transgressive episodes within an overall regression. This evolution, not simply a reworking, involves dynamic changes in sand body type and 3-D variability. Examples from the modern and ancient are reviewed, with a proposed classification scheme, and discussion of methods to decipher the precursor sand body from the final depositional form.