

Delta Architecture and Process Variability During Cross-Shelf Transits; Autogenic and Allogenic Responses

Olariu, Cornel ¹; Steel, Ronald J. ¹ (1) Jackson School of Geosciences, University of Texas at Austin, Austin, TX.

It is unlikely that deltas maintain a single regime character (fluvial, wave, or tide domination) during cross-shelf migration. Along-strike variation of delta regime is well seen along many coastlines, and downdip variation as deltas prograde across shelves is increasingly being documented. A predictive understanding of this variability is important for understanding (1) the reservoir characteristics of the delta deposits and (2) sediment delivery across the shelf and onto the deepwater slope, on the basin scale clinoform. Deltaic cross-shelf transit time is typically <150ky, and Holocene supply- or accommodation-driven deltas show multiple depositional lobes that formed and shifted with a recurrence of 1-2ky. Such delta lobes can be dominated mainly by fluvial (e.g., Mississippi), wave (Godavari) or tide (Mekong) processes but even within this short time scale the lobe character changes laterally and basinwards. The most typical cross-shelf transition is from fluvial (with multiple shallow distributary channels, prominent levees) or tidal (with deep funnel shape channels) to wave (strike elongated spits and barrier islands) regimes as the entire delta complex progrades towards the shelf edge.

In ancient successions the delta regime can be determined from the facies of extended outcrops or from the isopached morphology of subsurface delta lobes. Cretaceous Fox Hills deltas in Wyoming's Washakie Basin show changes from fluvial to wave dominated character as they are correlated from inner to outer shelf. However, even locally within the proximal reaches of the system the outcrop dominated by channel deposits and incisions on the delta front changes laterally over a distance of 1 km into hummocky cross-strata and wave ripple-laminated sandstone. Pliocene outcrops of the paleo-Orinoco delta indicate an analogous change of the dominant processes from tidal to wave domination as the delta prograded from inner to outer shelf. The paleo-Orinoco outcrops representative of the inner shelf show abundant heterolithic facies with mud-filled channel incisions whereas very thick (commonly 150m) sand belts dominated by clean hummocky and swaley cross stratification characterize the outermost reaches of the shelf.

The interacting short timescale autogenic and longer timescale allogenic responses to steady and unsteady forcing of the main variables during repeated cross-shelf transits of the deltas are discussed.