

## **Contrasting Facies in Slope and Basin-floor Deposits That Correspond to Rising and Flat Shelf Edge Trajectories, Lewis Shale, Washakie Basin, Wyoming**

**Dessy Widyasti Sapardinia<sup>1</sup> and Piret Plink-Bjorklund<sup>1</sup>**

<sup>1</sup>Colorado School of Mines, Golden, CO

### **ABSTRACT**

The Upper Cretaceous Lewis Shale shelf margin of the Washakie basin, Wyoming, is a distinctive system, as this margin has a high sediment supply compared to many other systems, and thus produced basin-floor fans during relative sea-level lowstands as well as highstands. This study focuses on comparing and contrasting the slope and basin-floor deposition during lowstands and highstand, with the aim to understand the differences of depositional dynamics in rising vs falling relative sea-level conditions in such sediment-supply dominated systems. Sixteen sedimentary facies are identified using detailed core descriptions based on lithology, sedimentary structures, and biogenic features. The falling stage and lowstand systems are recognized as shelf-margin clinothems with falling or flat shelf-edge trajectory, and the highstand systems as shelf-margin clinothems with rising shelf-edge trajectory. This study shows that there is no distinct difference in the distribution of facies in lowstand vs highstand fans. Thus, other criteria have to be used to contrast the slope and basin-floor fan deposits. Facies proportions, occurrence of linked debrites, bed thickness, grain size, organic matter content, sandstone sorting, and sandstone sedimentary structures are shown to differ, and these differences are interpreted to be mainly controlled by the river-mouth position in relation the shelf edge and by the availability of accommodation on the shelf. During falling or low relative sea level (flat shelf-edge trajectory), a river mouth feeds directly into slope and basin, as the shelf is exposed, resulting in thicker and coarser slope and basin-floor deposits, more abundant organic content on the basin floor, poor to moderate sandstone sorting, and a higher proportion of structureless and graded sandstone. The latter is related to high deposition rates. In contrast, during relative rise of sea level (rising shelf-edge trajectory), a larger proportion of sediment accumulated on the shelf, resulting in thinner and finer beds on the slope and basin floor, low organic matter content, moderate to good sandstone sorting, and more laminated sandstone facies. The latter reflects lower deposition rates, compared to the lowstand systems. The improved sorting is assigned to transient reworking of sediment on the shelf by basinal processes.