Basin-Fill Geometry of Eocene Tyee Basin - From Fluvial Deposits to Extensive Sand-Rich Basin Floor Fans

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Tyee Basin in the Coast Range of southern Oregon was a forearc basin that received and accumulated a thick succession of sand-rich sediments between late Early Eocene and early Middle Eocene (Ulatisian - Narizian). Although the Tyee Basin is relatively well-studied, the clinoformal architecture of the entire basin infill, consisting of repeated clinothems with topset, deep water slope, and basin-floor fan components, has not previously been accurately reconstructed. The shelf-margin topsets of the Tyee Formation include a range of fluvial, river- and tide-influenced deltaic and shelf deposits that accumulated from the repeated cross-shelf transits of high-supply rivers and deltas. The deepwater slope (estimated gradient 1.5 - 2 degrees) was characterized by fine-grained turbidites and sandy turbidites that developed in nested slope channels. These channels (some large enough to be considered canyons) fed extensive, large-volume submarine fans on the basin-floor with aprons back onto the lower slope. At present Tyee Basin has an elongate, north-south oriented configuration with an aggradational shelf and shelf-margin prism exposed mainly in the southern areas and the stacked basin-floor fans exposed in the northern part of the basin.

We logged and mapped a number of strike- and dip-oriented outcrop transects across the basin. This work allowed us to interpret the position of these outcrops within the topset, slope and basin-floor compartments of a series of NNW-oriented alluvial-neritic-bathyal clinoforms. Stacked, very thick and sand-rich deltaic cycles (each some 35 -40 m thick) observed on the southern topset reaches of the system fed coarse sediments, through very large shelf-valleys, to large slope channels (sometimes >100m deep) that further served as bypass conduits to the fan systems in the northern half of Tyee Basin. The aggradational to progradational character of the basin-fill clinoforms, the active tectonic setting of the basin and the Greenhouse climate of the early-middle Eocene, all suggest that the feeder rivers and deltas were repeatedly driven across moderately wide shelves to make outsized fans by a high supply of sediment rather than by falls of relative sea level.