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Depositional Models for Ponded and Healed-Slope Accommodation on Above-Grade Slopes: Implications for Reservoir Characterization

Distribution and architecture of submarine sands vary across slope environments with different types of accommodation. This reflects the interplay of deep-water depositional processes and evolution of accommodation on most above-grade slopes. At the scale of individual depositional cycles (typically 4th-order), early capture of submarine fans occurs locally in ponded accommodation or in areas where there are significant breaks in slope. Complete filling of basins occurs where depositional rates exceed local rates of subsidence due to mobile substrate withdrawal. Multiple phases of healing and erosion of the slope follow as gravity flows top sills separating inboard from outboard basins. As the focus of deposition shifts to down-slope basins, slope deposits in updip basins either aggrade to the equilibrium profile or erode at local nick points between basins. Drapes of muddy turbidites and/or hemipelagics form, either, as the majority of sediments bypass inboard basins to more outboard basins, or as sediment flux decreases across the slope in response to rising sea level or slope-system avulsion.

At the scale of multiple depositional cycles (typically 3rd-order and lower) most above-grade slopes with highly mobile substrates go through a transition from an early, sand-prone succession called the "ponded facies assemblage" to a later shale-prone, slope-bypass succession called the "bypass facies assemblage". "Ponded" refers to the predominance of seismic facies associated with a confined style of deposition. "Bypass" refers to the abundance of shale-prone seismic facies within an intraslope setting where the bulk of coarse-grained sediment bypassed this area of the slope.

Variations to this idealized model reflect finer-scale stratal stacking pattern relationships, delivery mix changes, and above-grade slopes with stepped-profiles.