

Greenhouse and Icehouse Margins and Shelf-Edge Trajectories: Significance for Sediment By-Pass

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Repeated sediment delivery across the shelf and onto the shelf margin, whether by accommodation- or supply-driven forcing of river deltas to the shelf edge, causes shelf-edge migration and large-scale accretion of margin sedimentary prisms. For margins of similar height, this accretion rate can be modest (few km/my) or fast (10s of km/my) depending mainly on the width of the shelf and the sediment flux across the shelf edge. Greenhouse margins, despite a likely weak accommodation drive, nevertheless can partition great volumes of sediment into deepwater areas likely favoured by high rates of sediment yield during warmer climate and a tendency for deltas to remain near the shelf edge for long periods without floodback. In this setting there can occur both lowstand and highstand delivery of sand into deepwater areas. On Icehouse margins we predict longer and higher frequency transgressive-regressive delta transits across the growing shelf-margin prism driven by glacio-eustatic sea-level fluctuations, with punctuated deepwater sand delivery at sea-level lowstands and thus the creation of conventional stratigraphic sequences.

The shelf-edge trajectory during the longer-term growth of many margins is commonly irregular, with alternating rising and flat segments that have a time scale of 0.5-2my. These segments themselves, always consisting of stacked basic sequences, are useful predictors of alternating strong sediment storage on the shelf (for segments of rising trajectory) and strong bypass of sediment to deepwater areas (for segments of flat trajectory). The possible causes of shelf-edge trajectory segmentation are discussed with reference to a number of ancient shelf margin successions.