Spatial-temporal variation in modern deepwater channel-fan system development: Pandora and Moresby Troughs, Gulf of Papua.

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The distribution and geometry of deep-water channel fan depositional systems are dictated by combined effects of local processes, ocean hydrodynamics (controlling shelf and upper slope sediment movement), and glacio-eustacy. Most studies have considered transgression and highstand as times of negligible sediment supply to deepwater. However, more recent work, including ours, suggests that the development of oceanographic processes on the flooding shelf and the shelf morphology itself influence on-shelf sediment trapping mechanisms and can also facilitate off-shelf sediment transfer.

Preliminary study in Gulf of Papua (GoP), Papua New Guinea, has shown that during Marine Isotope Stage 2 (MIS-2, 14.1-27.6 Ka) sea level was ~125 m lower than present, and the shelf was exposed, enabling fluvial systems to progress seaward, incising the shelf plain and directly feeding canyons and deeper basins with sediment.

During the Holocene sea level rise (14 Ka – recent), we observed two contrasting source to sink histories in two adjacent depocenters, Pandora and Moresby Troughs. In Pandora Trough, sea level rise drowned the shelf, promoting the clinoform development and preventing direct fluvial sediment transfer to the canyons and deeper water. In Moresby Trough, regional shore-parallel currents developed that impinge on the eastern shelf edge. These eastward currents entrain sediment from major western GoP rivers, bypassing canyons to the south, and may have created a coalesced sediment source that could potentially produce a single large deep sea fan, compared to smaller deposits that would be created from isolated sources.