

1) Is the balance between shelf accommodation space and sediment supply such that the slope is the dominant depocenter, and how has this evolved since the LGM?

Continental slopes on tectonically active margins may be the major depocenter for terrestrially derived material at most (all?) stages of sea level. In these settings, sources and sinks are tightly coupled, adjusting quickly to environmental changes on a variety of timescales. Large sediment inputs associated with high-standing, easily erodible drainage basins can quickly overwhelm rates of subsidence and uplift, leading rapidly to off-shelf transfer of sediment. As these large signals are present during all stages of sea level, this dynamic balance between input and sequestration should be active throughout this time period as well.

2) Are sediment-gravity flows a significant mechanism of off-shelf sediment transport in flood-dominated, anthropogenically altered dispersal system?

Globally, small mountainous drainage basins comprise a major component of active margin systems, and the production and discharge of sediment from these systems is typically episodic and potentially great. Floods generated in these areas develop quickly and are often contemporaneous with energetic oceanographic conditions. Anthropogenic impacts on drainage basins has significantly augmented these already large flood loads. Discharge by sediment-laden rivers during such conditions is known to result in sediment gravity flows on continental margins that are capable of rapidly moving sediment and associated materials seaward. Little available accommodation space on the Waipaoa shelf is believed to force a majority of sediment gravity flows to deposit their loads in thick beds on the continental slope, building the dominate sink for sediment and organic carbon.

3) Do intraslope sources dominate slope sediment flux on an actively deforming margin?

“Mass failure, gullying, and avalanche deposits are controlling the path and sources of seaward sediment dispersal beyond the shelf”

“Canyon death on a gully and avalanche dominated slope”

The coast adjacent to Waipaoa Sedimentary System yields a flood-dominated and anthropogenic fingerprint that suggests an order of magnitude increase in land-derived sedimentation. Despite the magnitude of this signal, slope sedimentation is volumetrically dominated by intraslope sediment sources that could be asynchronous with both land-use and climate change. The slope morphology today shows an abandoned canyon system overprinted by numerous gullies, slumps, and avalanches. This margin features regular earthquakes, active deformation from tectonic erosion, and elevated pore pressures. Slope processes are dominated by sediment-tectonic interactions that buffer the terrigenous signal, and now bypass Poverty Canyon.