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Tectonic influences on sedimentary processes and submarine landscape evolution: the Waipaoa River, New Zealand example

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The development of dispersal systems on tectonically active margins is determined not only by the processes of fluvial discharge, oceanic sediment redistribution and sediment accumulation, but by structural elements as well (e.g., folding, faulting, submarine failures). The Waipaoa dispersal system exhibits a number of features that reflect the presence of tectonic elements that are affecting the development of the shelf and slope, including: uplifted anticlines; truncated anticlinal structures on some parts of the shelf edge; a large failure on the midslope blocking seaward sediment transport; clogged submarine canyons; and fault-derived accommodation space on the outer shelf. This study, a part of the NSF Margins Source-to-Sink initiative, is examining grain-size distributions, radionuclide activities (Th-234, Be-7, Pb-210, C-137, C-14) and tephrachronology to determine the influence of tectonic factors on the distribution of slope sedimentary processes in space and time. Be-7 activities suggest that fluvial sediment is rapidly reaching the shelfbreak, whereas Pb-210 accumulation rates suggest that sediment accumulation is actively being directed by tectonic elements. The distribution of rates demonstrates that significant material is accumulating on the outermost shelf at rates approaching 1 cm/y, is transported off-shelf to accumulate in the upper portions of submarine canyons along much of the margin at rates up to 2.5 cm/y and decreases below 1200 m water depth to approximately 0.2 cm/y in canyon and intercanyon sites. Farther seaward, rates are uniformly low, 0.05-0.1 cm/y, as significant quantities of sediment are blocked from further seaward transport by a

large failure deposit. However, using high-resolution seismic data, the pattern of sedimentation appears to be broadly similar through time, suggesting the dominant drivers for sediment accumulation (e.g., tectonism, sediment supply and removal) have consistently varied through the Holocene.