Processes Effecting Sediment Transfer Across the Land-Sea Interface and Resulting Shelf Stratigraphy

Wadman, Heidi M.[1]; McNinch, Jesse E.[1] (1) Field Research Facility, US Army Corps of Engineers, Kitty Hawk, NC.

The land-sea interface is a sensitive, dynamic filter that modulates the transfer of sediment from terrestrial to marine environments. The degree of filtering is a function of the complex interactions between sediment supply, sea level, physical energy and tectonics. Understanding the processes influencing the efficiency of sediment segregation at this interface will yield insight on the processes that create stratigraphy on adjacent continental shelves. We present examples of two land-sea interfaces from tectonically active, regressive settings on the North Island of New Zealand: (1) the inner shelf off of the Waiapu River, and (2) Poverty Bay, adjacent to the Waipaoa River. An extensive array of geophysical, sedimentological, and hydrodynamic data are used to quantitatively assess the efficiency of sediment segregation, deposition, and subsequent resuspension and off-shore transport at the land-sea interface. The two systems share several similarities with regards to the processes controlling the efficiency of the land-sea filter, including sea level, physical energy and tectonics.

Results from Poverty Bay indicate that while the system is occasionally overwhelmed by fine-grained sediment deposition resulting in the preservation of event beds near the surface, more often the system efficiently segregates sediment, preserving little fine-grained sediment. Both long-term floodplain stratigraphy and stratigraphic models indicate this has been the case for the Waipaoa system for the last several thousand years, despite a recent 4-5 fold increase in sediment supply. In contrast, results from the Waiapu show a shift from efficient to inefficient sediment segregation at the land-sea interface over the same time-frame, with significant modern capture of fine-grained material primarily as event layers on the inner shelf (16-34% of the modern, fine-grained budget). This suggests that in Poverty Bay, an increase in sediment supply has been modulated by the other filtering processes, resulting in consistently efficient segregation and bypassing. Conversely, on the Waiapu inner shelf, the increase in sediment supply has overwhelmed the modulating effects of the other processes, changing the behavior of the land-sea filter and thus altering the type of stratigraphy formed. The influence of these differing filters is evaluated in the context of the effects on the stratigraphy farther offshore, where preservation over the long-term is more likely to occur.