Presto, M., A.S. Ogston, C. D. Storlazzi, and M. E. Field. 2006. The influence of winds in sediment transport processes on a fringing reef flat: Southern Molokai, Hawaii. Eos Trans. AGU, 87(36), Ocean Sci. Meet. Suppl.

Abstract:
The fringing reef off of southern Molokai has been a focus of the U.S. Geological Survey Coral Reef project to study land-based sedimentation on coral reefs. This multi-year study provides the opportunity to compare the relative importance of selected physical processes in sediment transport on the reef. Our studies show that the strength and direction of wind across the shallow reef flat has significant influence on transport patterns. Further, differing wind patterns act over different time scales, and the length of time and direction the wind blows is also an important variable. Daily sediment-transport processes on the south Molokai reef flat are dominated by the trade winds, which historically occur 90 percent of the time in the months from April through November and 50 percent of the time the rest of the year in the Hawaiian Islands. Kona storms occur infrequently in the Hawaiian Islands and impact sediment transport on the reef flat by commonly generating large waves and strong winds, as well as producing significant precipitation that delivers sediment from adjacent upland watersheds. Temporal and spatial measurements of current velocity, suspended-sediment concentration, and wave-orbital velocity were collected on the reef flat and provide a basis to quantify the occurrence and importance of processes generated from daily trade winds and seasonal storm events on the total sediment flux. From our measurements, the cumulative transport of moderate concentrations of sediment in suspension from daily trade-wind generated currents and waves is much greater than transport attributed to the relatively infrequent, short term, high turbidity levels generated from episodic storms. Although storm events are crucial for re-supplying sediment to the system, typical trade-wind driven processes occurring on the reef flat may have a greater cumulative impact on sediment redistribution