Department of Ocean & Resources Engineering

Seminar

The Application of Beach Morphology Data to Predicting Coastal Change

by

Peter Ruggiero

Coastal Monitoring & Analysis Program
Washington State Department of Ecology

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Abstract

The dynamic interaction of environmental forcing and coastal morphology occurs over at least five orders of magnitude in time and space, with temporal responses ranging from multiple wave cycles (tens of seconds) to interannual climatic variations (El Niño) and spatial variability ranging from ripples to large-scale coastal behavior. This wide range of scale presents a difficult sampling problem that must be overcome in order to aggregate to scales relevant to coastal management and engineering projects. The Southwest Washington Coastal Erosion Study (SWCES), sponsored by the U.S. Geological Survey and the Washington Department of Ecology, employs a hierarchical scale approach in order to understand the regional sedimentary system of the Columbia River littoral cell (CRLC) in the Pacific Northwest of the United States. The primary goal of this multidisciplinary effort is to predict morphologic behavior along the 165 km long CRLC, extending from Tillamook Head, Oregon to Point Grenville, Washington, at a management scale of decades and tens of kilometers. This talk will discuss applications of the Study's nested beach monitoring program, implemented to quantify short- medium-term (event-seasonal-interannual) beach change and morphologic variability along the littoral cell.

Beach state parameter (i.e., grain size, beach slope, and dune height) data are being collected to enhance the conceptual understanding of the CRLC functioning and to refine predictions of future coastal change. Bulk parameters of shoreline and profile change are being derived to compare short-term variability with long-term regional trends assisting in shoreline change model calibration. Coastal susceptibility to adverse impacts of morphologic change is being assessed via the application of a probabilistic total water level model that predicts the frequency of dune toe impact and wave overwash. Finally, the relationships between nearshore morphology and shoreline change are being investigated with analyses of the first, regional nearshore bathymetry measurements on the high-energy dissipative beaches of the U.S. Pacific Northwest.