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# **Characterization of Environmental Parameters Affecting Bed Stability**

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## **LONG-TERM GOAL**

The goal of the project is to support the Mine Burial Prediction (MBP) modeling efforts by providing characterizations of environmental parameters affecting bed stability (especially waves, currents and tides) at the MBP study sites and other sites of interest.

## **OBJECTIVES**

The goals of this environmental characterization study are to: 1) provide information about the spatial and temporal distribution of bed shear stress due to waves, tides and currents to MBP investigators working on bedform migration and scour processes; and 2) evaluate the data requirements (quality and quantity) for meaningful estimates of bed shear stress distributions.

## **APPROACH**

Combine analysis of available data, data collected during the MBP field studies and a model of wave-current interaction to examine the spatial and temporal distribution of bed shear stress.

## **WORK COMPLETED**

This project is in its initial phases. To date, I have been working on three aspects of this project. First, I have been analyzing existing wave and meteorological data from offshore buoys near the Florida and Cape Cod study sites. These data can provide a general sense of the magnitude and variability of wave forcing at these sites. Whether the data accurately reflect the wave conditions at the locations of the measurements can only be determined after results are available from the field campaigns. Second, I have been examining the spatial and temporal variations of bed shear stress at a site which is well characterized (the Eel shelf), in order to develop approaches and indices that will be useful at the MBP sites. Finally, I have been working with Dick Bennett to identify the environmental data needs of the investigators working on MBP modeling projects.

## **RESULTS**

NOAA wave buoys have been operating offshore of Tampa, FL (NDBC Buoy 46036) since 1994 and offshore of Nantucket, MA (NDBC Buoy 46008) since 1982. Mean significant wave height at the Nantucket buoy ranges from 2.3 m (standard deviation of 1.2 m) in January to 1.0 m (standard deviation of 0.5 m) in July; an annual maximum wave height of 10 m has a 5-year recurrence time. Mean wave conditions at the Tampa buoy are smaller, averaging less than 1.0 m. Mean annual

maximum significant wave height at the Tampa buoy is 40% lower than at the Nantucket buoy during the 5 years of common record. STRATAFORM field measurements have shown that spectral wave data from the offshore buoy on the Eel margin (NDBC Buoy 40622) can be used to obtain good estimates of wave speeds across the outer and mid-shelf region (water depths of 50 m and greater). On the wave-dominated Eel shelf, these can be used to provide a good indication of the probability of sediment motion across much of the shelf. The MBP study sites are in shallower water, where effects of wave shoaling are more likely to be important. It may be necessary to use a refraction-diffraction model to relate offshore wave conditions to those at the field site. Preliminary field data will be valuable in making this determination.

I surveyed the modelers participating in the MBP program in May, 2001, concerning their needs for environmental data as model input and/or for model testing. Such data could include flow conditions (waves, currents, tides and wind), bed properties (size distributions, porosities, small-scale roughness, geotechnical properties), and bathymetry. Responses were collated by data type and provided to Richard Bennett for planning purposes.