Coastal Wind Stress Observations Made Near Tidal Inlets

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In comparison to the large body of work focused on air-sea fluxes of heat and momentum over the open ocean, the physics of the marine atmospheric boundary layer (MABL) in coastal waters has been under-investigated. Wind stress observations made from mobile platforms as part of the Riverine and Estuarine Transport (RIVET) experiments will be presented. This ONR sponsored project was a two-part field campaign focused on studying wave-current-wind interaction at tidal inlets of different scales. Data was collected at both the New River Inlet in North Carolina (RIVET 1) and the Columbia River Inlet on the Oregon-Washington border (RIVET 2). Among other considerations, these two sites present a stark contrast in tidal range, wave climate, bathymetry, and above-sea level terrain. Analysis of the RIVET 1 wind data revealed significant wind stress variability (in both magnitude and direction) within 2 km of the inlet mouth. Much of the variability in the wind stress magnitude can be attributed to wind speed and direction relative to the shore-normal. The average parameterized wind stress (or drag coefficient) was found to be ~2.5 times that of open-ocean estimates, at the equivalent wind speed. The findings from RIVET 1 are summarized in Ortiz-Suslow et al. [2015]. Preliminary results from RIVET 2 suggest a very different physical regime with a high degree of variability potentially attributed to the relative angles of wind, wind stress, wind seas, and swell. However, near surface, horizontal gradients in the current and temperature fields are also expected to play a significant role. Overall, a relatively unique data set has been collected, which enables the comparison of directly measured wind stresses at two vastly different tidal inlet systems.