



**US Army Corps  
of Engineers®**

Engineer Research and  
Development Center

# Advanced Nearshore Circulation and Sediment Transport Modeling

**Description** Develop a physics-based model of circulation and sediment transport in the surf zone to improve Corps sediment management practices.

**Issue** The processes by which nearshore waves and currents interact with bathymetry and coastal structures, sometimes forming rip currents, and the processes by which sand is transported around, over, and through structures are not well understood. In general, nearshore currents and sediment transport have significant vertical and horizontal structure, but these are not included in the present generation of coastal models. Advanced capabilities to numerically model the details of nearshore circulation and sediment transport are critical to reduce the cost and improve the performance of Corps project design.



**Users** Corps District Offices.

**Products** A quasi-2D (cross-shore and vertical) numerical model of surf zone currents has been developed. This model includes irregular wave forcing, mass transport, undertow (offshore flow in the lower water column), sand ripple prediction, full wave-current boundary layer solution, wave setup, and longshore current. The model relies on a minimum of empiricism and was verified using data from the Large-scale Sediment Transport Facility (LSTF) at ERDC. The LSTF is a unique facility for measuring waves, currents, sediment transport, and beach morphology development at large scales. A quasi-3D model to give reliable estimates of nearshore circulation and sediment transport is presently under development.

**Benefits** Advanced capabilities to numerically model the details of nearshore circulation and sediment transport reduce the cost and improve the performance of Corps navigation and coastal flooding project design.

**Corps Program** Navigation Systems Research Program, Mr. James Clausner, Program Manger.

**Point of Contact** For additional information, please contact Dr. Jane McKee Smith at 601-634-2079 ([jane.m.smith@erdc.usace.army.mil](mailto:jane.m.smith@erdc.usace.army.mil)) or Dr. Bradley D. Johnson at 601-634-4612 ([bradley.d.johnson@erdc.usace.army.mil](mailto:bradley.d.johnson@erdc.usace.army.mil)).

**Partners** Mr. Ernest R. Smith, ERDC (Large-Scale Sediment Transport Facility); Prof. Ole S. Madsen, MIT.