INFLUENCE OF STORM PROCESSES ON CROSS-SHELF SEDIMENT TRANSPORT

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Abstract

Current models for deepwater sediment sources call upon conduit-fed slope canyons bringing sediments in to steep-sloped settings, generating turbidite-driven basinward sediment transport. However, new findings in shelf environments suggest that shelfal processes can play a large role in line-sourcing sediment plumes directly from the shelf, absent of slope conduits. In addition, distal shelf settings, once thought to be devoid of reservoir quality sediments are increasingly the target of low-net:gross exploration efforts, whose risk can be reduced through careful understanding of outer shelf sediment distributions.

A series of experimental studies will be performed in a large, nonrecirculating flume to test plunging hyperpycnal plumes (PHP) as a viable means for cross-shelf sand transport to middle and outer shelf locations, and potentially to deeper-water locations. The PHP result from storm-flood events bringing in huge amounts of sediments into the shelf. However, these plumes are believed to die off quickly as they cannot maintain their turbulence due to the gentle nature of shelf slopes. I hypothesize that wave-modification of gravity-driven currents can sustain a shelf turbidity current carrying the sediment to longer distances across the shelf. In our study, we will physically model the interaction of storm-produced gravity waves and the PHP generated due to storm-associated flood events, and how change in the current and wave characteristics affect the sediment transport. Improved understanding of sediment transport on storm-dominated shelves has implications for interpretation of environmental settings, paleoclimate models, paleowater depth assessments and understanding of reservoir nature and distribution in distal shelf and deepwater settings.

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