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Drilling into dewatering sites along the Costa Rica margin (IODP proposal 633): first results from pre-site survey seismic data evaluation

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IODP drilling proposal 633 (Costa Rica Mud Mounds) aims to enhance the general understanding of complex forearc dewatering processes of the erosive subduction system off Costa Rica. Major sites of dewatering planned for drilling are mounds, related to mud diapirism/volcanism and precipitation of authigenic carbonates, and large-scale slides related tothe subduction of seamounts.
New pre-site survey seismic data was collected during a cruise of R/V Marcus Langseth in 2008 at the proposed sites of Mound Culebra and Mounds 11 and 12. The new seismic profiles were acquired using a 36-gun, four-string linear gun array up to 240 Hz, and a 240 channel streamer with 3000 m of active length. The new data are of exceptionally high quality and allow a detailed analysis of the processes that control fluid migration in the Costa Rican margin. We will present first results obtained from prestack depth migration focusing on structures above the acoustic basement.
The selected mound sites at Mound Culebra and Mound 11 are both clearly related to deep-reaching fault systems, corroborating preliminary estimates of the source depth of fluids and extruded material. In addition, the new seismic data show differences in terms of the mounds' activity and stage of development. A continuous bottom simulating reflector (BSR), i.e. the base of the gas hydrate stability zone, is visible in the vicinity of themounds, but seems to vanish directly beneath their surface expression. The selected drill sites are chosen to penetrate deeper than BSR depth in order to record changes in fluid geochemistry and microbiology along the flow path where it transgresses into the hydrate stability field.
At Jaco Scar, which is the target site selected for studying seamount subduction, there is evidence for fluid flow as detected by geochemical anomalies in scar sediments and prominent methane plumes in the water column. Drilling of the seamount site at Jaco Scar will test the hypothesis that seamount subduction creates deep-reaching conduits between the upper plate sediments and the continental basement wedge.

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