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Buildup and gas hydrate system of mound structures offshore Costa Rica revealed by 2D MCS seismic data

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Our analysis of 2D MCS seismic data from the Middle American margin provides an insight into the buildup and formation mechanisms of mound structures and the effects of fluid ascent on the gas hydrate system observed on the continental slope offshore Costa Rica. Our targets, Mound Culebra and Mounds 11&12, are the sites of IODP drilling proposal 633-Full2, which aims to enhance the general understanding of complex forearc dewatering processes of the erosive subduction system off Costa Rica. The new seismic profiles were acquired using the 36-gun, four-string linear gun array of R/V Marcus Langseth, and a 240 channel streamer with 3000 m of active length. We investigate the role of the acoustic basement for the fluid ascent and the interactions between gas hydrate formation and dissociation with the fluid ascent from the deep sources. The selected mound sites are both related to deep-reaching fault systems, corroborating preliminary estimates of the source depth of fluids and extruded material. In addition, the new seismic data shows differences in terms of the mounds' activity and stage of development. Upward bending of the bottom simulating reflection (BSR) and the absence of the reflection in the area of the fluid conduit may indicate a build-up of free gas within the gas hydrate stability zone, probably due to increased fluid flow and associated hydrate dissociation.