Sedimentary Dispersal of Seismoturbidites Offshore Sumatra and Cascadia: Forcing Factors from Physiography

Details

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Abstract

Correlation of turbidite beds among disparate sites is an important technique for testing for regional similarity of depositional sequences, and regional synchroneity of the triggering mechanism. For seismogenic turbidity currents, the flow and deposition is governed by a number of factors, including source proximity, local site conditions, flow path (hydraulic) geometry, temporal and spatial patterns of earthquake rupture, hydrodynamics, and topography. These factors likely provide a first order control on the sedimentary structure of the deposits, and will vary in importance among sites, regions, and variable earthquakes. Using sedimentary cores offshore the Cascadia and Sumatra-Andaman subduction zones, we investigate turbidite structure as it relates to some of these forcing factors. Channel systems tend to promote and preserve low-frequency components of the content of the current over long distances. More proximal slope basins and base-of-slope apron fan settings tend to preserve turbidite structure that is likely influenced by local physiography, stacking of sources, retrogressive failure, and other details of the failure process. Cascadia's margin is dominated by glacial cycle constructed pathways which promote turbidity current flows for large

distances. In contrast, the Sumatra margin pathways did not inherit a large channel fed sedimentary system and the outer forearc is separated from Sumatra by an unfilled forearc basin. For this reason, the sediment source for the Sumatran trench and outer slope is from the north, delivered to the trench and recycled by accretion and repeated slope failures. Canyon systems are short, acting as more variable proximal sources to the trench axis and canyon mouth fans, increasing the variability of the resulting deposits. The trench in both systems is likely also fed by sheet flows from the lower slope, based on the continuity of 3.5 kHz Chirp profiles over long distance parallel to the margin.

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