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Determining the Ages and Origins of Earthquake Triggered Submarine Landslides

Details

Meeting	2003 Fall Meeting
Section	Ocean Sciences
Session	Identifying Submarine Landslide Time of Failure II
Identifier	OS31A-05
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Abstract

We have been determining the ages of turbid flows from submarine landslides to establish a paleoseismic record for the Cascadia margin and the Northern San Andreas Fault. This involves multiple approaches to both test the turbidites for earthquake origin, and to develop the time series of events. In our work, we are focusing on the Holocene record, because prior to the Holocene, lowered sea-level resulted in a very different sediment distribution system, essentially defeating many of the mechanisms that allow the earthquake record to accumulate in abyssal channels during high sea-level stands. To establish earthquake origin, we test for synchronous triggering using simple relative dating techniques, and for wide geographic correlation. The basis for this is that of all the possible triggers for turbid flows, only earthquakes are capable of triggering widespread failure of many canyon systems simultaneously. To test for synchroneity, we look for channel confluences and examine the deposits both above and below the confluence. If the record is entirely of earthquake origin, the total number of events above any given datum will be the same above and below the confluence. Because of the high velocity of turbid flows, merging at the confluence must take place within hours, or deposits from separate tributaries will be recorded as multiple events. Looking more closely, we find that separate mineralogies from such tributaries are observed to merge and form a bi-modal amalgamated turbidite down stream. To look for wide geographic correlation, we use physical properties such as density, magnetics, and color reflectance to attempt to establish a regional correlation. To establish the paleoseismic history, once having determined the origin of the events, we determine AMS 14C ages from planktonic forams deposited in the hemipelagic sediments that underlie each turbidite sequence. Our rationale is to collect samples from the youngest hemipelagic interval between events to date the overlying event. Though there may be some erosion of this interval, thus biasing events to slightly older ages, we use more distal cores, which are less likely to have basal erosion for primary dating, and inspect the bases visually for evidence of erosion. Dating the lower hemipelagic sediment between events can be problematic due to the difficulty in positively identifying the boundary between the turbidite tail and the overlying hemipelagic sediment. Current work shows that reservoir corrections applied to these ages can vary temporally and spatially, emphasizing the need for independent datums for best results.

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