Origins of Turbidites Along the Northern California Margin: Earthquakes on the Northern San Andreas Fault?

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Abstract

During June and July, 2002, we collected 60 cores from channel and canyon systems draining the northern California margin. The objective of this project is to test the hypothesis that many of the turbidites deposited in these channels resulted from turbid flows triggered by earthquakes on the northern San Andreas fault. Previous work on the Cascadia margin has shown that turbidites there were most likely the exclusive result of earthquake triggering of turbid flows. Along the north coast of California, the northern segment of the San

Andreas lies close to the coast or just offshore between San Francisco and Point Delgada. Favorable physiography of both fault and channel systems suggested that the northern San Andreas might be a good locality to test the methods and hypotheses previously applied to Cascadia. Unlike Cascadia, the Northern California margin does not appear to have a regional stratigraphic datum, thus results will depend mostly on AMS 14C dating of individual events. Preliminary mineralogic data however, suggest an earthquake origin for at least some of the events examined thus far. We have been able to distinguish three mineralogic provenances in the cores, well linked to the onshore source geology. Channels from separate provenances come together at confluences, below which we see mixed provenance. Rather than separate events from each provenance, we see either doublets, with no intervening time between them, or bimodal coarse fractions in the turbidites, each peak representing a separate provenance. Since the coarse fractions of turbidites settle out in minutes to hours, the couplets and bimodal distributions indicate little or no time passage during deposition. Synchronous deposition in turn suggests a synchronous timing of the triggering of the source events. Few, if any, triggering events other than earthquakes can satisfy the very short time requirements for synchronous initiation of turbid flows separated by large distances along the margin. Our preliminary investigations suggest that at least some of the events observed in our initial look at these cores are probably earthquake triggered.

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