Rapid Climatic Signal Propagation from Source to Sink in a Southern California Sediment-Routing System

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Terrestrial source areas are linked to deep-sea basins by sediment-routing systems, which only recently have been studied with a holistic approach focused on terrestrial and submarine components and their interactions. Here, we compare an extensive piston-core and radiocarbon-age dataset from offshore southern California to contemporaneous Holocene climate proxies in order to test the hypothesis that climatic signals are rapidly propagated from source to sink in a spatially restricted sediment routing system, including the Santa Ana River drainage basin and Newport deep-sea depositional system. Sediment cores demonstrate that variability in rates of Holocene deep-sea turbidite deposition is related to complex ocean-and-atmosphere interactions, including enhanced magnitude and frequency of the North American monsoon and El Niño-Southern Oscillation cycles, which increased precipitation and fluvial discharge in southern California. This relationship is evident because, unlike many sediment-routing systems, the Newport submarine canyon-and-channel system was consistently linked to the Santa Ana River, which maintained sediment delivery in spite of evidence of Holocene tectonic uplift and significant sea-level rise. Results of this study demonstrate the efficiency of sediment transport and delivery through spatially restricted, consistently linked routing systems, as well as the utility of deep-sea turbidite depositional trends as paleoclimate proxies in such settings.