Large Crater Structures Offshore Southern California

Details

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Abstract

Digital mosaics of swath and conventional bathymetry data reveal large, distinct near-circular crater structures in the inner California Continental Borderland offshore of southern California. Two have maximum crater diameters that exceed 30 km, and a third has a crater diameter of about 12.5 km. One of these, Catalina Crater, exhibits a well-defined crater morphology -- raised outer rim, ring moat, and elevated central peak -- that resembles an impact site. The others have a similar morphology but more disrupted by later tectonic or volcanic activity. Preliminary analyses of available seismic, gravity and magnetic data over Catalina Crater reveal similarities and differences in geometry, structure, and geophysical signature to known impacts. All three crater structures occur within the Catalina terrane, a highly extended volcanic and metamorphic province floored by Catalina Schist basement. An alternative origin may thus involve explosive volcanism, caldera collapse and resurgent magmatism, and/or possibly schist remobilization, associated with the Catalina terrane. Timing of crater formation postdates the initial rifting and rotation of the western

Transverse Ranges, and predates major right-slip along the San Clemente and San Diego Trough fault systems -- or about 18 to 16 Ma. No single model for impact, caldera, or other crater forming mechanism fully accounts for all of the present observations and data regarding the morphology, internal structure, and known lithology of these near-circular features. Regardless of their origin, these complex craters represent some of the largest structures of their kind in western North America and provide a unique opportunity to better understand crater forming processes in a submarine environment.

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