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DIFERENTIATION OF BASEMENTS TYPES USING SEISMIC REFLECTION DATA AND 40Ar-39Ar DATING IN THE WESTERN HALF OF THE FARALLON BASIN (GULF OF CALIFORNIA, MEXICO)

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The Gulf of California is an active continental rift with an oblique right lateral displacement. Defining a clear boundary between continental and oceanic crust is difficult due to the high sedimentation rate. The new crust is a mixture of sills and sediments that do not produce aligned magnetic anomalies. The main objective of this work is to identify this boundary in the western part of the Farallon Basin. In order to accomplish this goal we used multichannel 2D high-resolution seismic reflection data taken during a cruise aboard oceanographic vessel Francisco de Ulloa in 2006. We also used petrological characterization and 40Ar-39Ar dating of continental samples collected in nearby Santa Catalina, Santa Cruz and San Diego islands, Punta Botella in the Baja California Peninsula, and marine samples of the continental margin next to Las Animas island (ROCA 2008 cruise).
Oceanic crust created in the Farallòn spreading axis is identified primarily by saucer-shaped structures in the seismic profiles, which are interpreted as sills. The plutonic continental basement is located on the westernmost part of the margin and is recognized by a continuous high amplitude reflector. There are also volcanic patches in this area, like the South Farallon Massif, which are evident as discontinuities in the high amplitude reflector and with a different seismic character.
The Farallon Basin is affected by two different tectonic regimes, the first (compressive) is related to the subduction of the Farallon Plate under the North American Plate, when the plutonic basement was originated. It consists of granodiorites and tonalites belonging to two phases of subduction during the Upper Cretaceous and Early Miocene. Outcrops of the latter phase are exposed in the peninsula of Baja California (Conception Bay); Mexico mainland (middle Sinaloa); and dredged samples of Pescadero Basin. These are similar to the plutonic Santa Catalina Island outcrop described and dated in this study. These Miocene plutonic rocks will be important to interpret the margin correlation of the Gulf of California. The second tectonic regime (extensional) is related to the opening of the Gulf of California, during which new oceanic crust was formed. Two groups of faults have been identified in the study area and are compared with previously mapped faults and bathymetry. The first group shows a NW-SE trend (probably Late Miocene), and the second is NE-SW oriented (probably Pliocene-Quaternary). A bottom simulating reflector, probably related to opal diagenesis, is also recognized.