

## Geologic and Hydrologic Role of Sill Intrusion and Delineation of the Oceanic Crustal Boundary in the Central Gulf of California

*Jared Kluesner - Scripps Institution of Oceanography, Marine Physical Laboratory*

High-resolution multichannel profiles recently shot in the central Gulf of California display concordant and discordant (concave-upwards) sills intruded shallowly within (I) young sediments in the axial troughs of Guaymas, Carmen and Farallon Basins, (II) off-axis in the basin floors, and (III) within the sediment cover of subsided and extended continental crust. We interpret some imaged sills as 3D saucer-shaped intrusions based on their concave-upward profiles, the overlying circular and elliptical plans of domal uplifts of the present multibeam-mapped seafloor, and their striking resemblance to field-mapped and 3-D seismically imaged saucer-like sills. Vertical zones of high-amplitude, disturbed reflectors leading up from sills are probably "blow-out pipes" acting as conduits for hydrothermal fluids and gases migrating up and away from the heated sill-sediment contact aureole, forming pockmarks on the present seafloor. Bright spots, dim spots, phase reversals, and acoustic turbidity in the sediments above sill intrusions suggest the presence of hydrocarbons and fluid flow throughout the study area. Seismic evidence of sill intrusions into the shallow crust throughout the central gulf suggests melt is being delivered not just to spreading centers, but to a much broader area of oceanic and continental crust. We have improved the delineation of the oceanic/continental crustal boundary in the central and southern gulf by sampling igneous basement (tholeiitic basalt and gabbro = oceanic; granitic = continental), by identifying the extent of magnetic stripes diagnostic of seafloor spreading, by interpreting multichannel reflection profiles, and by geomorphology. Although the "boundary" is somewhat smeared by the intrusion of shallow sills (some known to be tholeiitic, most inferred to be) into the cover of both granitic and oceanic basement, we find no evidence of "transitional zones" of hybrid crust; at those sheared and rifted margins where basement is accessible, granite commonly abuts tholeiitic flows and sills. Seafloor spreading magnetic anomalies, with low amplitudes and broad transition widths, can be read out to C2Ar in Alarcon Basin, and C2An.1 in Guaymas Basin (but only on profiles that avoid major off-axis seamounts and intrusions); in both cases they indicate significantly slower accretion during the first 1 m.y. of spreading, presumably because of concurrent continued extension of the rifted margin. Widespread sill intrusion over continental basement does hamper identifying the ocean/continental boundary on seismic reflection profiles, and because the already thin Cordilleran crust was clearly highly extended during prolonged rifting we do not think that crustal thickness is a reliable criterion for the extent of oceanic crust.