Crustal structure during active rifting in the central Salton Trough, California, constrained by the Salton Seismic Imaging Project (SSIP)

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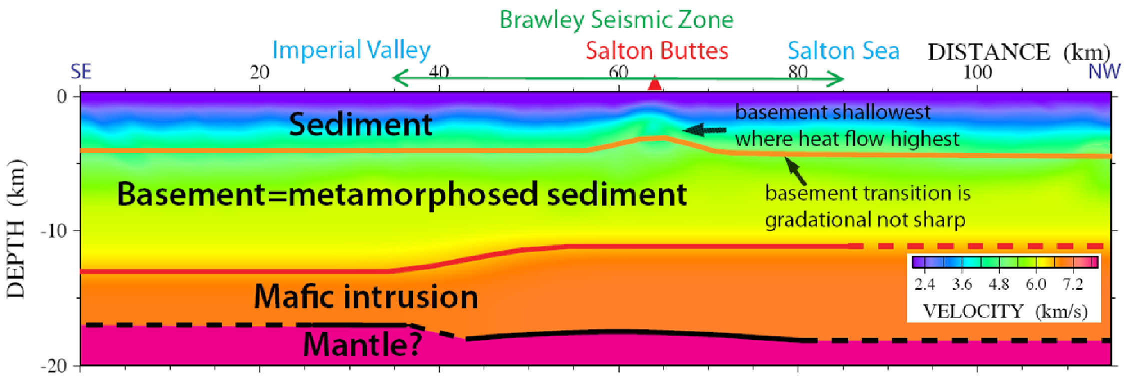
Seismic refraction and reflection travel times from the Salton Seismic Imaging Project (SSIP) are being used to constrain crustal structure during active continental rifting in the central Salton Trough in southern California. SSIP, funded by NSF and USGS, acquired seismic data in and across the Salton Trough in 2011 to investigate rifting processes at the northern end of the Gulf of California extensional province and earthquake hazards at the southern end of the San Andreas Fault system. Seven lines of refraction and low-fold reflection data were acquired onshore, two lines and a grid of airgun and OBS data were acquired in the Salton Sea, and onshore-offshore data were recorded. More than 50 students from 31 colleges and universities participated in the field work.

First arrival travel time tomography images a ~40 km wide basin in the central Salton Trough. Crystalline basement with a seismic velocity of ~5 km/s generally occurs at ~4 km depth in the valley, but shallows to 2-3 km depth beneath the volcanic Salton Buttes and the Salton Sea geothermal field. The sediment-basement boundary has a large seismic velocity contrast and is a strong seismic refractor. However, the lack of a corresponding seismic reflection indicates that this boundary must be gradational over hundreds of meters, and cannot be a depositional contact. Crystalline basement is interpreted to be late Pliocene to Quaternary sediment metamorphosed by the high heat flow and hydrothermal activity. Basement is shallowest under the volcanic and geothermal field where the heat flow and hydrothermal alteration are highest. Preliminary modeling of deeper seismic reflections indicates rift-related mafic intrusion in the lower crust and a very shallow (~18 km) Moho. Mafic intrusion is ~2 km shallower beneath the Brawley Seismic Zone, volcanoes and geothermal fields. Ongoing seismic analysis will illuminate the partitioning of strain during continental breakup.



Preliminary seismic velocity model of the crust along the axis of the Imperial Valley and Salton Sea.