

Structure of the lithosphere and asthenosphere beneath the Gulf of California

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The Gulf of California is a tectonically young and active rift system that forms the transition between the East Pacific Rise and the San Andreas transform fault. Its formation is associated with the cessation of subduction of the Farallon plate beneath the North American continent which occurred approximately 12 Myr ago at the latitudes of central Baja California.

We used Love and Rayleigh interstation surface wave dispersion measurements to determine the shear velocity structure to 200 km depth. The average SV-velocity structure shows a thin lid overlying a low-velocity layer. Two distinct regions can be identified in the shear velocity structure of the region. A high velocity anomaly beneath the south-central part of the gulf shows evidence for the presence of a slab remnant. The velocity structure beneath the northern part is more consistent with that of a slab window as suggested from the tectonic evolution of the area. The patterns of azimuthal and radial anisotropy also point to changes in mantle flow between the slabless region and the region with the slab remnant. The large variations in seismic velocities on a relatively small scale are the result of the complex tectonic evolution of the area, changing from a subduction environment to a setting of extension and transform motion in the former back-arc region which is presently the Gulf of California. The complex 3-D structure of the region makes it difficult to accurately determine the base of the thin lithosphere in this region, but in the future we hope to identify the LAB from converted phases.