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Measurements of upper mantle shear wave anisotropy from stations around the southern Gulf of California

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Measuring shear-wave splitting gives an unique opportunity to quantify mantle deformation and to relate it to present or past tectonics. In this study upper mantle azimuthal seismic anisotropy is quantified for stations around the southern Gulf of California. Measurements on the mainland are consistent with the absolute motion of the North American plate, thus implying lithospheric drag of the asthenospheric material below. Results are also consistent with the direction of Basin and Range extension during Miocene time. These observations also agree with previous work in the Basin and Range farther north. The fast E-W direction found at the southern tip of the peninsula can be explained by asthenospheric flow produced by the subducted Farallon plate, just as it has been previously proposed for stations in the northern half of the peninsula. Null measurements are obtained for three stations. Two of these might have an E-W oriented fast axis, just like the station at the southern tip of the peninsula. On the other hand, if anisotropy is absent under the three stations, then the observations could be explained by upwelling of hot material from the former Magdalena ridge through the broken Magdalena slab. One measurement in the middle of the peninsula agrees with the absolute plate motion of the Pacific plate.