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Changes in the kinematics of deformation and lithospheric structure revealed from seismic anisotropy in southeastern Tibetan plateau

***Sol, S**

EMsol@lehigh.edu

ADept of Earth and Env. Sciences, Lehigh University, 31 Williams Drive, Bethlehem, PA 18015, United States

Meltzer, A

EMameltzer@lehigh.edu

ADept of Earth and Env. Sciences, Lehigh University, 31 Williams Drive, Bethlehem, PA 18015, United States

Zurek, B

EMzurek@lehigh.edu

ADept of Earth and Env. Sciences, Lehigh University, 31 Williams Drive, Bethlehem, PA 18015, United States

We combine all the available SKS splitting observations in southeastern Tibet to provide a more detailed analysis of the anisotropic seismic structure of the lithosphere as well as a better understanding of the complex regional deformation of the mantle beneath the plateau. The data display evidence for seismic anisotropy across the study region. Fresnel zone analysis suggests that the main source of anisotropy resides in the mantle lithosphere. The presence of small-scale and regional lateral variations in seismic anisotropy is observed within individual tectonic domains such as the Lhasa terrane and across major sutures and tectonic domains. In the Lhasa terrane, we observed a sharp change in fast direction resulting from a change in mode of deformation from orogen perpendicular extension in central Tibet to orogen parallel strike-slip in the eastern syntaxis. A recent tomographic study suggested that such a change may correlate with the disappearance of the underthrusting Indian lithosphere beneath the Eastern syntaxis. In this eastern portion of the Lhasa terrane, a few stations display a lack of anisotropy over a range of backazimuths indicating either that the medium is isotropic (or weakly anisotropic) or transversely isotropic with a vertical symmetry axis. Shear-wave splitting measurements also show lateral variations in seismic anisotropy across the Tsangpo and the Bangong sutures indicating that these sutures separate major lithospheric domains. Anisotropic changes across the Tsangpo suture may characterize a change from a more rigid Indian

mantle to a more ductile Eurasian mantle while across the Bangong suture the anisotropic variations may reveal a change in ductile/viscous behavior as revealed by previous geophysical data. Such a behavior can explain the observed increase in delay times beneath the Qiangtang province. The reassessment of previously published splitting data in southeastern Tibet highlights the importance of obtaining well constrained splitting measurements with good azimuthal coverage to observe possible complex anisotropic structure.

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