Geophysical Research Abstracts
Vol. 21, EGU2019-417, 2019
EGU General Assembly 2019

Constraining the dynamics of the subducting Nazca slab from seismic anisotropy.

Shubham Agrawal (1), Caroline Eakin (2), Daniel Portner (3), and Emily Rodriguez (4)

(1) Research School of Earth Sciences, Australian National University, Canberra, Australia (shubham.agrawal@anu.edu.au), (2) Research School of Earth Sciences, Australian National University, Canberra, Australia (caroline.eakin@anu.edu.au), (3) Department of Geosciences, University of Arizona, Tucson, AZ, USA (portner@email.arizona.edu), (4) Department of Geosciences, University of Arizona, Tucson, AZ, USA (rodrigueze@email.arizona.edu)

The Andean Subduction Zone is an excellent place to understand subduction dynamics and slab deformation owing to the varying geometry of the subducting Nazca slab beneath South America. A number of previous studies have looked into the anisotropy in the region using receiver-side shear wave splitting techniques (e.g. SKS). However, only a handful have used the source-side technique (direct teleseismic S waves), which can isolate the slab and sub-slab component and thus provide a better depth constraint on the source of anisotropy. This project is the first attempt made to study the entire Andean Subduction Zone for both upper mantle and transition zone anisotropy using the source-side technique. We manually scrutinize $\sim$ 3000 seismograms for the signature of S-wave splitting and record 494 split and 604 null measurements. We find evidence for strong azimuthal dependence of seismic anisotropy which directly reflects the 3-D nature of anisotropy in the sub-slab mantle, as well as the interaction with different components of the subduction zone and the varying geometry of subducting slab. By comparisons with the latest regional tomographic models, we trace 28 individual ray-paths that travel throughout the length of the subducting Nazca slab. We observe that the fast direction of anisotropy appears to follow the slab strike, particularly where slab geometry is contorted, suggesting over-printing of the fossil fabric by new subduction-related slab deformation. Moreover, using deep earthquakes (> 410 km), we observe widespread significant anisotropy in the transition zone, which appears confined to the deeper portions of the subducting slab.