Shear Wave Anisotropy Beneath the Andes from the BANJO, SEDA and PISCO experiments

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We present the results of a shear wave splitting analysis of data collected by three temporary broadband arrays located on the central western margin of South America: BANJO, SEDA, and PISCO, which, span 1000km in both latitude (BANJO) and longitude (SEDA, PISCO). We determined the splitting parameters, fast polarization direction and delay time, for teleseismic core phases, as well as local S waves from within the Nazca slab. This variety of seismic phases enabled us to investigate the depth distribution of anisotropy in the mantle within the subduction zone region. We find that the main contribution to the splitting in the core phases is from below the slab, with fast polarization directions trench-normal near 20 degrees south (BANJO line) and predominantly trench normal north and south of this latitude. The complex anisotropic pattern below the slab is not what would be predicted by a model of entrained flow produced by the descending Nazca plate. Instead, it suggests a more complicated three dimensional flow field which may be induced by the retrograde motion of the slab, in combination with local variations in the stress field beneath the slab.

The above-slab pattern of anisotropy rapidly changes from west (NS fast directions, small delay times) to east (EW fast directions, larger delay times). The western values are consistent with EW shortening of the South American plate associated with the growth of the Andes, while those to the east are probably due to fossil anisotropy within the stable Brazilian Craton.