Shear wave splitting observation in western Tibet

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We analyzed seismic waveforms recorded by the Y2 array (IRIS) through the shear wave splitting technique to investigate the seismic anisotropy of the crust and upper mantle in western Tibet. First, the STA/LTA method and time frequency analysis were adopted to detect clear SKS waves and determine the frequency band of filtering, respectively. Second, cluster analysis method was selected to determine the optimal time window. Third, an automatic minimum transverse energy method was applied to calculate the fast polarization directions and delay times of the SKS waves. Finally, visual checking was used to ensure the reliability of the results

Assuming a single-layer anisotropic model, our observations exhibit either an ENE-WSW or nearly E-W trend of stacking fast polarization directions with average delay times from 0.4 s to 1.43 s except for those close to ~82°E which present N-S oriented fast polarization directions with delay times of about 1.0 s. The ENE-WSW or nearly E-W trending fast polarization directions observed along the Karakoram fault and the Bangong-Nujiang suture may have resulted from mantle flow in the asthenosphere. The nearly N-S trending fast orientation directions in the southeastern part of the array, just above the underlying fast shear wave anomaly beneath the Indus-Yarlung suture, can be interpreted as underthrusting of Indian mantle lithosphere. Our measurements suggest a decoupling deformation pattern between the crust and mantle lithosphere below western Tibet and a changing behavior of the Indian lithospheric mantle from slab-like underthrusting beneath the Karakoram fault to underplating at ~82°E.