Geophysical Research Abstracts
Vol. 16, EGU2014-7318, 2014
EGU General Assembly 2014

Seismic anisotropy inferred from teleseismic and local shear waves beneath the Pamir

Tuna Eken (1), Sofia-Katerina Kufner (1), Frederik Tilmann (1,2), Bernd Schurr (1), Xiaohui Yuan (1), James Mechie (1), Christian Haberland (1), Rainer Kind (1,2)

(1) Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ, Section 2.4 (Seismology), Potsdam, Germany (tuna.eken@gmail.com, +420 272 761 549), (2) Institute of Geological Sciences, Department of Earth Sciences, Freie Universität Berlin, Berlin, Germany

The Pamir region, which is located at the north of the western Himalayan syntaxis, is considered to be a unique place with its active continental subduction. Strongly arcuate southward-directed subduction of Eurasian continental lithosphere is evident in the high resolution images inferred from P receiver function (PRF) analysis and precise hypocenter distributions of Pamir deep seismicity reaching intermediate depths (up to 300 km depth). Our main motivation in the current study is to map lateral variations of seismic anisotropy parameters for a better understanding of a possible link between surface and internal deformation in the context of crust and mantle structure. To achieve this aim we perform shear wave splitting (SWS) analysis on both S-wave signals of local deep-focused earthquakes and SKS phases of teleseismic earthquakes recorded at several temporary passive seismic networks (i.e. TIPAGE, FERGANA, TIPTIMON) in the region. Our first findings inferred from SKS splitting analysis involve 460 measurements obtained for 71 high quality teleseismic events (Mw>5.8) recorded at 48 broadband stations within the TIPAGE seismic network with delay times of typically 1-1.5 s. The pattern of fast polarization directions (FPDs) measured at the stations in the central Pamir, overlying the zone of intermediate depth seismicity mainly follows the rotation of the strike direction of the subduction except that stations in the east differ by up to $\sim$10° in an anti-clockwise direction. The FPDs in this part show nearly NE-SW directions in the west and toward the east exhibit a gradual clockwise rotation with ENE-WSW orientations along most of the main profile. Similarly the stations located in the vicinity of the Main Pamir Thrust in the north indicate FPDs which tend to align with prominent southward dipping thrust faults $\sim$ 150 km to the north or northwest of the deep seismicity as well as the main strike of the Alai Valley. Our initial findings imply that the subduction process plays a major role in controlling observed anisotropy in the mantle. Although a few stations are located to the south of the deep seismicity (mantle wedge site) most are to the north. We can speculate that the splitting directions are caused by a combination of slab-parallel asthenospheric flow induced by roll-back and for the stations at the northern edge of the Pamir, lithospheric compression in N-S direction. Overall oblique distribution of FPDs with respect to the suture zone separating the Central and Northern Pamir terranes also verifies the significant role of active deformation rather than representing frozen-in anisotropy. An SWS analysis to be further conducted using local earthquakes will allow us to resolve the depth extent of seismic anisotropy when interpreted together with SKS splitting parameters by shedding light into the possible role of an asthenospheric origin of seismic anisotropy.