Geophysical Research Abstracts
Vol. 13, EGU2011-6535-9, 2011
EGU General Assembly 2011

A cross section through the eastern Pamir and Tien Shan obtained by teleseismic receiver functions

Felix Schneider (1), Xiaohui Yuan (1), Christian Sippl (1), Bernd Schurr (1), James Mechie (1), Christian Haberland (1), Mustafo Gadoev (2), Ilhomjon Oimahmadov (2), Ulan Abdybachaev (3), and Sobit Negmatullaev (4)

(1) GFZ German Research Centre for Geosciences, Potsdam, Germany (felix@gfz-potsdam.de), (2) Geological Institute, Tajik Academy of Sciences, Dushanbe, Tajikistan, (3) Central Asian Institute for Applied Geoscience (CAIAG), Bishkek, Kyrgyzstan, (4) PMP International, Dushanbe, Tajikistan

To investigate the mechanisms of mountain building processes in continental collision zones, the Pamir region is a prominent example, that shows several interesting features. In this region comparatively high convergence accommodated over a small meridional orogenic width causes extreme crustal shortening. This leads to crustal thickening, high deformation rates and maybe continental subduction. In contrast to the adjacent regions of the Indian-Eurasian collision zone such as the Himalaya and Tibet, in the Pamir-Hindu Kush mountain range intermediate depth seismicity occurs in the mantle, the origin of which is not yet well understood.

Besides, these mantle earthquakes form a narrow down-dipping band resembling a Wadati-Benioff zone with changing dipping directions, pointing northwards beneath the Hindu Kush and southwards beneath the Pamir. Different subduction scenarios with different geometries and compositions of either one or two slabs have been proposed to explain this formation, including remnant and decoupled oceanic lithosphere, one partly overturned slab of either continental or oceanic composition and two opposing slabs of continental lithosphere.

Within the framework of the multidisciplinary **Ti**en Shan **P**amir **Ge**odynamic program (TIPAGE) we deployed a temporary network of 32 broadband and 8 short period seismic stations across the Pamir in two different network configurations from 2008 to 2010. In the first year 24 stations were set up in the eastern Pamir forming a 350 km long north-south profile, with a station spacing of approximately 15 km. In the second year we rearranged the deployment in order to get an equally distributed network with a station spacing of approximately 40 km. We extended this dataset with data of a temporary network in the Ferghana Valley in Kyrgyzstan, which ran for one year from 2009 to 2010.

We have performed a receiver function (RF) analysis that images seismic discontinuities to get insights into the gross crustal and upper mantle structure. A cross section along the profile through the eastern Pamir, the Tien Shan and the Ferghana Valley is obtained by migration of the RF-amplitudes using a common conversion point stacking algorithm. This shows a prominent southward-dipping structure in the mantle south of the Main Pamir Thrust, which coincides with the Wadati-Benioff-type zone formed by the hypocenters of the intermediate-depth earthquakes, that we had localized by manual picking.

By comparing the arrival times of direct Moho conversions and those of reverberated phases (that is crustal multiples), we derive the average crustal Vp/Vs ratio and its lateral variation. We find low values of around 1.68 for crustal Vp/Vs ratios beneath the Pamir, which corresponds to a Poisson's ratio of 0.225 indicating an overall felsic crust, whereas towards the Tien Shan the Vp/Vs ratio increases, reaching values around 1.77 (Poisson's ratio of 0.265). Vp/Vs then slightly decreases towards the Ferghana Valley to 1.73 corresponding to an intermediate Poisson's ratio of 0.25. Crustal thickness varies along the profile from 75 km beneath the southern Pamir to 64 km beneath the Tien Shan and then decreases abruptly in a distinct step to 45 km towards the Ferghana Valley.