Geophysical Research Abstracts
Vol. 18, EGU2016-3427, 2016
EGU General Assembly 2016

New Seismic Array Observation in the Northwestern Iranian Plateau

Ling Chen (1,2), Mingming Jiang (1,2), Morteza Talebian (3), Abdolreza Ghods (4), Sun-Lin Chung (5), Yinshuang Ai (1,2), Farhad Sobouti (4), Yumei He (1), Khalil Motaghi (4), Tianyu Zheng (1), Mohammad Faridi (6), Qi-Fu Chen (1), Yan Lyu (1), Wenjiao Xiao (1,2), Morteza Khalatbari Jafari (3), and Rixiang Zhu (1)

(1) State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences (IGGCAS), Beijing, China, (2) CAS Center for Excellence in Tibetan Plateau Earth Sciences, Beijing, China, (3) Research Institute for Earth Sciences, Geological Survey of Iran (RIESGSI), Tehran, Iran, (4) Department of Earth Sciences, Institute for Advanced Studies in Basic Sciences (IASBS), Zanjan, Iran, (5) Institute of Earth Sciences, Academia Sinica & Department of Geosciences, National Taiwan University, Taipei, Taiwan, (6) Geological Survey of Iran, Northwestern Regional Office, Tabriz, Iran

The Iranian Plateau, being formed as a consequence of the on-going Arabia-Eurasia collision, is a natural laboratory for understanding mountain/plateau building processes and deep dynamics related to the early phases of continent-continent collision. A key issue in the study of the Iranian Plateau is to acquire detailed information about the structure and deformation of the crust and mantle. For this purpose, we (IGGCAS, RIESGSI, IASBS) deployed a new temporary broadband seismic array in NW Iran, under a multidisciplinary collaborative project named “China-Iran Geological and Geophysical Survey in the Iranian Plateau (CIGSIP)”. The new array consists of three linear sub-arrays running northeastward from the south of the Zagros Fold and Thrust Belt to the coast area of the southern Caspian Sea, forming an observational corridor of ∼550-km long and ∼150-km wide. The main sub-array consists of 46 stations with station spacing of 10-15 km. Eight and nine additional stations were located ∼75 km to the west and east, respectively, of the main sub-array to provide 3D constraints on the deep structure. All the 63 stations operated for about one year from October 2013 to October 2014.

We investigate the crustal and upper mantle structure beneath this new seismic array by combining P- and S-receiver function (RF) images with ambient noise tomography and gravity modeling results. Our images reveal substantial structural variations in the crust of different tectonic units that are bounded by major strike-slip faults. The Main Zagros Reverse Fault (MZRF), generally considered as the suture between the Arabian and Eurasian plates, was imaged to dip to NE, separating an overall slow crust but with a faster and denser lowermost part in the SW Arabian side from a relatively fast crust, especially a fast middle-lower crust in the NE Iranian side. Structural differences are also observed between the Alborz Mountains and the southern Caspian Sea where an apparent Moho step (∼18 km) was required by both the seismic and gravity data. The crust beneath the Zagros belt displays a two-layer azimuthal anisotropy and hence deformation pattern, with orogen-parallel anisotropic fabrics in the upper-middle crust and orogen-perpendicular (convergence-parallel) ones in the lower crust to uppermost mantle. This feature is analogous to that observed in some other orogens, such as Taiwan and the orogenic core of Central Alps, indicating that the upper and lower parts of the crust in these collisional orogens are dominated by different deformation regimes and processes. In addition, our P- and S-RF images combined with previous P-RF images sampling different portions of the Zagros show that the thickest part of the crust migrates from beneath the MZRF in the NW Zagros to the active margin in the central to SE Zagros. This probably suggests a change in the patterns of crustal deformation and crust-mantle interaction also along the strike of the orogen. At shallow upper mantle depths, our images show sub-Moho signals dipping to both NE and SW, which might reflect complicated mantle structure and processes beneath NW Iran. This deserves further detailed investigations.