Geophysical Research Abstracts
Vol. 13, EGU2011-2347, 2011
EGU General Assembly 2011

High-frequency P and S seismic anomalies in the upper mantle beneath the Alpine-Himalayan orogenic belt reveal mechanisms of the lithosphere recycling due to collision

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A model of seismic P and S anomalies in the upper mantle beneath the Alpine-Himalayan orogenic belt was constructed based on the tomographic inversion of travel-time data from the revised ISC catalogue for the years 1964-2004. The inversions were performed independently in overlapping circular windows that cover the entire study area. The free inversion parameters in each window were defined individually depending on the available data based on synthetic modeling. Such adaptive tuning of parameters enables more optimal usage of the input data in areas with inhomogeneous ray coverage compared to global inversions. This approach resolves high frequency patterns but is less sensitive to large anomalies with sizes comparable to the window diameter. Thus, this approach is somewhat similar to high-frequency filtration of the velocity distribution. The 3D models of P and S anomalies presented in horizontal and vertical sections show complex interactions of the lithospheric segments beneath the Alpine-Himalayan orogenic belts. In the talk I will focus on a few selected features: (1) Beneath the Calabria region, the model reveals an elongated "sausage-shaped" high velocity anomaly which deepens down to 400 km depth and then is laying horizontally. (2) In Iran we observe two types of the lithosphere collisions: continent-continent in Zagros and ocean-continent in Makran. For the both cases, we observe northward sinking of the lithosphere in the upper mantle. (3) Beneath Pamir-Hindukush we observe high-velocity body which is isometrical in map view at depths of more than 400 km which is interpreted as a drop of delaminated mantle lithosphere. (4) Beneath Tien-Shan we observe southward deepening of the continental Tarim lithosphere. (5) Beneath Burma region we observe clear images of high-velocity slab coinciding with the deep seismicity, while the mechanism of oblique subduction remains enigmatic. The digital version of the 3D P and S models is available online at www.ivan-art.com/science/REGIONAL.