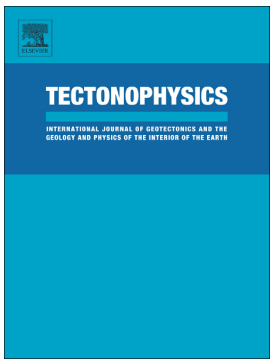

Mantle transition zone beneath the central Tien Shan: Lithospheric delamination and mantle plumes

Grigoriy Kosarev, Sergey Oreshin, Lev Vinnik, Larissa Makeyeva

PII: S0040-1951(17)30513-9
DOI: https://doi.org/10.1016/j.tecto.2017.12.010
Reference: TECTO 127717

To appear in: *Tectonophysics*

Received date: 11 July 2017
Revised date: 15 September 2017
Accepted date: 15 December 2017

Please cite this article as: Grigoriy Kosarev, Sergey Oreshin, Lev Vinnik, Larissa Makeyeva , Mantle transition zone beneath the central Tien Shan: Lithospheric delamination and mantle plumes. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tecto(2017), https://doi.org/10.1016/j.tecto.2017.12.010

Mantle transition zone beneath the central Tien Shan: lithospheric delamination and mantle plumes

Grigoriy Kosarev, Sergey Oreshin, Lev Vinnik and Larissa Makeyeva

Institute of physics of the Earth, Moscow, Russia

Abstract

We investigate structure of the mantle transition zone (MTZ) under the central Tien Shan in central Asia by using recordings of seismograph stations in Kyrgyzstan, Kazakhstan and adjacent northern China. We apply P-wave receiver functions techniques and evaluate the differential time between the arrivals of seismic phases that are formed by P to SV mode conversion at the 410-km and 660-km seismic boundaries. The differential time is sensitive to the thickness of the MTZ and insensitive to volumetric velocity anomalies above the 410-km boundary. Under part of the southern central Tien Shan with the lowest S wave velocity in the uppermost mantle and the largest thickness of the crust, the thickness of the MTZ increases by 15-20 km relative to the ambient mantle and the reference model IASP91. The increased thickness is a likely effect of low (about -150 K) temperature. This anomaly is indicative of delamination and sinking of the mantle lithosphere. The low temperature in the MTZ might also be a relic of subduction of the oceanic lithosphere in the Paleozoic, but this scenario requires strong coupling and coherence between structures in the MTZ and in the lithosphere during plate motions in the last 300 Myr. Our data reveal a reduction of thickness of the MTZ of 10 - 15 km under the Fergana basin, in the neighborhood of the region of small-scale basaltic volcanism at the time near the Cretaceous-Paleogene boundary. The reduced thickness of the MTZ is the effect of a depressed 410-km discontinuity, similar to that found in many hotspots. This depression suggests a positive temperature anomaly of about 100- 150 K, consistent with the presence of a thermal mantle plume. A similar depression on the 410-km discontinuity is found underneath the Tarim basin.