Data

Several regional seismic profiles and receiver functions are used to identify the crustal LVZ (Figures 2 and 3). The spatial relationships of structures at different depths are made clear by the different receiver functions and surface wave dispersions obtained in the previous ambient noise tomography (Li et al., 2018a). Then, a joint inversion was performed to connect the horizontal velocity models obtained from receiver functions and surface wave dispersions of the Pamir plateau, and thus, we use the harmonic analysis of receiver functions to minimize the potential influence of the dipping interface (Schneider et al., 2013). The joint inversion was performed with the Gaussian coefficients of 1.0 and 2.0. (d–e) The Rayleigh wave phase and group velocity recorded at station MAD8. (a–c) Three harmonic components $A_i$ ($i=0,1,2$) of the rayleigh wave group velocity $v_{g}$. (f) Receiver function dataset of the station MAD8. (g) Horizontally averaged average receiver functions of 20 stations based on a 24-stations profile with a 15-km station spacing in the Pamir plateau, and FERGHANA operated in the Tien Shan and Ferghana basin from 2009 to 2010. In this study, we use a 24-stations profile, with a 15-km station spacing in the Pamir plateau, and in the Ferghana basin, to perform joint inversion with Rayleigh wave group velocity and surface wave dispersion. The joint inversion is based on a 24-stations profile with a 15-km station spacing in the Pamir plateau, and FERGHANA operated in the Tien Shan and Ferghana basin from 2009 to 2010. In this study, we use a 24-stations profile, with a 15-km station spacing in the Pamir plateau, and in the Ferghana basin, to perform joint inversion with Rayleigh wave group velocity and surface wave dispersion.

Results and Discussions

The 2.0 horizontal velocity anomaly model along the profile and continental subduction zone beneath the Pamir plateau (Figure 4). The horizontal velocity anomalies in the uppermost mantle beneath the Pamir plateau are significant and extend upward to the Moho. Therefore, we propose a continental subduction model of the Pamir plateau, which is similar to the Tibet model (Li et al., 2018a), but with a slightly shallower subduction depth. In the Tibet model, the thickness of the continental crust is reduced by dehydration processes in the upper mantle, and the subduction depth is significantly shallower than that of the Pamir plateau. The subduction depth in the Tibet model is shallower than that of the Pamir plateau, and the subduction depth in the Tibet model is shallower than that of the Pamir plateau. The subduction depth in the Tibet model is shallower than that of the Pamir plateau.

References


Wei Li1,2,3 Yun Chen1,2 Ping Tan1,2,3,4

We propose a conceptual model of the continental subduction zone beneath the Pamir plateau. And the fluid generated in this process will significantly enrich in the middle-lower crust to form two divided low-velocity zones (LVZ1 and LVZ3), respectively. The fluid enrichment and possibly hydrous melting will significantly reduce the middle-lower crustal strength and restrict the shallow tectonic deformation and exhuming process, and only provide constraints on a small portion of the continental subducting zone in past studies. The Pamir plateau is related to the passive subduction of the Asian continental slab, and therefore, it's an idea place to study the dynamic behavior of the subducting slab and its influence on the tectonic and geodynamic processes. In this study, the fluid enrichment and possibly hydrous melting will significantly reduce the middle-lower crustal strength and restrict the shallow tectonic deformation and exhuming process, and only provide constraints on a small portion of the continental subducting zone in past studies.