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Sharp images of the subducted lithosphere in Tibet

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SV- and SH-wave velocity images of the crust and upper mantle beneath the Tibetan Plateau and surrounding areas are obtained by the inversion of Rayleigh- and Love-wave group velocities. The surface wave data were initially collected from events of magnitude Ms $>$ 5.0 and shallow or moderate focal depth occurred between 1980 and 2002: 713 of them generated Rayleigh waves and 660 Love waves, which were recorded by 13 broadband digital stations in Eurasia and India. Up to 1,525 source-station Rayleigh waveforms and 1,464 Love wave trains were earlier analysed to obtain Love- and Rayleigh-wave group velocity maps at periods 10.4-95.3 s. Assuming the model region covered by a mesh of 2^ox2^o-sized grid-cells, we have used the Marquardt-Levenberg damped least-squares approach and the Lanczos singular-value decomposition to carry out tomographic inversion. The results provide: a) SV- and SH-wave differential velocity maps at various depths; b) sharp images of the subducted lithosphere by velocity cross sections along prefixed profiles; c) maps of sediment and crustal thicknesses; d) regionalized velocity-depth models and isotropic S-wave velocities; e) radial anisotropy maps estimated from the Love-Rayleigh discrepancy at several depths; f) strength and spatial extent of percentage anisotropy. The crustal thickness is 65-74 km and the Moho topography keeps a clear correlation with the elevations of the Tibetan Plateau. The results demonstrate an unusual thick crust-mantle transition: a top mantle with almost constant velocity gradient, continued by a lithospheric root whose depth can be substantiated at $\sim$140 km (Qiangtan Block) and exceptionally at $\sim$180 km in some places (Lhasa Block), with laterally varying fast velocity very close to that of some shields that reaches $\sim$4.8 km/s under northern Lhasa Block and Qiangtang Block. The most prominent anisotropic regions occur in Lhasa and Qiangtang Blocks in the western and central parts of the Plateau, with transverse radial anisotropy ranging between 4% and 6%, which becomes up to 8% in

some places. Finally, we find seismological evidence for crustal flow beneath Tibet.