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Full-waveform tomography illuminates 3-D anatomy of the Tibetan Plateau

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The collision of the Indian and Eurasian plates has resulted in high-altitude Tibetan Plateau with profound seismic activity. Within this natural geological laboratory, a symphony of geodynamic phenomena unfolds, including plate underthrusting, tearing, mantle upwelling and rift formation. In this study, we apply the seismic box tomography to the southern Tibetan Plateau, aiming to quantify the density as well as bulk and shear moduli, which provides us with crucial physical constraints on the compositional and thermal structures of a highly deformed lithosphere in southern Tibetan Plateau.

In order to obtain the three-dimensional lithospheric structure, we perform full-waveform inversion of teleseismic (30° – 90°) surface- and body-wave waveforms recorded by the Hi-CLIMB network, a densely distributed (5–10 km station spacing) N-S oriented linear seismic array deployed during 2002 and 2005. In our iterative hierarchical inversion workflow, we calculate the sensitivity kernels based on the adjoint method and the model is updated by the L-BFGS algorithm. Data covariance matrices are introduced to control the data quality and objective weighting functions for different seismic events. We will present our preliminary results of the on-going study with comparison to existing models.

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