LITHOSPHERIC STRUCTURE BENEATH THE TIBETAN PLATEAU USING SIMULTANEOUS INVERSION OF SURFACE WAVE DISPERSION AND RECEIVER FUNCTIONS

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A Digest Presented to the Faculty of the Graduate
School of Saint Louis University in Partial
Fulfillment of the Requirements for the
Degree of Doctor of Philosophy

2001

Digest

The lithospheric structure of the Tibetan Plateau is estimated beneath the 11 broadband seismological stations that were deployed during the 1991/1992 Tibetan Plateau passive-source experiment. The simultaneous inversion of receiver functions and dispersion curves is used, and a novel approach to constrain the inversion to first match specific arrivals is developed and implemented. This progressive inversion guides the receiver function modeling procedure to geologically, rather than mathematically simple Earth structures.

Receiver functions in Tibet exhibit a complex but consistent pattern, providing evidence that azimuthal anisotropy may be important under the Plateau, that lateral variations in seismic properties may be as important as vertical variations, or that both azimuthal anisotropy and horizontal inhomogeneity may be a characteristic of the Tibetan Plateau at depth. Surface-wave measurements are sensitive to such complexity and cannot be described by a unique isotropic seismic structure under any of the stations. In fact, some stations, such as XIGA or LHSA, exhibit S-wave velocity differences as large as 13% in the crustal layers, when Rayleigh- and Love-wave dispersion curves are inverted independently along with the corresponding receiver function.

The Moho depth beneath a N-S profile, defined by nine out of the 11 stations, varies from 60 km at the northern Plateau to 76 km under station LHSA located in southern Tibet. Faster lower crustal rocks are observed toward the edges of the Plateau and the existence of large low velocity zones within the Tibetan crust was not required by the inversions although the data permit such an existence under some of the stations.

The joint inversion technique provided a confident estimate of the upper mantle velocity reduction under central Tibet, which has been observed as a zone of inefficient Sn-wave propagation and slow Pn-wave velocity.