北京大学理论与应用地球物理研究所

学士学位论文

# 根据 SKS 波分裂看上地幔各向异性

# The Anisotropy of the Upper Mantle from the SKS Wave Splitting

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# Abstract

Observations of shear wave splitting in Dabie Mountain South China allow us to expect the upper mantle beneath the mountainous region is anisotropic. Seismic anisotropy has close relationship to the strain-induced preferred orientation of highly anisotropic crystals (such as olivine) and thus provides methods of studying motions in the mantle associated with plate tectonics, as well as the past and present lithospheric deformation of the plates. In our work, thirty-four temporary stations arranged approximately along the longitude transverse Dabie Mountain range and provide sufficient teleseismic phases (such as SKS) characterizing the earth structures of the orogenic belts.

Most recent studies on upper mantle anisotropy show that the anisotropic system is roughly hexagonally symmetric with horizontal fast axis. Furthermore, in order to simplify problems and investigate the potential development of the research approaches, we take one-layer with horizontal axis as our primary model.

After a succinct review of researches on anisotropy dated from 1950s, we represent two existent methods studying shear wave splitting in detail with comparison, before we apply the relatively new technique to deal with our practical data from one station. The results indicate that the new technique can recover the orientation of the fast axis and the delay time between two quasi shear waves, as do the widely accepted traditional methods. Therefore, we provide foundation to model more complicated anisotropy in this new approach.

The FORTRAN program for numerical implementation is appended in this dissertation.

Key words: SKS wave; shear wave splitting; seismic anisotropy; upper mantle; grid-search; non-linear inversion