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# Imaging the Earth's anisotropic structure with Bayesian Inversion of fundamental and higher mode surface-wave dispersion data

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We develop a Markov Chain Monte Carlo inversion of fundamental and higher mode phase-velocity curves for radially and azimuthally anisotropic structure of the crust and upper mantle.

In the inversions of Rayleigh- and Love-wave dispersion curves for radially anisotropic structure, we obtain probabilistic 1D radially anisotropic shear-velocity profiles of the isotropic average Vs and anisotropy (or Vsv and Vsh) as functions of depth. In the inversions for azimuthal anisotropy, Rayleigh-wave dispersion curves at different azimuths are inverted for the vertically polarized shear-velocity structure (Vsv) and the 2-phi component of azimuthal anisotropy.

The strength and originality of the method is in its fully non-linear approach. Each model realization is computed using exact forward calculations. The uncertainty of the models is a part of the output. In the inversions for azimuthal anisotropy, in particular, the computation of the forward problem is performed separately at different azimuths, with no linear approximations on the relation of the Earth's elastic parameters to surface wave phase velocities. The computations are performed in parallel in order reduce the computing time.

We compare inversions of the fundamental mode phase-velocity curves alone with inversions that also include overtones. The addition of higher modes enhances the resolving power of the anisotropic structure of the deep upper mantle.

We apply the inversion method to phase-velocity curves in a few regions, including the Hangai dome region in Mongolia. Our models provide constraints on the Moho depth, the Lithosphere-Asthenosphere Boundary, and the alignment of the anisotropic fabric and the direction of current and past flow, from the crust down to the deep asthenosphere.