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Layered mantle flow beneath the Japan Sea and NE China from inversion of surface wave dispersion using rj-MCMC method

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The surface wave dispersion data with azimuthal anisotropy can be used to invert for the wavespeed azimuthal anisotropy, which provides essential dynamic information about depth-varying deformation of the Earth's interior. The traditional method to solve this inversion problem is a two-step process, i.e. inverting the isotropic wavespeed first, based on which the anisotropic part is solved successively. In this study, we try to simultaneously invert both the isotropic and anisotropic shear wave velocity using the rj-MCMC (reversible jump Markov Monte Carlo) algorithm, which allows sampling the model space in a transdimensional way.

Our research is conducted in the Northeast Asia, including the East and Northeast China (EC and NEC), Korean Peninsula and the sea of Japan (see Fig. 1). The previous anisotropic and tomographic studies were mainly conducted on separated continents, lacking a panoramic view of geodynamics across the entire region. In this study, we construct a crustal and uppermantle model of the whole region based on the Rayleigh wave dispersion data collected by Fan et al. (2020, GRL), and acquire high-resolution patterns reflecting valuable geodynamic characteristics.

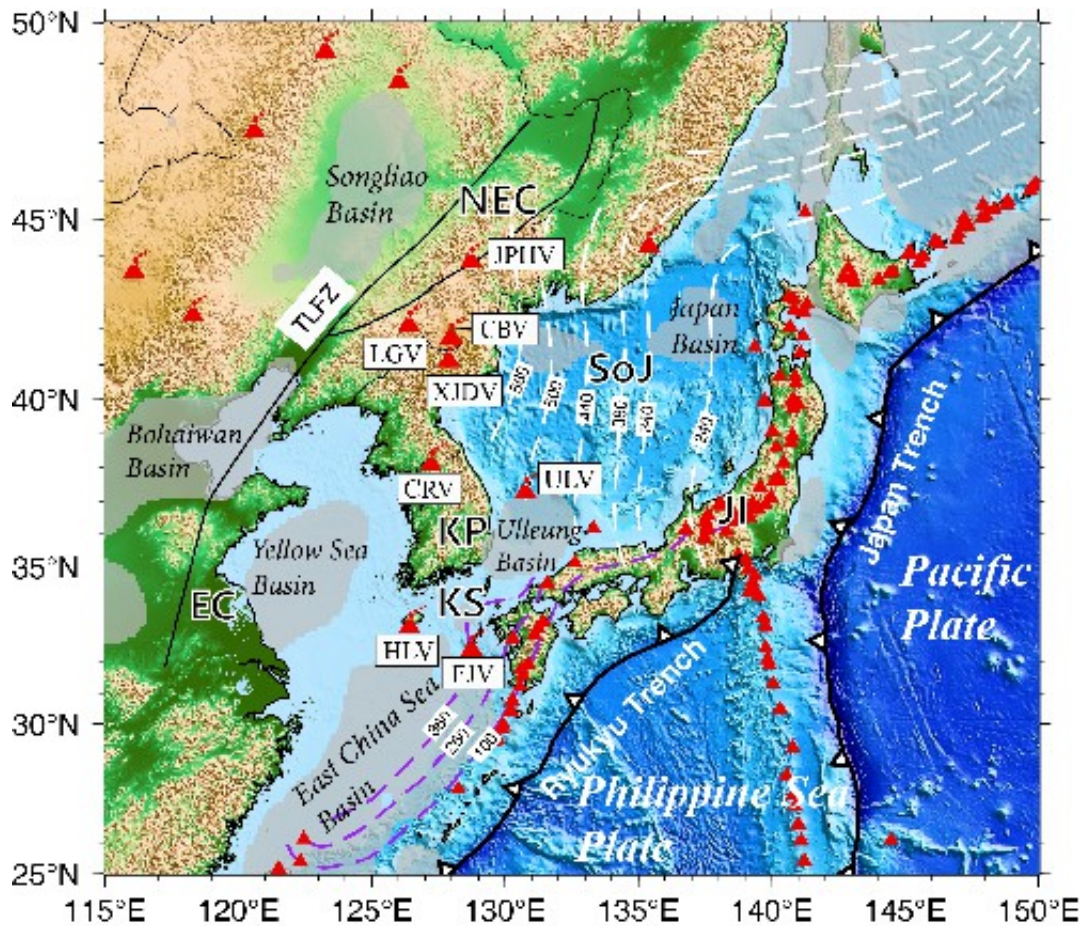


Figure 1. Map of the NE Asia showing the main tectonic features. Major blocks: NEC = north-east China; EC = East China; KP = Korean Peninsula; KS = Korea Strait; SoJ = Sea of Japan; JI = Japanese Island. The gray area in the background delineates the major sedimentary basins with thickness no less than 1.5 km. Red volcano symbols denote the Late Cenozoic intraplate volcanoes, including: CBV = Changbaishan volcano; JPHV = Jingpohu volcano; LGV = Longgang volcano; XJDV = Xianjingdao volcano; CRV = ChugaRyong volcano; ULV = Ulleung volcano; HLV = Halla volcano; FJV = Fukuejima volcano. Small red triangles show the locations of island arc volcanoes. The Japan Trench where the western Pacific Plate subducts, and the Ryukyu Trench where the Philippine Sea Plate subducts are outlined by black lines with white sawtooth. Interface depths of the subducting Pacific slab and Philippine Sea slab are marked by white and purple dashed lines, respectively, with depth annotation. The Tanlu fault zone (TLFZ) is represented by thin black lines.