Crustal anisotropy beneath Northeastern margin of Tibet Plateau inferred from receiver functions

Collision between Indian and Eurasian plates results in intense deformation and crustal shortening in the Tibetan Plateau. How the Tibet Plateau deforms remains a topic of debate. NE margin of the Tibetan Plateau experienced complex deformation between Qilian orogen and its adjacent blocks. It is particularly interesting to clarify the deformation mode of the crust and the lithosphere beneath this area.

We use a new set of teleseismic records obtained by 54 broad-band digital seismic stations of the China Array Phase II on the NE margin of the Tibetan Plateau, arranged along a NNE-SSW oriented line. To avoid influence of different back-azimuth and probability of dipping Moho interface, we selected the events which with similar locations. Seismic data from different stations was averaged according to the locations of stations to make the result looks smoother. Average receiver functions are estimated in the frequency domain from multi-taper spectrum correlation. Moho depth varies from 7s to 5s from eastern Tibetan Plateau to Alxa Block, corresponding to crustal thickness of ~60km and 40km, respectively. A clear negative polarity signal present in the first ~2s of receiver functions beneath NE Tibet and Alax Block suggests a presence of the low velocity layer in the middle crust. Positive polarity signal can be recognized at ~5s of receiver functions beneath Qilian Block and West Qinling Block, suggesting an additional impedance boundary in the lower crust.

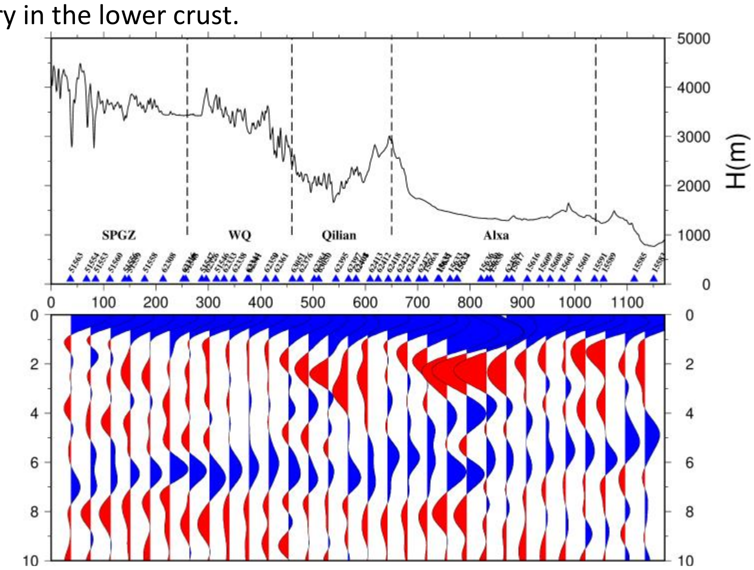

Figure A

In this study, our goal is to infer anisotropic parameters such as trends of fast/slow symmetry axes, and locations of anisotropic layers at depth. We first calculate harmonic expansion stacks of receiver functions within different orders (k=0,1,2). The depths of top and bottom of the anisotropic layer is estimated by calculating a peak in the vector-length of the 2-lobed and 4-lobed harmonic components. 2-lobed harmonic components represent anisotropic layer with tilted symmetric axis and 4-lobed components suggest anisotropic layer with horizontal symmetric axis, respectively. For a layer with a tilted symmetry axis, we can constrain the trend orientation of the axis using 2-lobed harmonic components and distinguish between fast or slow axis with the help of the 4-lobed harmonic components. For a layer with a horizontal symmetric axis, we can figure out fast or slow symmetric axis according to 4-lobed harmonic components. Figure A shows examples of results we obtain for individual locations along the profile. Detailed and updated results will be present in the workshop meeting.