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Resolving the Crustal Seismic Anisotropy of Taiwan using Ambient Seismic Noises

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We present results of the crustal anisotropy of Taiwan derived from ambient noise tomography. We collected an unprecedented data amount for the noise tomography in Taiwan using continuous data from two island-wide broad-band networks and the temporary arrays deployed by the TAIGER (TAiwan Integrated GEodynamics Research) experiment.

In our earlier works, we have derived 2D maps of surface wave velocity in the period range from 4 to 20 seconds with the same data set. Besides robust shallow seismic structure, our model also provides vital constraint on resolving the long-lasting controversy about most prominent Bouguer gravity anomaly in central Taiwan, implying that it is likely caused by a deeper mountain root.

For the tomography of seismic azimuthal anisotropy, we have examined the effects of irregular azimuthal path distribution. We also evaluate the influences of topography on surface wave dispersion using SEM (spectral element method) and removed the contribution from surface topography from data prior to the inversion.

We implemented a wavelet-based multi-scale inversion technique to simultaneously invert for isotropic velocity and azimuthal anisotropy for the Rayleigh waves in the period range from 4 to 20 seconds. The resulting models shows that the pattern of azimuthal anisotropy gradually varies with increasing periods, from convergence-perpendicular striking NNE-SSW trend at shorter periods to near convergence-parallel E-W trend at longer periods, suggesting that there is a strong depth dependence of seismic anisotropy in Taiwan. In the shallow crust, the anisotropy pattern is dominated by the surface structure; while in the deeper portion, it is more coherent to the plate-motion-induced stress direction.

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