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Resolving the crustal seismic anisotropy of Taiwan using ambient seismic noises

Tzu-Ying Huang (1), Yuancheng Gung (1), Ying-Nien Chen (2), Ling-Yun Chiao (2), and Shiann-Jong Lee (3)

(1) Department of Geosciences, National Taiwan University, Taipei, Taiwan, (2) Institute of Oceanography, National Taiwan University, Taipei, Taiwan, (3) Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan

We construct the 3D isotropic/anisotropic crustal models of Taiwan using ambient seismic noises. We have collected an unprecedented data amount for the noise tomography in Taiwan using continuous data from island-wide broad-band and short-period networks and the temporary arrays deployed by the TAIGER (TAiwan Integrated GEodynamics Research) project. In our earlier works, we have derived 2D maps of azimuthal anisotropy in the period range from 4 to 20 seconds using this data set. In particular, the effects of irregular azimuthal path distribution are carefully examined and the influences of topography on surface wave dispersion are evaluated using SEM (spectral element method) and removed from data prior to the inversion. In these maps, 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. To further investigate the depth distribution of the observed anisotropy, we developed 3D models of anisotropy. Instead of the commonly used two-step inversion in the construction of 3D models using surface waves, we derive the 3D model in one step using a wavelet-based multi-scale inversion technique, by which both the horizontal spatial localization and non-stationary model smoothing are assured and there is no need to invoke additional smoothness regularization. We present the results, compare them with other early studies, and discuss the tectonic implications.