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Characteristics of Crustal Response of Taiwan from Autocorrelation Functions

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Autocorrelation of the ambient noise field and the seismic wave coda theoretically provide the near zero-offset reflectivity responses of the structure beneath the recording stations. The strong reflectivity in the stacked result implies the existence of the strong impedance of the subsurface layers. In this study, we investigate the crustal reflection characteristics beneath Taiwan by autocorrelating the ambient noise data and the regional/teleseismic coda waves. The broadband data are from the permanent broadband network BATS and the temporary deployments Formosa Array which aims to provide dense spatial sampling at the northern part of Taiwan. The autocorrelations are calculated by the phase autocorrelation and the amplitude autocorrelation with an additional spectral whitening at the pre-processing stage. Then the resulting stacks are computed using the time-frequency phase weighted stacking method. Similar results at the same location but from different recording periods and instrument types indicate the consistency and robustness of the subsurface signal. For the results of permanent stations which have years of data, seasonal variations of the amplitude of the signal can be observed. The priori information from receiver functions and tomographically inferred theoretical PmP two way times can help us to identify the signal from Moho, and most of the results show good correspondence with it, although some of the stations appear no clear Moho signal that can be attributed to gradual structural transition. Besides of explaining the single station result, for the dense array dataset, we can further trace the variation of the reflectivity responses along the profile we interest, which provides more constraint for illustrating the subsurface images.