Surface wave dispersion measurements from interstation cross correlation of ambient seismic noise recorded by the short-period CWB Seismic Network

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Abstract

Recent studies have demonstrated that the interstation cross correlation of ambient seismic noise can be used to extract the Earth structure information between two stations (e.g., Shapiro and Campillo, 2004). In this study, we derive surface wave dispersion curves from continuous seismic noise records on the 71 three-component, short-period seismographs of the Central Weather Bureau Seismic Network (CWBSN). The original seismograms are first resampled at the time interval of 0.2 s and deconvolved by the instrument response with a highpass filter cutoff frequency of 20 s to produce a series of length-of-day time series. To lower the influence of earthquake-related signals and the uncertainty in the instrument sensitivity, two normalization procedures are then employed to process the obtained displacement records before cross correlation and stacking of seismic noise. The first method uses "one-bit" normalization in which the instrument-removed seismograms of positive and negative signs are replaced by 1 and -1, respectively (e.g., Shapiro et al., 2005). The other method is called time-domain normalization which involves the running average of absolute amplitudes of waveforms in a fixed-length sliding time window and the down-weight of the amplitude of waveforms at the center of the window (Lin et al., 2006; Yang et al., 2006; Bensen et al., 2007; Moschetti et al., 2007). Finally, cross correlation of the daily "normalized" waveforms between pairs of stations and stacking of the resulting cross-correlograms over longer periods of time yield the estimated Green functions between the stations. Group velocity dispersion as a function of period (mainly at 1-10 s) measured from the emergent coherent surface wave trains will be used for tomographic imaging of shear velocity structure in the crust across Taiwan.

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