Geophysical Research Abstracts
Vol. 15, EGU2013-12015, 2013
EGU General Assembly 2013

Improvement of Signal-to-noise ratios of surface wave signal obtained through ambient noise correlations

Cornelis Weemstra (1,2), Lapo Boschi (3), and Julie Verbeke (4)

(1) Spectraseis, Denver, Colorado, U.S.A., (2) Institute of Geophysics, ETH, Sonneggstrasse 5, 8092 Z\"urich, Switzerland, (3) Institut des Sciences de la Terre de Paris, UPMC, Universit\'e Paris 6, CNRS, FR-75005 Paris, France, (4) Lamont-Doherty Earth Observatory, Columbia University, New York, NY, USA

Spectral whitening has become a widely used preprocessing method in the field of ambient seismic noise. Using two years of noise recordings from an array of European stations, we show that an improvement in the signal-to-noise ratio (SNR) of station-station cross-correlations can be obtained using a different form of spectral whitening. This alternative combines spectral whitening with the processing associated with the spatial autocorrelation (SPAC) method (Aki, 1957). The difference between the two techniques is the order of ensemble averaging and normalization. Spectral whitening involves normalization of the cross-spectrum by the individual power for each time-window and subsequent ensemble averaging. SPAC-processing in turn involves ensemble averaging prior to normalization: the ensemble-averaged cross-spectrum is normalized with respect the ensemble averaged power. The SPAC-method relies on the stationarity of the wavefield. In general, the wavefield is only stationary over relatively short time intervals (Okada, 2003). We therefore explain the increased SNR's with this characteristic of the wavefield.

[Aki, 1957] Aki, K., 1957, Space and time spectra of stationary stochastic waves, with special reference to microtremors.: Bulletin of the Earthquake Research Institute, University of Tokyo, 35, 415–457.

[Okada, 2003] Okada, H., 2003, The microtremor survey method: Society of Exploration Geophysicists. Geophysical Monograph, No. 12.