On Comparison of CCA with SPAC Using Simulated Microtremor Records and the CCA Using Only Three Geophones Simultaneously

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CCA method for microtremor array proposed by Cho *et al.* (2006) and Tada *et al.*(2007) has shown a big advantage for the estimation of underground velocity structure up to the depth related with seismic risk of structures by using a very small array, of which radius can be less than few meters, therefore seems to be effective for exploration in densely populated areas and for estimation of ground condition at every housing lot in cities.

I have checked the performance of CCA using 6 components array of 6m radius in comparison with 15 components SPAC using maximum radius about 100m, the simulated microtremor records (Dataset-N101 (Cornou et al.(2006)) then free from the disturbance by the characteristics of measuring system especially geophones. CCA's dispersion curve has shown a surprisingly good coincidence with that of SPAC. How ever, both of them have phase velocity between that of the fundamental mode and that of the 1st higher mode.

Considering on the poor condition of equipment in the developing countries where they can have only one digital recorder of three components just by luck, I checked the applicability of CCA to this difficult condition. 2 sets of 3 components records selected at every 120 degrees have shown the lower side limit frequency about 1.4 times higher than that of 6 components CCA and a systematic lags at higher frequencies but opposite sense for different set. In order to combine them, the ratio of the sum of G_{z0z0} of both to the sum of G_{z1z1} is used in place of CCA coefficient. The calculated dispersion curve showed a good coincidence with 6 components CCA and also with SPAC but the lower side limit frequency is remained un-improved.

As shown above, the performance of CCA is confirmed. A possibility to apply CCA using a measuring system that can obtain only 3 components simultaneously is shown also.

Reference:

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