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STABILITY OVER TIME OF AMBIENT VIBRATION ARRAY MEASUREMENTS

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Ambient vibration array measurements have become increasingly popular over the last two decades for deriving shear-wave velocities of the underground structure s. One of the issues for the applicability of such type of measurements is the stability over time of dispersion estimates. In this study, we focus on the hourly stability of dispersion estimates in relation with the noise sources spatial distribution and the array layout. We use ambient noise array data from five months of continuous recordings acquired in two different geological contexts: the city of Grenoble (France) which is located in a deep stiff sediment basin having a resonance frequency of about 0.3 Hz and close by the city of Argostoli in Cephalonia (Greece) in a shallow sedimentary valley having a resonance frequency of about 1.8 Hz. The dense array in Grenoble consists in 13 stations with minimum inter-station distance and aperture of about 200 m and 1 km , respectively, which allows extracting dispersion curve from 0.3 to about 5 Hz (Cornou et al., 2003). The array in Argostoli is composed of 21 stations with minimum inter-station distance and aperture of 5 m and 160 m, respectively, allowing phase velocities to be estimated from 2 to 20 Hz (Imtiaz et al., 2014). At both sites we extracted hourly dispersion curves of Rayleigh waves by using frequency wavenumber and spatial auto-correlation techniques. We show the stability over time of dispersion estimates, whatever the noise sources spatial distribution and energy. It confirms the findings of Endrun et al. (2010) who observed that dispersion estimates derived from array measurements performed at the same sites with several years between measurements however were very similar. The stability in time is explained by the ability of the two array layouts to correctly sample a large range of azimuths. When using sub-arrays having a restricted azimuthal range , dispersion estimates are less repetitive over time as a consequence of relation between sources spatial distribution and array capability.

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