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DERIVATION OF SURFACE WAVE DISPERSION CURVES FROM ARRAY ANALYSIS OF AMBIENT VIBRATIONS

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The use of ambient vibration measurements for site effect assessment promises to be a low-cost alternative compared to borehole drilling. In recent years, several authors (e.g. Tokimatsu, 1997, Louie, 2001, Kind et al., 2001) have used ambient vibration data recorded with micro-array settings in order to determine the frequency dependence of the phase velocity of surface waves (mostly Rayleigh waves) within the ambient noise wavefield. In this study we show a comparison of the performance of different array techniques applied to ambient vibration data with special focus on the automatic extraction of dispersion curves in a postprocessing stage. Tests on synthetic data sets are presented in order to demonstrate the capabilities and limitations of standard f-k algorithms (e.g. Kvaerna & Ringdahl, 1986, Capon, 1969) and the SPAC algorithm (Aki, 1957). For algorithms making use of the assumption of a plane wave arrival we find that a preselection of analyzed time windows according to the assumptions made, i.e. the existence of a dominant surface type wave, as well as the incorporation of the narrow-band array transfer function shape are essential for the reliability of the automatically obtained dispersion curves. The performance for real data has been tested for ambient vibration array measurements obtained at several sites in the Lower Rhine Embayment (LRE - Northwestern Germany) where shear wave velocity information has been available from borehole data.