Derivation of Vs30 from dispersion curve: skipping the inversion step?

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In the framework of the EU-NERIES project, 20 sites among all European strong motion sites in Italy, Greece, Turkey and France were selected to be representative of most common soil classes, and for which shear-wave velocities from borehole measurements (cross-hole and down-hole tests) are available. Passive (array noise) and active experiments have been carried out at these sites in order to evaluate the ability of surface waves technique to provide reliable estimates of shear-wave velocity profiles. In order to stay cheap and feasible, active seismic experiments involving 24 geophones and hammer source were carried out at all sites. Data were processed by using the MASW technique and Rayleigh and Love waves dispersion curves were retrieved from 5-10 Hz to 30-50 Hz. Passive array experiments were also performed by using 8 seismological stations linked with wireless connections and monitored with near real-time processing. Combining up to four different arrays with aperture ranging from 10 m and to 900 m, Rayleigh and Love waves dispersion curves were derived over a broad frequency range (from 0.5 Hz up to 45 Hz) by using the FK and MSPAC techniques. At about 75% sites, dispersion curves from ambient vibration and MASW are in good agreement over the overlapping frequency band. The other 25% sites correspond to complex geometrical site structures. Whatever the site, passive experiments are shown to be very suitable to retrieve accurate estimates of phase velocities at high frequency (over 20-30 Hz). This experiment also clearly outlined the limited penetration depth (comprised between 15 and 25 m) of the MASW technique. Inversion of dispersion curves to derive shear-wave profiles and EC8 site class (which is mainly based on Vs30) is a difficult and highly debated issue. Here we test an alternative to get average shear-wave profiles and especially Vs30 from the dispersion curves only. For these 20 sites, we show that site classes may be estimated directly from the dispersion curves. Theses results are confirmed by an extensive study involving about 800 velocity profiles from real sites.