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An alternative method for determination of *Rayleigh* and *Love* wave velocities from microtremor records in a single circular array without central station

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A procedure for experimental calculation of surface wave dispersion curves using seismic array has been analyzed. The proposed method requires 3-component records on a set of seismic stations located in a single circumference, avoiding the necessity of the central station. This method can be considered as a variant of the SPAC method, showing relevant differences with regard to those developed by Okada and Matsushima (1989) and Cho *et al.*, (2006), which require 3-component records in a circular array with central station and measurements of horizontal components in two circular arrays with different radii, respectively.

A representation of the wavefield as a discrete summation of *Rayleigh* and *Love* plane waves with arbitrary directions, amplitudes and relative phases is used, including the case of the ambient noise wavefield (microtremor). Then, a couple of intermediate quantities (B and C) are calculated from the 0- and $\pm$1- order coefficients of the Fourier series expansion of the functions representing the vertical (V), radial (R), and tangential (T) spectra of motion on the circular array vs. the azimuthal coordinate. Such frequency-dependent intermediate quantities are defined as $B = i\,(T_{-1} V_1 + T_1 V_{-1}) / (R_{-1} V_1 - R_1 V_{-1})$ and $C = i\,(R_0 / V_0)\,(R_1 V_{-1} - R_{-1} V_1) / (T_{-1} R_1 + R_{-1} T_1)$, where de subscripts denote the order of the Fourier coefficients and i represents the imaginary unit. It is possible to show that the *Love* wavenumber k_L and the *Rayleigh* wavenumber k_R can be derived directly from the measurable coefficients B and C by using the analytical results for a dense array: $B = f_1(k_L r)$ and $C = f_0(k_R r) /[B f_1(k_R r) -1]$, where r is the radius of the array, $f_n(x) = x J_{n-1}(x) / J_n(x) -n$, and $J_n(\cdot)$

represents the n - order Bessel function.

The reliability of the method has been shown, using simulated ambient noise generated by surface point sources in 1D layered ground structures. The computation of *Love* wave velocities in the new method is simpler than following Okada and Matsushimas' work since no previous estimation of *Rayleigh* wave velocity is required.