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A three-component array and some statistics: quantifying ambient surface wave anisotropy in the Paris Basin

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Three-component seismic arrays can be used to estimate local phase velocities of Love and Rayleigh waves as a function of propagation backazimuth. We show frequency resolved results from such an analysis in the range 0.2-1.1 Hz based on several days of noise data from a temporary array in the Paris Basin. Above 0.4 Hz we observe higher surface wave modes which exhibit wider backazimuth ranges compared to the microseism peak frequencies at 0.2 Hz. Anisotropy in phase velocity is quantified by fitting the Smith and Dahlen (1973) approximation to the observations. We find that both 2θ and 4θ variation exists for Rayleigh and Love waves over much of the band 0.4-1.1 Hz. Statistical significance of the anisotropy parameters is established using bootstrap confidence intervals. The observed fast directions from 0.4-1.1 Hz are roughly aligned with the preferred shallow fault direction ($<$300 m). This preferred direction might therefore extend well into the upper crust. A full inversion for local subsurface structure and anisotropy will be done using the fitted anisotropy parameter spectra.