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Rayleigh wave group velocity tomography of the Netherlands from ambient seismic noise

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In recent years ambient seismic noise interferometry is increasingly used to study the subsurface structure. The method is based on the ability to extract the Green's function between two receivers from the cross-correlation of their ambient noise recordings. With surface waves being the dominant signal of these cross-correlation functions, surface wave dispersion curves are most readily determined from these data. For a dense network of seismic stations tomographic imaging of the dispersion data can then be applied.

In this study, we determined group velocity maps of the Netherlands from ambient noise cross-correlations to infer the crustal and uppermost mantle structure. The NARS-Netherlands project was set up for this purpose and 19 broadband stations have been installed across the Netherlands since 2008. The data from this temporary NARS-Netherlands network were complemented by those of selected stations from permanent networks of the Royal Netherlands Meteorological Institute (8), the German Regional Seismograph Network (2), and the Belgian Seismic Network (2).
Data processing to obtain the cross-correlation functions was done following Bensen et al. (2007). Group velocity curves were extracted by time-frequency analysis with additional time-frequency filtering to suppress signals outside the fundamental mode band. Group velocity maps were obtained in the period band of 10 to 25 s. The variations in group velocity primarily reflect the variations in sedimentary thickness across the Netherlands and outline various basins. In the next step the group velocity maps will be inverted for 3-D shear-velocity structure.