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Imaging coda-Q in the 2-10s period band using seismic noise

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Coda quality factor (coda-Q) is used to estimate the attenuation and scattering properties of the Earth (Aki & Chouet 1975). So far focus has been on earthquake data at frequencies above 1 Hz, as the high noise level in the first and second microseismic peak, and possibly lower levels of scattering, hinder stable measurements at lower frequencies. In this work, we measure and map coda-Q in the period bands 2.5 s - 5 s and 5 s - 10 s in the greater Alpine region using noise cross-correlations using permanent seismic stations and data from the temporary AlpArray experiment. We demonstrate that it is possible to measure coda-Q using noise cross-correlations, in spite of a relatively high noise level of the correlations. When severe quality selection criteria are applied, the resulting measurement is independent of azimuth and distance so there is no sign of influence of the directivity of the noise field. At longer periods than 10 s, the dispersion of the data is too high to obtain reliable maps. Mapping shows persistent low-coda-Q anomalies in the Po plain and north-east of the Alps and high-coda-Q anomalies north of the Adriatic Sea and in southeastern France, however the shape of the correlations leads to a long coda window that doesn't allow us to discriminate between early and late coda, so we cannot distinguish between intrinsic and scattering Q. We additionally compared cross-correlations stacked over one year of data, with those of four years of data, for the stations pairs where such a long times series was available. This comparison demonstrates that the convergence of the coda-Q measurement is slow, but any bias is systematically towards higher coda-Q. Therefore, high coda-Q values may be estimated, but the geographical distribution between high and low coda-Q areas is respected.