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Is it possible to retrieve Moho reflections from high-frequency autocorrelations of ambient noise?

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Ambient seismic noise autocorrelation is becoming a common technique to obtain the zero-offset reflection response at a receiver to study the structure of the crust and uppermost mantle.

In this study, we focus on the feasibility to recover body wave reflections from the Moho using ambient noise autocorrelations at different frequency bands. We concentrate on the high-frequency content of the ambient field since we are interested in perform higher resolution studies. For the purpose of analyse the seismic visibility and feasibility of higher resolution Moho studies, we are using two years of data from broadband stations of the TopoIberia experiment and additional short period stations deployed in Spain. The frequency-dependent visibility of the Moho reflections depend on structural complexity (along the path and of the discontinuity itself) and of the ambient noise energy spectrum. The frequencies analysed go from 0.7 Hz up to 10 Hz and are scaled in different bands of interest. The reflectivity responses have been calculated using the phase autocorrelation and the classical auto-correlation, and are stacked using the linear stack and the time-frequency domain phase weighted stack. Consistency and robustness of autocorrelograms is explored by comparing stacks from different recording periods. Low-frequency Moho reflections are robust and easy to detect, the higher-frequency reflections, nevertheless, are difficult to detect and show a high spatial variability when they are detected. (Research support, Ref: CGL2016-81964-REDE, CGL2014-56548-P, SA065P17, EU grant 730900).