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Probe deep Earth with body waves from ambient seismic noise correlation

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Seismic noise correlation is now an established method to observe the propagation of surface waves between pairs of sensors, without involving transient sources. These observed surface waves are used to obtain high-resolution images of the crust and upper mantle, or for mapping the velocity changes associated with tectonic events. More challenging is to retrieve supplementary information commonly extracted from the earthquake seismograms such as amplitude decay and body waves. We here focus on the latter, and particularly in the possible extraction of body waves which propagate through the deeper part of the Earth. We first show that both long and short period body waves reflected at deep Earth's discontinuities can be retrieved from noise correlations. These observations are possible using several datasets, and show that body waves emergence is not limited to some particular geographical location of the seismic stations. Such worldwide body wave observations provide new and original information on the deep Earth structure and are here further exploited to imaging purposes, by applying commonly employed signal processing techniques often applied for deep Earth studies. The resulting structural models show the resolution power of body waves derived from seismic noise correlations, and are in good agreement with previous results in the same study areas.