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# Sensitivity kernels for coda-wave interferometry in a three-dimensional scalar scattering media

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The ambient seismic noise has proven to be a powerful tool to assess velocity changes within the ground using coda-wave interferometry (CWI). CWI is based on the analysis of small waveform changes in the coda of the signals. Localizing and imaging the source that generates changes can be done with the help of sensitivity kernels which contain information on how each part of the surrounding medium contributes to the overall waveform perturbation that is recorded at a receiver. Although progress has been made in the theory of sensitivity kernels in the case of a full elastic space, the inclusion of a free surface has proven to be difficult. Indeed, the free surface couples body waves and surface waves, which affects the sensitivity of coda waves with respect to the full-space case. Furthermore, one expects the depth sensitivity of coda waves to be strongly dependent on the relative contribution of surface and body waves, which depends on the lapse-time, source-receiver distance and scattering properties of the medium. Using the Monte-Carlo method, we compute traveltime-sensitivity kernels in a 3D scalar problem that includes body and surface waves, based on a recent theoretical model that integrates both through a mixed boundary condition. From these results, we assess the impact of the depth of a velocity perturbation on the recorded signals at the surface. Our results will be compared with previous numerical approaches from the literature.