



## **Imaging changes at depth in elastic media using coda waves**

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In the context of seismic monitoring, recent studies made use of the diffuse character of seismic coda waves to locate medium changes in the Earth on the horizontal plane. The depth location, however, remains a challenge. We use 3D wavefield simulations to investigate the lapse-time dependent depth sensitivity of seismic coda waves towards velocity perturbations in an elastic heterogeneous medium. We introduce a thin layer with a perturbed velocity at different depths. Then, we determine the apparent relative velocity changes due to this layer at different times in the coda and for different degrees of heterogeneity of the model. We show that in all cases, the depth sensitivity can be modeled as a combination of bulk and surface wave sensitivity. The partition ratio between bulk and surface waves shows a universal behavior and can be used to construct probabilistic 3-D sensitivity kernels for imaging purposes that combine surface and bulk wave propagation.

We show numerical results where we use these 3D kernels to locate changes in different types of media.