



Joint inversion for boundary and volumetric heterogeneities with the adjoint method

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We propose an alternative approach to invert for boundary topography, using a waveform misfit to perform inversions with the adjoint method. The elastodynamic equations are formulated and solved on a fixed reference domain of a chosen geometry (eg. rectangular or circular). The equilibrium mapping onto the physical body then contains information about the positions of boundaries. We can take this equilibrium mapping as a model parameter and invert for it, along with the usual volumetric parameters. Sensitivity kernels are derived for the equilibrium mapping, to facilitate gradient-based optimisation. In doing so, we are forced to work with Sobolev inner products rather than the usual L^2 inner products. Synthetic 2D inversions are used to illustrate the method.