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A semiclassical inverse spectral problem for elastic surface-wave tomography

More than a decade ago, Campillo and his collaborators discovered that cross correlation of ambient noises yields Green's function for surface waves. Since then, seismologists began to use these noises to do a "passive imaging" of the geological structure of the Earth. We use a semiclassical framework to describe surfaces in an elastic half space that is stratified near the boundary at some scale comparable to the wave length. The analysis is based on the work of Colin de Verdiere on acoustic surface waves. A one-dimensional ODE operator, parametrized in phase space, have its eigenvalues governing the geometrical behavior of surface waves. Recovery of material parameters from dispersion relations of surface waves can be formulated as an inverse spectral problem for the ODE operator. Under certain generic conditions, we give a reconstruction scheme for the S-wave speed with multiple wells.