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# Bayesian approach to infer temperature and mineralogical composition of the transition zone from seismic waveforms

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The transition zone plays a key role in the dynamics of the Earth's mantle, specially for the exchange of matter between the upper mantle and the lower mantle. Phase transitions, convective motions, hot upwelling and cold downwelling materials make the 400 - 1000 km depth range very anisotropic and heterogeneous, both thermally and chemically. A classical procedure to infer the thermal state and the composition of this region is to construct a radial model and to perturb this reference model to obtain the three-dimensional distribution of seismic velocities. Radial and lateral distributions are secondly interpreted in terms of temperature and composition. However, the degree of heterogeneity and anisotropy is strong enough that the concept of a one-dimensional reference seismic model might be addressed for this depth range. These statements also concern the problem of a posteriori errors and discretization schemes. Some recent studies prefer to directly invert seismic travel times and normal modes catalogues in terms of temperature and composition. We implement a non linear inverse approach (Monte Carlo Markov Chains) to interpret surface wave waveforms in terms of temperature, anisotropy, and composition. A guideline of this method is to let the resolution power of the data govern the spatial resolution of the model. Up to know, the model parameters are the temperature field and the mineralogical composition; other important effects, such as water and macroscopic anisotropy, will be taken into account in the future. In order to reduce the computing time of the Monte Carlo procedure, polynomial Bézier curves are used for the parameterization. This choice allows for smoothly varying models and first-order discontinuities. The method is tested in the one-dimensional case using broad-band surface wave data along the Vanuatu-California path.