ISTerre
Institut des Sciences de la Terre

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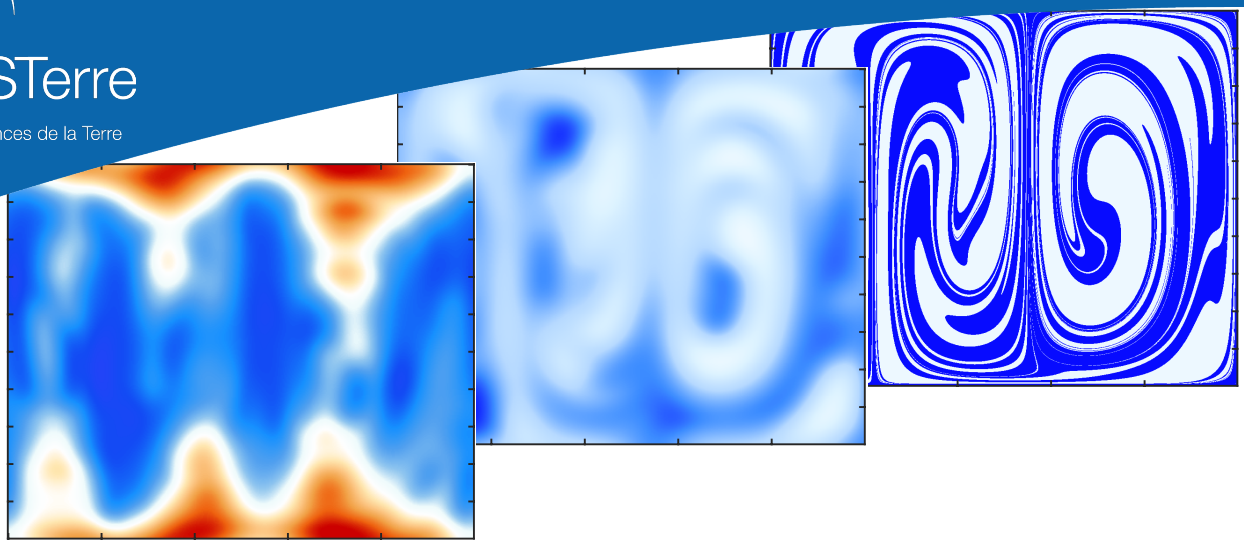

Reconciling scales in global seismology

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For more than 30 years, seismologists have used seismic waves to produce 3D images of the structure of the Earth. Despite many successes, a number of key questions still remain, which are of the uttermost importance to understand plate tectonics. The problem is that different seismic observables sample the Earth at different scales; they have different sensitivity to structure, and are usually interpreted separately. Images obtained from short period converted and reflected body waves see sharp discontinuities, and are interpreted in terms of thermo-chemical stratification, whereas seismic models constructed from long period seismograms depict a smooth and anisotropic upper mantle, and are usually interpreted in terms of mantle flow.

In this presentation, we will first show that a non negligible part of the observed anisotropy in smooth tomographic models may be artificial and the result of unmapped fine layering in the mantle, i.e small-scale heterogeneities that cannot be resolved by long-period seismic waves. In this way, we will show that tomographic images do not represent the true Earth, but rather a smooth effective, apparent, or equivalent model that provides a similar long-wavelength data fit, and which cannot be interpret in terms of deformation. We will propose a fully probabilistic approach to explore the ensemble of small scale models equivalent to a given smooth tomographic profile. Finally, we will show how a joint interpretation of different frequency bands can allow to fully localizing the patterns of deformation in the mantle.

Jeudi 16 janvier 2017 à 11 h

Salle de conférences d'ISTerre

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