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Influence of global heterogeneities on regional imaging based upon full waveform inversion of teleseismic wavefield

Vadim Monteiller (1), Stephen Beller (1), Stephane Operto (1), and Jean Virieux (2)

(1) Geoazur, Univ. Nice-Sophia Antipolis, France (vadim.monteiller@geoazur.unice.fr), (2) ISTerre, Univ. Grenoble Alpes, Grenoble, France

The current development of dense seismic arrays and high performance computing make feasible today application of full-waveform inversion (FWI) on teleseismic data for high-resolution lithospheric imaging. In teleseismic configuration, the source is often considered to first order as a planar wave that impinges the base of the lithospheric target located below the receiver array. Recently, injection methods coupling global propagation in 1D or axisymmetric earth model with regional 3D methods (Discontinuous Galerkin finite element methods, Spectral elements methods or finite differences) allow us to consider more realistic teleseismic phases. Those teleseismic phases can be propagated inside 3D regional model in order to exploit not only the forward-scattered waves propagating up to the receiver but also second-order arrivals that are back-scattered from the free-surface and the reflectors before their recordings on the surface.

However, those computation are performed assuming simple global model. In this presentation, we review some key specifications that might be considered for mitigating the effect on FWI of heterogeneities situated outside the regional domain. We consider synthetic models and data computed using our recently developed hybrid method AxiSEM/SEM. The global simulation is done by AxiSEM code which allows us to consider axisymmetric anomalies. The 3D regional computation is performed by Spectral Element Method. We investigate the effect of external anomalies on the regional model obtained by FWI when one neglects them by considering only 1D global propagation. We also investigate the effect of the source time function and the focal mechanism on results of the FWI approach.