Geophysical Research Abstracts
Vol. 18, EGU2016-14438, 2016
EGU General Assembly 2016

Imaging the density distributions at the regional scale using full waveform and gravity data inversion - Application to the Pyrenees

Roland Martin (1), Dimitri Komatitsch (2), Sebastien Chevrot (1), Sylvain Bonvalot (3), Yi Wang (1), Vadim Monteiller (2), and Grégory Dufréchou (1)

(1) CNRS, laboratoire Geosciences Environnement Toulouse, Toulouse, France (roland.martin@get.obs-mip.fr), (2) CNRS, laboratoire de Mécanique et d'Acoustique, Marseille, France , (3) IRD, laboratoire Geosciences Environnement Toulouse, Toulouse, France

We present a hybrid inversion method that allows us to image density distributions at the regional scale using both seismic and gravity data. One main goal is to obtain densities and seismic wave velocities (P and S) in the lithosphere with a fine resolution to get important constraints on the mineralogic composition and thermal state of the lithosphere. In the context of the Pyrenees (located between Spain and France), accurate Vp and Vs seismic velocity models are computed first on a 3D spectral element grid at the scale of the Pyrenees by inverting teleseismic full waveforms. In a second step, Vp velocities are mapped to densities using empirical relations to build an a priori density model. BGI and BRGM Bouguer gravity anomaly data sets are then inverted on the same 3D spectral element grid as the Vp model at a resolution of 1-2 km by using high-order numerical integration formulae. Solutions are compared to those obtained using classical semi-analytical techniques. This procedure opens the possibility to invert both teleseismic and gravity data on the same finite-element grid. It can handle topography of the free surface in the same spectral-element distorted mesh that is used to solve the wave equation, without performing extra interpolations between different grids and models. WGS84 curvature, SRTM or ETOPO1 topographies are used.