Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04648, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04648
EGU General Assembly 2008

LitMod3D: a new 3D program for modelling the thermal, compositional, density, rheological, and seismological structure of the lithosphere

J. Fullea (1), J.C. Afonso(1), J.A.D. Connolly(2), S. Zlotnik(1), M. Fernandez(1)

(1) GDL, Inst. Earth Sci. "J. Almera", CSIC, Barcelona, Spain, (2) Earth Sci. Dept., Swiss Federal Inst. Technol., Zurich, Switzerland

The determination of the present-day thermal and compositional structure of the lithospheric and sub-lithospheric upper mantle is one of the fundamental goals in modern lithospheric modelling. Here we present an interactive 3D program (LitMod3D), based on the previously released 2D code LitMod, which can be used to perform combined geophysical-petrological modelling of the lithosphere. The code combines data on petrology (i.e. partial melting, phase changes, and compositional heterogeneities), mineral physics (composition- and P, T-dependendent thermophysical properties), and geophysical information. It solves simultaneously the heat transfer, thermodynamical, rheological, geopotential, and isostasy equations for any given lithospheric domain, and outputs temperature, surface heat flow, density, seismic wave velocity, gravity anomalies, elevation, lithospheric strength, and geoid anomalies. The final result is a self-consistent lithospheric/sublithospheric model that simultaneously fits all geophysical (and petrological) observables, and consequently reduces the uncertainties associated with the modelling of these observables alone or in pairs, as commonly done in the literature.

The program is interactive, fully documented, and available upon request. It consists of two main modules: the first one solves all relevant equations for any given 3D lithospheric-sublithospheric model from the surface down to the 410-km discontinuity; the second module is a graphical interface that allows to visualize and interactively modify the model (structure and parameters) through cross sections and map views of

the different lithospheric layers defined.

The code has been successfully applied to both oceanic and continental domains. Modelling results are presented and compared with available geophysical and petrological information in each case. Particular attention is given to the analysis of possible vertical and lateral compositional heterogeneities within oceanic and Archean lithospheric domains and their effect in geophysical fields.