Geophysical Research Abstracts
Vol. 17, EGU2015-3655-1, 2015
EGU General Assembly 2015

Electrical conductivity of the Earth's mantle after one year of SWARM magnetic field measurements

François CIVET, Erwan THEBAULT, Olivier VERHOEVEN, Benoit LANGLAIS, and Diana SATURNINO
University of Nantes, LPGNantes, CNRS - UMR 6112, Nantes, France (francois.civet@univ-nantes.fr)

We present a global EM induction study using L1b Swarm satellite magnetic field measurements data down to a depth of 2000 km. Starting from raw measurements, we first derive a model for the main magnetic field, correct the data for a lithospheric field model, and further select the data to reduce the contributions of the ionospheric field. These computations allowed us to keep a full control on the data processes. We correct residual field from outliers and estimate the spherical harmonic coefficients of the transient field for periods between 2 and 256 days. We used full latitude range and all local times to keep a maximum amount of data. We perform a Bayesian inversion and construct a Markov chain during which model parameters are randomly updated at each iteration. We first consider regular layers of equal thickness and extra layers are added where conductivity contrast between successive layers exceed a threshold value. The mean and maximum likelihood of the electrical conductivity profile is then estimated from the probability density function. The obtained profile particularly shows a conductivity jump in the 600-700 km depth range, consistent with the olivine phase transition at 660 km depth. Our study is the first one to show such a conductivity increase in this depth range without any a priori informations on the internal strucutres. Assuming a pyrolitic mantle composition, this profile is interpreted in terms of temperature variations in the depth range where the probability density function is the narrowest. We finally obtained a temperature gradient in the lower mantle close to adiabatic.