



Paraná-Etendeka lithosphere modeling according to GOCE observations and geophysical constraints: improvement of PERLA project

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One of the challenges of the European Space Agency (ESA) is to improve knowledge of physical properties and geodynamic processes of the lithosphere and the Earth's deep interior, and their relationship to the Earth-surface changes. PERLA project is a part of the challenge of ESA's Living Planet program to investigate the Solid Earth, and in particular the lithosphere of the Paraná-Etendeka Large Igneous Province (LIP). At the present stage the study is focusing on the upper mantle, the source of the magma. The aim is to motivate the asymmetry of the shallow volcanic effusion of the Early Cretaceous tholeiitic magmatism, that in Paraná is wide, thick and represented by the basaltic layer of Serra Geral Formation, while in Etendeka it is rare and spanned. Viceversa the alkaline magmatism shows similar effusions along the region with dyke swarms and associated alkaline and alkaline-carbonatite complexes from Early Cretaceous to Paleogene age.

ESA's Living Planet program offers a suite of scientific satellites, the Earth Explorers, and in this context PERLA adopts the newest GOCE satellite mission products. The Marussi tensor field and especially its vertical component show a positive anomaly along the coastline sector of both the western and eastern Atlantic Ocean. Positive anomalies are also related to the deeper Moho under the northern part of Paraná basin, in South America (SAM) and the Etendeka continental part. Here we aim to define the detail of masses between crust and upper mantle by modeling the Marussi Tensor components and the invariants. The invariants are easier to understand because they are independent of the reference system.

The forward model uses Tesseroids. The density model is compared with recent seismologic models, and is performed according to the results provided by the physical laws governing rock densities and seismic velocity of lithosphere in function of temperature and pressure combined with laboratory measurements of a great number of mineral samples. Also the age of the mantle is included, according to the standard petrological classification of mantle with the percentages of four lead minerals: Olivine, Orthopyroxene, Clinopyroxene and Garnet.

Studying the GOCE gravimetric data with the integration of geophysical and also petrological constraints is useful to investigate the lithosphere and to improve the geodynamics of complex geologic areas like LIPs.