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TITLE: The New Satellite Derived Gradient Fields for Gaining a Better Understanding of the Paraná Basin

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ABSTRACT BODY: The Paraná and surrounding regions are of great interest due to the presence of a Large igneous Province (LIP), representing one of the most important continental flood basalt deposits on Earth. In the last decades many efforts have been spent (e.g. Ernesto et al., 2002, Piccirillo and Melfi, 1988) to understand the evolution of the basalts and alkaline rocks of the Paraná Basin, but the geodynamic processes are not understood yet. One big question regards the geochemical signature of the volcanic rocks and their origin due to existence of mantle heterogeneity or crustal contamination and the presence of underplating).
Here, we analyze the gravity field and gravity gradient tensor in order to formulate a density model that accounts for the surface geology and the deeper lying structures. The gravity field and the gradient tensor are calculated using the recent EGM08 gravity potential expansion into spherical harmonics. Moreover, when available, we analyze the observations of the GOCE satellite mission.
We present the correlation of the geological units defined in existing geological maps, with the Marussi tensor or with quantities derived from it. The geologic structures are seen in the gravity signal when density variations accompany the contact between different geologic units. We find that the gravity gradient tensor is useful to mark different kind of geological structures as fold belts , faults, magmatic deposits. Our goal is to correlate all known geologic structures with the fields in order to check whether there are signals tied to unknown structures. We formulate a model for the different units filling the basin., The sediment and basalt densities are constrained by density values we find in literature. The density model allows to make isostatic calculations, that considers topographic and intracrustal masses, as the basalts and the sediments. Our goal is to determine to which extent the isostatic model allows to define the amount of underplated material below the crust which should have accompanied the large basalt igneous province.
We use our density model to estimate the expected resolution power of the GOCE-satellite regarding crustal density inhomogeneity. GOCE is the first satellite to measure the gravity gradient on board and we show what new results can be achieved in the Paraná region by analyzing the upcoming GOCE data.
Our study is accomplished in the frame of different projects as the GOCE-Italy project supported by the Italian Space Agency, responsible Prof. F. Sansò, the FAPESP project, responsible prof. I. Vittorello, and is part of the ESA GOCE EO project ID 4323, responsible Prof. C. Braitenberg.

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