Geophysical Research Abstracts
Vol. 13, EGU2011-9427, 2011
EGU General Assembly 2011

Tensor gradient field from GOCE as tool for gaining insight of the Amazon and the Solimões Basin, Brazil

Everton Bomfim (1), Carla Braitenberg (2), and Eder Molina (1)

(1) University of São Paulo, Institute of Astronomy, Geophysics and Atmospheric Sciences – IAG. São Paulo, Brazil (everton@iag.usp.br) and (eder@iag.usp.br), (2) University of Trieste, Department of Geosciences, Trieste, Italy (berg@units.it)

We aim at gaining an improved understanding of the lithospheric structure beneath the Solimões and Amazonas sedimentary basins by using the gradient tensor observations of the GOCE mission.

The most direct way to detect density anomalies is the study of the gravity potential field and its derivatives. The global availability and good resolution of the GOCE satellite data mission coupled with the availability of data from terrestrial gravity and/or airborne gravity surveys are ideal for the scope of intercomparison and classification of the two large-scale Amazon and Solimões sedimentary basins.

In geological terms the Amazon and Solimões basins are very old and classified as intracratonic Paleozoic basins; together they cover an area of almost 1,000,000 km^2 separated by the Purus Arch. The basins belong to an intracontinental rift system that straddles the border between Brazil and Guyana, covering some 4,500 km^2 of the Brazilian territory.

We consider the gravity gradient tensor components from global geopotential models as EIGEN5C and EGM08 and the new fields recovered from the GOCE satellite.

We use various combinations of the gravity gradient components in order to enhance different properties of the complex pattern of the field and to aid interpretation of the data. We use the amplitude of the horizontal gradient of vertical gravity (gz); amplitude of the total gradient or analytic signal of gz; and the differential curvature which is also known from the early torsion balance literature as the horizontal directive tendency or HDT. The horizontal gradient can be used as a detector of edges, or to map outlines of bodies. The analytical signal can be used for interpretation of deeper masses. The magnitude of the differential curvature strongly emphasizes the effects of shallower sources. The differential curvature is proportional to the difference between the maximum and minimum curvature of the geoid. It is an invariant under a rotation in the horizontal plane, and when plotted as a vector it points towards high and low density. We present the different quantities and compare them on the basis of a geological-geophysical database which collects the known information in this area. Of particular interest in our study is the linear positive signal that runs along the central axis of the Amazon basin: we use the new observations to infer the origin of this signal, which is presently unknown.