The new global gradient tensor in detecting basement units

Carla Braitenberg, Anna Russian, Patrizia Mariani, and Ildiko' Nagi

University of Trieste, Department of Geosciences, Trieste, Italy (berg@units.it, +39040575519)

The gravity gradient tensor has gained great interest due to the GOCE satellite mission (launched March 2009), which hosts a gradiometer on board. In expectation of the GOCE data, we calculate the global gradient tensor, from the spherical harmonic expansion of the gravity potential up to degree and order 2159 (EGM2008). We analyze the gradient tensor produced by simple geometric bodies, as a point mass, a line mass, or composite masses. We analyze the different tensor components and define derived quantities which are invariants of the tensor, and show which are ideal in studying the inhomogeneities of the crust. We show which tensor components are best to map the contours of density inhomogeneities, and which are best to map the nucleus of the anomalous body. In order to illustrate our findings, we map the tensor field derived from the EGM2008 model over geologically interesting areas, as e.g. the South American plate. We show that several geologic units can be identified by a quantitative analysis of the tensor field. We show interesting results regarding the cratonic South American basins as Amazon and Parana' basins, which are characterized by thick sedimentary covers and considerable volumes of magmatic products in the crustal columns.