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Adaptative gravity modelling from GOCE gradient data over the Himalaya

Michael Hayn (1), Matthias Holschneider (2), and Isabelle Panet (1)

(1) IGN-LAREG, Univ Paris Diderot, Sorbonne Paris Cite, France (hayn@math.uni-potsdam.de), (2) Institute for Mathematics; University of Potsdam, Potsdam, Germany

Gravity data give important information for investigating the Earth's interior structure. The gravity data of the the satellite GOCE, reaching an unprecedented precision for a resolution of about 90 km, are especially important for regions with difficult access for ground measurements, such as mountain regions.

Our aim is to build a regional model of the Earth's gravity potential over the Himalaya region using GOCE gravity gradients, including those obtained during the period when the satellite altitude was lowered. To assure a high stability and to minimise the numerical costs, we develop an approach where the model resolution is adapted to the local scales of variability of the gravity field. Furthermore, it respects the ellipsoidal shape of the Earth.

In this approach, the modelled gravity potential is represented as a superposition of multipoles located closely below the Earth's surface. According to the local scale of the field, the multipoles are distributed with larger or shorter distances to each other and to the surface. The prior knowledge about the local scales is derived from the wavelet transform of a the EGM2008 gravity model.

The multipoles are positioned by means of an iterative approach. Afterwards, the model coefficients are estimated by maximising the Bayesian posterior distribution of the model.

We apply this modelling approach on GOCE data over the Himalaya region and discuss our preliminary results. The model will be used to study the dynamic processes in this active area.