Case Study on Heterogeneous Geoid / Quasi-geoid Based on Space Borne and Terrestrial Data Combination with Special Consideration of GOCE Mission Data Impact

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The main purpose of this proposal is to perform a case study on geoid based on optimal combination of space-and- ground-based data . For this purpose, the space-borne long wavelength geoid solution coming from different satellite missions will be assessed with respect to ground data. Therefore one might say that this study also is concerned with satellite gravity models validation. Main accent here will be put on assessment of the available GOCE mission gravity models. For this purpose a suitable test area in China and in Finland will be selected and the GOCE models will be assessed in that area. As ground measurements we will use gravity anomalies on land and sea together with the deflections of the vertical, GPS/leveling data and the altimetry-based marine geoid. This is not a trivial task due to the data distribution, data accuracy as well as the fact that the GOCE models contain only limited information about the gravity field, mainly very long wavelength of about 100km. However in the ground data we have all wavelengths present. We will apply for this purpose the so-called Spectral Enhancement Method and will study also some low-pass filtering techniques in order to be able to compare GOCE with the properly filtered ground data (and vice versa). In the second phase of the project, estimation of the geoid/quasigeoid for part of China and Finland will be performed. We will use the well-known remove-restore technique where we reduce the long wavelength part in our observations from the GOCE model. This will give one geoid/quasigeoid solution based on the GOCE model(s). Thus computed geoids for continental and offshore China part as well as for Finland will be compared to available GPS/leveling points. This will give us insight on how well GOCE performs. We will use also for this purpose other long wavelength models and the results will be compared to that of GOCE. This will give also insight about how GOCE performs as compared to other satellite models. Also studies on improvement of the geoid/quasigeoid accuracy by combining GOCE with other long wavelength models will be performed and analyzed. This project will lead to PhD thesis of one person at the Finnish Geodetic Institute (FGI) funded by the FGI primary budget, and also couple PhD thesis in China funded by the CASM budget. Both students will be supervised by Dr. Kirco Arsov and Prof. Wen Hanjiang.

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