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Accurate Establishment of Error Models for the Satellite Gravity Gradiometry Recovery and Requirements Analysis for the Future GOCE Follow-On Mission

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A b s t r a c t

Firstly, the new single and combined error models applied to estimate the cumulative geoid height error are efficiently produced by the dominating error sources consisting of the gravity gradient of the satellite-equipped gradiometer and the orbital position of the space-borne GPS/GLONASS receiver using the power spectral principle. At degree 250, the cumulative geoid height error is 1.769×10^{-1} m based on the new combined error model, which preferably accords with a recovery accuracy of 1.760×10^{-1} m from the GOCE-only Earth gravity field model GO_CONS_GCF_2_TIM_R2 released in Germany. Therefore, the new combined error model of the cumulative geoid height is correct and reliable in this study. Secondly, the requirements analysis for the future GOCE Follow-On satellite system is carried out in respect of the preferred design of the matching measurement accuracy of key payloads

comprising the gravity gradient and orbital position and the optimal selection of the orbital altitude of the satellite. We recommend the gravity gradient with an accuracy of 10^{-13}-10^{-15} /s^2, the orbital position with a precision of 1-0.1 cm and the orbital altitude of 200-250 km in the future GOCE Follow-On mission.

Key words: GOCE Follow-On, single and combined error models, requirements analysis, power spectral principle, satellite gravity gradiometry recovery.