

A simulation study of gravity field recovery by multiple gravity satellites

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The dedicated gravity satellite GRACE, which has been successfully launched in 2002, will provide spherical harmonic coefficients of the earth gravity field for every one month. Those extreme high precision gravity field data are expected to determine the temporal variations of the gravity fields due to time varying geophysical phenomena such as global water cycling. Although there is no doubt that even only one GRACE satellite should greatly contribute to those studies, one interesting question is how the spatial and/or temporal resolution of gravity field recovery will be improved if more than one gravity satellites will be operated simultaneously. As a matter of fact, both CHAMP and GRACE are under operating, and this means the situation of multiple satellites is real even at the present day. In future, there may be a chance that more than one GRACE /GRACE-FO type missions could be realized simultaneously. In this study, we thus carry out simulation studies of gravity field recovery by assuming multiple-satellite observation of GRACE and/or GRACE-FO. The simulation procedure is as follows; 1) synthesize time varying gravity fields using surface pressure data of ECMWF reanalysis data sets, 2) calculate multiple satellite positions and observe the synthesized gravity field data, 3) calculate spherical harmonic coefficients using the observed data and compare with the true synthesized gravity fields. We tested several combinations of multiple satellites, for instance, same orbit heights with same sensitivities, different orbit heights with different sensitivities, and so on, and we finally discussed effective combination of the satellites for the gravity field recovery.