



Determination of the gravitational potential at GOCE-type satellite orbit using frequency signal transmission approach

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We provide a way to determine the in-situ Earth's gravitational potential at a GOCE-type satellite (GTS) orbit based on frequency signal transmission between a high-orbit navigation communication satellite (NCS) and the GTS. By emitting and receiving frequency signals between the GTS and a NCS, we can determine the gravitational potential at the GTS orbit. For a near-polar GTS with height about 250 km above the geoid, we choose three NCSs to determine the gravitational potential at the GTS position. This approach is referred to as the satellite frequency signal transmission (SFST) approach. Simulation results show that the accuracy of the determined gravitational potential at the GTS position can achieve equivalent centimeter level if optical atomic clocks with instability of 1×10^{-18} are available. The SFST approach provides a new way to determine the Earth's external gravity field. This study is supported by NSFC (grant Nos. 41631072, 41721003, 41574007 and 41429401), the Discipline Innovative Engineering Plan of Modern Geodesy and Geodynamics (grant No. B17033) and DAAD Thematic Network Project (grant No. 57173947).

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