Geophysical Research Abstracts
Vol. 15, EGU2013-3342, 2013
EGU General Assembly 2013

On the capability of SWARM for estimating time-variable gravity fields and mass variations

Tilo Reubelt (1), Oliver Baur (2), Matthias Weigelt (3), and Nico Sneeuw (1)

(1) Geodetic Institute, Stuttgart University, Geodesy, Stuttgart, Germany (reubelt@gis.uni-stuttgart.de, +49 711 1213285), (2) Space Research Institute, Austrian Academy of Sciences, Graz, Austria , (3) Faculte des Sciences, de la technologie et de la Communication, Universite de Luxembourg

Recently, the implementation of the GRACE Follow-On mission has been approved. However, this successor of GRACE is planned to become operational in 2017 at the earliest. In order to fill the impending gap of 3-4 years between GRACE and GRACE-FO, the capability of the magnetic field mission SWARM as a gap filler for time-variable gravity field determination has to be investigated. Since the three SWARM satellites, where two of them fly on a pendulum formation, are equipped with high-quality GPS receivers and accelerometers, orbit analysis from high-low Satellite-to-Satellite Tracking (hl-SST) can be applied for geopotential recovery. As data analysis from CHAMP and GRACE has shown, the detection of annual gravity signals and gravity trends from hl-SST is possible for long-wavelength features corresponding to a Gaussian radius of 1000 km, although the accuracy of a low-low SST mission like GRACE cannot be reached. However, since SWARM is a three-satellite constellation and might provide GPS data of higher quality compared to previous missions, improved gravity field recovery can be expected. We present detailed closed-loop simulation studies for a 5 years period based on time-variable gravity caused by mass changes in the hydrosphere, cryosphere and solid Earth. Models for these variations are used to simulate the SWARM satellite orbits. We recover time-variable gravity from orbit analysis adopting the acceleration approach. Finally, we convert time-variable gravity to mass change in order to compare with the a priori model input.