Closing the gap between GRACE and GRACE-FO with Swarm

Christina Lück (1), Roelof Rietbroek (1), Jürgen Kusche (1), Anno Löcher (1), Le Ren (2), Steffen Schön (2), Alexey Androsov (3), Jens Schröter (3), and Sergey Danilov (3)

(1) Institute for Geodesy and Geoinformation, University of Bonn, Bonn, Germany (lueck@geod.uni-bonn.de), (2) University of Hanover, Institut für Erdmessung, Hanover, Germany, (3) Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany

The Gravity Recovery and Climate Experiment (GRACE) mission has provided data about mass distributions within our Earth for more than 15 years. With its decommissioning in October 2017, scientists all over the world have lost access to high-quality time-variable gravity fields. The follow-on mission (GRACE-FO) has arrived at its launch site and is expected to deliver first gravity fields not earlier than mid 2018. Thus, we are facing a longer data gap than ever before since the launch of GRACE.

Efforts have been made to use kinematic orbits from low Earth orbit (LEO) satellites to derive time-variable gravity fields. Within our project "Consistent Ocean Mass Time Series From LEO Potential Field Missions" (CONTIM) of the DFG funded Priority Programme SPP1788, we investigate the potential of ESA's three-satellite magnetic field mission Swarm to extend time series of gravity changes and ocean mass variations beyond the GRACE mission lifespan. We make use of the most recent kinematic orbits from Delft as well as from solutions computed within our project.

We will show Swarm-derived time series of ocean mass changes for the whole Swarm mission lifespan, starting in December 2013. Wherever it is possible, we compare our solutions to the more accurate GRACE solutions. In addition, we validate our results with recent ocean models. Considering monthly gaps, as well as the gap between GRACE and GRACE-FO, we compare ocean mass from Swarm to results interpolated from existing GRACE solutions. Furthermore, we investigate how the choice of non-conservative force modelling, solution parameterization, and other pre- and post-processing steps affect the solutions.