



Combined SLR gravity field time series for continuous Earth System Monitoring

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Continuous monitoring of the perpetual changing Earth is one of the key topics of present Earth System research. In the past, the satellite mission Gravity Recovery And Climate Experiment (GRACE) was measuring the time-variable gravity field of the Earth with outstanding performance in accuracy and reliability. On October 27 in 2017, GRACE de-orbited and this very successful geodetic satellite mission ended. On May 22 in 2018, the successor mission GRACE-FO (Follow On) was launched and scientific data will be provided soon to the users. Between the two satellite missions, there is a gap of more than six months. Beside the GRACE and other satellite missions, several analysis centers (ACs) worldwide process laser ranging (SLR) data to spherical satellites orbiting the Earth which allow a very accurate estimation of the low-degree spherical harmonics of the Earth's gravity field. Up to now, the available time series are stand-alone solutions which co-exist to each other.

In this investigation, we will combine the SLR-derived time series of low-degree spherical harmonics from different SLR analysis centers and, moreover, combine them with the GRACE data in order to extend the continuous time series of the monthly gravity field in the GRACE/GRACE-FO gap and into the past (before the launch of GRACE in 2002). We will compare the combined SLR time series to GRACE monthly solutions and evaluate the impact of different solution setups like the SLR-orbit length, a priori models, etc. on the results. Additionally, we study the benefit of a combined SLR time series compared to the AC stand-alone solutions and motivate the advantages of such a combination in the future!