

SLR and GRACE gravity field determination and combination

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At the Astronomical Institute of the University of Bern (AIUB) long time-series (1995 – 2017) of low resolution (max. degree 6) gravity field coefficients have been determined from a combination of LAGEOS and geodetic SLR satellites in low Earth orbit (LEOs), namely: Beacon-C, Ajisai, Starlette, Stella, Larets, and Lares. Monthly gravity fields, excluding degree 1 terms, are co-estimated with orbits (10-day LAGEOS and 1-day LEO arcs), station coordinates, range biases, geocenter variations and Earth orientation parameters.

For the period 2003-2016 also GRACE monthly gravity fields were produced at AIUB with a significantly higher resolution (max. degree 90). After truncation of the gravity field corresponding to SLR, the derived mass variations match well in selected areas with strong mass transport signals and SLR can thus serve to shed light on mass transport in the pre-GRACE period and help to bridge the gap to GRACE-FO. But the coarse resolution leads to prominent signal leakage that has to be taken into account when quantifying the SLR-derived mass transport.

A consistent processing of GRACE and geodetic SLR satellites enables the combination at normal equation level, strengthening mainly the degree two terms of the gravity field that in the case of GRACE suffer from accelerometer instrument artifacts and aliasing with the S2 tide. Further GRACE + SLR combinations at normal equation level including several Analysis Centers (ACs) are envisaged in the frame of the COmbination Service for Time-variable Gravity field solutions (COST-G) of the IGFS / IAG.