Gravity field recovery at the Astronomical Institute of the University of Bern (AIUB) is rigorously treated as an extended orbit determination problem, which avoids the introduction of any a priori gravity field information from the CHAMP-, GRACE-, or GOCE-era. The so-called Celestial Mechanics Approach (CMA) is applied to GPS high-low satellite-to-satellite tracking (hl-SST) data of low Earth orbiters (LEOs), via the use of previously established kinematic LEO positions, and to K-band low-low satellite-to-satellite tracking (ll-SST) data of the GRACE mission.

We use data from the GRACE mission to assess the capabilities of the CMA to recover the time-variable signals of the Earth's gravity field. We estimate seasonal and secular variations either simultaneously with the static field, or solve for monthly snapshots and fit seasonal and secular variations a posteriori to these snapshots. Statistical tests indicate that the estimated time variations are significant at least up to degree 60. Applying different smoothing techniques we evaluate time variable signals in selected regions and assess the agreement with results from other processing centers.

The detection of time-variable gravity signals from hl-SST data is a more challenging task. The long time series of CHAMP GPS data allows it, however, to combine normal equations belonging to monthly solutions of different years, which significantly reduces the noise level. A further reduction of the noise may be achieved by suppressing variations which are not significant. We assess the quality of the so-derived time-variable gravity signals by comparing them with results from GRACE.