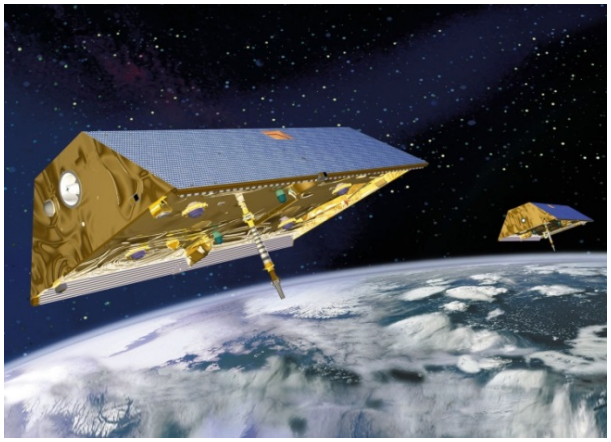

UNIVERSITÄT BERN

Universität Bern

Astronomisches Institut

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Bachelor Thesis

Optimized GRACE Satellite Orbits for Periods of Low Altitude / High Ionosphere Activity

MOTIVATION

The static gravity field and its variations in time are the main result of the GRACE satellite mission and are determined together with orbit parameters and pseudo-stochastic accelerations in a common parameter estimation process. The stochastic accelerations are designed to absorb non-modeled accelerations and keep the dynamic orbit close to the kinematic positions determined from the GPS observations. They are constrained in size not to absorb the gravity signal of interest. The parametrization and constraints were tailored to quiet ionospheric conditions and an orbit altitude of more than 400 km. In the late mission phase the GRACE satellites are now flying at lower orbital altitudes. This in combination with increased ionospheric disturbances due to increased solar activity following the 11-year solar cycle led to sub-optimal orbit fits. The stochastic orbit parametrization has to be adapted to the new conditions. This will lead to improve gravity field estimates for the late mission phase of GRACE.

DESCRIPTION

- Experience in the GRACE orbit and gravity field determination for quiet ionospheric conditions and high orbit altitudes shall be gained using the in-house software of the Celestial Mechanics Approach.
- The pseudo-stochastic parametrization of the orbits shall be optimized by adapting the constraints imposed to the pseudo-stochastic accelerations. To find optima settings the RMS of the orbit fit and the signature of the stochastic accelerations needs to be studied.
- The adapted constraints shall then be applied to estimate monthly and annual gravity fields from kinematic positions alone (without use of the GRACE K-Band link) to assess the quality of the resulting gravity fields in comparison to GRACE K-Band gravity field solutions.

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