



## Bachelor/Master Thesis

### Analysis of most recent GRACE mission data

#### MOTIVATION

Inter-satellite K-Band ranging with micrometer-precision from NASA's GRACE mission, originally designed for a nominal mission lifetime of 5 years, has meanwhile provided observations of large-scale mass variations in the system Earth for more than 14 years. Today, the main instruments such as the microwave assemblies being used for satellite-to-satellite tracking or the accelerometers, which observe non-gravitational forces, are still in nominal operation on both satellites. However, the capacity of the GRACE batteries is strongly reduced due to ageing and cell failures of the batteries. To reduce the load on the batteries and to extend the GRACE mission lifetime the microwave assemblies and accelerometer instrument control units have been regularly switched-off and -on since several years for about 40 days whenever the Sun was close to the orbital plane and the satellites could not get enough power from their solar arrays only. Most recently the frequency of switching-off and -on the instruments had to be even further increased. This complicates the orbit and gravity field determination, which is performed at the Astronomical Institute of the University of Bern (AIUB) in an automated processing of daily batches of GRACE data.

#### DESCRIPTION

- To familiarize with the topic of this Bachelor/Master thesis, orbit and gravity field determination using the in-house developed Celestial Mechanics Approach shall first be performed with GRACE data that are not affected by the above described interruptions. Use can be made of the procedures existing at AIUB for automated GRACE gravity field determination.
- The issues caused by the frequent data gaps shall then be identified and their consequences on GRACE orbit determination investigated. A more flexible determination of the GRACE orbits shall then be developed such that eventually an automated determination of monthly gravity fields may be established. This shall allow it to analyze the most interesting data of the final phase of the GRACE mission, e.g. in view of deriving the most recent trends/accelerations of ice mass losses over Greenland and Antarctica.