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Gravity Field Determination at AIUB: Current Activities

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Research on global gravity field recovery from satellite missions such as CHAMP and GRACE was initiated at the Astronomical Institute of the University of Bern (AIUB, Switzerland) in the year 2006. Since September 2007, the activities were extended in the framework of the project Satellite Geodesy sponsored by the Institute for Advanced Study (IAS) of the Technical University of Munich (TUM, Germany).

Gravity field recovery at AIUB is rigorously treated as an extended orbit determination problem. This so-called Celestial Mechanics Approach is applied to GPS high-low satellite-to-satellite tracking (hl-SST) data of low Earth orbiters (LEOs), via the use of kinematic LEO positions, and to K-band low-low satellite-to-satellite tracking (ll-SST) data of the GRACE mission. Kinematic LEO positions are determined at AIUB using the GPS orbit and clock products of the Center for Orbit Determination in Europe (CODE). CODE is an analysis center of the International GNSS Service (IGS) and is operated by AIUB in cooperation with the Federal Office of Topography (swisstopo, Switzerland), the Federal Office of Cartography and Geodesy (BKG, Germany), and the Institute of Astronomical and Physical Geodesy (IAPG) of the Technical University of Munich.

We will describe the currently implemented refined processing strategies of the Celestial Mechanics Approach and present selected results. The benefits of our rigorous approach are demonstrated by comparisons of our latest annual GRACE ll-SST solutions and multi-annual CHAMP hl-SST solutions with the results of other groups and by external validations. A special focus is on the relevance of background models for GRACE gravity field determination when using K-band data, and on the impact of systematic errors in GPS observations when performing gravity field recovery with hl-SST observations.