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Gravity Field Determination at AIUB: From annual to multi-annual solutions

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Gravity field recovery at the Astronomical Institute of the University of Berne (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 the associated covariance information, 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).

After almost ten years in orbit, CHAMP provides the unique opportunity to fully exploit a long series of GPS hl-SST data and, in view of the GOCE mission, to gain experience for gravity field recovery from LEOs at very low orbital altitudes. We will present the new AIUB-CHAMP03S static gravity field model based on 8 years of data and discuss the most important advances in the processing of GPS hl-SST data. The benefits of our rigorous approach will also be demonstrated by our new AIUB-GRACE03S static gravity field model based on 5 years of hl-SST and ll-SST data.

The Celestial Mechanics Approach was generalized to model the annual, semi-annual and trend signals of the time variable gravity field. First results of this procedure will be presented, which is uniquely based on the daily normal equations also used as input for the determination of the static GRACE gravity field models.