The poster presents activities at the Astronomical Institute of the University of Bern (AIUB) in the field of precise orbit determination (POD) for Low Earth Orbiters (LEO) using the GPS. They are currently focused on
the two GRACE satellites and range from general studies about reduced-dynamic and kinematic POD based on zero- and double-difference observations to the implementation and testing of the POD procedures in the framework of the High-Level Processing Facility (HPF) for ESA’s upcoming GOCE mission.

**GRACE Zero-Difference Reduced-Dynamic POD**

This part of the poster presents GRACE A and B orbit solutions for the days 243/2003 to 363/2003 using different zero-difference GPS data samplings and orbital arclengths.

**Solution A (red):**
- GPS data sampling: 10-second
- Arclength: 30-hour reduced-dynamic orbit

**Solution B (blue):**
- GPS data sampling: 30-second
- Arclength: 30-hour reduced-dynamic orbit

**Solution C (green):**
- GPS data sampling: 30-second
- Arclength: 24-hour reduced-dynamic orbit

The reduced-dynamic POD methodology is based on 6-minute constant accelerations and is described in [Jäggi, 2006]. The gravity field model EIGEN-2G03C [Forste, 2005] is used as an initial gravity field. The analysis of the orbit consistency in the radial, along-track, and cross-track directions.

**GRACE Double Difference Reduced-Dynamic POD**

This part of the poster presents GRACE A and B orbit solutions with 24-hour orbital arclength for the days 243/2003 to 256/2003 using 30-second double-difference GPS data. 50 well selected IGS ground stations were used to form the Ground-Space (GS) baselines (coordinate and troposphere solutions were introduced as known from CODE).

**Float Solution D (black), E (cyan):**
- Baselines GS-A and GS-B (D), or GS-A and B-A (E)

**Fixed Solution F (magenta):**
- Like solution E, but fixed space-baseline ambiguities

**30-Hour Processing**

This part of the poster presents GRACE A and B orbit solutions observed over midnight (= observation file boundary) from GRACE A (top) and CHAMP (bottom). Discontinuities seem to occur only for GPS observations from GRACE. Continuous phase observations over observation file boundaries are important if LEO arcs longer than 24 hours shall be generated, e.g., 30-hour arcs for GOCE. Kinematic, and to some extent also reduced-dynamic orbit solutions weaken narrow-lane ambiguities to be set only for all GPS satellites at midnight.

**30-Hour Satellite Tracking**

The poster presents activities at the Astronomical Institute of the University of Bern (AIUB) in the field of precise orbit determination (POD) for Low Earth Orbiters (LEO) using the GPS. They are currently focused on the two GRACE satellites and range from general studies about reduced-dynamic and kinematic POD based on zero- and double-difference observations to the implementation and testing of the POD procedures in the framework of the High-Level Processing Facility (HPF) for ESA’s upcoming GOCE mission.

**GOCE HPF Project**

AIUB is responsible for the Precise Science Orbit (PSO) determination of the GOCE satellite. The PSO includes a kinematic (1 sec) and a reduced-dynamic (10 sec) orbit solution. For this purpose a general zero-difference LEO POD procedure was developed which is also used for the GRACE processing presented on this poster. GOCE observations will have 1-second data sampling. Studies showed that 5-second clock corrections (linearly interpolated to 1 sec) are needed to reach the expected accuracy.

**Orbit Determination of Low Earth Satellites at AIUB**

IGS Workshop, ESOC, Darmstadt, Germany, May 8-12, 2006

Poster compiled by A. Jäggi and H. Bock, May 2006