

THE CHAMP GPS OCCULTATION EXPERIMENT: RESULTS ACHIEVED AND FUTURE PROSPECTS

J. Wickert*(1), G. Beyerle (1), L. Grunwaldt (1), R. Koenig (1), T. K. Meehan (2), Ch. Reigber (1), and T. Schmidt (1)

(1) GeoForschungsZentrum Potsdam (GFZ), Potsdam, Germany (2) Jet Propulsion Laboratory (JPL), Pasadena, CA, U.S.A.

The German geoscience satellite CHAMP (CHALLENGING Minisatellite Payload, launched on July 15, 2000) is in orbit now for about 2 years. CHAMP's measurements are used to determine Earth's gravity and magnetic field and to derive precise information about vertical temperature, humidity and electron density distribution on a global scale using the innovative GPS (Global Positioning System) radio occultation technique.

Starting with seven occultations, recorded during a one hour period on February 11, 2001, more than 40,000 occultations were measured within the first year of CHAMP's GPS radio occultation experiment. Since February 2002 CHAMP continuously provides up to 270 neutral atmosphere and up to 200 ionosphere occultation measurements per day. As the CHAMP mission is expected to last until 2005, a unique long-term data set of GPS occultation measurements is anticipated.

Due to improved instrument characteristics (state-of-the-art GPS occultation receiver provided by JPL, optimized occultation antenna) compared to the proof-of-concept mission GPS/MET (GPS/Meteorology), a significantly higher percentage of the CHAMP data reaches closer to the Earth's surface and can be analysed continuously despite of the Anti-Spoofing status of the GPS. The data stream from the satellite (combined with precise orbit data of CHAMP and the GPS satellites and data from a global fiducial ground network) is analysed at the GFZ Potsdam using an operational processing system. The resulting atmospheric data products are provided by GFZ's Information System and Data Center (ISDC) to scientific users.

The results of processing more than one year of CHAMP atmosphere occultation data and aspects of the processing itself are reviewed: 1) Quality of the derived atmospheric data products, 2) Consequences of the termination of Selective Availability of the GPS for occultation processing, 3) Application of wave optics based analysis methods to the CHAMP data in the lower troposphere 4) Demonstration of the capability for operational provision of occultation data for possible use within data assimilation for Numerical Weather Prediction using a near-polar satellite receiving station at Spitsbergen.

Besides CHAMP, also the GPS occultation experiment onboard the Argentine SAC-C satellite (launched on November 21, 2000) was successfully activated. The data are provided for several campaigns by JPL. Together with the U.S.-German twin-satellite mission GRACE (Gravity Recovery And Climate Experiment, launched on March 17, 2002), capable to record setting as well as rising occultations, hopefully three successful GPS occultation experiments will provide up to 1,000 occultations daily in the next future.