

GNSS RADIO OCCULTATION AT GFZ: RECENT RESULTS AND ACTIVITIES

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During the last decade GNSS techniques for ground and space based atmo-spheric/ionospheric remote sensing were established. The atmospheric refraction, error source for the majority of geodetic applications, is used as measurement signal. Atmospheric properties as globally distributed vertical profiles of refractivity, temperature, water vapor and electron density can be derived from space based techniques. Ground based measurements, provided by global and regional networks, allow for the derivation of vertically or along the line-of-sight (slant) integrated water vapor (IWV, SWV) or electron density content (TEC). In addition, the analysis of GPS signals, reflected from water and ice surfaces can be used to derive properties of these surfaces, as, e.g., altitude information or wave heights. GFZ is active in these various fields of GNSS remote sensing. Here we focus to recent results of space based GNSS radio occultation measurements?. The status of the GPS radio occultation (RO) experiments aboard the satellites CHAMP, GRACE-A and the German radar satellites TerraSAR-X and TanDEM-X is reviewed. The CHAMP mission is expected to end in September 2010, its measurements are continued by GRACE-A. Recent GFZ results from operational data analysis of the TOR (Tracking, Occultation and Ranging) experiment aboard TerraSAR-X are presented. TerraSAR-X, together with TanDEM-X, form a twin-radar-satellite configuration in orbit since June 21, 2010, when TanDEM-X was successfully launched from the Russian cosmodrome Baikonur. The status of the analysis of GPS-RO data from Metop (GRAS) at GFZ is also reviewed. Examples of scientific GNSS RO data applications at GFZ are given. These studies are also based on the COSMIC/FORMOSAT-3- data and include, e.g., climatological investigations of the vertical atmospheric temperature structure in troposphere and stratosphere as well as electron density irregularities in the E-region of Earths ionosphere. We also present results of a scientific-technical study for the realisation of a small satellite mission aimed to GNSS based remote sensing. The study was performed in cooperation with Technical University Berlin and regional industry from Berlin/Brandenburg. The satellite MicroGEM is foreseen to apply GPS/Galileo radio occultation and to pioneer the space based application of coherent reflectometry for remote sensing of water and ice surfaces. Last but not least the status of recent airborne GNSS reflectometry/occultation experiments is reviewed. Commercial of the Shelf (COTS) GNSS receivers are foreseen to be used aboard the German airship Zeppelin NT at the lake Bodensee region and the German research aircraft HALO (High Altitude and Long Range aircraft) during the GEO-HALO experiment at the Aegean Sea, Mediterranean.