

GPS REMOTE SENSING: RECENT RESULTS FROM GFZ

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Abstract: During the last decade GPS techniques for ground and space based atmospheric/ionospheric remote sensing were established. The atmospheric refraction, error source for the majority of geodetic applications, is used as measurement signal. Atmospheric properties, as, e.g., 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) or electron density (Total Electron Content) content. 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.

We review recent GPS remote sensing results from GFZ. The status of the GPS radio occultation (RO) experiments aboard the satellites CHAMP, GRACE-A and TerraSAR-X is reviewed. Examples of scientific applications of the GPS RO data are given, e.g. climatological investigations of the vertical atmospheric temperature structure based on the long term data set from CHAMP/GRACE (2001-2009) or ionospheric irregularities in the E-region of the Earth's ionosphere.

We also show recent results of ground based monitoring. Observations of the regionally densified German network (about 350 stations) are processed in Near-Real-Time to provide IWV data, which are assimilated by several European weather centers. In addition the slant data from these stations are used as basis for 3D-tomographic water vapor reconstructions.

Finally we briefly introduce results and review the status from recent ground and airborne

GPS reflectometry/scatterometry experiments at GFZ.