Geophysical Research Abstracts, Vol. 9, 06940, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06940

GPS water vapour tomography with the German GPS network

M. Bender (1), J. Wickert (1), G. Dick (1), M. Rothacher (1), A. Raabe (2)

(1) GeoForschungsZentrum Potsdam, Telegrafenberg, 14473 Potsdam, Germany (bender@gfz-potsdam.de, wickert@gfz-potsdam.de) (2) Institut für Meteorologie, Universität Leipzig, Stephanstraße 3, 04103 Leipzig, Germany (raabe@uni-leipzig.de)

Precise knowledge about the temporal and spatial variations of the atmospheric water vapour is essential for climate research as well as for various other applications, e. g. weather forecast, hazard mitigation and water management. Remote sensing of the atmosphere by means of GNSS techniques can provide humidity information with high temporal and spatial resolution for all weather conditions.

First 3D humidity fields obtained with measurements from the German GPS network will be presented. The tomographic reconstruction of the absolute humidity in the troposphere is based on GPS data provided by almost 250 stations. The GPS data are processed to isolate the slant wet delay (SWD), i. e. the delay of the GPS signal due to the water vapour. Using approx. 1,000 SWD values the wet refractivity N_{wet} of the troposphere has been reconstructed. The humidity is closely related to N_{wet} and can be obtained by making use of additional synoptic data.

Further studies based on simulated data show the great potential of tomographic GNSS water vapour retrieval systems. The results obtained with simulated networks of increased density are compared with the recent state. Comparative tomographic studies demonstrate the impact of several parameters on the finally reconstructed field, such as the spatial resolution of the 3D grid, the elevation cut-off angle and the error level of the GPS data.

The preconditions of the temporally and spatially variable GPS data with respect to tomographic applications are illustrated for different meteorological situations.