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New Global ZWD/IWV Conversion Models for the Meteorological Application of GNSS Using Numerical Weather Model Data

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The satellite observations are processed to estimate the zenith/slant tropospheric delays. These delays can be divided into the hydrostatic (ZHD) and wet (ZWD) parts. The latter one is closely related to the water vapour content of the atmosphere. The tropospheric zenith wet delay (ZWD) can be converted to integrated water vapour (IWV) using a simple scale factor (Q). This scale factor is usually estimated as a function of the surface temperature by empirical equations derived from regional radiosonde observations. The most widely used models are the ones given in Bevis et al. 1992 and Emardson-Derks (2000). Although these models rely on North-American and European radiosonde observations, they are widely used on different places of the globe for GNSS meteorology.

At the Bevis model the mean temperature of atmospheric water vapour is computed using an empirically derived linear function of the surface temperature. Therafter the scale factor can be computed. At the Emardson-Derks model the Q factor is estimated as a direct function of the surface temperature using a second order polynomial with four empirical constants. The temperature, the relative humidity and the geopotential of 37 pressure levels of the ECMWF ERA-Interim numerical weather model (NWM) monthly mean solutions are used for the computations for the period of 2001-2010, with 1°x1°resolution for the whole globe.

Our research aims to derive similar empirical functions using global numerical weather models for a global grid. Thus a global model can be developed, which takes into consideration the regional climatic effects in the ZWD/IWV conversion. Our models are also validated by a global set of radiosonde observations.