



Assimilation of GNSS single-frequency derived ZTDs into the WRF model

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Most GNSS receivers, in particular mass-market receivers, provide only single-frequency data with limited quality. In consequence, depending on the GNSS sensor, time series of tropospheric zenith total delay (ZTD) are obtained with different accuracy. Within this study, it is analysed if the accuracy of those data is adequate for assimilation into numerical weather prediction (NWP) models.

Therefore, GNSS ZTD estimates were derived from different solutions, i.e. (1) single-frequency code + phase data (processed by the use of RTKLIB package), and (2) single-frequency code data (processed by the Rokubun processing core). The obtained parameters were validated against reference values, i.e. (3) dual-frequency data (using RTKLIB). For all three runs, precise IGS final orbits and clocks (SP3) have been used. Moreover, in case of the single frequency runs (1-2), a regional ionospheric model was applied for compensation of ionospheric effects (IONEX files). The ionospheric parameters have been estimated from dual-frequency phase observations of a network of 46 GNSS reference stations, located in Austria and the bordering countries, for August 2nd, 2016.

Since the assimilation of ZTDs in weather forecast models is a complex task, first a proper characterisation of the observation errors has been carried out. For the assimilation of the ZTDs into the Weather Research and Forecasting Data Assimilation model, three-dimensional variational assimilation (WRFDA 3DVar) system was utilised. For the assimilation the 36-km resolution domain over Europe has been performed. In order to assess an impact of the ZTD estimated from different solutions on the weather forecast, a forecast accuracy analysis was carried out against Global Forecast System (GFS) data, using the Forecast Sensitivity to Observations (FSO) package has been verified. Within this presentation the validation of the 24-hour weather forecast after the assimilation of single-frequency GNSS ZTD in the comparison with reference data is shown.