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Estimation of near real-time tropospheric delays from a nationwide reference station network and their assimilation into weather forecast models

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The microwave signals of the GNSS satellites (GPS, GLONASS and in future GALILEO) are time delayed when passing the atmosphere. Based on this signal delay, e.g. the humidity distribution within the troposphere can be determined. This presentation deals with the preliminary results of the project GNSSMET-AUSTRIA initiated in late 2009 as a cooperation of the Institute of Geodesy and Geophysics, Vienna and the Central Office for Meteorology and Geodynamics (ZAMG). The goal of GNSSMET-AUSTRIA is to investigate if and how the atmospheric precipitable water content (derived from GNSS data) can be used within an operational Nowcasting system (ALADIN). It has been proved that e.g. passing weather fronts can be analysed much better by introduced GNSS derived tropospheric wet delays because this data is influenced by changes in humidity in the free atmosphere, whereas the data at the meteorological ground stations reacts to these changes only with a time delay. This allows to forecast heavy rainfall causing potentially local floodings more reliable and to narrow down the affected region.

GNSSMET provides integral humidity values estimated from data of a 40 stations GPS and GLONASS network covering the whole Austrian territory with a spatial resolution of about 50 km and a temporal resolution of 1 hour. These values shall be assimilated into ALADIN and analysed regarding their influence on the forecast model. Additionally, results of some innovative approaches in data modelling (Global Mapping Function, PPP, tomography) are tested and will be presented.