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Near Real-Time Estimation of Tropospheric Zenith Total Delays and Coordinate Monitoring

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The near real time estimation (NRT) is the activity mostly applied in the practice for integration of tropospheric zenith total delays (ZTD) to the weather processes for use in nowcasting and forecast verification. Accuracy of estimation of the tropospheric zenith delays using GPS observations is not only a condition of the precision of the orbits used for data processing but also of the extension and of the density of a network. Generally, for more accurate determination of delays of satellite signals in the ionosphere and troposphere all baselines in the network have to be short and height differences between the stations to be small.

The network of the NRT analysis at BKG consists of approx. 100 stations distributed over various European countries. The estimated ZTD parameters are integrated into the EUMETNET GPS water vapour programme for weather forecast service (E-GVAP, http://egvap.dmi.dk) on an hourly basis. The ZTD estimates are converted into integrated water vapour (IWV) using nearby SYNOP stations. As products IWV maps for Europe (24 hours loop), for Germany (24 hour loop), and for the United Kingdom (6 hour loop; frequency 15 minutes) are provided. As a quality check, the ZTD estimates of stations closely together, e.g. WTZR and WTZJ, on the same tower (distance amounts to 1.7 m) are compared regularly in certain periods.

Beyond that, as a second leg of the NRT analysis, coordinate monitoring can be used for station monitoring. Within the EUREF Permanent Network (EPN, http://epncb.oma.be) a new rapid combination has been established with the BKG NRT solution as one of the inputs. However, the very advantage of the NRT lays in

the fact that with the NRT, the variations of station positions at the subcm-level, e.g., caused by a natural disaster or occured due to strongly weather changes within a day, can be detected in due time. Near real time data processing with ultra rapid orbit is well suitable for the observation of the nature disaster which causes at least 3 cm of movement in the earth's crust. For the examination of smaller movements of the earth's crust data evaluation using final precise orbits is a prerequisite.