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Heterogeneity of residuals from comparison of GNSS and raytracing based troposphere slant total delays, as an indicator of hydrometeors

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Post-fit residuals from Precise Point Positioning (PPP) carry the troposphere information except of multipath and residual antenna Phase Centre Variations (PCVs), when precise satellite orbits and clocks were introduced. Slant total delay (STD) of GNSS signal is a sum of a priori slant hydrostatic delay, estimated wet delay, asymetry introduced by the estimated zenith total delay (ZTD) horizontal gradients and a post-fit residual reduced by the systematic (site-dependant) effect. It was revealed, that application of reduced post-fit residuls to the slant total delays obtained from GNSS data processing increases the discrepancy with slant delays from raytracing (RT) through the Numerical Weather Model (NWM). One of the possible sources of that effect is neglected influence of hydrometeors in raytracing procedures. If the assumption of hydrometeor information existence in the PPP post-fit residuals is correct, we expect the diversity of slant delay discrepancies for satellite-receiver rays pointing or not the hydrometeors.
Paper presents the spatial and temporal correlation analysis of the slant delay residuals (GNSS - RT) with hydrometeor phenomena recorded during the COST ES1206 GNSS4SWEC benchmark period (May 5th - June 29th, 2013). It presents the discussion of the results from different GNSS PPP slant delay estimation approaches including coordinates unconstraining or heavy constraining, and the calculation of slant delays with and without ZTD horizontal gradients estimation.