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Impact of tropospheric mismodelling in GNSS precise point positioning: a simulation study utilizing ray-traced tropospheric delays from a high-resolution NWM

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In the GNSS analysis the tropospheric delay is parameterized applying Mapping Functions (MFs), zenith delays and tropospheric gradients. Thereby, the wet (hydrostatic) MF is derived under the assumption of a spherically layered troposphere. The coefficients of the closed-form expression are computed utilizing a climatology or Numerical Weather Model (NWM) data. In this contribution we analyse the impact of the tropospheric mismodelling on estimated parameters in Precise Point Positioning (PPP). This is done in that we mimic PPP in an artificial environment, i.e. we make use of the linearized observation equation where the observed minus modelled term equals ray-traced tropospheric delays from a high-resolution NWM. The estimated parameters (station coordinate residuals, station clock residuals and tropospheric parameters) are then compared with the perfectly known values. The byproduct of the simulation study is a new closed-form expression for the wet MF. Its success in practice depends on the ability of current (future) NWMs to predict the coefficients of the new closed-form expression.