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# Performance assessment of the COAMPS numerical weather prediction model in precise GPS positioning: EUPOS network case study

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The Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS®) represents a complete three-dimensional data assimilation system comprised of data quality control, analysis, initialization, and forecast model components. COAMPS has been developed by the Marine Meteorology Division (MMD) of the Naval Research Laboratory (NRL). The U.S. Navy uses the system for short-term numerical weather predictions for various regions of the world. Currently COAMPS ver.3.1 is also operated and tested at the Department of Civil Engineering and Geodesy of the Military University of Technology, Warsaw, Poland (MUT). It is primarily used for military applications, but also a new module has been developed to provide tropospheric zenith total delays (ZTD) for stations of the Polish part of the European Position Determination System (EUPOS). ZTDs can be obtained in both near-real time and several hours ahead.

In the highest-precision GPS applications tropospheric delays are usually estimated from satellite observables. When processing long baselines the common practice is to derive the hydrostatic component from any troposphere model and use it as a priori information. The non-hydrostatic part is estimated in the adjustment along with station coordinates. The change of satellite geometry during the observational session allows overcome high correlation between the tropospheric delays and the station height components. However, when processing very short sessions and medium baselines, this change is too small and does not allow estimating reliable ZTDs. Hence, ZTD are derived from troposphere models and used for correction of GPS data in the processing.

This contribution presents the application of COAMPS-derived ZTDs in precise GPS positioning when using short data spans (1–5 minutes) and processing medium baselines (50-80 km). The presented tests were performed in two areas: Wielkopolska Lowland (all stations located at similar heights), and Carpathian Mountains (where station height differences run into several hundreds of meters). The ZTDs derived from COAMPS model were used for correcting GPS observations. The ZTDs were mapped into slant delays using several mapping functions also these derived from numerical weather models (NWM), namely: VMF1, GMF, UNBab and Niell. Mapping functions and ZTD based on NWMs are said to provide the best troposphere modeling nowadays. About 200 sessions were processed in order to analyze accuracy and repeatability of the derived station coordinates. The results were compared to the ones obtained with application of simple Modified Hopfield model as well as well-established UNB3m neutral atmosphere model. Another tested and compared approach was the modelling of the tropospheric delays at the reference station network and then providing the interpolated corrections to the user receiver. All the processing was performed with use of GINPOS software developed at the University of Warmia and Mazury in Olsztyn (UWM).