Geophysical Research Abstracts
Vol. 18, EGU2016-591, 2016
EGU General Assembly 2016

Impact of selected troposphere models on Precise Point Positioning convergence

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The Precise Point Positioning (PPP) absolute method is currently intensively investigated in order to reach fast convergence time. Among various sources that influence the convergence of the PPP, the tropospheric delay is one of the most important. Numerous models of tropospheric delay are developed and applied to PPP processing. However, with rare exceptions, the quality of those models does not allow fixing the zenith path delay tropospheric parameter, leaving difference between nominal and final value to the estimation process. Here we present comparison of several PPP result sets, each of which based on different troposphere model. The respective nominal values are adopted from models: VMF1, GPT2w, MOPS and ZERO-WET. The PPP solution admitted as reference is based on the final troposphere product from the International GNSS Service (IGS). The VMF1 mapping function was used for all processing variants in order to provide capability to compare impact of applied nominal values. The worst case initiates zenith wet delay with zero value (ZERO-WET). Impact from all possible models for tropospheric nominal values should fit inside both IGS and ZERO-WET border variants. The analysis is based on data from seven IGS stations located in mid-latitude European region from year 2014. For the purpose of this study several days with the most active troposphere were selected for each of the station. All the PPP solutions were determined using gLAB open-source software, with the Kalman filter implemented independently by the authors of this work. The processing was performed on 1 hour slices of observation data. In addition to the analysis of the output processing files, the presented study contains detailed analysis of the tropospheric conditions for the selected data. The overall results show that for the height component the VMF1 model outperforms GPT2w and MOPS by 35-40% and ZERO-WET variant by 150%. In most of the cases all solutions converge to the same values during first hour of processing. Finally, the results have been compared against results obtained during calm tropospheric conditions.