The Effect of the State-of-the-Art Mapping Functions on Precise Point Positioning

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Global Navigation Satellite Systems (GNSS) are effectively used for different applications of Geomatic Engineering. There are lots of model error sources that affect the performance of the point positioning. Especially for the Precise Point Positioning (PPP) technique, which depends on the absolute point positioning, these errors should be modelled since PPP technique utilizes undifferenced and ionosphere-free combinations. Studies about PPP technique show that the effect of tropospheric delay caused by water vapor and dry air in the troposphere, which affects GNSS signals, is an important parameter should be modelled. Total zenith delay consists of both hydrostatic and wet delay. Hydrostatic delay can be accurately estimated by using atmospheric surface pressure and height with empirical models. Although there are many empirical models currently used for the determination of the zenith wet delay, the accuracies of these models are inadequate due to the temporal and spatial variation of atmospheric water vapor. Moreover, the tropospheric delay occurs along the path of GNSS signals and the Mapping Functions (MFs) are used to convert the tropospheric signal delay along the zenith direction to the slant direction. In this study, it is aimed to measure the effect of the globally produced MFs as Niell Mapping Function (NMF), Vienna Mapping Function 1 (VMF1), Global Mapping Function (GMF) and Global Pressure Temperature model 2 (GPT2) for GNSS positioning accuracy. Only GPS satellite system has been taken into account. For the analysis it has planned to process approximately 294 permanent stations from Crustal Dynamics Data Information System (CDDIS) archive with Jet Propulsion Laboratory’s GipsyX v1.2 software. In order to reveal the effect of different season the GPS observations in January, April, July and October, 2018 have been obtained. The solutions were derived for different session durations as 2, 4, 6, 8, 12 and 24 hours for each global MFs and root mean square values have been estimated for each session durations.

Keywords: State-of-the-Art Mapping Function, Troposphere, Precise Point Positioning, Accuracy, GipsyX