Analyzing the Tropospheric Delay Estimates on Global Navigation Satellite Systems (GNSS) with Precise Point Positioning (PPP) Services using the goGPS software.

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The tropospheric delay is an essential source of error for positioning using the Global Navigation Satellite System (GNSS). Scientific applications of GNSS positioning such as the study of earth crust deformation and earthquake prediction require high accuracy in positioning, an analysis of tropospheric delay calculations is needed to improve the accuracy of GNSS positioning. One part of the tropospheric delay is Zenith tropospheric delays (ZTD), which are estimated using the Precise Point Positioning (PPP) method. ZTD estimates can be beneficial for meteorological applications, for example, is the estimation of water vapor levels in the atmosphere from the estimated ZTD. We use GNSS data from the BAKO station in Cibinong and JOG2 station located in Yogyakarta. The GNSS data format is an Independent Exchange Receiver (RINEX) which we extracted using the sophisticated open-source GNSS software, called goGPS version 1.0 Beta from Geomatics Research and Development s.r.l. - Lomazzo, Italy. We validate the results of the extraction process with two international tropospheric products from International GNSS Services (IGS) with commercial software Bernese version 5 and the University of Nevada Reno (UNR) with software from NASA Jet Propulsion Laboratory (JPL) namely GIPSY / OASIS II. Epoch in this study, we use days of the year (DOY) 022-025 / 22-25 January representing the rainy season and DOY 230-233 to coincide on August 17-20 representing the dry season 2018. Then we use DOY for a full month in January 2018 and August 2018 to determine the value of Zenith Wet Delay (ZWD). Our results obtained RMS values throughout DOY, both at BAKO and JOG2 stations showing small values < 2 mm. The RMS value is relatively minimal, meaning that the troposphere estimation process with goGPS shows good agreement because it is almost the same as the international troposphere product from UNR and IGS. Then the RMS values, both in January and August and the two BAKO and JOG2 stations, are relatively consistent and work well at different times and stations. ZWD values tend to be higher in the rainy season than in the dry season, which shows that ZWD can be useful for meteorological purposes.

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