Estimation Atmospheric parameters for Weather Study and Forecast over Equatorial Regions Using Ground-Based Global Position System

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Abstract : There are various models to estimate the neutral atmospheric parameter values, such as in-suite and reanalysis datasets from numerical models. Accurate estimated values of the atmospheric parameters are useful for weather forecasting and, climate modeling and monitoring of climate change. Recently, Global Navigation Satellite System (GNSS) measurements have been applied for atmospheric sounding due to its robust data quality and wide horizontal and vertical coverage. The Global Positioning System (GPS) solutions that includes tropospheric parameters constitute a reliable set of data to be assimilated into climate models. The objective of this paper is, to estimate the neutral atmospheric parameters such as Wet Zenith Delay (WZD), Precipitable Water Vapour (PWV) and Total Zenith Delay (TZD) using six selected GPS stations in the equatorial regions, more precisely, the Ethiopian GPS stations from 2012 to 2015 observational data. Based on historic estimated GPS-derived values of PWV, we forecasted the PWV from 2015 to 2030. During data processing and analysis, we applied GAMIT-GLOBK software packages to estimate the atmospheric parameters. In the result, we found that the annual averaged minimum values of PWV are 9.72 mm for IISC and maximum 50.37 mm for BJCO stations. The annual averaged minimum values of WZD are 6 cm for IISC and maximum 31 cm for BDMT stations. In the long series of observations (from 2012 to 2015), we also found that there is a trend and cyclic patterns of WZD, PWV and TZD for all stations.

Keywords : atmosphere, GNSS, neutral atmosphere, precipitable water vapour

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