TOWARDS AN OPERATIONAL NEAR REAL TIME METEOROLOGY ON THE AFRICAN GNSS NETWORK: CHALLENGES AND BENEFITS

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ABSTRACT

An important goal in modern weather prediction is to improve short- term weather forecasts, especially of severe weather and precipitation which largely depends upon position from the equator. However, the ability to achieve this goal is hindered by the lack of timely and accurate observations of atmospheric water vapour, which is one of the most poorly measured and least understood constituents of the earth`s atmosphere due to its high temporal and spatial variability. This situation is being addressed by the Global Positioning System (GPS) technology. GPS signals are slowed and bent by changes in temperature, pressure and water vapour in the atmosphere. Traditionally, the GPS signal propagation delay is considered a nuisance parameter that is an impediment to obtaining precise coordinates using GPS receiver. Recent development in GPS precise positioning and orbit determination has enabled the atmospheric parameters to be determined to a high degree of accuracy on a routine basis, using continuous tracking data from ground based GPS receivers. This paper focuses on the meteorological applications with the existing and anticipated GNSS reference stations in the African region, and the need to measure atmospheric water vapour content in Near-Real-Time (NRT). The technical issues to implement NRT GPS water vapour estimation is also discussed, including the data requirements for meteorological and climate applications, NRT data processing and quality control procedures for GPS orbits. Finally, the three (3) days experimental GPS Precipitable Water Vapour (PWV) residuals from NRT and post data processing for ten (10) IGS tracking network stations within and around the African region were compared. The results are presented herein.

Keywords: Global Navigation Satellite System (GNSS), Continuous Operating System (CORS), Zenith Tropospheric Delay (ZTD), Near-Real-Time GPS (NRT GPS), Integrated Water Vapour (IWV), Zenith Wet Delay (ZWD), Zenith Hydrostatic Delay (ZHD)

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