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Comparative studies of Traveling Ionospheric Disturbances (TID) at North, South and Equiturial African Continent

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This article presents the results of medium-scale travelling ionospheric disturbance (MSTID) observations that were obtained using Global Positioning System - Total Electron Content (GPS-TEC) data obtained from the arrays of GPS ground-based stations situated at the three geographical sectors (southern hemisphere (SH), northern hemisphere (NH) and equatorial ionization anomaly (EIA) zone) of African region, with each array in triangle configuration. In this study, we consider selected days of moderate and below moderate geomagnetic conditions (kp $\leq$ 4), during different solar activity years; i.e. 2008 (low solar year with average sunspot number (Rz) of 4), 2014 (high solar year with Rz =113) and 2016 (moderate solar year with Rz =41). The sporadic MSTID structures with a varying magnitude which are latitudinal dependent were detected in all the sectors as observed from the GPS-TEC data. Some propagation characteristics of the MSTID were estimated, with most observed MSTID signal indicating two different dominant times periods (short and long periods). The dominant periods were determined by applying wavelet theory on the GPS-TEC perturbation results. Statistical angle of arrival and Doppler method for GPS interferometry (SADM-GPS) algorithm was employed, and the mean horizontal velocity and the dominant periods (long) for the selected days were obtained to be: ($\sim$ 192m/s, $\sim$90 minutes (mins)), ($\sim$242m/s, $\sim$78 mins) and ($\sim$ 116m/s, $\sim$90 mins) for SH, NH and EIA respectively. In total, the results show that period and phase speed is different in each sector in terms of regional comparison except for phase speed from SH and EIA zone which tends to be a little more similar. The study shows that MSTIDs were progressively propagating towards the equator (i.e. equatorward direction).