

Ionosphere over Africa: Results from Geomagnetic Field and GPS measurements During International Heliophysical Year IHY

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Space Environment Research Centre of Kyushu University, Japan, installed 13 units of Magnetic Data Acquisition Systems MAGDAS over Africa during the International Heliophysical Year IHY. Institute for Scientific Research Bolton College USA in collaboration with the Aeronomy and Radiopropagation Laboratory of International Centre for Theoretical Physics, Italy, has jointly placed over 15 units of GPS systems over Africa suitable for total electron content TEC and ionospheric scintillation studies. Magnetic records from 10 stations along the African 96o Magnetic Meridian (Geographical 30o ? 40o East) were examined for Solar quiet daily Sq variations in the three geomagnetic field components H, D and Z. Latitudinal variations of Sq in the geomagnetic components were examined. Signatures of equatorial electrojet and worldwide Sq were identified and studied in detail. H field experienced more variation within the equatorial electrojet zone. Diurnal and seasonal variations of the geomagnetic variations in the three components were discussed. Sq H is expectedly consistently maximum within the electrojet zone as a result of EEJ. Sq Z demonstrates 2 sunrise maxima at about +20o and -30o degrees; maintain a single maximum at noon and sunrise. Sq D has maximum values at about -20o (sunrise), -10o (noon time) and +10o (sunset). Levels of inter-relationships between the Sq and its variability in the three components were statistically derived and interpreted in line with the mechanisms responsible for the variations of the geomagnetic field. Data from 2 magnetic observatories within equatorial electrojet EEJ strip and 2 stations outside the EEJ strip were employed to evaluate and study the signatures of the Equatorial electrojet over the African sector. The transient variations of the EEJ at two almost parallel axes using Lagos-Ilorin and Nairobi-Addis pairs were examined. The EEJ appear stronger in East than West Africa. Complementarily data from GPS was used to study diurnal and seasonal variations of TEC and occurrence of Scintillations over some selected stations in Africa. TEC maximizes in daytime at about local noon and exhibits seasonal redistribution. TEC exhibits spatial variation over Africa. Participation of Africa in International Space Weather Initiative ISWI is discussed.

Keywords: Equatorial Electrojet, TEC, Scintillations, Geomagnetic data