RADIO REFRACTIVITY GRADIENT OVER NIGERIA USING CM-SAF SATELLITE RETRIEVED DATA

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ABSTRACT

Variations of radio refractivity gradients at the low level, mid-level and upper level of the atmosphere are presented for 26 stations in Nigeria using NOAA 15, 16 and 18 satellite data retrieved from the Department of Satellite Application Facilities on Climate Monitoring (CM-SAF), DWD, Germany. The selected stations were distributed across the four climatic regions making up Nigeria, viz: coastal region and the guinea savannah region in the southern part, the midland and the sub sahelian regions at the northern part. The data utilized are layered temperature, pressure and relative humidity taken at 0900hr and 1400hr for a period of four years from 2004 to 2007. Results have shown that refractivity gradient variations in each region are influenced by local orographic features and prevailing atmospheric conditions premised on the north-south movement of the Inter-Tropical Discontinuity (ITD). Super-refractive condition has been found to be prevalent at the southern stations (coastal and guinea savannah regions) while at the midland and the sub sahelian regions, the atmosphere is mostly sub-refractive. At all the stations and regions, dry season period has been found to favour super refraction, a condition that decreases northward. Seasonal average of effective earth radius (k-factor) has been established for each of the four climatic regions. High coefficient of determination (CD) as high as 99.99% was obtained at the low level using least square analysis between $\Delta N$ and $N_s$, at both the coastal and guinea savannah regions. At midland regions it is ranged between 64 and 97% while at the sub-sahelian region CD ranged from 37% - 53%.

Keywords: Radio wave, Refractivity gradient, effective earth radius factor and super-refraction.

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Received: 2012/03/28

Accepted: 2012/09/20