

Climatology of GPS amplitude scintillations over equatorial Africa during the minimum and ascending phases of solar cycle 24. (2015).

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Abstract

Abstract

This study characterizes African equatorial scintillations at L-band frequency during the minimum and ascending phases of solar cycle 24. Three years' (2009–2011) of amplitude scintillation data from three African equatorial GPS stations, namely; Lagos (6.48°N, 3.27°E, dip: 4.95°S), Nigeria; Nairobi (1.16°S, 36.80°E, dip: 10.65°S), Kenya; and Kampala (0.30°N, 32.50°E, dip: 11.12°S), Uganda were used for this investigation. We grouped the data into daily, monthly, seasonal, and yearly scales, at elevation angles greater than or equal to 30°. Scintillations exhibit daily trend of occurrences during the hours of 1900 LT–0200 LT, with higher occurrence levels being localized within the hours of 2000–2300 LT. Generally, highest scintillation occurrences were recorded during equinoxes and the least during June solstice. Intriguingly, over equatorial Africa, January was observed to be a non-scintillation month, and post-midnight scintillations were observed during June solstice months, although at weak intensities. Scintillations were also observed to increase with solar and geomagnetic activities. These results would support the development of future African equatorial scintillation models, which could also be of support to the implementation of global navigation satellite system (GNSS)-based navigation in Africa.

Keywords: African equatorial ionosphere· Scintillations· GNSS· Aviation· Solar cycle 24

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