Extended Abstract: Climatology of ionospheric amplitude scintillation on GNSS signals at South American sector during solar cycle 24

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Scintillations are caused by ionospheric irregularities and can affect trans-ionospheric radio signals from Global Navigation Satellite Systems (GNSS), High Frequency (HF) communication, and the satellites control system. Scintillation is expected to increase during solar maximums and at certain locations, such as the Equatorial Ionospheric Anomaly (EIA) crests, which are located at ~15-20º north and south of magnetic equator and have the maximum plasma density at the ionospheric F-region, whereas at magnetic equator, such density is minimum [1], and the South Atlantic Magnetic Anomaly (SAMA), where the weakest geomagnetic field on Earth allows precipitations of energetic particles from the inner radiation belt to the atmosphere [2]. Thus, knowing how the scintillation behaves in different periods of solar cycle, as well as at different locations, can be a useful tool to forecast the accuracy of navigation systems and to predict when and where the tracking obstruction is likely to occur.

In this work, we investigate the amplitude scintillation at South American (SA) sector during the full solar cycle 24, from 2009 to 2019, using S4 index, in order to understand its behavior over a region affected by large probability of small-scale irregularities formation due to the presence of the crests of the EIA and at the SAMA, for magnetic latitudes lower than 40º.

Preliminary results show that the scintillation increases according to the solar activity, attaining higher values during solar maximum. On the other hand, during solar minimum, the ionization density is reduced and the scintillation decreases. The scintillation is of lower intensity at magnetic equator and higher intensity at low latitudes near the northern and southern crests of EIA, being more pronounced during spring and summer seasons of solar maximum, and after sunset hours, which suggest a strong effect of plasma bubbles.

References

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