

GNSS Derived Ionospheric TEC Observed Through Different TEC Calibration Techniques in the Brazilian Sector

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Global Navigation Satellite System (GNSS) is becoming a reliable tool for use in air navigation systems. Its use as the main technology for determination of airplanes positioning has various economic and logistic benefits but it depends strongly on the ionospheric layer influences. The Brazilian sector ionosphere, mainly over the equatorial ionization anomaly (EIA), presents remarkable errors in the GNSS signal as compared to North America and Europe. In order to study the total electron content latitudinal variation of the Brazilian ionosphere we used a pair of GNSS receivers on the ground, one located in the equatorial region (Sao Luis) and other in the southern crest of the EIA (Cachoeira Paulista), to collect the GNSS observables and calculate the vertical TEC using different methods that has proven to work well to describe the ionospheric behavior in the North America and in Europe. We compared this results with a modified Nagoya TEC calculation method used by the EMBRACE (Estudo e Monitoramento BRasileiro do Clima Espacial - Brazilian Study and Monitoring of Space Weather) program. This work intends to follow the performance of different TEC tuning methods to evaluate the spurious effects of the ionospheric EIA gradients in the TEC determination under typical conditions of the low-latitudes ionosphere in the Brazilian sector. The calculated TEC under different solar cycle conditions, geomagnetic activity, and seasonal variations show deviations in the performance of each method and stress the importance of well adjust the GNSS observations to local conditions in order to optimize the TEC evaluation. This study contributes to a better understanding of local GNSS signal errors in the global intent of offering conditions to improve the accuracy, integrity, availability, and continuity requirements for the use of GNSS for air navigation in South America.

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