Abstract

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The Brazilian equatorial and low-latitude regions are subject to various dynamic and electrodynamic processes. As a result, ionospheric modeling over this region remains a challenge. In this article, we present the results of the first observation of data ingestion into the climatological model, NeQuick, during both quiet and disturbed conditions over Brazil. The variation of the daily F10.7 solar radio flux, the main driver of the NeQuick model, strongly influences its performance in both space and time, especially during high solar activity. With data ingestion, using the local level of ionization, NeQuick's performance can be improved. We developed an algorithm to obtain the local effective ionization parameters (Az1 and Az2) using a single station in the equatorial trough and low-latitude regions, which are subsequently used in the NeQuick to reproduce vTEC at co-located stations. The model's input (effective ionization level) was obtained when the modeled vTEC best fits the measured vTEC at the reference stations Maraba (5.35° S, 49.11° S, dip lat.: 3.06° S; MABA) and Ourinhos (22.93° S, 49.88° S, dip lat.: 17.42° S; OURI). Statistical results show that the model's performance greatly improves after data ingestion, reproducing vTEC at all latitudes close to the reference stations in 2014. We found that NeQuick improved by 71 %, 74 %, 83 %, and 69 % after ingestion during the storm periods of 17–21 February, 10–14 April, 6–10 June, and 23–27 December in the low-latitude region at SJSP. Using the Az1 values obtained at MABA and Az3 at SALU during July 2014, NeQuick reproduces the critical frequency of the F2 layer with a percentage improvement of approximately 20 % and 37 % respectively.