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TOTAL ELECTRON CONTENT FROM GPS AND DPS WITH NEQUICK2 AND IRI-2016 MODEL OVER NIGERIA.

Abstract

The current contributions of Africa sector on the development and improvement of ionospheric models (IRI and NeQuick) are not adequate compared with the continuous support received from Asia and South America sector. In Africa sector, the paucity of ionospheric instrumentations over the equatorial region has a considerable effect on this shortcoming. On the basis of this, a comparison study was carried out to investigate the relationship between the GPS-, DPS-, IRI- and NeQ-TEC over an equatorial station during the quietest period and during a just ascending phase of low solar activity in the year 2010. Separately for the fact that the GPS-, DPS-, IRI- and NeQ-TEC exhibit solar zenith angle dependence, we also obtained exaggeration of plasmaspheric electron content (PEC) contribution that appears as an enhancement in the faster sunrise increase in the morphologies of DPS, IRI and NeQ-TEC compared with the GPS-TEC. The enhanced increment in DPS, IRI, and NeQ-TEC contributed to the larger percentage change of overestimations found during the pre-sunrise in May, June and July between GPS and DPS-TEC, June, July, October, and November between GPS and IRI-TEC and finally in June and July during the dusk time between the GPS and NeQ-TEC. This result indicates that during pre-sunrise, large correction factors need to be applied on all the modeled values especially during the June solstice of the IRI-model that revealed the largest percentage of all overestimation. The daytime GPS-TEC and DPS-TEC in April, September and December are approximately equal in values, this shows the accurate prediction of daytime DPS is possible in the absence of PEC contribution in the topside Ne model during the daytime. The dusk time DPS-TEC decay faster compared to the dusk time decay in GPS, IRI, and NeQ-TEC. We also reported the over-emphasized fountain effect signatures that appear as noontime depression in all the modeled parameters. Therefore, a model formulation needs to be introduced that will control the refill of the daytime bite-out found in the modeled data due to fountain effect. In the seasons, we found that all the TEC maximize during the March equinox and minimize during June solstice. The comparison of the season with respect to TEC follows similar signature obtained when the monthly median variation in TEC are compared.