



A comparison of the longitudinal variation of EIA using GIM and IRI

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We have studied the longitudinal variation of the Equatorial Ionization Anomaly (EIA) for the months of June and December solstice of the year 2015 using Global Ionosphere Map (GIM) and International Reference Ionosphere (IRI). We have investigated specifically the longitudes 10°E, 45°E, 45°W, 65°W, 95°E, 140°E, 165°W and for the local time from 7hr to 16hr. During June solstice, the GIM predicts the strongest EIA is noted in 95°E and weakest in 140°E. The highest longitudinal value of TEC is also found to be for 95°E at 13 LT. The EIA on the average is not observed over 140°E (single crest phenomenon). Mostly all the troughs have a shifting from north to south, with the troughs still in the magnetic equator or northern side. For 10°E and 45°E, both crests are in the northern side. For those longitudes which show single crest phenomenon, the peak TEC is found to be on the northern side. During December solstice, the GIM shows the EIA at all the studied longitudes, but for 45°W and 65°W the EIA is weak. The troughs for all the EIAs are found to be near the geomagnetic equator with stronger southern crests. For early hours when the EIA starts to develop, either both the crests are symmetric or the northern crest is stronger and then for the later hours southern crest becomes stronger. For 160°W, where the dip and geographic equator coincide, the trough is exactly at the equator and the crests are almost symmetric. Mostly all the troughs shift from south to north with local time during December. The highest value of TEC is found over 160°W at 14 LT. The TEC is observed to peak at around 14-15 LT which is consistent with EIA formation. The IRI predicts that the EIA is developed for almost all the longitudes during June. All the EIAs are developed by 11 LT and remain up to 16 LT. For the early hours, either both crests are symmetric or southern crest is stronger and after that the northern crest becomes stronger. The troughs for all the longitudes show shifting from north to south with LT. The highest value of the NmF2 is found to be for 45°E. From IRI TEC plots for the month of June, it is observed that mostly all the troughs are in the northern side except for 160°W whose troughs are at the geomagnetic equator. For early hours of the development of EIA, the southern crests are stronger and after that northern crests become stronger. Highest value of TEC is observed at 45°E at 16hr. During December solstice, the IRI predicted EIA to be formed at all the longitudes and are developed by 11 LT and remains up to 16 LT except for 160°W whose EIA develops at 8 LT. The troughs mostly follow the dip equator after the EIA is completely formed whereas the troughs mostly start forming in the summer side. For 10°E, 45°E and 45°W the northern crests are stronger at all times but for 140°E and 160°W, the stronger northern crests in the early hours diminishes in the later hours with southern crests getting stronger. For 10°E and 45°E, from the early development of EIA the northern crests are stronger. For 140°E and 160°W, northern crests are stronger for the early hours and after that southern crests become stronger. For 45°W, for the first two hours after the development the northern crest is stronger, after that southern crest becomes stronger and then again for the later hours the northern crest becomes stronger. Unlike the GIM, the IRI predicts well developed EIA for all longitudes. The IRI and the GIM both suggest highest NmF2/TEC values at 160°W during December. There are discrepancies in the IRI and GIM predictions even for longitudes where sufficient data coverage exists. There is clear correlation of crest and trough location to the subsolar point and the strength of the crests to the wind modulation of ionospheric plasma density.

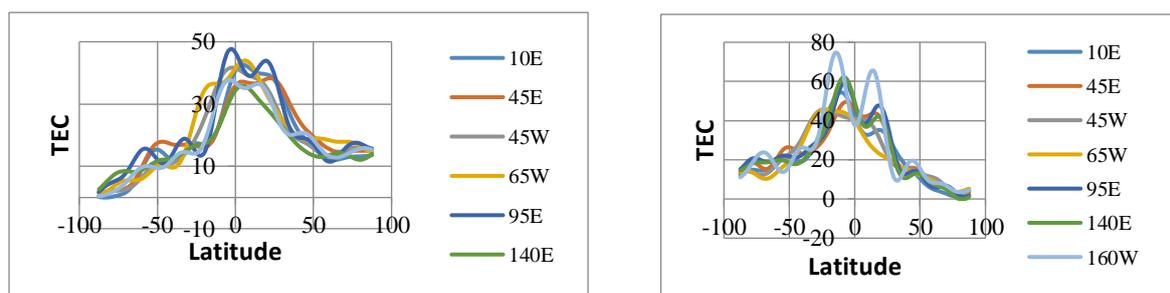


Figure 1. Latitudinal variation of TEC for the studied longitudes for 14LT for 30th June (left) and 30th December, 2015 (right)