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A Modelling study of equatorial and low latitude ionosphere around 95^0 E during the deep solar minimum 2009-2010 using SAMI2 model

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The extremely low solar activity during the solar cycle 23/24 provides an unprecedented opportunity to understand the variability of Earth's ambient ionosphere. SAMI2 (Sami2 is another model of the ionosphere) model is simulated during the extended solar minimum period July 2009 - May 2010 and the simulated data is compared with the quiet time TEC observations from a chain of GPS stations around 95ºE meridian. GPS TEC data from Dibrugarh (27.5ºN, 95ºE,43º dip), Kunming(25.02 ºN, 102.7ºE,38º dip), Havelock Island(12.02ºN, 92.98ºE,11º dip) and Cocos Islands(12.2ºS, 96.8ºE,43º dip) are used for this study . Comparison with the model reveals that there are significant deviations between the observed and simulated TEC is noticed depending upon the station and season.

During the June solstice SAMI2 TEC is quite consistent with observed TEC over all stations. In December solstice SAMI2 overestimates the day time TEC at the northern stations but almost matches the TEC at equatorial and southern stations. During both equinoxes SAMI2 overestimates observed TEC at northern stations during daytime peak hours.

To investigate the relative contributions of neutral density, ionizing EUV and ExB drifts to the observed results, SAMI2 model is used as the computational engine. Based on the observed results, changes are made to these three components of the model and a good agreement between the simulated and measured data is obtained .With the modified ExB drift the SAMI2 simulations almost matches the daytime TEC during equinoxes. It is also clear that the neutral winds can play an additional role in modulating the resultant ionospheric density and composition.

References

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