

Interactive comment on “Ionospheric Response to Solar EUV Radiation Variations: Comparison based on CTIPe Model Simulations and Satellite Measurements” by Rajesh Vaishnav et al.

Anonymous Referee #2

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The paper reports the time delay of ionospheric TEC responses to solar EUV irradiance using SDO-measured solar EUV flux, GNSS-based TEC observations, and simulated TEC from first-principle ionospheric model CTIPe. The study finds that the average time delay of about 17 and 16 hours for the observed and modeled TEC responses to EUV irradiance, a hemispheric asymmetry in the time delay, as well as the different CTIPe-simulated TECs using two different solar EUV irradiance models. The paper delivers an interesting and inspiring study with a clearly-presented motivation, methodology, and results. The study contributes to the scientific understanding of the ionospheric responses to solar irradiance and can guide the solar irradiance specification in ionospheric models. I only have some minor comments listed below:

1. Line 69, “ionospheric composition”: ionospheric electron density (or ion density) is perhaps more precise here? There are plenty of neutral species in the ionosphere as well, whose densities drop with altitude.
2. Lines 74-75: It would be helpful to include a figure showing the GNSS ground receiver locations around 15 degree E, or at least some justification of how many ground receivers near the region were used to produce the TEC maps.
3. Lines 73-74, “moderate solar activity phase”: is the interval during solar inclining or declining phase?
4. Line 177, “mid-day (11:00-13:00LT)”: is it an average of the TEC values during 11-13LT?
5. Lines 191-192, “The Figure 2(a) shows the two peaks of ionization during the spring 2011, but in autumn the maximum is shifted towards winter, clearly solar driven, and in 2013 there are local minima during equinox.” What exactly are the “two peaks” during spring 2011, and what does “maximum is shifted towards winter” mean? These are not clear from Figure 2(a).
6. Lines 193-195: I suppose the “spring”, “summer”, “winter” refer to the seasons in the Southern Hemisphere? This should be stated in “The bias between the modeled and observed 195 TEC is higher during the spring and summer season.”
7. Line 212, are the TEC averages being taken within low, mid, and high latitude bands?
8. Lines 218-219, “the influence of other dynamical processes in the ionosphere (e.g., lower atmospheric forcing) is stronger. ”: Is there any evidence supporting this statement? The weak 27d periodicity in F10.7 for 2011 and 2013 does not necessarily imply that the other dynamical processes have a stronger impact. Or the authors refer to the 27 d periodicity in TEC instead of F10.7 here? Line 220, “The 27 d period is stronger in the winter season”: Southern Hemisphere winter?

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9. Line 246, “daily data of 40N and 40S”: Are there GNSS ground receivers nearby 40N and 40S, 15E? How accurate is the GIM TEC map at these two locations?

10. Line 250, “solar radiation”: perhaps “solar EUV radiation” to be more precise? because F10.7 proxies the EUV irradiance only.

11. Lines 257-260: attributing the unusual behavior for 2012 to the underlying model in the TEC maps is not convincing, since the underlying model of TEC maps should remain unchanged for different years.

12. Lines 289-290, “the ionospheric delay is increasing with increasing solar activity.”
“Does this refer to the increasing delay from 2011 to 2013 and the solar activity enhances from 2011 and 2013?”

13. Lines 300-301, “This negative correlation indicates the effect of local dynamics.”: Can you provide more explanation on this?

14. Line 305, “The observed TEC always overestimated the model simulated TEC at all latitudes.”: Given the observed TEC is the “truth”, it sounds more natural to say that the model simulated TEC underestimate the observed TEC.

15. Line 364, “The large bias observed in the physics-based model is mainly due to the solar EUV flux input and grid resolution.”: How grid resolution impact the agreement between simulated and observed TEC? A justification is necessary.

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