Review comments on manuscript "**Global TEC prediction performance assessment of IRI-2016 model based on EOF decomposition**" by Li et al., 2019; submitted to Annales Geophysicae

The manuscript compares total electron content from Global Ionospheric Maps products and International Reference Ionosphere during 2013. Empirical Orthogonal Functions are employed to detail the differences between the two datasets. Seasonal average analysis was performed which showed that the IRI model reproduces the equatorial ionisation anomaly distinctively while GIM TEC does show enhancement of TEC over equatorial/low latitude regions, but does not necessarily show the different bands of enhancement at the EIA crests. While related studies exists, I think this work is relevant especially if it clearly shows by how much the IRI under-predicts GIM TEC (in terms of TECu) in different latitude regions. However this is not clearly shown in the current paper.

Additionally, as the authors know, the IRI model provides TEC up to an altitude of 2000 km while GIM TEC products are based on GNSS observations (at about 20000 km). Assuming that the IRI model was 'accurate' at its specified height, it would be missing some plasmaspheric contribution. The authors have missed to point out this important aspect early in the paper. I believe it is related to line 10, page 6, and Figure 1. Information about this is later presented on page 15, line 10.

Below are comments which may assist in improving the paper.

Page 3, line 35: I thought that the GIM TEC products are provided at time resolution of 2 hours. Please cross-check that they are also available for 15 minutes.

Page 4, line 5, please include original references for the hmF2 model options included within the IRI 2016 model. One is based on COSMIC observations (Shubin) and the other one on ionosonde measurements and spheric harmonic method (Altadil).

Page 4, line 10: In the statement "The global TEC date calculated ...". The word 'date' should be data.

Page 5, line 5 is not clear. In the text "If the IRI TEC and GIM TEC are decomposed, then their EOF base functions and coefficients will exhibit poor comparability". Why would this be the case? And do you mean that this would be so, if they were decomposed separately? Assuming that they exhibit some similarities/differences, wouldn't such decomposition bring them out? May be not in magnitude of coefficients or base functions; but perhaps in the trend and identification of physical features?

Following on the previous comment, do you mean that IRI TEC and GIM TEC are combined to form one data file which is later used for decomposition?

Page 7, Table 1, indicate the units of some parameters; maximum, minimum and mean bias; e.g mean bias (TECU).

Page 6, just after line 15: Bias values are computed using IRI TEC and GIM TEC? It is not clear how daily RMS values in 2013 displayed in Figure 2 are computed. Are they just average of the bias values calculated using IRI TEC and GIM TEC?

Page 5, equation 10: Shouldn't RMS be RMSE? This seems to be what is plotted in Figure 2(a). RMSE values of IRI 2016, how are they computed?

Under subsection 3.2: the authors state "We combined the IRI TEC and GIM TEC data ...". If these datasets are combined, how do you obtain Figure 4?

In Figure 3, is global data for 2013 used? How do you account for latitudinal differences? Does this figure reflect only seasonal changes as indicated in the last statement on page 7?

Equation 7 and Figure 7: I am not sure of the physical significance and justification of combining IRI TEC and GIM TEC. Afterall, they have different inherent errors. What can be derived from this combination taken at same grid points can as well be determined from one dataset either GIM TEC or IRI TEC. Otherwise combining these datasets removes the differences/similarities that the authors would want to study? Provide a scientific justification for combining both datasets and what additional features or interpretations are obtained. I don't think that the text in line 15, page 15 is sufficient to justify this inclusion. This has already been discussed.

 Unless I am not understanding equation 7, how do you separately derive A1-A6 for GIM TEC and IRI TEC that you have plotted in Figure 8? Once again, is this necessary? What additional information do we get in Figure 8?