Interactive comment on "Long-term trends in the ionospheric response to solar EUV variations" *by* Rajesh Vaishnav et al.

Anonymous Referee #1

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The manuscript provides the investigation of the ionospheric response to the temporal and spatial dynamics of the solar activity by using 18 years solar activity indicators and also some geomagnetic activity indices. The topic is relevant and important for the community. In general, manuscript written good, but there are some problems in the manuscript. Authors need to consider these problems before resubmitting a revised version of the manuscript.

General comments about the manuscript

In Figure 1b and Figure 4 parameters do not separated easily, please use different colors as much as possible for each parameter. In the current version especially red and pink colors are mixing.

All abbreviations should be described clearly in the first place that they appear in the manuscript. In the current version of the manuscript some of them are not given with full name. Also, for the daily sunspot area the abbreviation is given as DSA. Please replace it as daily SSA

In Figure 4 the significance levels of obtained periodicities are not given. I suggest that authors should add at least 95 % confidence level line to each periodogram.

Please add some information about the appendix figures inside the manuscript.

Page 1 line 21, authors mentioned that "Wavelet variance estimation suggests that GTEC variance is highest for the seasonal timescale followed by the 16-32 days period, similar to the F10.7 index highest variance for the 16-32 days period." Please replace as "Wavelet variance estimation suggests that GTEC variance is highest for the seasonal timescale followed by the 16-32 days period, similar to the F10.7 index.

Line 25 "DSA" – "Daily SSA"

Line 34 "(e.g. Schmölter et al., 2018)", please add a few more reference.

Page 2 line 55, "...at different time scales." – "at different time scales such as (...)." Please clarify

Page 4 line 136 "...GTEC with four selected solar proxies..." please give these solar proxies inside a parenthesis.

In page 5 line 157, authors mentioned that they used 7 days smoothed data and they mentioned 6.7 days periodicity. From 7 days smoothed data it is not possible to get 6.7 days periodicity. This part should be removed.

Authors mentioned 128 – 256 days periodicity from GTEC and solar parameters. Source of this periodicity should be given more clearly (see Lou et al. 2003, Kilcik et al, 2018). For the 45 days periodicity, it is also one of the fundamental periodicity of solar activity and it detected in many solar activity indices (Lou et al. 2003, Chowdhury

et al. 2015, Kilcik et al, 2018). Please explain this periodicity a bit more detail. (Lou, Y.Q., Wang, Y.M., Fan, Z., Wang, J.X., Wang, S.: 2003,Mon. Not. Roy. Astron. Soc. 345, 809. Chowdhury, P., Choudhary, D.P., Gosain, S., Moon, Y.J.: 2015, Astrophys. Space Sci. 356, 7. Kilcik, A., Yurchyshyn, V., Donmez, B., Obridko, V.N., Ozguc, A., Rozelot, J.P.: 2018, Solar Phys. 293, 63.)

In page 6 line 179, authors mentioned that "...solar rotation period of 27 days is only a mean value and different solar regions rotate with a different velocity which can be up to 35 days." Please replace this sentence as "...the 27 days periodicity is only a mean value of solar differential rotation. It also strongly depends on the life time and proper motion of observed active regions."

Page 6 line 204, "The correlation coefficient is also decreasing during high solar activity years such as 2002 and 2014 but increases during the recovery phase of solar activity." This sentence is not correct, it should be clarified.

Page 8 line 246, authors mention that "The F1.8 and DSA cannot adequately represent the solar activity at the solar rotation (16-32 days) time scale." SSA is one of the best solar indicator in solar physics literature, so please clarify this sentence with more detail.

In line 264, "...several other physical processes." Please clarify these processes

In general, please use wavelet scalogram instead of wavelet transforms for wavelet plots. Also in the wavelet plots, what is the meaning of negative power it should be explained clearly or wavelet scalograms should be modified.

I think current version of the manuscript is not appropriate for the publication in the journal. It needs some corrections.