

Reviewer #4 (Comments to Author):

We would like to thank the reviewer for his/her comments of the paper. We have tried to answer all the comments and issues below.

General remarks:

This paper describes VLF observations in two mid latitude stations of the semi-annual oscillation in the D region of the lower ionosphere and suggests that NO_x molecule transport from the lower atmosphere to the night time D region could be at the origin of this oscillation. Such VLF observations are new and could be worth for publication in ACP journal. However, some parts of the paper could be improved taking into account the following remarks:

The abstract and conclusion claim that NO_x transport modulates the SAO signature in VLF measurements. The different possible origins of the observed effects are examined in chapter 4 integrating i) a short discussion about dynamical transport of neutral species, ii) a comparison with satellite measurements to research the origin of phase differences observed in the VLF data recorded by both stations, iii) a short analyze of possible tidal effects which could explain the observed results and amplify the SAO signature. However, conclusion is lacking about the quantification of the different processes. The paper general conclusion claiming that the NO_x molecule transported from the upper level of the atmosphere produce enhanced ionization in the night time D region is interesting but this is not demonstrated. A comparative study of the different processes examined in chapter 4 could significantly improve the paper.

We agree with the reviewer that a quantitative study which examines the different processes could significantly improve the paper. However, in order to acquire reasonable results, we believe that a GCM with D-region chemistry is needed. As we currently do not run such a model, this has to be left for future research, as was mentioned in the Conclusion section.

The VLF and satellite comparison is interesting and should be better analyzed.

The aim of the satellite data comparison was to investigate the phase difference of SAO from the VLF amplitudes. As mentioned within the text, in depth comparison is problematic, due to the latitudinal range and zonal coverage differences between the two datasets, as well as the need for a MLT chemistry model for specific OH* and D-region ions' chemistry. Therefore, we find such an analysis beyond the scope of this paper.

Suggested technical corrections:

Some parts of the text could be improved. For example: Page 12, lines 24 to 28; Page 14, lines 16-20.

We have refined the parts of the text mentioned by the reviewer.

The quality of the Figures could be improved. The size of the characters is too small.

As was written to reviewer #3, we agree with the reviewer's comment regarding Figure 1, and we have fixed it accordingly. Figure 2 was also updated, so that its tick labels now mark the beginning of each year. However, we have not found problems with reading the labels in Figures 3-4. It should be mentioned that figures 2-4 were already fixed after prior comments, and were approved.