

Interactive
Comment

Interactive comment on “Semi-annual oscillation (SAO) of the nighttime ionospheric D-region as detected through ground-based VLF receivers” by I. Silber et al.

Anonymous Referee #1

Received and published: 2 December 2015

Review of: Atmos. Chem. Phys. Discuss., 15, 30383–30407, 2015

Semi-annual oscillation (SAO) of the nighttime ionospheric D-region as detected through ground-based VLF receivers

I. Silber, C. G. Price, and C. J. Rodger

This is a novel contribution to the study of SAO by using two VLF receivers during nighttime. The authors conclude that: “the main source of the SAO in the nighttime D-region is due to NO_x molecules transport from the lower levels of the thermosphere, resulting in enhanced ionization and the creation of free electrons in the nighttime D-region, thus modulating the SAO signature”. The weaknesses are the bad graphical

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presentation, no explicit discussion of the robustness or influences of the used data processing methods and finally the physical interpretation of the link between the seasonal dependence of NO transport and VLF amplitudes is not examined in detail, like a simple model of the NOSC waveguide programs and comparisons with experimental data. A better understanding is needed, too.

In this form I do not recommend this work for publication; may be after major and minor revisions.

Major comments:

M1- All figures are presented in unreadable form. Figure 1: Tick label too small. Connecting line is too small. Improvement needed. Figure 2: Tick labels and axes description are unreadable. Improvement needed. It is hard to count months in upper plots. Vertical lines are needed related to one or two months. Figure 3, 4: as Fig. 2 need improvement!

M2- It is known that the nighttime measurements of VLF phase and amplitude are highly variable. So the motivation or some robustness tests of methodical capabilities should be discussed in relation to the SAO, AO, SC behavior.

M3- Furthermore the interpretation should be improved: how the “normal two parameters” like high and sharpness used in propagation models (McRae and Thomson, 2000; e.g., MODESRCH Long Wave Propagation Capability) influencing the amplitudes and phases as function of seasonal cycle, including SC (trend like) or AO or SAO in order to understand the physical link in a better way.

Minor comments:

-m1 p2 l18: NB should be defined

-m2 p3 l15: EUV should be defined

-m3 p3 l21: VLF is used for 3-30 kHz range, but MH-NSY uses 45.9 kHz, out of

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range!?

-m4 p5 l2: Why is the magnetic field measured not EM?

-m5 p5 l25 –p7 l11: The procedure of data filtering is explained but the influence on SAO not really quantified ! Numbers are needed here!

-m6 p8 l15: Is it a significant correlation, because the phasing is not so good, as written (see Fig. 2), and are missing data examined?

-m7 p8 l27: what means “normally expected”, this is not clear

-m8 p10 l8: Why MJO is not considered?

-m9 p14 l24: What about lunar tides they are larger in the ionosphere?

-m10 Figure caption of Fig. 2.: “30 days” is that correct, or “31 days”, should be uneven!

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