

Interactive comment on “Investigation of the ionospheric absorption response to flare events during the solar cycle 23 as seen by European and South African ionosondes” by Veronika Barta et al.

Anonymous Referee #1

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Comments on manuscript “Investigation of the ionospheric absorption response to flare events during the solar cycle 23 as seen by European and South African ionosondes”

The analysis of the absorption induced by the solar flares was performed in this paper. The ionosonde data located at different latitudes were considered. The methods of the fmin and dfmin were applied.

I think this is interesting paper. The problem of the absorption due to solar events is one of the topical problem in the wave propagation investigation. In the paper a lot of

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data were analysed.

Main concern: In section Results: “These measurements may inform models in the future in describing the changes in ionospheric absorption during solar flares with different intensities.” What models do you mean? How results of this paper could be used in them? For example, the main outcome of the D-RAP models [<https://www.swpc.noaa.gov/products/d-region-absorption-predictions-d-rap/>] is a global map of the absorption, corresponding to a number of operating frequencies.

I suggest the following minor revision before it is published:

1. I suppose that the structure of the paper is being difficult to understand. 1) The section Introduction is very long. I suggest reducing the part regarding proton precipitation in polar cap (really it is not the main topic of the paper). 2) I suggest to split “Introduction” into a few of paragraphs, otherwise the perception of the text is obstructed. 3) Please, in section “Data and Methods” separate one item from another. 4) The understanding of section “Results” seems to be difficult. I think that the structure of this section should be change. This section would be better for understanding corresponding to following scheme: particular issue of research, the figures description, provisional conclusion.

2. The sense of the paragraphs (Page 2-3 (30)) in “Introduction” is not clear to me. “The electron density (N_e) of the D region is enhanced by up to one order of magnitude down to about 55 km prior to, during and after the solar proton event (SPE) on January 17, 2005. The largest N_e are found during the maximum of the X-ray flare on January 17. The electron density is still enhanced on January 18 when the X-ray flare decayed but the solar proton fluxes are still enhanced (Singer et al., 2011).” Is it continuation of the paragraph about Patterson et al. (2001) or not?

3. Page .2 (10) I suggest to replace citing Sauer and Wilkinson (2008) text (in italics) by your expression.

4. Please clarify the reason of the analysis of the critical frequencies foE and foF2 (Fig. 1,2) while the absorption is the main subject of the paper.
5. As I understand “The aim of the present study is the investigation of the solar flare effects on ionospheric absorption at mid- and low-latitudes taking into account the solar zenith angle. . .”. I would like once again to draw you attention to the D-RAP model (which is definitely based on the solar zenith angle dependence). I think that this model should be mention in your paper. The correlation between your results and D-RAP model results should be discussed.
6. I suppose that the number of references to other authors in section “Results” could be diminished.
7. Table 2. Please, mention in the caption the unit (“UT”, probably).
8. Table 3 and 4. Please, add the units in the titles “Solar zenith angle”, “Duration of fade-out”, “fmin” and “dfmin”.
9. I suppose that the values of the fmin have to be presented with equal (and reasonable) precision (perhaps one decimal point) in the Tables 3 and 4. The similar issue with dfmin.
10. Figure 1. I thing it is better to write “first panel”, ”second panel” etc., instead of “upper plot” and “second upper plot”
11. It seems to me that axes labels size and titles font size in the Figures 2-5 looks like very small.

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