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Interactive comment on "On the directions and structure of the short-term magnetic variations" *by* Andrey Khokhlov et al.

Anonymous Referee #2

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The article "On the directions and structure of the short-term magnetic variations" presents a new technique to analyse the magnetic variations recorded at ground observatories. This work is based mostly on mathematical consideration and, as the authors point out, it currently does not provide a physical explanation of the results they have found, because its interpretation is not yet completely understood. 4 examples are discussed to illustrate the technique and the difficulties raised during the analysis. They authors affirm that they analysed a much larger set of data coming from additional observatories. Overall, this article presents some weak points that make it unacceptable for publication in its present form. I strongly suggest to revise completely the text and the examples shown, in order to clarify the whole topic. I also suggest strongly to take advantage of the possibility of adding supplementary information that could be useful

fo the readers. A companion document containing additional figures from the observatories under analysis could strengthen the results. It would be extremely beneficial to show, for instance, how the polarisation plane changes during disturbed periods, showing for instance one complete week of daily polarisation spheres.

Another major issue of this manuscript is the lack of references. Only one is provided, that discusses noise at one observatory, while many more would be necessary to support the affirmations that are made and recognise data provides. For instance: a reference to INTERMAGNET (Love, J. J., and A. Chulliat (2013), An international network of magnetic observatories, Eos, Transactions American Geophysical Union, 94(42), 373–374) and to its technical reference manual (Louis, B. S. (Ed.) (2012), INTERMAGNET Technical Reference Manual, ed. 4.6) are necessary, and others pertaining to similar studies.

All figures need to be improved to include axes labels and titles. The information is provided in the caption, but since there is in general very little explanation of the figures, the minimum starting point to understand what is shown, is to provide the labels near the axes. Titles might include at least the observatories code names and the date of analysis shown.

Some specific questions:

I do not understand the affirmation (page 1, line 15) "However the study of the short-term variations was mainly reduced to their absolute or component estimations without serious interest to their directional structure". Without any reference this affirmation is missing a confirmation from the literature.

Page 2 last line: I think a hint to the preprocessing should be added. I understand it is explained later in the manuscript, but a mention to it can be added.

Page 3 first line: Does the plot of figure 1 shows the statistics of |B| of or |b|?

Add a reference to the statistics of Poisson's processes.

I suggest to present the case studies described on page 3 and 4 in a table, and indicate for each how many hours are included in the study.

Does figure 2 include the same amount of data for each diagram?

I think that the whole discussion around “the bigger the |b|’ the smaller the angle between b and the polarisation plane”, page 6 lines 7-10, Figure 6, page 7 line 1-5, can be shortened. In my understanding this is a consequence of the definition made for the polarisation plane.

Section results: please indicate how many magnetic observatories have been analysed to substantiate the conclusions.

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