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Interactive comment on "Turbulent Processes in the Earth's Magnetotail: Spectral and Statistical Research" *by* Liudmyla Kozak et al.

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Dear Professor Zimbardo,

We are grateful for the comments and advices on the article.

We took into account your remarks and clarifications.

1. Fig. 1 is supplemented by the components of the magnetic field in the GSM coordinate system for one of the spacecraft (the SC that is closest to the current layer) for each of the events considered (Fig. 1b).

2. According to the available measurements of CIS instrument we estimate the percentage content of heavy elements in the region of the magnetic field dipolarization.

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Discussion paper

The text in the brackets has been added.

“according to the measurements of the CIS instrument for the event 2005-10-01, in the region of the magnetic field dipolarization, the percentage of oxygen ions in relation to protons ($\langle n(O^+)\rangle/\langle n(H^+)\rangle$) is $21.1 \pm 10.0\%$ (SC C3) and $9.3 \pm 1.5\%$ (SC C4), and the percentage of helium in relation to protons ($\langle n(He^+)\rangle/\langle n(H^+)\rangle$) $\sim 2.4 \pm 0.3\%$ (SC C3) and $\sim 4.8 \pm 0.7\%$ (SC C4); for the event 2005-10-15 — $\langle n(O^+)\rangle/\langle n(H^+)\rangle \sim 11.1 \pm 1.0\%$ (SC C4), and $\langle n(He^+)\rangle/\langle n(H^+)\rangle \sim 3.4 \pm 0.5\%$ (SC C4); for the 2015-09-12 event — $\langle n(O^+)\rangle/\langle n(H^+)\rangle \sim 18.9 \pm 7.3\%$ (SC C4), and $\langle n(He^+)\rangle/\langle n(H^+)\rangle \sim 15.8 \pm 5.4\%$ (SC C4)”

3. As shown in Figure 1 in the middle panel (event for 2005-10-15), the level of fluctuations of the magnetic field module in the interval 1 (that is, in the prepolarization interval) for C2 exceeds the value of the level of fluctuations for other spacecrafts, which is manifested in higher values of the PSD. After the start of dipolarization (interval 2), the level of field fluctuations for different spacecrafts is not very different from each other, and in addition, the relative uniformity of the spectrum value is amplified by its "blurring" on a large scale.

4. Holder’s exponent h is indeed the Hurst index of the 1st order: h = H(1). The text of the article has been added (Holder exponent is the Hurst exponent of 1st order)

5. Thank you, indeed, in equation 6 we replaced B(t) with B (τ).

6. Thank you for the information on review by Zaburdaev et al., Rev. Mod Phys. 2015. It will be useful for our further research and we included it in our references. It should be noted that in this paper we basically took the relation between the exponent of the structural function and the generalized diffusion coefficient, which, if we are not mistaken, was first obtained in detail in Lovejoy 1998. (We refer to this article in the references) Usually there is a connection between the definition of the diffusion coefficient considered in the “Levy flights” analysis and in the framework of the ESS analysis. In our 2015 work (Kozak, L. V., Prokhorenkov, A. S. Savin, S. P. Statistical

analysis of the magnetic fluctuations in boundary layers of Earth's magnetosphere. Adv. Sp. Res. 56, 2091–2096 (2015)) for the area of the magnetosphere, we compared the values of the diffusion coefficient obtained by two different approaches.

Since in this paper we evaluate the diffusion coefficient from the analysis of the magnetic field fluctuations, we obtain a coefficient which characterizes the transport processes associated with the spatial-temporal structure of the magnetic turbulence.

We have added in the article: "In this case, the properties of diffusion are considered within the concept of a multi-fractal multiplicative cascade" The equation (8) described in more details and the sentences are supplemented with: "... fractal properties of the medium and characterize (on average) the topological properties (connection properties that determine the transfer) of a stochastic structure of turbulence"

7. Thank you. Corrections have been made.

8. The article text has been submitted to the professional translator.

Regards, Authors

Please also note the supplement to this comment:
https://www.ann-geophys-discuss.net/angeo-2018-50/angeo-2018-50-AC3-supplement.pdf

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