

## ***Interactive comment on “Intermittent turbulence in the heliosheath and the magneto sheath plasmas based on Voyager and THEMIS data” by Wiesław M. Macek et al.***

### **Anonymous Referee #3**

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In this paper, the authors review their studies on the multifractal properties of the magnetic field in the heliosheath and magnetosheath. It is certainly an interesting paper, and worth publishing in this journal. However, some issues should be clarified before, most of them related to conclusions that are not so clearly supported by the results.

1. Please explain what does the “scaling ranges from 2 to 32 days” means. Although a reference is given, it would be better to understand the paper more self-consistently.
2. In the section on heliosheath data, it is said that the degree of multifractality basi-

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cally “still follows the periodic dependence fitted inside the heliosphere”. Since no mention has been given of a periodic fit inside the heliosphere before in the text, this sentence is not understood. What does the periodic dependence means?

Also, in the conclusions, the authors say that they have demonstrated that multifractality is modulated by the solar cycles further in the heliosheath. I guess this is the periodic function they refer to. If so, please state this more clearly at this point.

3. In the same sense, the caption of Fig. 5 refers to “a periodic function” which is not mentioned in the text.
4. Fig. 6 compares the degree of multifractality  $\Delta$  and the asymmetry  $A$  as obtained by the authors and Burlaga. Whereas  $A$  follows a similar behavior in both references, having similar values, and increasing after the termination shock,  $\Delta$  does not. Except at 95–107 AU, Burlaga’s values lie outside the range inferred from the two-scale model. Besides,  $\Delta$  seems to be rather constant at the four distances from the Sun in the two-scale model, whereas Burlaga’s values decrease in the heliosheath. Please comment on the differences.
5. Section on the magnetosheath, referring to Fig. 9. It is said that “the value of kurtosis often increases with Alfvénic Mach number”. Please explain this observation, as it is not clear from Figs. 9 (a) and (b), in particular for the magnetopause (MP, triangles) points. In fact, a few lines later in the same paragraph, it is observed that the change is smaller, from 12.05 to 11.44. So it actually decreases.

A similar sentence is also in the conclusions, where it is said that “at higher Alfvénic Mach numbers  $M_A$  fluctuations are often somewhat more intermittent than at the lower numbers”.

6. The discussion of Fig. 11 (last paragraph in Sec. 4) is not always clear. For instance, please clarify the sentence “but for cases (b) and (c) they are rather

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similar”. Are the authors referring to the kurtosis for  $z^+$  and  $z^-$ ? If so, this is not clear for Fig. 11 (c), for  $\tau < 30$ .

Also, later it is said that the level of intermittency for  $z^+$  is usually similar to  $z^-$ . However, this is not seen in Fig. 11(c) for  $\tau < 30$ , and in Fig. 11(d) for most of the plotted range.

7. In the conclusions, the authors say that multifractality “falls steadily with the distance from the Sun”. This does not seem to be supported by either Figs. 5 or 6.
8. Later, the authors state that they “have identified the scaling region of fluctuations”. Please clarify the meaning of this sentence.

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