

Interactive comment on “Dynamics of He⁺⁺ ions at interplanetary shocks” by Olga V. Sapunova et al.

Anonymous Referee #2

Received and published: 5 February 2021

General remarks:

In this paper the authors discuss preliminary results obtained by the BMSW instrument. Specifically, they focus on the change in the alpha-particle distribution during a limited number of shock crossings. Although the topic is relevant and of interest, the manuscript, in my mind, presents rather a “work in progress” and cannot be published in its present form.

A detailed list of comments, motivating this decision, is attached below.

More serious concerns:

1. As I understand, the BMSW instrument does not have a magnetometer on board and hence magnetic field measurements from other instruments on spatially separated spacecraft are used. These measurements from additional instruments, however,

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make up a considerable number of the quantities considered including the Mach number, shock normal angle, etc. It is well-known that the turbulent magnetic field evolves over short timescales, and that the magnetic field (and especially fluctuations thereof) varies similarly over small length scales. This can also be seen from Figs. 4 and 5, where the plasma properties are significantly different between different instruments. Thus, I do not think that using magnetic field measurements from a different spacecraft can be used to analyse particles distributions measured on a another spacecraft. Therefore, in my mind, the bulk of the analysis presented in this manuscript cannot be robustly defended. If we then take away the magnetic field measurements, the manuscript contains insufficient new material for publication.

2. Only a small number of events are considered (a total of 20) and I think this small subset is insufficient for a statistical study. E.g. the results presented in Fig. 6 seem not to be statistically significant.

3. Given the small number of events (point 2), and the fact that non-local magnetic field measurements are used (point 1), I do not think that the results presented in Fig. 7 (and this is the main results of the manuscript) is statistically significant, and therefore not a robust result.

Smaller issues:

1. The manuscript states that IPs are generated by solar flares, which is definitely not correct.

2. Although I'm not a native speaker, the language in the manuscript has to be improved, and at several places, I had a hard time figuring out what the authors mean, e.g. "with a wavelength having a time scale of . . ."

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2020-72>, 2020.

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