

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

Anonymous Referee #3

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This paper presents preliminary results using He⁺⁺ ion high time resolution measurements of the solar wind during the interplanetary shock front passage combined with magnetic field data. Either more information about the study performed should be included if this is to be an individual event study or else more events are needed if it is intended to be a statistical study. The English needs to be read/ edited by somebody in the field. This may help to clarify some issues in the text. Below some suggestions for the authors to consider.

Abstract: It could be added that BMSW data has high time resolution and that He⁺⁺ measurements were compared with magnetic field data, and that 20 out of the 57 registered events were selected. At the end of the abstract 1-2 sentences presenting the main results would benefit the reader.

Page 1: The background and the motivation behind the work performed should be

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elaborated in the introduction. At the end of the introduction shortly present the next sections of the paper.

Page 1: IT IS WRITTEN "Interplanetary shocks (IP) generated by solar flares and coronal mass ejections and propagated in the solar wind are one of the main agents transferring perturbations from the Sun to the Earth (e.g., Borrini et al., 1982; Volkmer and Neubauer, 1985; Borockova, 1986)." The relevance of referring to both solar flares and coronal mass ejections as the origin of IPs needs to be explained in the context of the paper. (see for example Gopalswamy et al. 1998, <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/97JA02634>).

PAGE 1: It would be useful if the references "(e.g., Scholer and Terasawa, 1990; Scholer, 1990; Trattner and Scholer, 1991)." could be separated between "....modeling (REF1, REF2) and by experimental data (REF 1, REF2). Which studies have compared outputs from both approaches?"

Page 2: IT IS WRITTEN "The aim of this brief article is to study variations of the density of the He⁺⁺ ions at the front of an interplanetary shock and to detect changes in the He⁺⁺ ions parameters directly next to the ramp with a precision high time resolution." Why is this important? What does it teach us? Does it provide us information about the origin of the IP event?

Page 3: IT IS WRITTEN "Thus, 20 interplanetary shocks were selected, for which it was possible to isolate the flow of He⁺⁺ ions during the passage of the front." Could the origin of the IP events have anything to do with this selection? 20 out of 57 IP registered events is not a high ratio. Need to better explain why it was not always possible to isolate the flow of He⁺⁺ ions during the passage of the front. A table presenting and comparing the characteristics of the 20 IP events could be useful.

Page 8: IT IS WRITTEN "The presented preliminary results were obtained with a small number of events and require further research." For example (data analysis, modelling)? Though the current study used high time resolution measurements it is not

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completely clear for me what the investigation has provided (the novelty of the results). This should be presented in the conclusion.

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