Author response

The authors wish to thank the referees who reviewed the revised manuscript. Their comments and feedback have contributed significantly to improving the quality and structure of the manuscript.

Author response to referee #3

In this document we provide responses to each of the referee's comments (formatted as italics in indented paragraphs).

> *The authors refer to Suni et al. (2021) as "the previous study" multiple times in the abstract, so a citation should be included. I think the authors should clearly mention in the beginning that this study concerns jets that were not associated to FCSs in Suni et al. (2021). Currently, this information is dispersed around the abstract: "We focus on jets whose origins have not been clearly determined in a previous study using the same simulations" and "from those of jets found in a previous study, which were associated with foreshock structures of enhanced dynamic pressure and magnetic field"*

We have added a reference to Suni et al. [2021] in the abstract, and compiled the information about the nature of the FCS-jets in the sentence where the previous study is first mentioned.

> *The authors should discuss the nature of these foreshock compressive structures more in the manuscript. How do these FCSs move with respect to the solar wind flow? Do these structures appear locally or do they travel from far upstream? Which FCSs produce jets and which do not? I understand that answering some of these questions may require further analysis, and I do not think that is required. However, as the nature of FCSs is an integral part of the jet formation mechanism being suggested, it should be discussed more.*

We have not investigated the nature and formation of FCSs in detail, but we have added an introduction to shocklets and SLAMS, which are partially a subset of FCSs, to the introduction section.

> *In Figure 5 it seems like in all of the panels and for all shock bow shock criteria, the shock is initially closer to the Earth than after the jet. Could this be a signature of a local corrugation in the shock? Or is it simply due to the bow shock standoff distance increasing as a function of time in the simulation?*

We believe that this outward motion of the bow shock criteria is mostly due to the increasing bow shock standoff distance, but the short-lived perturbation around the formation time of the jets could be local corrugation. This is now mentioned in the manuscript.

> *It is not clear to me how the results agree with the exact mechanism suggested by Raptis et al. (2022), more so than the one hypothesized by Karlsson et al. (2015). In the simulations, are the FCSs reforming the shock and jets forming as solar wind is compressed between the old and the new shock or are the FCSs themselves crossing the shock and emerging downstream as jets? In the Discussion and Conclusions sections, the authors should be more specific about how their results support the mechanism suggested by Raptis et al. (2022).*

We have added a clarification, referring to Fig. 5, that we observe increasing density and magnetic field with decreasing distance from the bow shock in the foreshock structures that are associated with antisunward and FCS-jets, and that this agrees with the steepening of the foreshock waves that are associated with bow shock reformation and the jet in Raptis et al. [2022].

Line 2: "dynamics pressure" to "dynamic pressure".

We have corrected the spelling as requested.

Lines 52-54: This sentence is unclear to me. What was the definition deemed most appropriate for? If you mean that this definition was found to be the most appropriate one for the goal of capturing transient enhancements in dynamic pressure, I suggest rewording the sentence.

We have clarified that we found the definition in question to be most appropriate for capturing transient enhancements of dynamic pressure.

References

Savvas Raptis, Tomas Karlsson, Andris Vaivads, Craig Pollock, Ferdinand Plaschke, Andreas Johlander, Henriette Trollvik, and Per-Arne Lindqvist. Downstream high-speed plasma jet generation as a direct consequence of shock reformation. *Nature Communications*, 13(1):598, December 2022. ISSN 2041-1723. doi: 10.1038/s41467-022-28110-4.

J. Suni, M. Palmroth, L. Turc, M. Battarbee, A. Johlander, V. Tarvus, M. Alho, M. Bussov, M. Dubart, U. Ganse, M. Grandin, K. Horaites, T. Manglayev, K. Papadakis, Y. Pfau-Kempf, and H. Zhou. Connection Between Foreshock Structures and the Generation of Magnetosheath Jets: Vlasiator Results. *Geophysical Research Letters*, 48(20), October 2021. ISSN 0094-8276, 1944-8007. doi: 10.1029/2021GL095655.