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Discussions

Interactive comment on "Magnetosheath jet properties and evolution as determined by a global hybrid-Vlasov simulation" *by* Minna Palmroth et al.

Anonymous Referee #1

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The authors used a global hybrid-Vlasov simulation to study magnetosheath jets. They identified one magnetosheath jet that satisfies all the selection criteria of Plaschke et al. (2013), Archer and Horbury (2013), and Karlsson et al. (2015). They conclude that the size of magnetosheath jet is ∼2.3 x 0.5 Re and the jet is generated because of an interaction of the foreshock ULF waves and the bow shock surface. These conclusions are neither substantial nor supported by the provided evidence. Therefore, the referee cannot recommend its publication in AG. Detailed comments are listed below:

1. With just a short description about the foreshock ULF waves in the Discussion, it is difficult to understand how the high dynamic pressure is associated with the waves. The authors are required to do a detailed analysis, like what they did for an identification and validation of the magnetosheath jet.

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Discussion paper

2. The authors chose 1 cmˆ-3 and 750 km/s for the solar wind density and velocity. The equivalent dynamic pressure is 0.94 nPa, which is considered a special solar wind condition. The authors need to explain why they chose such a condition. Can the magnetosheath only be seen in this condition or any other condition? Readers will be interesting in knowing about it.

3. A dynamic pressure of 0.94 nPa results in the subsolar magnetopause standoff distance of 11.5 Re. But the standoff distance derived from the model is about 7 Re, as seen in Figure 1. The same problem occurs for the position of the bow shock. From the movies S1 and S2, the bow shock is gradually expanding and the magnetopause is gradually shrinking. The locations of the bow shock and magnetopause never reach a steady state. This problem has made the referee think that this hybrid Vlasov model might not stable, giving unrealistic positions of the bow shock and magnetopause. To a validation of the hybrid Vlasov model, the authors are strongly suggested to add the locations of the bow shock and magnetopause to their simulation results using an empirical model.

4. The definition of a magnetosheath jet is a bit confusing. In my opinion, it should go with a criterion of flow speed, but the selection criteria of Plaschke et al. (2013), Archer and Horbury (2013), and Karlsson et al. (2015) are all related with the dynamic pressure or density. The authors need to classify this issue and add a definition of the magnetosheath jets to the beginning of the Introduction.

5. In Figure 3a, it shows that the geometry of the magnetosheath jets by Archer and Horbury (2013) is well aligned with the surface of the magnetopause. Are they really jets? The jets found by Karlsson et al. (2015), as shown in Figure 4a, look tiny and sporadic. Are they really jets? The features, which are shown in Figure 2 by Plaschke et al. (2013), are jets-like. But these jets never touch the surface of the magnetopause, which is different from the results by Plaschke et al. (2016).

6. The X and Y scales in Figures 3, 4, and 5 should be the same.

In summary, only one conclusion about the size of the magnetosheath jet is not substantial for a publication in AG. The authors are required to add more conclusions, such as a proof on the association between the high dynamic pressure and the foreshock ULF waves (Item 1), and the solar wind condition for an occurrence of the jet (Item 2). In addition, the authors are required to clarify the potential problem in their model (Item 3) and the issue in the definition and features of the jets (Items 4 and 5).

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