

Comment on egusphere-2022-704

Anonymous Referee #2

Referee comment on "Solar wind magnetic holes can cross the bow shock and enter the magnetosheath" by Tomas Karlsson et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-704-RC2>, 2022

The manuscript presents an analysis of multipoint magnetic field and plasma measurements provided by Cluster in order to study magnetic holes in the solar wind and the terrestrial magnetosheath. In particular, the authors have identified 26 magnetic holes upstream of the bow shock and detected them shortly after, downstream in the magnetosheath. This study also presents a correlation between upstream and downstream observations of some of the magnetic holes' properties. The authors find that the temporal scale size and magnetic field rotation across the magnetic holes are very similar for the upstream and downstream observations, while the depth of the magnetic holes varies more. The results are consistent with the interpretation that magnetic holes are of solar wind origin, as suggested in previous works.

The manuscript presents a comprehensive and interesting analysis, reports new findings, and is well-written. I have only minor comments for the authors' consideration.

Lines 121-123: This seems to be a suggestion rather than a conclusion. I suggest rephrasing this sentence.

Lines 130-134: 'We will define an event as a magnetic hole event if a localized magnetic field decrease is below -0.5 in either the solar wind or the magnetosheath region, and there is a similar structure with a decrease of at least -0.4 in the 'complementary' region (in this case the solar wind.)' These seem to be arbitrary numbers. Is there a physical reason for this choice? Do the results presented in this work vary significantly if the authors consider different values for the magnetic field decrease in both regions?

Figure 3: How do the authors distinguish between magnetic holes (particularly rotational magnetic holes) in the solar wind and current sheet crossings (e.g, heliospheric current

sheet crossings)?

Line 246: The authors stated they identified 26 events of interest. I think it would be worth adding the amount of data that has been analyzed to be able to find them. How often magnetic holes are observed by Cluster?