Ann. Geophys. Discuss.,
https://doi.org/10.5194/angeo-2019-111-RC4, 2019

Annales Geophysicae Discussions

Interactive comment on "Overshoot dependence on the cross-shock potential" *by* Michael Gedalin et al.

Anonymous Referee #2

Received and published: 29 November 2019

This paper is a very interesting and elegant treatment of the magnetic overshoot structure of collisionless shocks including comparison of the presented analytical/numerical results with 2 periods of observation of Earth's quasi-perpendicular bow shock by THEMIS. The analysis is based on both analytical and numerical calculations of the proton orbits in a low-beta plasma at both perpendicular and quasi-perpendicular shocks for a variety of ramp potentials with the magnetic field determined by pressure balance. The analysis enables the ramp potential to be estimated based on the pattern of the downstream magnetic field magnitude oscillations.

In general I would recommend the paper for publication in Annales Geophysicae. However, I think the paper would benefit from some introductory text on collisionless shocks, and outstanding challenges in our understanding of them, in order that the paper is

more accessible, interesting and useful, for readers who are not experts in the subject.

Specific issues are:

1. (page 1, line 3) . . ..two critical cross-shock potentials are defined. . ..
2. (1, 4) How is the "normal" velocity defined? Normal to what?
3. (1, 5) Plasma-beta should be defined.
4. (1, 16) Define "super-critical."
5. (2, 4) Sufficient attention has not been devoted. . ...
6. (2, 6) . . ..as well as about. . ...
7. (2, 15 – 20) The distinction between v and u is not made clear.
8. (3, 4) . . ..derive an analytical. . ..
9. (3, 5) . . ..to weak. . .
10. (3, 12) . . ..velocity decreases. . .
11. (3, 18) . . ..field peak will. . ..
12. (3, 22) . . ..and the spread. . .
13. (4, 26) . . ..not affect the. . ...
14. (6, 14) . . ...compression, CGP. . .. . = 2, CGP is. . ...
15. (6, 21) . . .. There are two. . ...
16. (7, 1) . . ...but turns around. . ..
17. (7, 11) . . .For an initial. . ..
18. (7, 12) Insert a comma at the beginning of the line
19. (7, 16) . . ...point along the ion. . ...

20. (8, last line) . . .by the test-particle analysis. . ..

21. (9, 4) . . ..show the presence. . ..

22. (11, 6) . . .of a subcritical shock observed by THEMIS B plotted over. . ..

23. (11, 9) . . ...of ions are quasi-reflected. . ...

24. (11, 10) . . ..makes an interpolation, similar. . ...

25. (12, 2) . . ..shows a similar gap in a 2011/11/28. . ..

26. (12, 3) . . ...spectrogram in which reflected ions. . ..

27. (12, 8) . . ...The absence of ions reflected inside. . ...

28. (12, 11) . . ..quality measurements with regard to both precision. . ..

29. (12, 12) . . ..much worse: their precision. . ...and the finite number. . ...

30. (12, 14) . . ...would enable us to fill. . ..

31. (12, 15) . . .improve our ability to compare observations and theory.

32. (12, 17) . . ..examine the implications. . ...

33. (13, 2) . . ..and the onset. . ...These two features. . ...

34. (13, 3) . . ..potential that have. . .. . .

Interactive comment on Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2019-111, 2019.