4th Asia-Pacific Conference on Plasma Physics, 26-31Oct, 2020, Remote e-conference

Reconnection at the bow shock and in magnetosheath turbulence

Andris Vaivads[1]
[1] Space and Plasma Physics, KTH Royal Institute of Technology, Sweden
e-mail (vaivads@kth.se)

In recent years there has been an increased number of studies addressing the magnetic reconnection in magnetosheath turbulence and at or near the bow shock. In those regions reconnection often occurs on smaller scales and the properties of reconnected current sheets are much more difficult to study. There are still many open questions about the role of reconnection in the physical processes, particularly particle acceleration, occurring within those regions.

We present some recent examples of MMS observations of reconnection near the Earth's bow shock[1–3], compare those with existing simulation data[4] and discuss their importance. While in some cases the reconnection is triggered by solar wind discontinuities[1], in most cases shock turbulence develops intrinsically forming current sheets where reconnection can occur. The strongest turbulence develops downstream of quasi-parallel shocks and we discuss the role SLAMS and magnetosheath jets can have in the formation of turbulence. There are several studies of reconnection from the turbulent regions downstream of the quasi-parallel shocks[5–7]. In the studied cases spacecraft are crossing current sheets within the diffusion region and reconnection signatures has been observed in electrons. It has been suggested that turbulent current sheets are of small size and therefore ion signatures cannot develop[7]. There have been suggestions that other processes than reconnection, e.g. shock like acceleration, can lead to the electron heating in magnetosheath current sheets[8]. Finally, the relation between Kinetic Alfvén Wave turbulence and reconnection in localized current sheets continues to be highly important and open topic[9].

References

[1] Hamrin, M. *et al*. J. Geophys. Res. Space Phys. **124**, 8507–8523 (2019).
[2] Gingell, I. *et al*. J. Geophys. Res. Space Phys. **125**, e2019JA027119 (2020).
[3] Wang, S. *et al*. Geophys. Res. Lett. **46**, 562–570 (2019).
[4] Bessho, N. *et al*. Geophys. Res. Lett. **46**, 9352–9361 (2019).
[5] Eriksson, E. *et al*. Geophys. Res. Lett. **45**, 8081–8090 (2018).
[6] Retinò, A. *et al*. Nat. Phys. **3**, 235–238 (2007).
[7] Phan, T. D. *et al*. *Nature* **557**, 202–206 (2018).
[8] Eriksson, E. *et al*. J. Geophys. Res. Space Phys. **121**, 2016JA023146 (2016).
[9] Vega, C., Roytershteyn, V., Delzanno, G. L. & Boldyrev, S. Astrophys. J. **893**, L10 (2020).

.