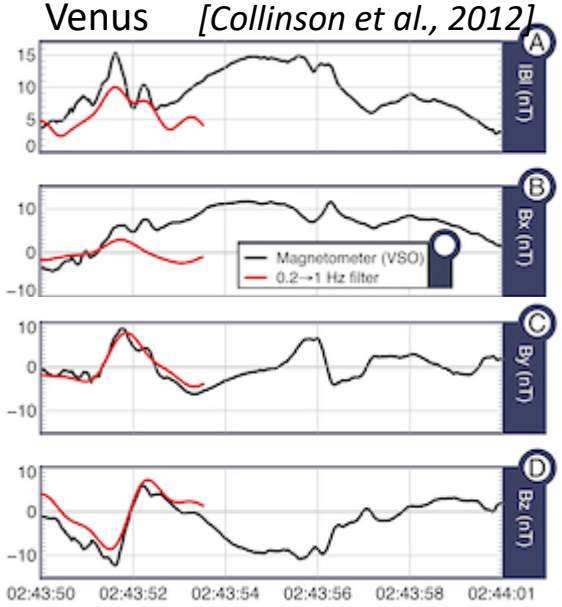
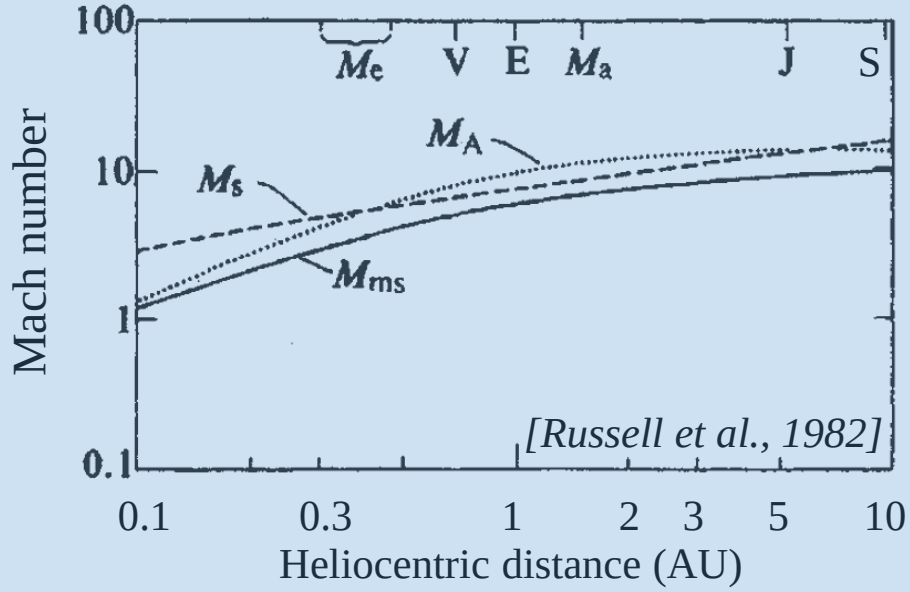
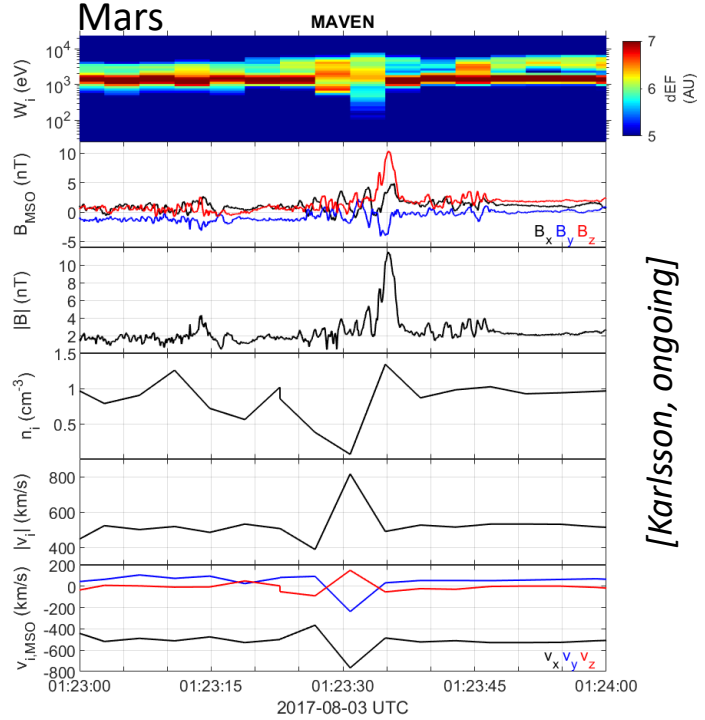
Venus [Collinson et al., 2012]



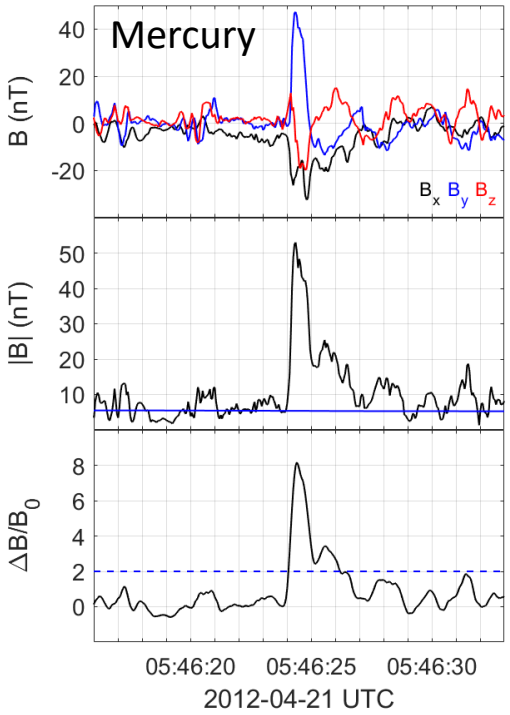


Mars



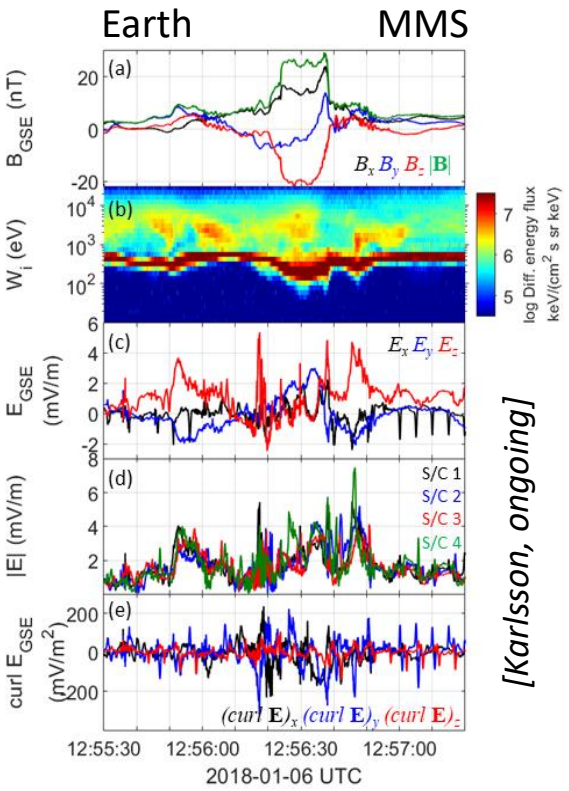
[Karlsson, ongoing]

Mercury



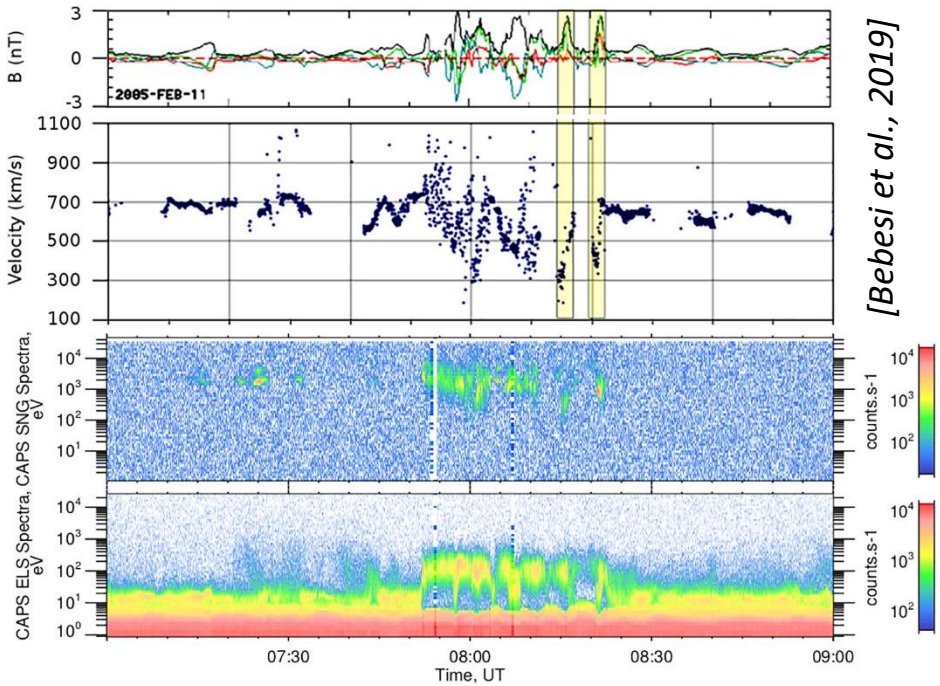
[Karlsson and Plaschke, ongoing]

Earth MMS



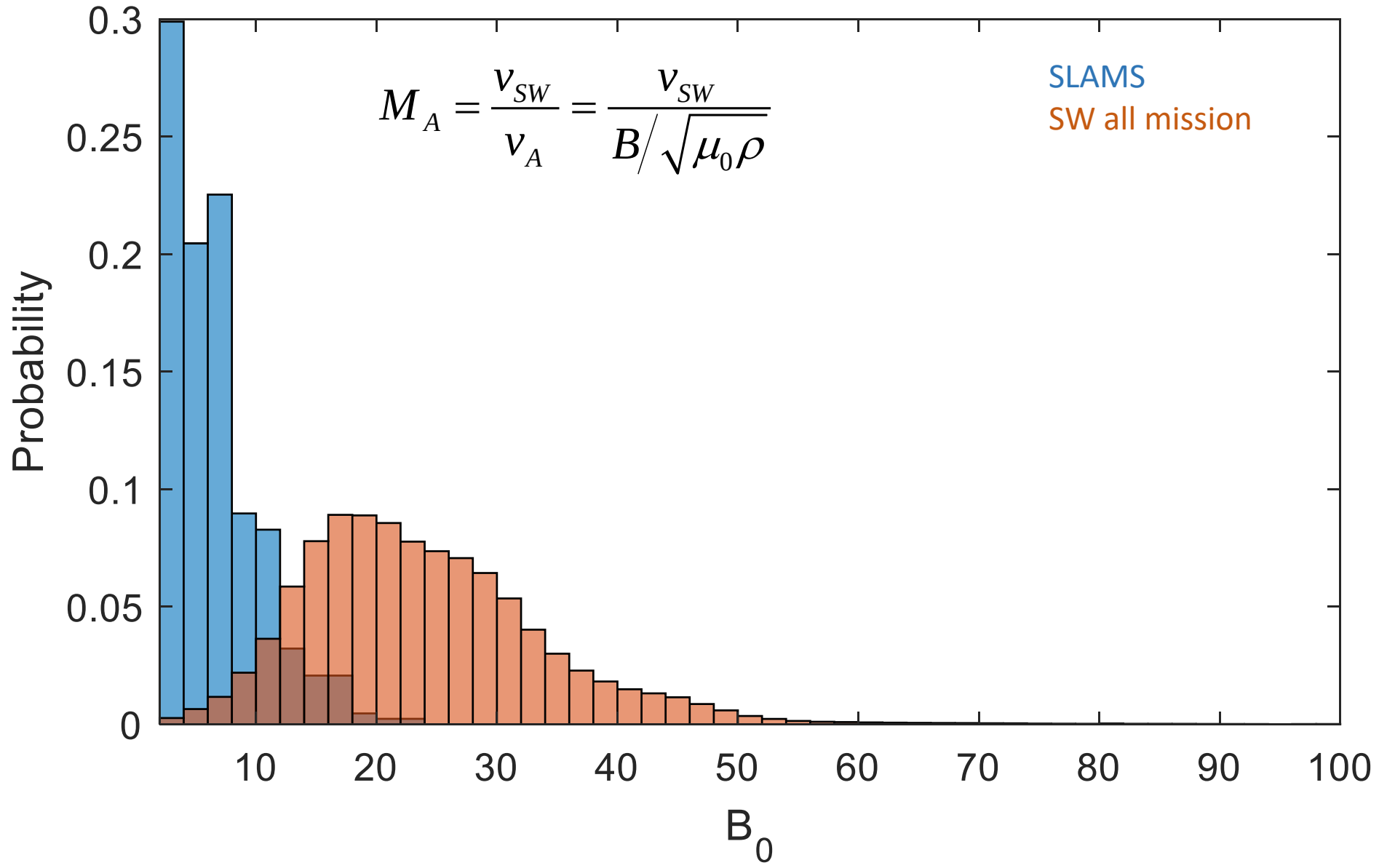
[Karlsson, ongoing]

Saturn



[Bebesi et al., 2019]

Mercury - MESSENGER



Evaluating the de Hoffmann-Teller cross-shock potential at real collisionless shocks

Steven J Schwartz[1], Robert Ergun, Harald Kucharek, Lynn Wilson III, Li-Jen Chen, Katherine Goodrich, Drew Turner, Imogen Gingell, Hadi Madanian, Daniel Gershman, Robert Strangeway

[1]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado, USA

Objectives

Q1: Do proposed "adaptive" dHT frame transformations work in real life?

Q2: Can MMS do this, i.e., can we integrate DC electric fields?

Basics

$$\mathbf{E} + \mathbf{V_e} \times \mathbf{B} = -\frac{1}{n_e e}\nabla \cdot \mathbf{P}_e + \ldots$$

$$\phi = -\int \mathbf{E} \cdot \mathbf{n}\, dn$$

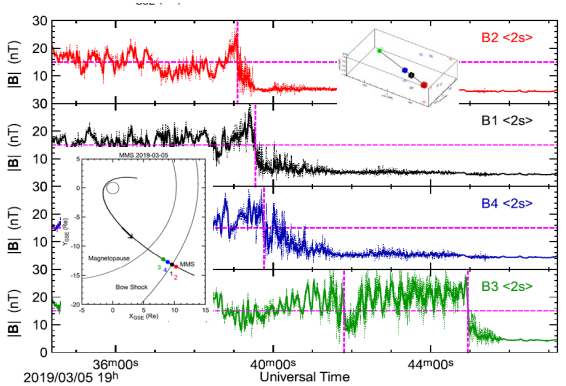
- dHT frame has **V** || **B**
- Not obvious in 3D non-stationary
- Gold standard comes from integrating ambipolar or using e- Liouville mapping

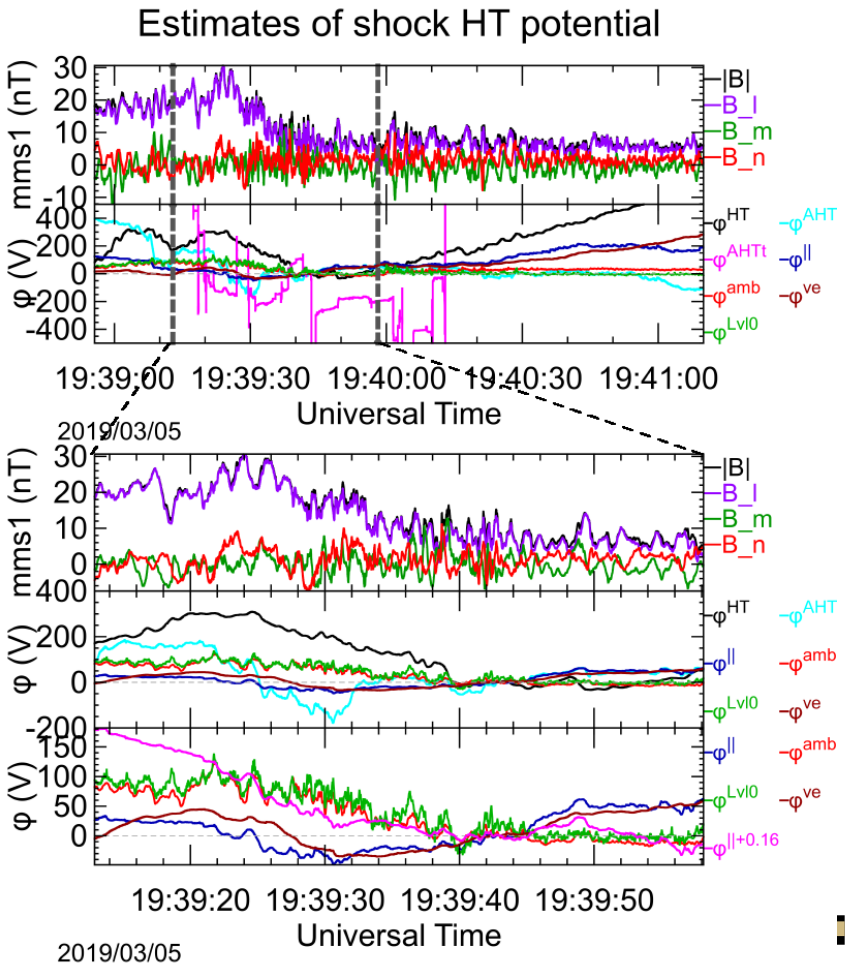
Method

- MMS string of pearls (to facilitate x <-> t)
- Compare various alternatives

Results

- Q1: No. Issues with non-constant **n** and/or B_n
- Q2: ALMOST! Basic $\int E_{||}$ and direct $\int$ of e- momentum eqn best, but only with addition of arb E-field offset (within errors)
- See poster for details
- Under review



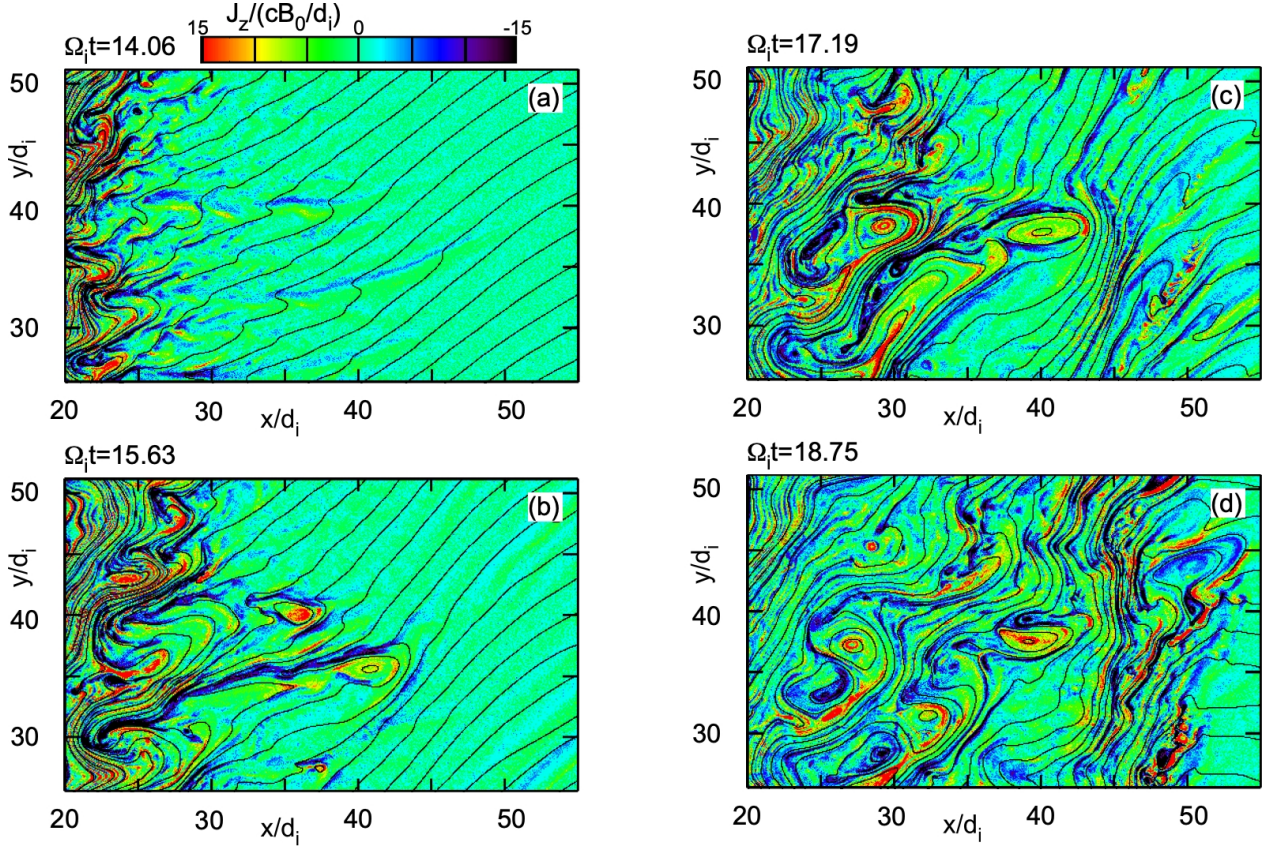


Laboratory for Atmospheric and Space Physics

Shock reformation and a mode conversion in a quasi-parallel shock

N. Bessho[1,2], L.-J. Chen[2], S. Wang[1,2], J. Ng[1,2], M. Hesse[3], and L. Wilson III[2]
1. UMD, 2. NASA GSFC, 3. NASA ARC

2D PIC simulation, theta=25 degrees, M_A=11.4 Bessho et al. 2020



The shock reformation looks due to the formation of flux ropes, which can compress the plasma to form the new shock front.

Mode conversion (oblique to perpendicular) plays an important role.
The quasi-parallel shock becomes a perpendicular shock.