

# *Simulation of Collisionless Shock Waves*

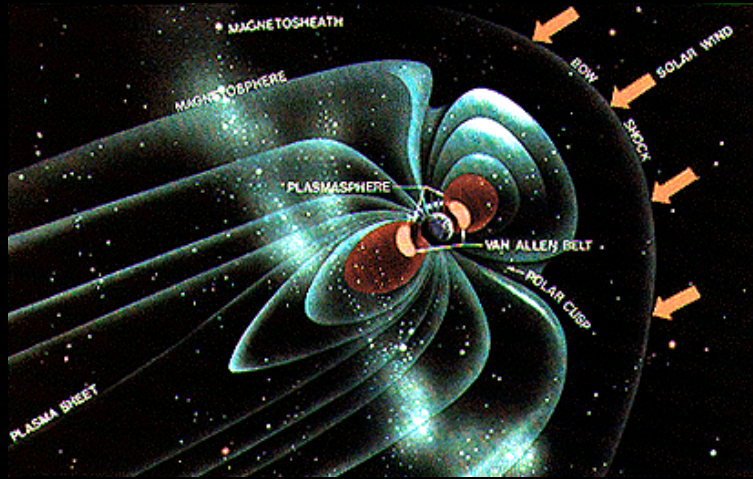


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&

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# Planetary bow shock



- Deceleration of the supersonic solar wind

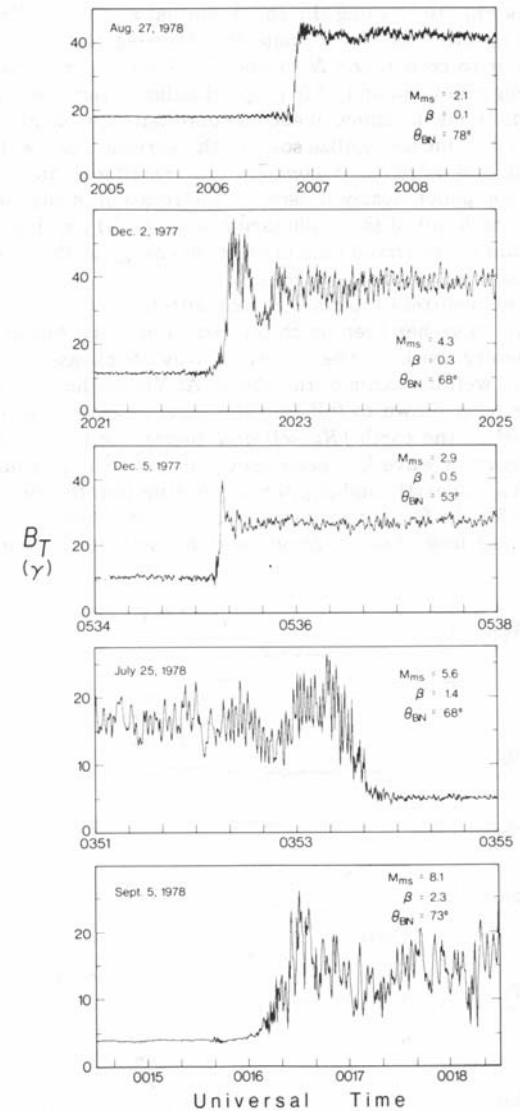
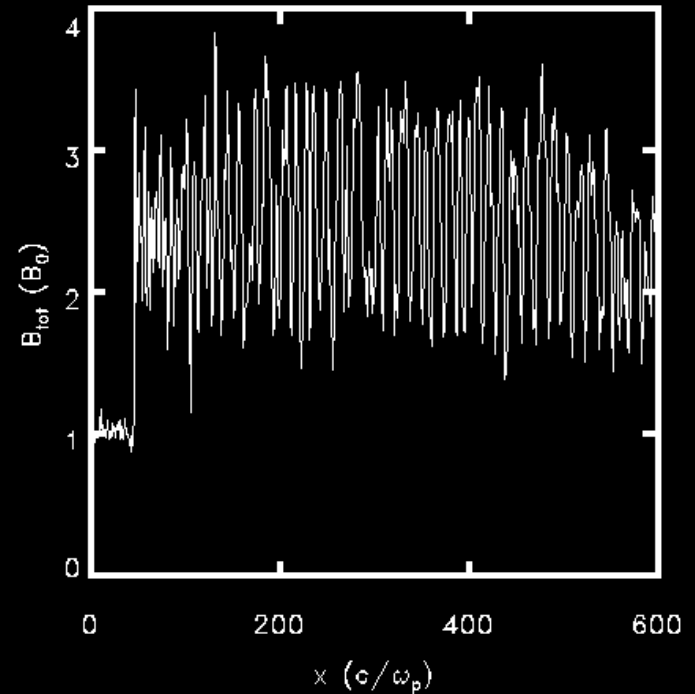
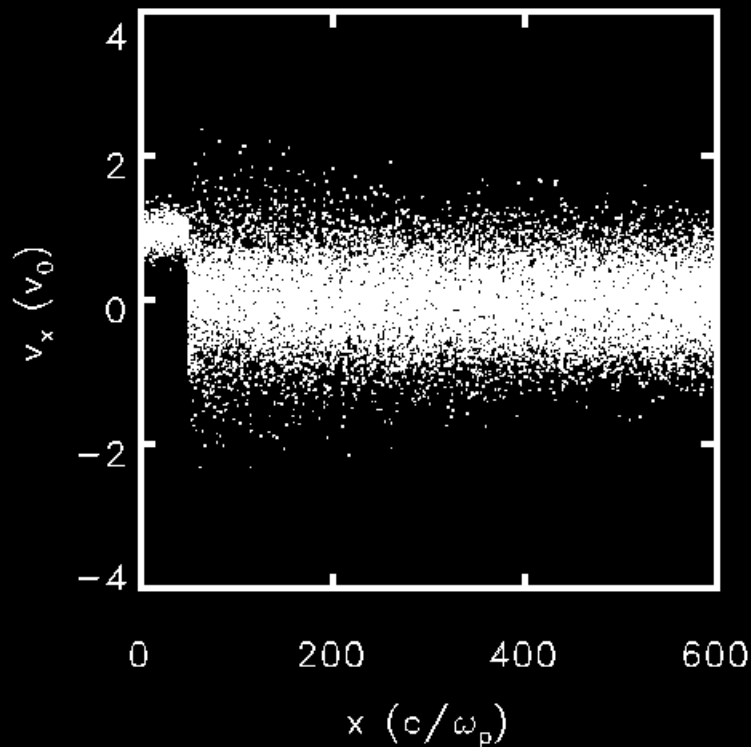


Fig. 6. ISEE 1 and 2 magnetic field measurements across the terrestrial bow shock illustrating the transition between low Mach number low beta quasi-perpendicular shocks and high Mach number high beta quasi-perpendicular shocks [Russell *et al.*, 1982].

# *Simulation Code*

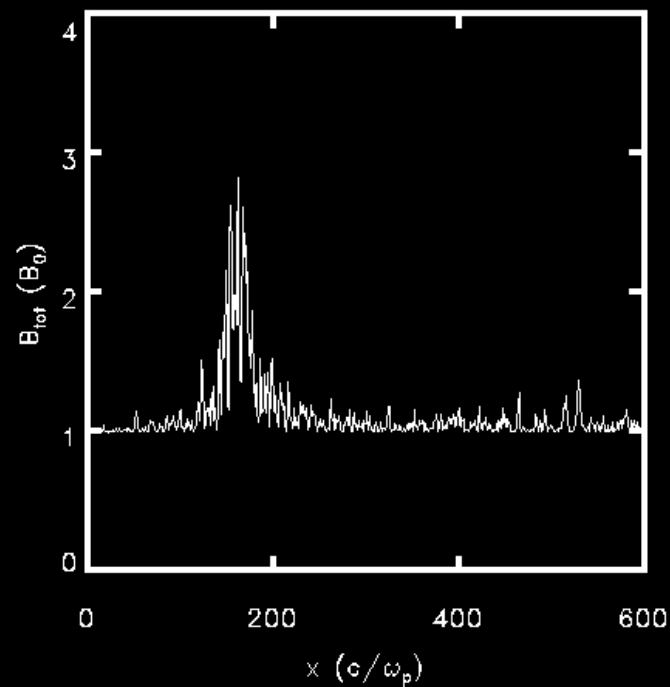
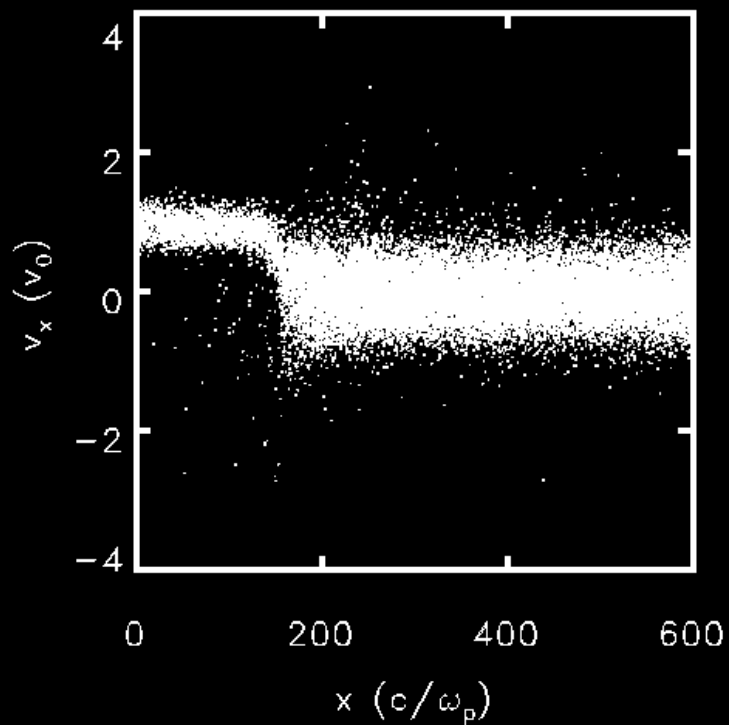
- Protons + electrons
- Hybrid description
- 1d in configuration space
- 3d in velocity space

# *Shock Simulation $v$ perp. $B$*



[Motschmann & Mann, 1998]

# Shock Simulation $v \parallel B$



[Motschmann & Mann, 1998]