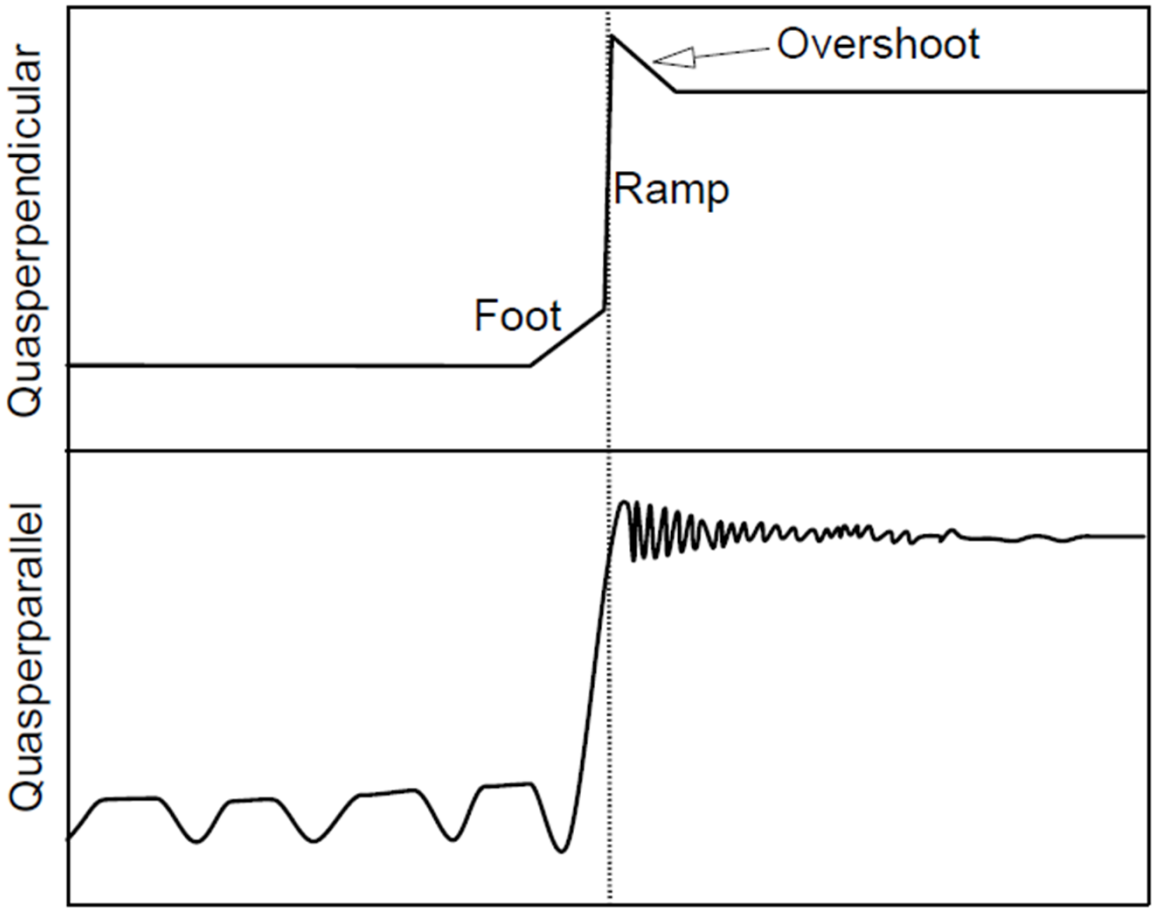
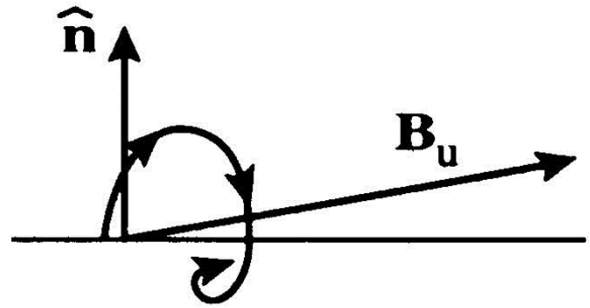
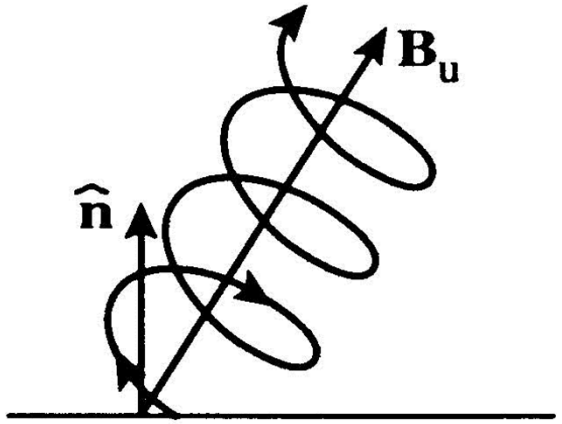


Fig. 6.10 in A. Otto (2006)



Quasi-Perpendicular



Quasi-Parallel

Fig. 5.5 in M. G. Kivelson and C. T. Russell (1995)

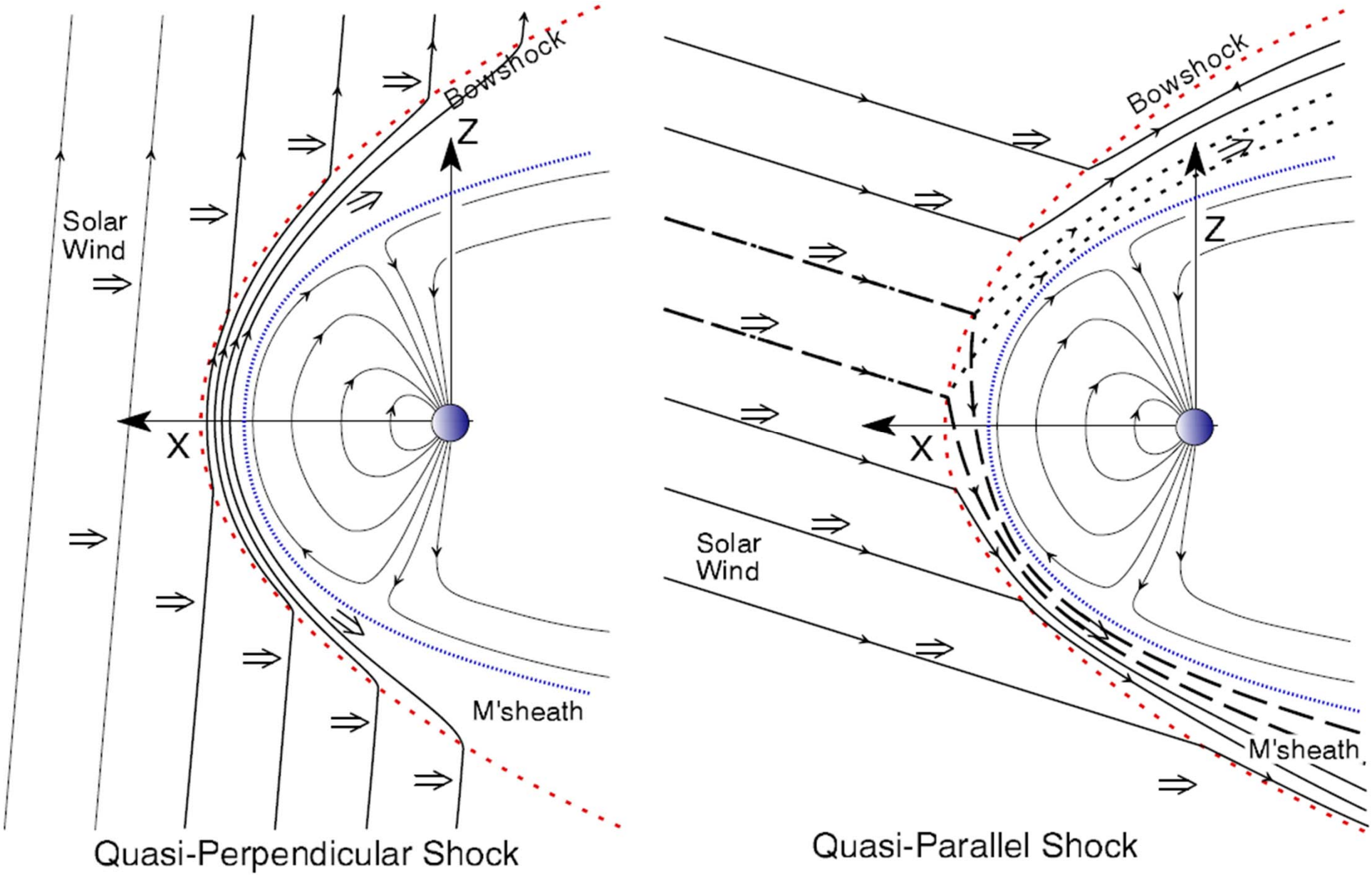
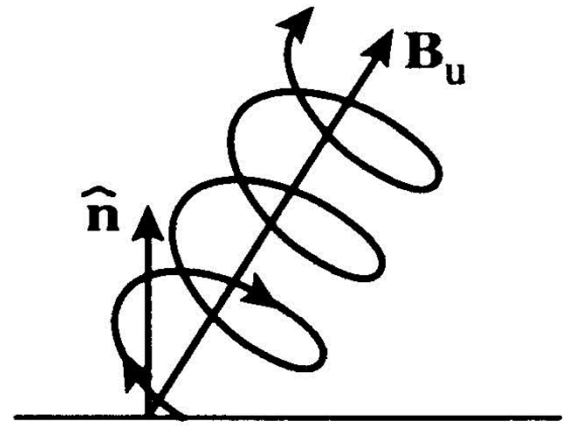
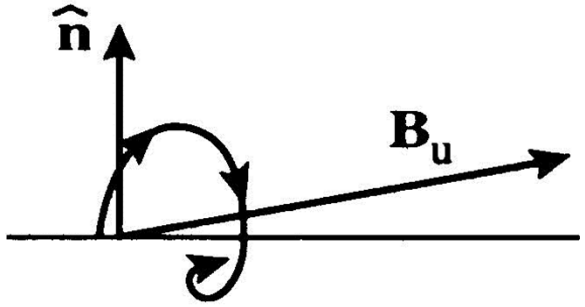


Fig. 6.12 in A. Otto (2006)



Quasi-Parallel



Quasi-Perpendicular

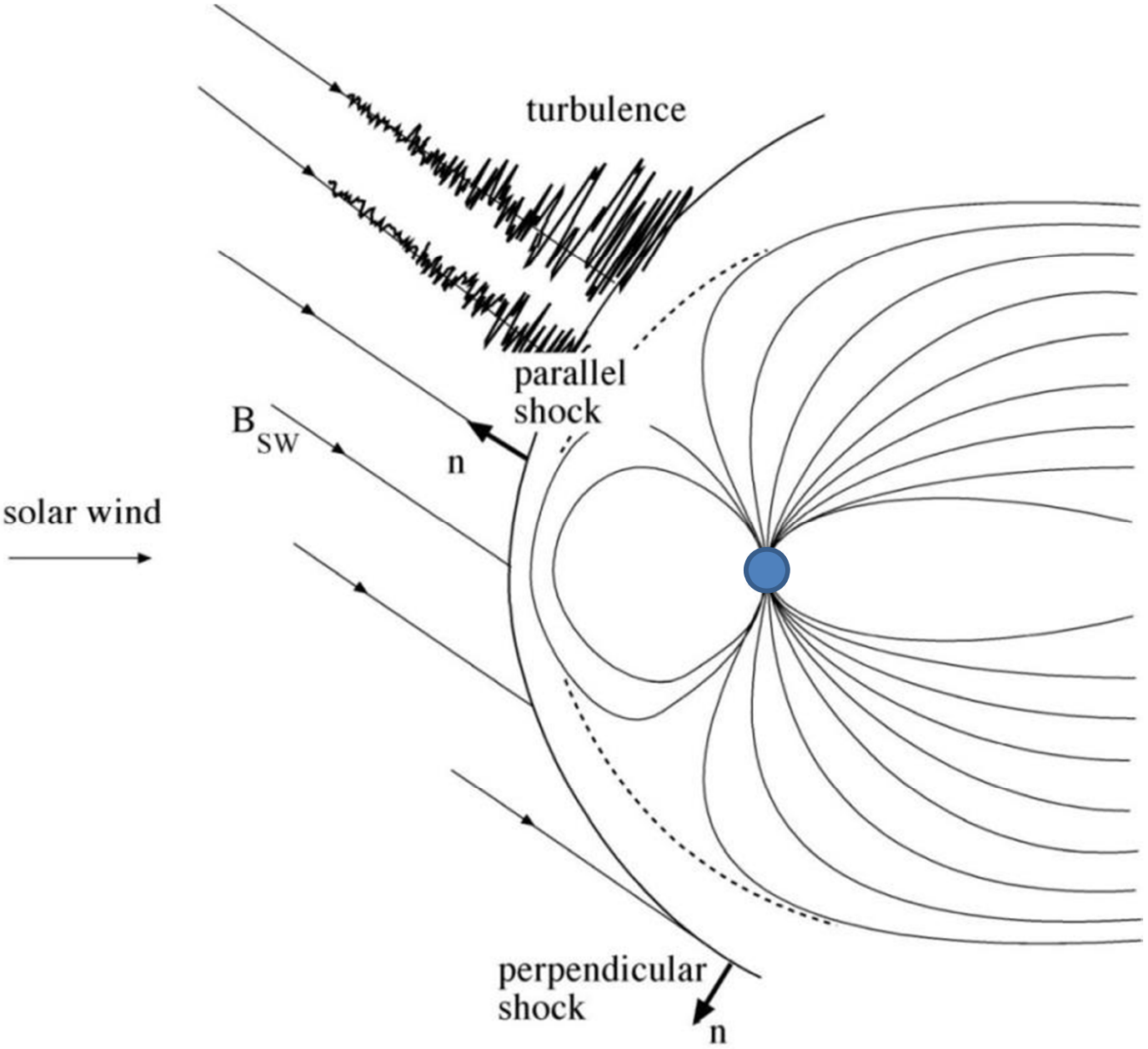


Fig. 5.5 in M. G. Kivelson and C. T. Russell (1995)

http://theory.physics.helsinki.fi/~plasma/lect12j/3_Shockwaves.pdf

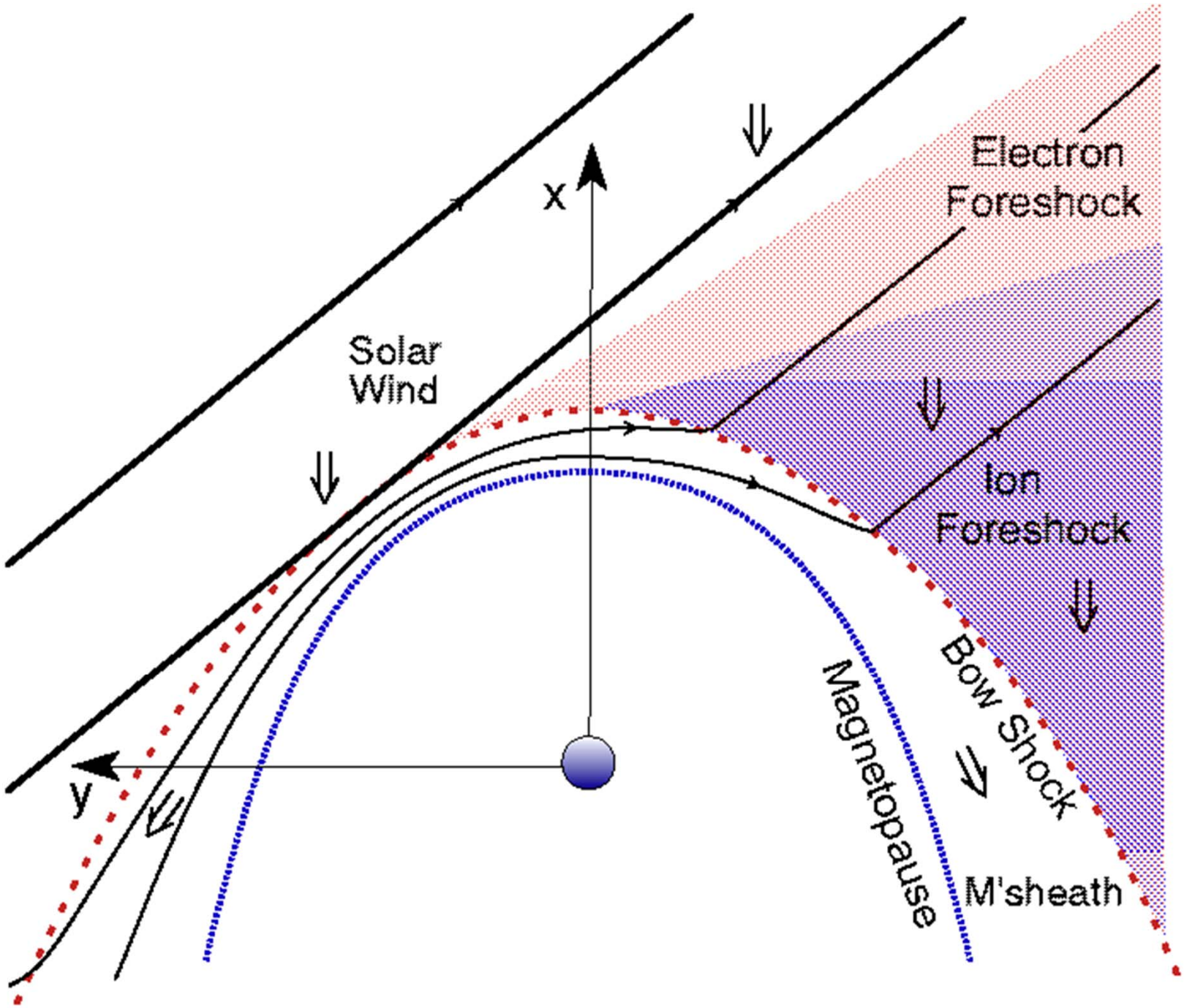


Fig. 6.9 in A. Otto (2006)

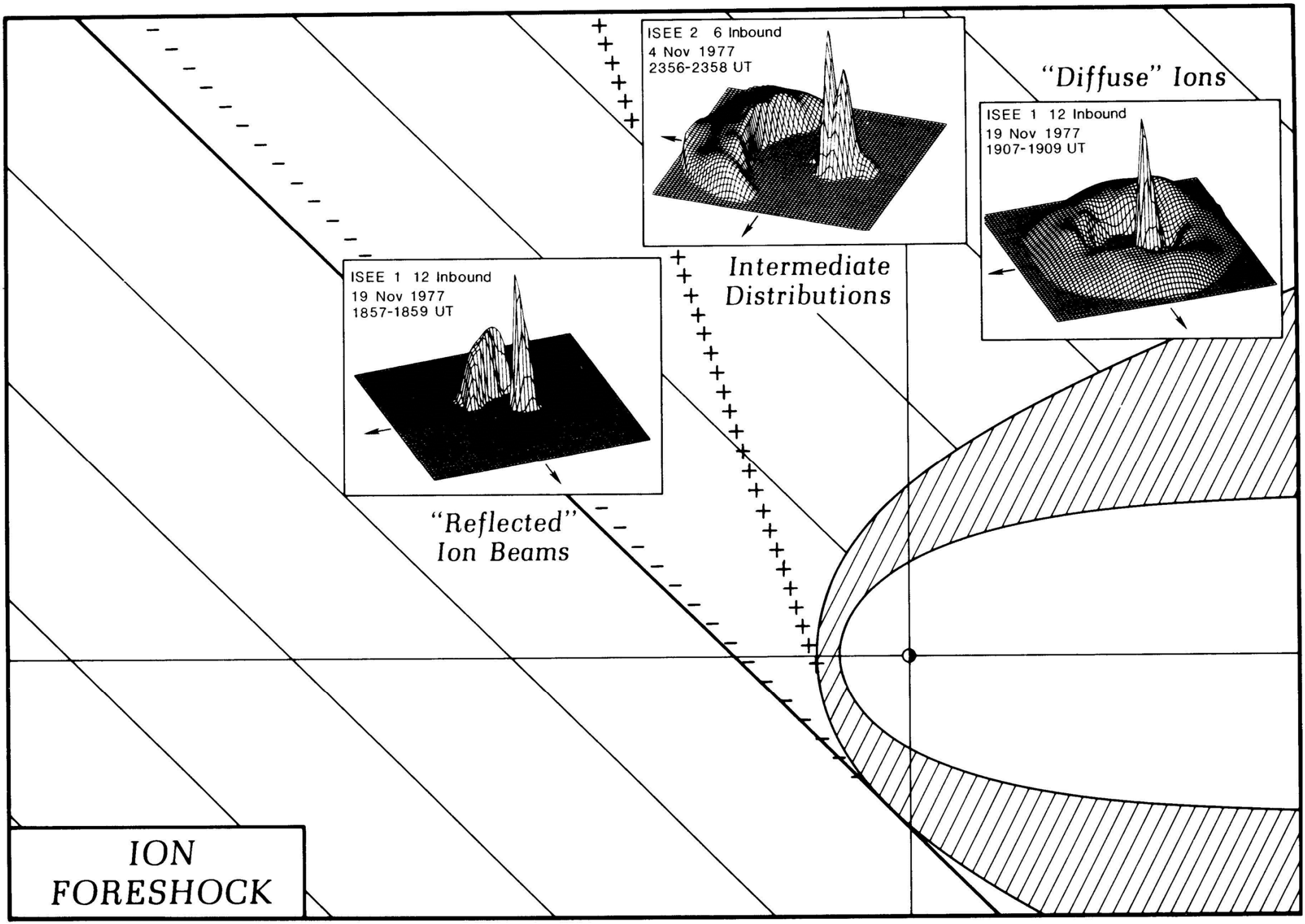


Fig. 1.14 in M. G. Kivelson and C. T. Russell (1995)

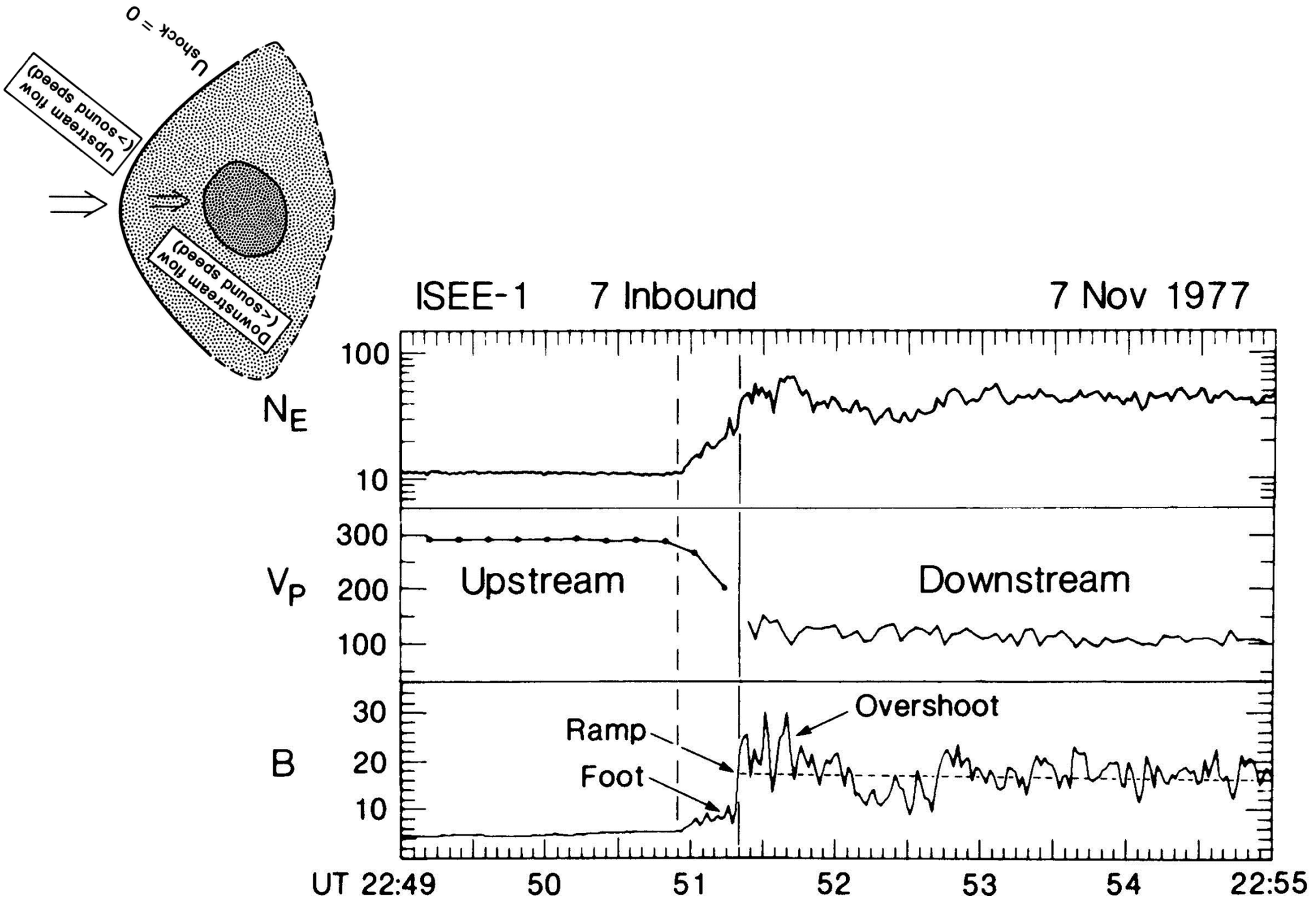
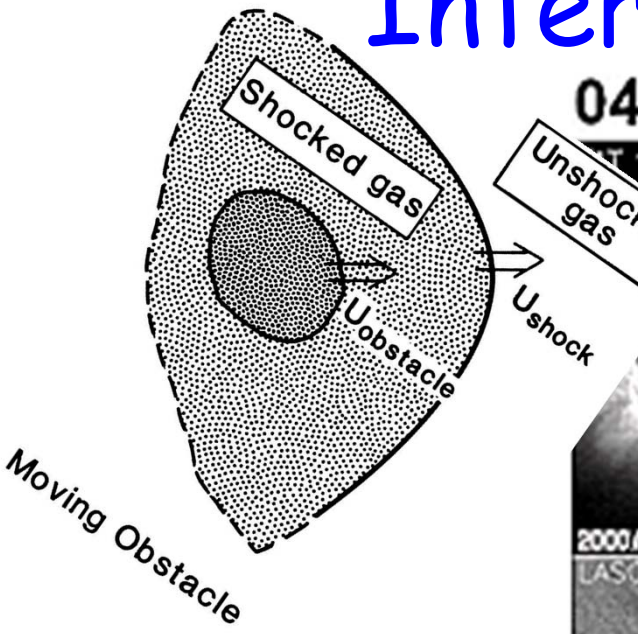
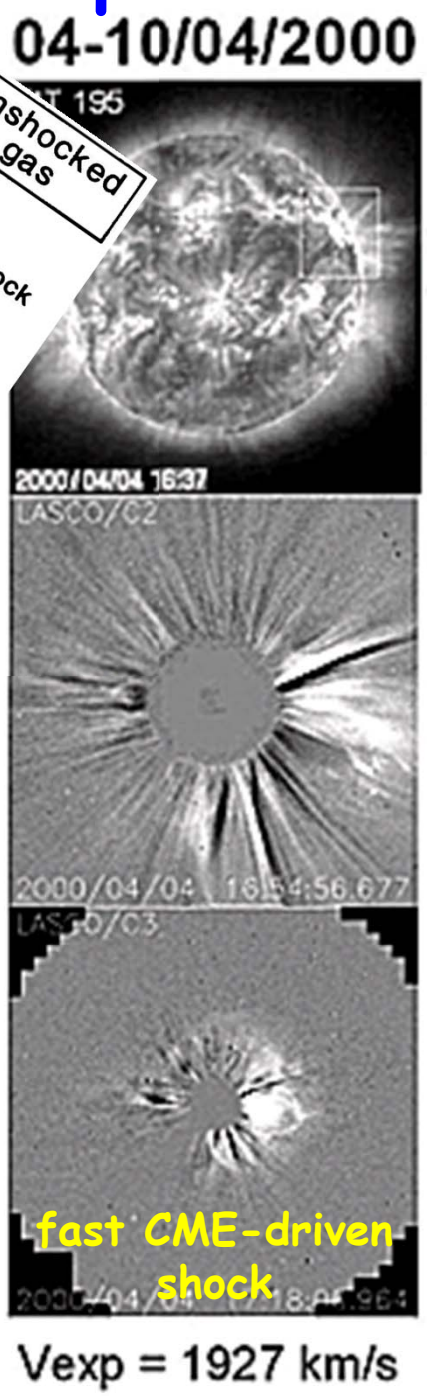
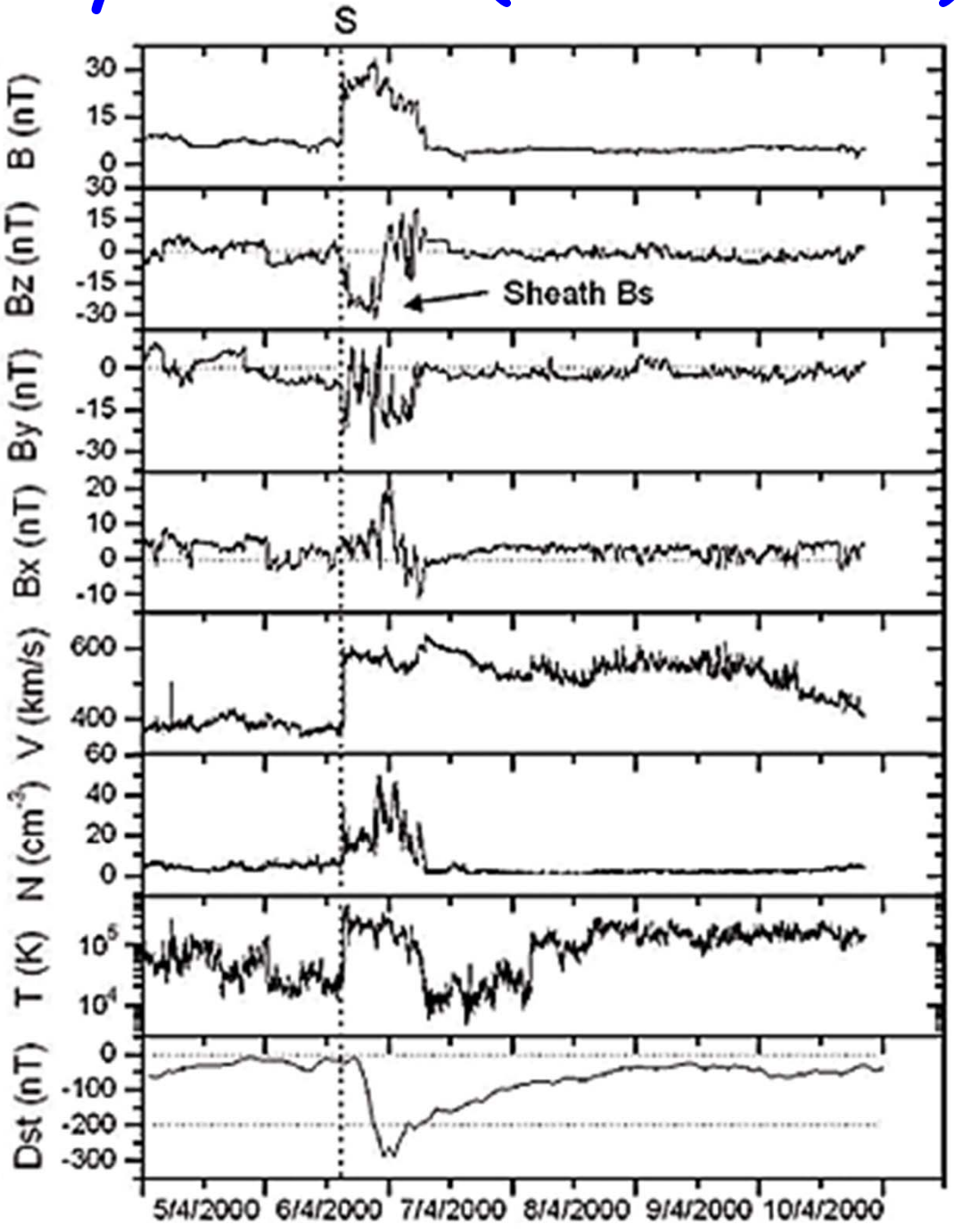


Fig. 5.4 in M. G. Kivelson and C. T. Russell (1995)

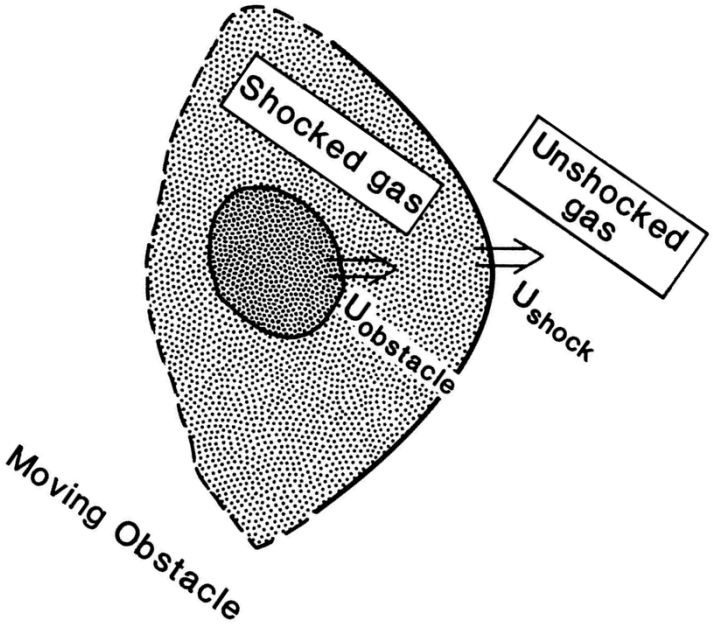
Interplanetary Shock (IP Shock)







http://www.scielo.br/img/revistas/bjp/v34n4b/a08fig01.gif



V_{sw2}=600 km/s

V_{sw1}=350 km/s

V_{shock}=750 km/s

Spacecraft Frame

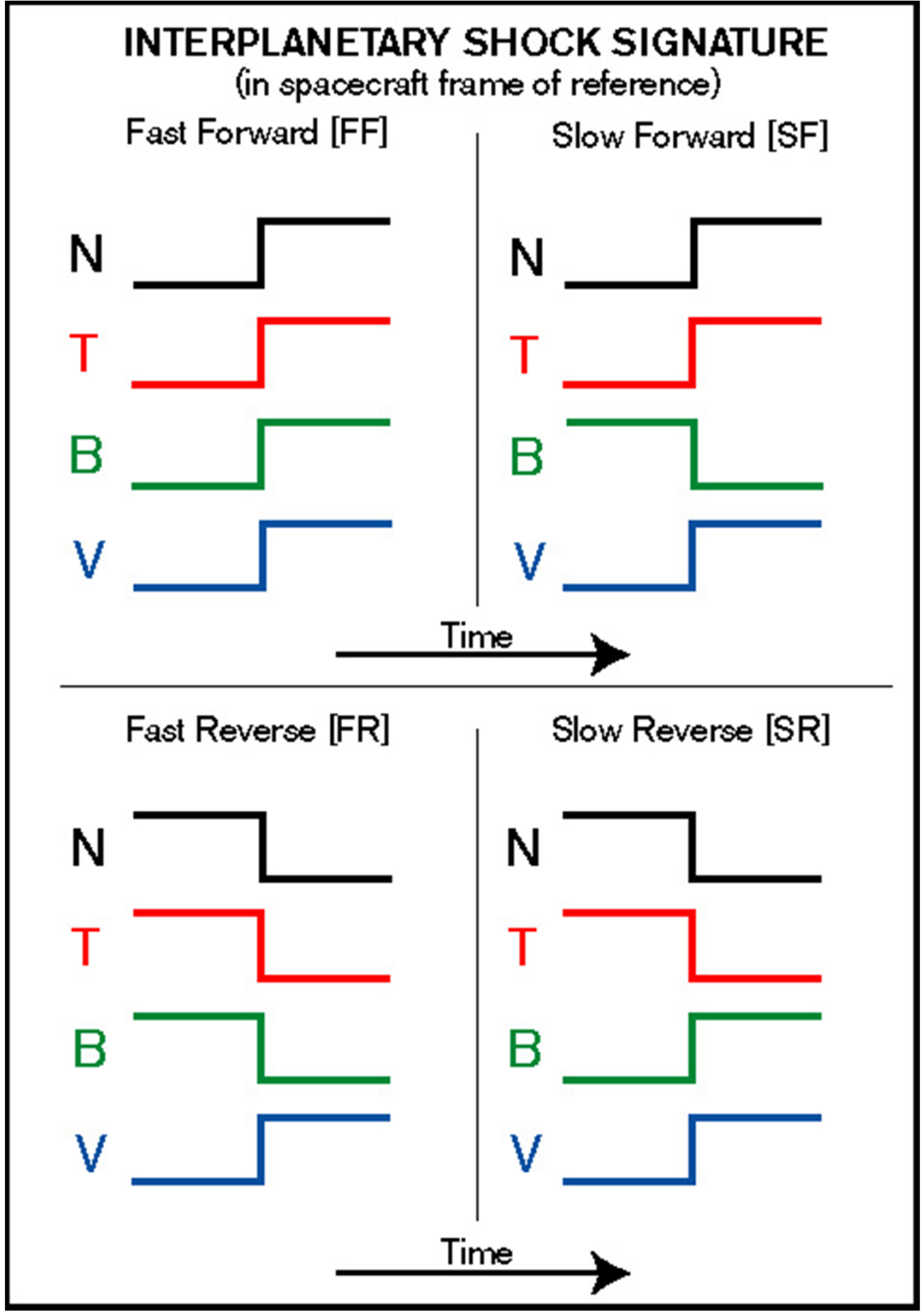
V^*_{sw2} =150 km/s

V^*_{sw1} =400 km/s

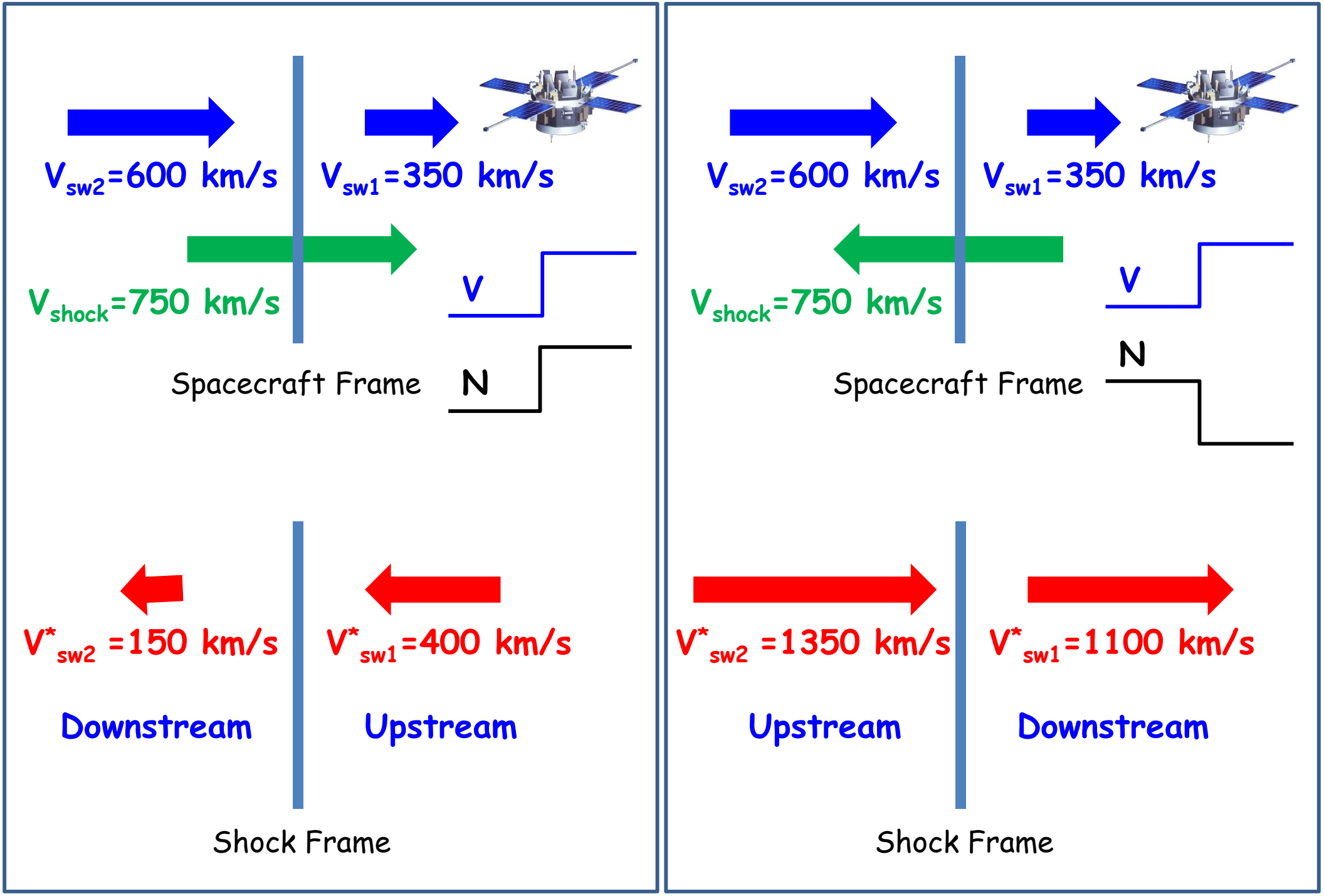
Downstream

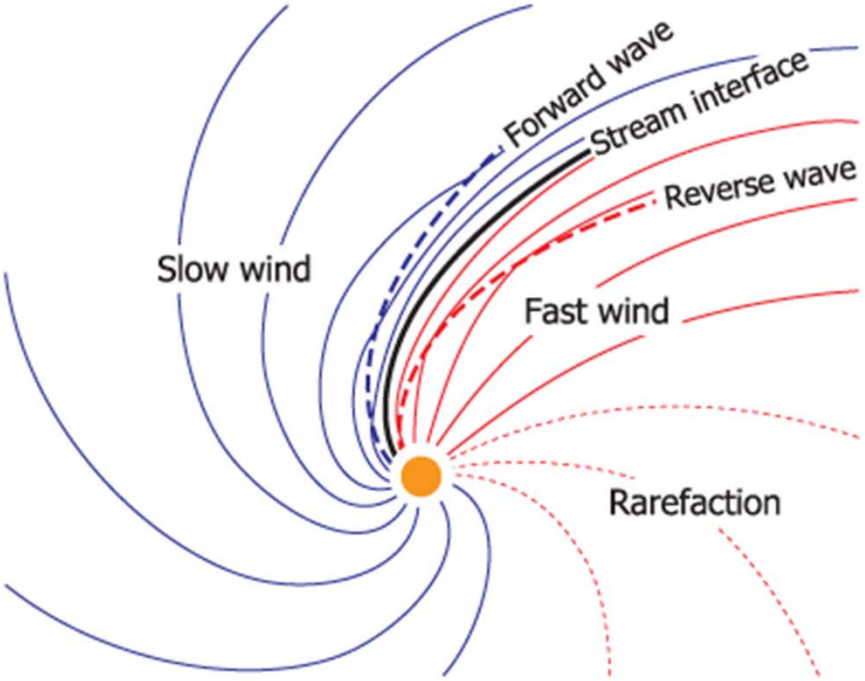
Upstream

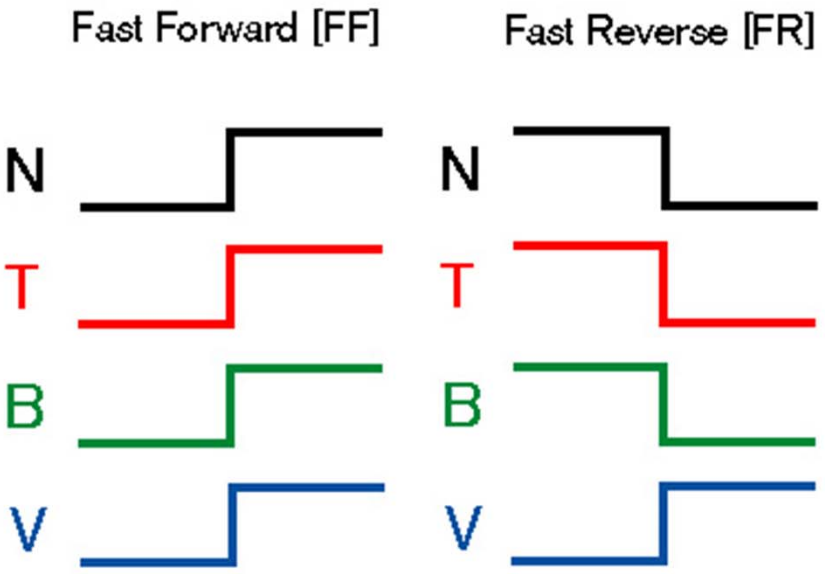
Shock Frame

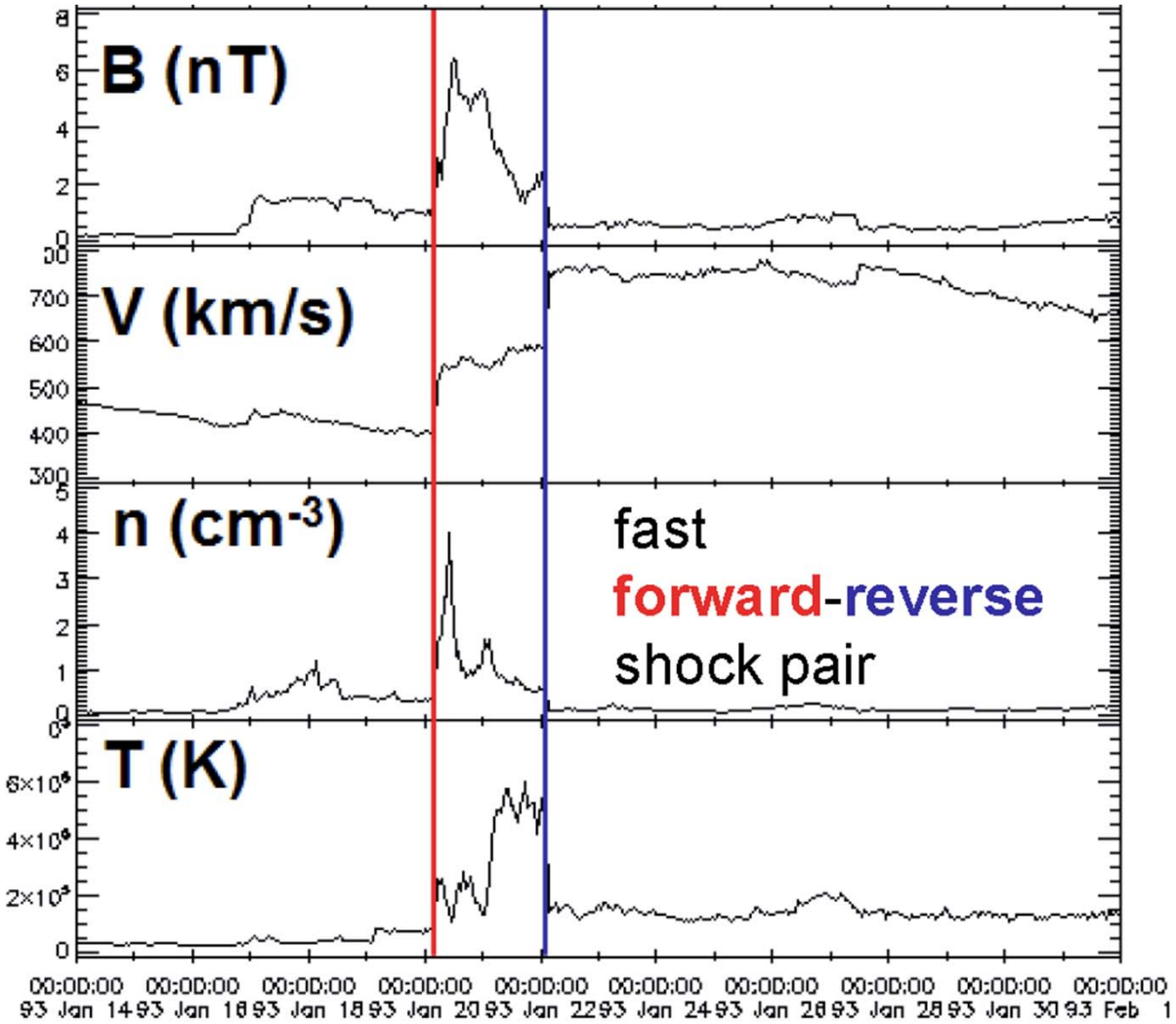


http://wind.nasa.gov/mfi/shock100.jpg

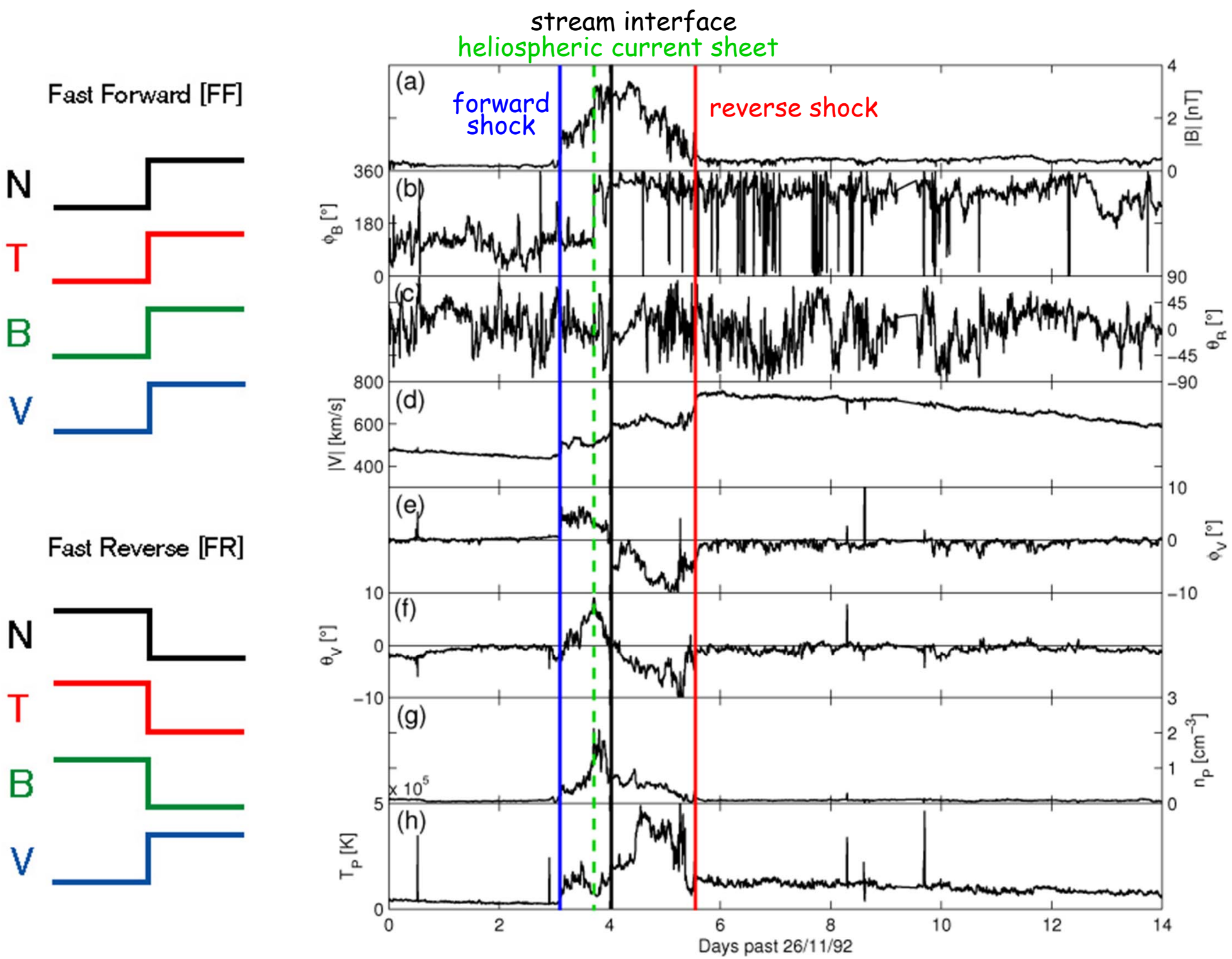

V_{sw2}=600 km/s
V_{sw1}=350 km/s
V_{shock}=750 km/s
V
N
Spacecraft Frame
V^*_{sw2} =150 km/s
V^*_{sw1}=400 km/s
Downstream
Upstream
Shock Frame
V_{sw2}=600 km/s
V_{sw1}=350 km/s
V_{shock}=750 km/s
V
N
Spacecraft Frame
V^*_{sw2} =1350 km/s
V^*_{sw1}=1100 km/s
Upstream
Downstream
Shock Frame





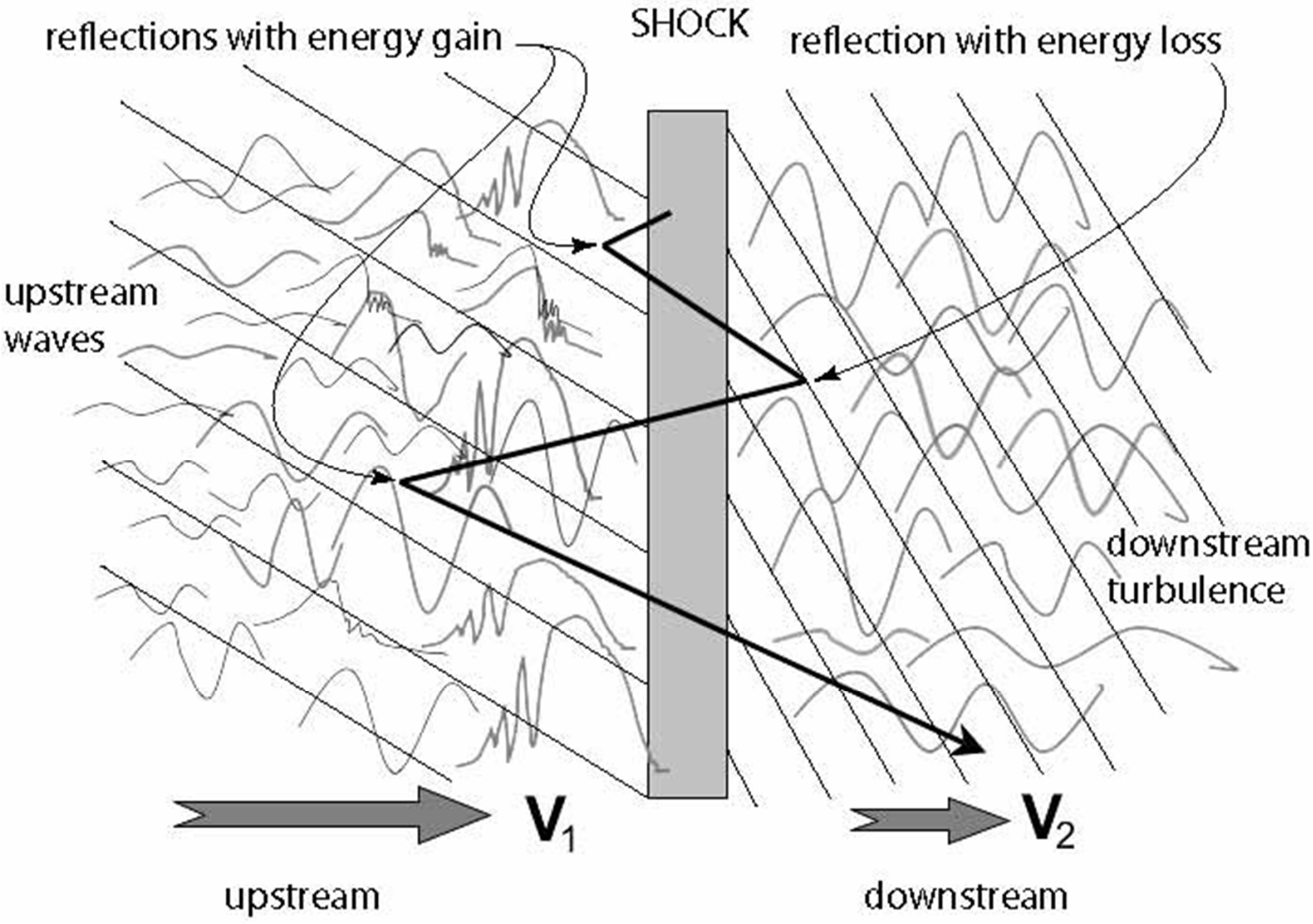


http://theory.physics.helsinki.fi/~plasma/lect12j/3_Shockwaves.pdf

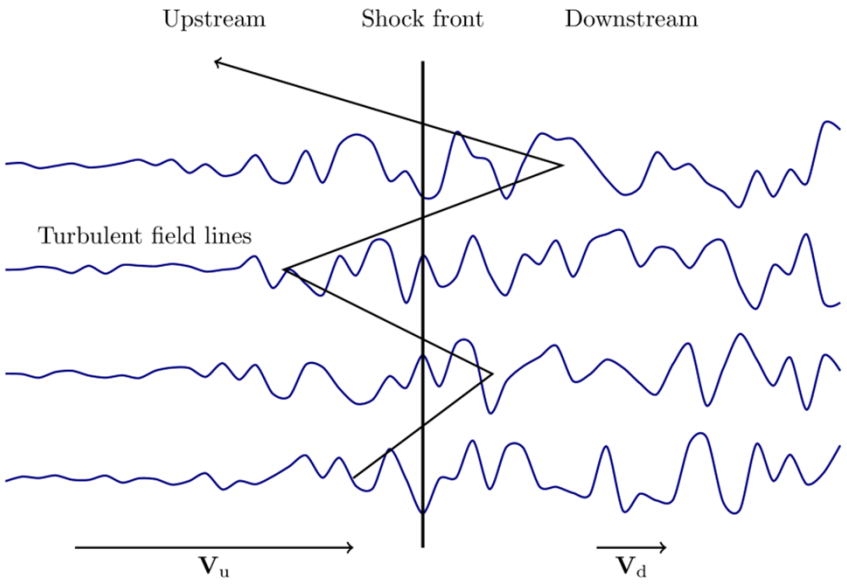


http://solarphysics.livingreviews.org/Articles/lrsp-2013-5/fig_8.html

Diffusive Shock Acceleration



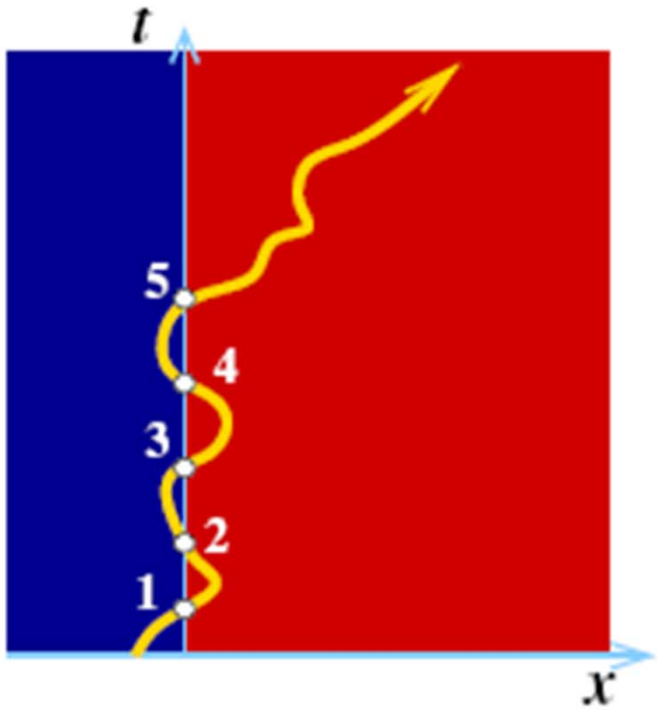
http://inspirehep.net/record/789082/files/chap6-fig-refl.png

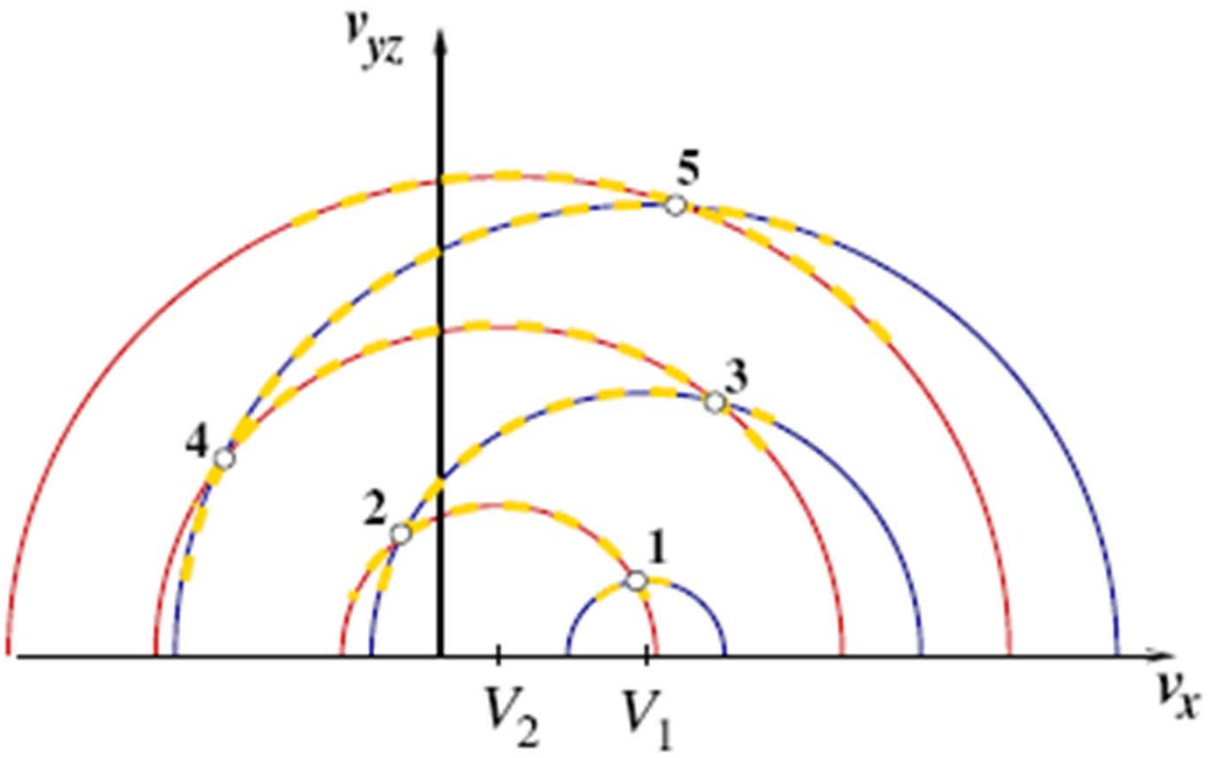


One interaction with the shock cannot provide very energetic particles
→ many interactions needed

Particle scattering → particle can interact with the shock many times

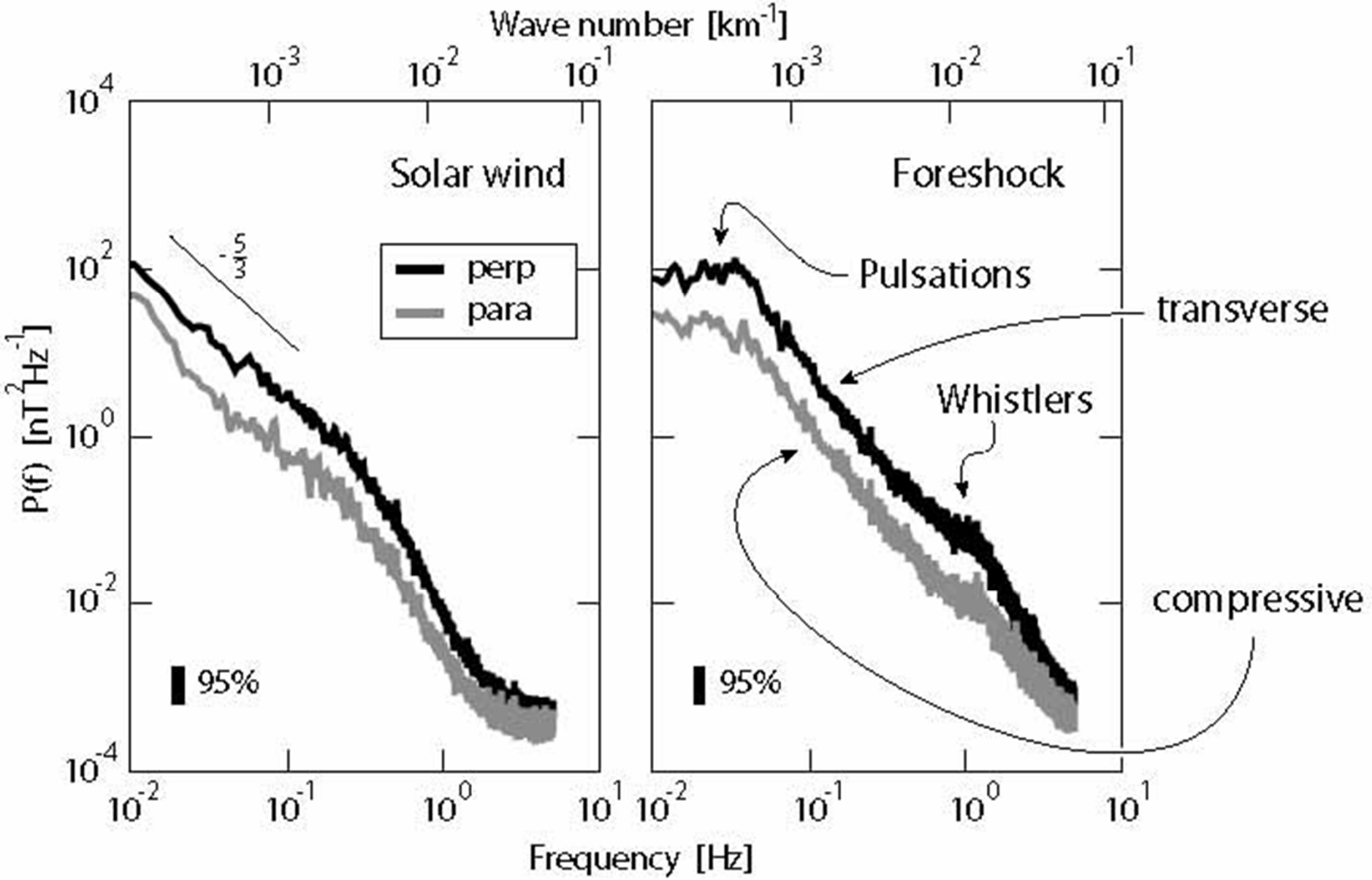
Simplest to describe for quasi-parallel shock waves





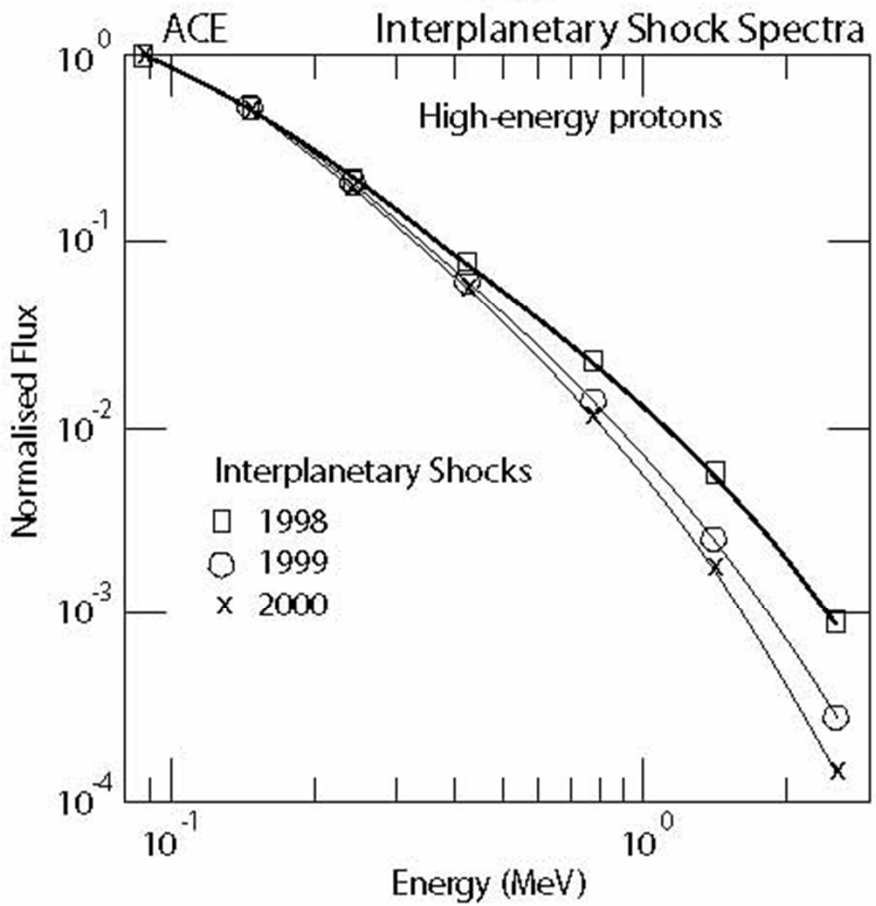
http://sprg.ssl.berkeley.edu/~pulupa/illustrations/diffsa/diffsa.png

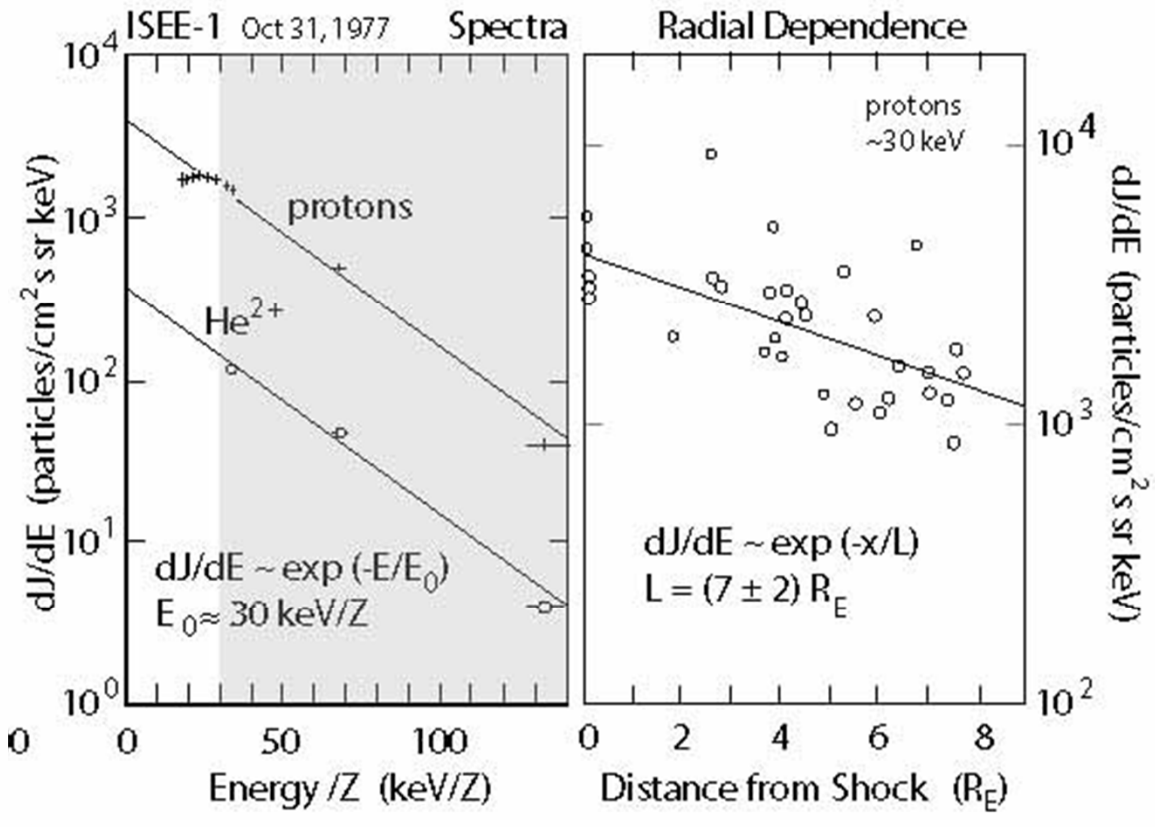
Vainio (2009)



Power spectral densities for the magnetic fluctuations measured by CLUSTER in the solar wind and foreshock. In both cases the anisotropy is quite pronounced with the solar wind behaving like Kolmogorov at low frequencies/large wavelengths.

http://inspirehep.net/record/789082/files/chap6-fig-narita1.png





Obviously the acceleration physics is similar at bow shocks and at travelling shocks. Both kinds of shocks accelerated ions to higher energies when being exposed to scattering centres to both sides of the shock. Hence, the acceleration mechanism generating these particles is of the kind of the first-order Fermi mechanism (or diffusive acceleration). This is in contrast to the power spectra observed at higher energies in cosmic rays.

http://inspirehep.net/record/789082/files/chap6-fig-ace.png

http://inspirehep.net/record/789082/files/chap6-fig-ipav.png