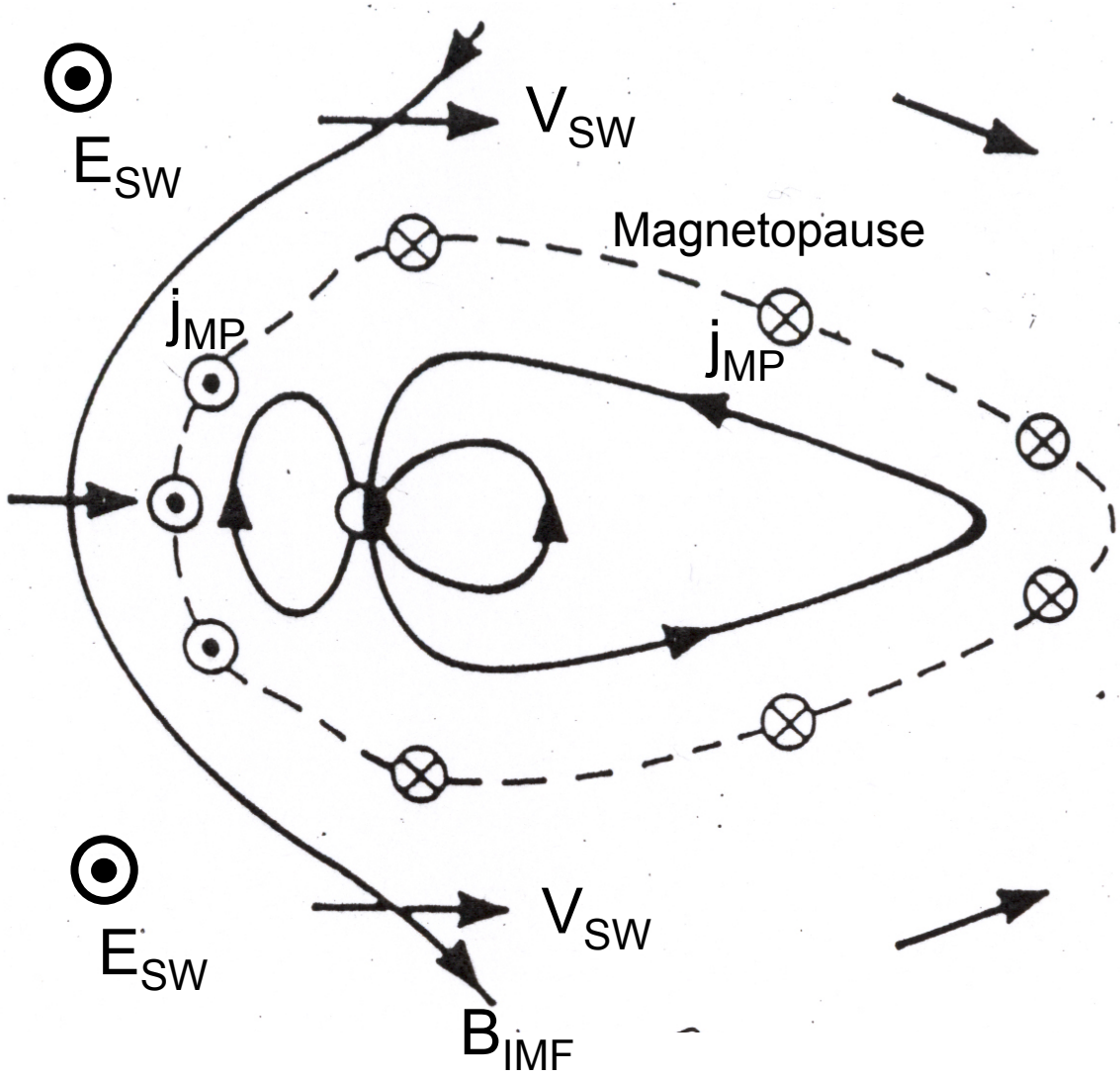
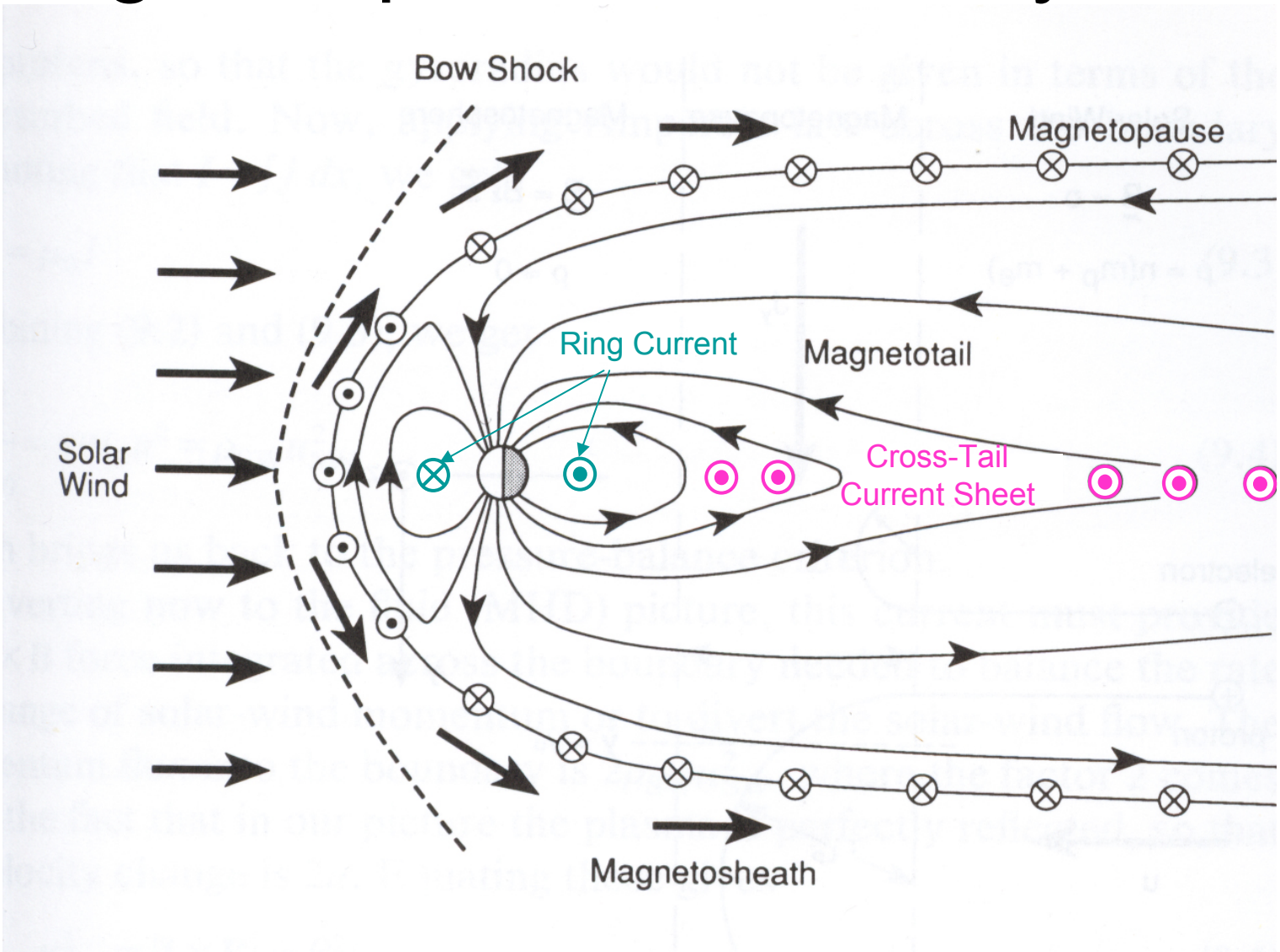
Basic Formation of a Magnetosphere

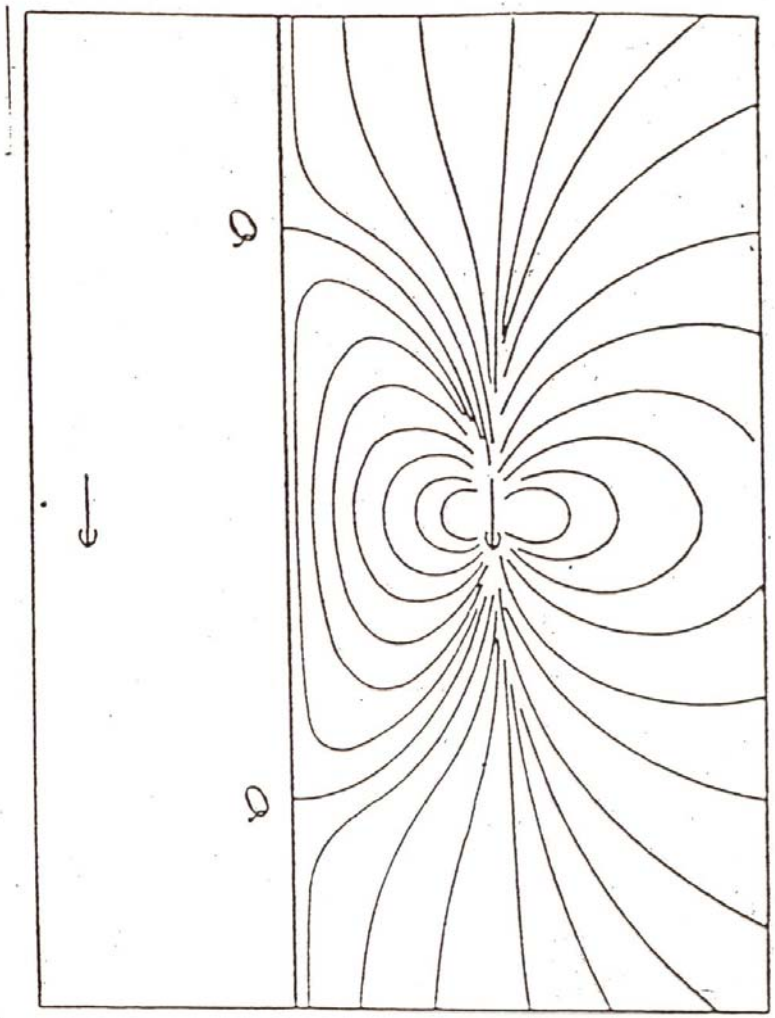


- Solar wind flow is frozen-out of the cavity occupied by the planets magnetic field;
- The dipole field is compressed on the dayside, and may expand to fill the void in the flow on the nightside
- Currents $\mathbf{j}_{MP}$ flow on the boundary to support any changes on magnetic field direction (recall curl $\mathbf{B} = \mu_o \mathbf{j}$)

Magnetospheric Current Systems

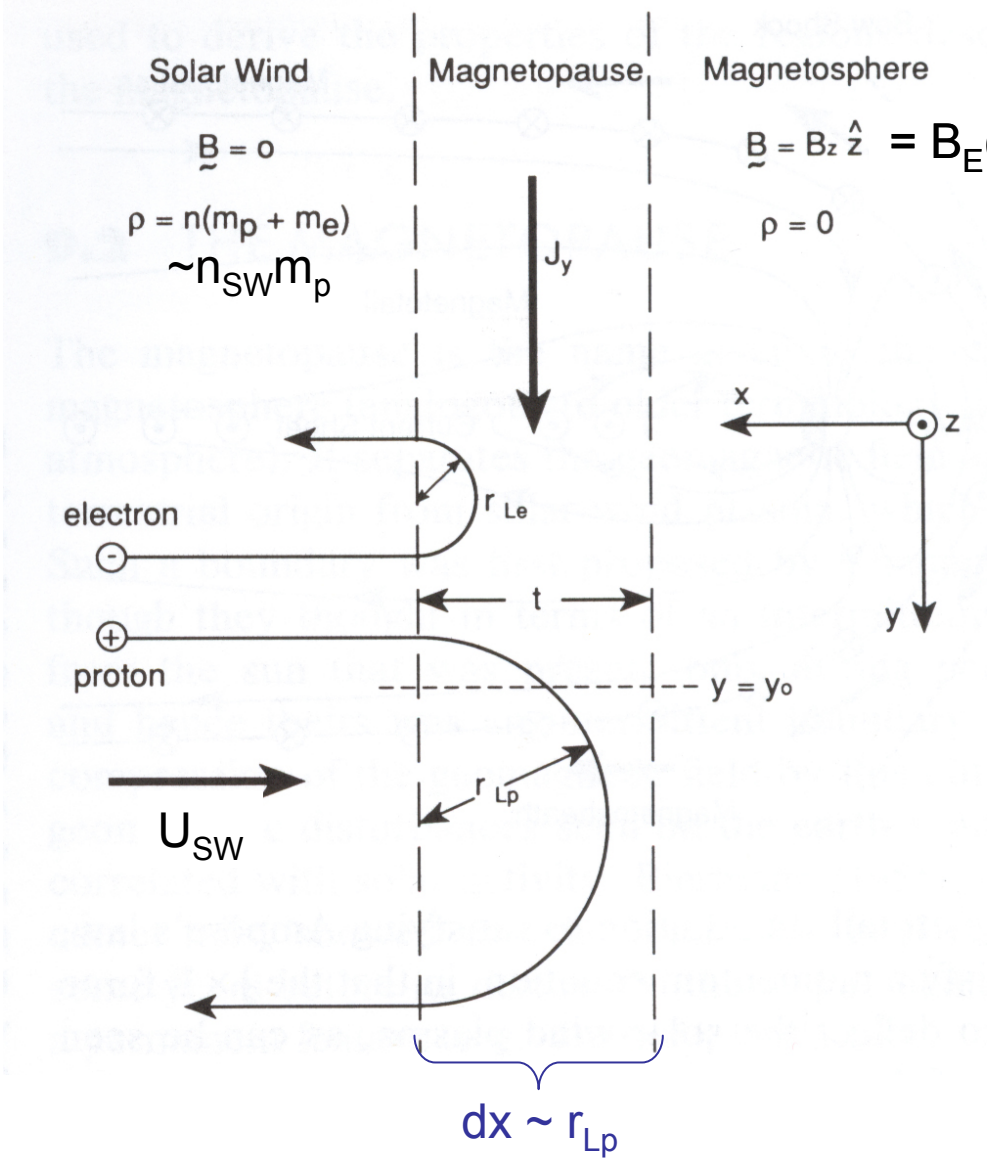


Chapman/Bartels 1940 Model



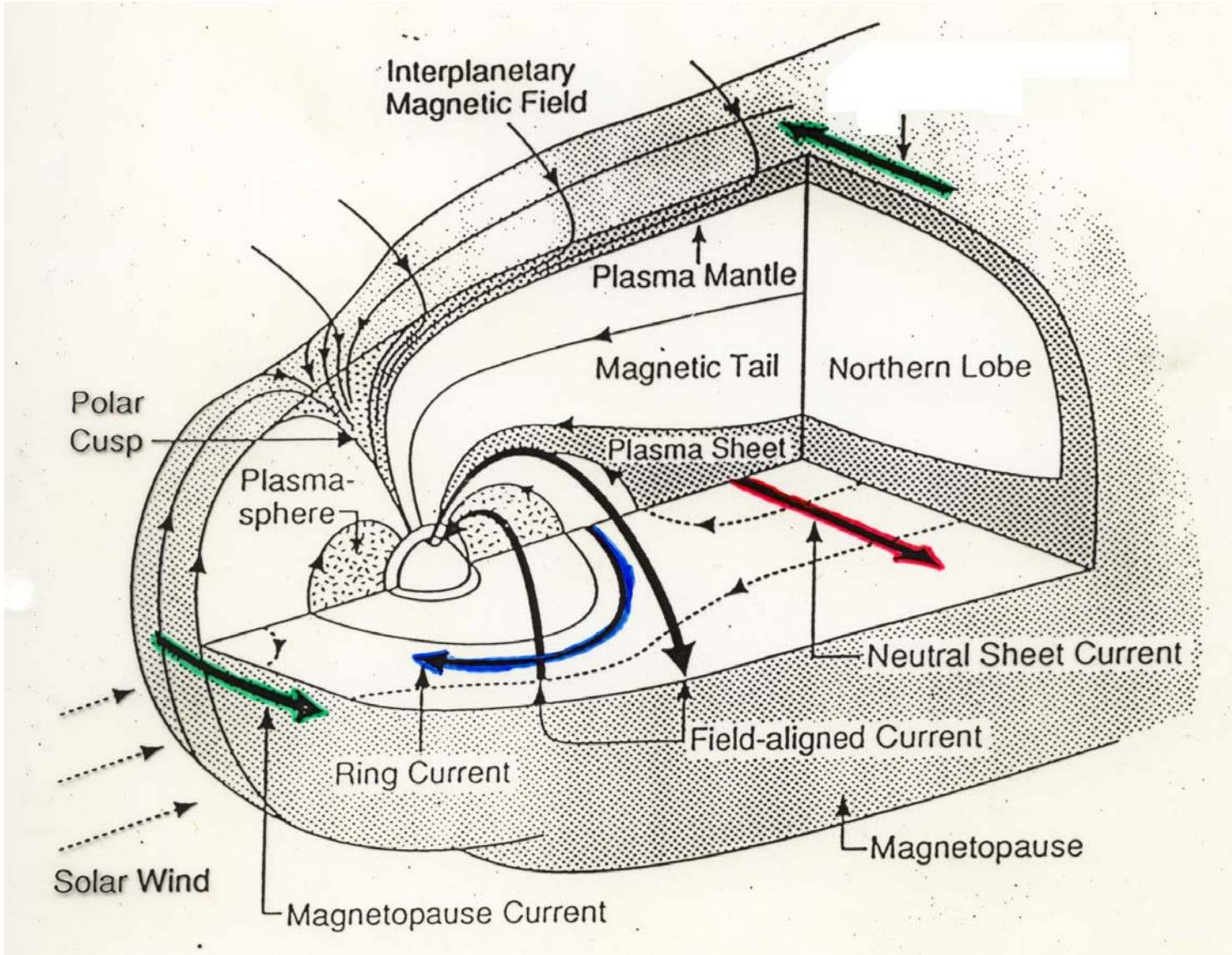
- First model of a dipole field compressed by highly conducting plasma (SW)
- Magnetic field is constructed using an image of the dipole an equal distance upstream of the boundary (arrow)

Single Particle Picture of the MP Current Layer

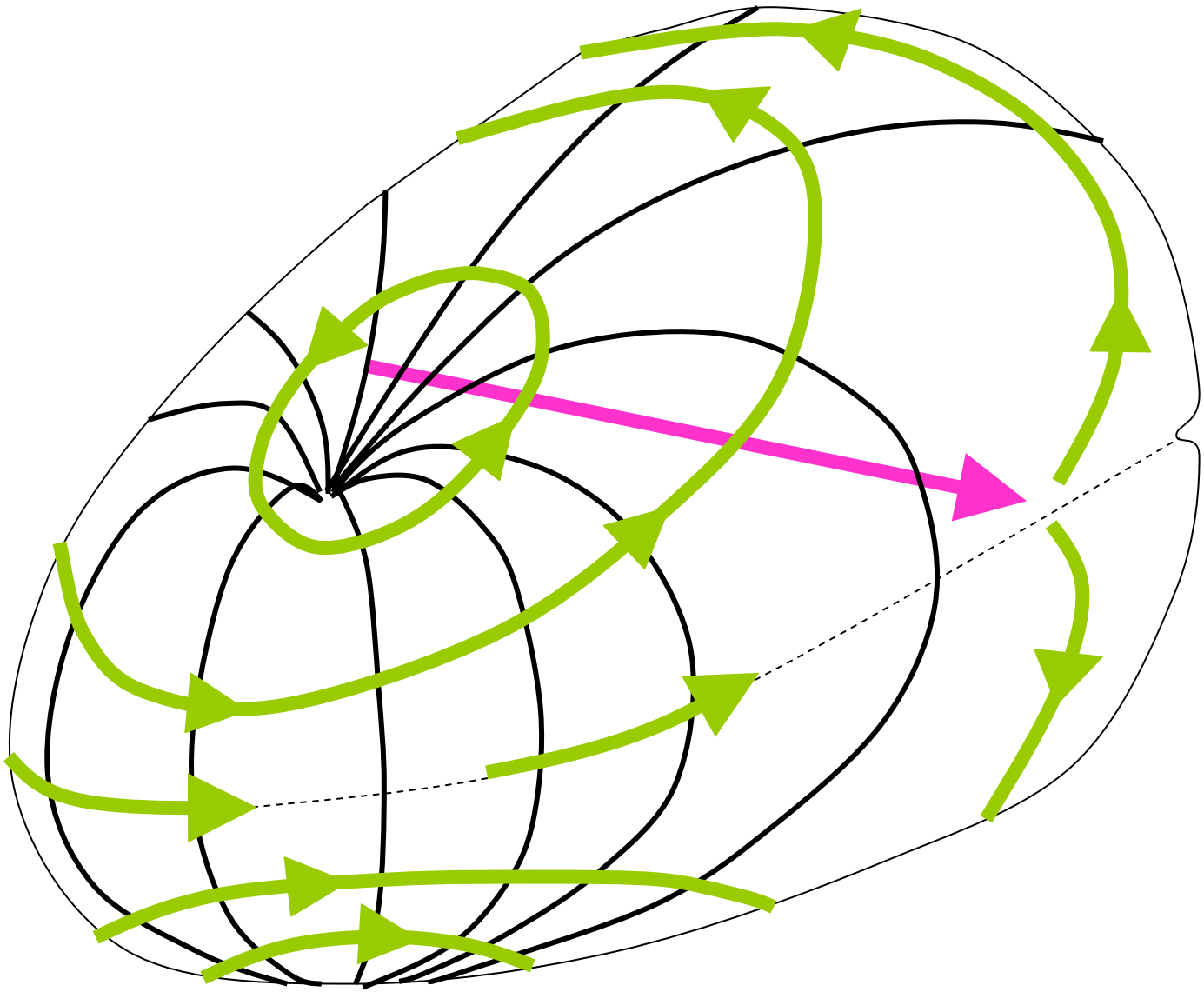


- In this model, solar wind particles are turned around when they encounter the terrestrial field, thus the current sheet is ~1 r_{Lp} thick.

Magnetospheric Currents in 3-D



Magnetopause Current Closure



- Dayside MP currents close around the cusp with near Earth tail MP currents
- Further tailward, the tail MP current closes with the nightside cross tail current
- Note that on the MP, the magnetic force j x B is directed everywhere outwards to oppose the external SW pressure