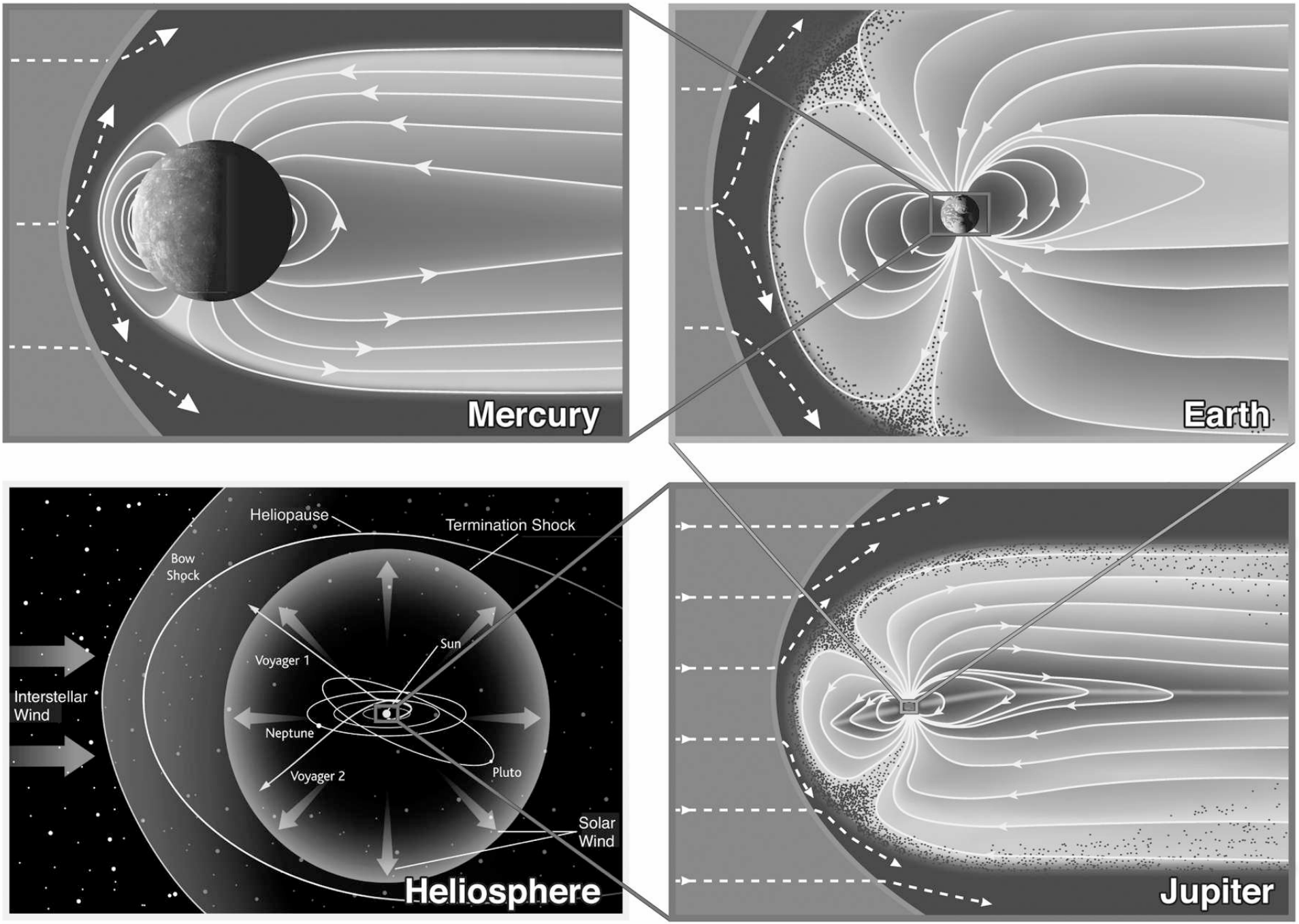
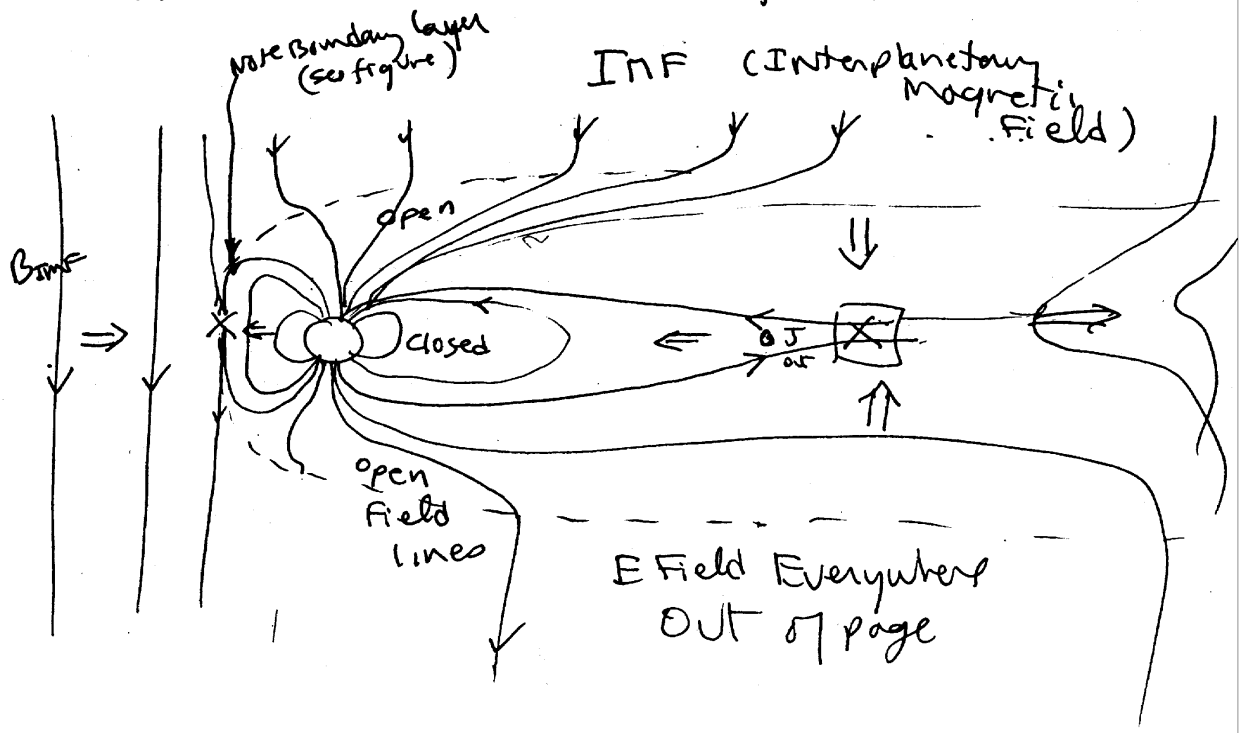


http://www.youtube.com/watch?v=c9qKIVlhXpQ#t=16

Putting it all together

Review of last time

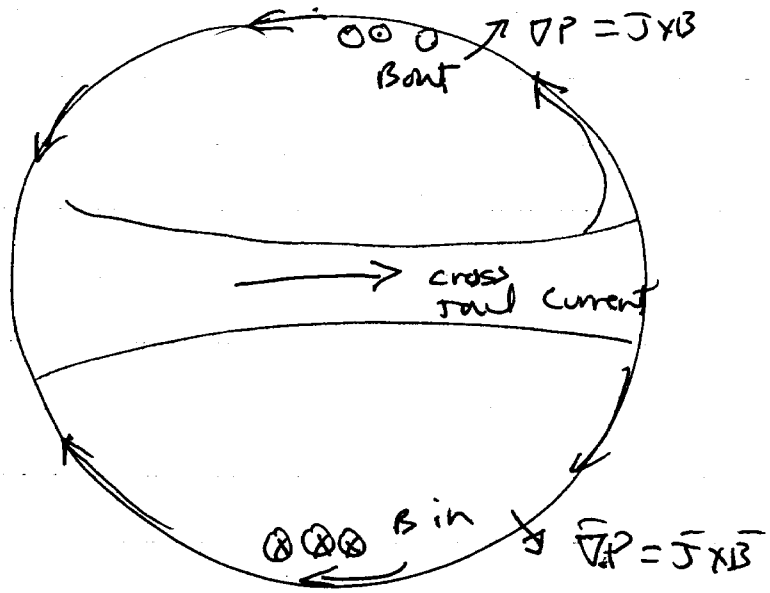
1. Finished discussion of Reconnection region – especially note 3 formulas on p. 152 of 2nd set of Notes.
2. Applied the results to magnetospheric Convection



First lets consider total energy input (see reconnection.pdf)

Review contd

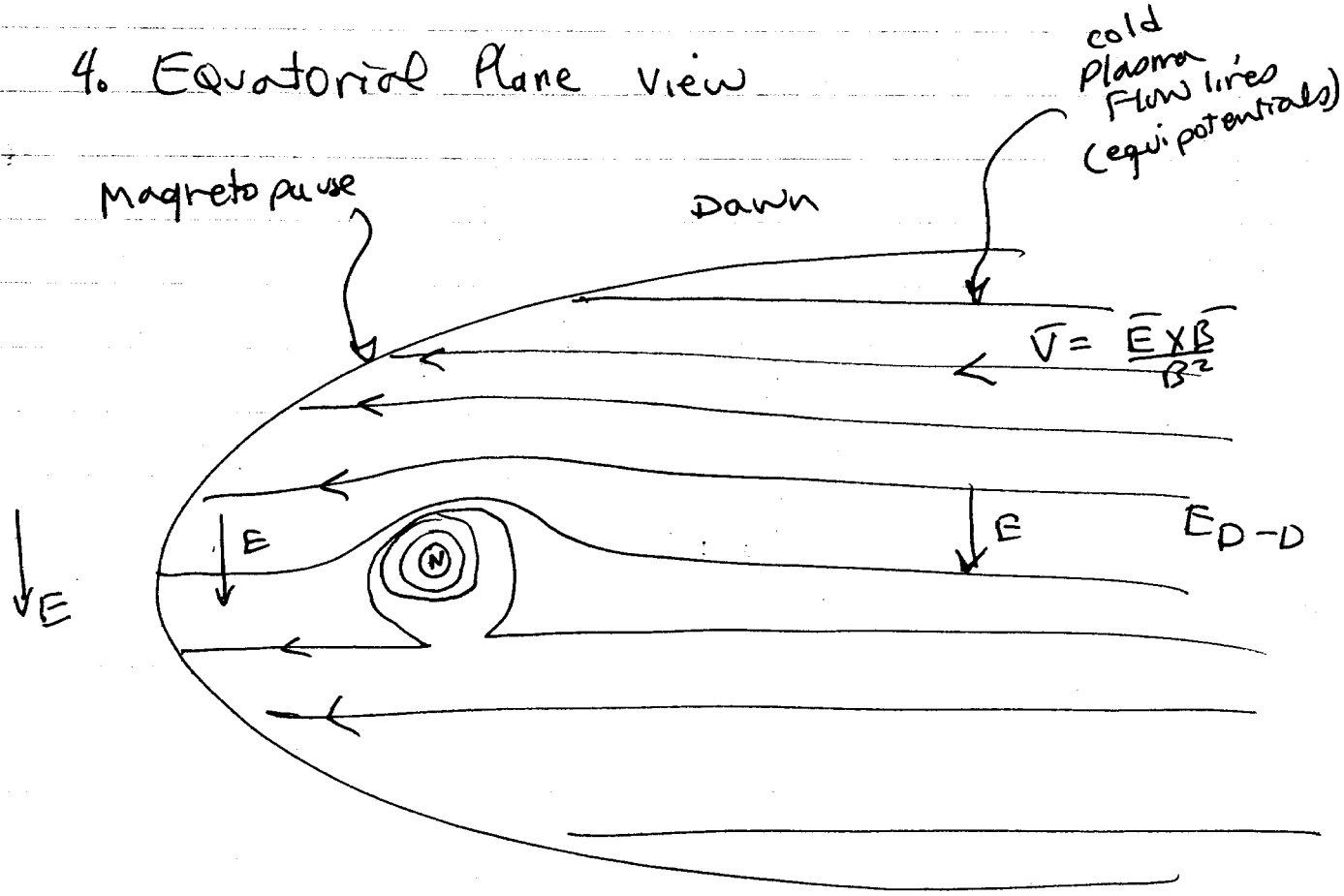
3. Tail Cross section



View from Earth looking Away from SUN

closed with magnetization current

4. Equatorial Plane view



Review cont'd

5. Magnetopause as pressure balance surface

$$\nabla\left(P + \frac{B^2}{2\mu_0}\right) = \frac{(\bar{B}\cdot\bar{\nabla})\bar{B}}{\mu_0} \equiv \frac{1}{\mu_0}\frac{\partial \vec{B}}{\partial l} = 0$$

at subsolar point

for $\frac{\partial \bar{B}}{\partial l}$ small

$$P_{sw} = \frac{B_m^2}{2\mu_0}$$

P_{sw} = Solar wind pressure $\propto |\rho \bar{V}\bar{V}|$

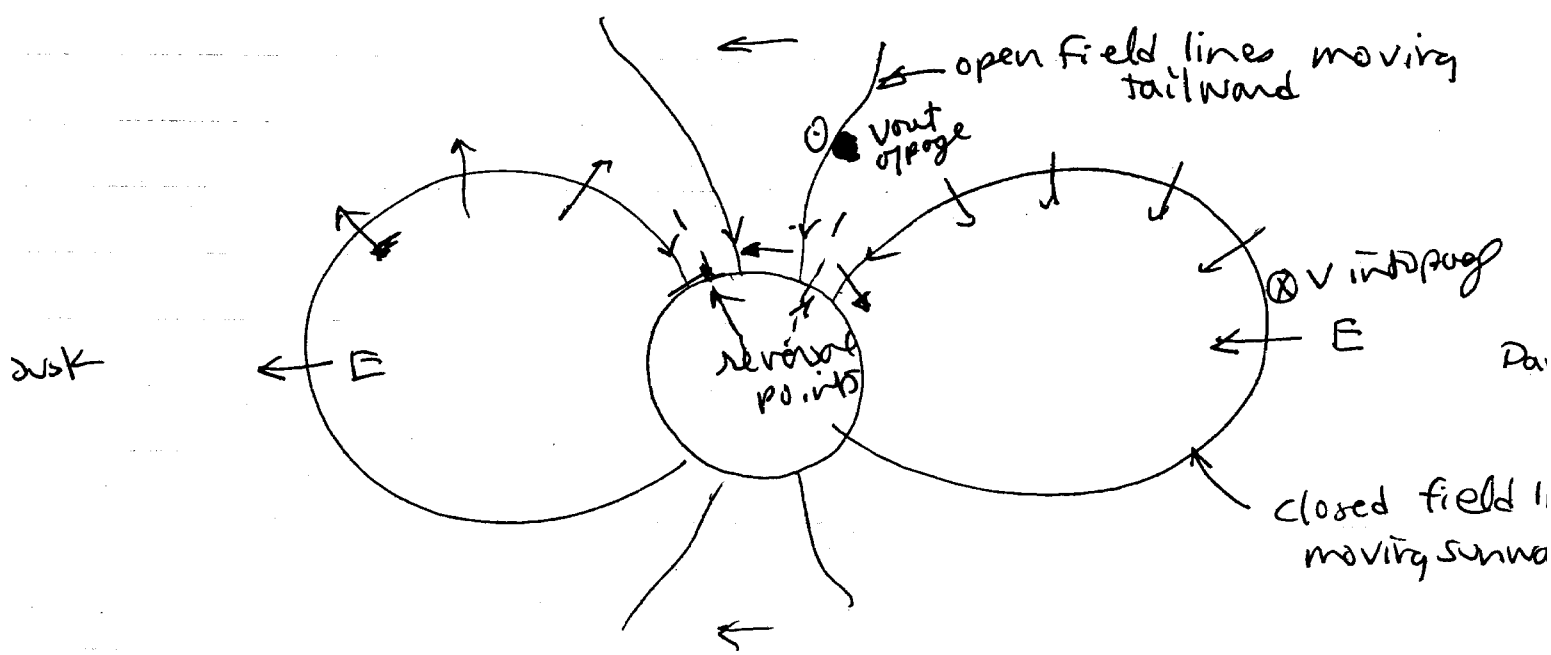
B_m = Magnetospheric B field

Same phenomenon – most planets / solar flares / pulsars

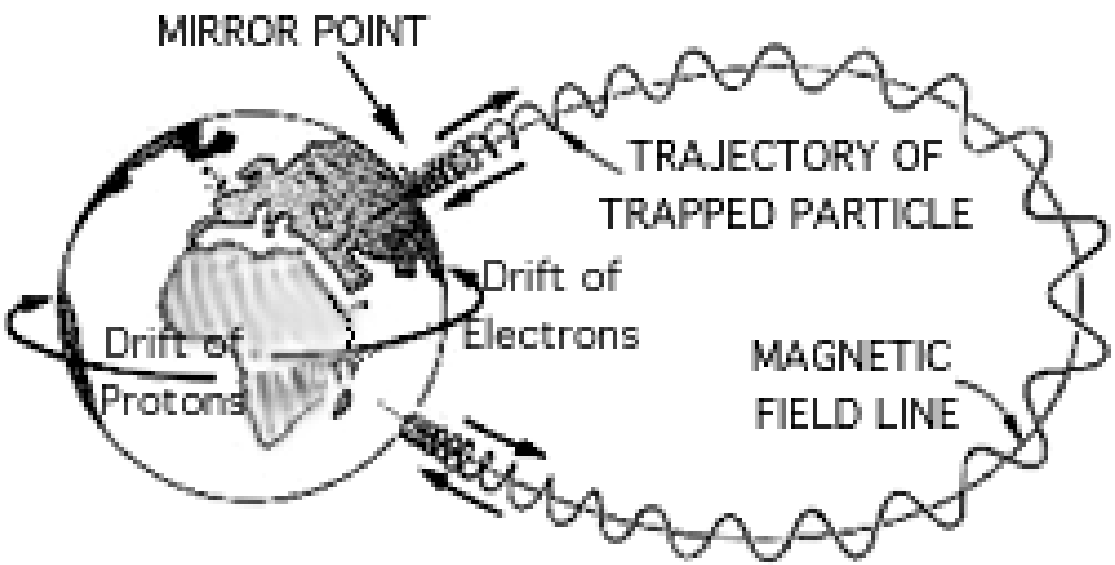
Implications for ionosphere

Density profile (see view graph)

$\sigma \rightarrow \overleftrightarrow{\sigma}$ (to be discussed) $\bar{J} = \overleftrightarrow{\sigma}\cdot\bar{E}$



single particle motion in radiation belts



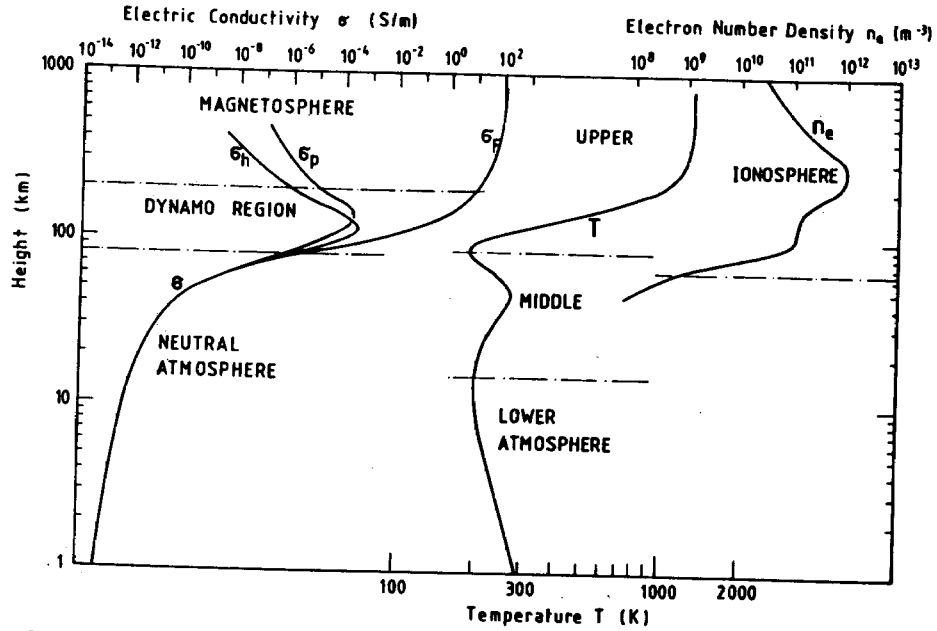


Fig. 1.1. Nomenclature of atmospheric regions based on profiles of electric conductivity, neutral temperature, and electron number density

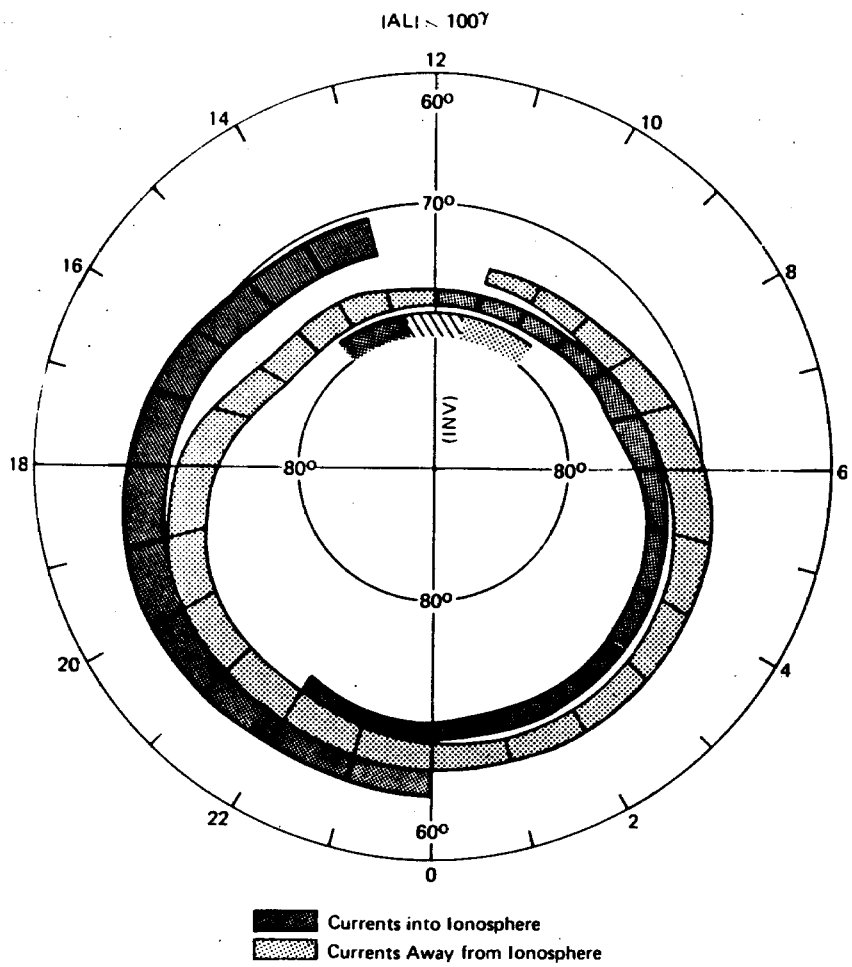


Fig. 9. The distribution of upward and downward field-aligned currents in invariant latitude-MLT coordinates (Iijima and Potemra, 1978).

Since field lines are nearly equipotentials

E from magnetosphere is carried right down to ionosphere

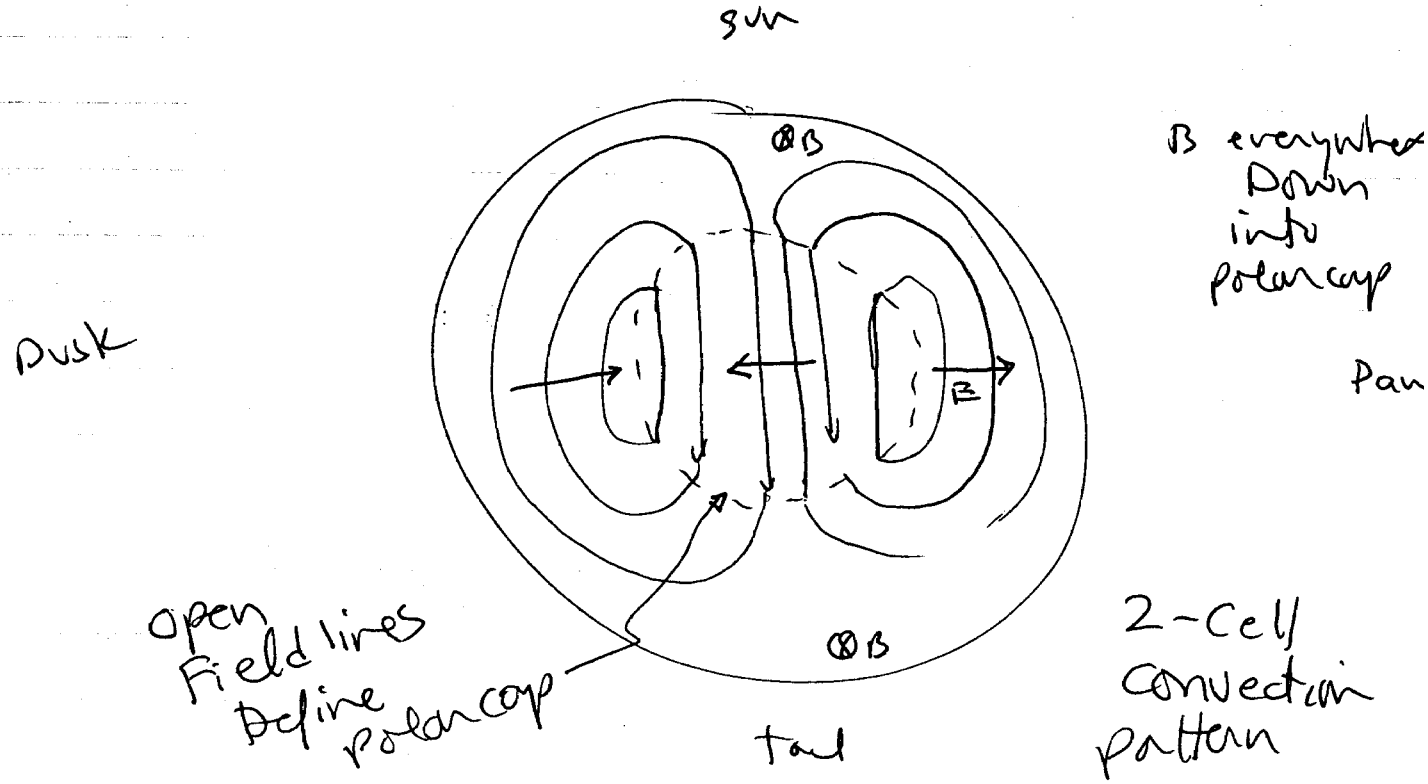
This puts ENTIRE polar cap(s) in motion

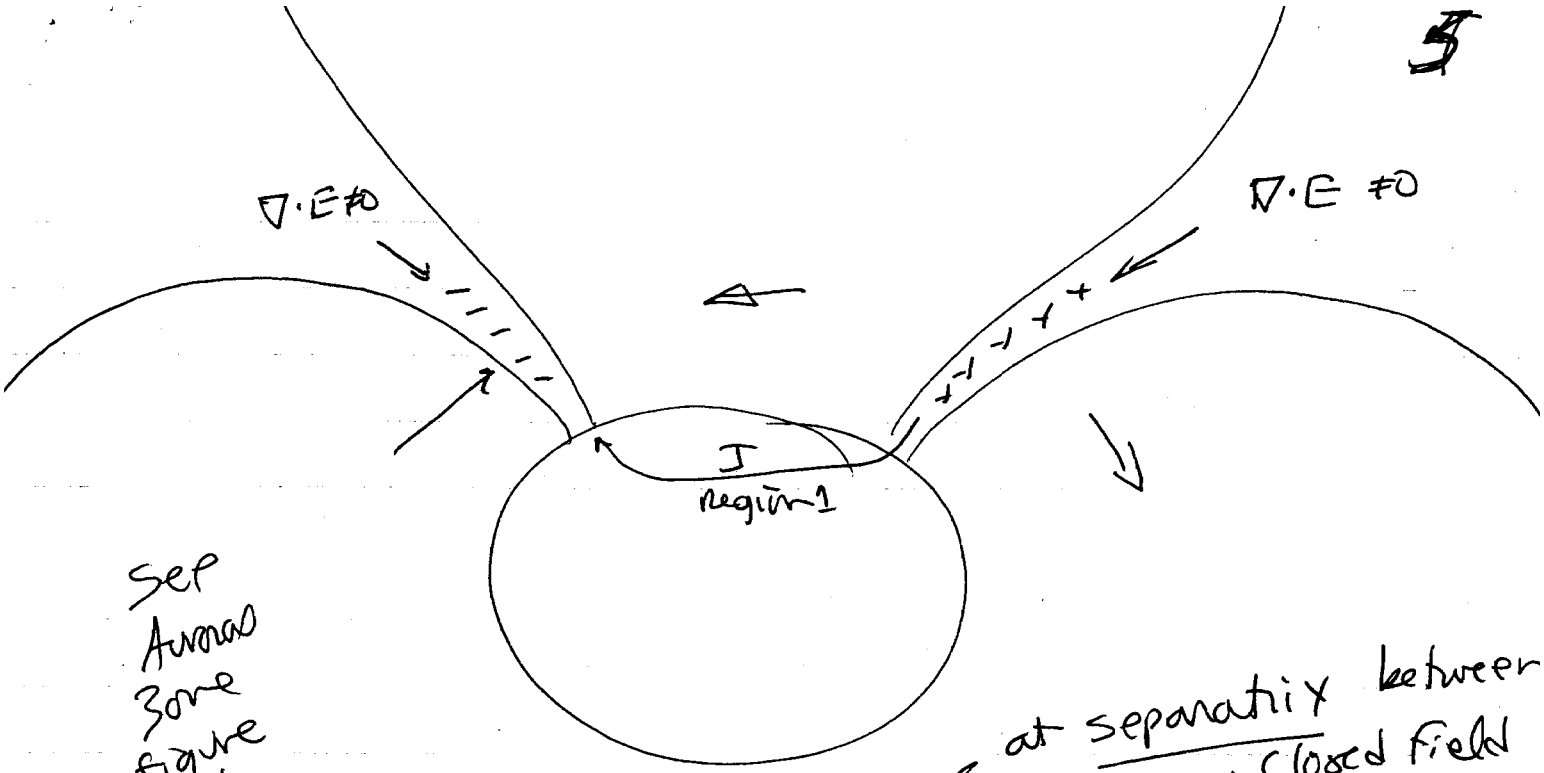
$$\vec{V} = \frac{\vec{E} \times \vec{B}}{B^2}$$

Note: $E_{magnetosphere} * \text{Amplification} = E_{ionosphere}$

(due to convergence of B field lines

Directions of ionospheric convection pattern



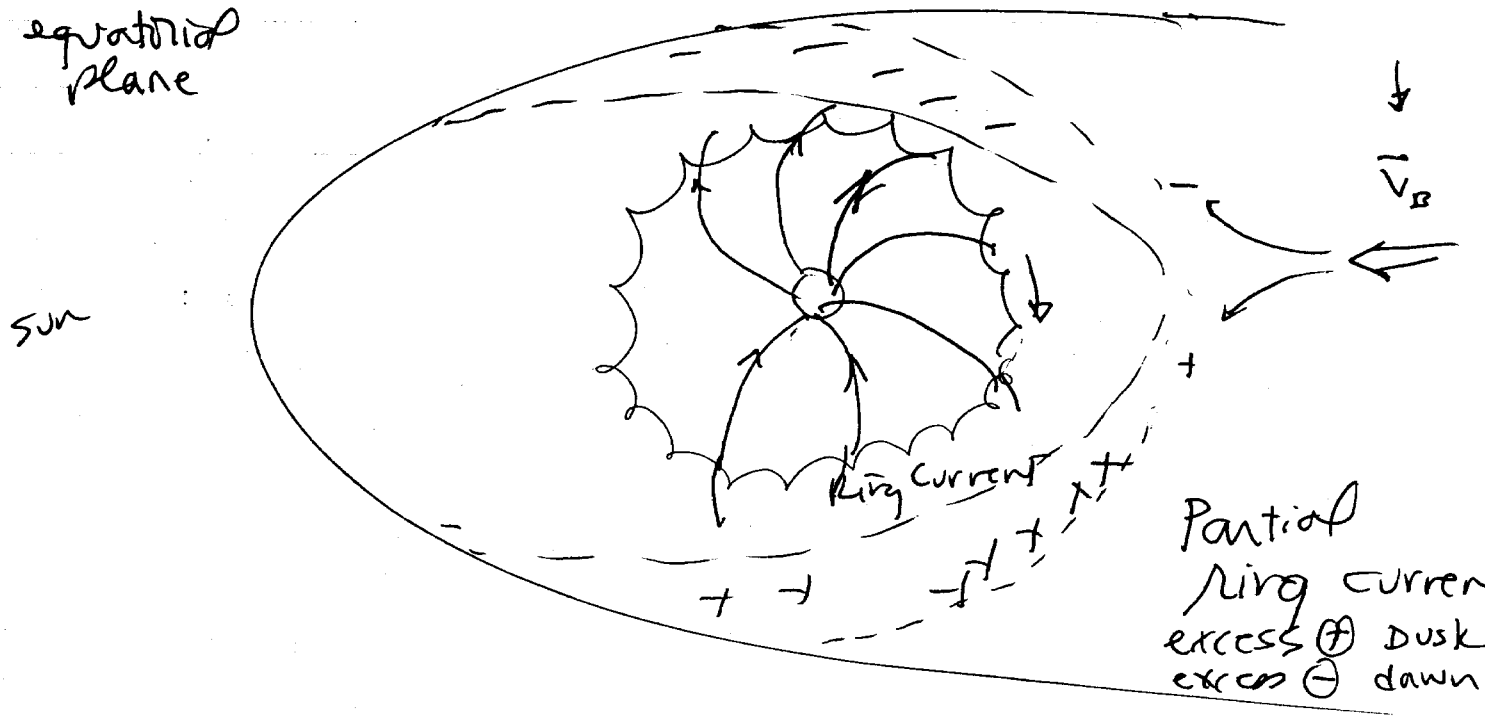


See Auroras zone figure on 5'

at separatrix between open + closed field lines

at E field reversals there is charge distribution which can drive currents through ionosphere

Also Region 2 currents associated with Ring Current



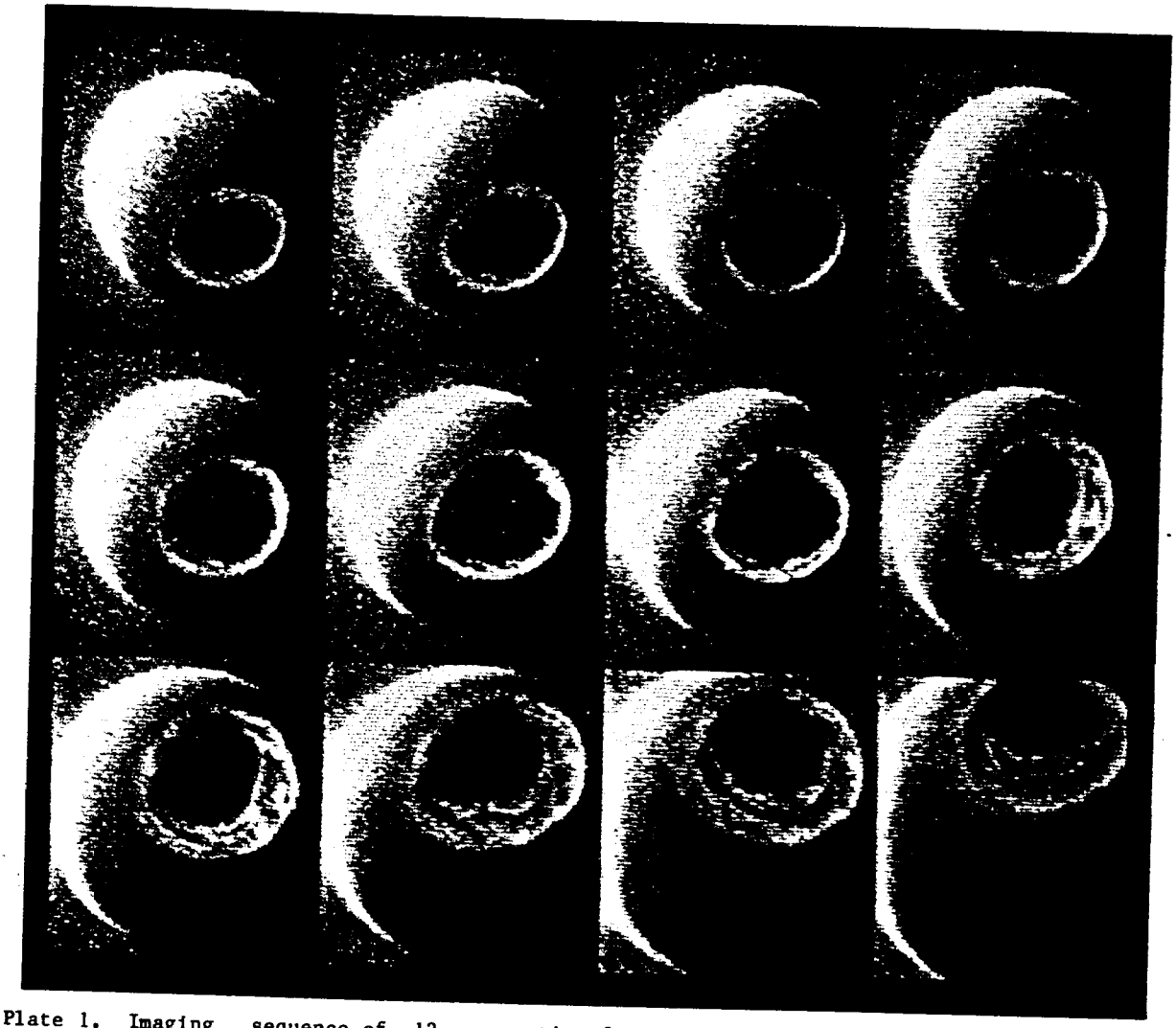
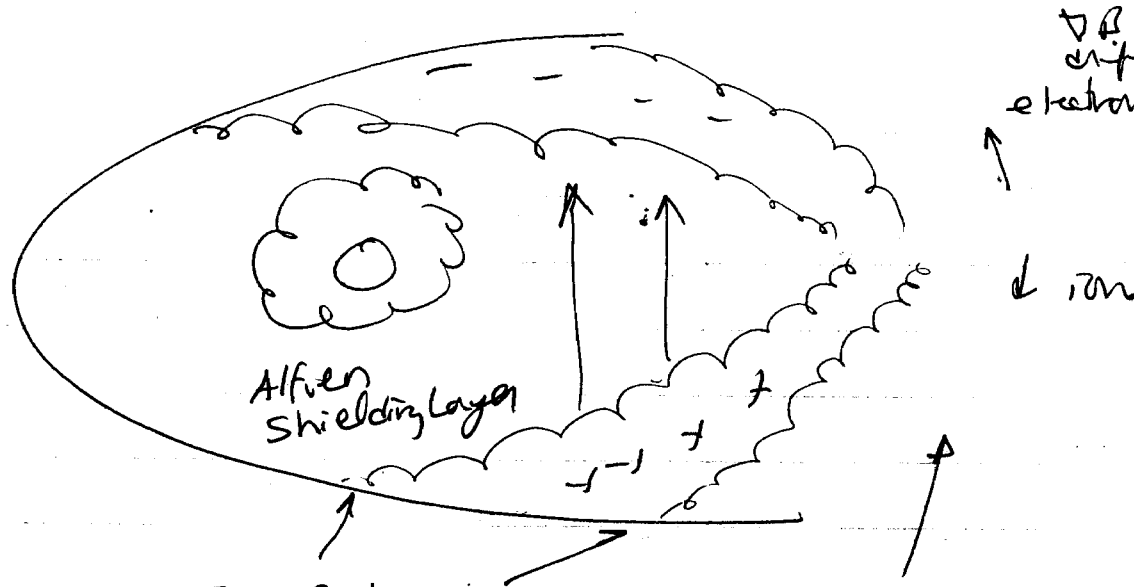


Plate 1. Imaging sequence of 12 consecutive frames displaying global auroral activity at ultraviolet wavelengths in the interval 0719 - 0945 UT on 8 November 1981. Onset of a sub-storm occurs at ~ 0719 UT (first frame), with maximum epoch at ~ 0850 UT (eighth frame). The geocorona is visible in the scattererd light of solar Lyman-α radiation sunward of the dayside limb, at upper left in each frame. Antisunward of the terminator the entire auroral region is detected in the light of OI at 130.4 and 135.6 nm.

Iijima + Potemra View Graph

Another affect of Partial Ring Current

→ Alfven Shielding



Alfven shielding is due to <u>Partial ring current</u> which gives excess ⊕ on dusk and ⊖ on dawn. This is like a "polarization" field which eventually <u>Cancels</u> the $E_{dawn \to dusk}$ Magnetospheric Electric Field below some Latitude Self Consistent with Co-rotation of Low Latitudes.