

Lecture 4. Structure of the Earth's Magnetosphere

4.1. The Average Structure of the Earth's Magnetosphere

Solar wind 太陽風

Bow Shock 船震波

Magnetosheath 磁鞘

Magnetopause 磁層頂

Magnetosphere 磁層

Magnetotail 磁尾

plasma sheet 磁尾電漿片

tail lobe (north lobe, south lobe) (北、南) 磁尾腔

plasmasphere 電漿球層

plasmopause 電漿球層頂,

Van Allen radiation belt (inner radiation belt, outerradiation belt) 范愛倫輻射帶

PSBL (plasma sheet boundary layer) 電漿片邊界層

LLBL (low latitude boundary layer) 低緯邊界層

HLBL (high latitude boundary layer) 高緯邊界層

cusp or cleft 極尖區

ring current 環型電流

diffuse aurora 擴散極光

discrete aurora 分立極光

field-aligned current 場向電流 (平行磁場線方向的電流)

Exercise 4.1.

Find out the "typical" plasma number density (#/c.c.), ion temperature (°K), electron temperature (°K), and magnitude of the magnetic field (nT) in the following regions:

- high-speed solar wind (> 600 km/sec)
- slow-speed solar wind (< 450 km/sec)
- magnetosheath
- dayside magnetosphere at $10 < L < 7$

- (e) tail lobes
- (f) plasma sheet
- (g) plasmasphere
- (h) high-latitude ionosphere (peak electron density)
- (i) low-latitude ionosphere (peak electron density), day and night, respectively.

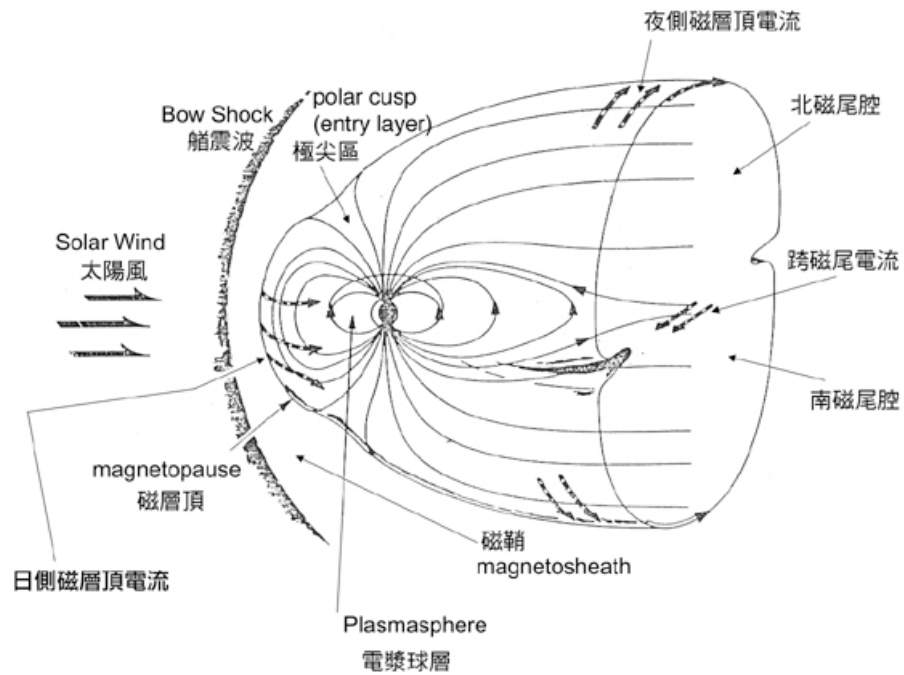


Figure 4.1. 地球磁層、磁鞘、與船震波之分布

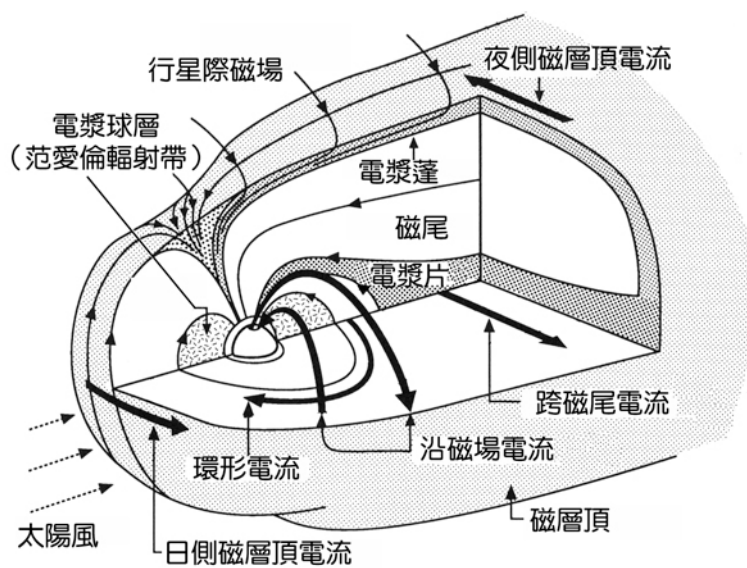


Figure 4.2a. 地球磁層頂內部的磁層結構

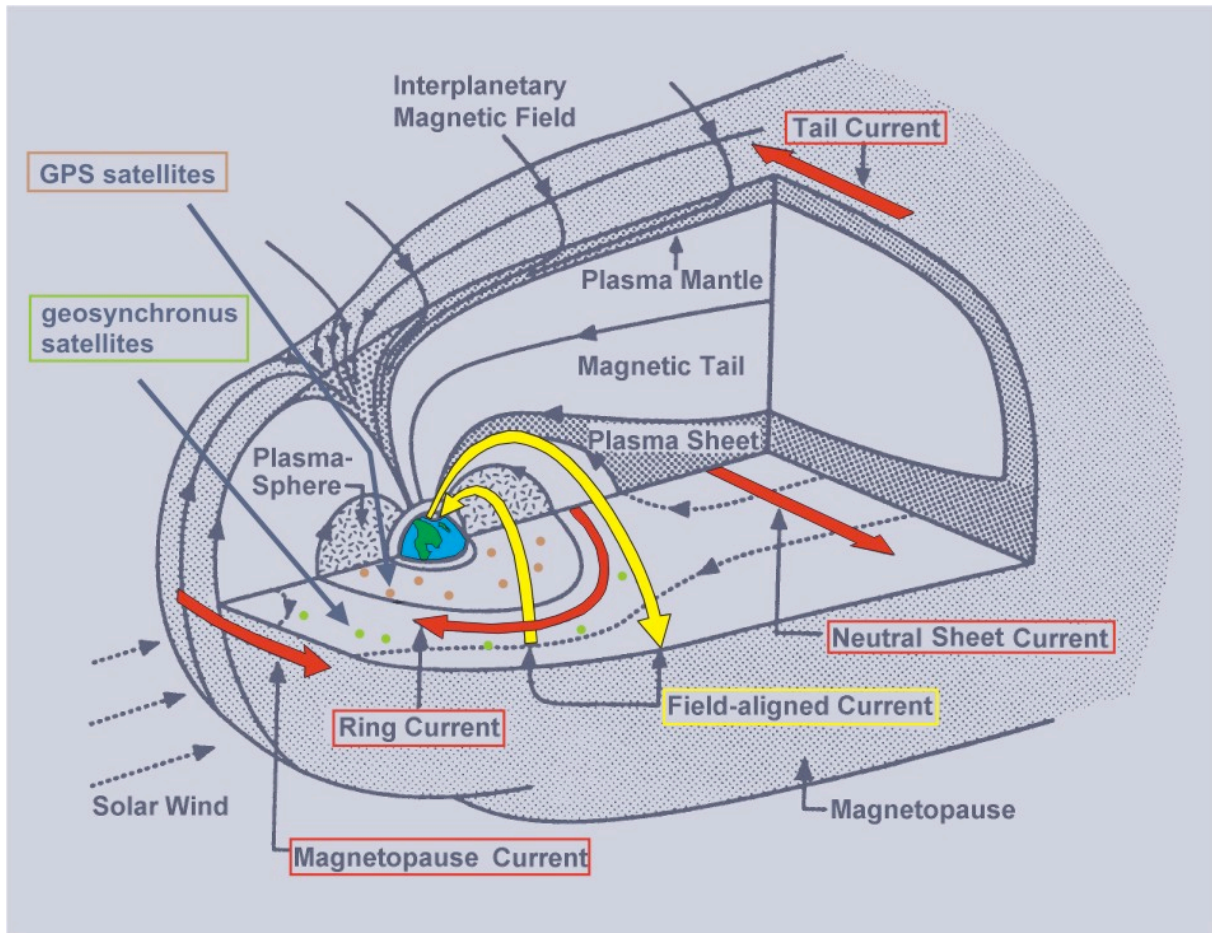


Figure 4.2b. 地球磁層頂內部的磁層結構

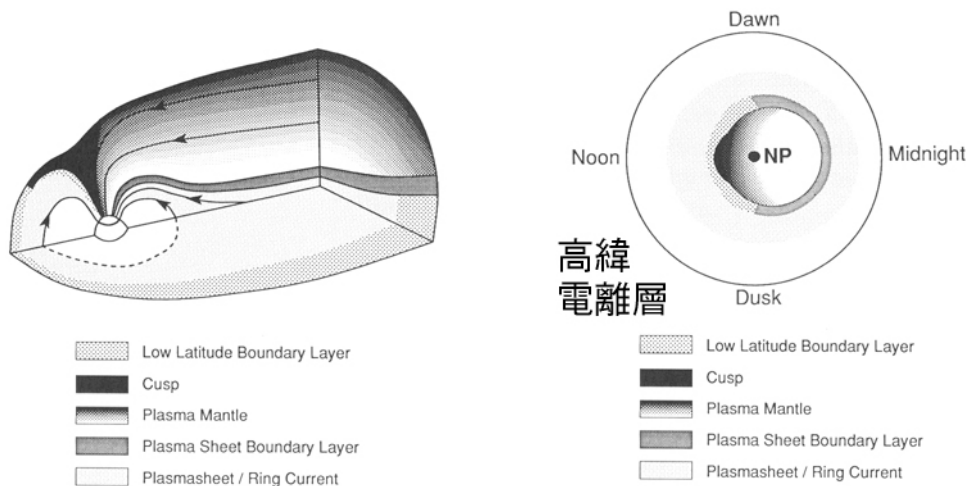


Figure 4.3. (左圖) 地球磁層中的各種邊界層。(右圖) 磁層中的各種邊界層，沿磁場線，在高緯電離層的投影位置與分布情形示意圖。太空科學家，可以像中醫把脈一樣，藉著在地面觀測沿磁場線，傳來的各種訊息，設法了解整個磁層，尤其是各個邊界層中的變化。