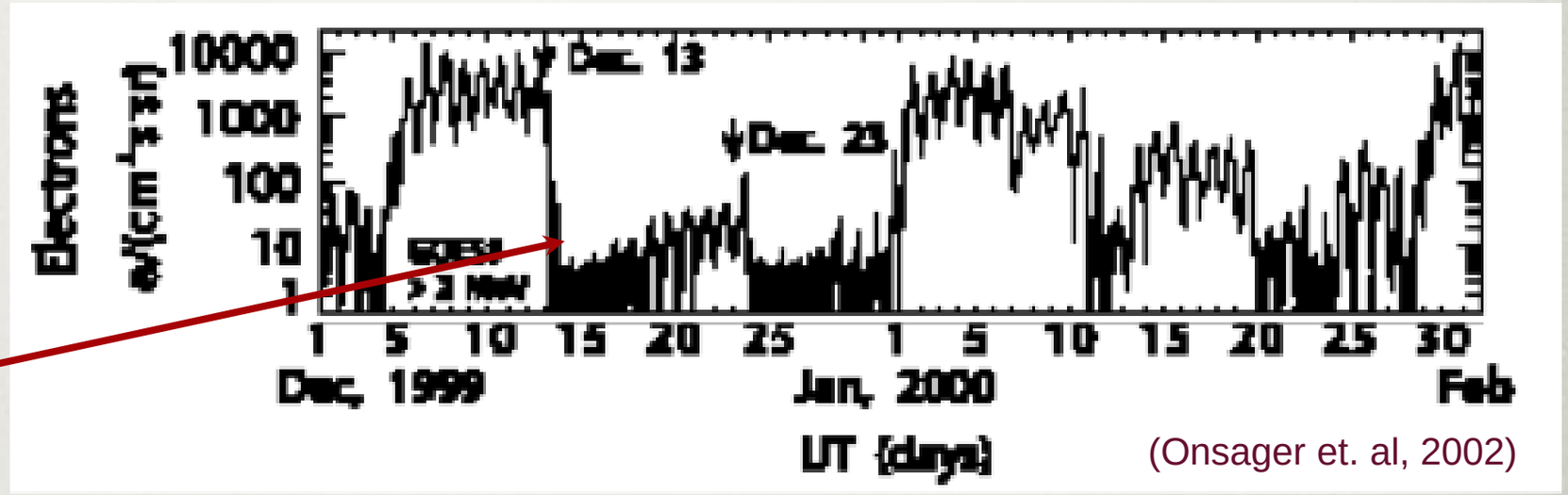
Electron Losses

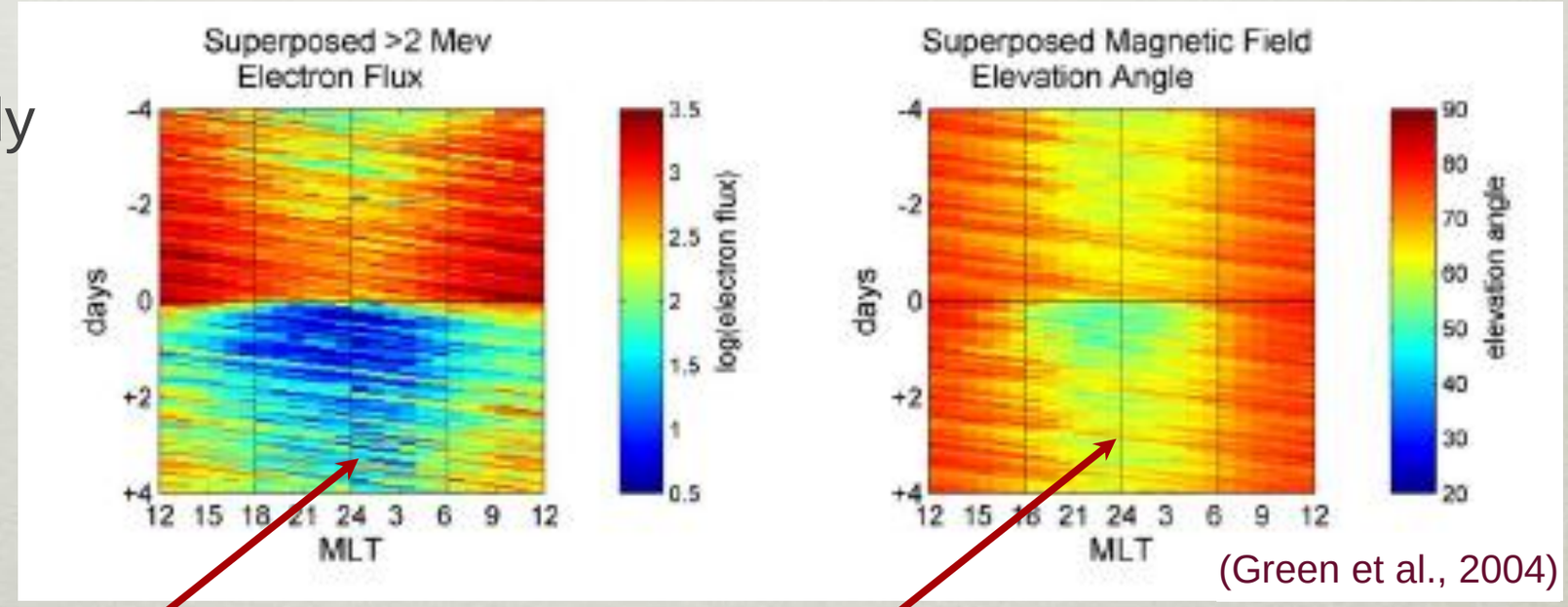
- Decreases of the trapped electron flux can be rapid and catastrophic



(Onsager et. al, 2002)

Depletions in >2 MeV electron flux measured by GOES spacecraft

Superposed epoch study of 52 depletion events => **real losses** of electrons



(Green et al., 2004)

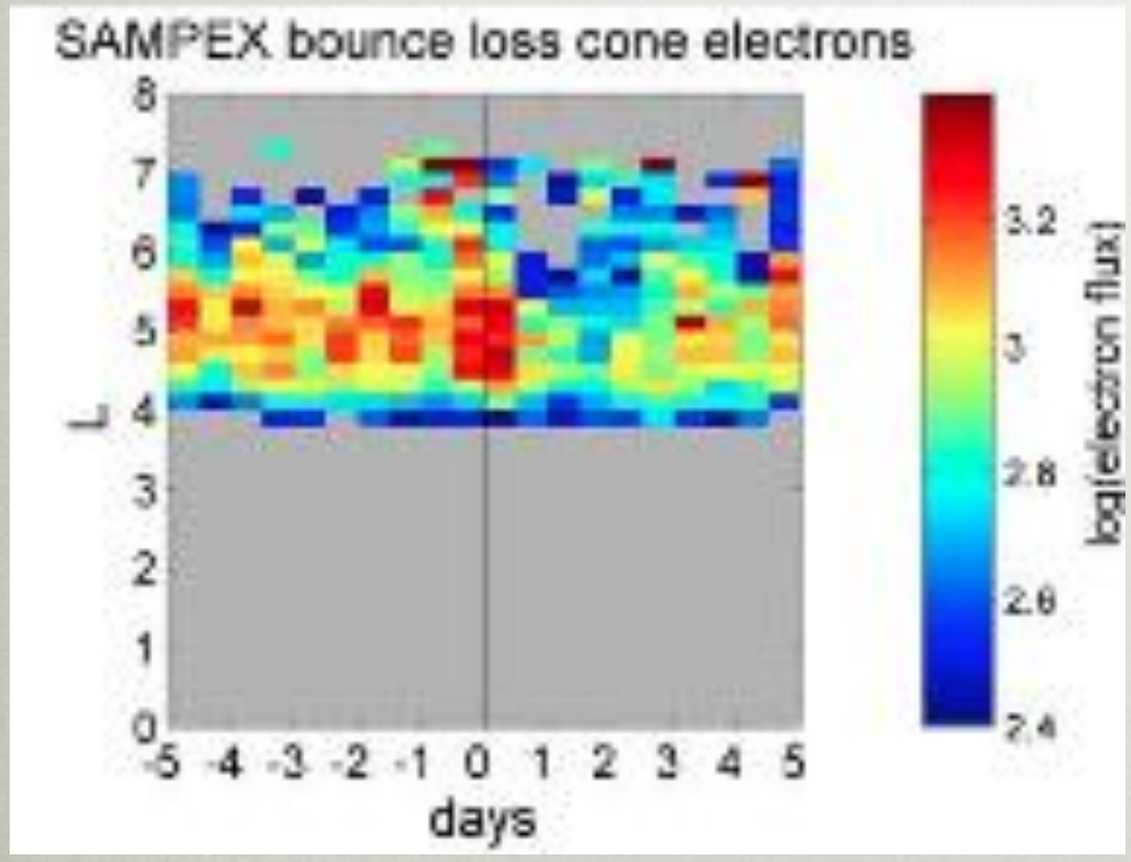
Electrons still gone

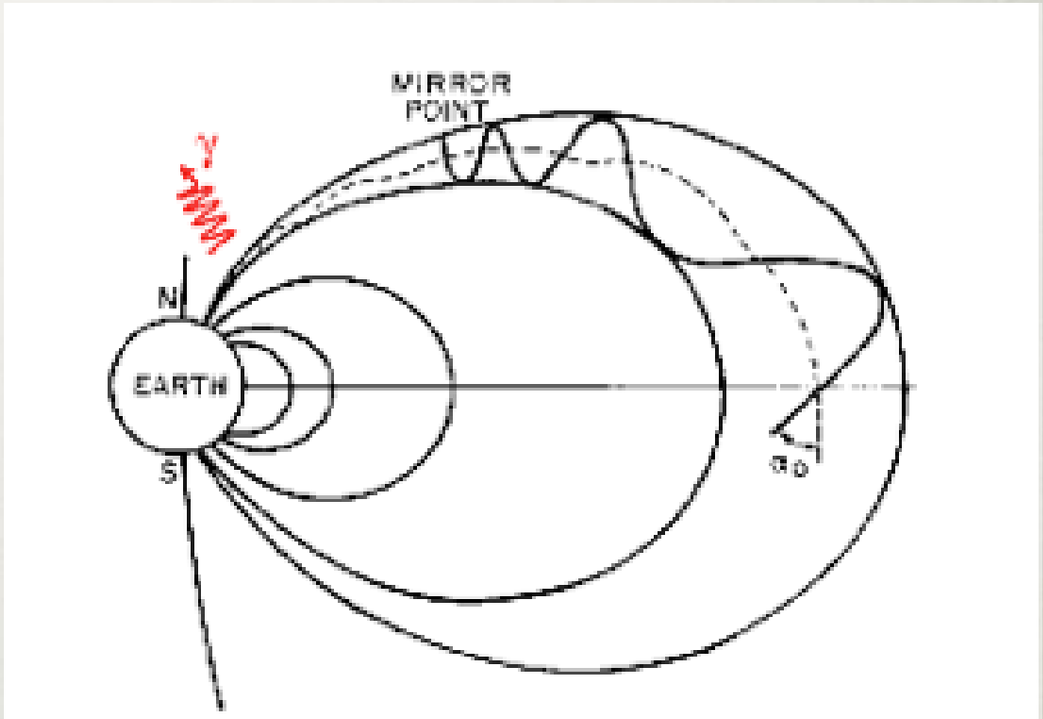
...even after magnetic field returns to dipolar

Precipitation Losses

- Precipitation into the atmosphere plays an important role.

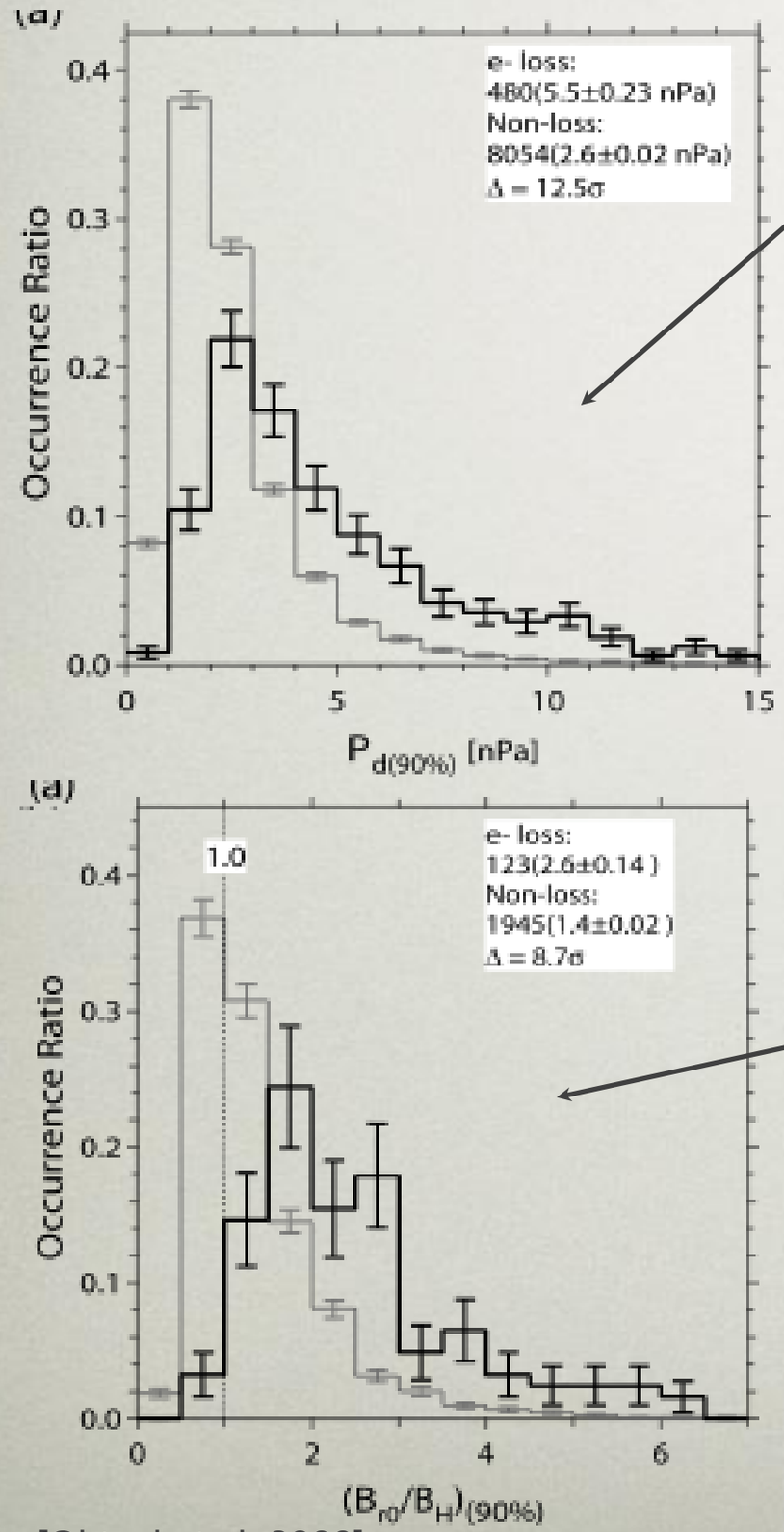
Increase in SAMPEX bounce loss cone flux => precipitation





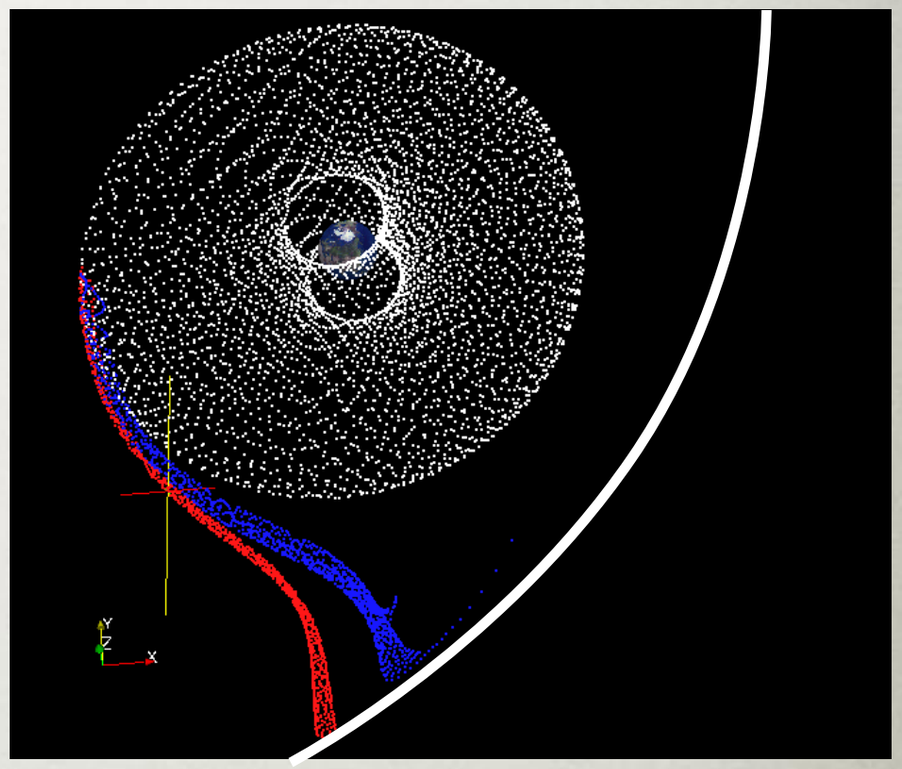
(Green et al., 2004)

Magnetopause Losses



[Ohtani et al, 2009]

Dynamic pressure is higher during loss events



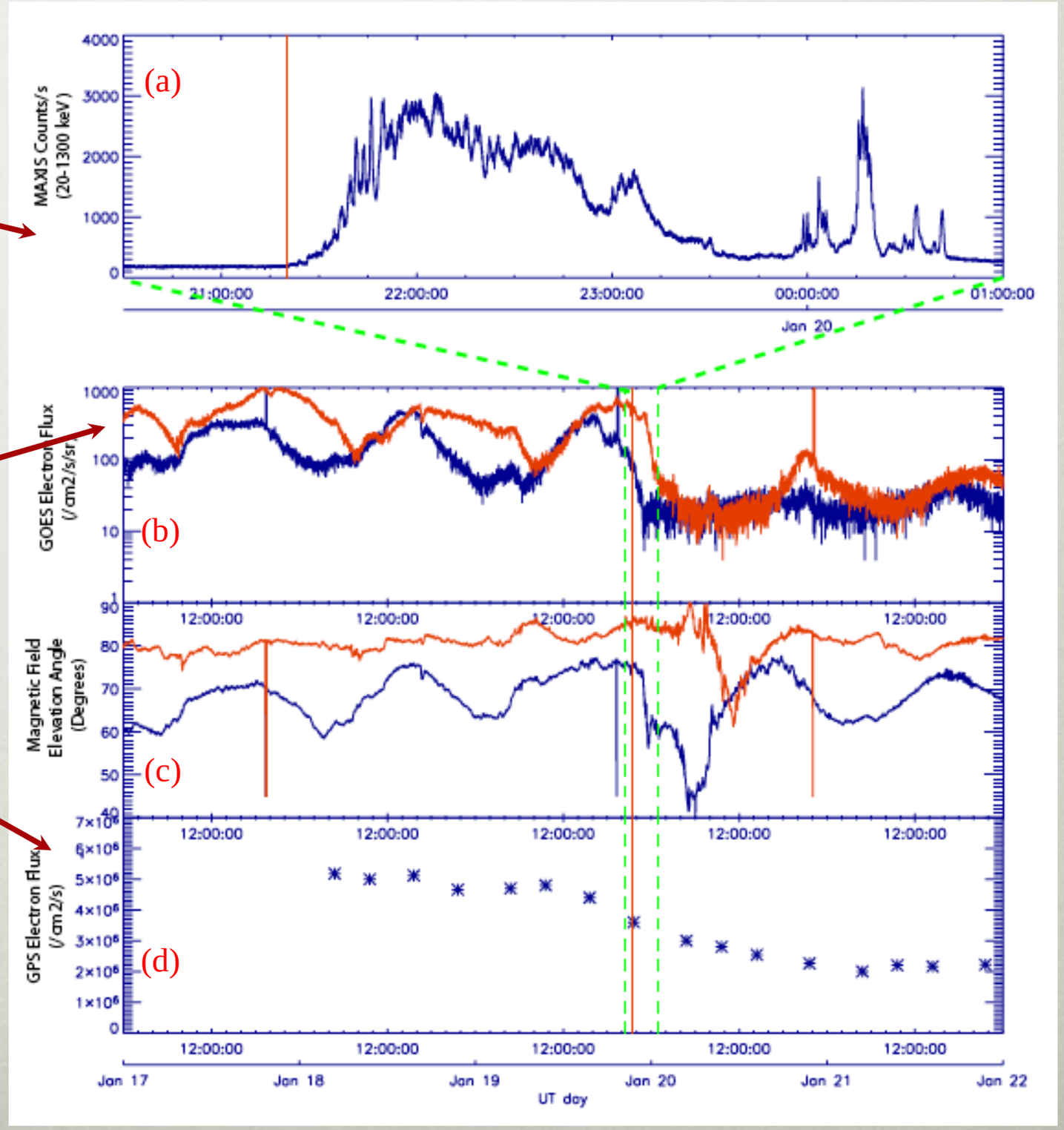
Courtesy A. Y. Ukhorskiy

Magnetosphere is more asymmetric during loss events

Jan. 19, 2000 Depletion Event

MAXIS Balloon X-ray observations
- L=4.7
- 1930-2200 MLT

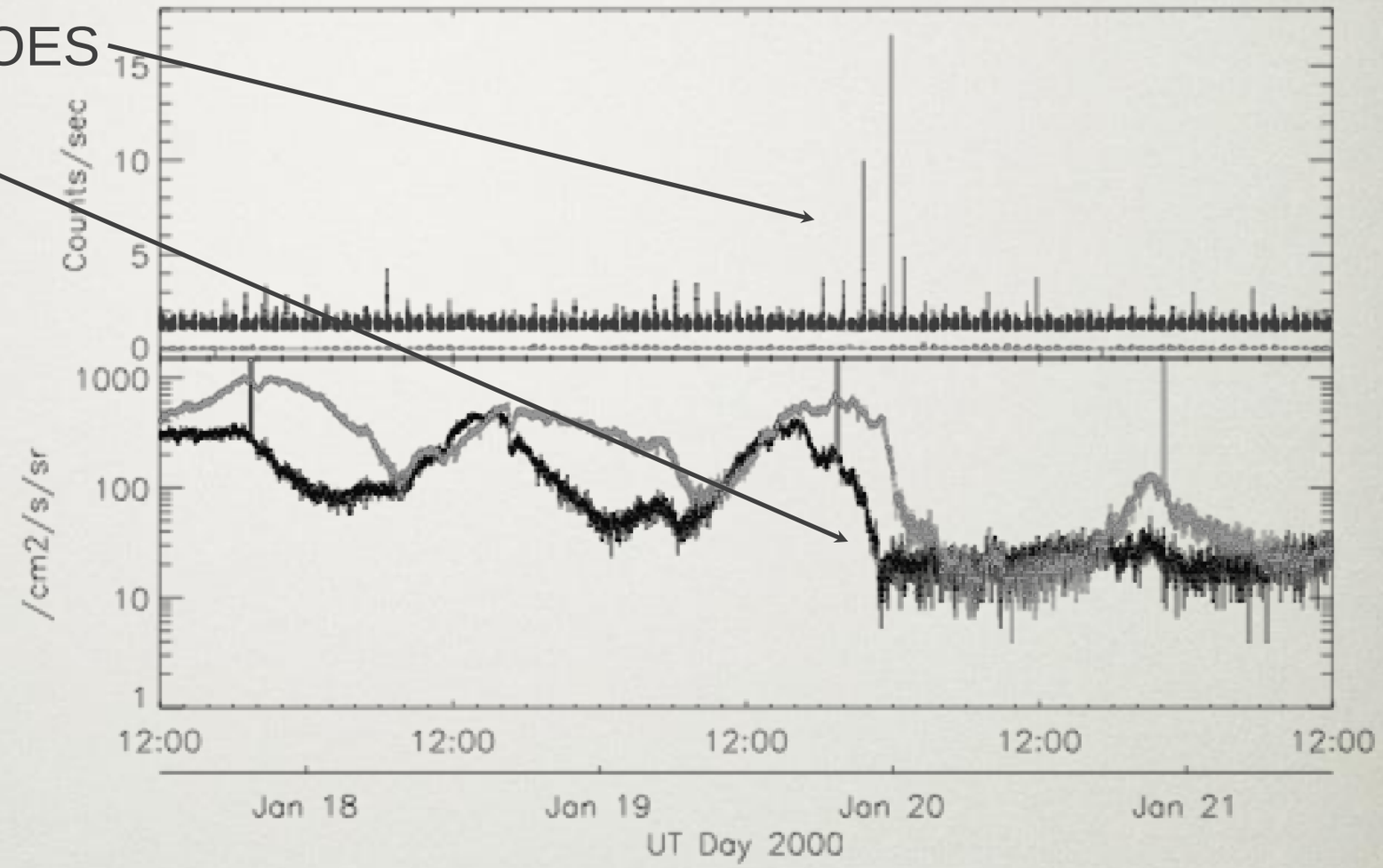
Depletion in trapped flux observed at GOES and GPS near the balloon location

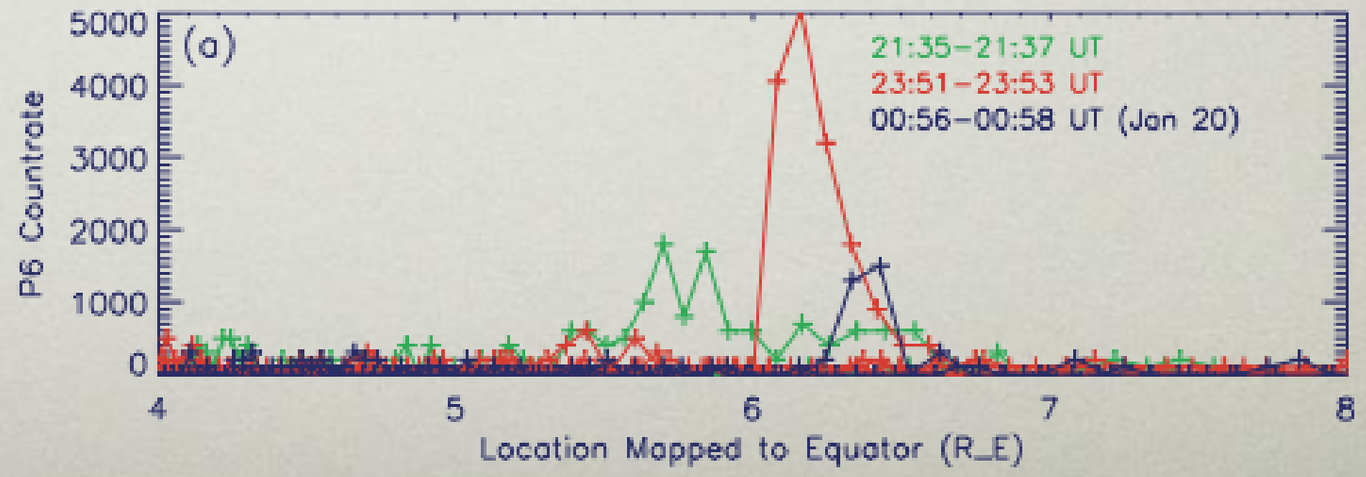


(Millan et al., 2007)

Magnetopause Losses?

- Precipitation observed by POES during GOES dropout event
- Precipitation maps to distances inside geosynchronous satellites
- Increase in dynamics pressure and asymmetric field
- GOES sampling open drift paths for at least part of the time

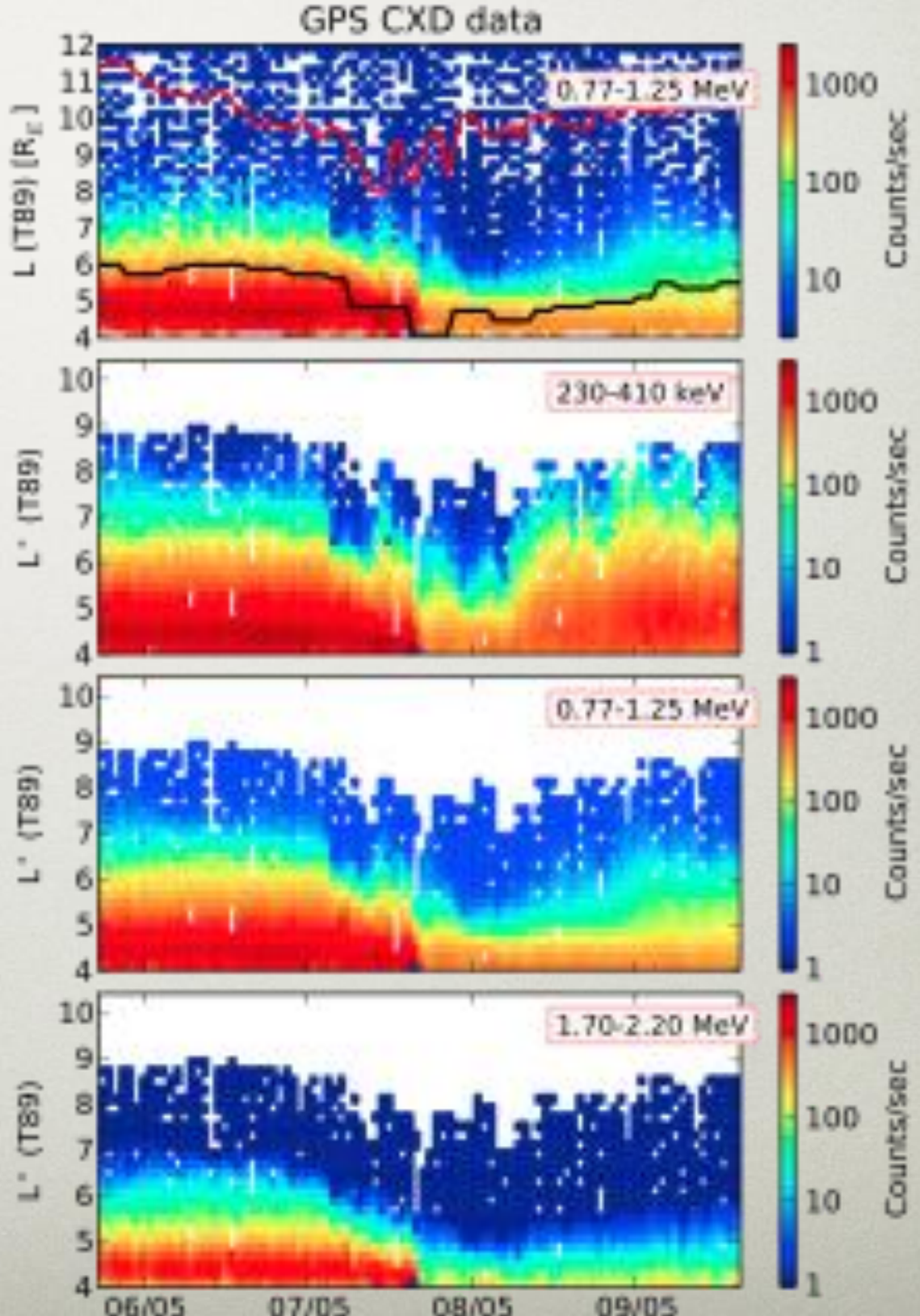




(Millan et al., 2009; 2010)

Rapid Losses

- Rapid loss (~2 hr) of >230 keV electrons across the radiation belts (L*=4-6)
- For L*<6, loss is too fast for outward radial diffusion/magnetopause losses or wave-particle interactions based on current theories.



[Morley et al., 2010]