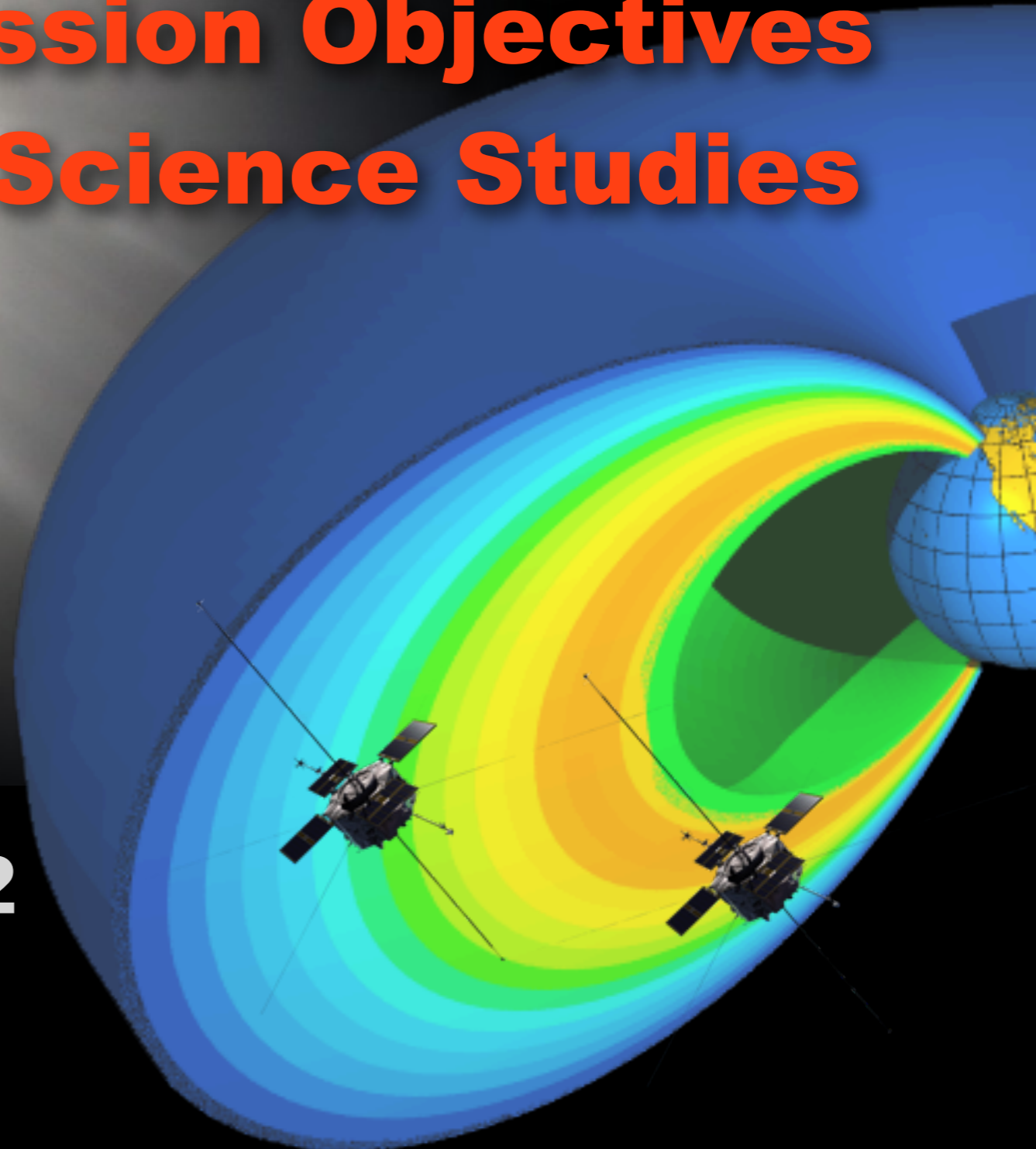




RBSP

Mission Objectives & Science Studies



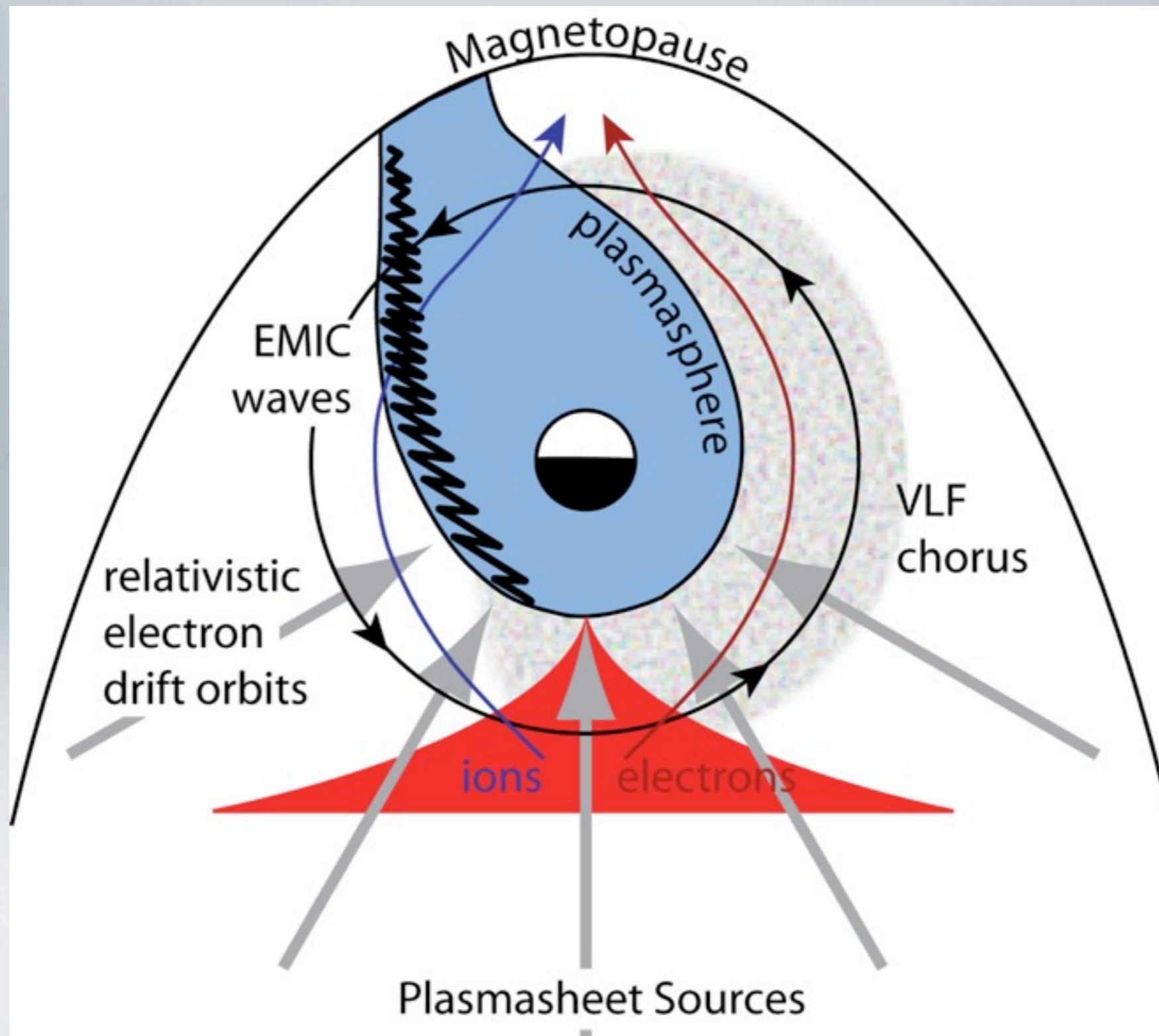
CEDAR, Santa Fe, June 25, 2012

Geoff Reeves
reeves@lanl.gov

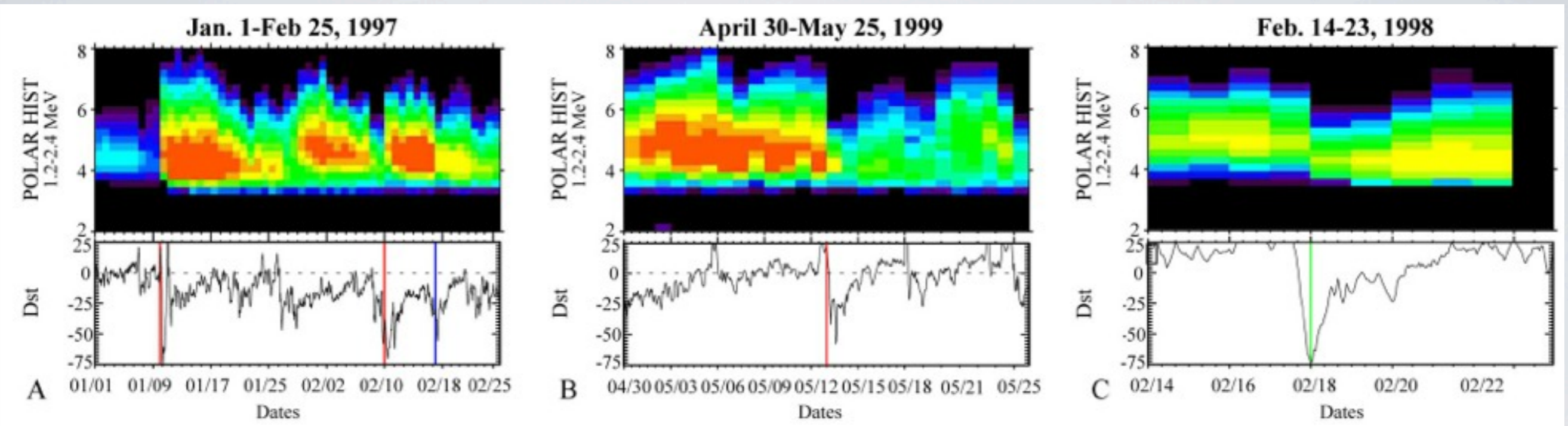
RBSP Mission Objectives

- Discover which processes, singly or in combination, accelerate and transport radiation belt electrons and ions and under what conditions.
- Understand and quantify the loss of radiation belt electrons and determine the balance between competing acceleration and loss processes.
- Understand how the radiation belts change in the context of geomagnetic storms.

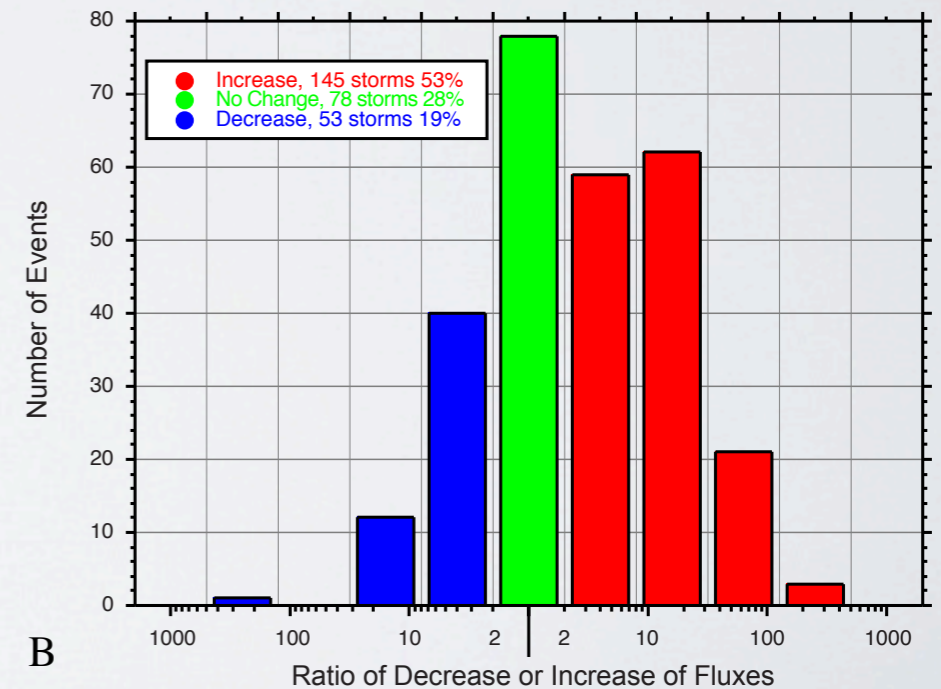
A Rich & Complex Environment



If You've Seen One Storm...



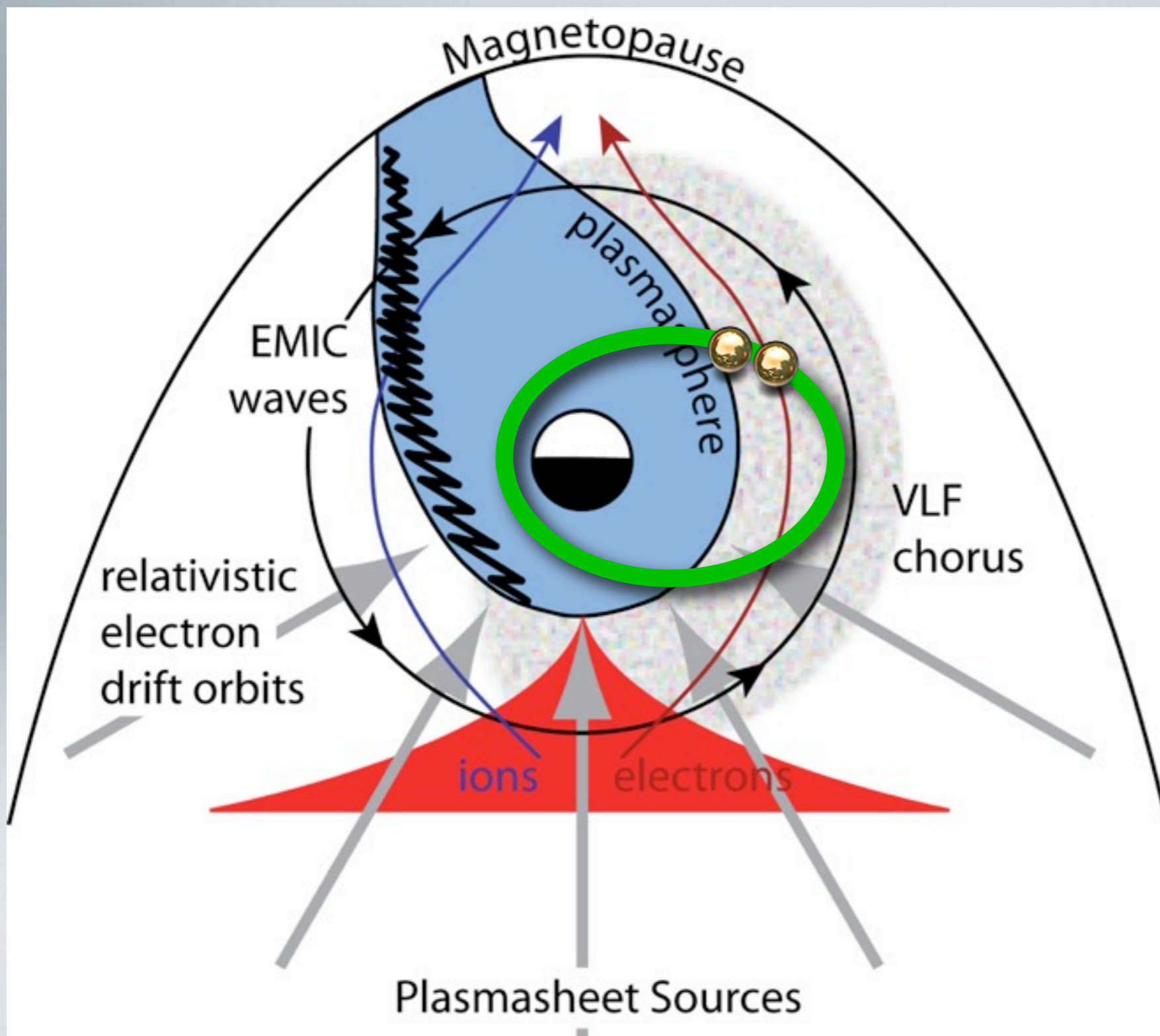
- The radiation belts respond to geomagnetic storms
- Strong storms do not imply strong radiation belt intensity
- Storms don't always produce intensifications at all
- Radiation belt structure and dynamics result from a delicate balance of processes



RBSP Mission in a Nutshell

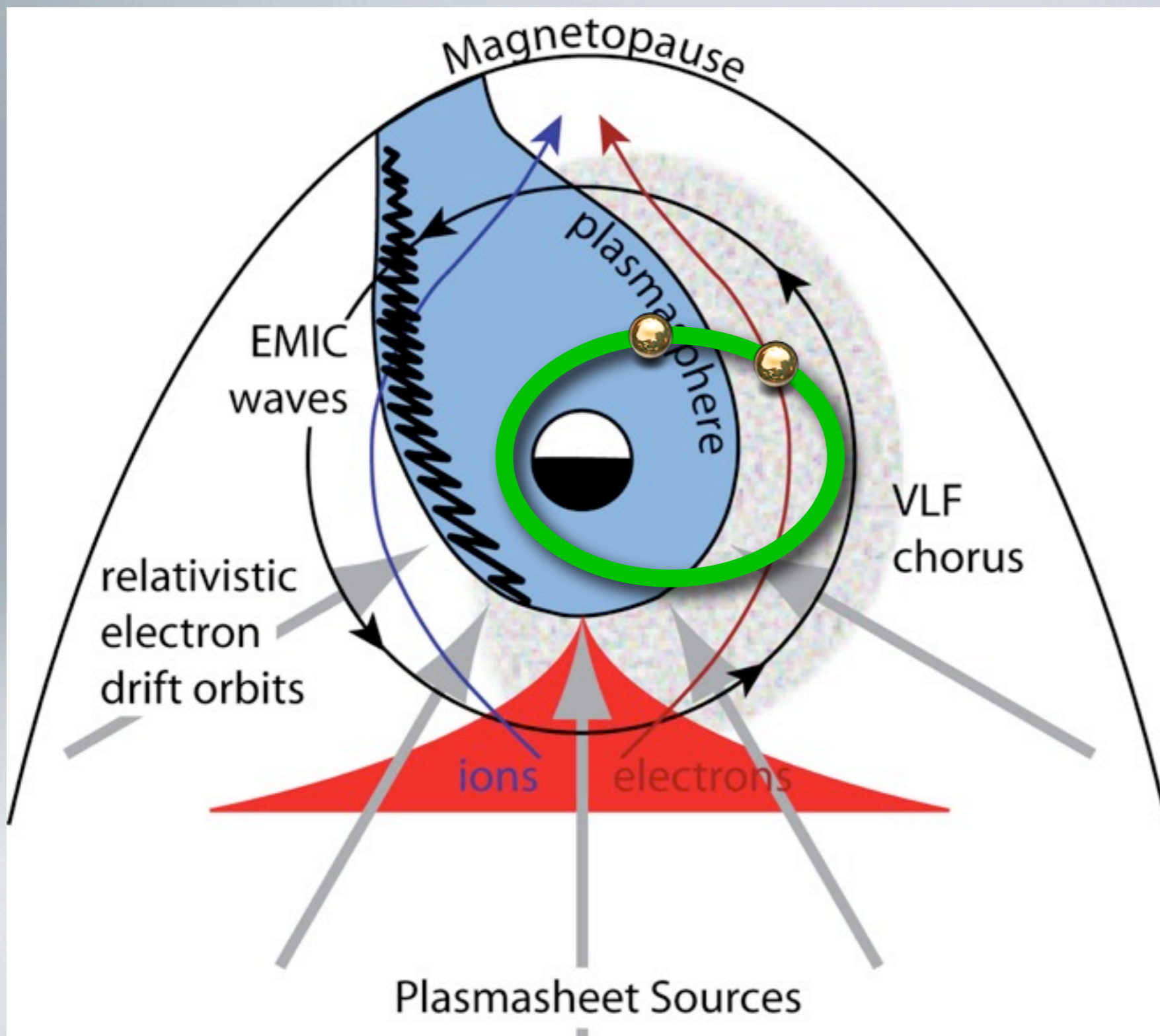
- RBSP consists of 2 satellites with an extensive complement of particle and fields instruments
- Elliptical, near-equatorial orbit with apogee ~ 5.7 RE
- Satellites are in near-identical, lapping orbits with a full range of radial separations in each LT quadrant
- During the 2-year mission apogee will precess through all local times starting ~ 6 MLT
- Launch: August 23, 2012 + 60 day commissioning
- Mission web site: rbsp.jhuapl.edu
- RBSP-ECT web site: www.rbsp-ect.lanl.gov

Spacecraft Separation



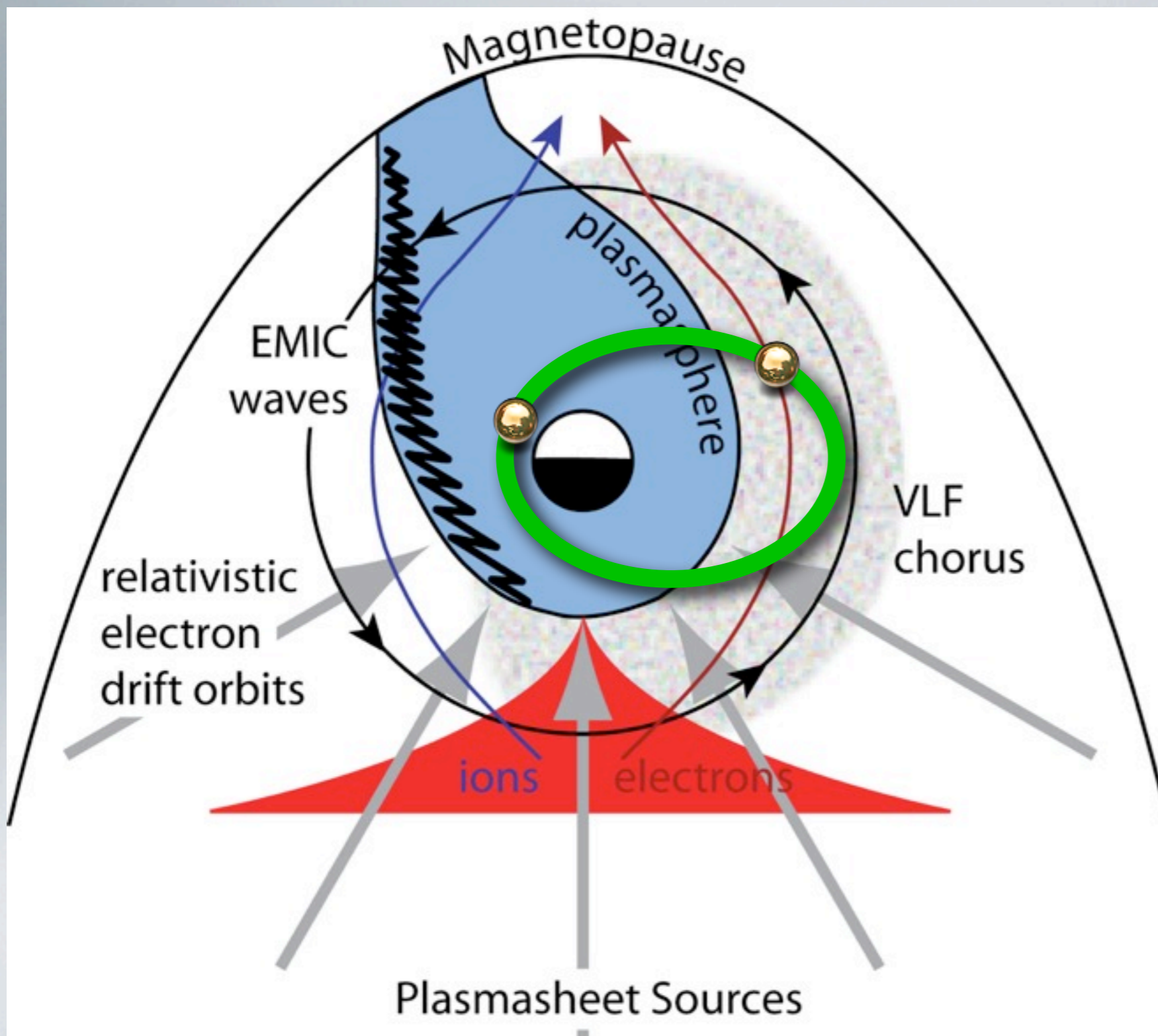
- Small separations probe rapidly-changing conditions

Spacecraft Separation



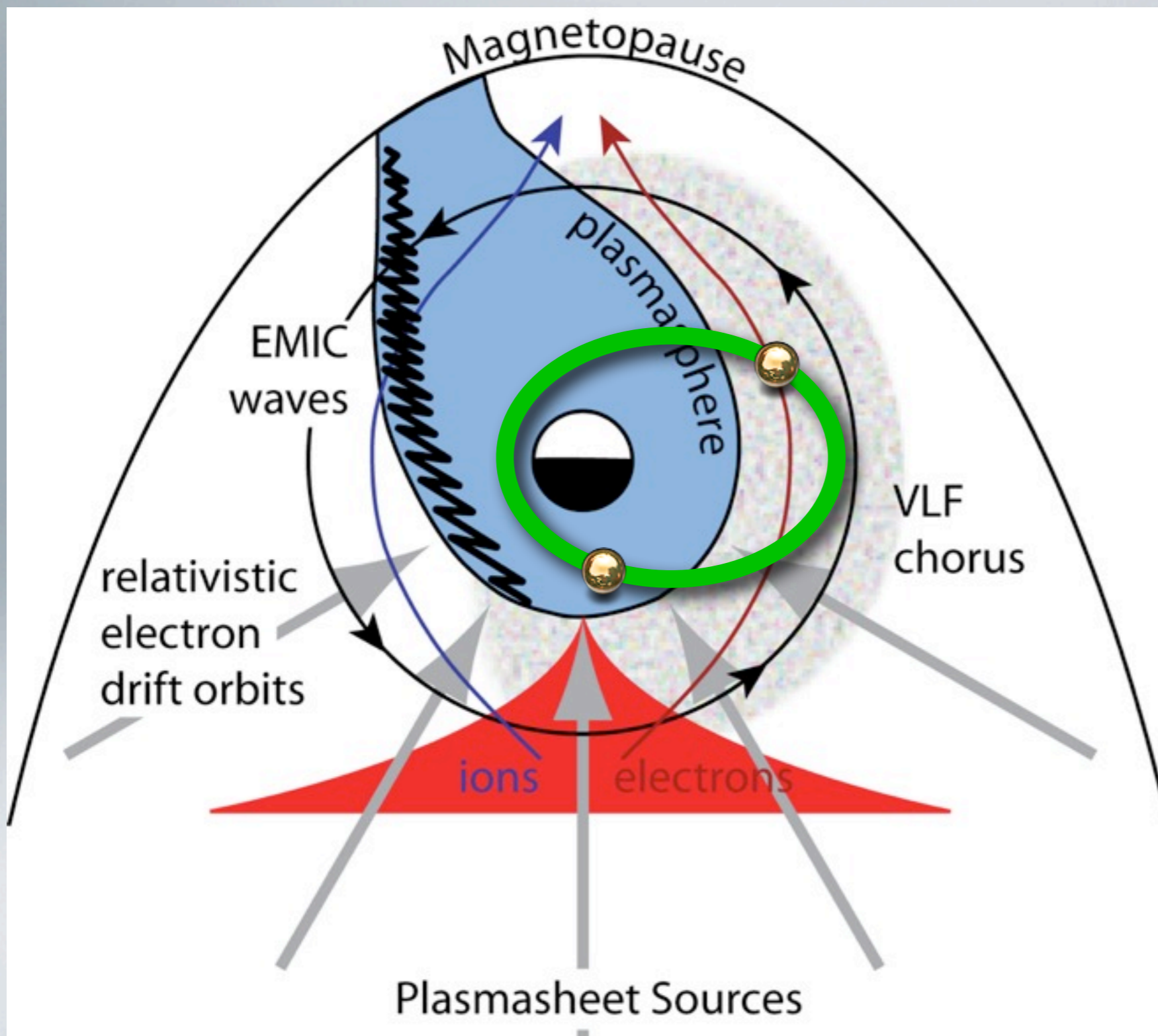
- Larger separations probe a range of spatial and temporal scales
- Revisit times range from min to 4.5 hours
- Satellites “lap” in about 2 months

Spacecraft Separation



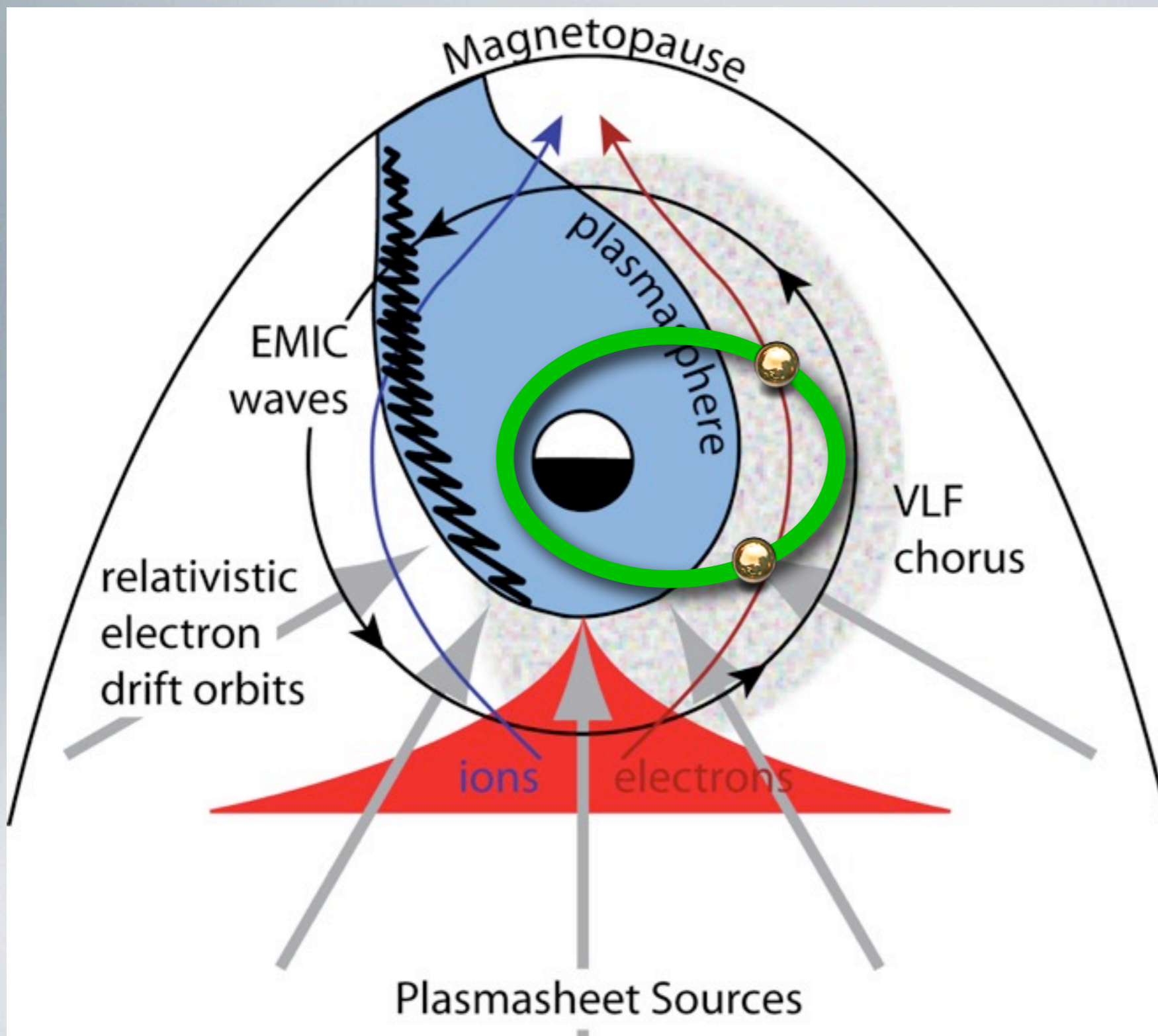
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Spacecraft Separation



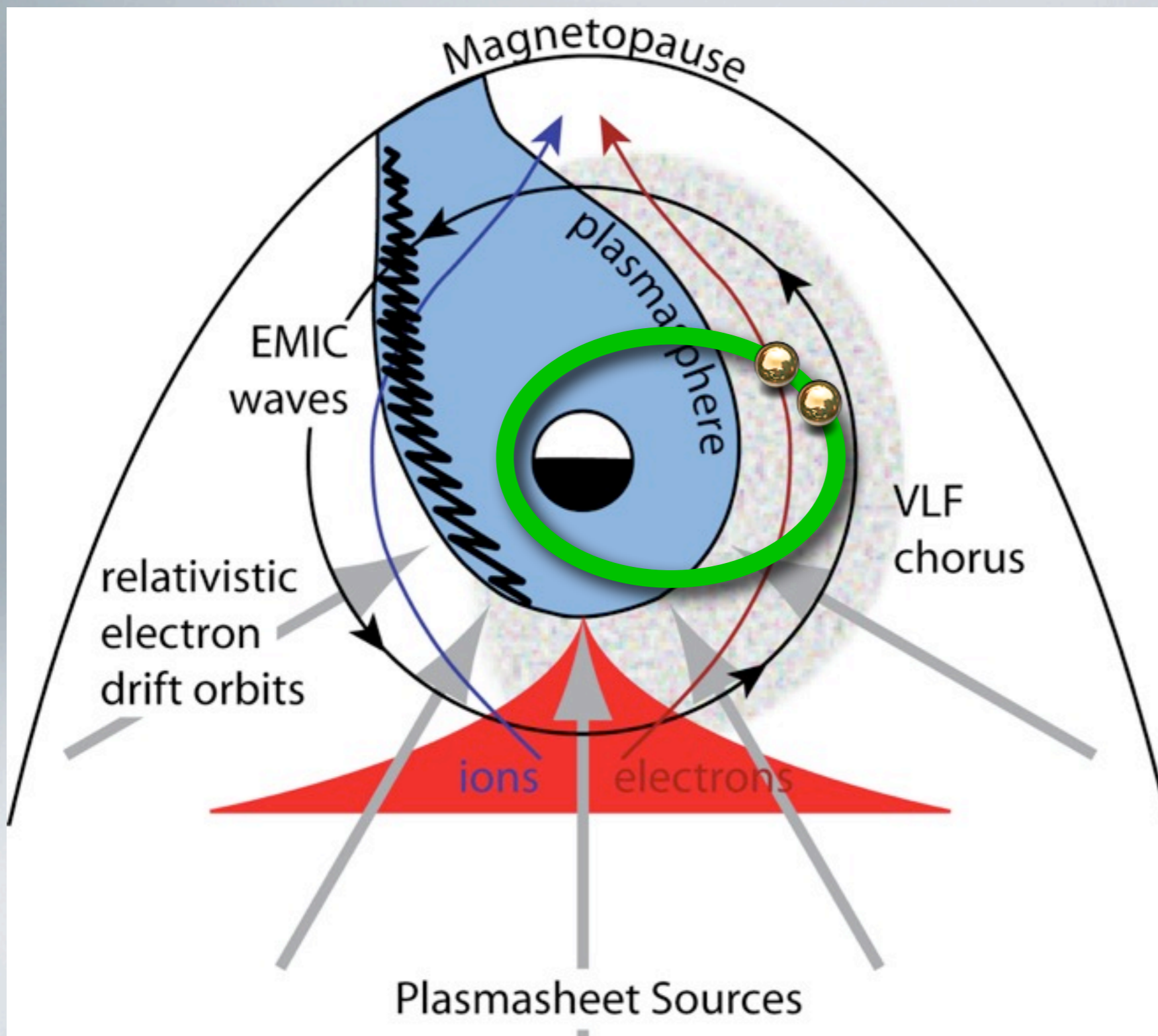
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Spacecraft Separation



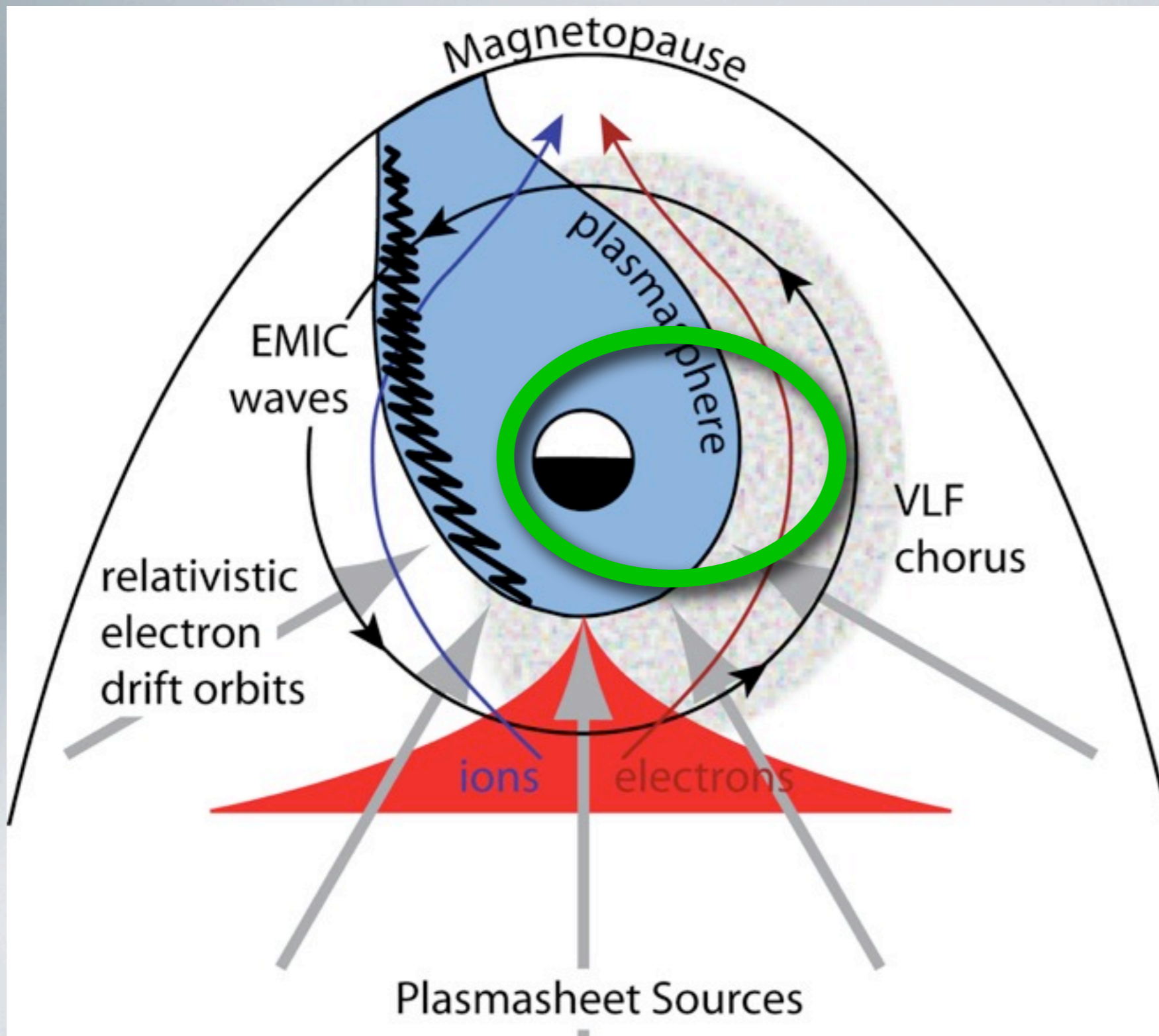
- Larger separations probe a range of spatial and temporal scales
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Spacecraft Separation



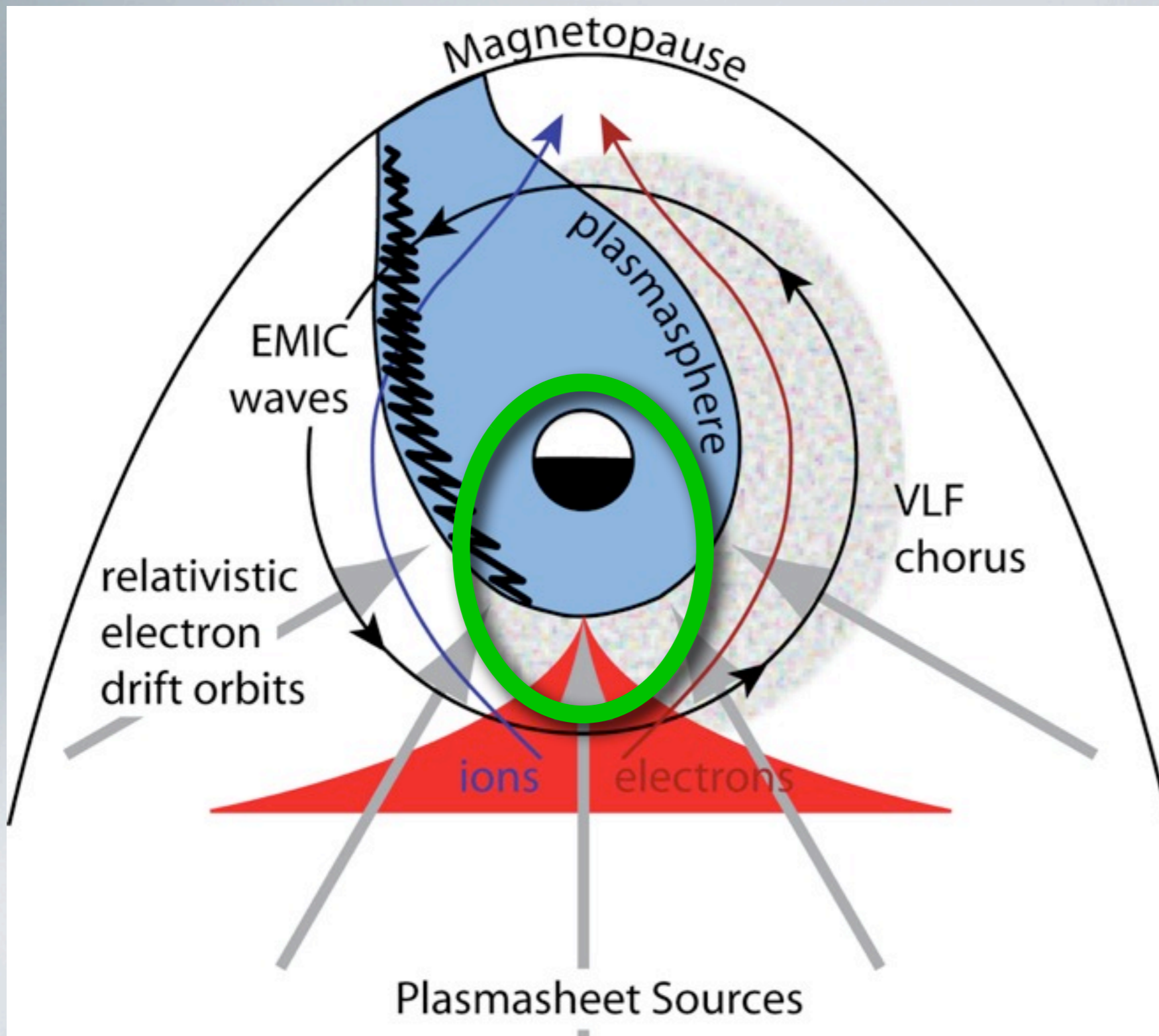
- Larger separations probe a range of spatial and temporal scales
- Revisit times range from min to 4.5 hours
- Satellites “lap” in about 2 months

Launch: Apogee at Dawn



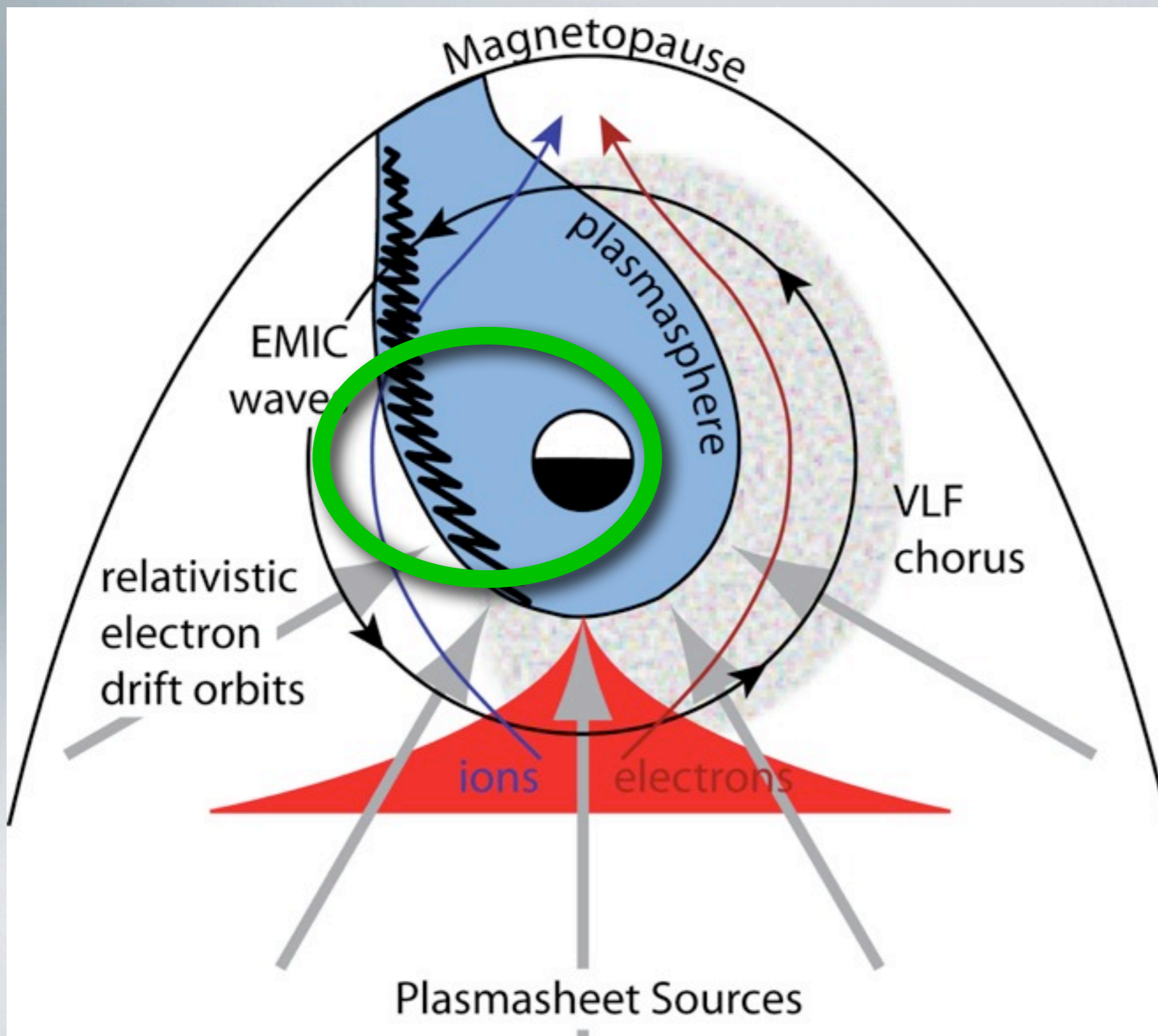
- Chorus
- Electron Drift & Instabilities
- Pulsating Aurora
- Plasmasphere
- Microbursts
- Electron Precipitation

6-Months: Apogee at Midnight



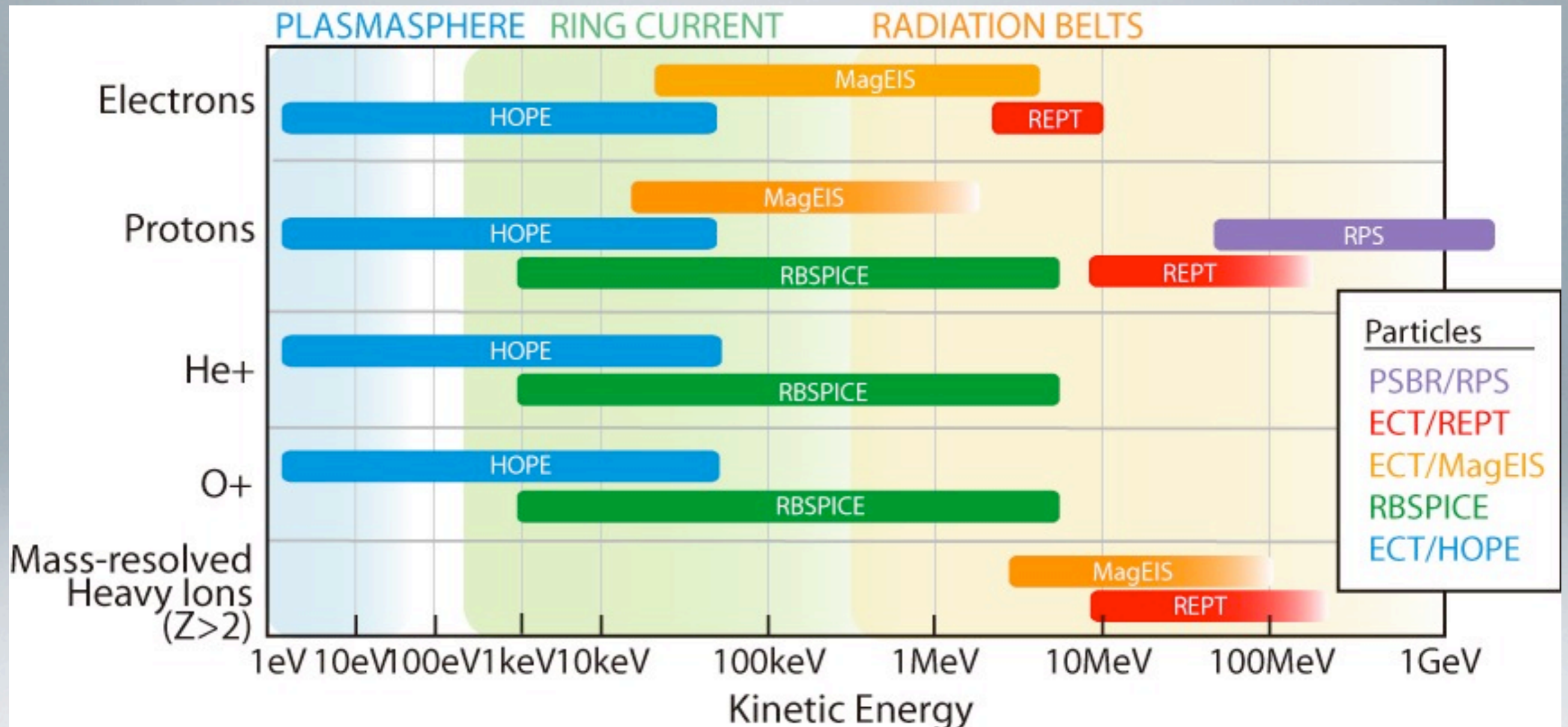
- Substorms
- Plasma sheet
- Field Line Curvature Scattering
- Dawn-Dusk Asymmetries

1-Year: Apogee at Dusk

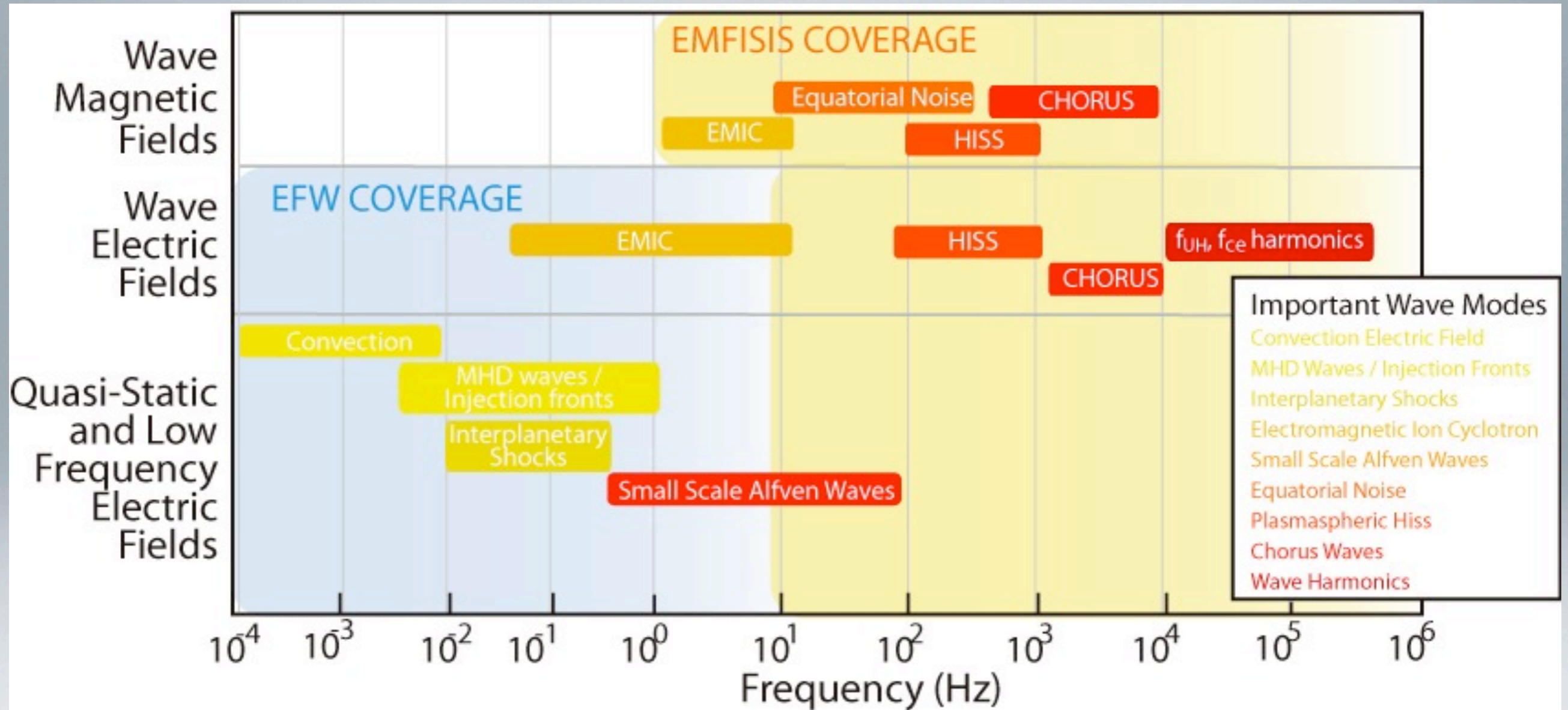


- EMIC Waves
- Ion Drift & Instabilities
- Ring Current
- Plasmaspheric Plumes
- Alfven Boundaries

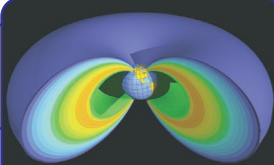
RBSP Particle Measurements



Fields & Waves Measurements



RBSP's Prime Measurement Goals date back a solar cycle



GEM

Inner Magnetosphere
Storms Campaign

WG2: Radiation Belts

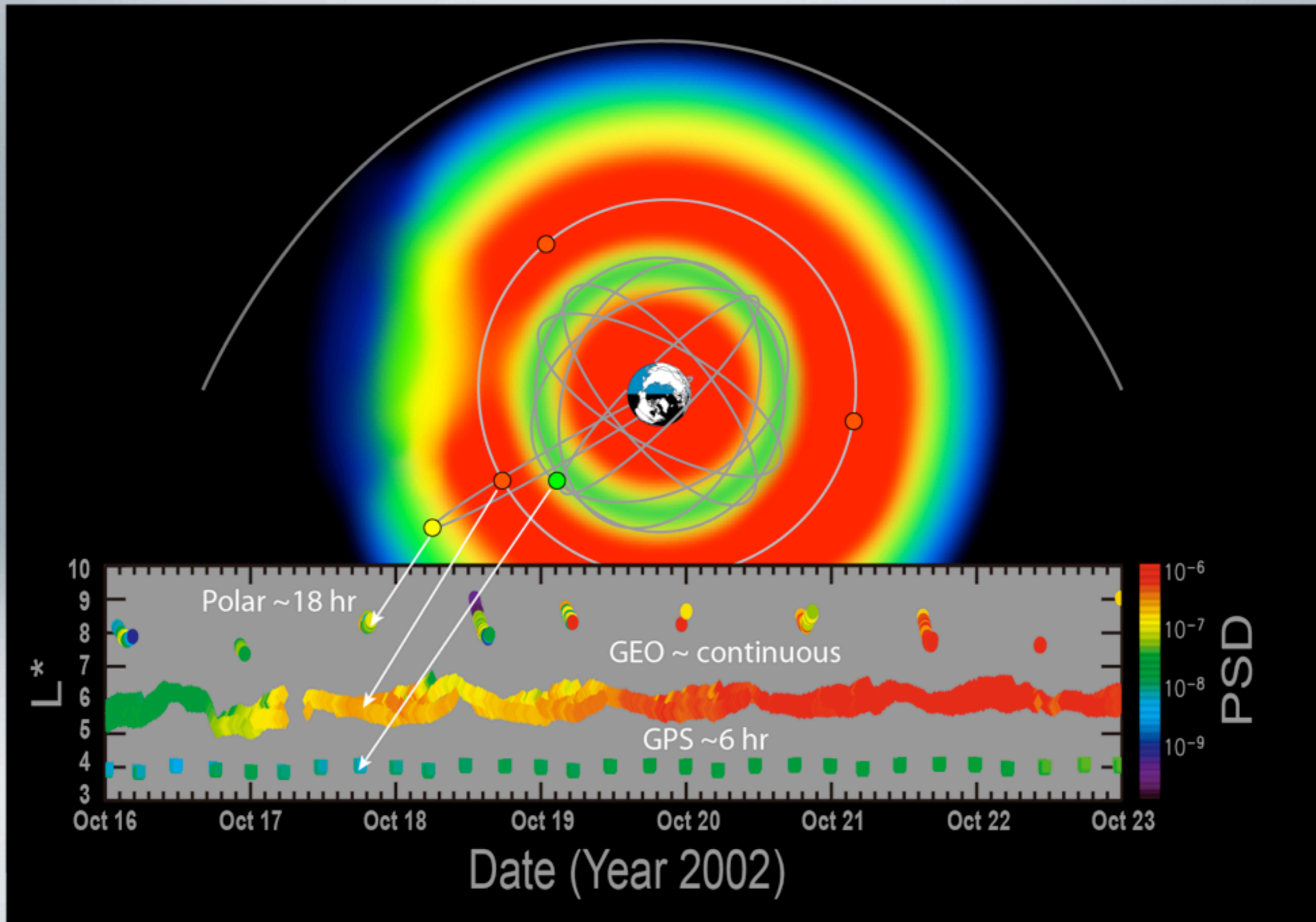
**GEM Science
Goals 2000**

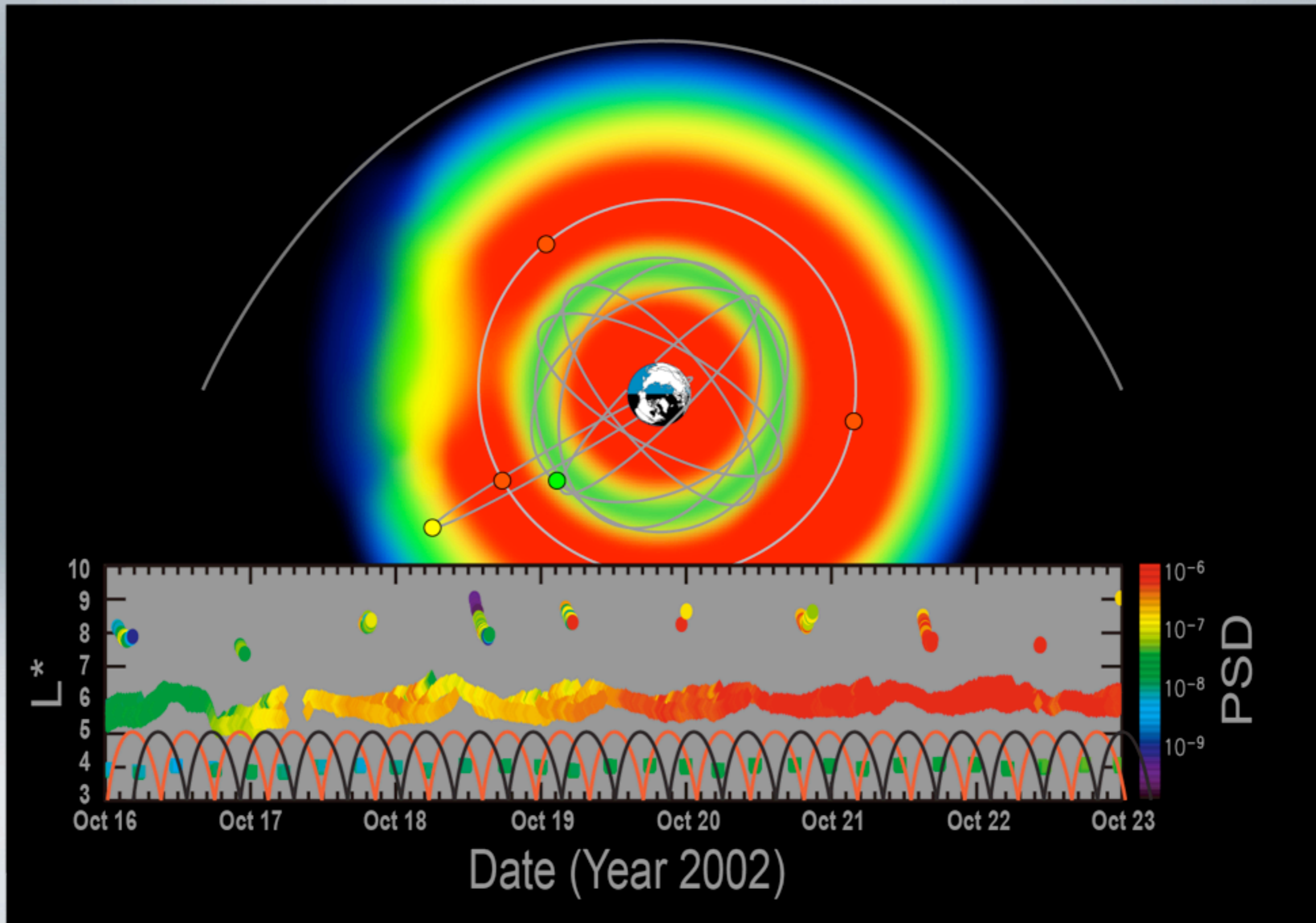
Three Principal Objectives

- 1) To evaluate the relative contribution of various proposed acceleration and loss processes through theory, modeling, and comparison with data
- 2) To create time-dependent phase space density profiles of the radiation belts that will more accurately represent their structure and dynamics than fixed energy profiles
- 3) To define and specify the specific science goals for the Radiation Belt module

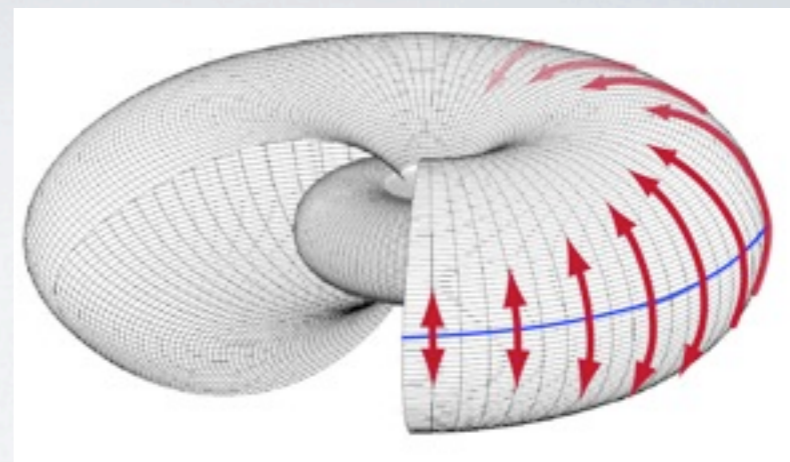
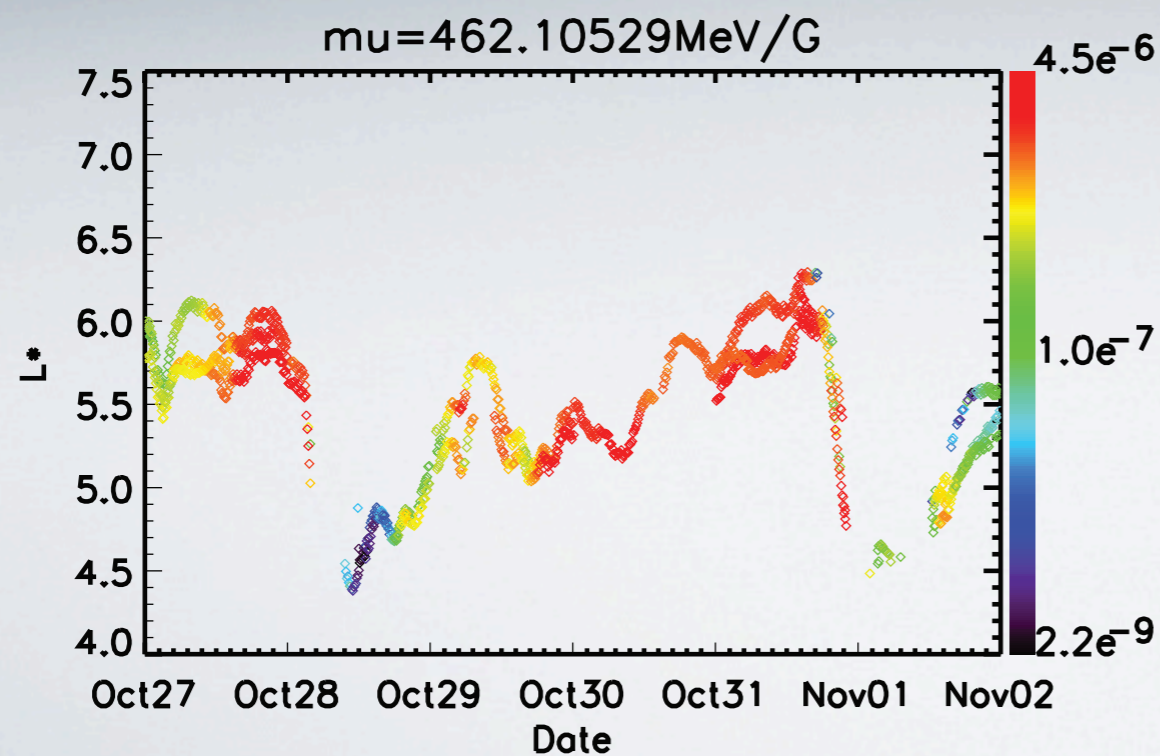
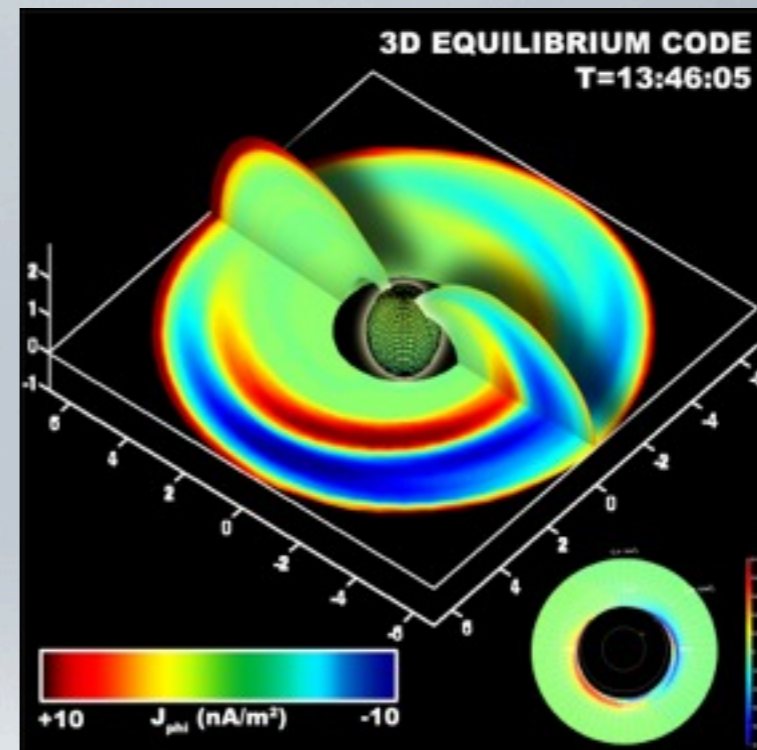
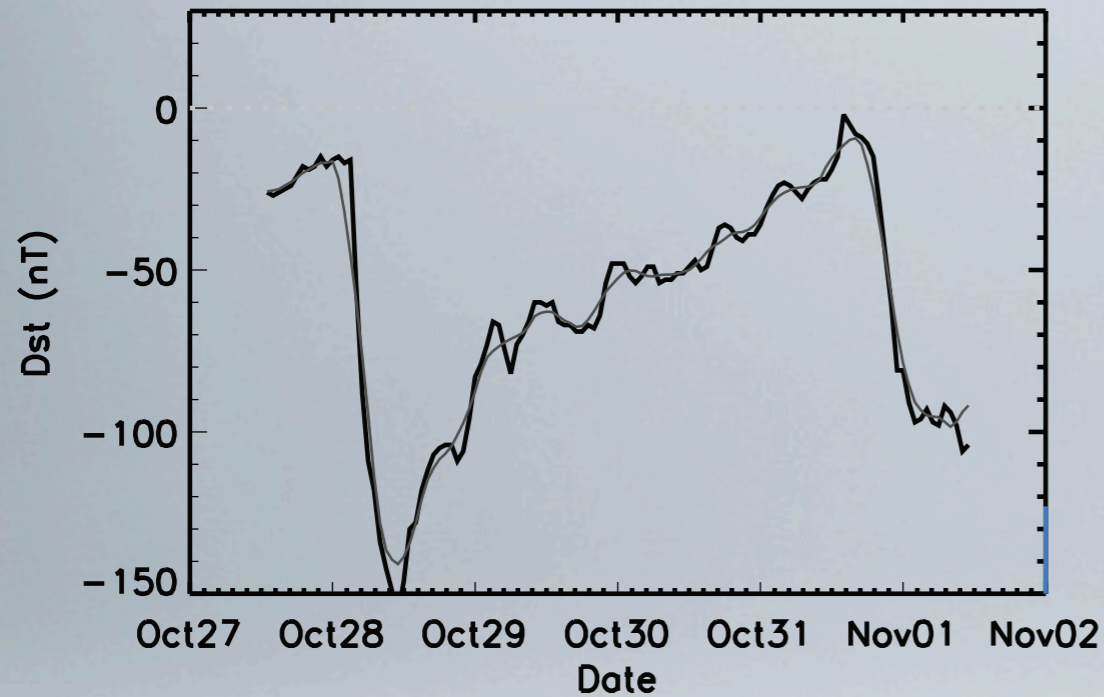


**RBSP
2012**

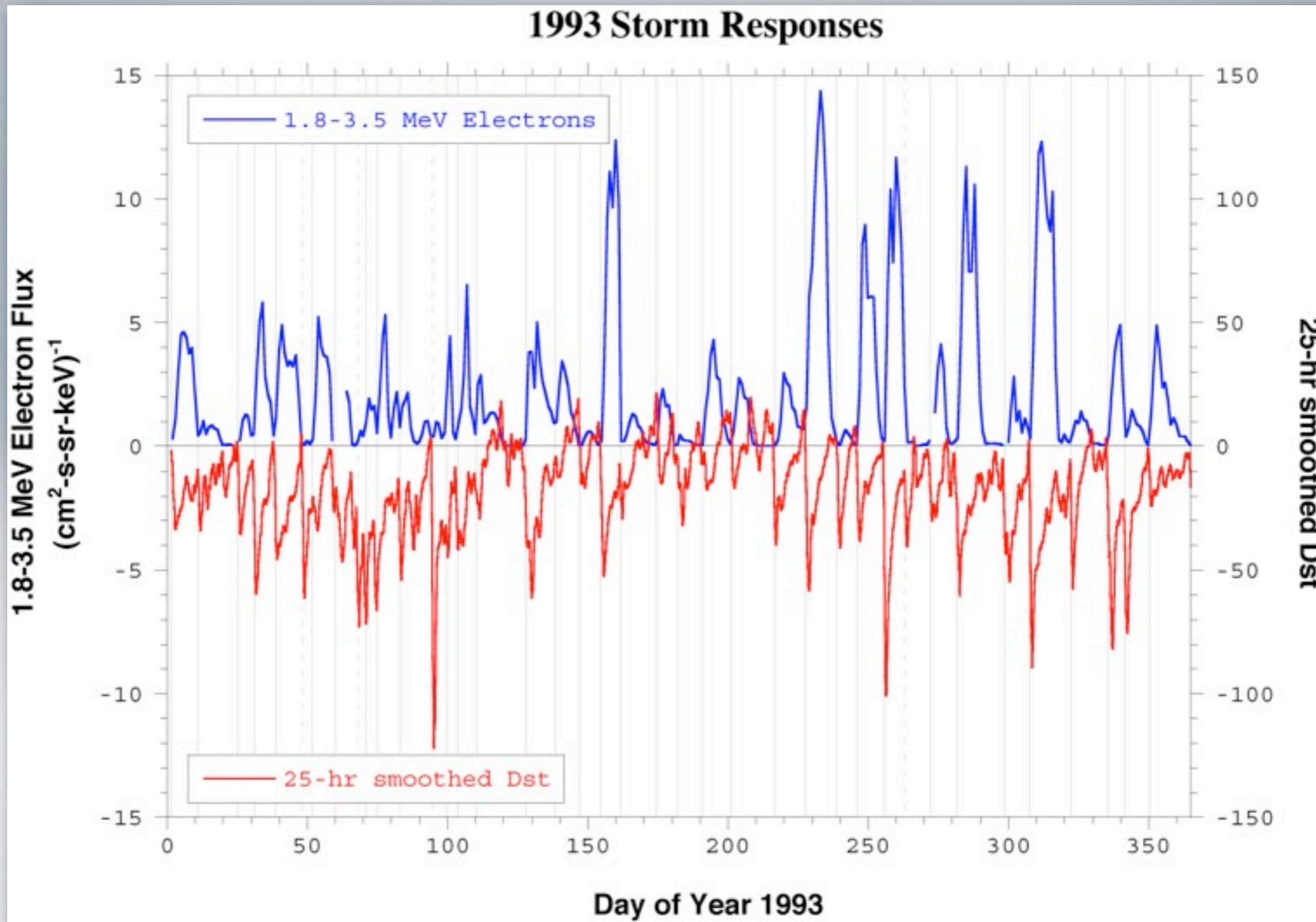




RB Science Depends on Knowing The Global Magnetic Field



It Also Depends on Understanding Storm Processes



RBSP needs other resources to do systems science



- BARREL balloon array
- ACE, THEMIS, GPS, GEO, etc.
- Ground-based measurements
- Cubesat Missions
- Theory, Simulation, & Modeling
- and many others

You can help with RBSP's Science Objectives



- Magnetometers, riometers, radars, etc. are great resources for providing the global context for RBSP
- When RBSP is measuring chorus interactions at dawn what is happening at dusk?
- What do electron and ion precipitation tell us about RB processes
- etc.

but maybe RBSP can help with Your Science Objectives



- Any studies that link magnetospheric & ionospheric observations now have 2 satellites that pass overhead with minutes to hours separation
- Likewise we can do simultaneous multi-point conjunction studies
- Plus, unprecedented E-field, B-field, wave, plasma & ring current measurements
- And a real-time Space Weather Broadcast

Thank You

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reeves@lanl.gov