THEMIS: RBSP's Best Friend*

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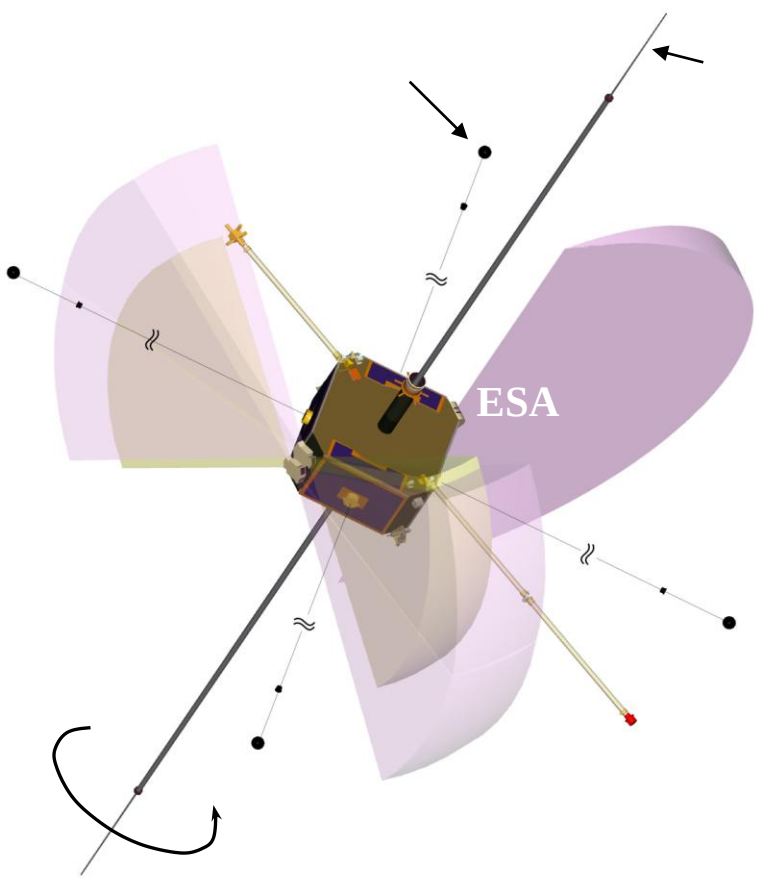
- 1. Instrumentation
- 2. Orbits
- 3. Radiation Belt Science…
- 4. Partnership with RBSP

*And the THEMIS elephant is the best friend of the RBSP elephant

SPACECRAFT AND INSTRUMENTS



FIVE IDENTICALLY-INSTRUMENTED SPACECRAFT (128 kg), EACH CARRYING:

ESA: Electrostatic analyzer measures 0.003-30 keV ions/electrons (UCB)
No composition

SST: Solid state telescopes measures 0.03*-6 MeV ions and electrons (UCB)
No composition, dead layer

FGM: Fluxgate magnetometer measures magnetic field to 128 Hz (Germany)

SCM: Search coil magnetometer measures 0.001 - 4 kHz magnetic field (France)

EFI: Electric field instrument on wires and axial booms 0.0003 - 400 kHz (UCB)

Where Will The Spacecraft Be?

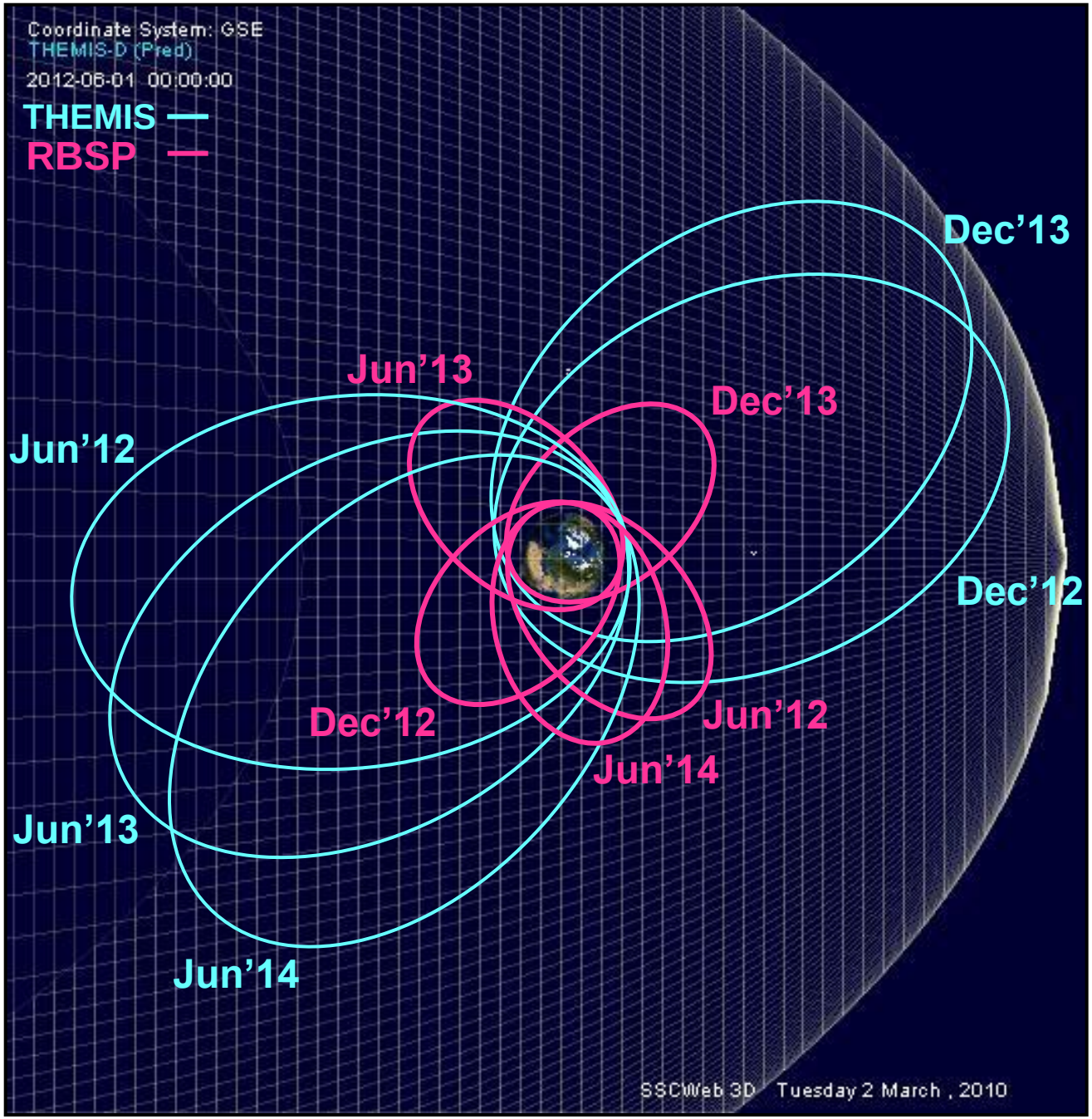
QuickTime™ and a
decompressor
are needed to see this picture.

11.7 R_E Apogees, T = 1 day

Season	RBSP	THEMIS
Summer 2012	0800 LT	2300 LT
Fall 2012	0500 LT	1800 LT
Winter 2013	0200 LT	1300 LT
Spring 2013	2300 LT	0800 LT
Summer 2013	2000 LT	0300 LT

…Usually far away

Source region monitor for RBSP?
Determine extent of wave fields?
Help track drifting injections?
Locate plasmapause?
Electric and magnetic field configuration?


Coordinate System: GSE
THEMIS-D (Pred)
2012-06-01 00:00:00
THEMIS
RBSP
Dec'13
Jun'13
Dec'13
Jun'12
Dec'12
Dec'12
Jun'12
Jun'14
Jun'13
Jun'14
SSCWeb 3D Tuesday 2 March , 2010

What Can THEMIS Provide?

- 3s spin period sets basic data rate.
- Slow survey mode (most of 24 hour orbit) gives on-board moments, spectra, B, E, waves each 3s, full plasma distribution function every 5 min
- Fast survey mode (triggered or preset) gives full 3s distribution functions, waveforms, 4 Hz E, B for **12/24** hours on orbit
- Brief wave and particle burst modes give even higher resolution data sets

THEMIS Ground Observatories

QuickTime™ and a
decompressor
are needed to see this picture.

Key:

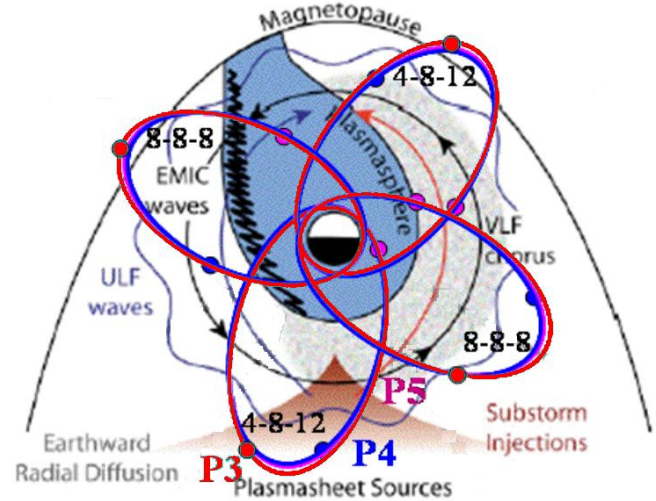
Pale Blue Balloon: EPO Mag (2 Hz)

Dark Blue Balloon: Mag (2 Hz)

Black Square in Circle: ASI and their FOV (3s)

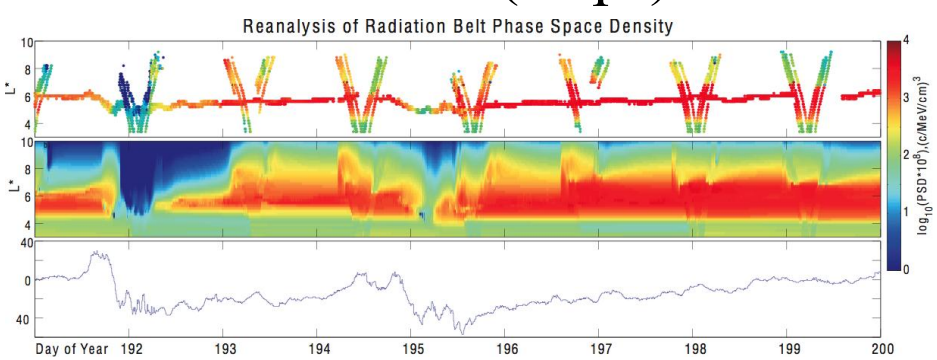
Provide- location of auroral oval, substorm and injection activity, ULF waves

THEMIS: Partner for RBSP during FY13/14 Solar Maximum

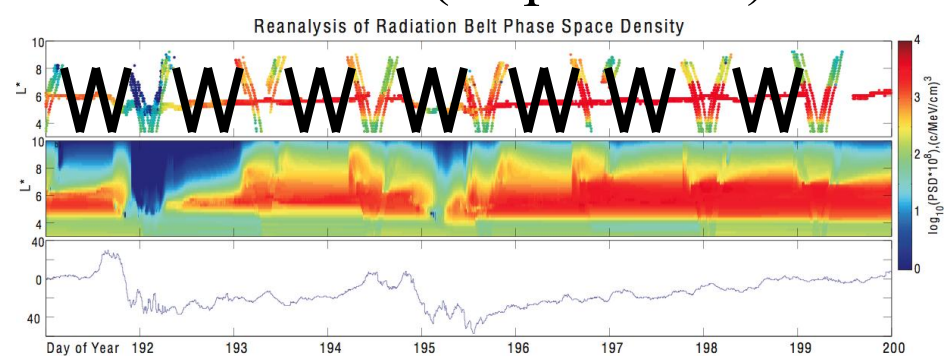


- Three broadly-spaced THEMIS spacecraft will provide continual observations of
  - 1. Source region plasmas and electric fields
  - 2. Radiation belt drivers, including transmitted shocks and pressure pulses, KH boundary waves, and substorm injections.
- Thereby constraining radiation belt models:

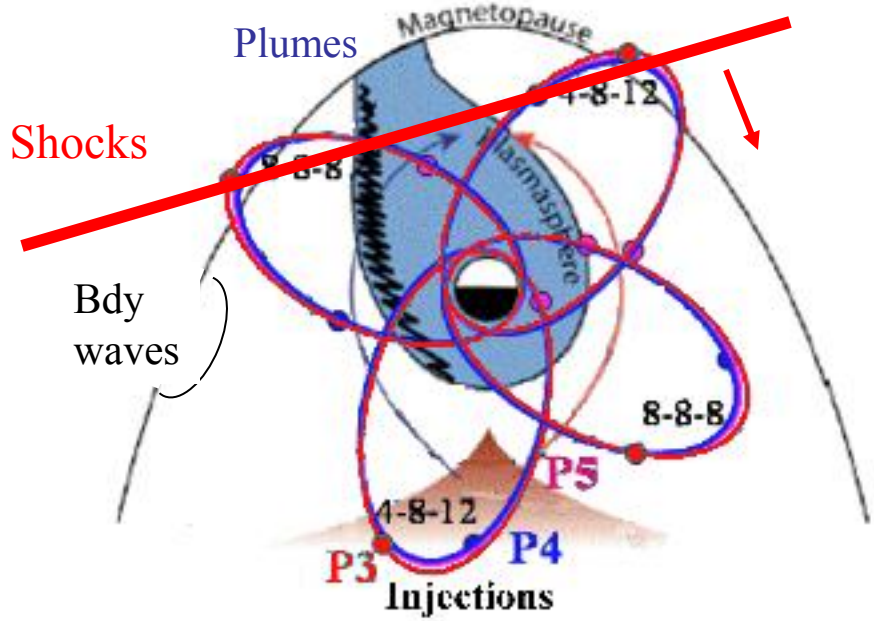
Now (Gaps)



2013/2014 (Gaps Filled)



THEMIS: Mesoscale Features in the Inner Magnetosphere



- Three broadly-spaced THEMIS spacecraft on similar orbits will:
  - 1. Time the propagation of compressional waves driven by FTEs, the Kelvin-Helmholtz instability, and shocks through the magnetosphere.
  - 2. Determine the characteristics of ULF waves in the inner magnetosphere.

dB dV dE

QuickTime™ and a
GIF decompressor
are needed to see this picture.

Movie courtesy S. Ukhorskiy