

COMMUNITY
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MODELING
CENTER

CRCM and RBE

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Outline

- ❖ The **C**omprehensive **R**ing **C**urrent **M**odel (CRCM)
 - Model logic: input/output
 - CRCM with Tsyganenko and CRCM-MHD one-way coupling
 - CRCM-MHD two-way coupling

- ❖ The **R**adiation **B**elt **E**nvironment (RBE) model
 - Model logic: input/output
 - RBE with Tsyganenko and RBE with BATSRUS-RCM
 - RBE-T04 Real-time run at <http://iswa.gsfc.nasa.gov/>

- ❖ Future works and challenges
 - Make CRCM and RBE available for Runs on Request:
 - CRCM-MHD one-way coupling
 - Standalone RBE (RBE with Tsyganenko models)
 - CRCM-MHD two-way coupling + RBE

The Comprehensive Ring Current Model (CRCM)

Fok Ring Current Model

Imposed E field

Full pitch-angle distribution

Rice Convection Model (RCM)

Self-consistent E field

Isotropic pitch-angle distribution

Comprehensive Ring Current Model (CRCM)

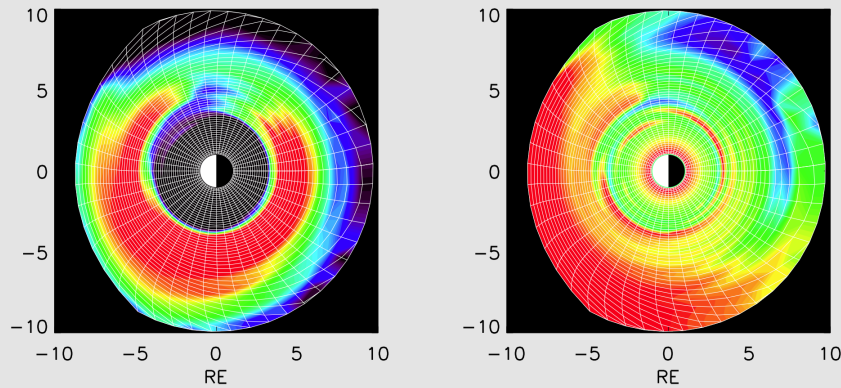
Self-consistent E field

Full pitch-angle distribution

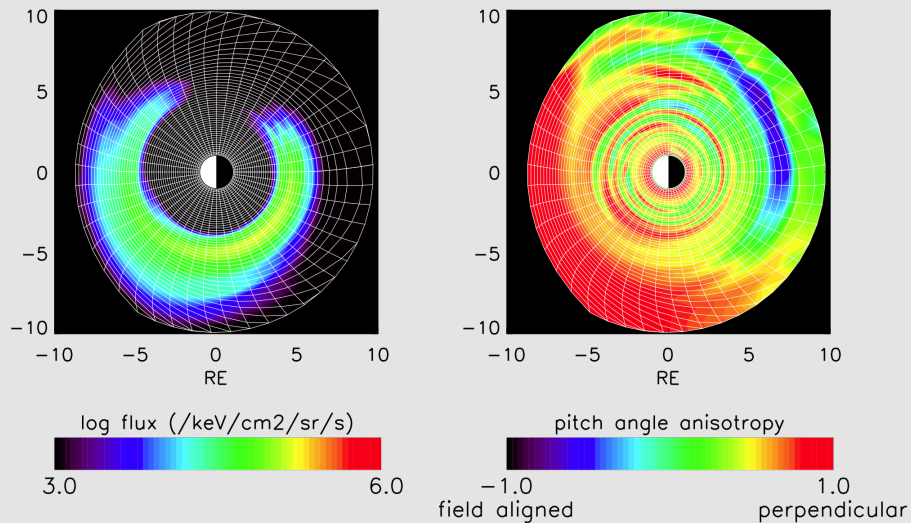
Comprehensive Ring Current Model: The Output

Ion and Electron Flux (1 – 300 keV)

44 keV H⁺



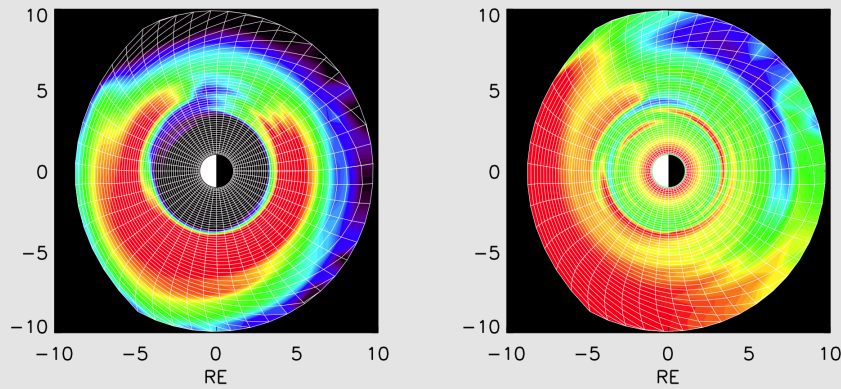
44 keV O⁺



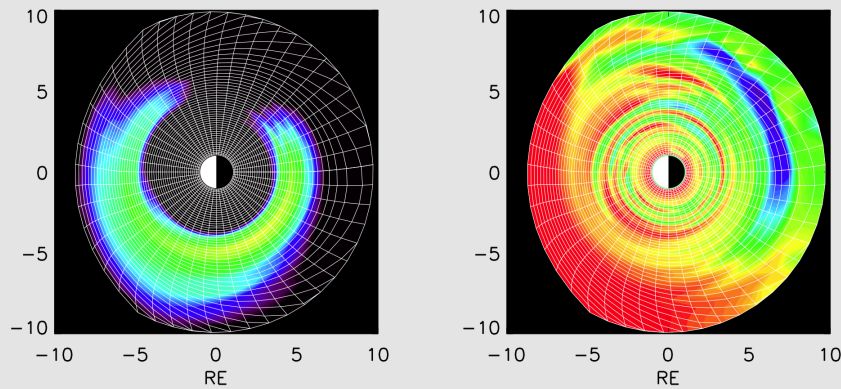
Comprehensive Ring Current Model: The Output

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44 keV H⁺



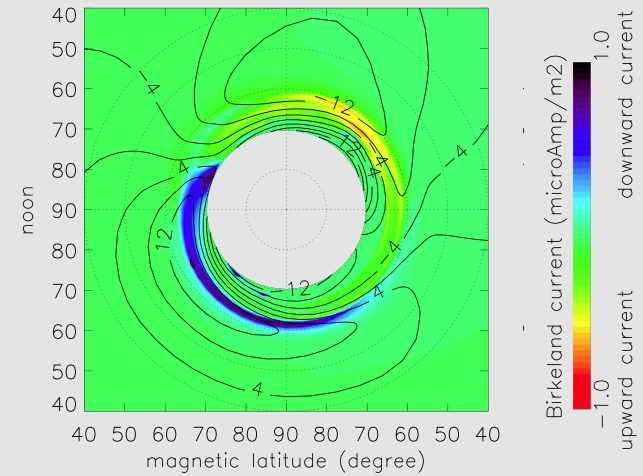
44 keV O⁺



log flux (/keV/cm²/sr/s)
3.0 6.0

pitch angle anisotropy
-1.0 1.0
field aligned perpendicular

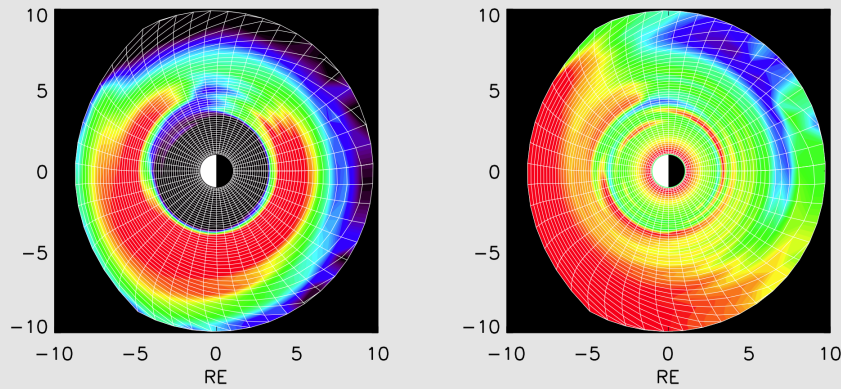
Ionospheric Φ and J_{\parallel}



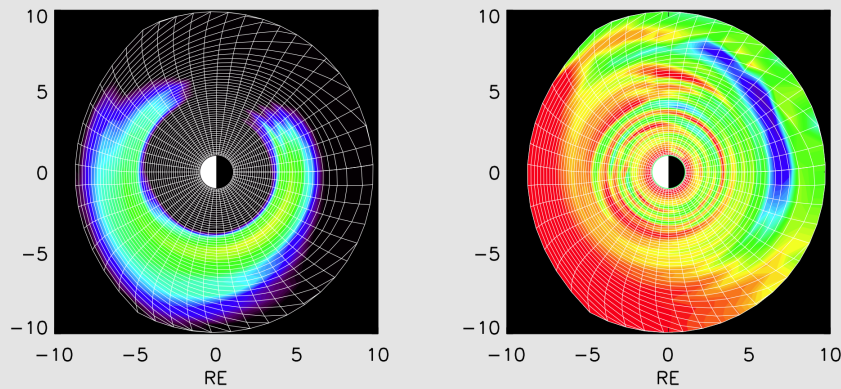
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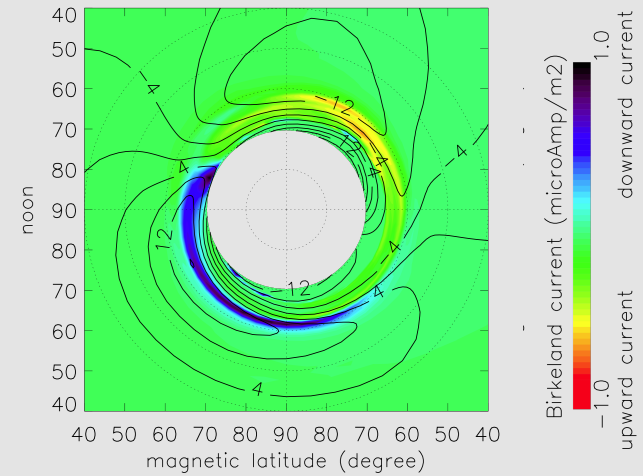
44 keV O⁺



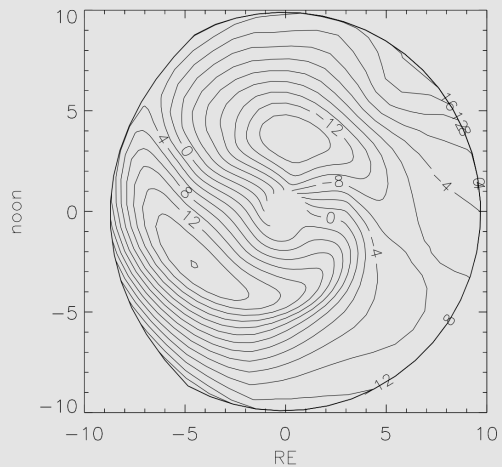
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Ionospheric Φ and J_{\parallel}

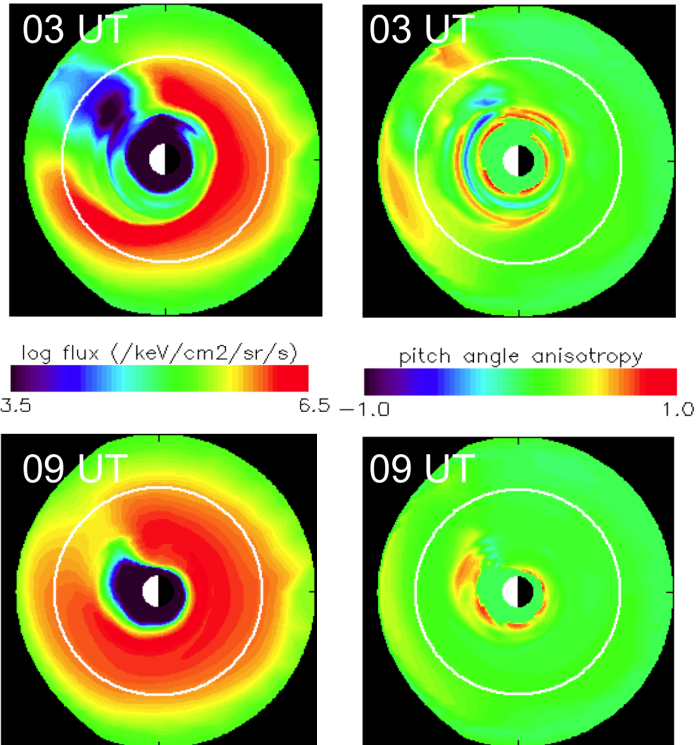


Magnetospheric Φ

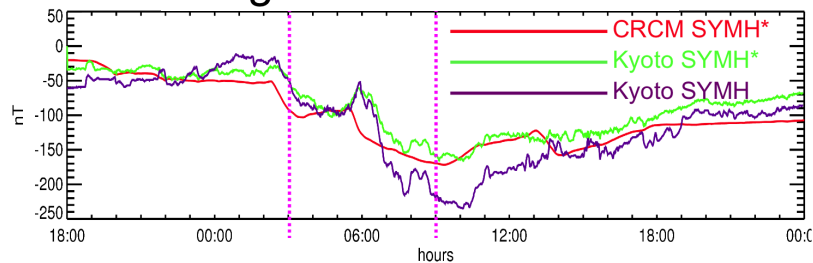


CRCM with Tsyganenko and BATSRUS Model

CRCM with T96
26-38 keV H⁺

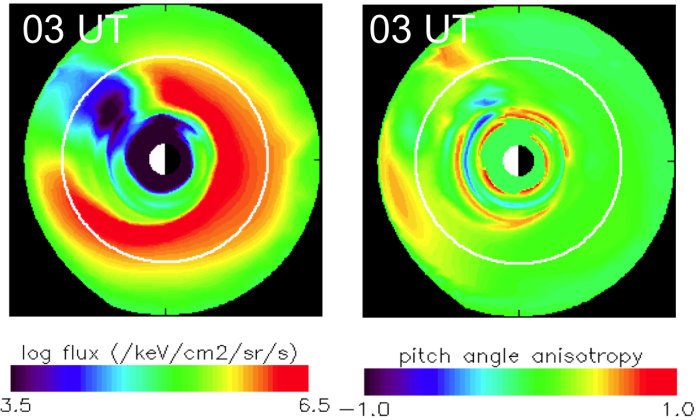


August 12 2000 storm

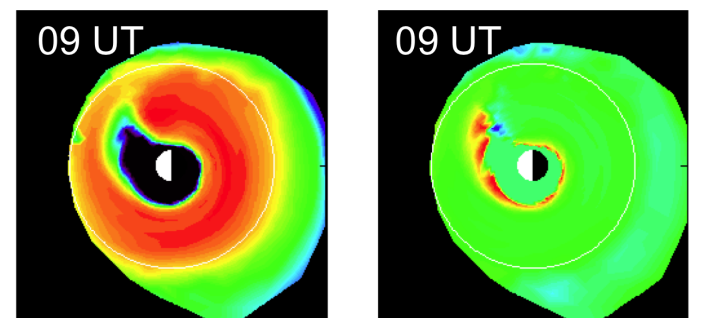
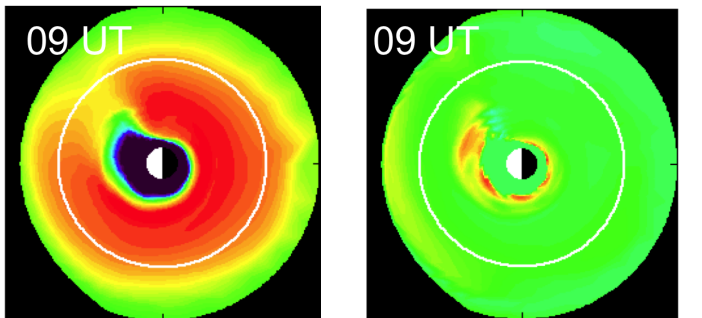
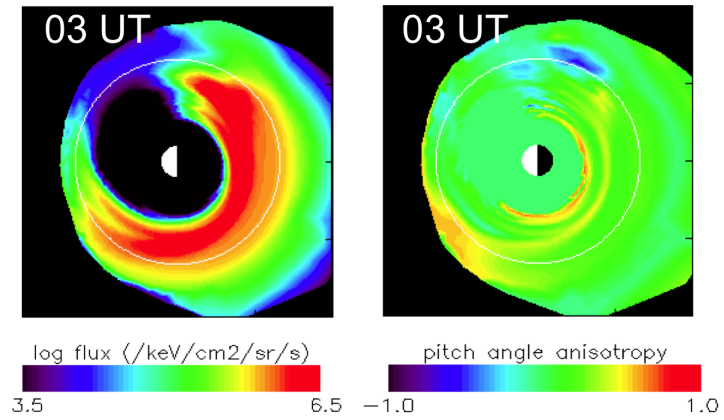


CRCM with Tsyganenko and BATSRUS Model

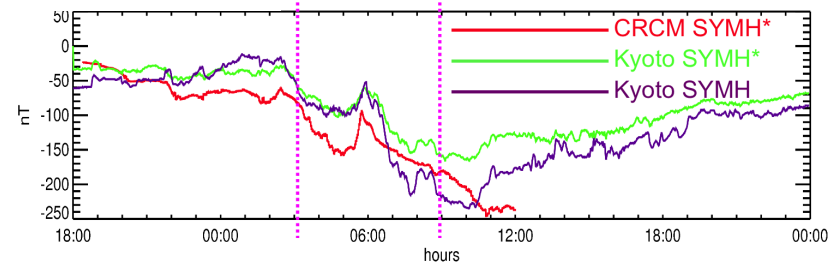
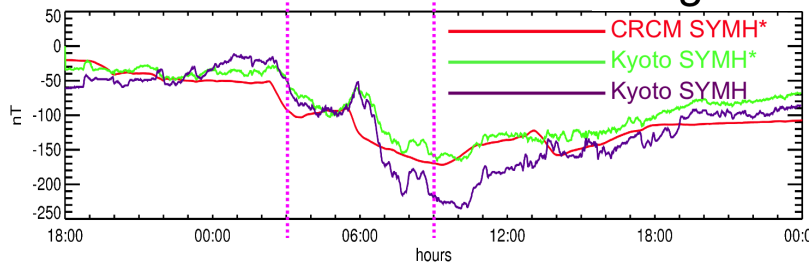
CRCM with T96
26-38 keV H⁺



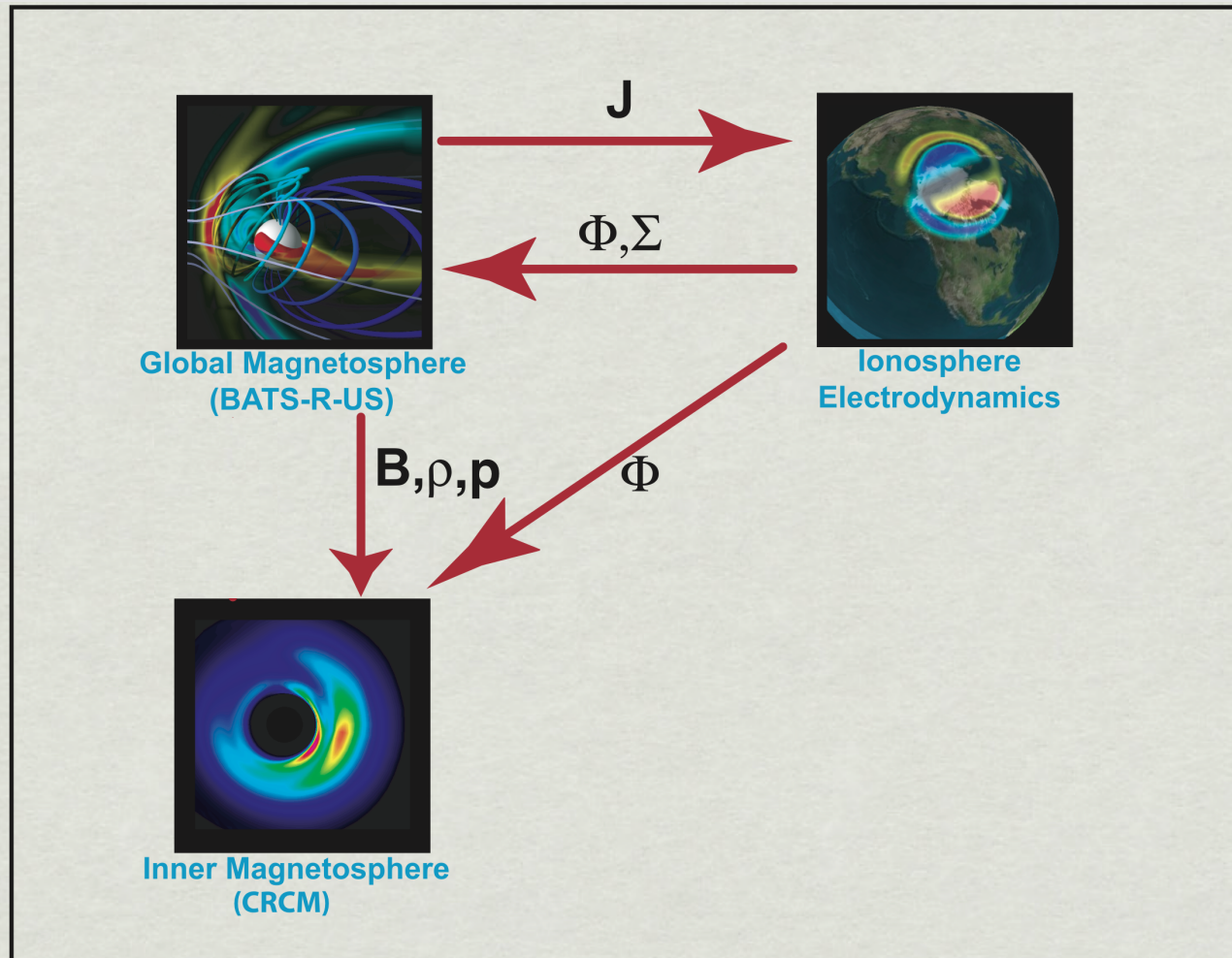
CRCM BATSRUS (One Way)
26-38 keV H⁺



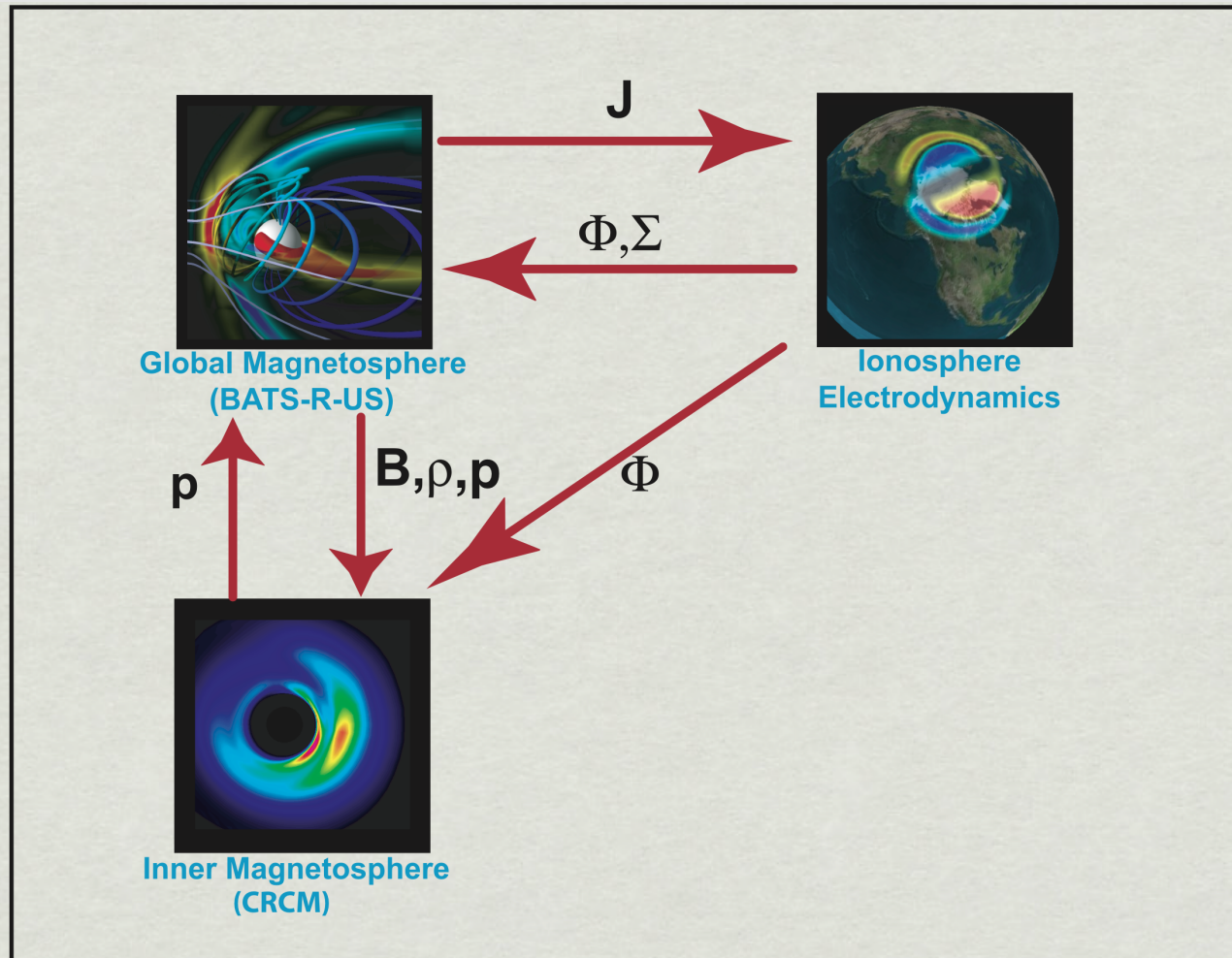
August 12 2000 storm



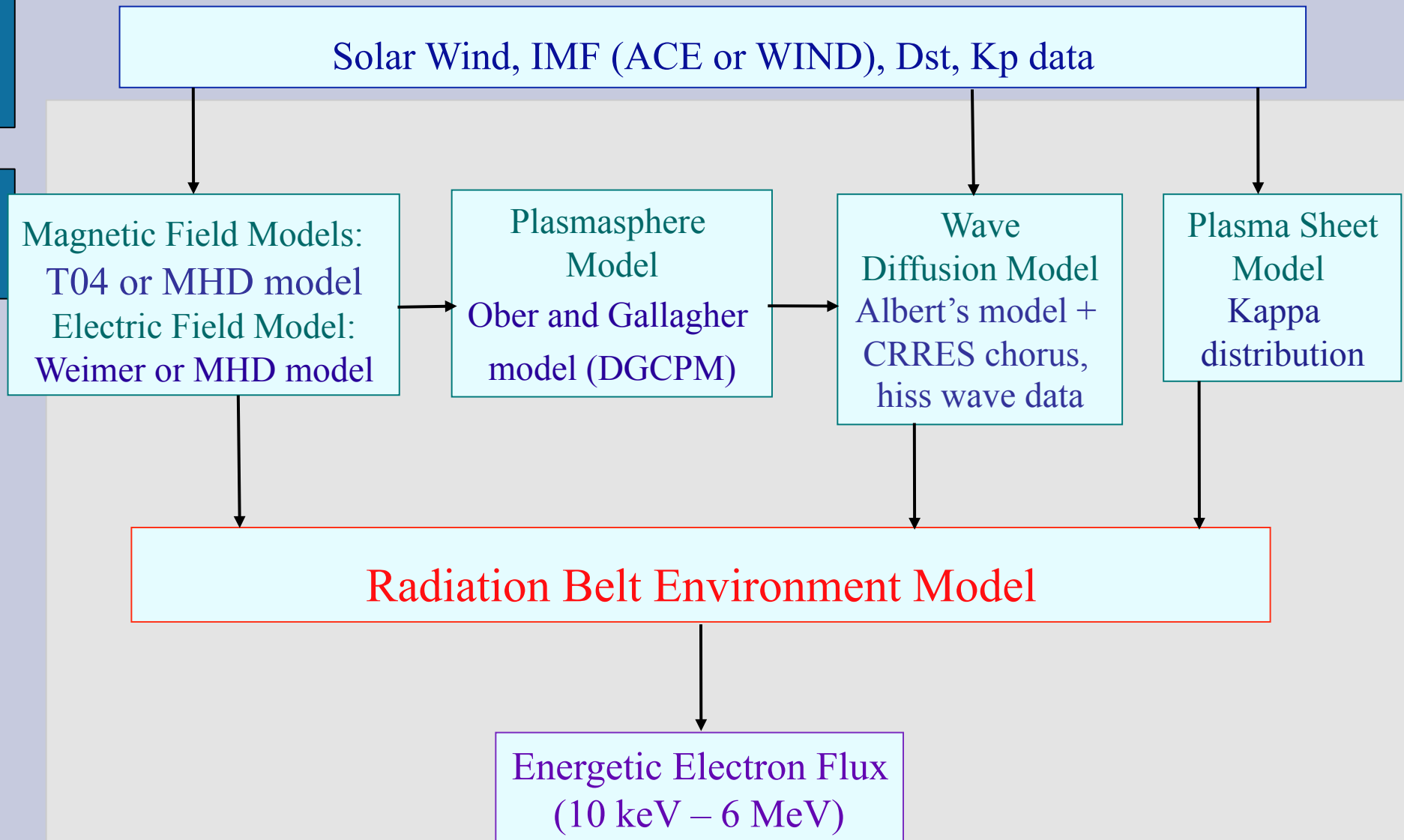
One-Way Coupled CRCM-BATSRUS



Two-Way Coupled CRCM-BATSRUS



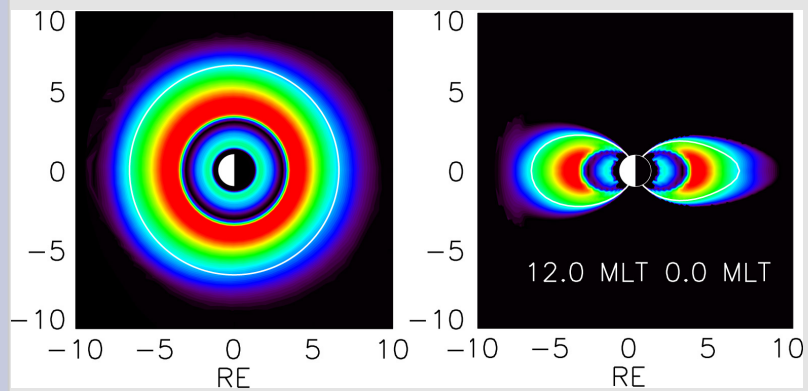
The Radiation Belt Environment (RBE) Model



Radiation Belt Environment Model: The Output

Electron Flux (10 keV – 6 MeV)

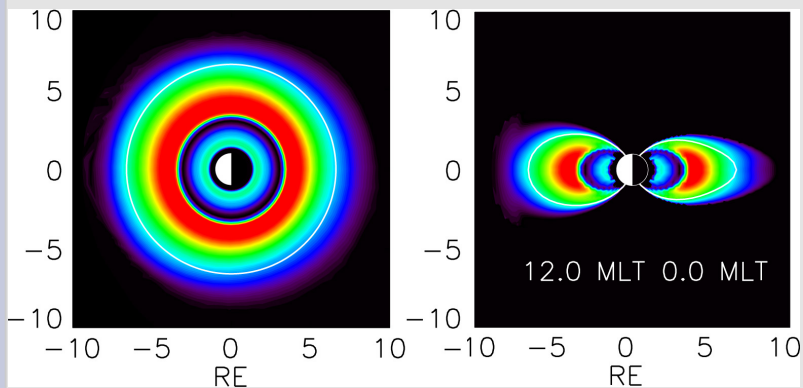
800 keV electrons



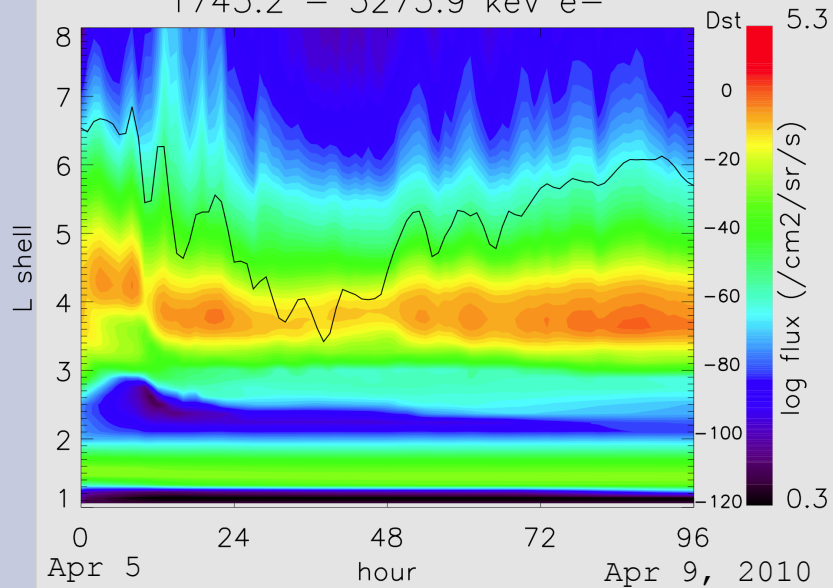
Radiation Belt Environment Model: The Output

Electron Flux (10 keV – 6 MeV)

800 keV electrons



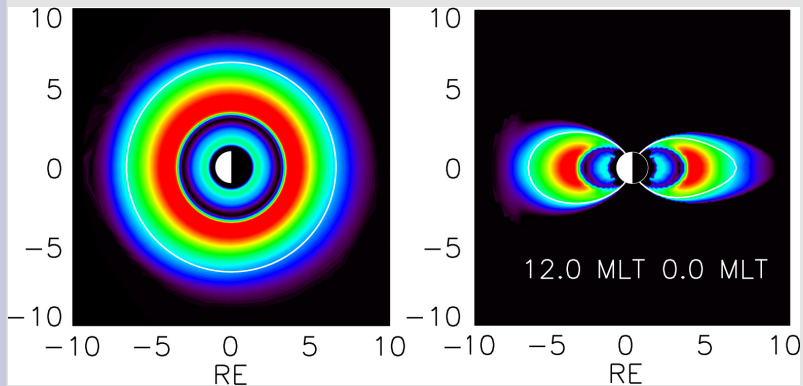
1745.2 – 5273.9 keV e⁻



Radiation Belt Environment Model: The Output

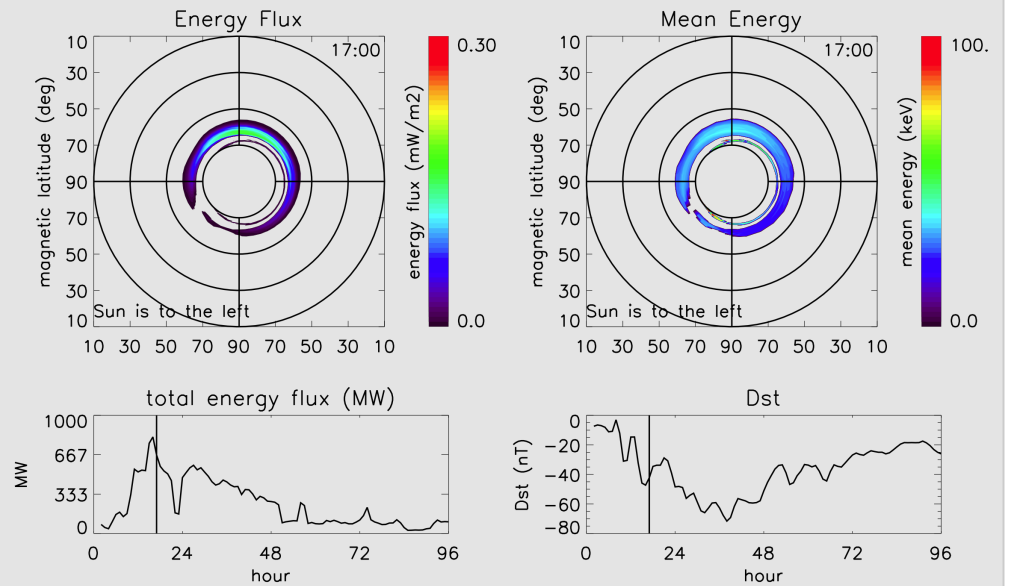
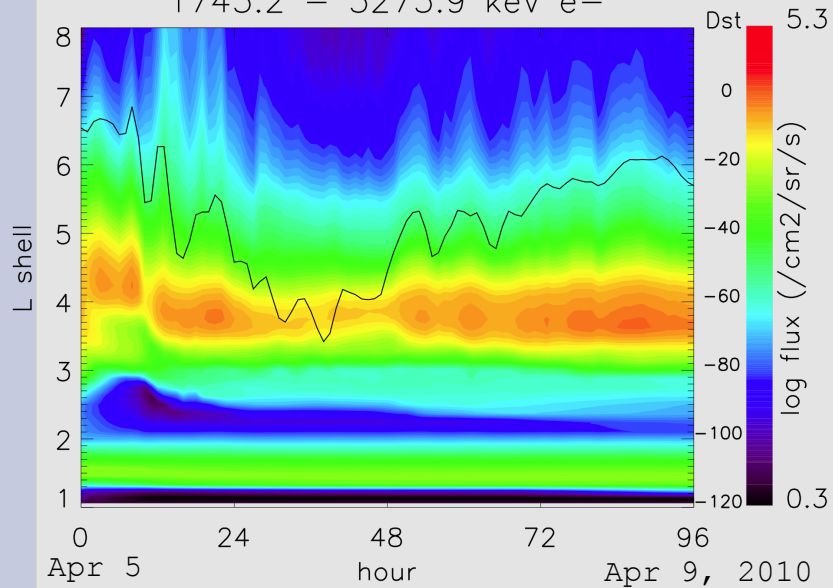
Electron Flux (10 keV – 6 MeV)

800 keV electrons

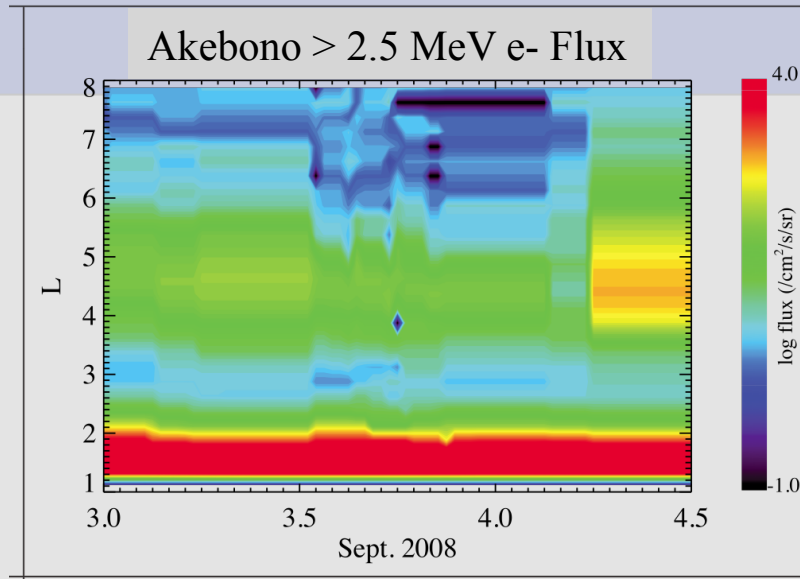


Electron Precipitating Flux

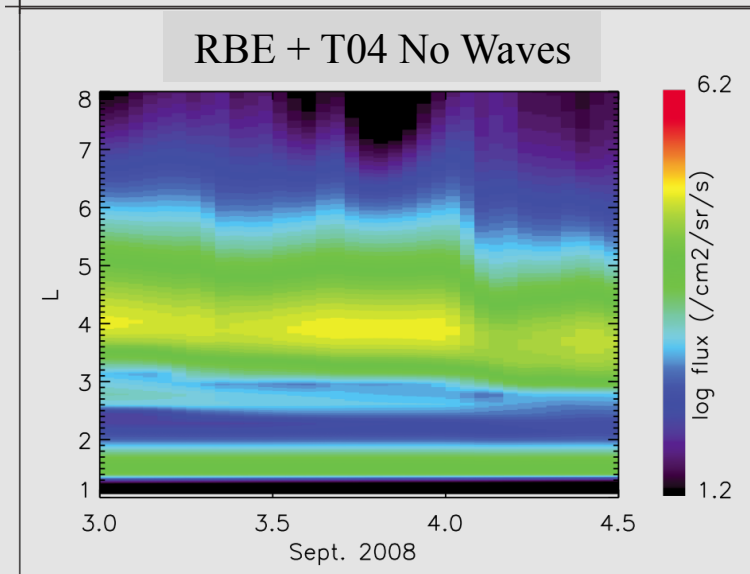
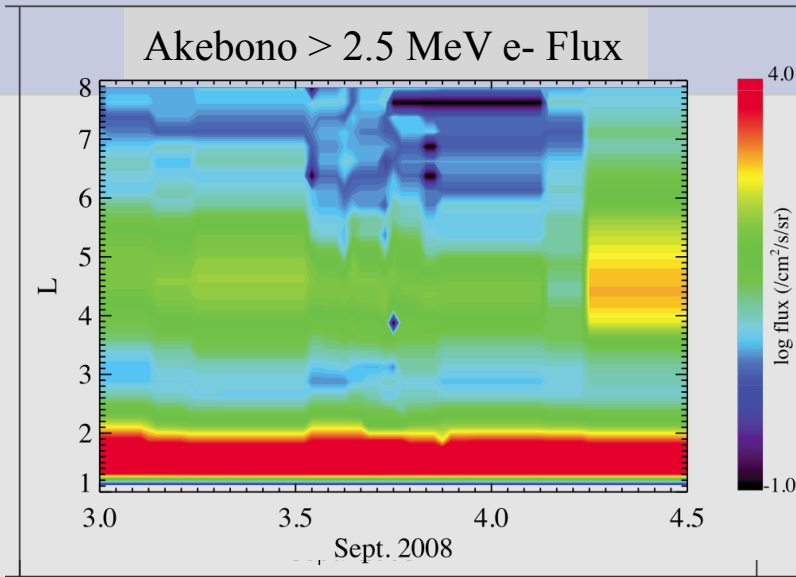
1745.2 – 5273.9 keV e⁻



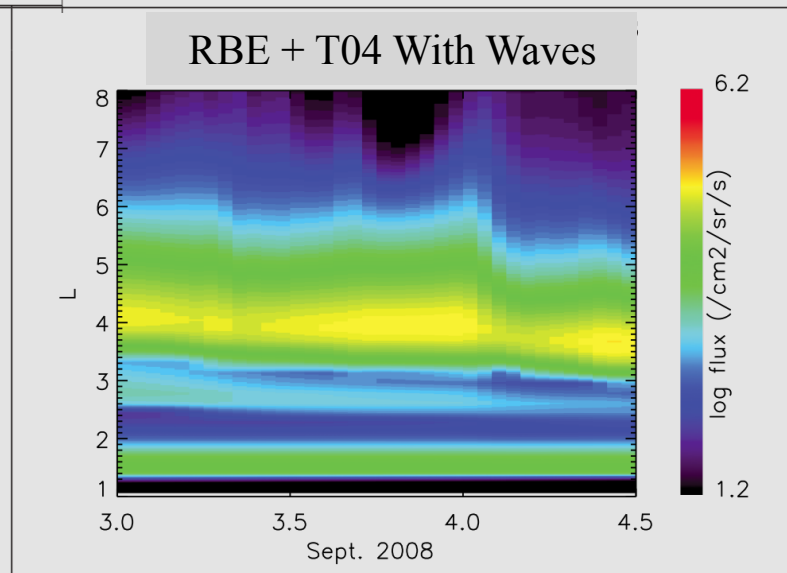
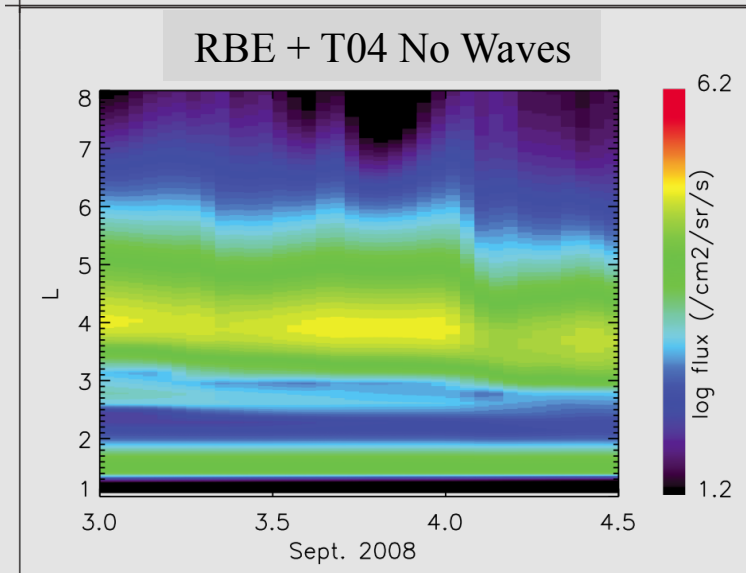
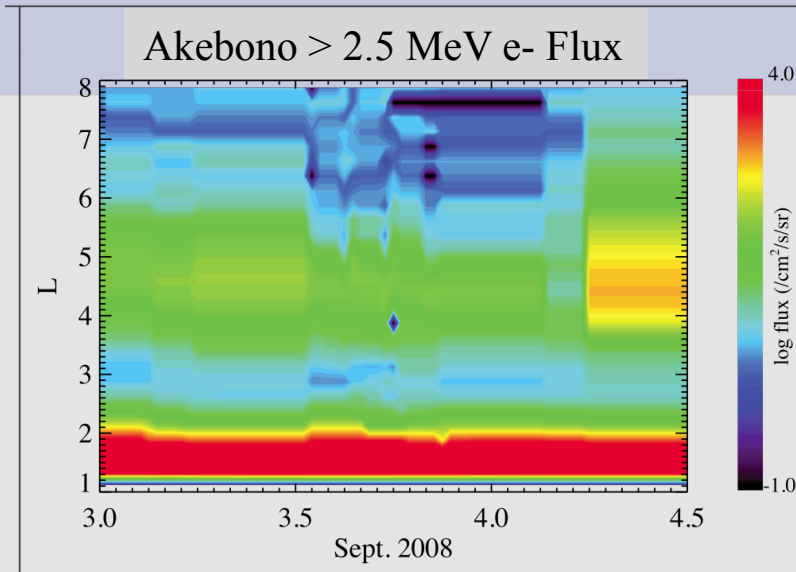
RBE with Tsyganenko and BATSRUS+RCM Model



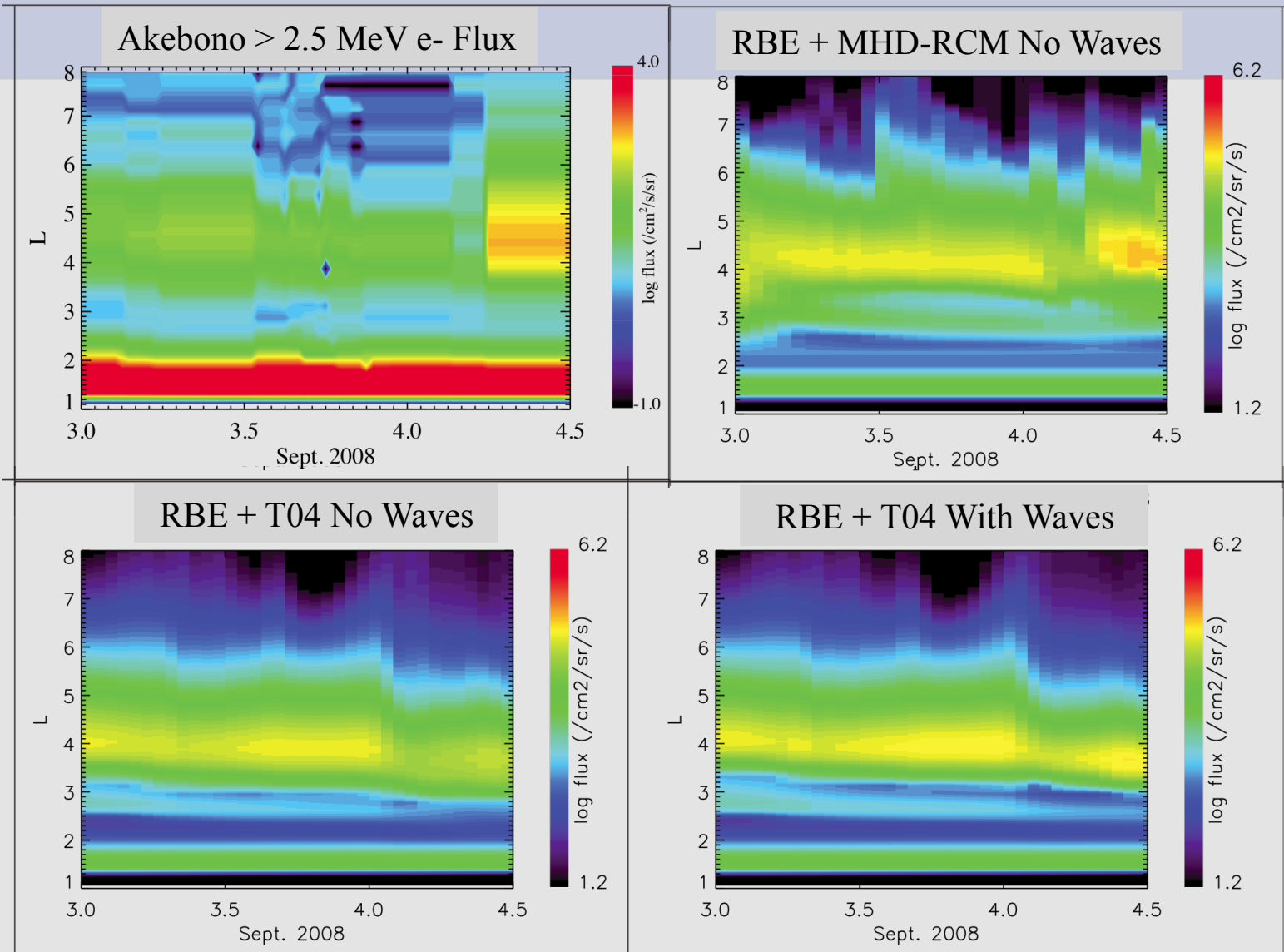
RBE with Tsyganenko and BATSRUS+RCM Model



RBE with Tsyganenko and BATSRUS+RCM Model



RBE with Tsyganenko and BATSRUS+RCM Model



INTEGRATED SPACE WEATHER ANALYSIS SYSTEM



[Click Here To Access The iSWA System Web Application](#)



About iSWA

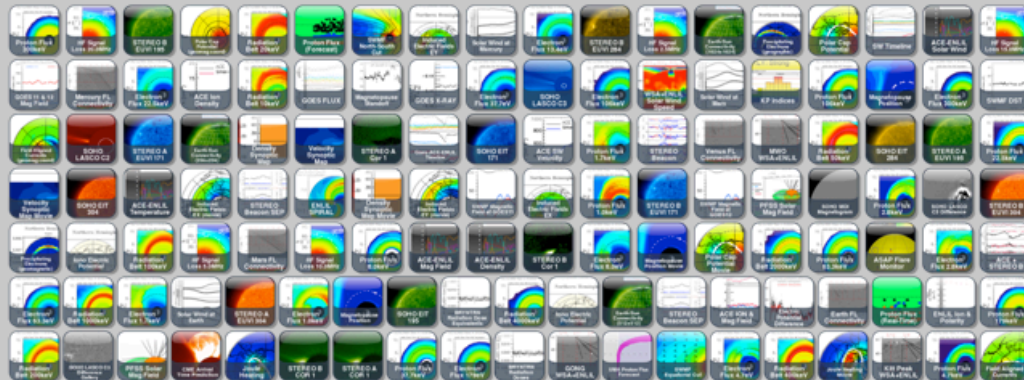
iSWA is a flexible, turn-key, Web-based dissemination system for NASA-relevant space weather information that combines forecasts based on the most advanced space weather models with concurrent space environment information. iSWA is customer-configurable and adaptable for use as a powerful decision-making tool. The system offers an unprecedented ability to analyze the present and expected future space weather impacts on NASA's human and robotic missions.

Mobile Applications

The NASA Space Weather App powered by iSWA is available for IOS devices from the iTunes App Store



The iSWA cygnet catalog includes a wide array of space weather analysis products. Simply select the cygnets of interest to create your own custom layout. Once you've created a layout or two that meets your needs, you can save and share it with a link like this: [Sample Layout](#)



RBE Running in Real-Time at ISWA

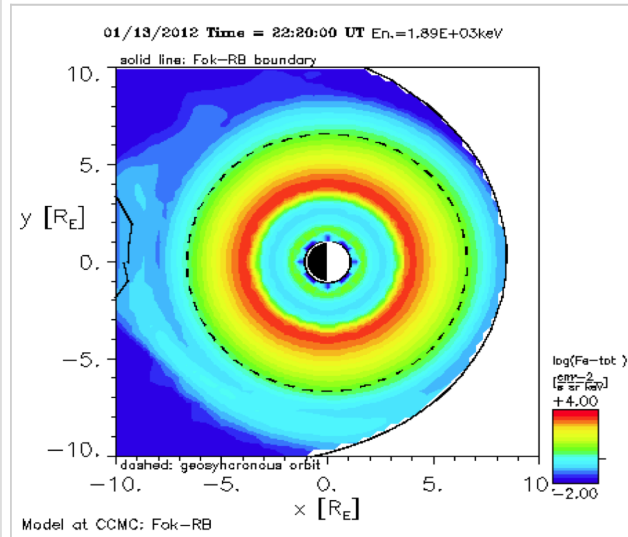
(<http://iswa.gsfc.nasa.gov/iswa/iSWA.html>)

Available Cygnets

Solar Heliosphere Magnetosphere Ionosphere Planetary/Spacecraft All Cygnets New Cygnets Events ALERTS bETA

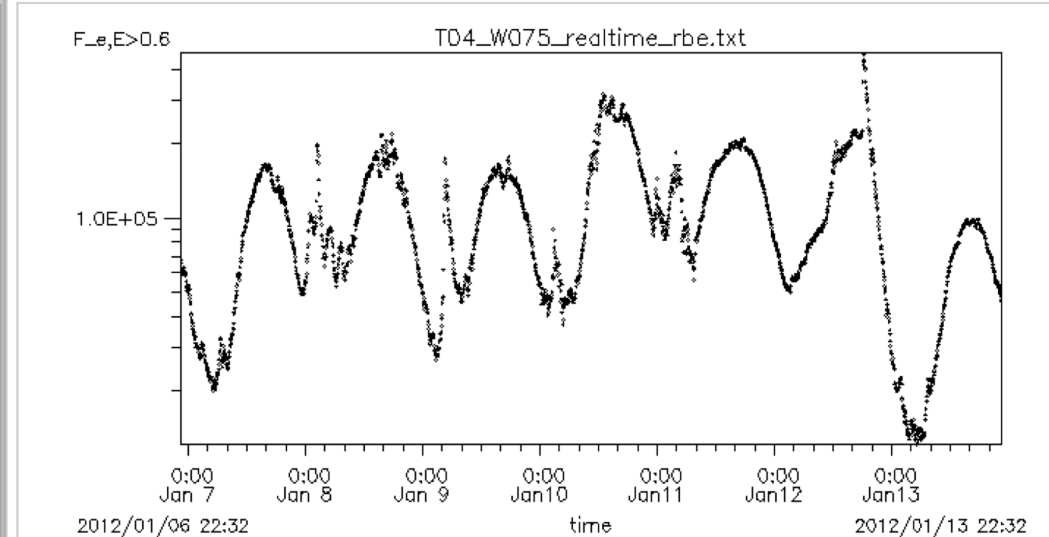
1 2 3 4 5 6 7 8 9 10 11-12

Fok Radiation Belt electrons at 2 MeV



2012-01-13 22:20:00.0

Fok Radiation Belt - fluxes (> .6 Mev) @ GEO W75 lon



2012-01-13 22:32:00.0

Future Works and Challenges

- ❖ Make CRCM and RBE available for “Runs on Request”:
 - CRCM-MHD one-way coupling

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Currently only the Fok Ring Current is available for Runs On Request (FokRC with GM models: BATSRUS, OpenGGCM, GUMICS, LFM)

Inner Magnetosphere:			
Fok Ring Current	Mei-Ching H. Fok	NASA, GSFC	Physics-based
AE-8/AP-8 RADBELT	Contact Person: D. Bilitza, NASA/GSFC	NSSDC, GSFC, NASA	Statistical

The interface of FokRC-MHD is the same as CRCM-MHD.

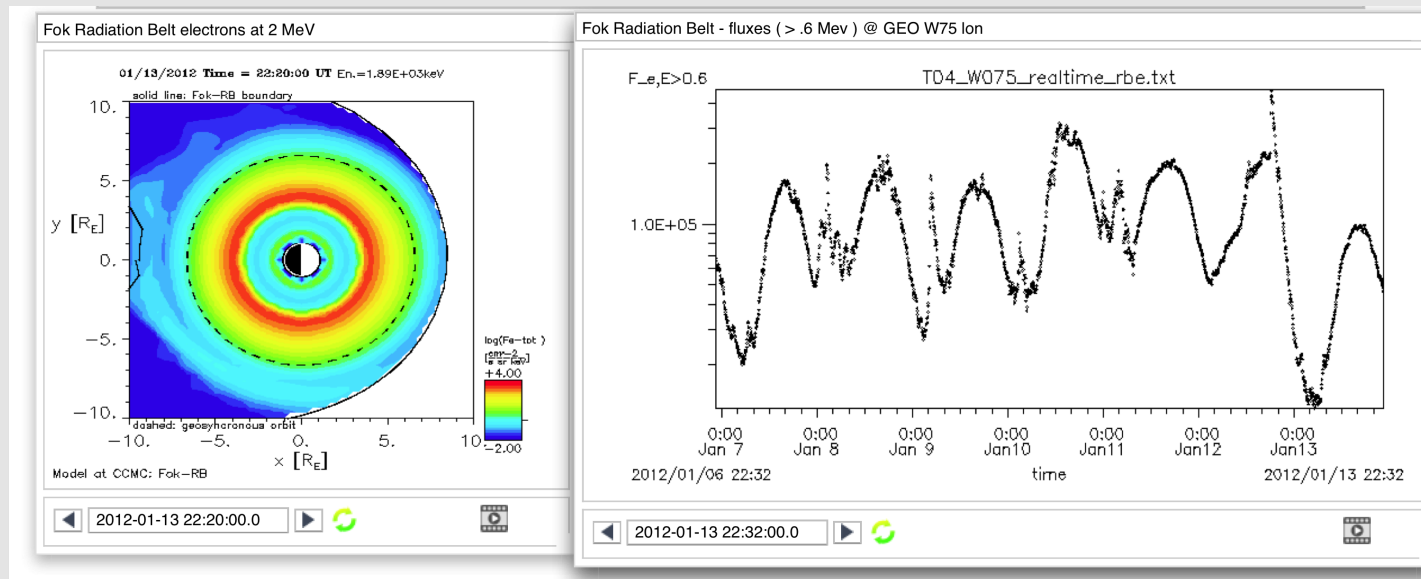
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RBE-T04 is running in real-time at iSWA!



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- ❖ CRCM-MHD 2-way Coupling + RBE

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