

---

# Magnetosphere to Ring Current-Radiation Belt and Back

Mei-Ching Fok and Ayrís A. Falasca  
NASA Goddard Space Flight Center

Space Environment Modeling Workshop  
Raytheon Landover Facility, Maryland  
May 9, 2002

# Magnetosphere to Ring Current-Radiation Belt and Back

---

- Ring current-radiation belt model (inner magnetosphere)
- Inner magnetosphere (IM) model inside MHD model
  - MHD parameters inputs to the IM model
- Event simulations using the IM-in-MHD model
  - July 15, 2000 storm
- IM to MHD?
  - What parameters to be passed from IM to MHD?
- Plans....

# What Drives Ring Current and Radiation-Belt Models

---

- Magnetic field model
- Convection electric field model
- Particle distribution at model boundary
- Radial diffusion model
- Model of hydrogen geocorona for calculating charge exchange loss
- Models of wave-particle interactions

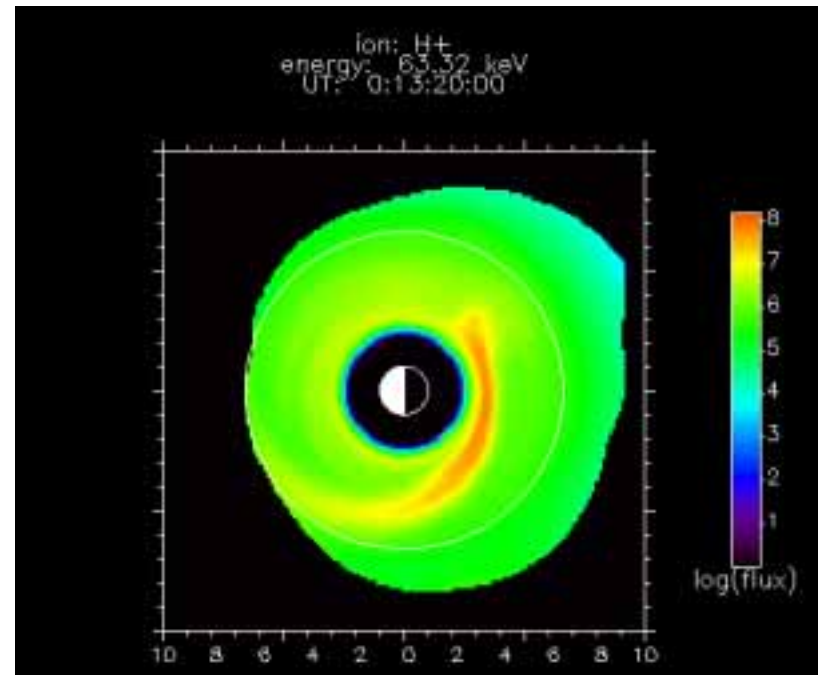
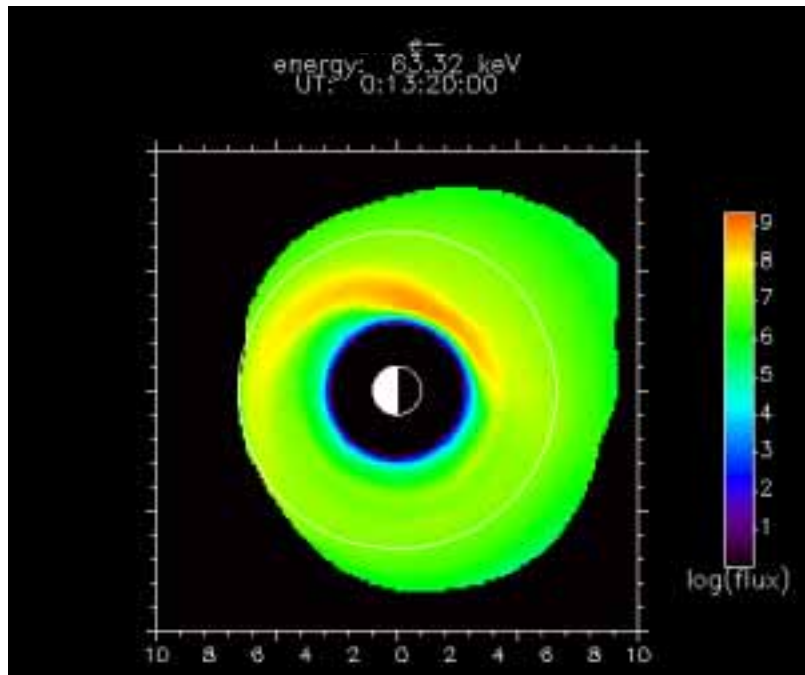
# CCMC Ring Current Model

---

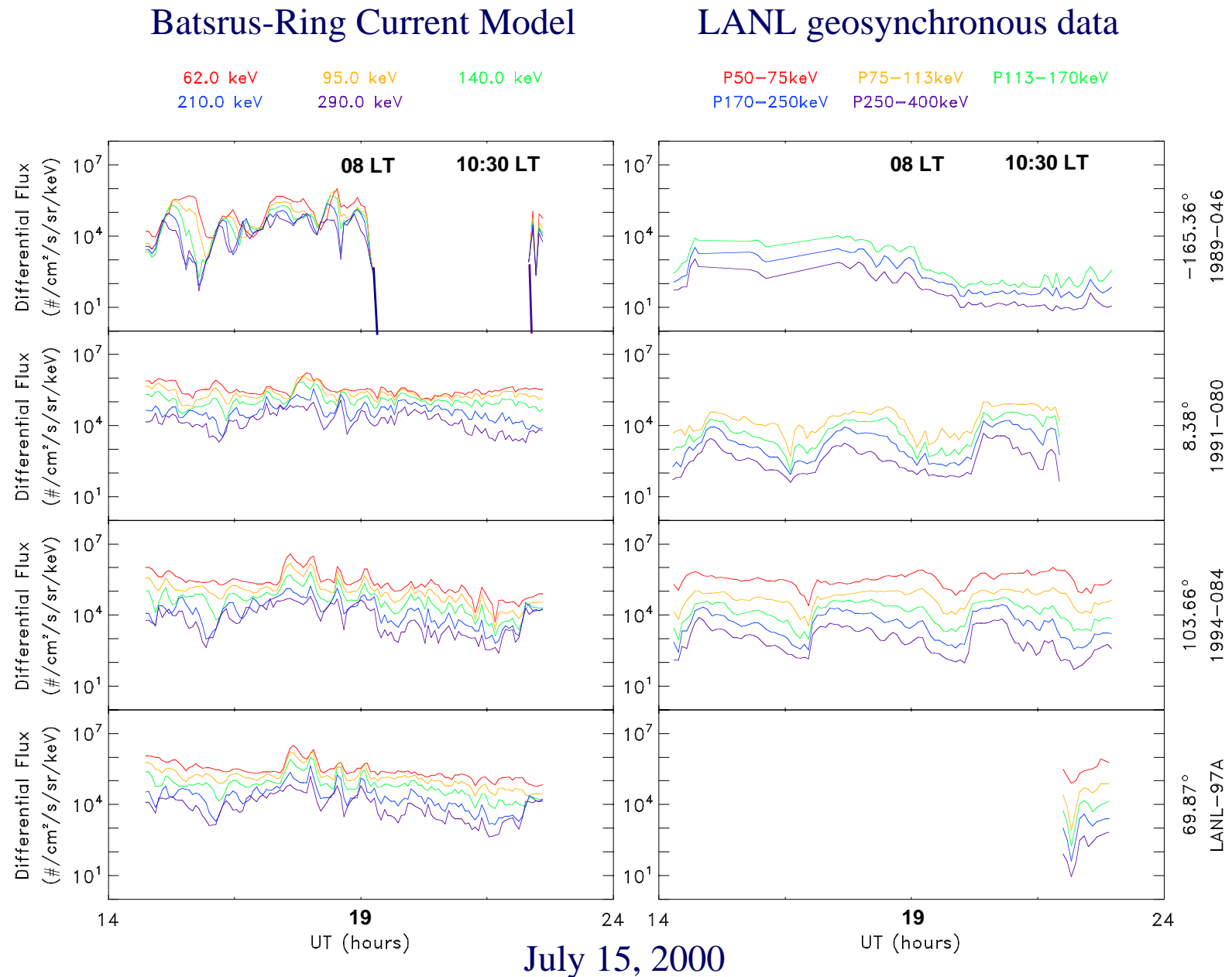
- Inner magnetosphere model ( $2 < r < 10$  RE)
- Model solves bounce-averaged kinetic equations of ion and electron distributions.
- Model considers drifts in MHD fields and losses along drift paths.
- Model boundary is fed by MHD density and temperature.
- Model outputs ion and electron fluxes in 3-D spatial space (SM) and 2-D velocity space (pitch angle and energy).

# Sample Output from CCMC Ring Current-Radiation Belt Model

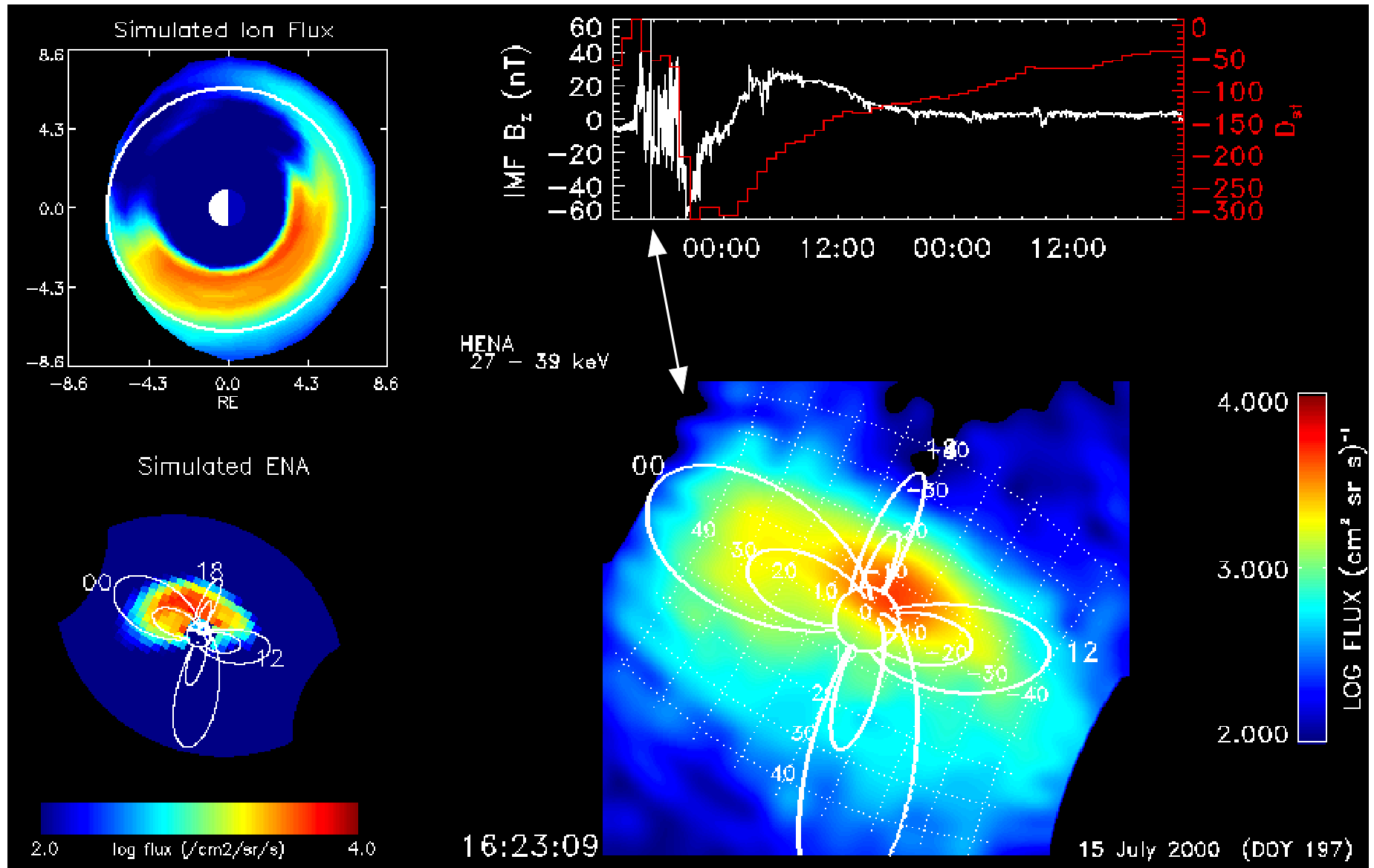
Electron and Ion differential fluxes at the equator on March 31, 2001



# Data-Model Comparison: LANL vs Batsrus-Ring Current Model

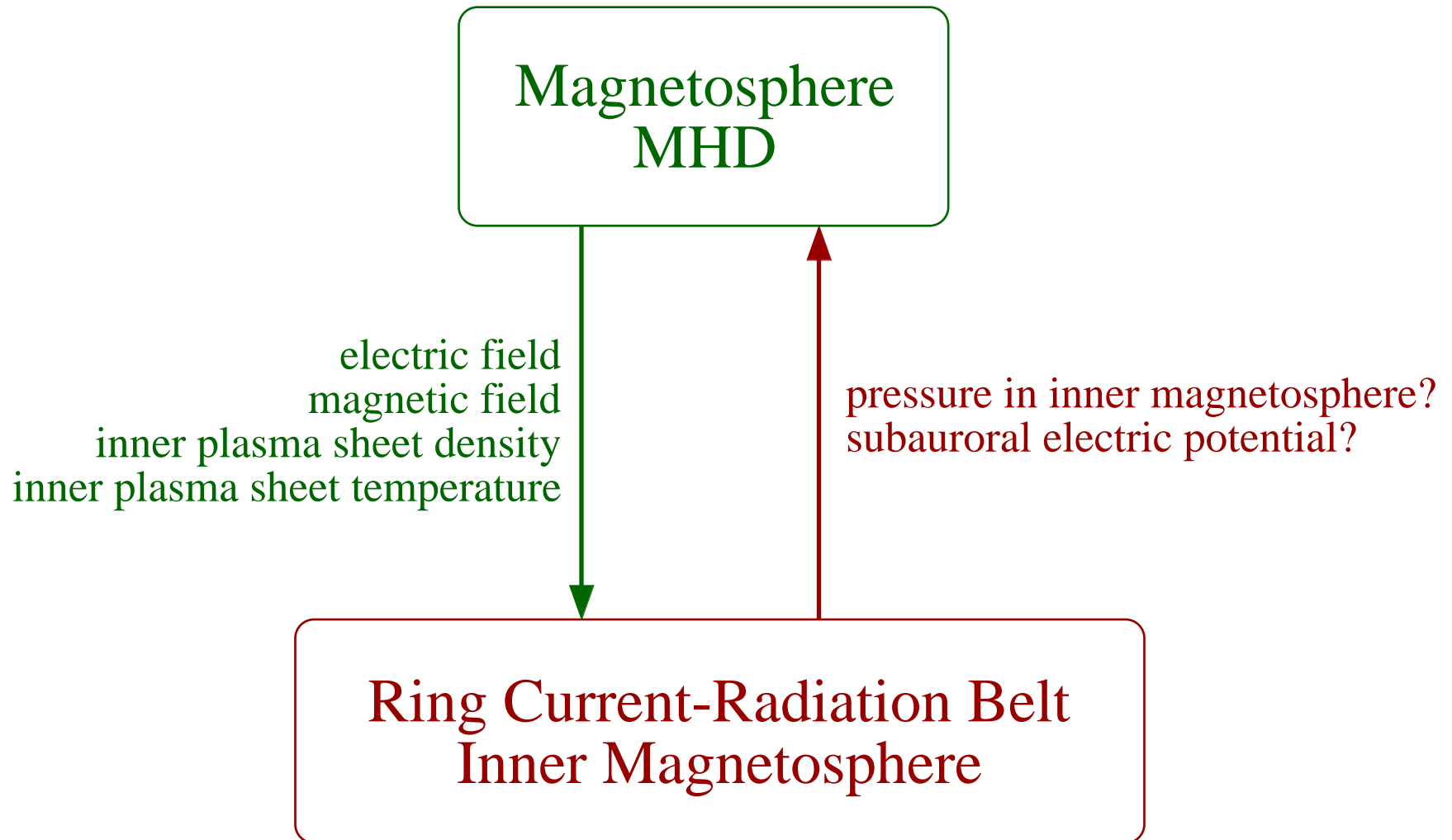


# Data-Model Comparison: HENA vs Batsrus-Ring Current Model



# Ring Current-Radiation Belt to Magnetosphere?

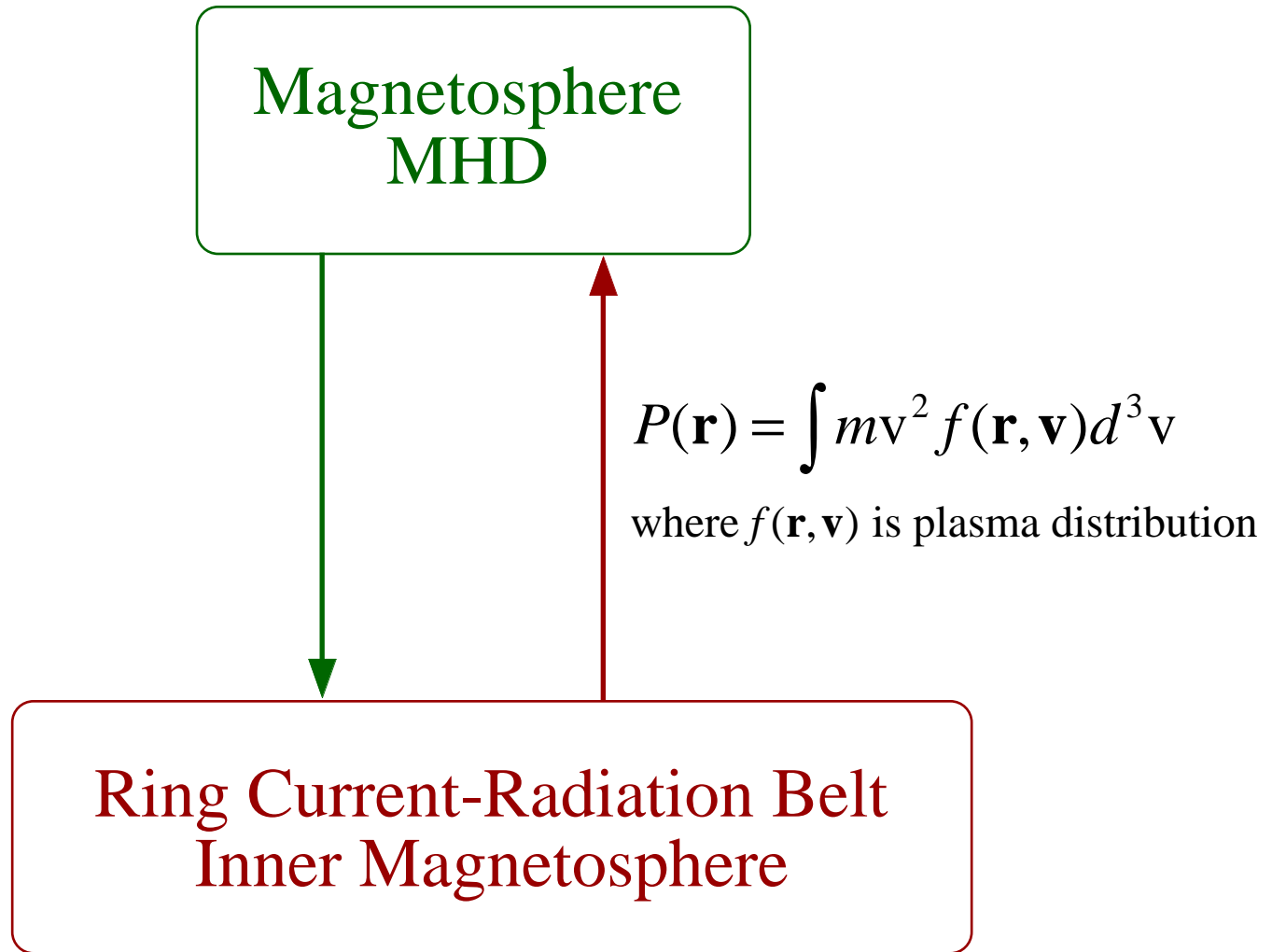
---



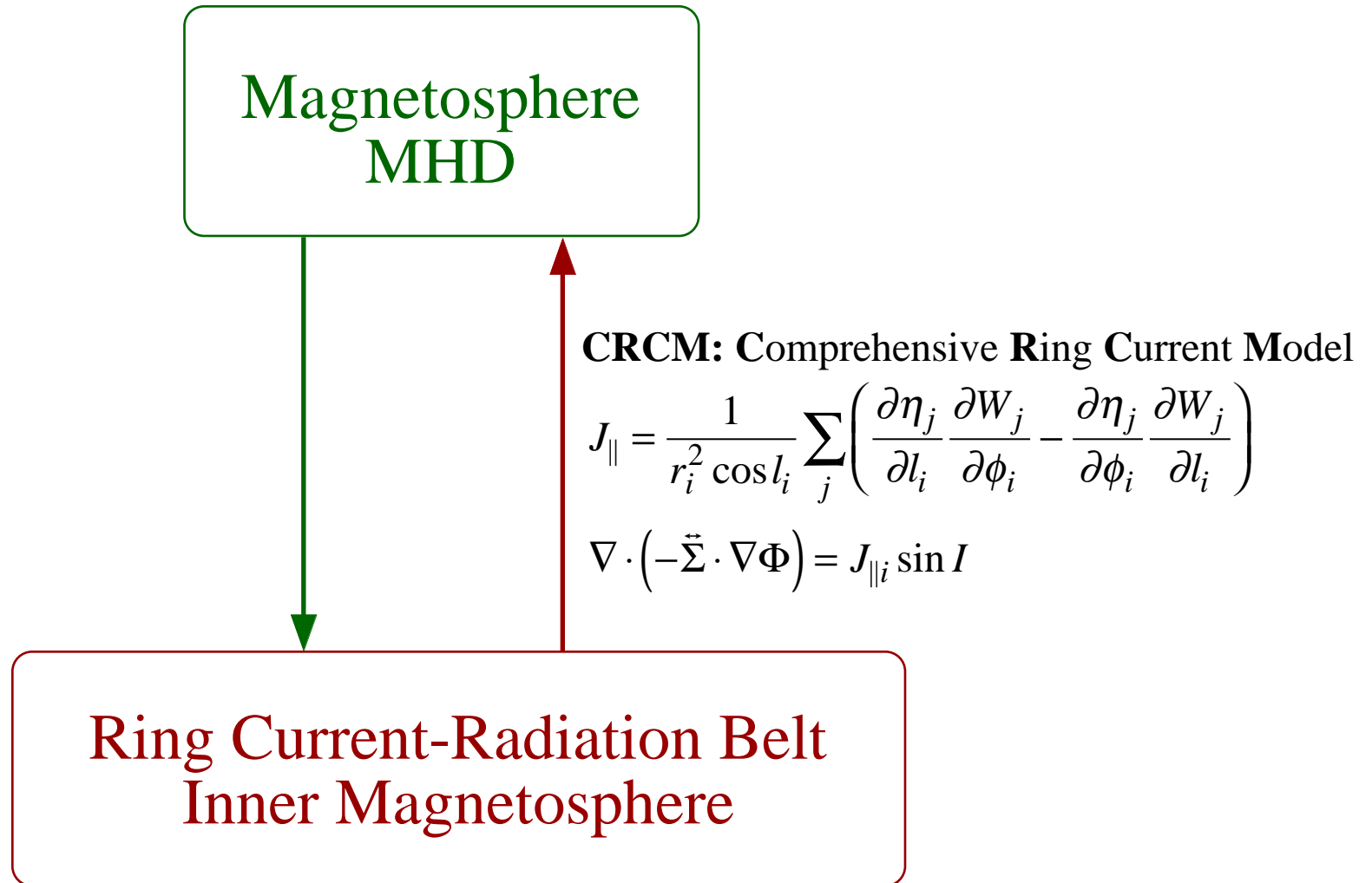


# IM to MHD: Plasma Pressure at MHD inner Boundary

---



# IM to MHD: Ionospheric Potential at MHD Equatorward Boundary



## Future Plans

---

- Continue to perform event studies using the MHD-driven ring current-radiation belt model
- Run CRCM inside MHD models
- Try inner-magnetosphere feedback to MHD
  - pressure at MHD inner boundary
  - ionospheric potential at MHD equatorward boundary
  - 
  -
-