Assessment of the RAM-CPL coupled plasmaspheric density model

Using Recent Observations from the Van Allen Probes

January 15 - 20, 2013 (max Kp = 4)
May 31 - June 5, 2013 (max Kp = 7)

(RBSP A)
Describing Convection Electric Fields

\[ \phi_{vs}(t) = -A(t)r^2 \sin \phi \]

\[ \phi_s(r, \varphi, t) = -F(r, \varphi)G(\varphi)V(t) \]
Comparing against EFW Measurements
Comparing against EFW Measurements

![Graph showing Volland-Stern Potential with EFW measurement and Model calculation lines.](image-url)
Refilling an Initial Plasmasphere

\[ \frac{\partial n}{\partial t} = \frac{(n_{\text{sat}} - n(t))}{\tau_{\text{fill}}} - \frac{n(t)}{\tau_{\text{loss}}} \]

Constant refilling rate

Assumed saturation density

Quiet Time (Kp= 1, 2), Filled Plasmasphere

- Model Plasmapause
- O’Brien Plasmapause
Simulating Erosion & Refilling with RAM-CPL

- MSIS86
- IRI87

Refilling Rates from Ionospheric Fluxes

- Initial Plasmasphere
- Convection Electric Field

RAM-CPL Plasmasphere Model

- Carpenter/Anderson Saturated Equatorial Density

Time-dependent Equatorial Density

Continuity Equation
Comparing against EMFISIS Extraction

Volland-Stern Potential

Electron Density, cc

EMFISIS determination
Model simulation

Kp Index

yaxis units changed from "cm²" to "cm² s⁻¹"
Determining Plasmapause Encounters

Plasmapause Encounters (Volland-Stern Potential)

Mean model error: .48 $R_E$
Number of undetected actual crossings: 4
Determining Plasmapause Encounters

Mean model error: \(0.71 \text{ R}_E\)
Number of undetected actual crossings: 1
Determining Plasmapause Encounters

\[ L_{pp} = 5.6 - 0.39K_{p_{\text{max}}} \] (within preceding 36 hrs)
Questions Open to Discussion

- Investigating new convection electric field models:
  - What is the response of the system to specific drivers?
- Estimating the plasmaspheric refilling rate:
  - Can this be improved with recent observations?
- Defining the plasmapause boundary:
  - As a threshold density?
  - As a steep gradient?