Assimilation of COSMIC DATA into GAIM-Physics-Based Data Assimilation Model (GAIM-FP)

IT climatology at low and mid-latitudes during solar minimum

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USU Physics-Based Data Assimilation Models

1. Kalman Filter Models of the Ionosphere
   - Gauss-Markov Model (GAIM-GM)
   - Full Physics Model (GAIM-FP)

2. Ensemble Kalman Filter Model of High-Latitude Electrodynamics & Ionosphere

3. Ensemble Kalman Filter Model of the Thermosphere
Typically the model is used to determine ionospheric weather.

**New Mode:**

Model is used to establish the Multi-day mean electron density distribution as well as the self-consistent ionospheric drivers.

a) Simultaneously Assimilate Multi-Days Worth of Data

b) Assimilate Empirical Maps (NmF2, hmF2, …)
Assimilate Empirical Maps (NmF2, hmF2, …)

- ~190,000 COSMIC electron density profiles
- Half-hourly maps of peak density (NmF2) and peak height (hmF2)
- Grid size: 1.25° X 7.5° (Latitude x Longitude)
- Period: Nov, 2008 – Feb, 2009
Assimilate Empirical Maps (NmF2, hmF2, ...)

COSMIC Dec Sol. 2008/09 14:30 UT

Longitude

Latitude

NmF2

hmF2

Longitude

Latitude

Utah State University
Mean NmF2 for December Solstice 2008/09

COSMIC

GAIM
NmF2/hmF2 at fixed local time

NmF2

GAIM FP

COSMIC

IPM
Mean NmF2 for December Solstice 2008/09

Weddell Sea Anomaly
NmF2 and hmF2 over Weddell See Anomaly

**COSMIC**

**GAIM-FP**

**IPM**
Meridional F-Region Wind over Weddell See Anomaly
Magnetic Meridional F-Region Wind for December Solstice 2008/09
Equatorial Nighttime Plasma Densities @ 440km

December Solstice

C/NOFS

COSMIC

GAIM-FP

IPM

June Solstice
Equatorial Vertical Drifts for December Solstice 2008/09

Scherliess & Fejer

GAIM-FP