

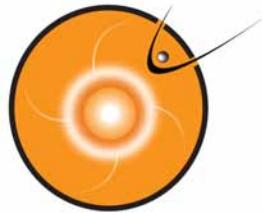
# Space Weather Products at the Community Coordinated Modeling Center

*M Hesse, M. Kuznetsova, A. Pulkkinen,  
M. Maddox, L. Rastaetter, D. Berrios, and  
P. MacNeice*

**CCMC and SWL**

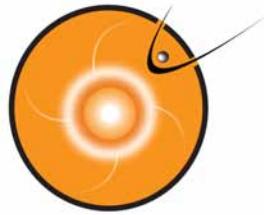
**NASA Goddard Space Flight Center**



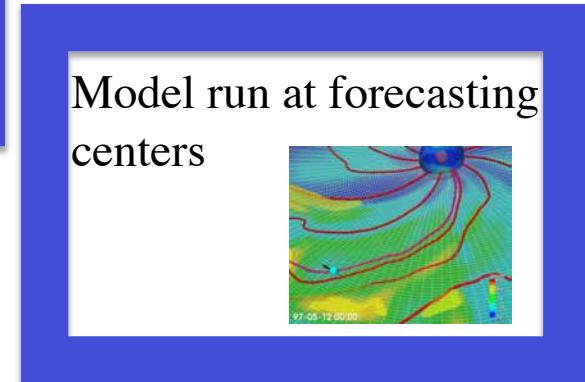
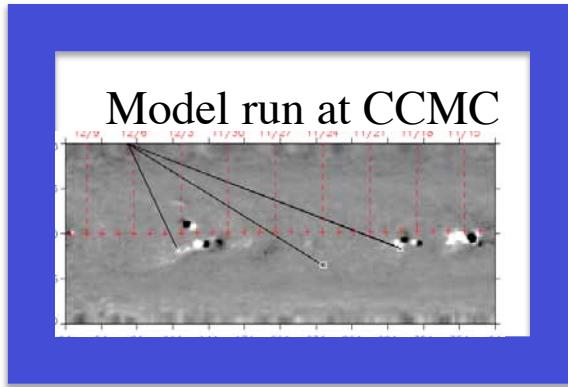


## Opportunities: Model Development

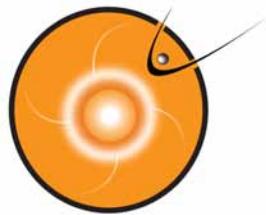
- Rapid model development schedule continually produces new capabilities
- Real-time calculations produce valuable space weather information
- SWx information and tools can be made available on-line
- New, innovative dissemination technologies, e.g., Google-Earth-based



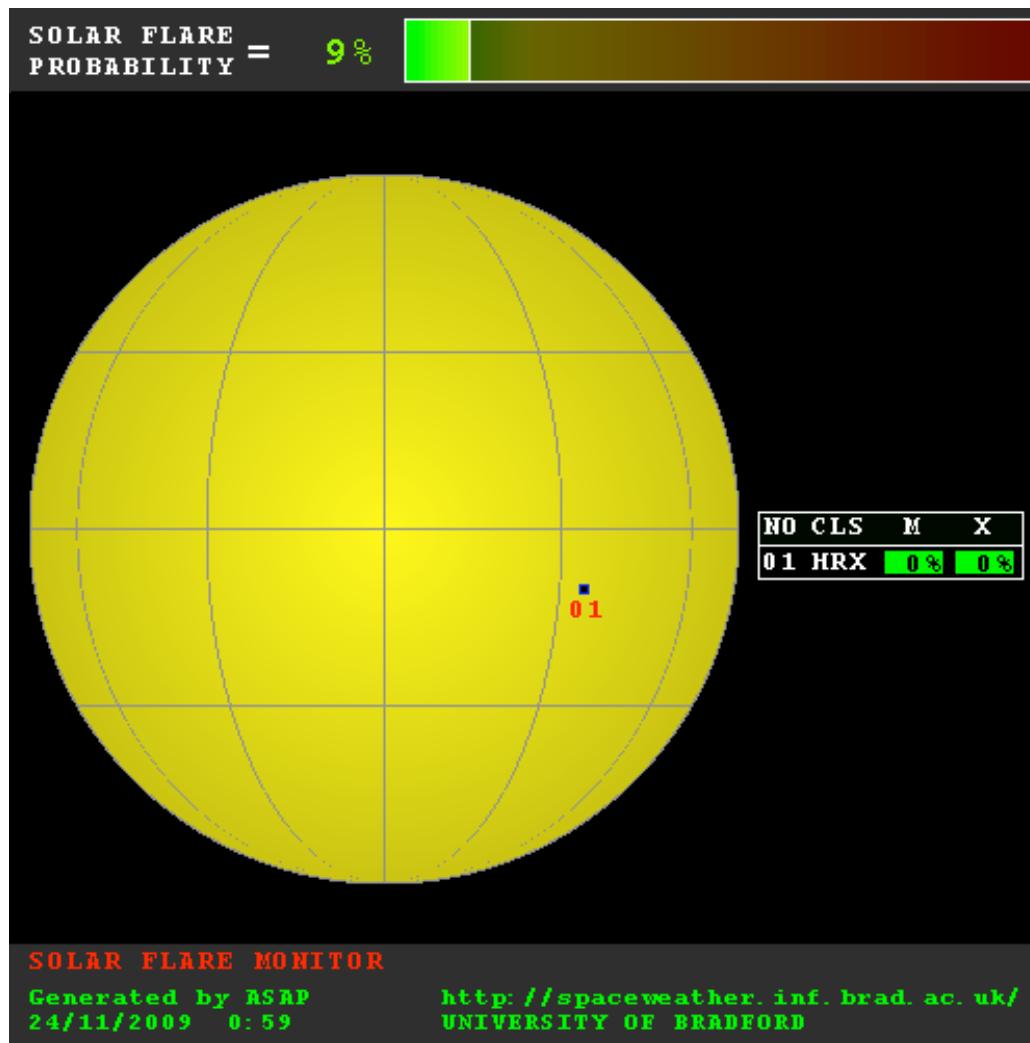
# Forecasting Agency Support

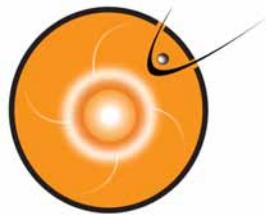


*folds tool development and operator education into process*

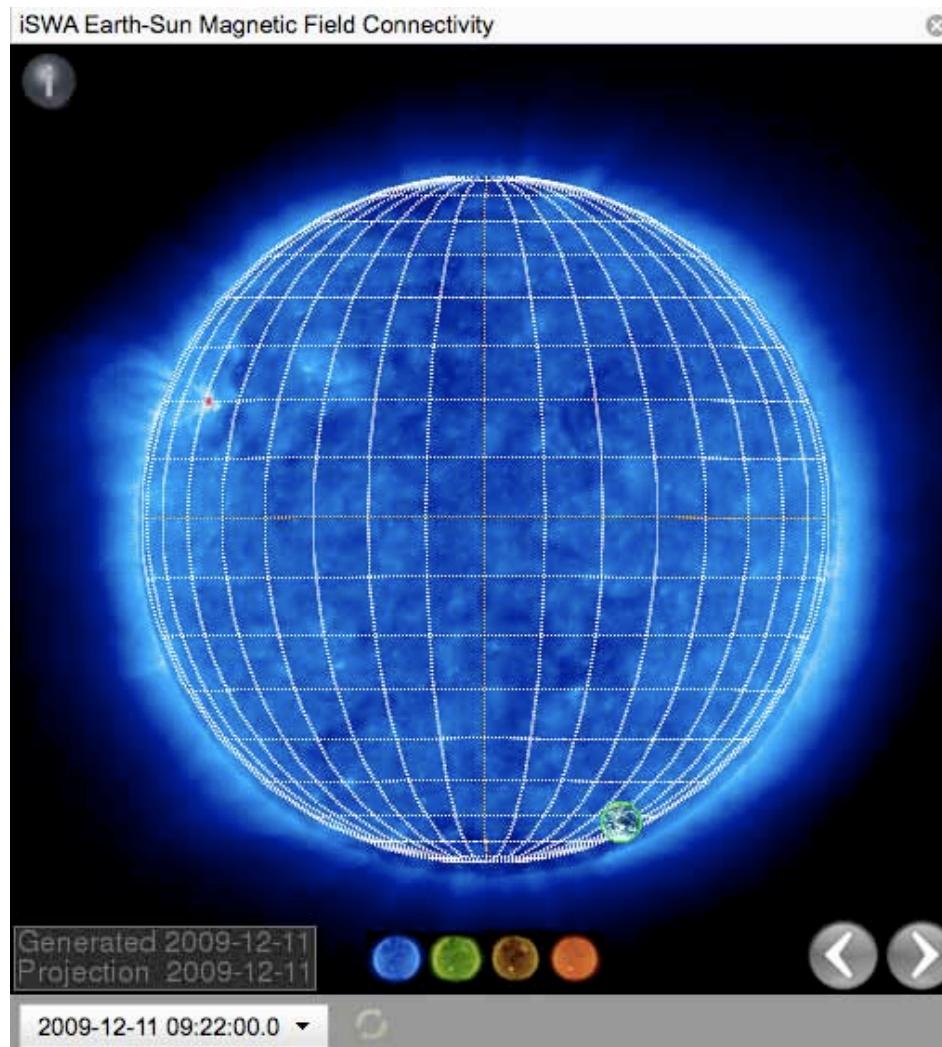


# Flare Monitoring Product (U. Bradford, UK)

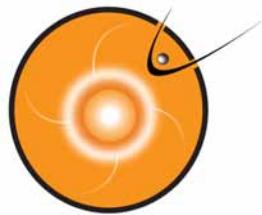




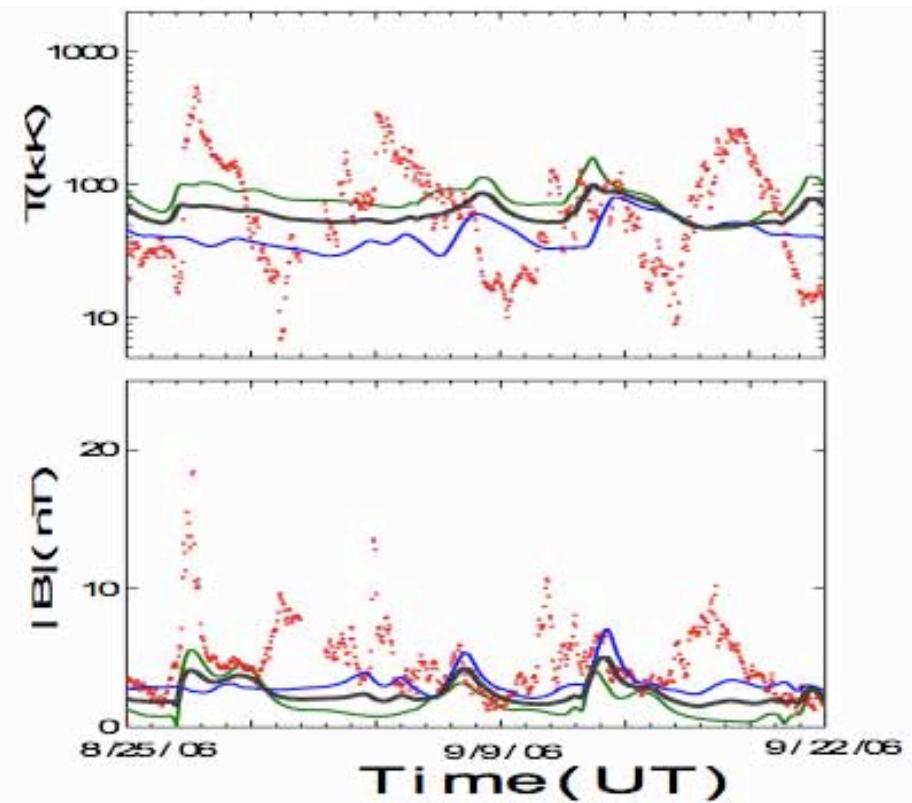
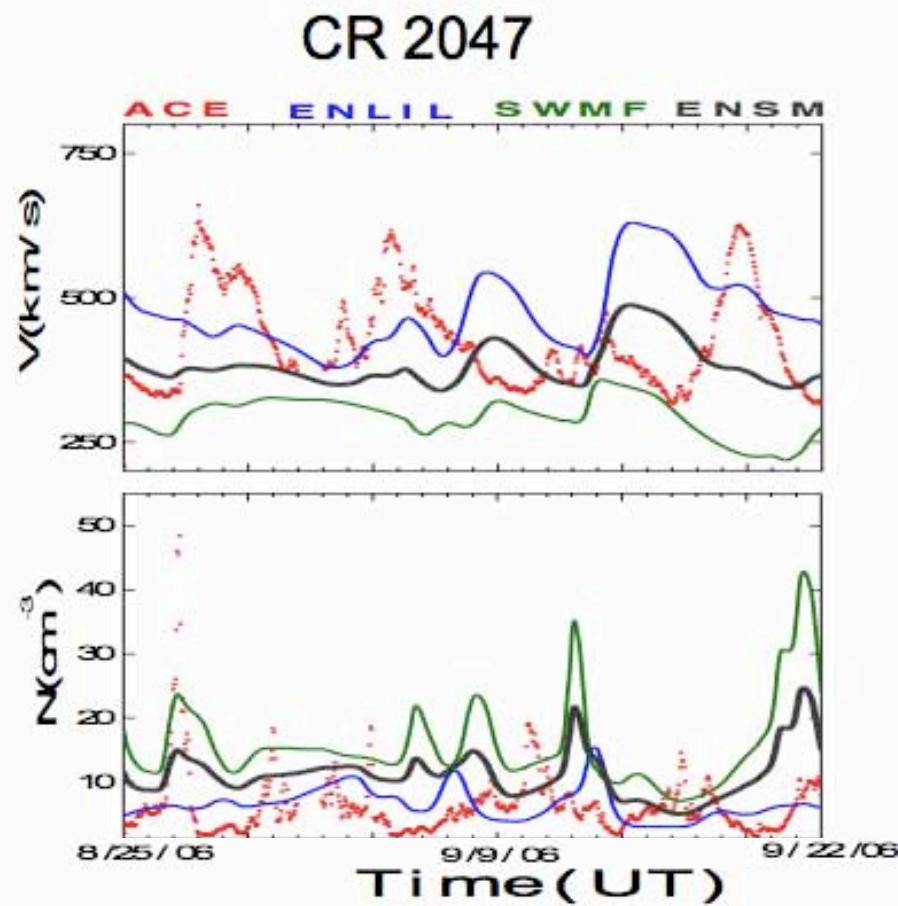
# Magnetic Connectivity Product



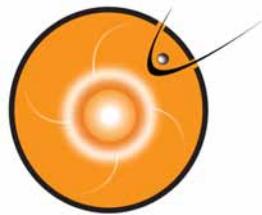
input from AFWA



## Example: Solar Wind Forecasts

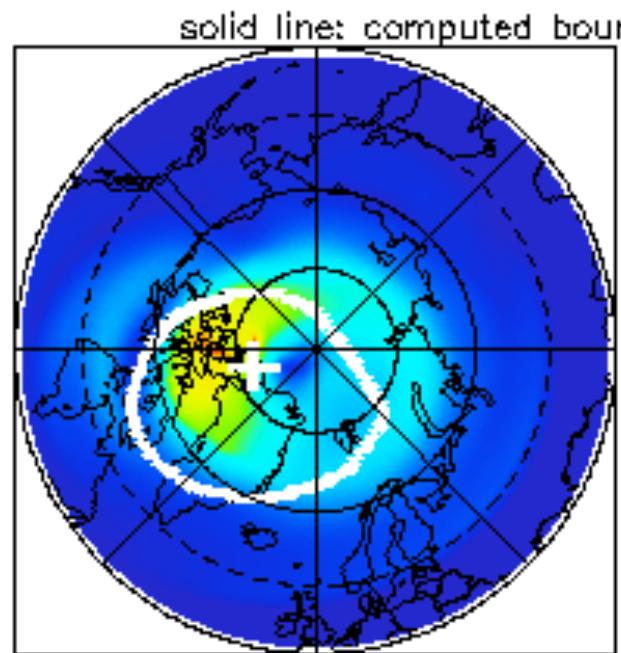


Model: WSA/ENLIL (CISM), SWMF (CSEM)



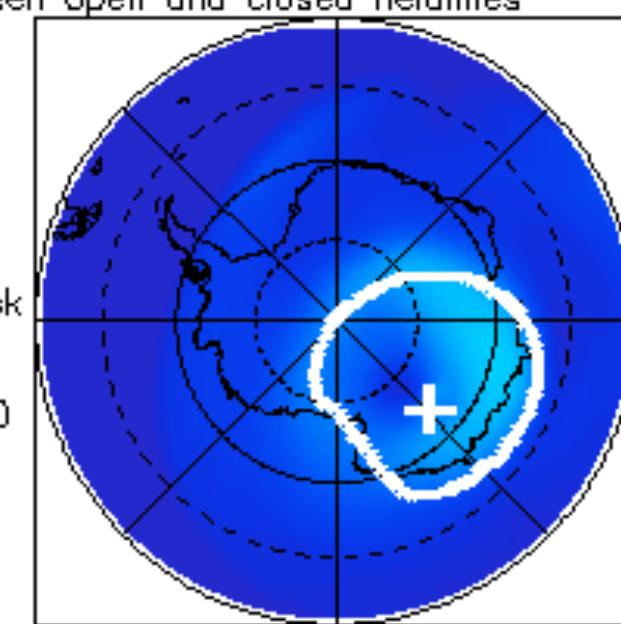
# New Product: Hemispheric Heating

**Northern Hemisphere**

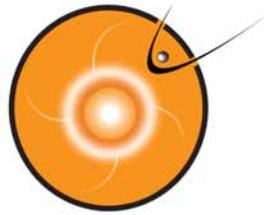


midnight  
Model at CCMC: BATSRUS

**Southern Hemisphere**

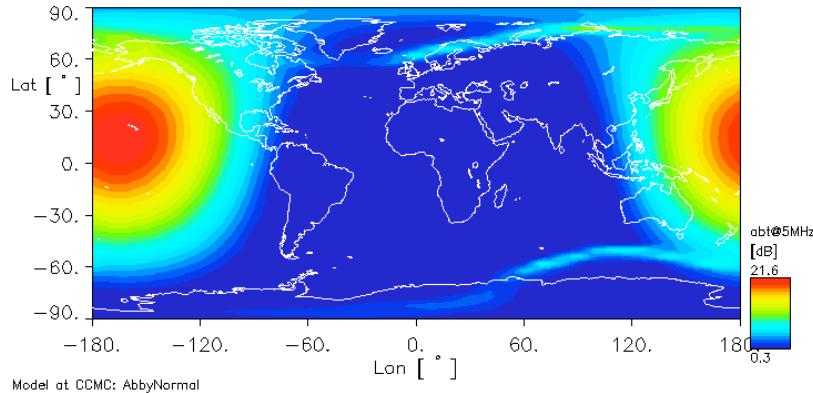


Wdiss [ $\frac{W}{m^2}$ ]  
79.3  
0.0

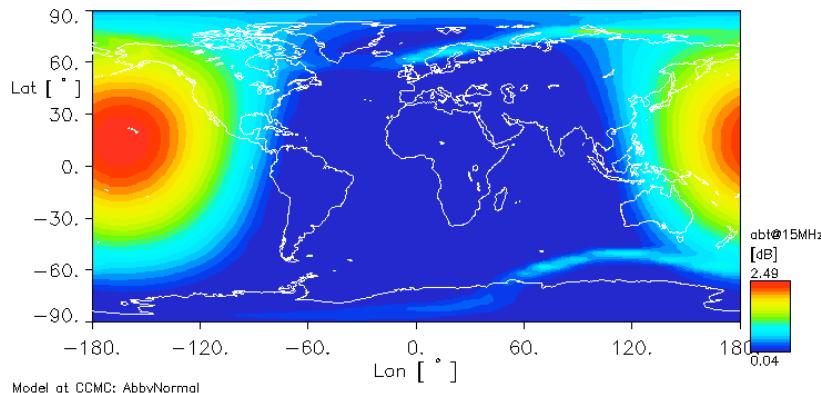


# ITM and Ground

04/27/2009 Time = 23:00:00 UT

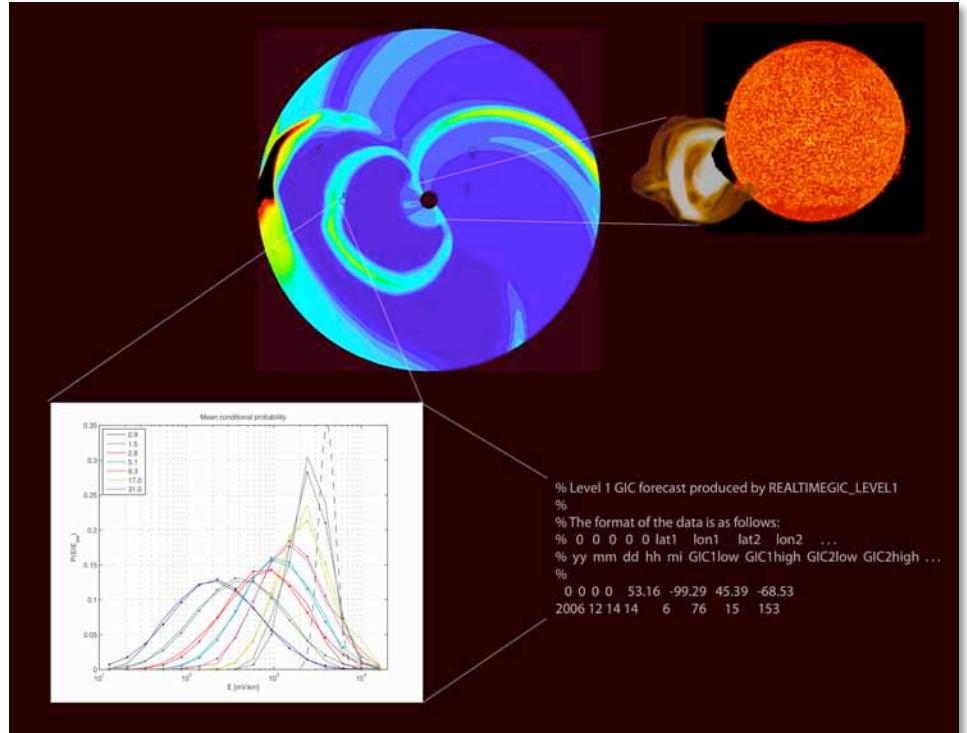


04/27/2009 Time = 22:55:00 UT



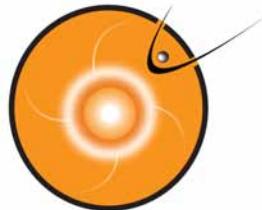
HF absorption:  
Executing in real-time

Model: AbbyNormal V. Eccles (USU)



GIC Warning:  
Electric power grid safety  
Updated every 4mins  
~45min forecast  
Different mode for CME events

Model: WSA/ENLIL, SWMF, A. Pulkkinen



# iSWA

iNtegrated Space Weather Analysis System (iSWA) : Version 1.0  
<http://iswa.gsfc.nasa.gov:8080/IswaSystemWebApp/>

Smart Bookmarks: Annapolis Weather, sp-to-nb, TMPL, SailFlow.com - MD ..., NWS - Radar, CCMC, NASA Watch, Flightview, Tide Finder, Annapolis Tide, Live Super Doppler ..., ISI Web of Knowledge, iSWA : demo 0.2

INTEGRATED SPACE WEATHER | Integrated Space Weather Anal...

Save Layout | Global Date/Time | Clear Layout

Available Cygnets

Solar | Heliosphere | Magnetosphere | Ionosphere | Planetary | All Cygnets | New Cygnets | ALERTS

ASAP Flare Monitor | SOHO EIT 171 | SOHO EIT 195 | SOHO EIT 284 | SOHO EIT 304 | SOHO LASCO C2

Ionospheric Joule Heating

Northern Hemisphere | Southern Hemisphere

Solar Flare Monitor

SOLAR FLARE PROBABILITY = 99% | 2009-12-04 21:52:00.0

Model at CCMC, BATSRUS

Wavelength 0.10–0.5nm  
0.05–0.4nm

Proton Energies

>1 MeV  
>5 MeV  
>10 MeV  
>20 MeV  
>50 MeV  
>100 MeV

Electron Energies

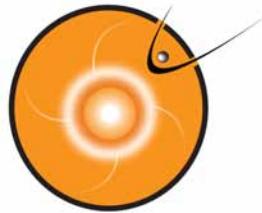
>0.6 MeV  
>2 MeV

ACE [ $\mu$ rn/s]

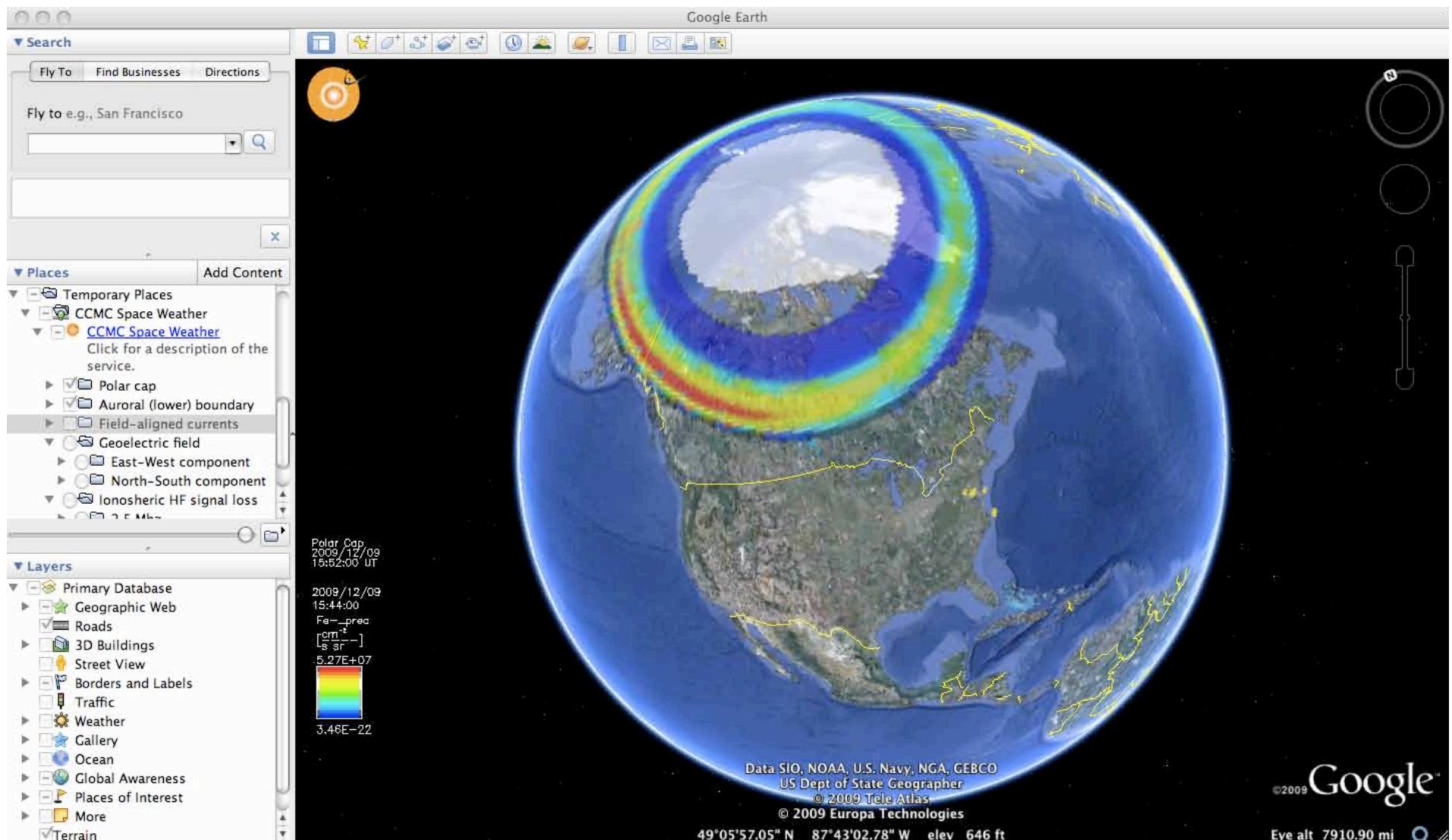
$B_x$   
 $B_y$   
 $B_z$

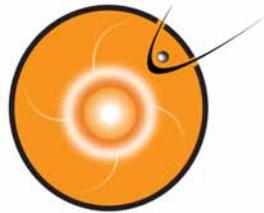
Done

iswa.gsfc.nasa.gov, >120 products!



# Innovative dissemination: Google Earth





# Summary

- CCMC developed a set of (>120) on-line SWx tools
- Tools have been refined through input from AFWA and NASA Mission Operators
- Providing SWx information for NASA's robotic mission operators, and working with NASA's SRAG
- CCMC established close working relation with AFWA
- CCMC providing transition to operation support to NOAA'S SWPC for the WSA/ENLIL (CISM) model combination
- CCMC is leading a geospace model evaluation effort for NOAA/SWPC
- CCMC supporting commercial SWx interests
  - Electric power research institute
  - Space Environment Technologies
- Looking forward to new opportunities for collaborations, including internationally