Space Weather Models running in real-time or forecasting mode

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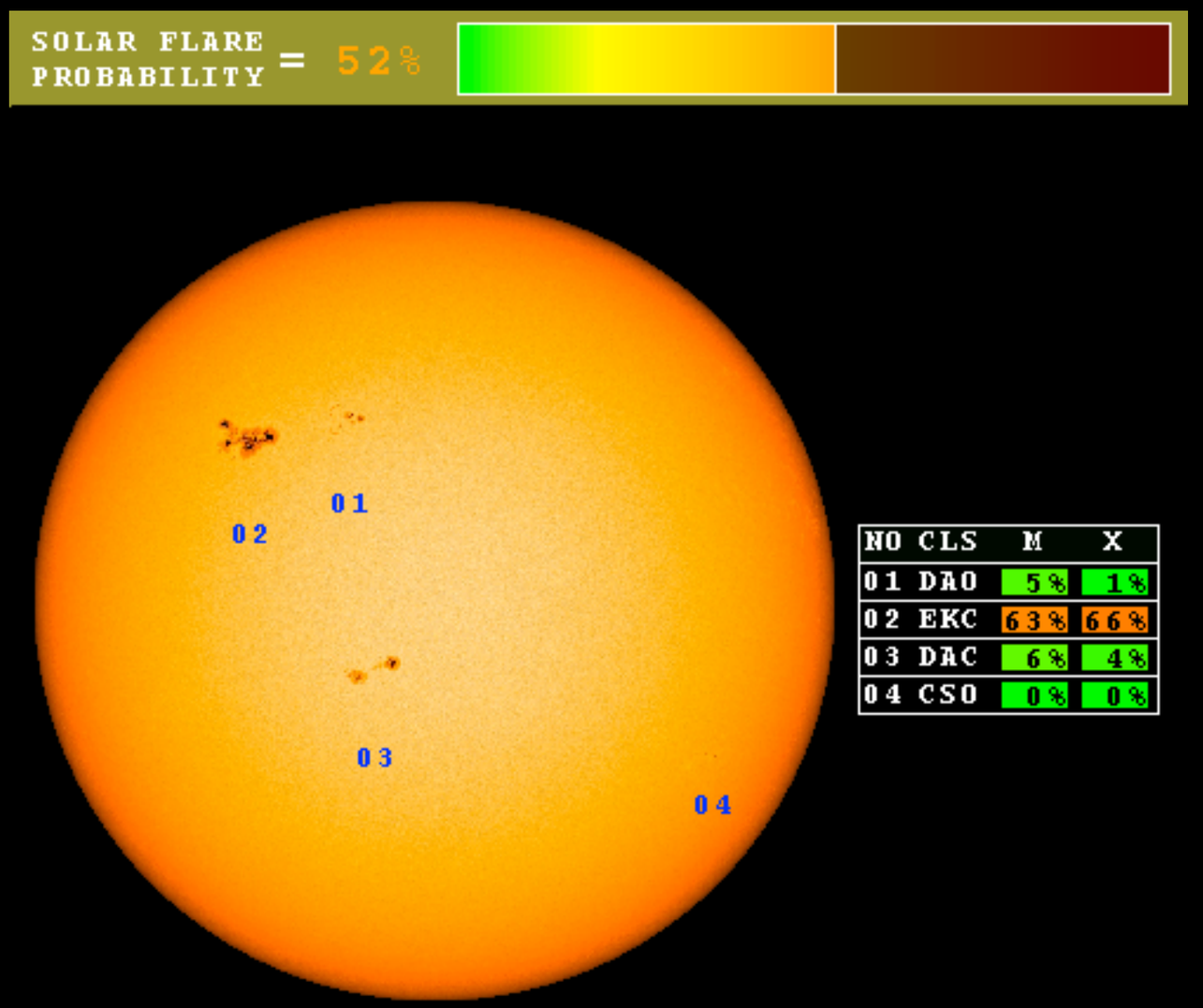
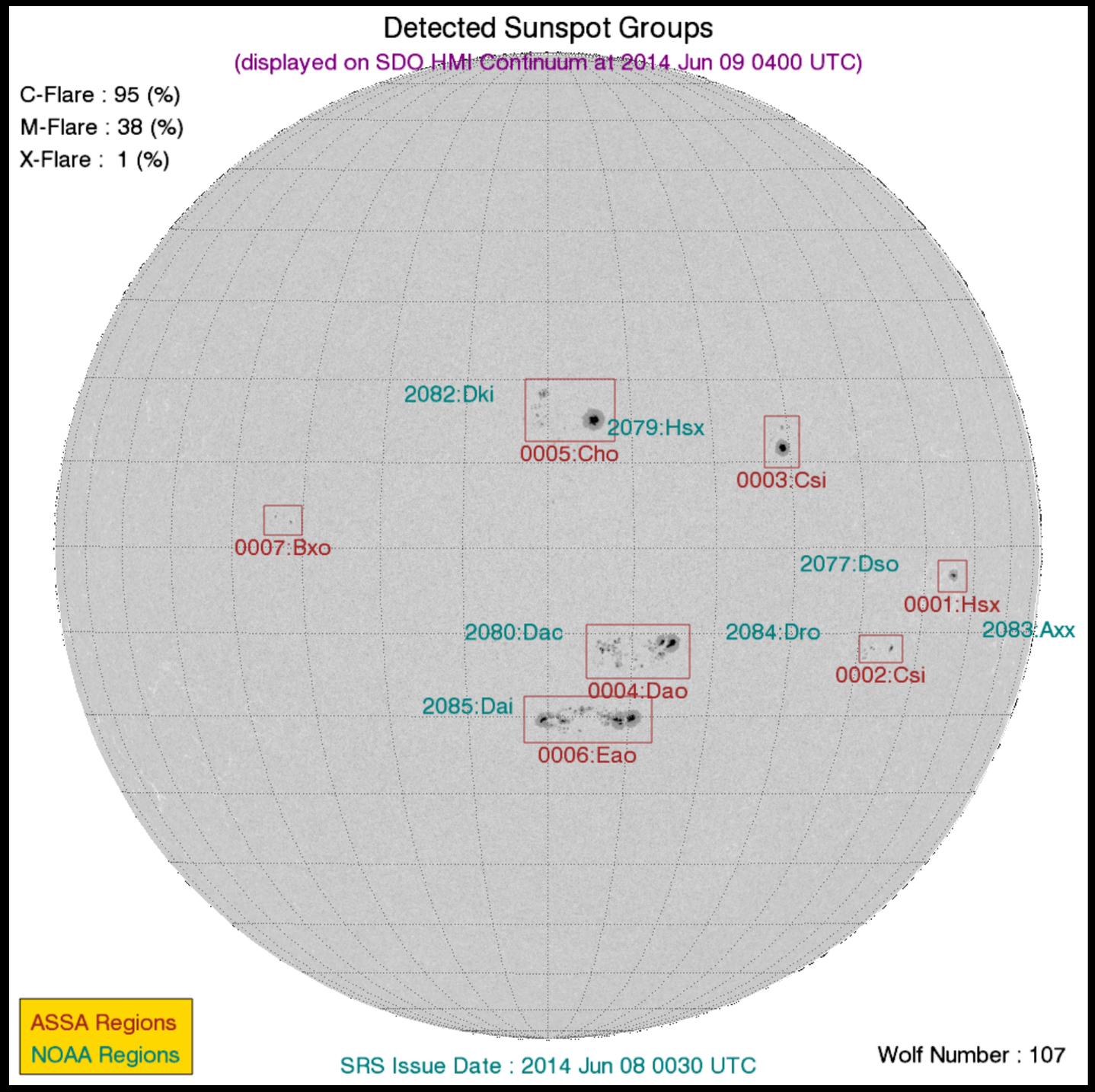
SW REDI 2015

Flare Prediction Model
ASAP (Automatic Solar Activity Prediction)
http://spaceweather.inf.brad.ac.uk/asap/



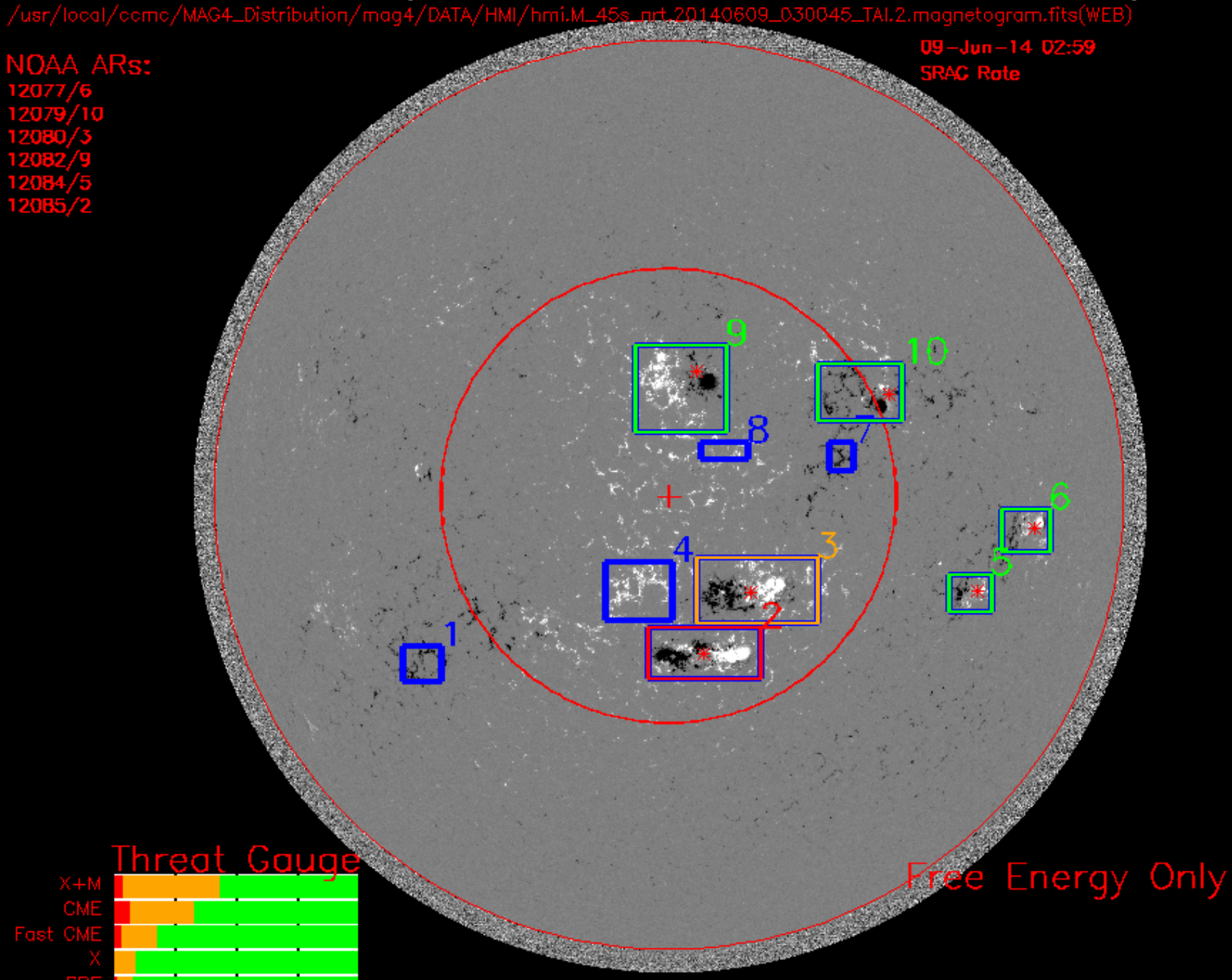
Flare Prediction Model
ASSA (Automatic Solar Synoptic Analyzer)



Provided by

Korean Space Weather Center

Flare Prediction Model
MAG4 (UAH/MSFC, Falconer et al.)

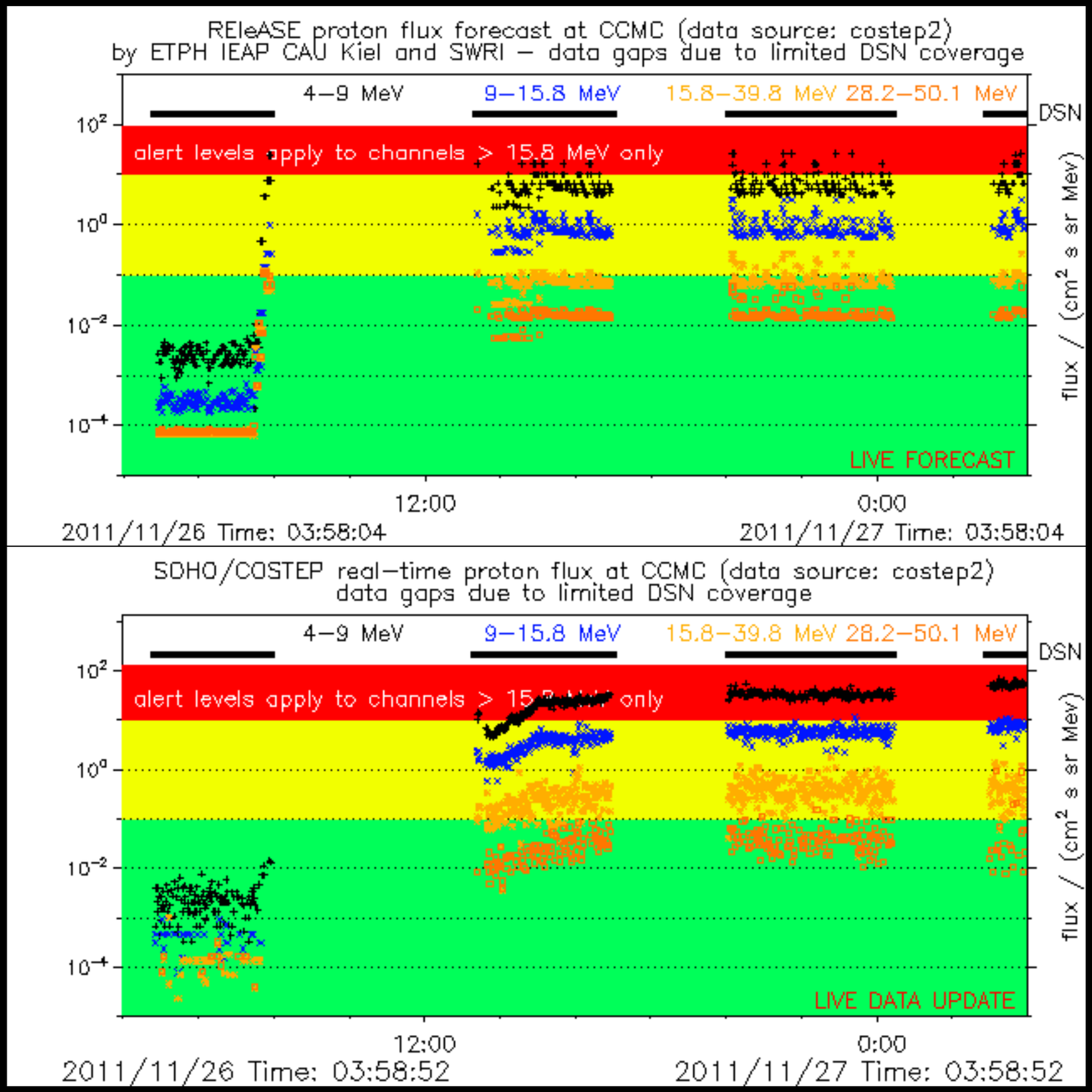


SEP prediction

REleASE (Relativistic electron Alert System for Exploration)

- Proton flux forecast model based on electron measurements by SOHO/COSTEP
- developed by Arik Posner (NASA/HQ)
- Reference: Posner, A. (2007), Up to 1-hour forecasting of radiation hazards from solar energetic ion events with relativistic electrons, Space Weather, 5, S05001, doi: 10.1029/2006SW000268.

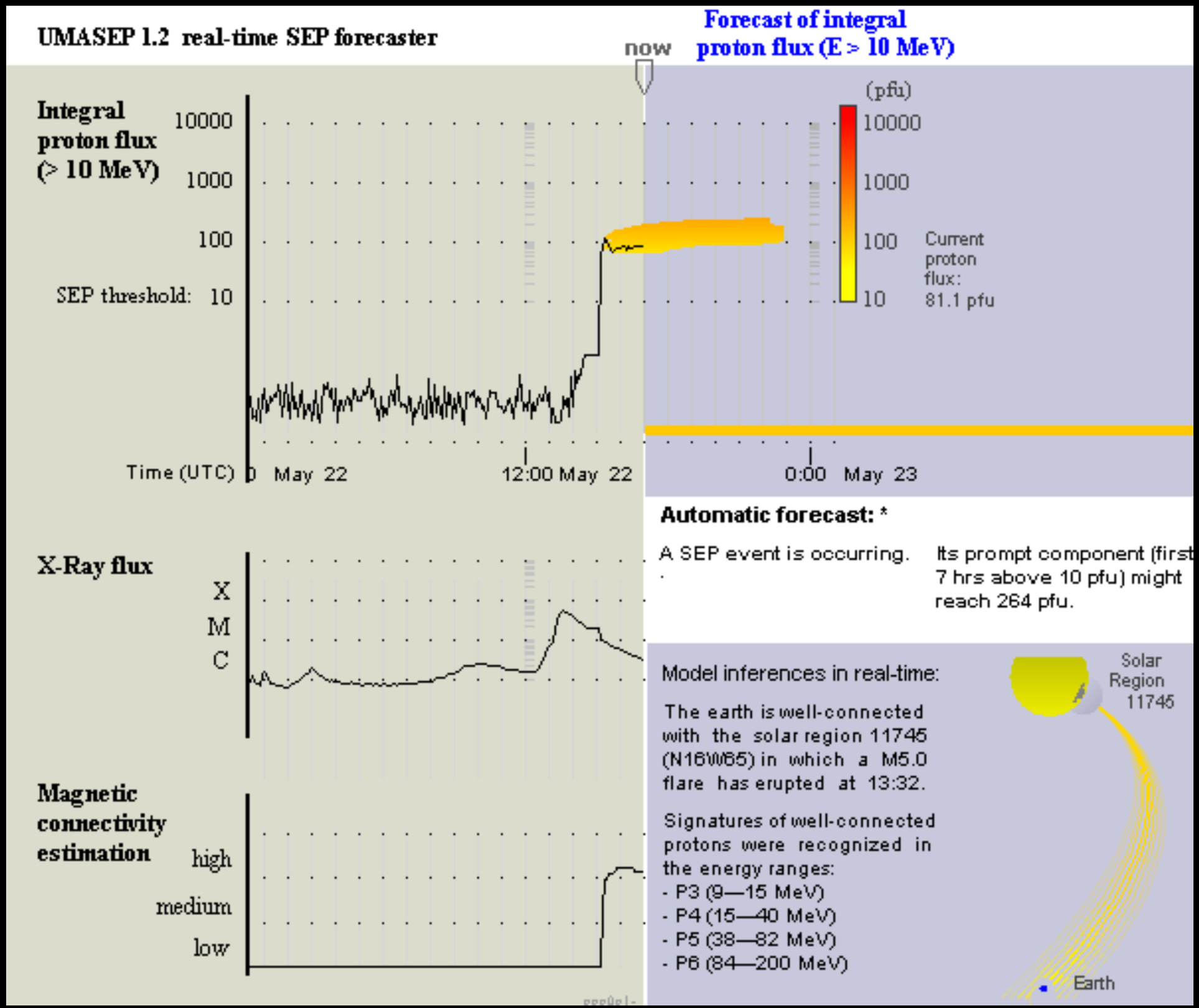
RELeASE: example



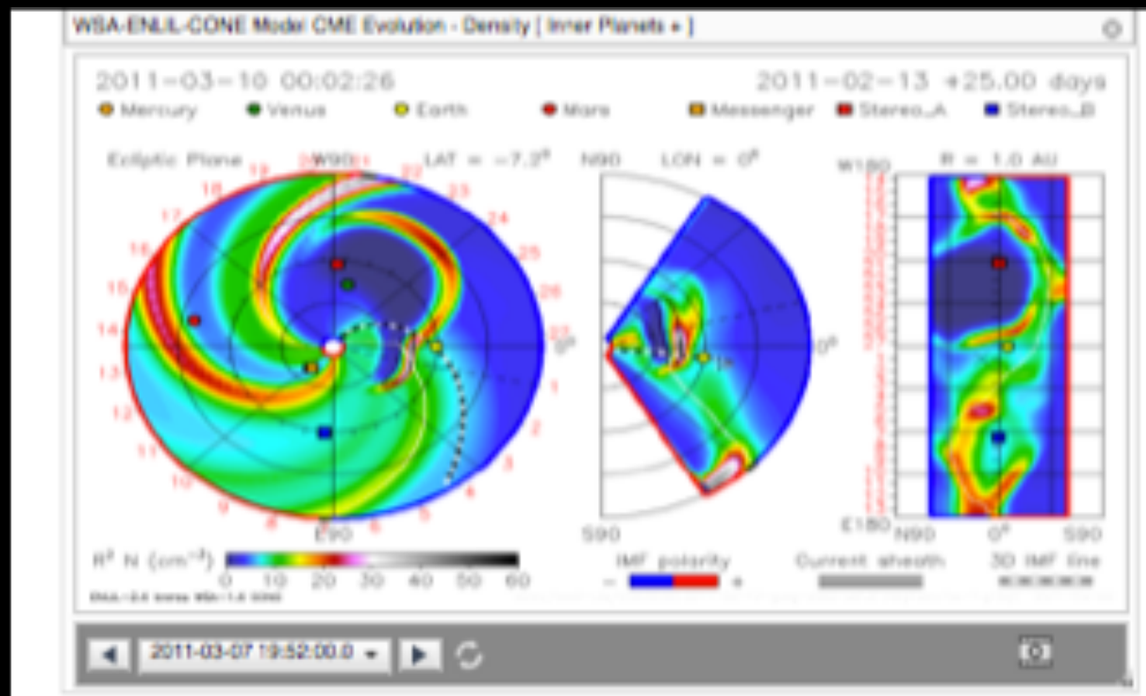
SEP prediction
UMA proton flux forecast

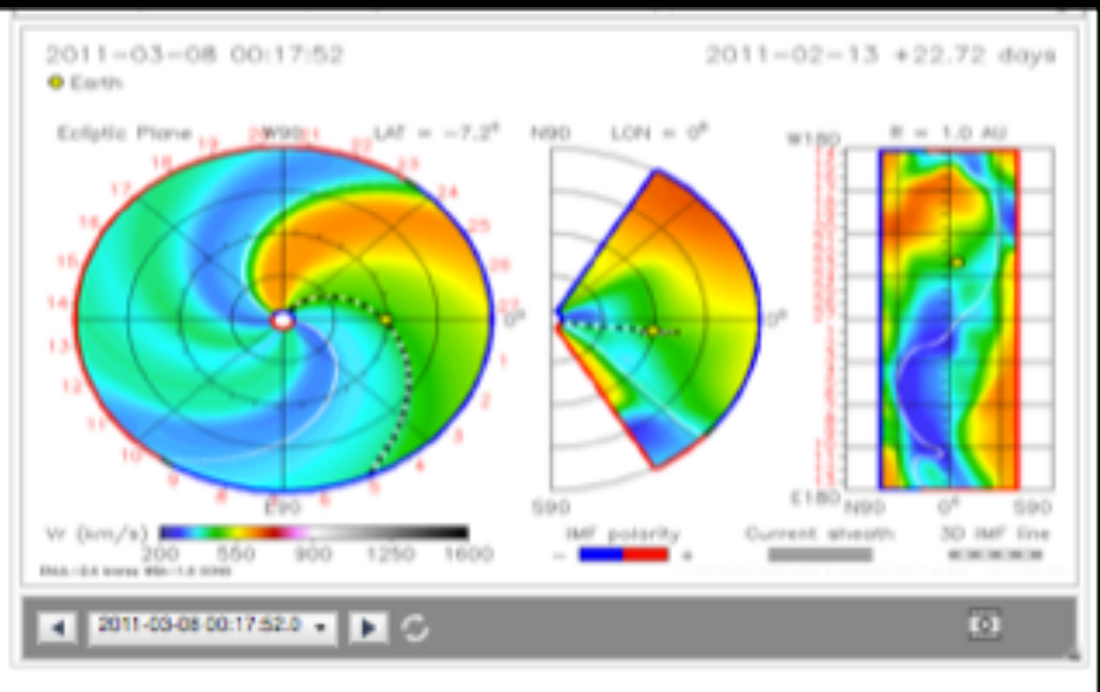
- Núñez, M. (2011), Predicting solar energetic proton events (E > 10 MeV), Space Weather, 9, S07003, doi 10.1029/2010SW000640.

UMASEP model



WSA+ENLIL



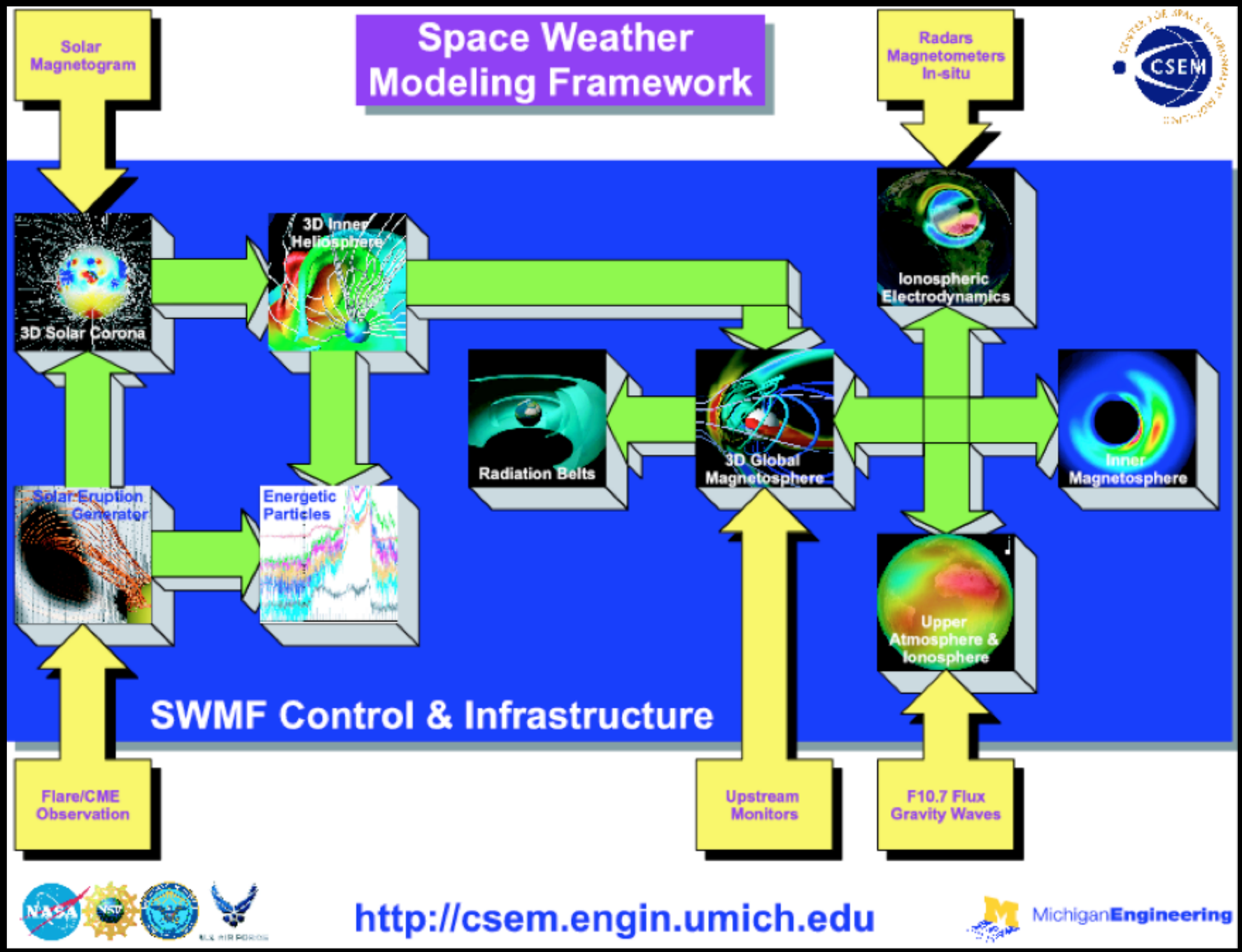


Predicting transport/ impacts of CME

Modeling and Predicting of the ambient solar wind

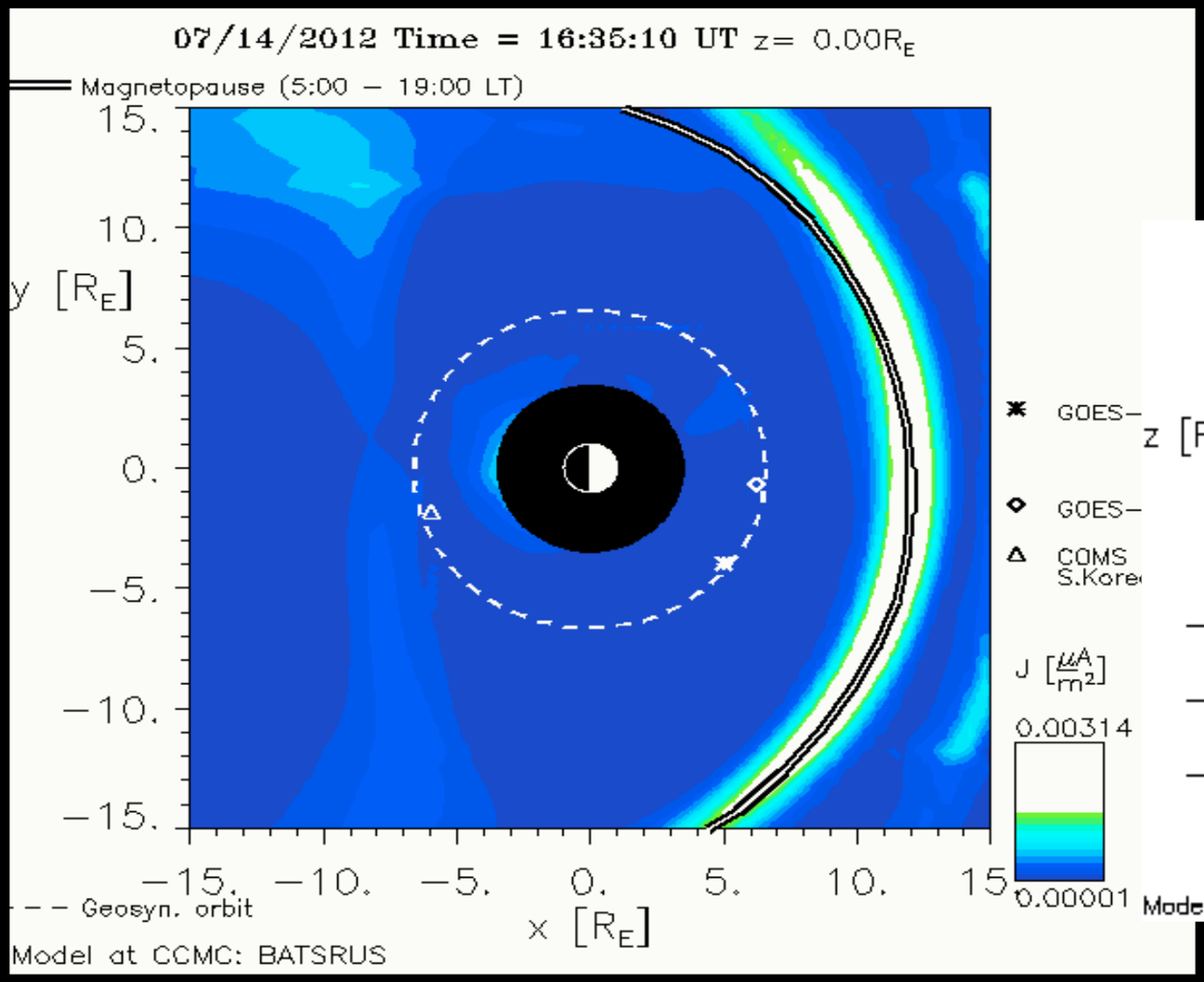
primary and popular

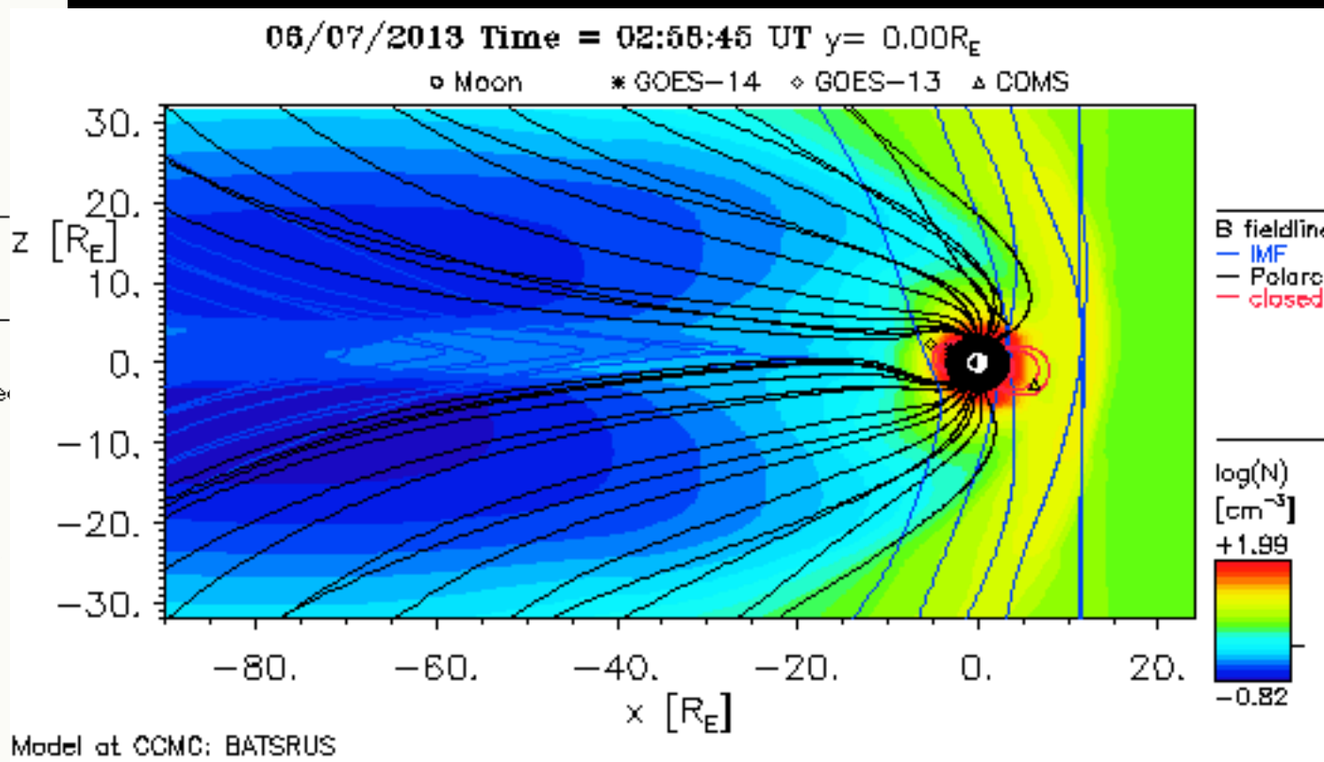
SWMF

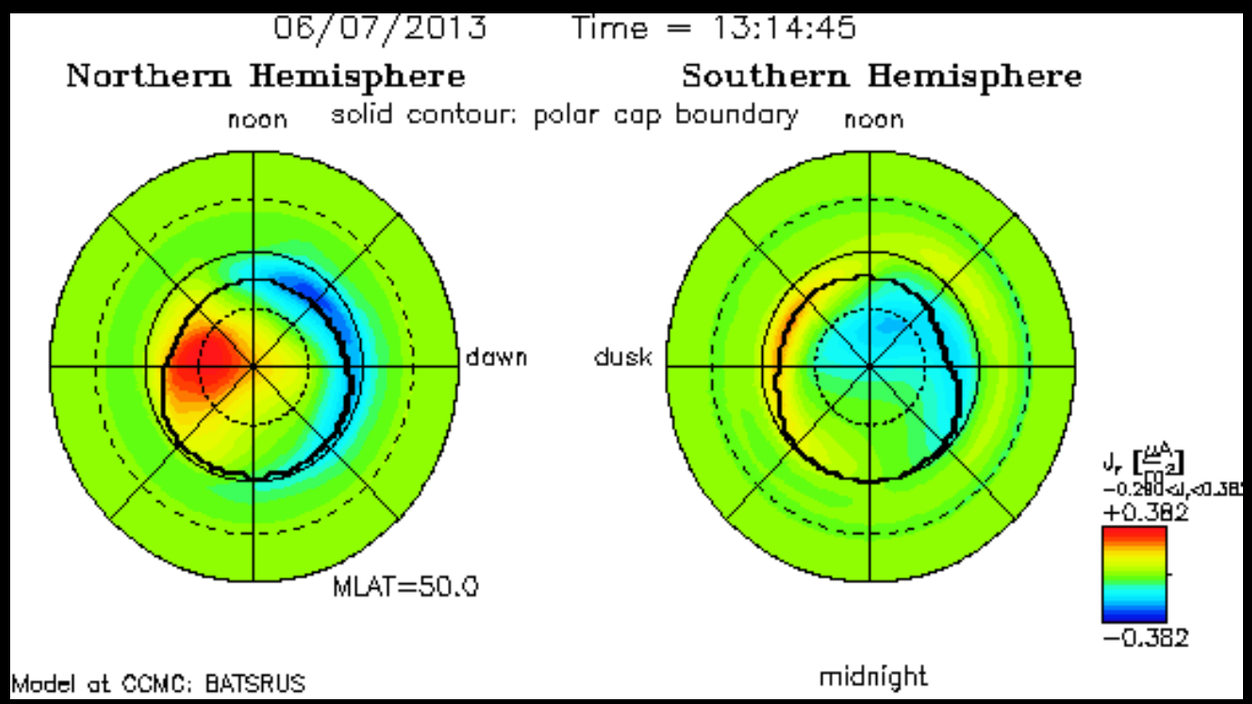


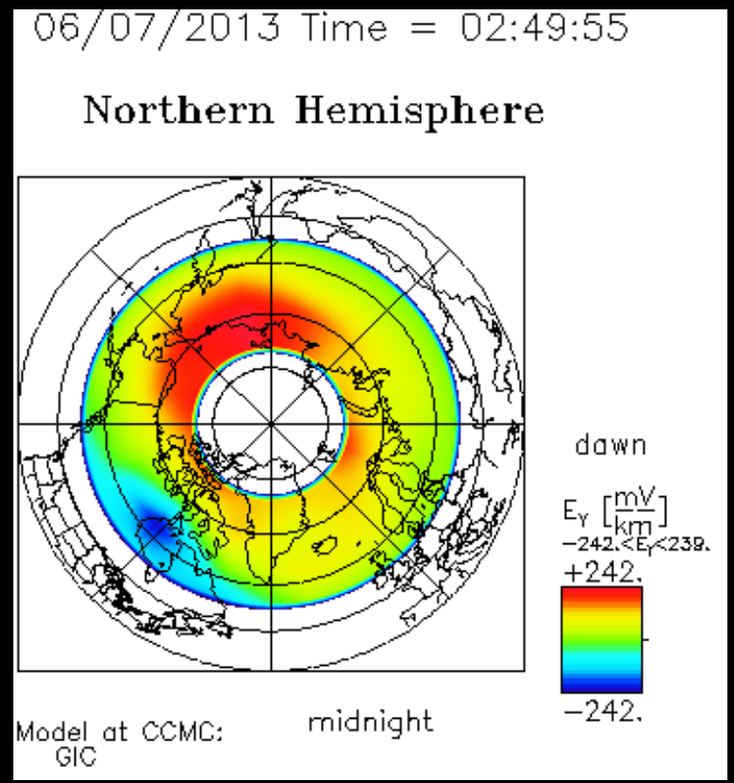
- the module - Global MHD model of Earth's magnetosphere - is heavily used

SWMF

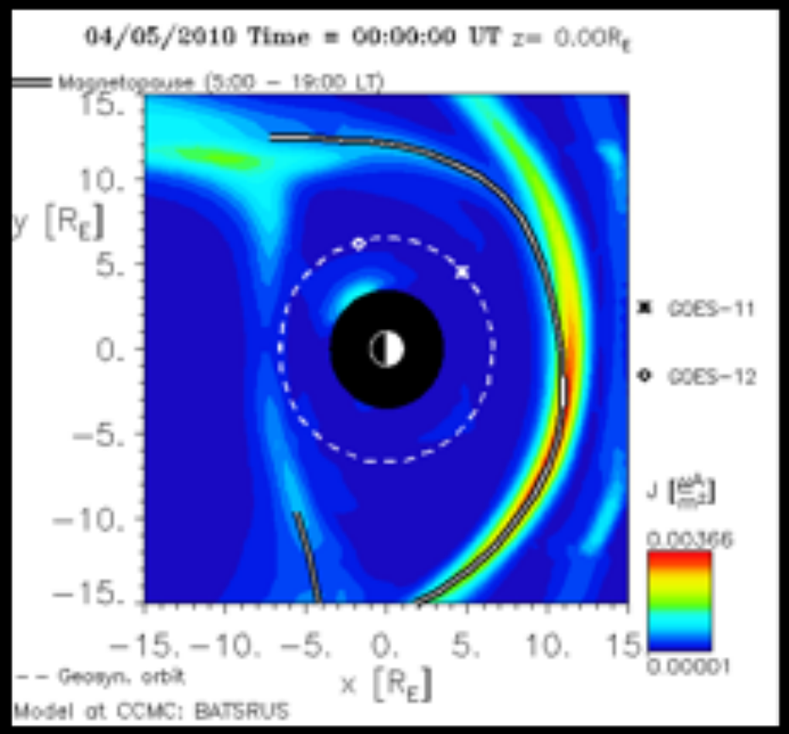

07/14/2012 Time = 16:35:10 UT z= 0.00R_E
Magnetopause (5:00 – 19:00 LT)
y [R_E]
x [R_E]
GOES–
GOES–
COMS
S.Kore
J [μA/m²]
0.00314
0.00001
Geosyn. orbit
Model at CCMC: BATSRUS

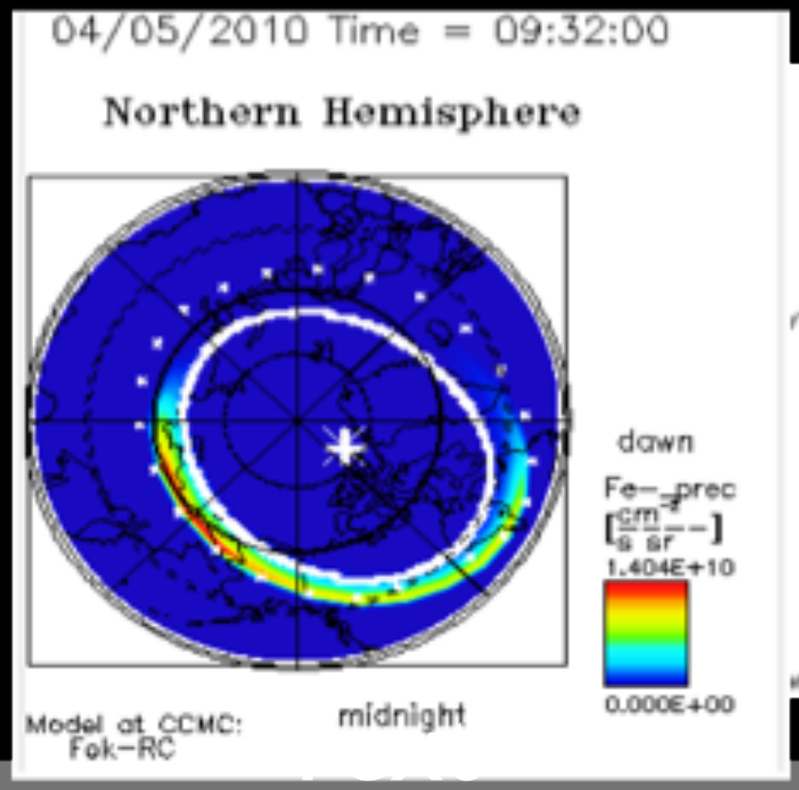

06/07/2013 Time = 02:56:45 UT y= 0.00R_E
Moon
GOES–14
GOES–13
COMS
z [R_E]
x [R_E]
B fieldlin
IMF
Polarc
closed
log(N)
[cm⁻³]
+1.99
–0.82
Model at CCMC: BATSRUS

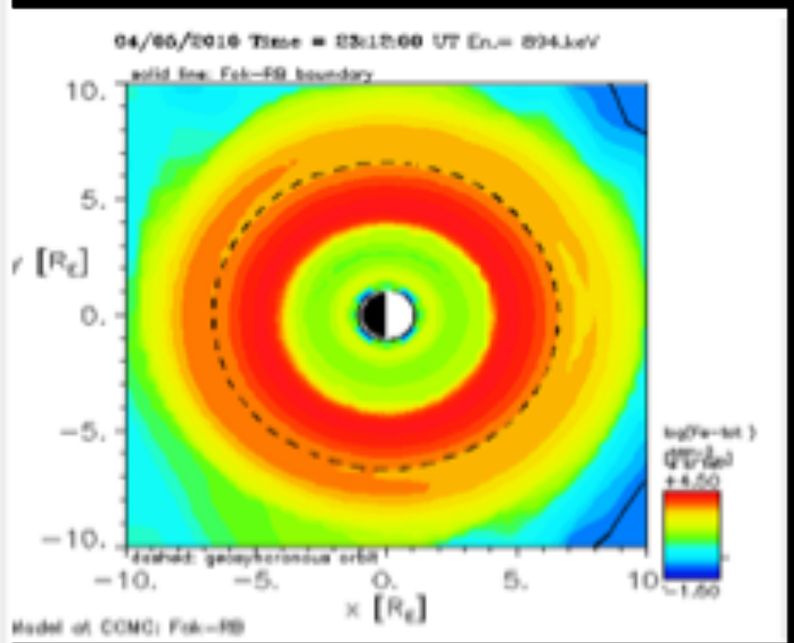

06/07/2013 Time = 13:14:45
Northern Hemisphere
Southern Hemisphere
noon
solid contour: polar cap boundary
noon
dawn
dusk
MLAT=50.0
+0.382
–0.382
midnight
Model at CCMC: BATSRUS


06/07/2013 Time = 02:49:55
Northern Hemisphere
dawn
E_Y [mV/km]
+242.
–242.
midnight
Model at CCMC:
GIC

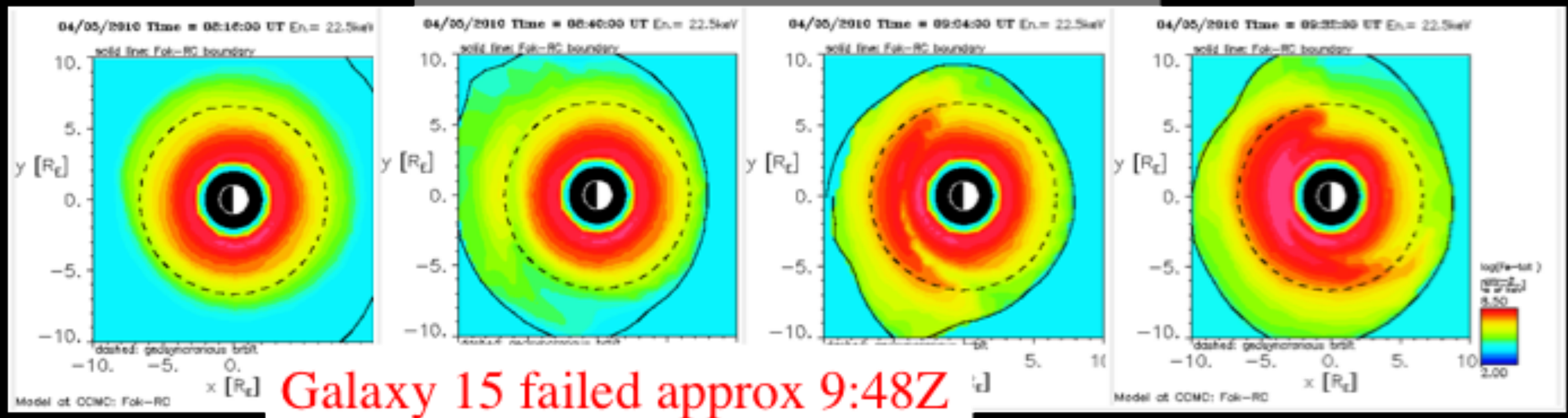
Fok Ring Current Model





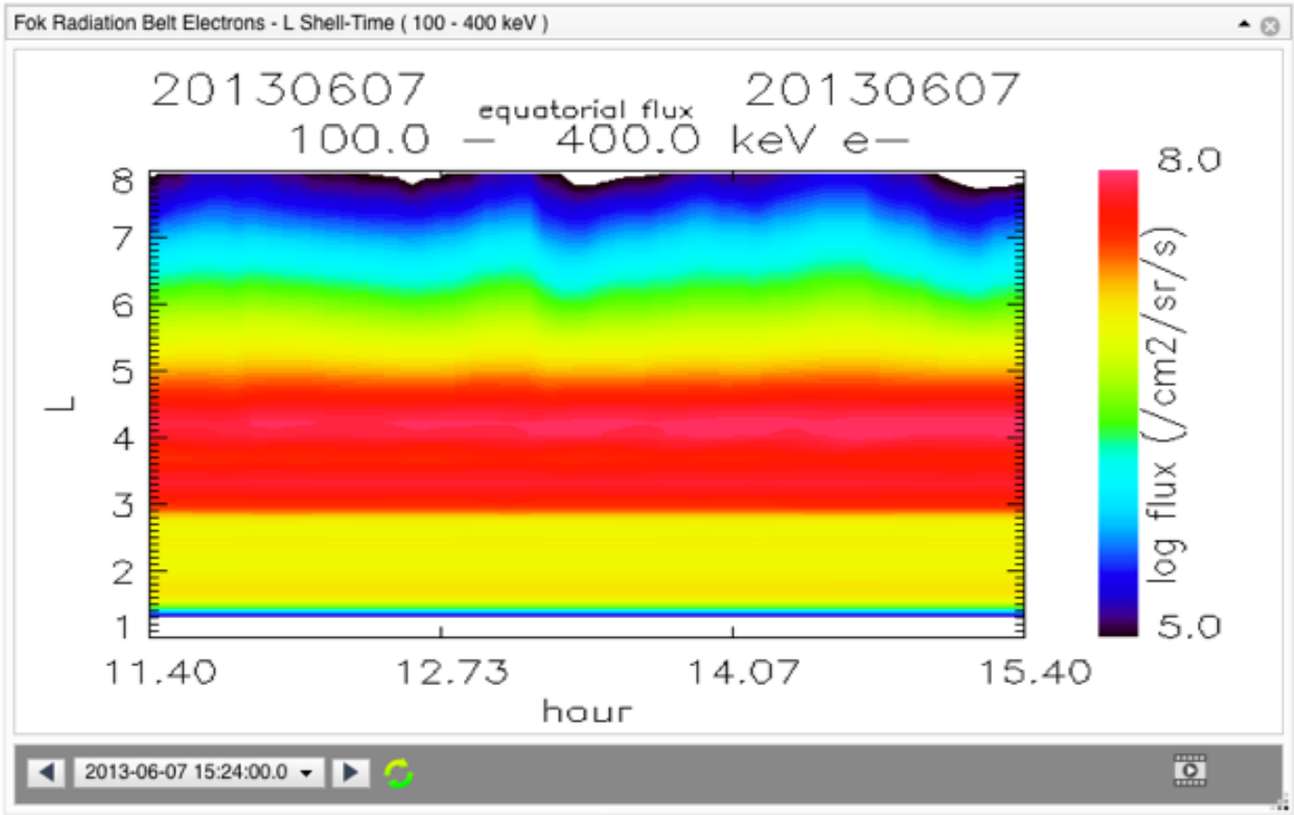


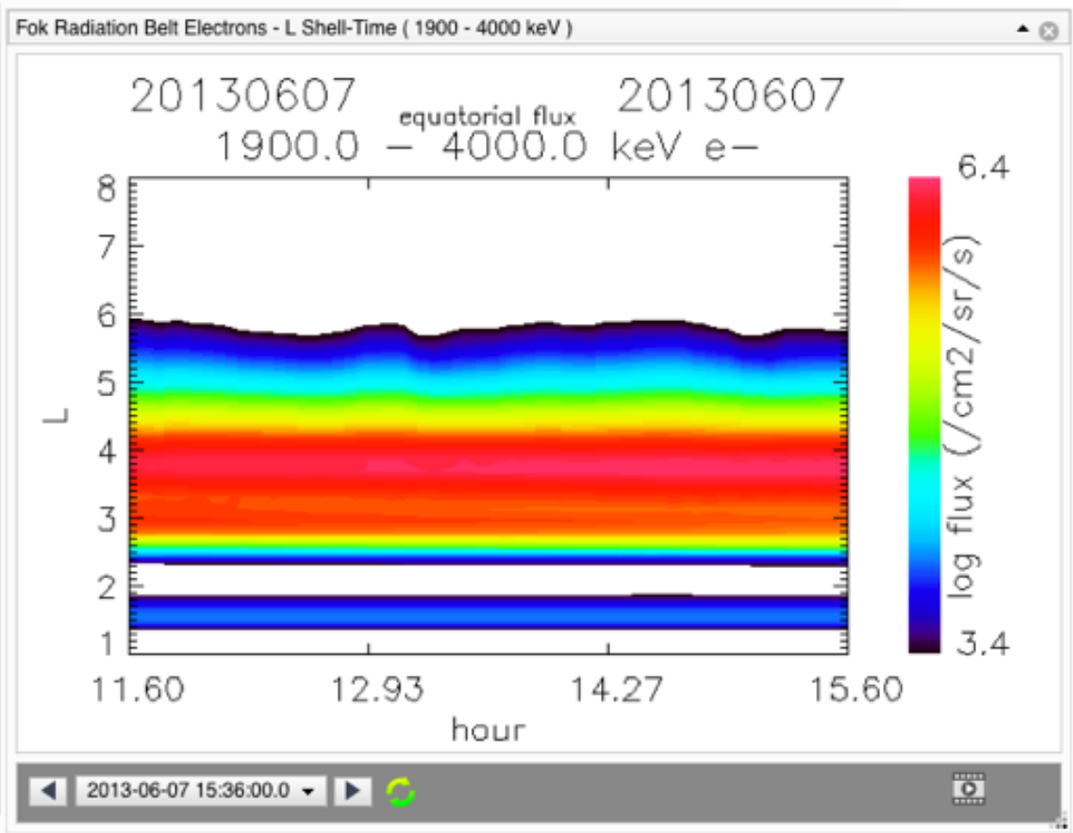
22keV electrons 4/5, 8:16-9:32Z

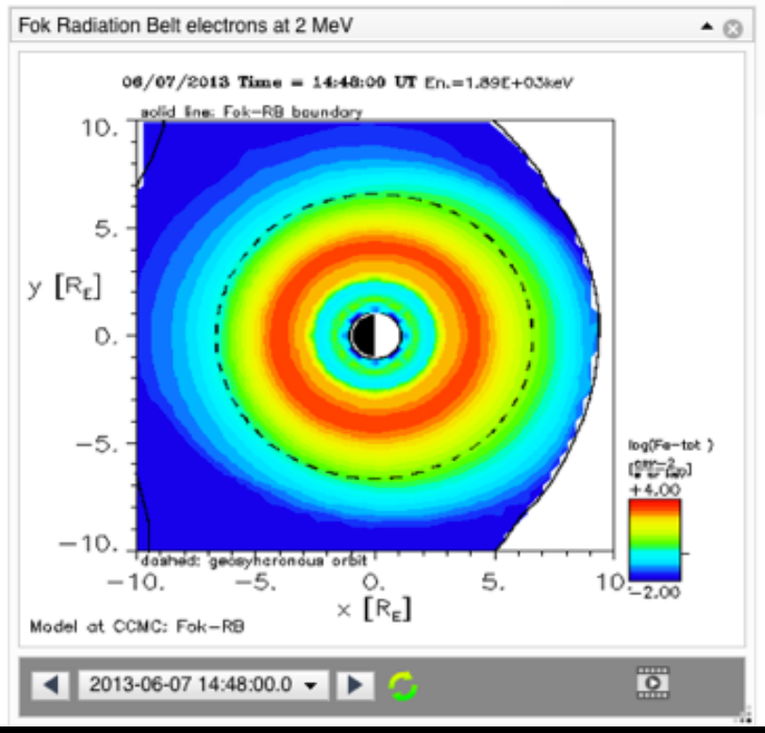


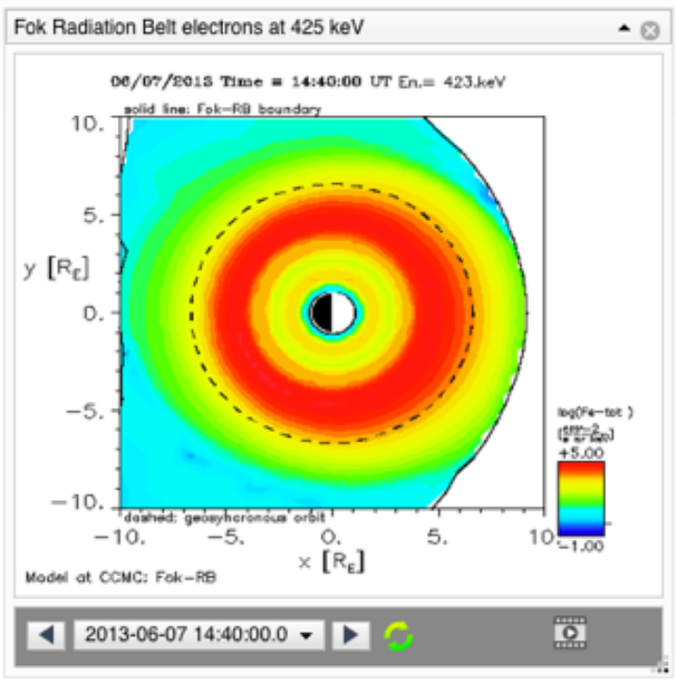
Galaxy 15 failed approx 9:48Z

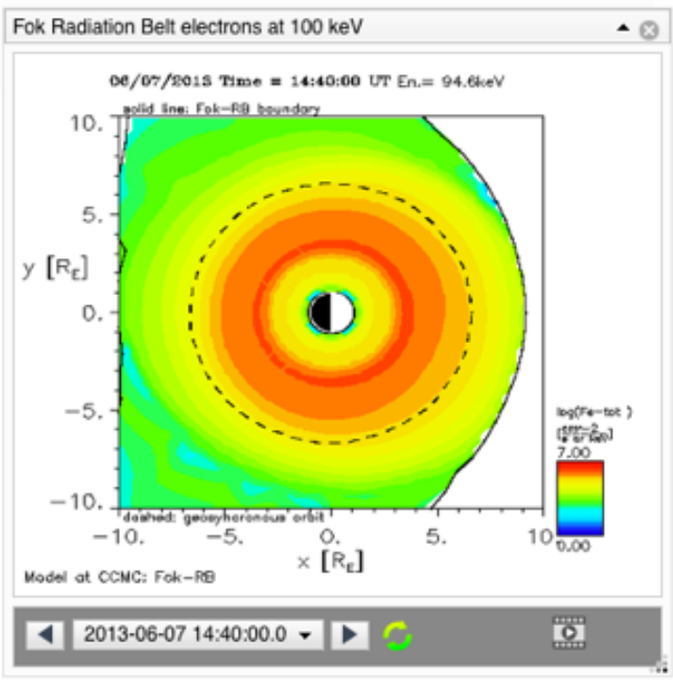
Fok Radiation Belt Model



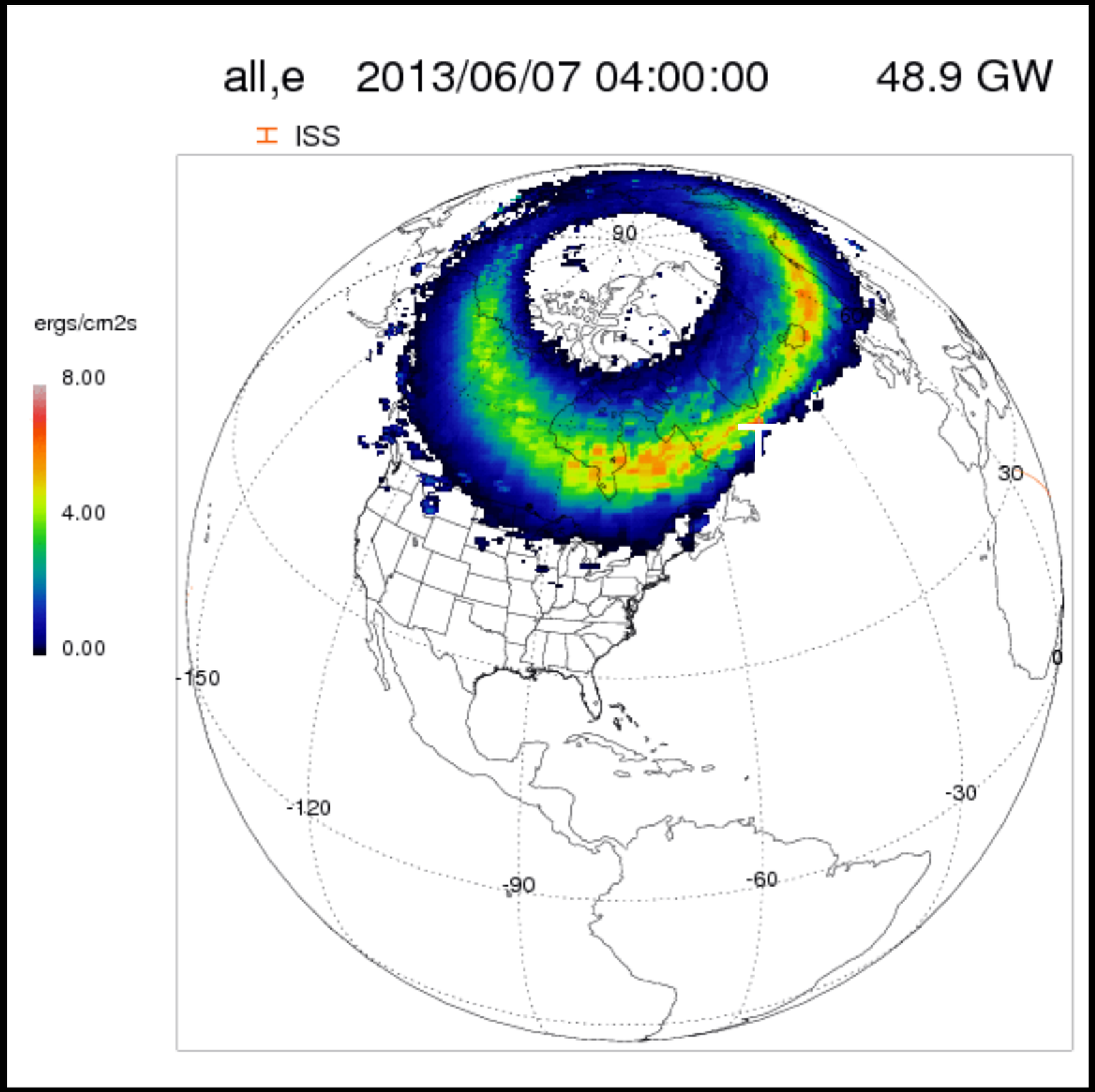








Auroral Model
Ovation Prime

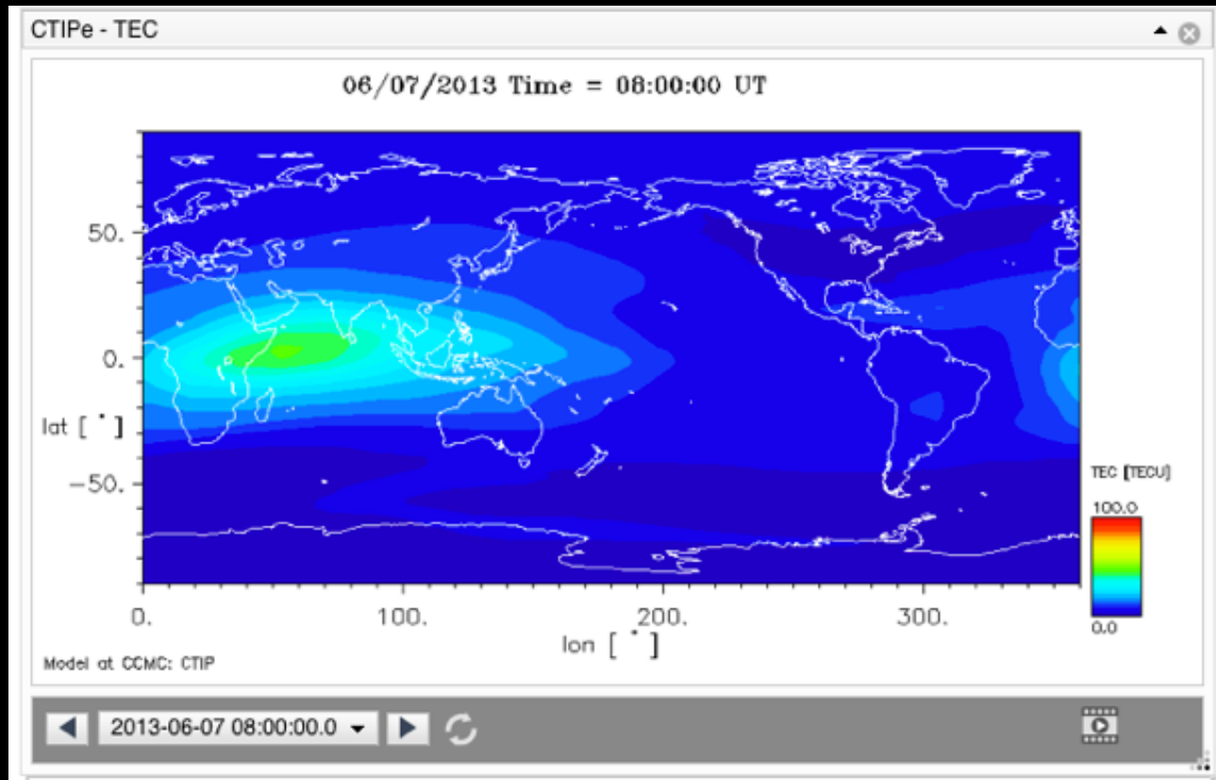


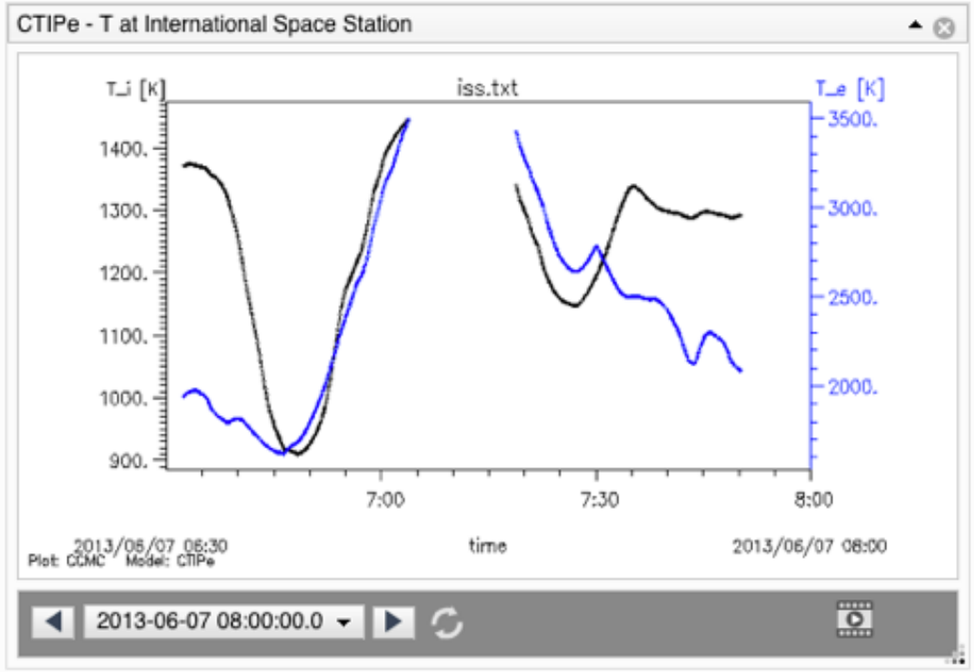
empirical model based on ACE measurements at L1

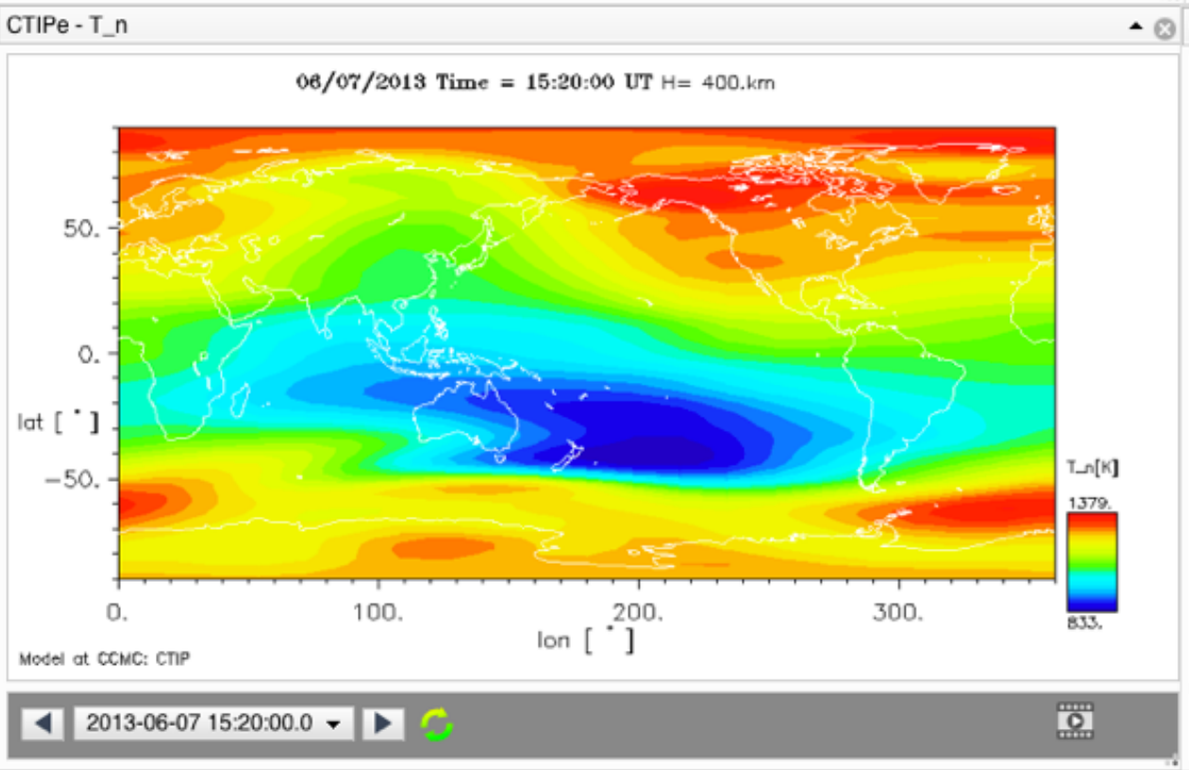
Newell et al., 2007, JGR

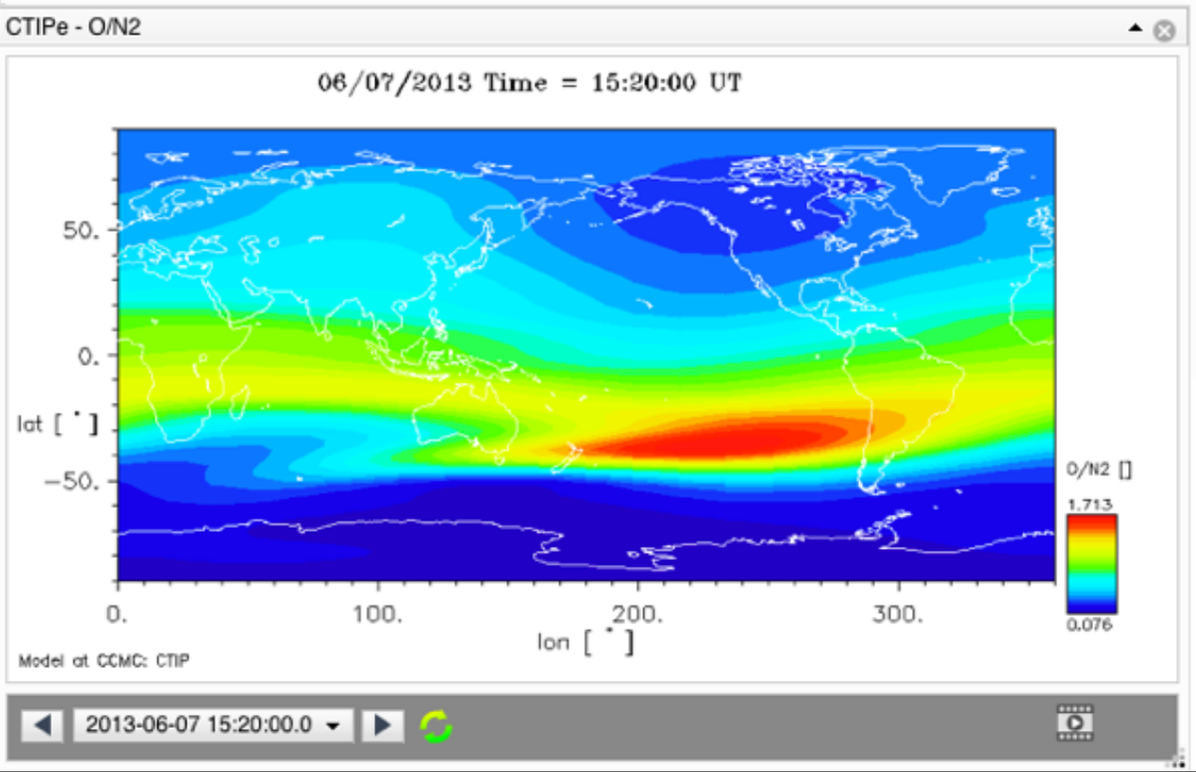
CTIPe

Coupled Thermosphere Ionosphere Plasmasphere Electrodynamics Model



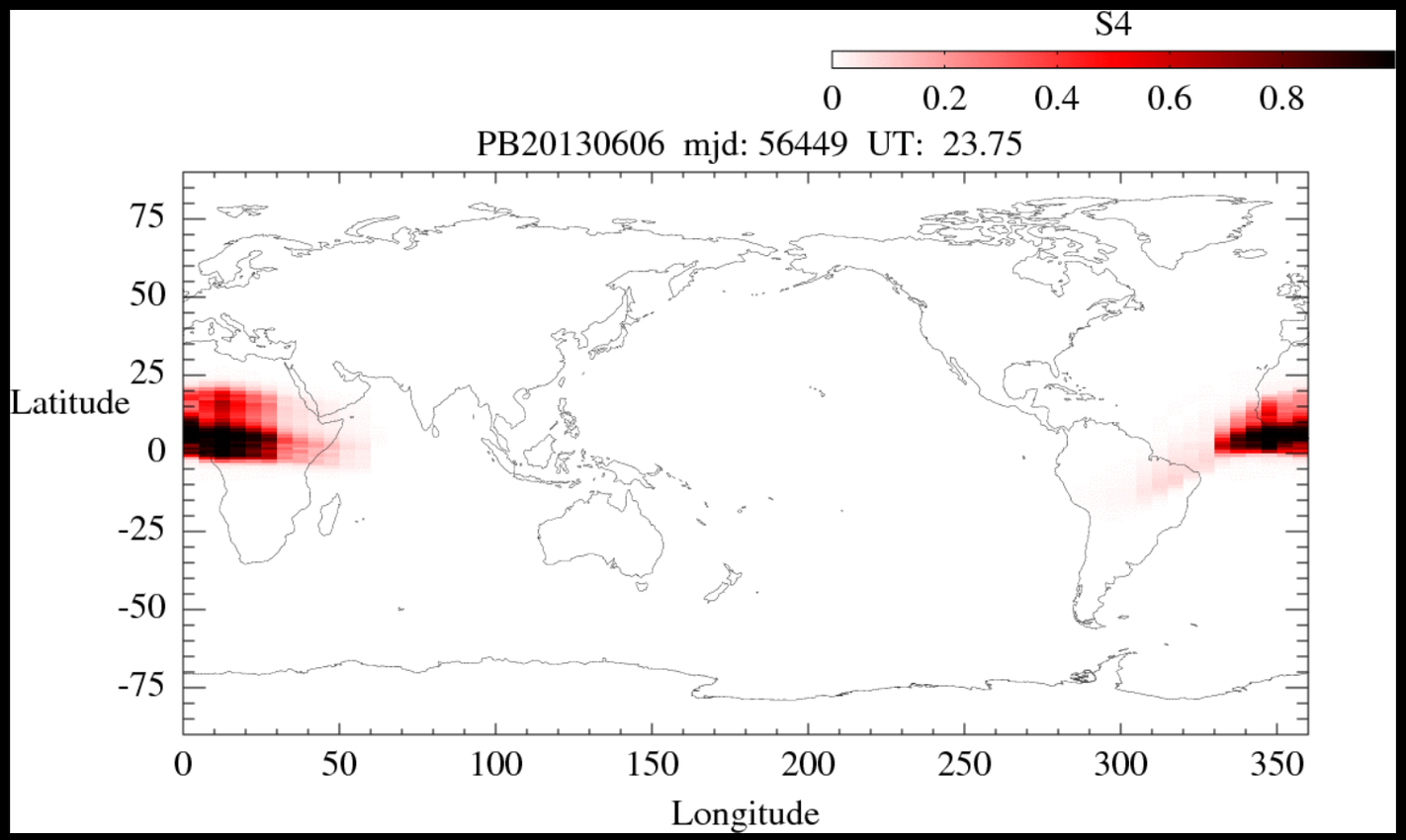


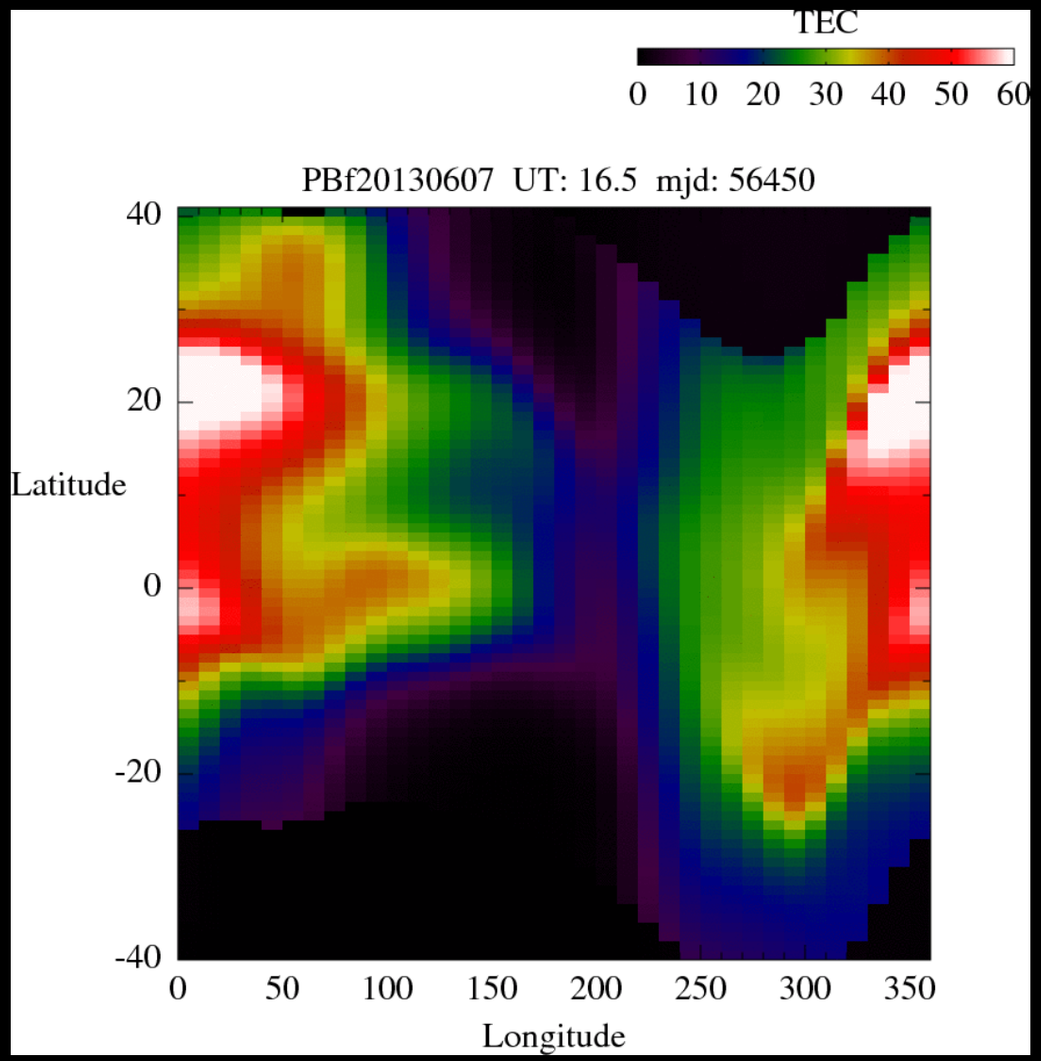




PBMOD
scintillation model

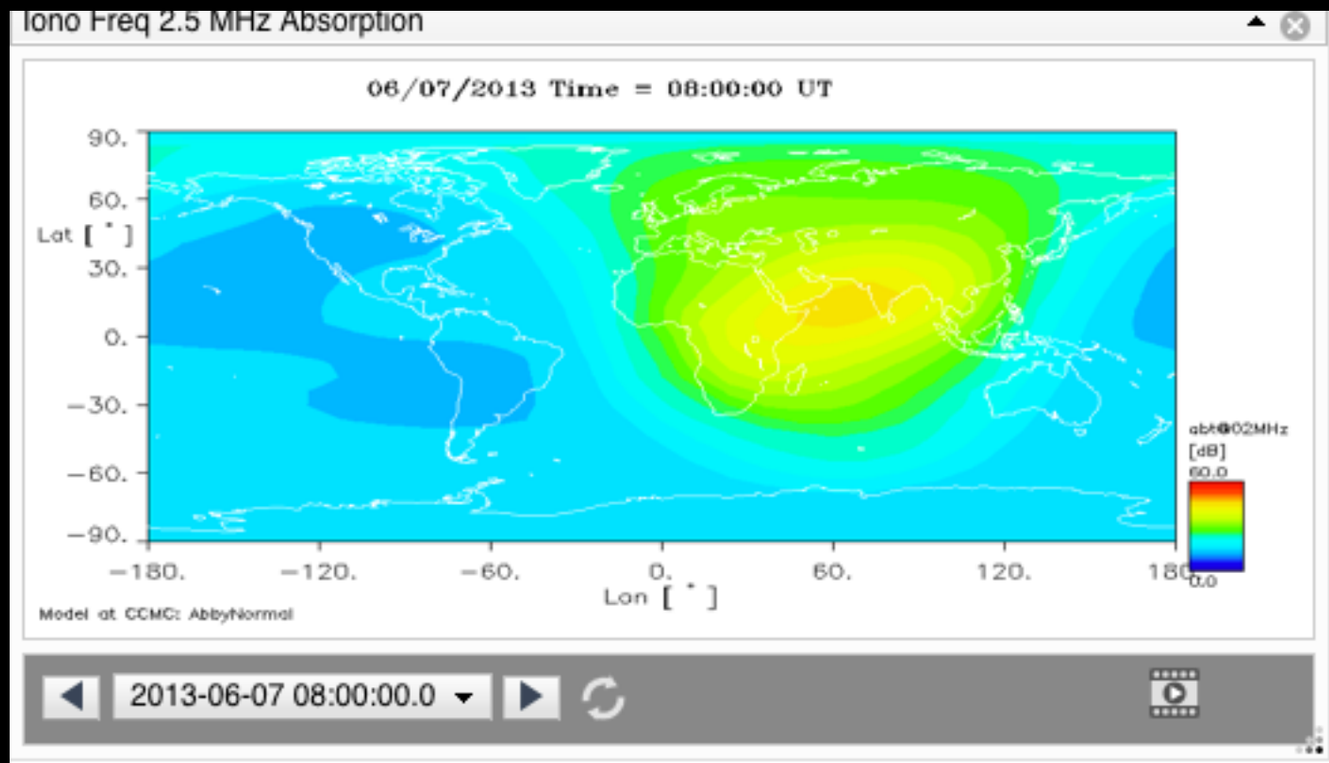
- http://ccmc.gsfc.nasa.gov/RoR_WWW/pbmod-rt/PBMOD-Text.html

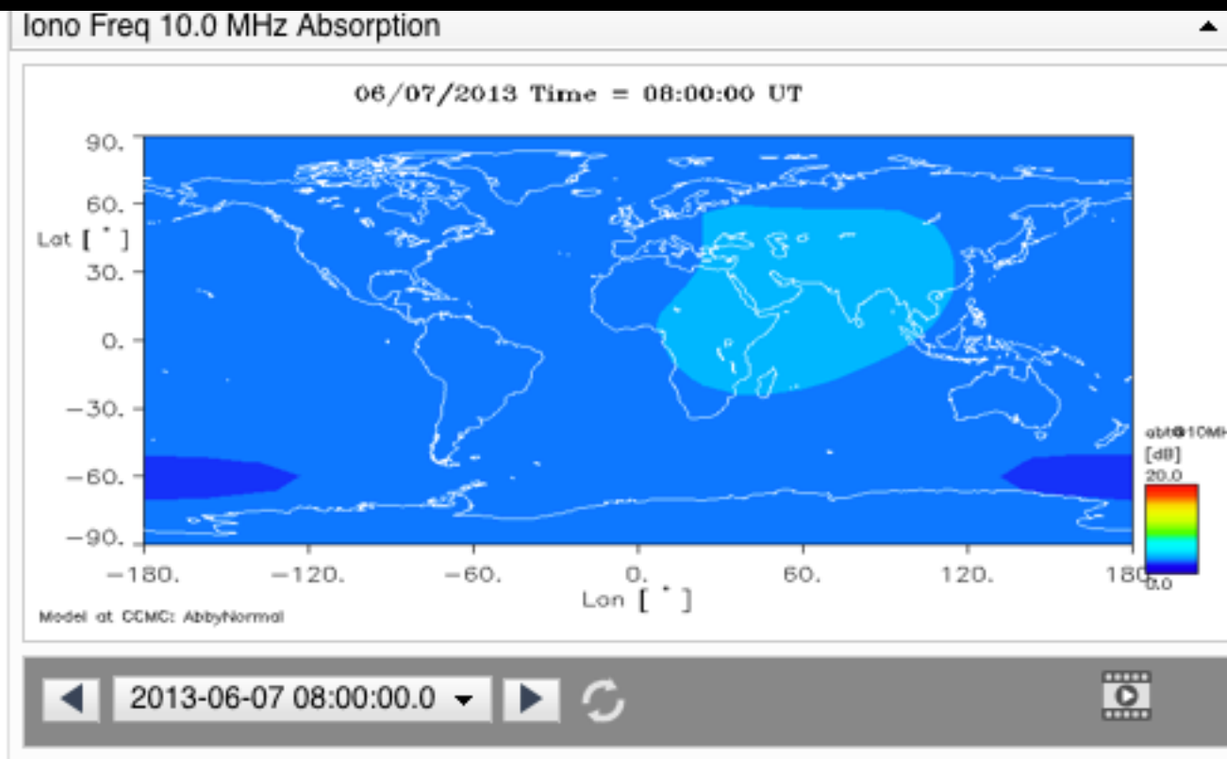




ABBYNormal HF signal absorption

- http://ccmc.gsfc.nasa.gov/models/modelinfo.php?model=ABBYNormal

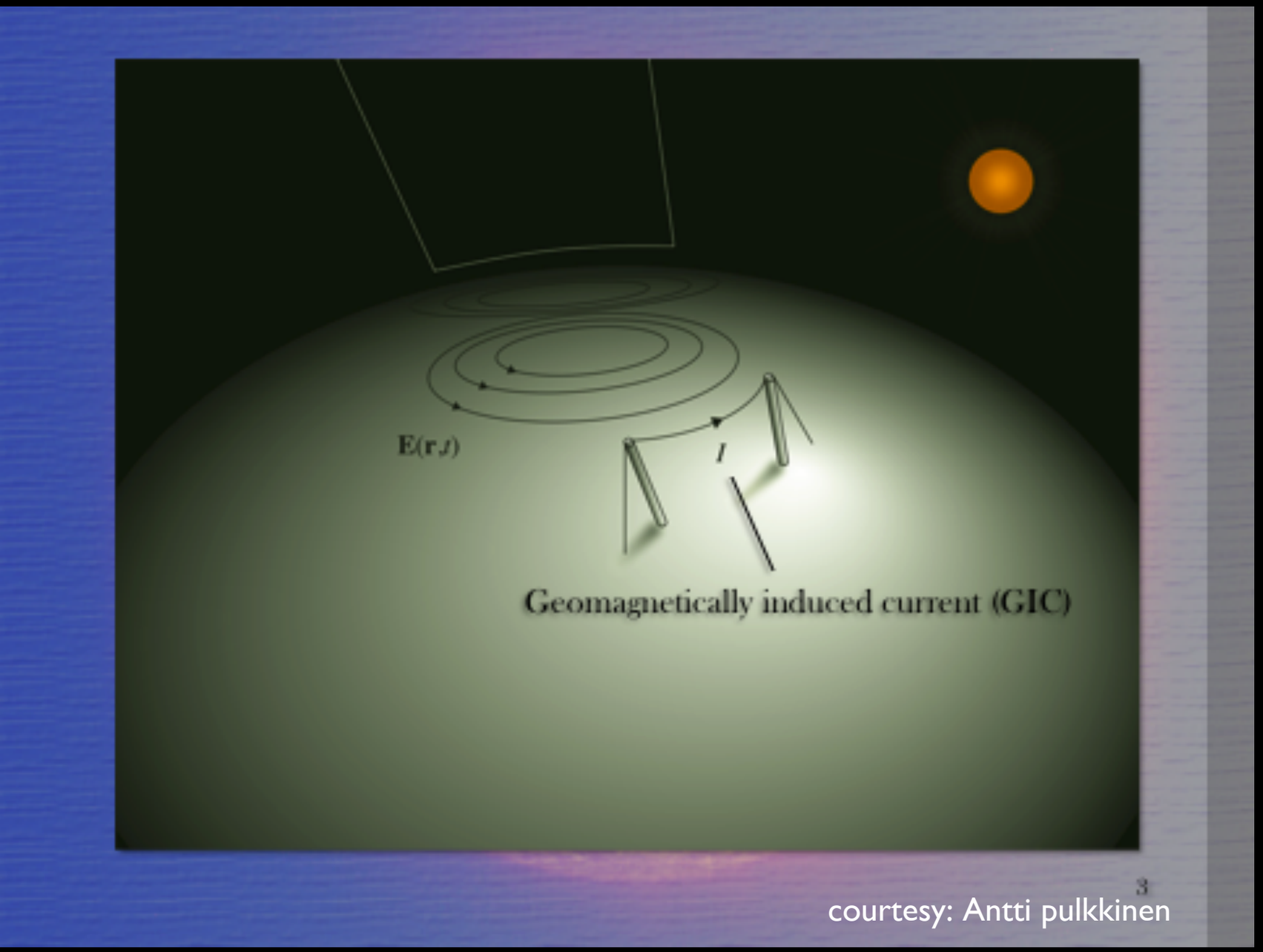


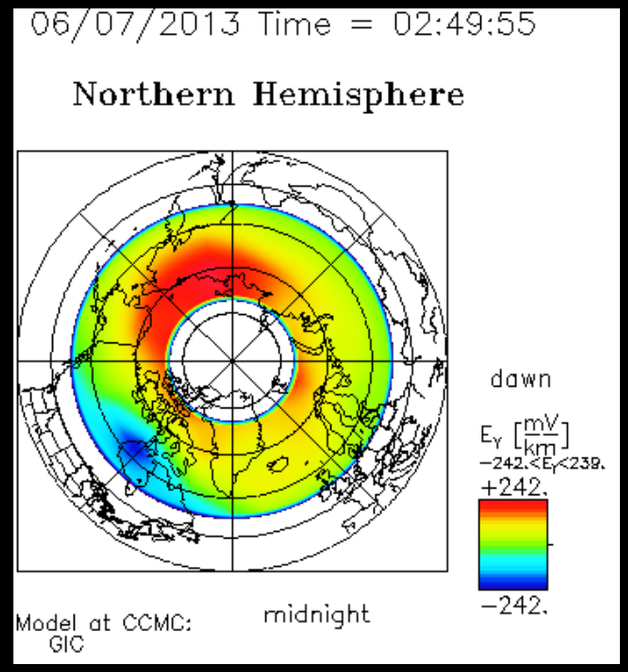


predicted Kp, Dst

- Kp based onNewell et al. formula
- Dst from SWMF
- Dst from WINDMI
  - http://ccmc.gsfc.nasa.gov/models/modelinfo.php?model=WINDMI

GIC illustration





courtesy: Antti pulkkinen

GIC
requires knowledge from the sun to mud