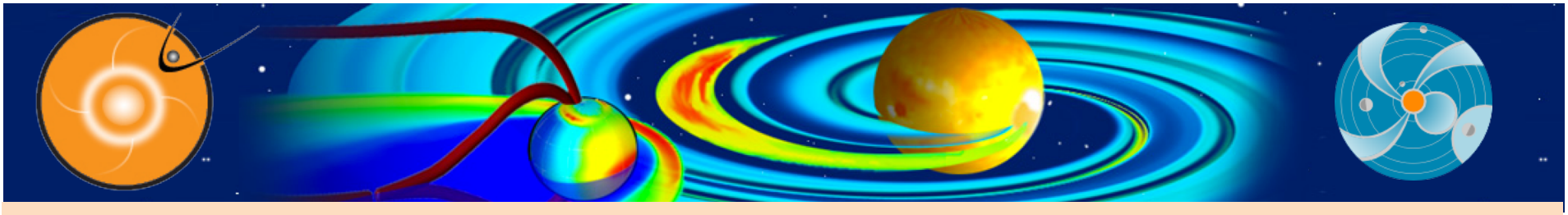
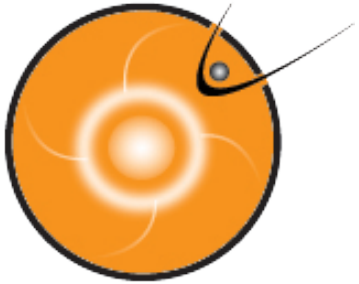


Community Coordinated Modeling Center

CCMC Report 2014-2016

M. Kuznetsova & CCMC Team

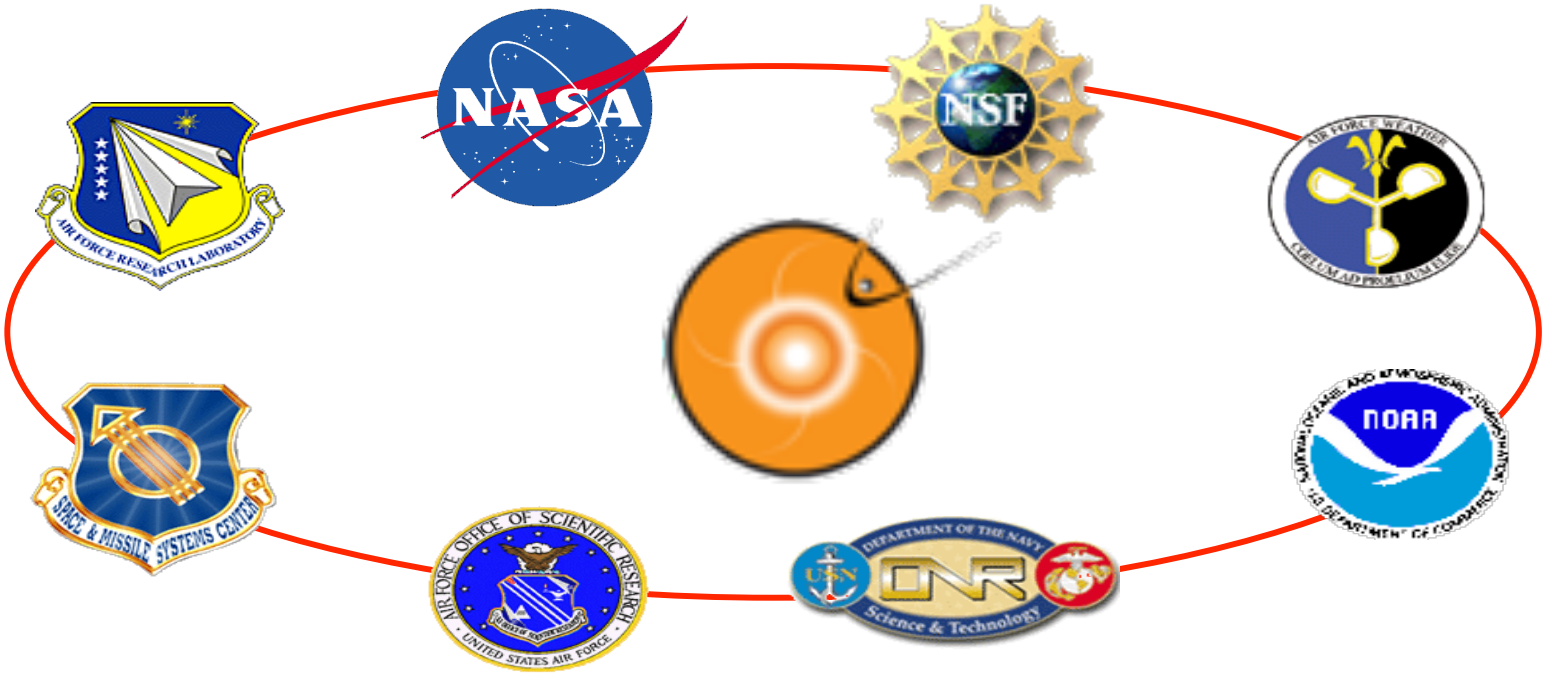
MODELS • DATA • TOOLS • DATABASES • SYSTEMS • SERVICES



Outline

- Brief History
- CCMC Now: Vision Update
- Models, Tools & Services Update
- Our Team
- Awards
- Outlook

Community Coordinate Modeling Center

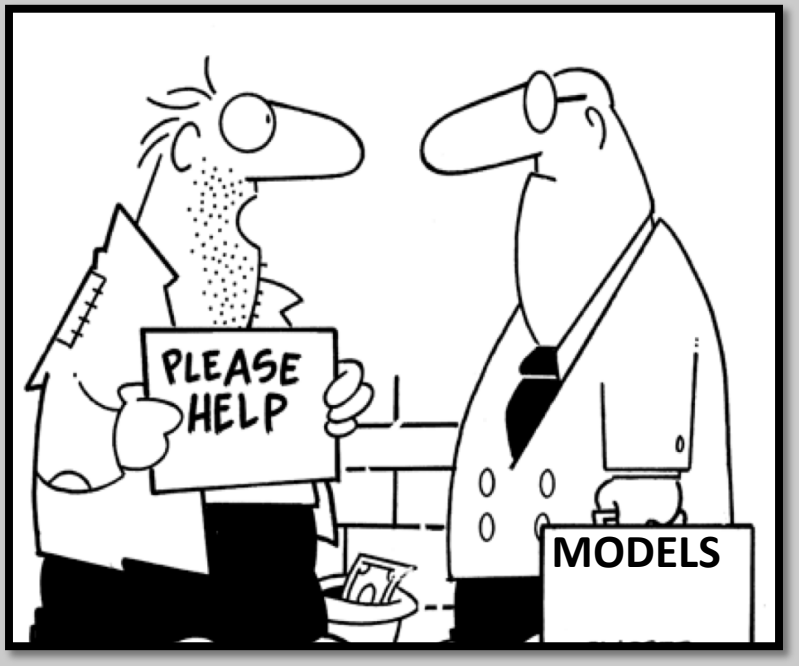


Established in 2000 as an essential element of the National Space Weather Program

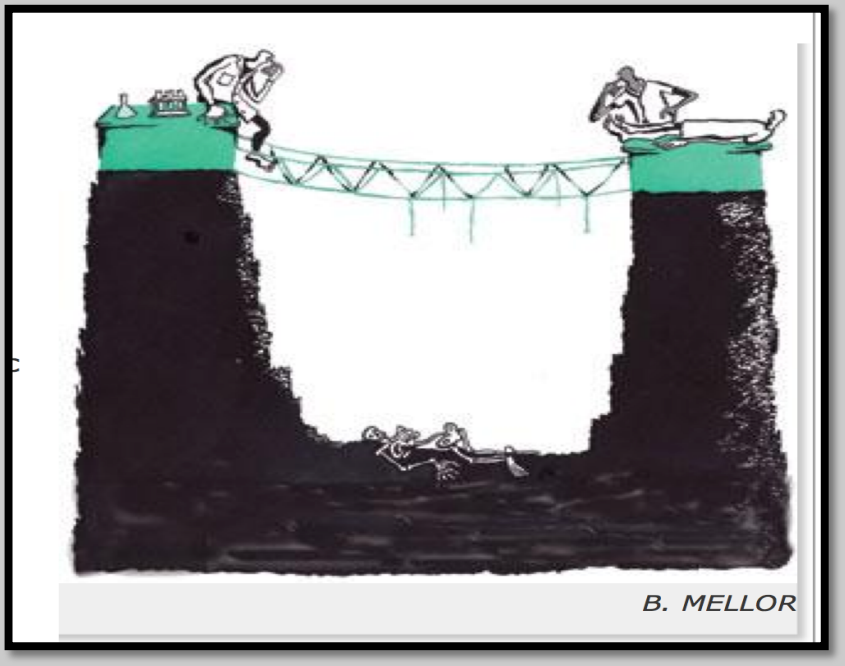
to facilitate research & development for the next generation of space environment modeling capability.

Prior to CCMC

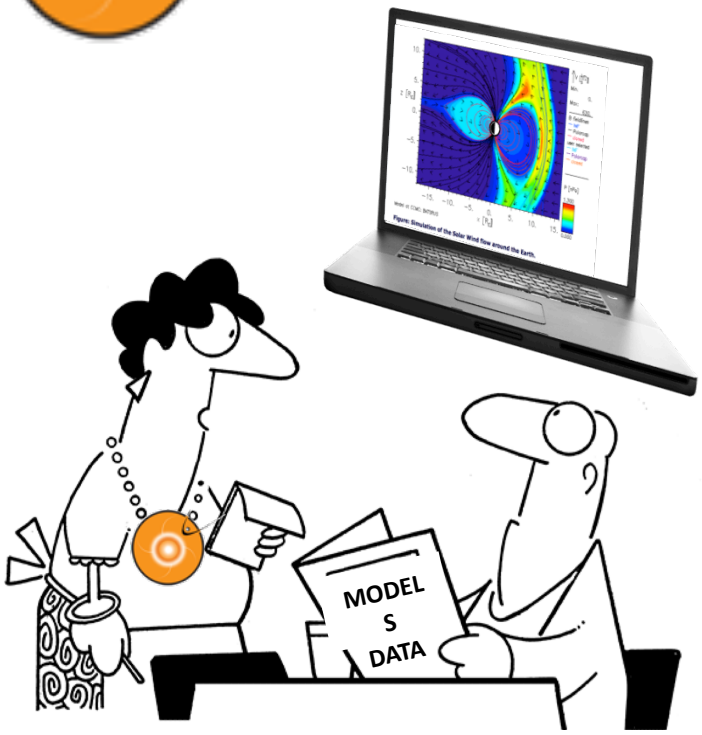
Models accessed and used by developers only.



"Valley of Death" between research and space weather applications

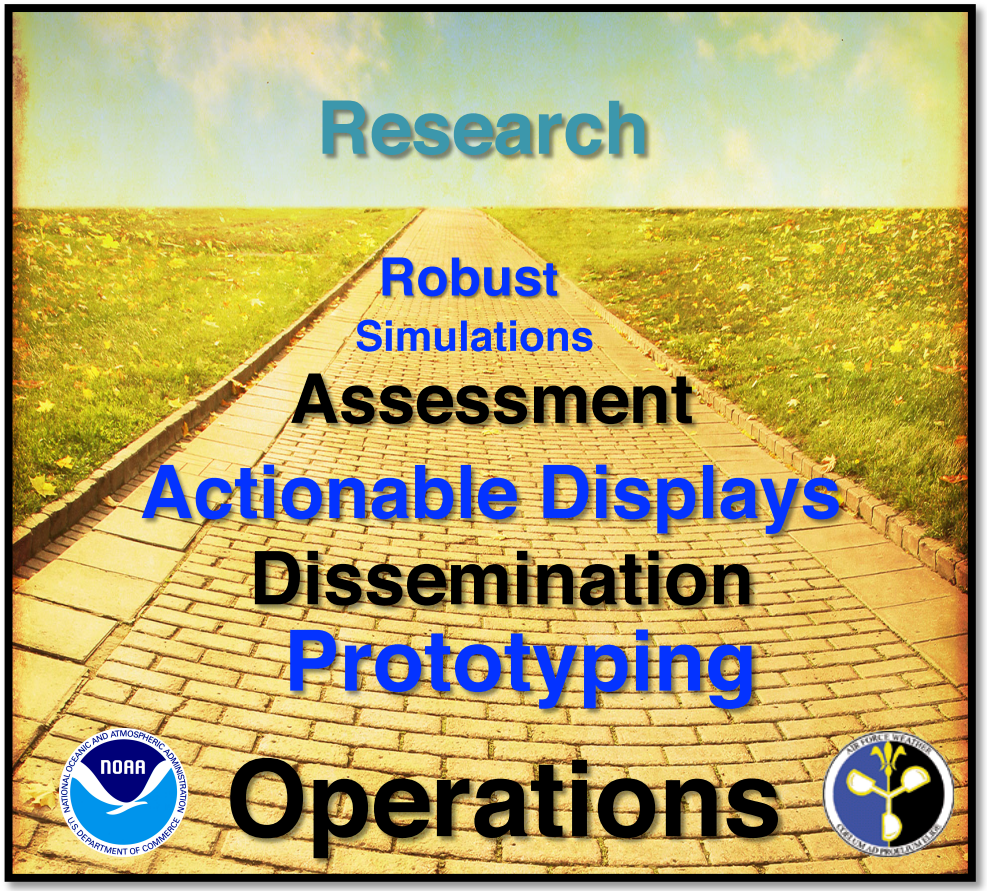


CCMC is a Game Changing Solution



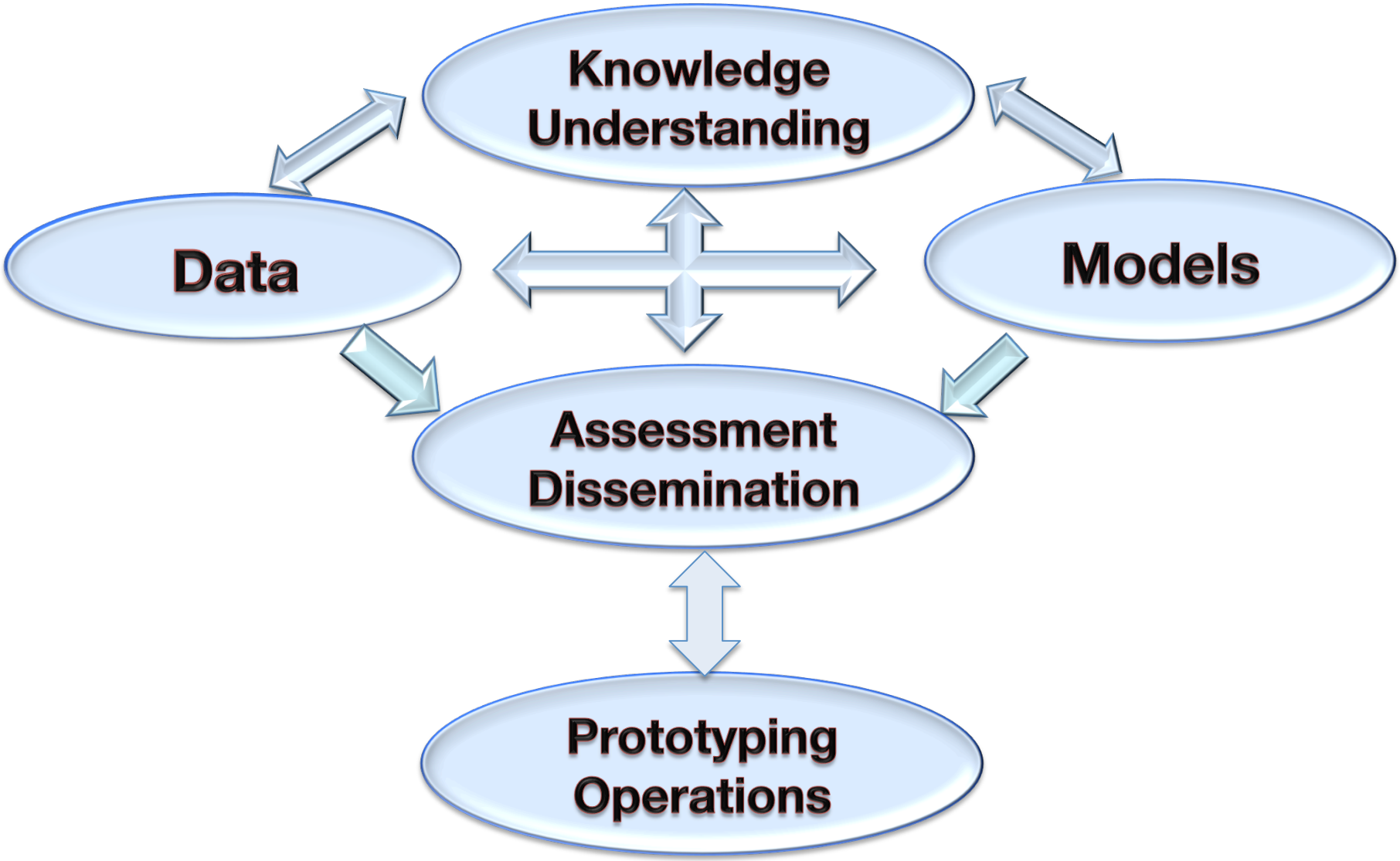
http://ccmc.gsfc.nasa.gov

CCMC transformed the way how advanced models are utilized in research

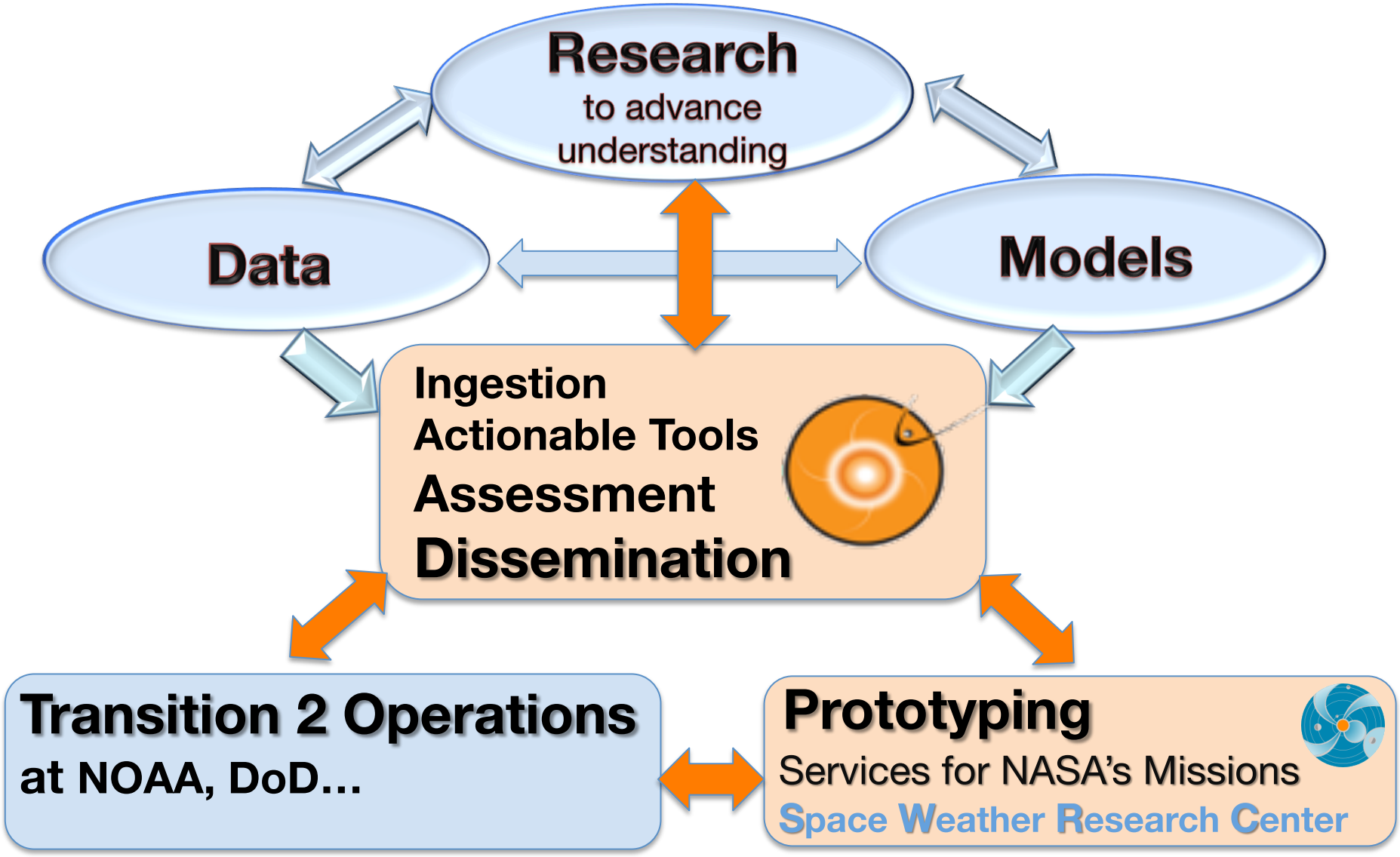


Pioneered the path from Research to Operations

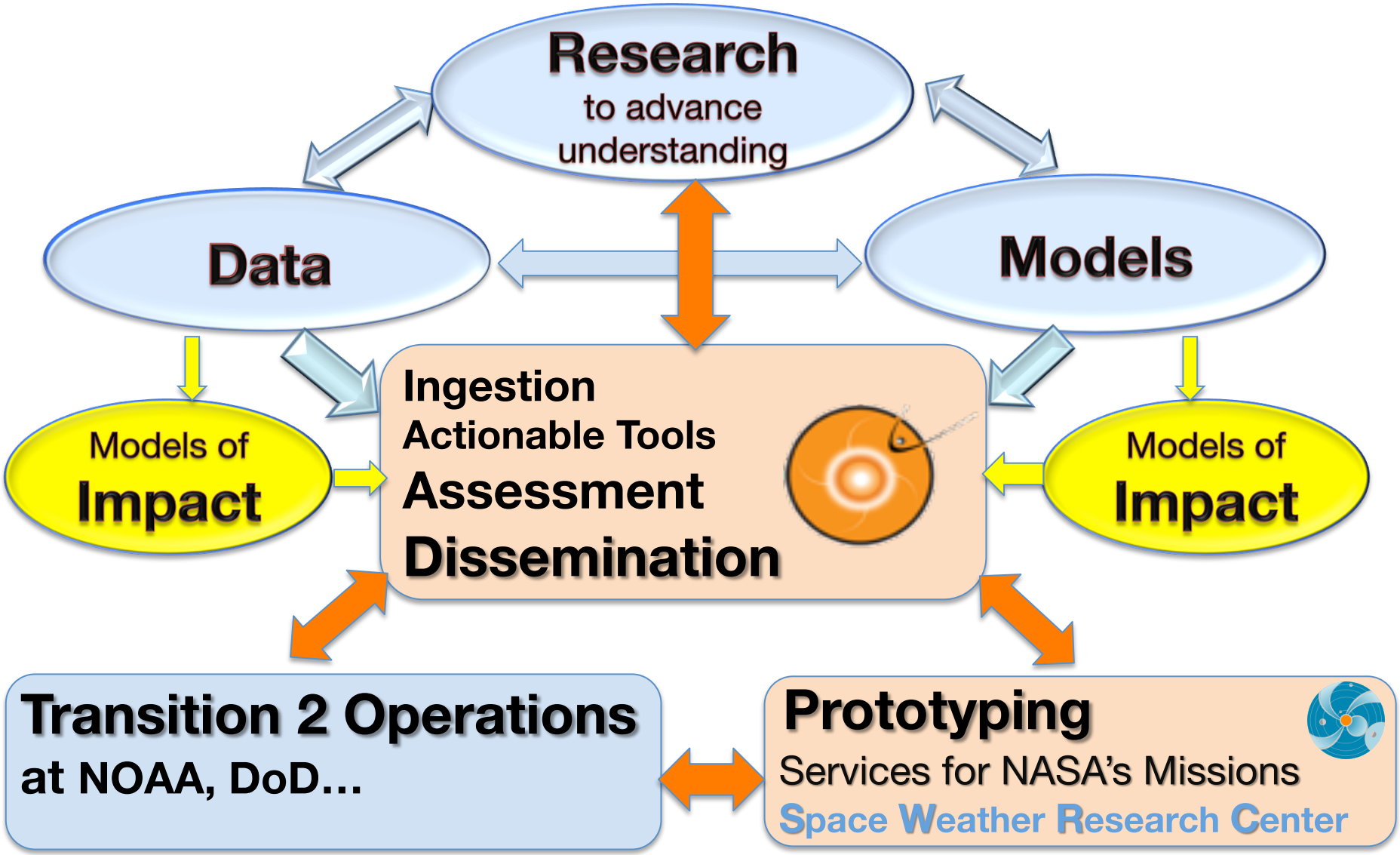
Key Elements of Space Weather Forecasting and Analysis Capability



The CCMC as a Hub for Collaborative Development of Space Weather Predictive Capability System

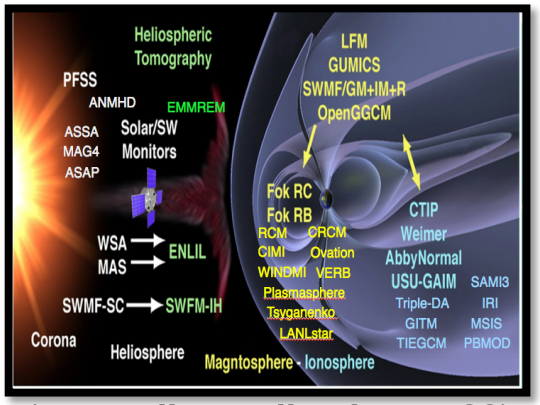


Research-Data-Models-Dissemination-Prototyping-Operations
Space Weather Predictive Capability



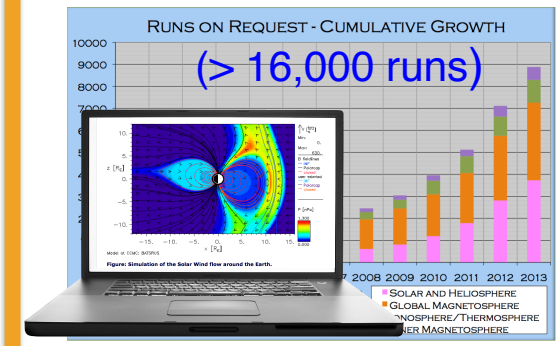
CCMC Assets & Services

Models

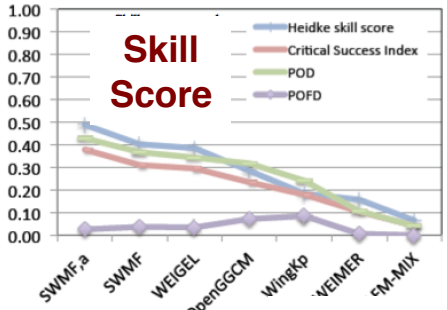


(expanding collection: > 80)

Simulation Services



Assessment



Scoreboard

Dissemination

Flexible Infrastructure
Tools, Databases
Actionable Displays

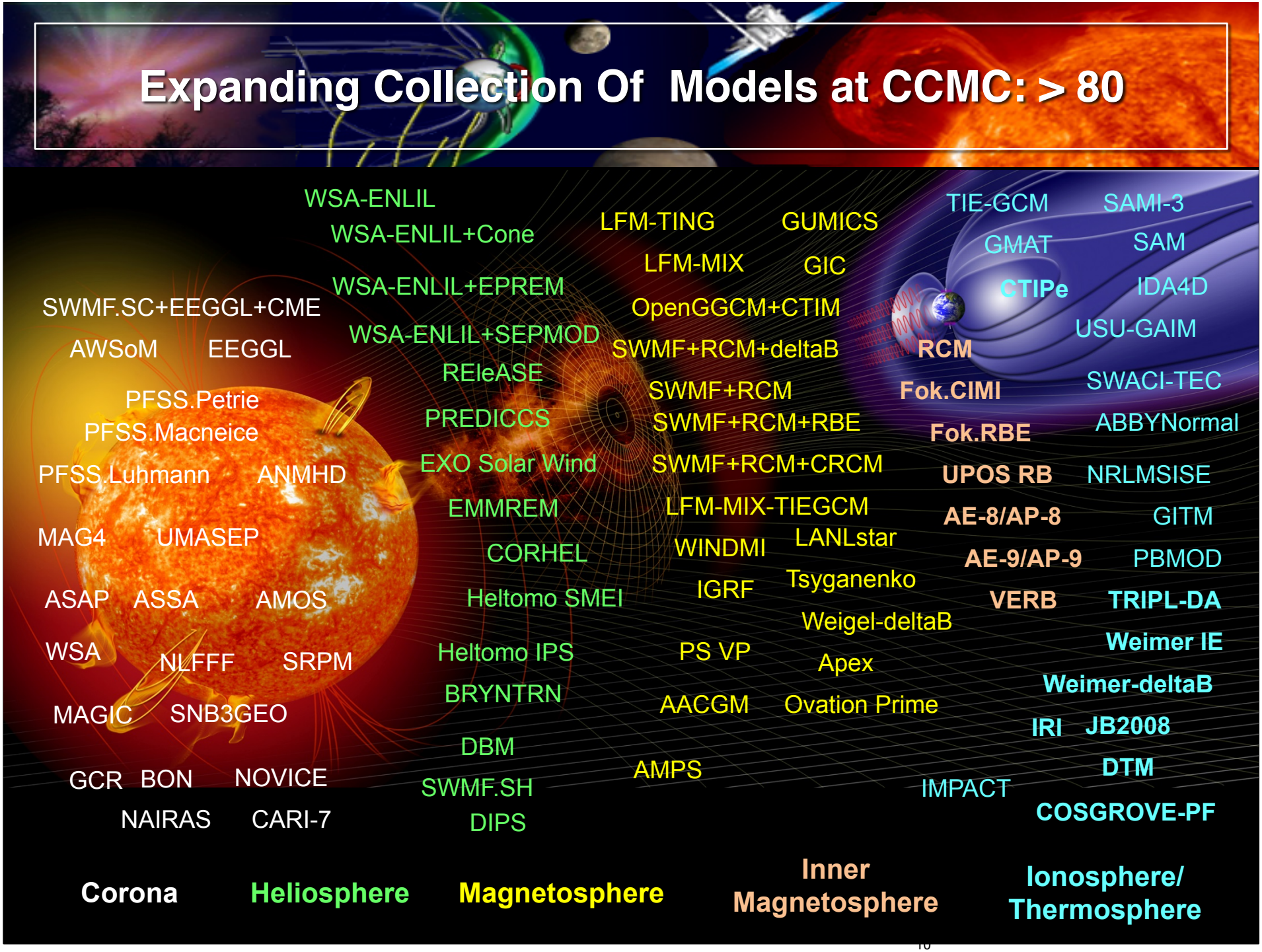
Space Weather Services

for NASA's missions

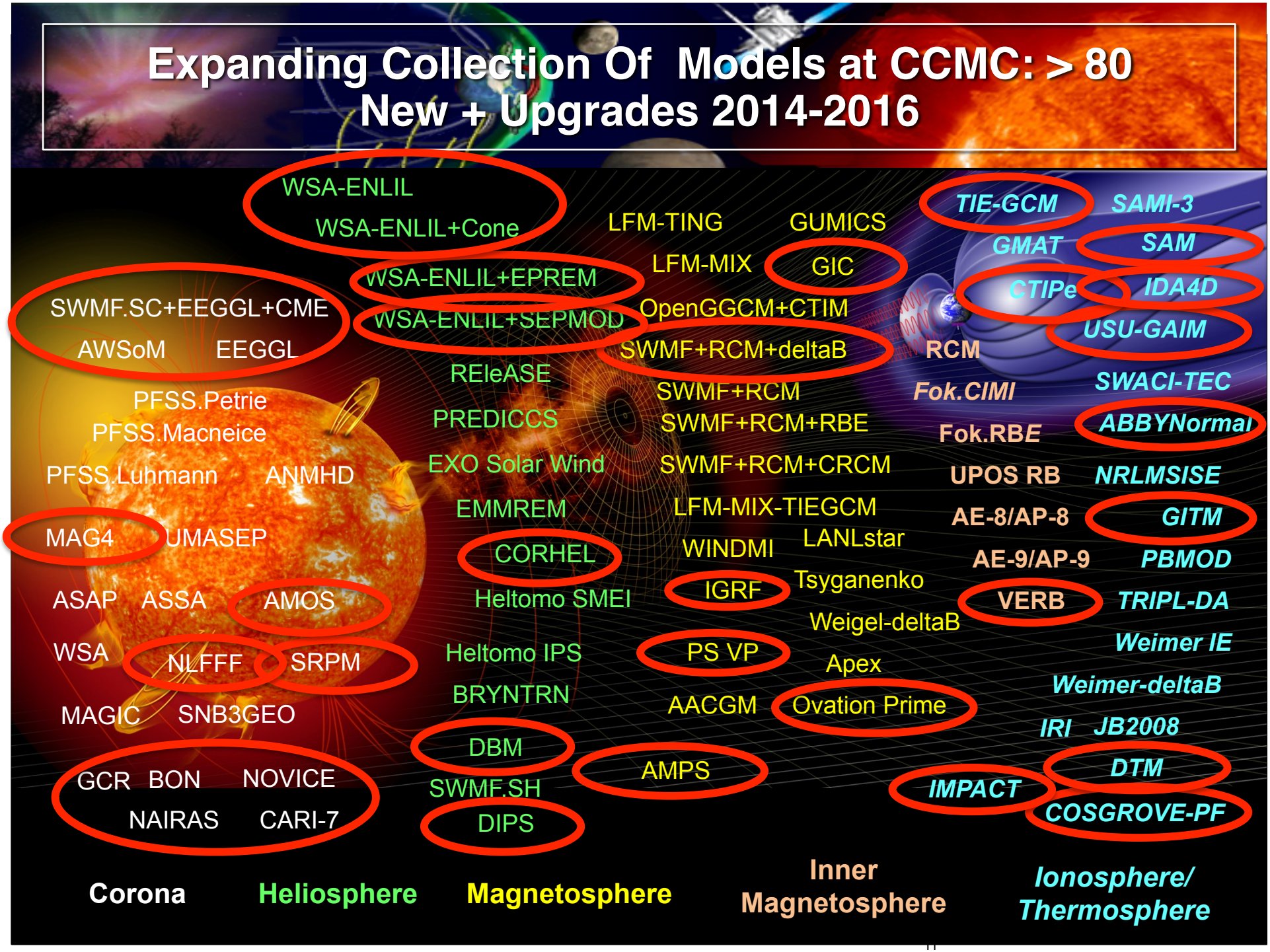
Space **W**eather
Research **C**enter

Hands-on Education

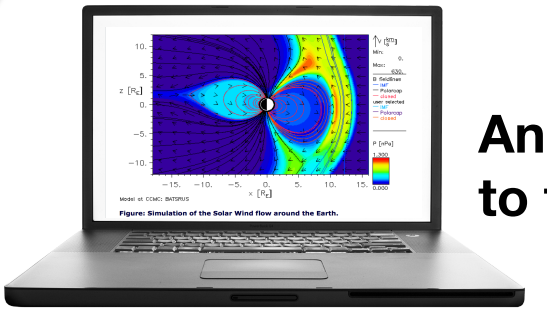
Expanding Collection Of Models at CCMC: > 80



Expanding Collection Of Models at CCMC: > 80
New + Upgrades 2014-2016



CCMC Web-Based Signature Services



Runs-on-Request System

An interactive system to serve advanced models to the international research community

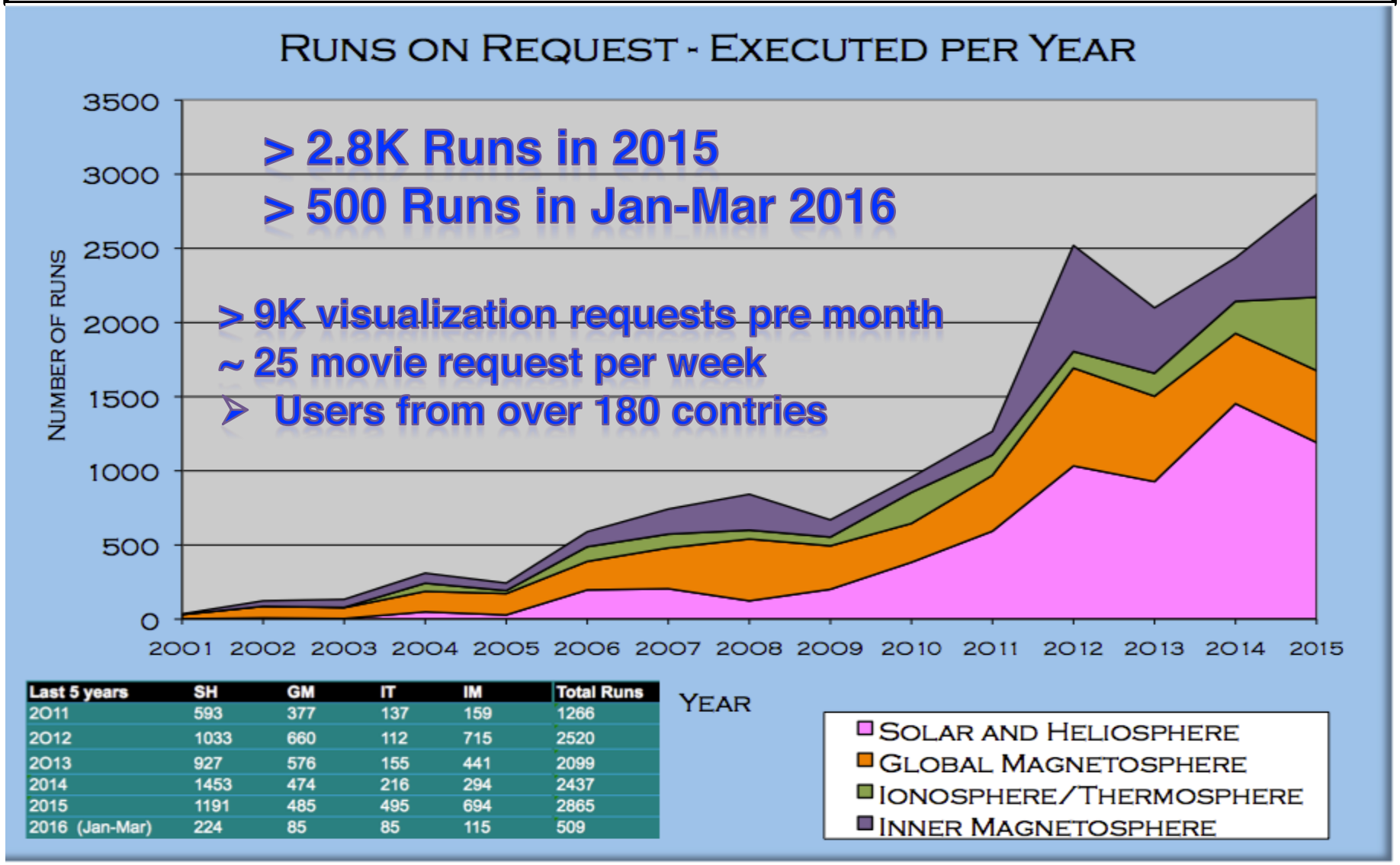
- User-configurable input parameters and settings.
- Comprehensive on-line visualization & downloads
- Users advising and custom simulations.

Integrated Space Weather Analysis System

A system for real-time space environment monitoring, event analysis, system science, and education.

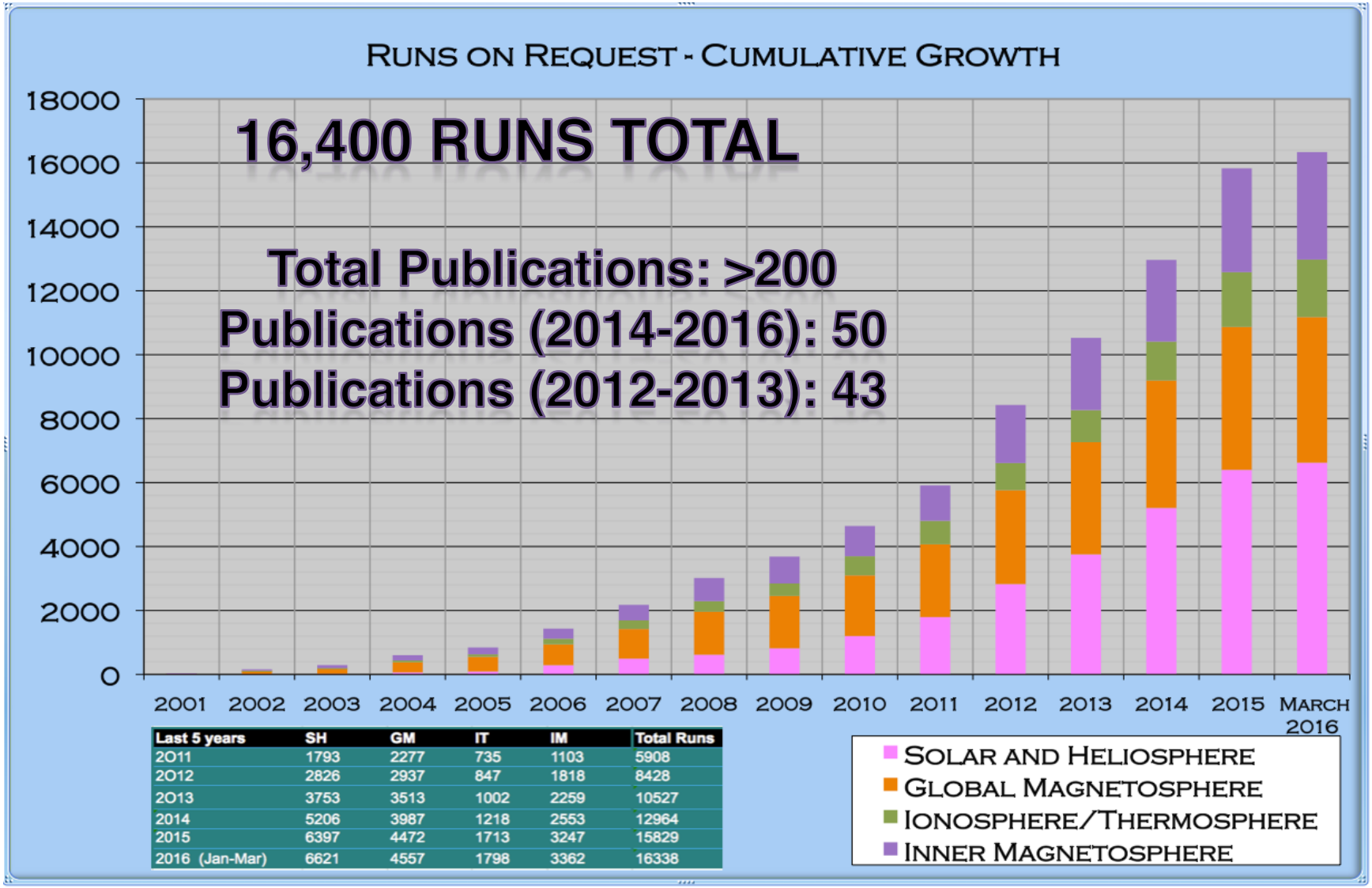
- Real-Time & Historical Model + Observational Data
- Actionable Products (Cygnets)
- User Configurable, Interactive Displays
- Web Services

CCMC Statistics: SIMULATION SERVICES



Last 5 years	SH	GM	IT	IM	Total Runs
2011	593	377	137	159	1266
2012	1033	660	112	715	2520
2013	927	576	155	441	2099
2014	1453	474	216	294	2437
2015	1191	485	495	694	2865
2016 (Jan-Mar)	224	85	85	115	509

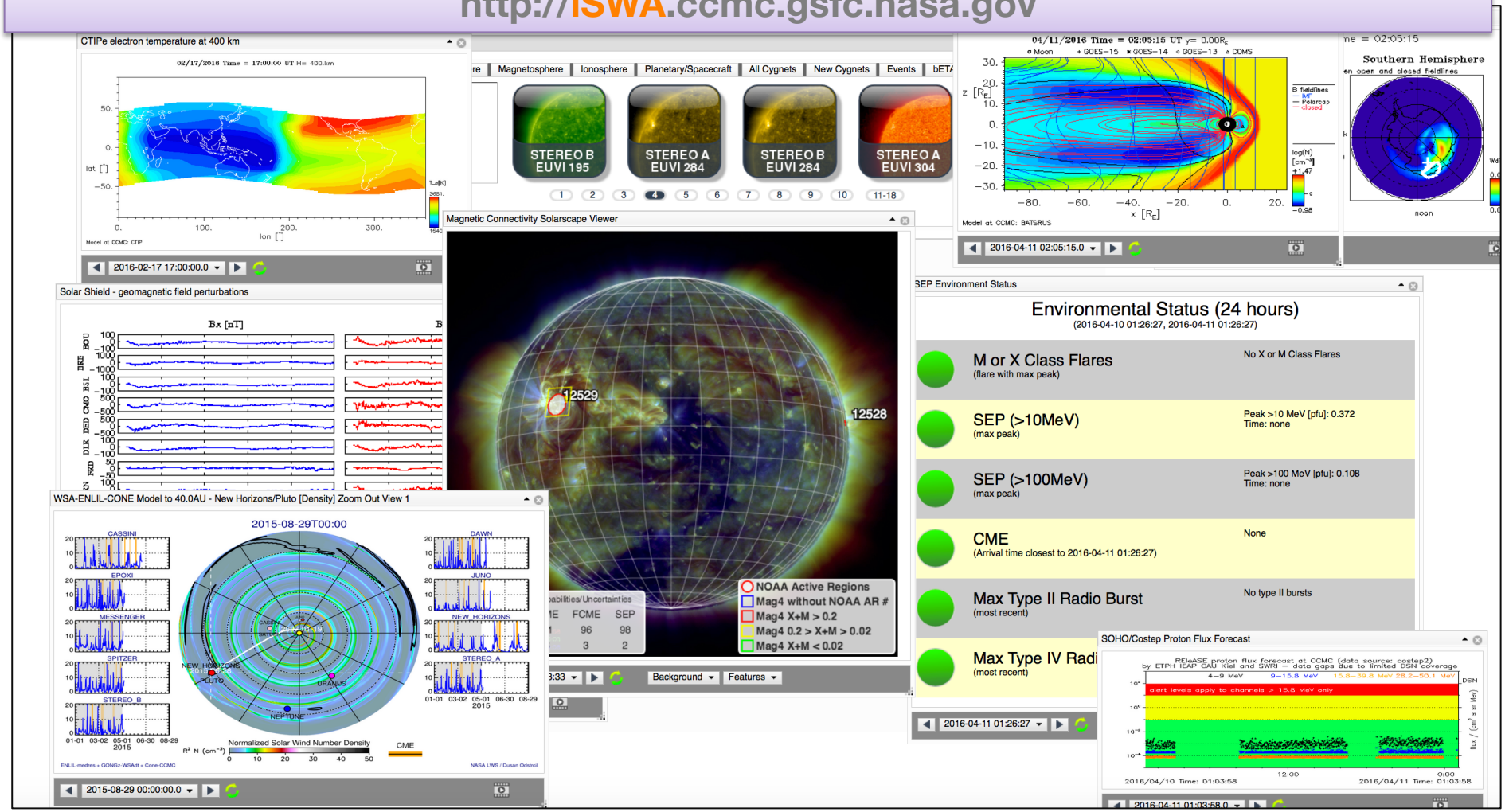
Runs-on-Request
Valuable and highly utilized resource
Usage Summary (March 2016)



Last 5 years	SH	GM	IT	IM	Total Runs
2011	1793	2277	735	1103	5908
2012	2826	2937	847	1818	8428
2013	3753	3513	1002	2259	10527
2014	5206	3987	1218	2553	12964
2015	6397	4472	1713	3247	15829
2016 (Jan-Mar)	6621	4557	1798	3362	16338

Integrated Space Weather Analysis System

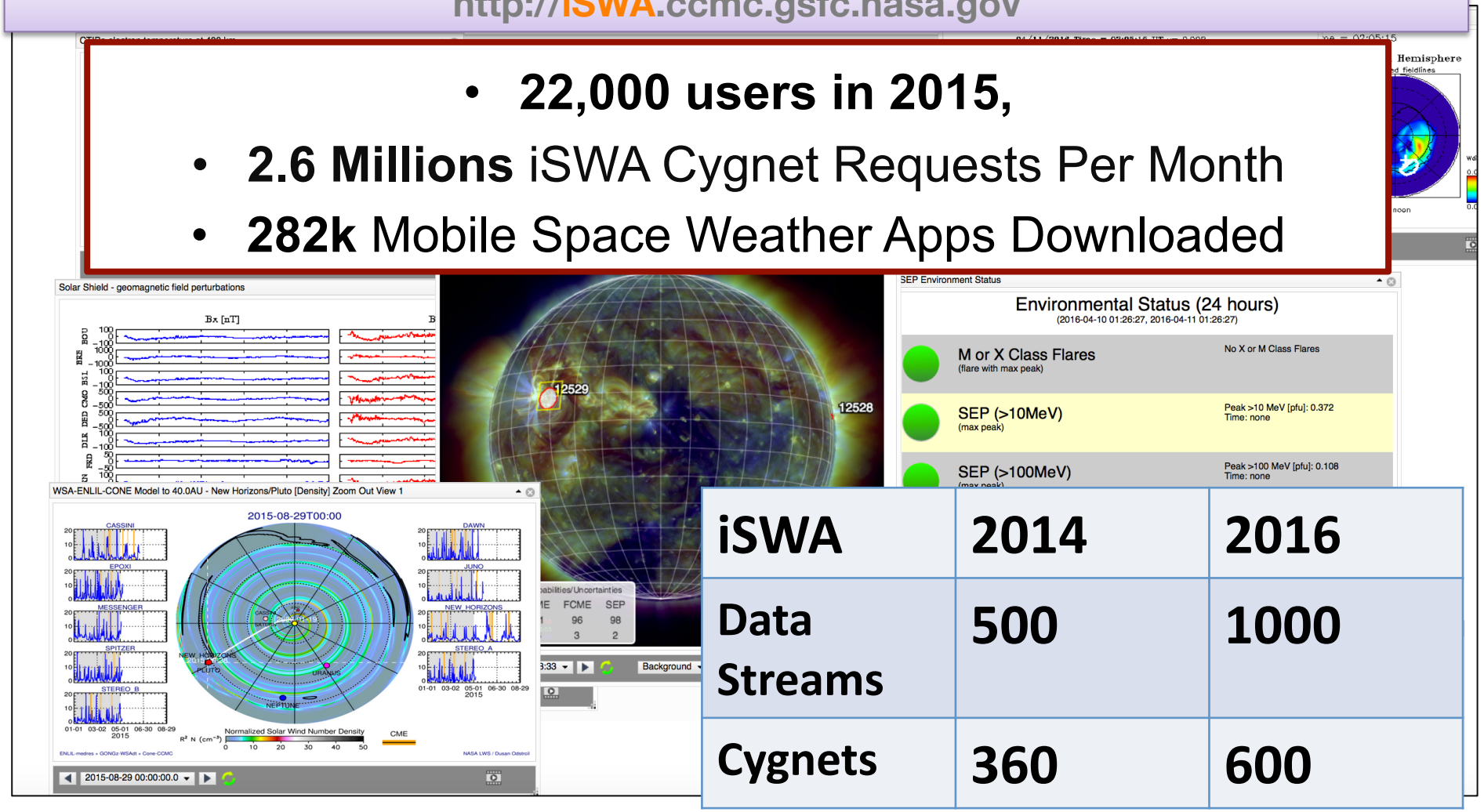
http://iSWA.ccmc.gsfc.nasa.gov



Integrated Space Weather Analysis System

http://iSWA.ccmc.gsfc.nasa.gov

- **22,000 users in 2015,**
- **2.6 Millions** iSWA Cygnet Requests Per Month
- **282k** Mobile Space Weather Apps Downloaded

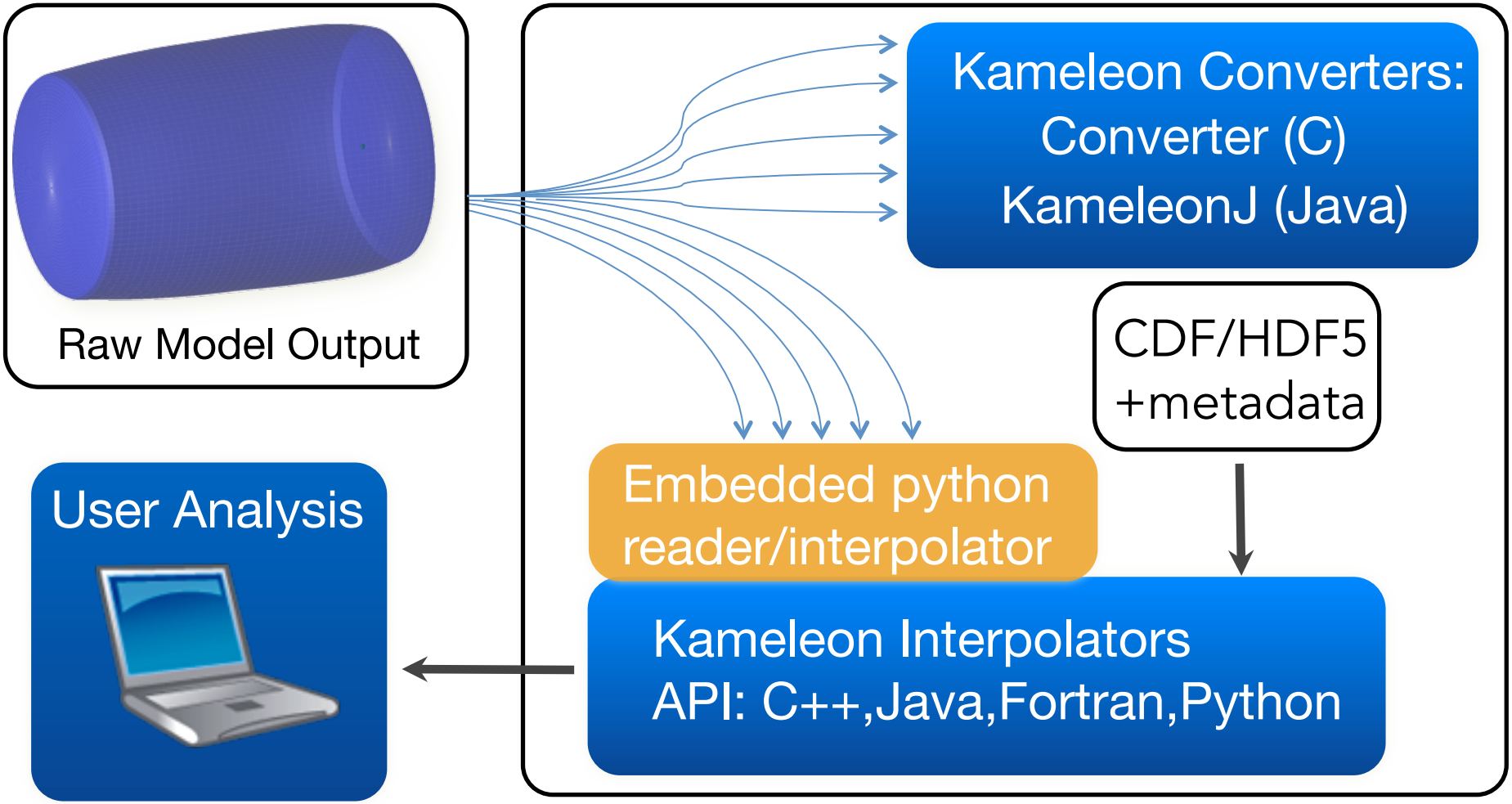


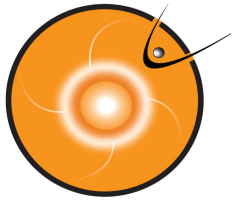
iSWA	2014	2016
Data Streams	500	1000
Cygnets	360	600

Kameleon

Metadata, Standardization, Access, Internpolation

Goal: To facilitate access to space weather models hosted at the CCMC and enable scientific discovery.





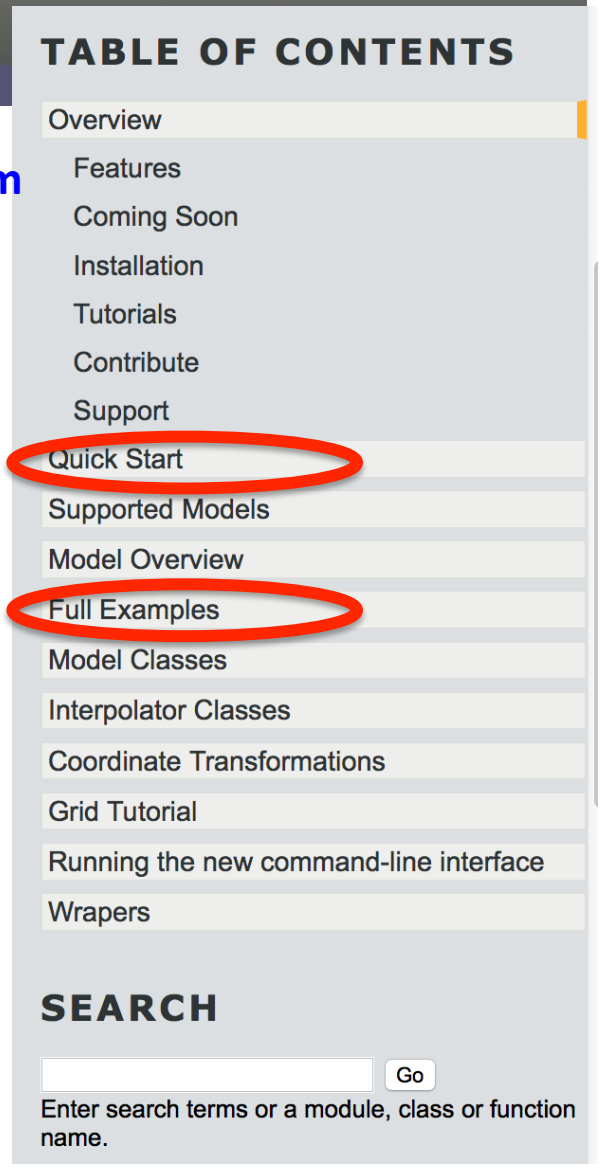
Kameleon-plus 6.0.1 documentation

http://ccmc.gsfc.nasa.gov/downloads/Kameleon/Overview.htm

- Tutorials
- Documentation
- Developer tools

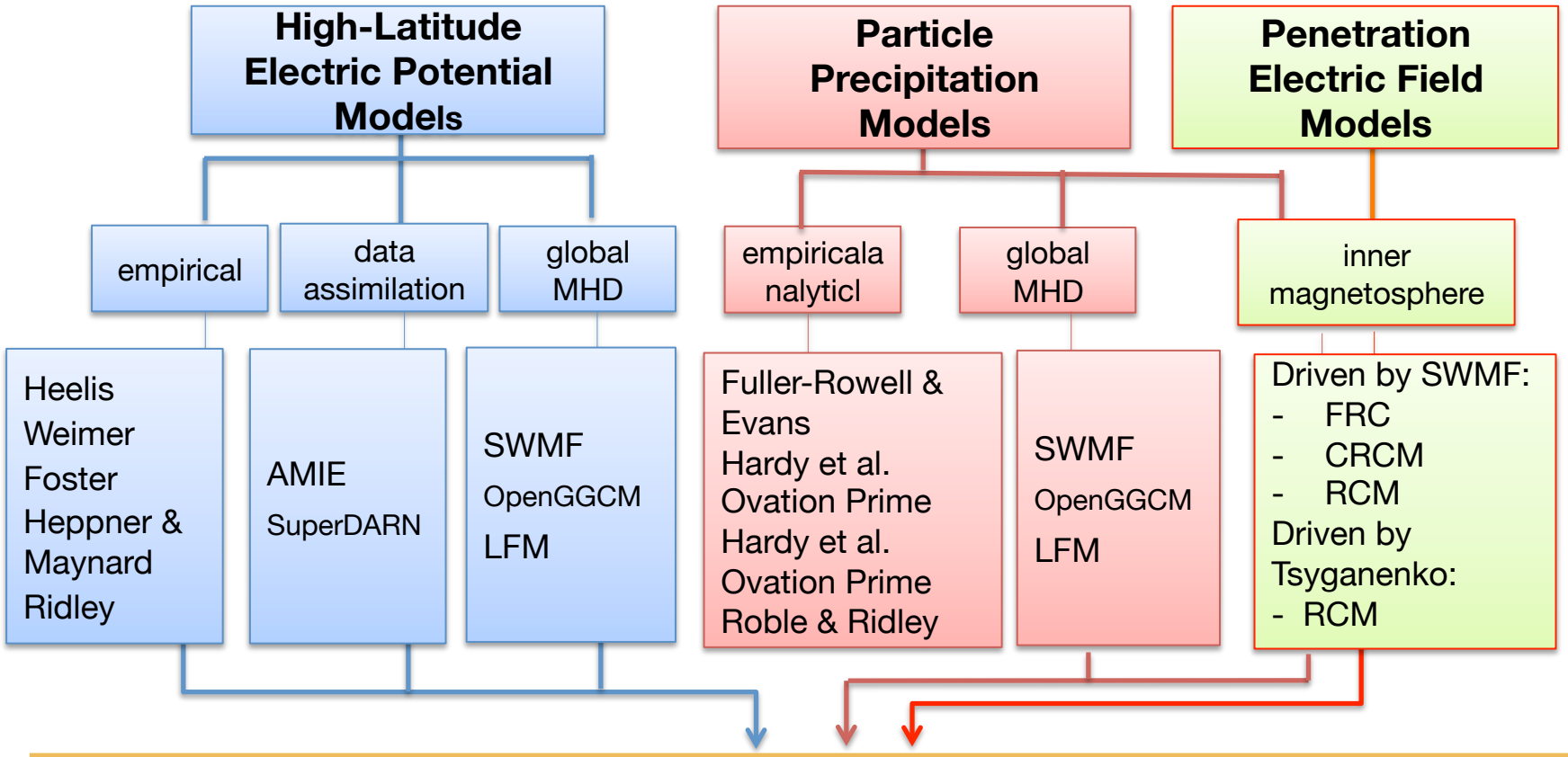
Quick installer for different platforms:

- Gets users up in running in minutes
- Precompiled libraries
- Example scripts in Python, C++, C, and FORTRAN
- Matplotlib Visualization scripts



CCMC: A. Pembroke

Mag-Iono-Coupling Patch-Panel

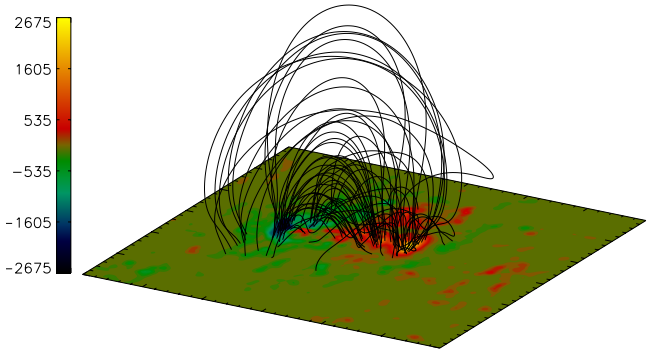


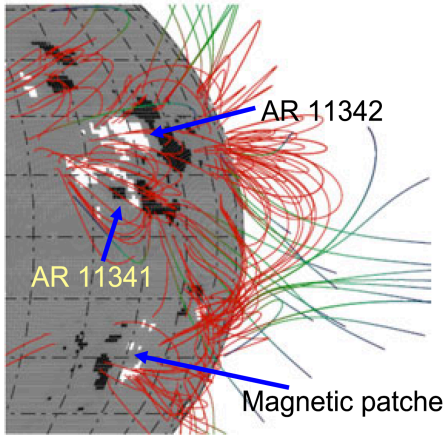
All drivers are converted to a common format.
The tool is called as a KAMELEON subroutine to provide values on the grid;
call kameleon (model, time, mlts, mlats, variables, values_output)

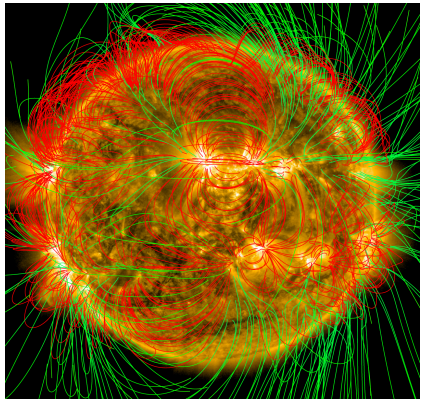
↓

Ionosphere/Thermosphere Models:
CTIPe/TIE-GCM/GITM

Non-Linear Force Free Model





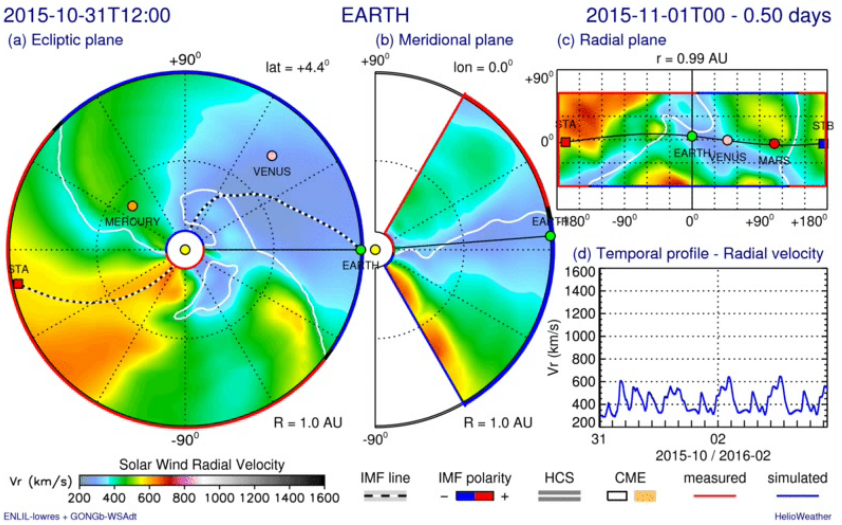


- Designed to study energy and helicity build up in flaring active regions.
- Input SDO/HMI vector magnetograms
- Application of Schuck's COADRED orbital artifact removal algorithm to HMI data
- Cartesian grid version available for use now
  - http://ccmc.gsfc.nasa.gov/requests/SH/NLFF
- Spherical & Global Grid versions – soon (June/July)
- Result Visualization (quicklook - now, interactive – soon)

Modelers: T. Asfaw, T. Weigelmann **CCMC: P. Macneice**

Towards Time-Dependent Magnetograms

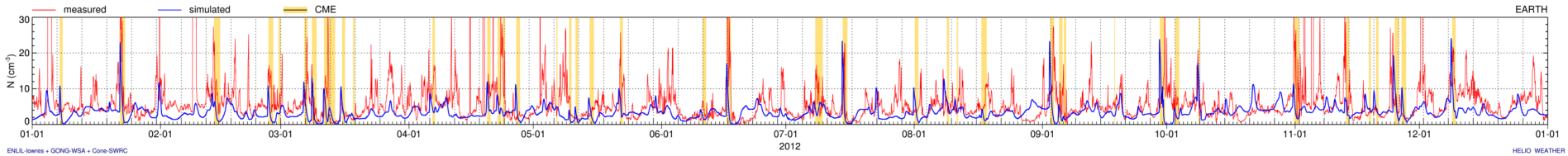
- New approaches to time evolving global photospheric field
  - Approach 1 – Time Interpolating WSA output based on hourly gong synoptic magnetograms - **Odstrcil**
  - Approach 2 – ADAPT (**Arge and Henney**) Time Interpolated Magnetograms



Progress at the CCMC:

WSA-Enlil 2.8f is installed and is offered for RoR

Simulations with time-dependent magnetograms are available for special requests;

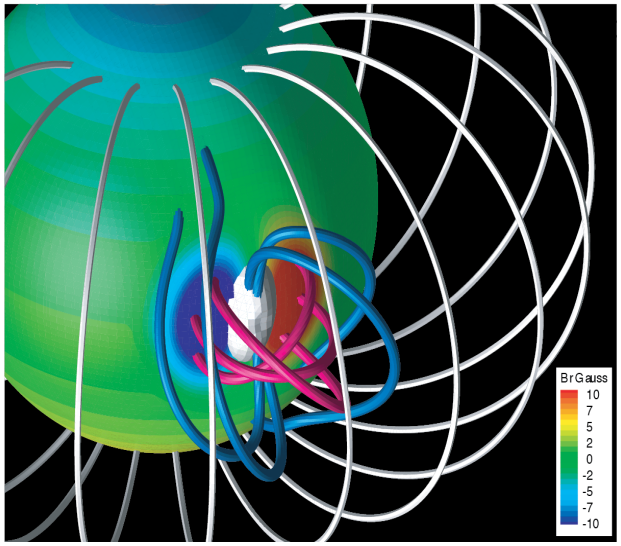


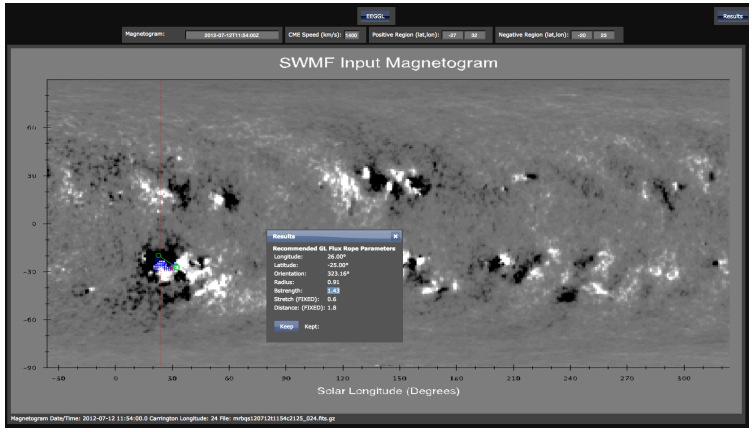
Modelers: N. Arge, C. Henney, D. Odstrcil

CCMC: P. Macneice

SWMF CME Modeling from Low Corona

- A new SWMF coronal model incorporates Semi-analytical **Threaded-Field-Line model** for the low solar corona (1 – 1.1 Rs)
- Speed up SWMF coronal simulations on factor of 100
- Uses a closed magnetic flux rope linearly superimposed on the background to initiate CME.





EEGGL Eruption Event Generator (Gibson & Low)

Use synoptic magnetograms to define location and orientation of CME flux rope.

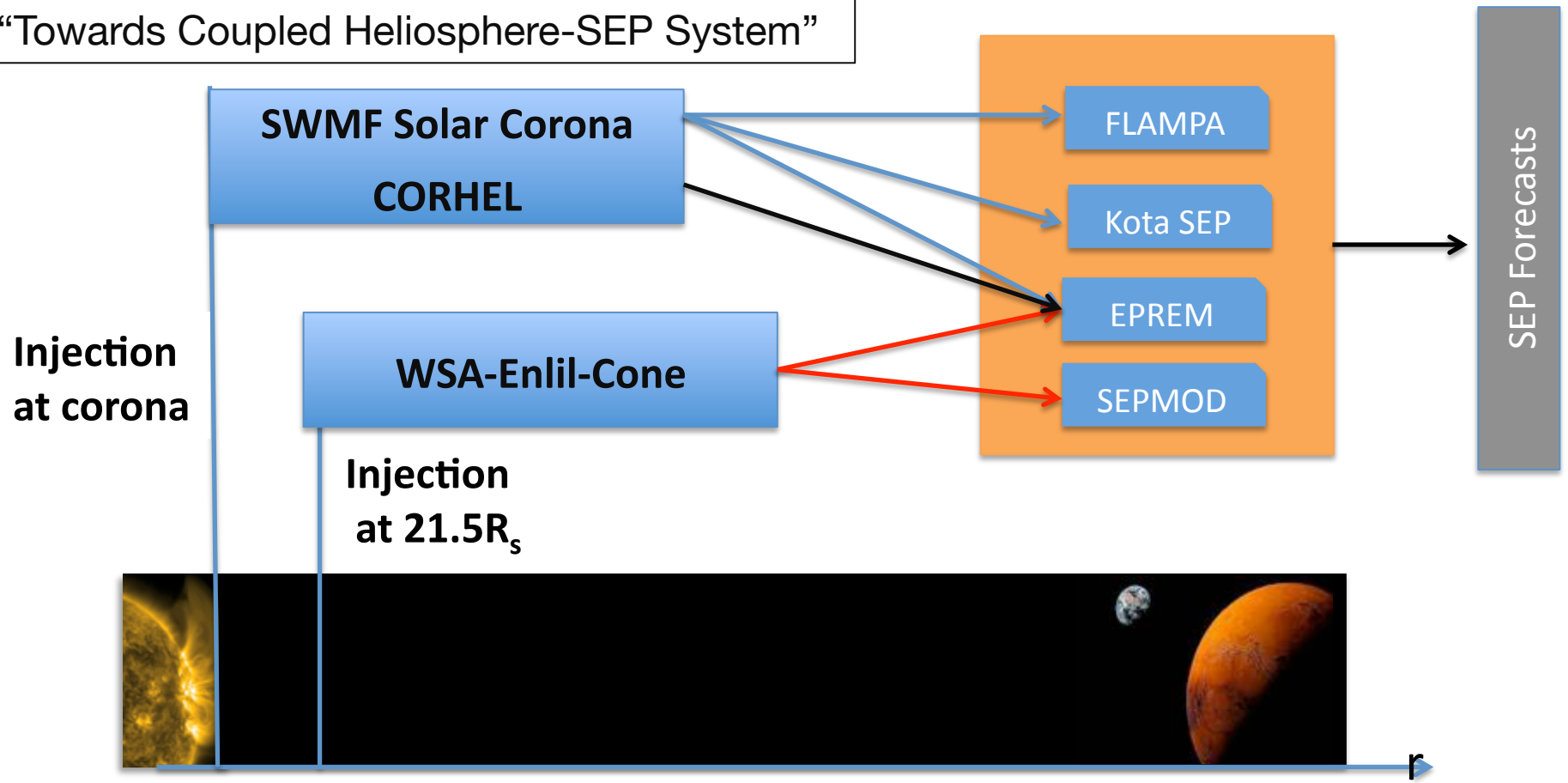
Modeler: I. Sokolov, U. of Michigan

CCMC: A.Taktakishvili, R. Mullinix

Heliosphere-SEP Modeling Patch-Panel

Monday, 5:10 pm: Matt Gorby et al.: "Modeling Particle Acceleration with Coupled MHD and Focused Transport Simulations "

Thursday, 3:55 pm: Leila Mays et al.:
"Towards Coupled Heliosphere-SEP System"

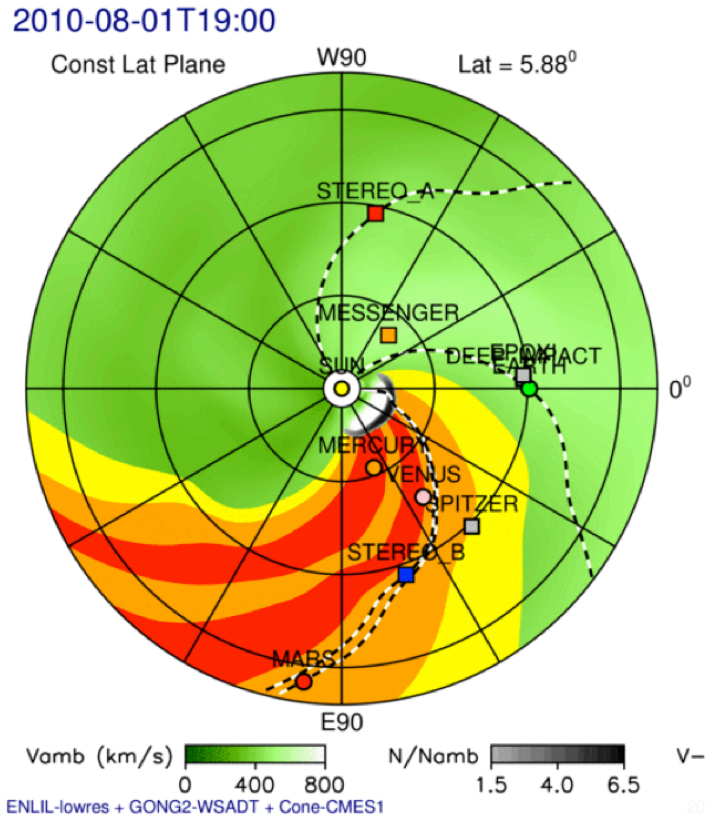


Modelers: D.Odstrcil, N.Arge, I.Sokolov, J. Luhmann, N.Schwadron, M. Gorby, J. Linker

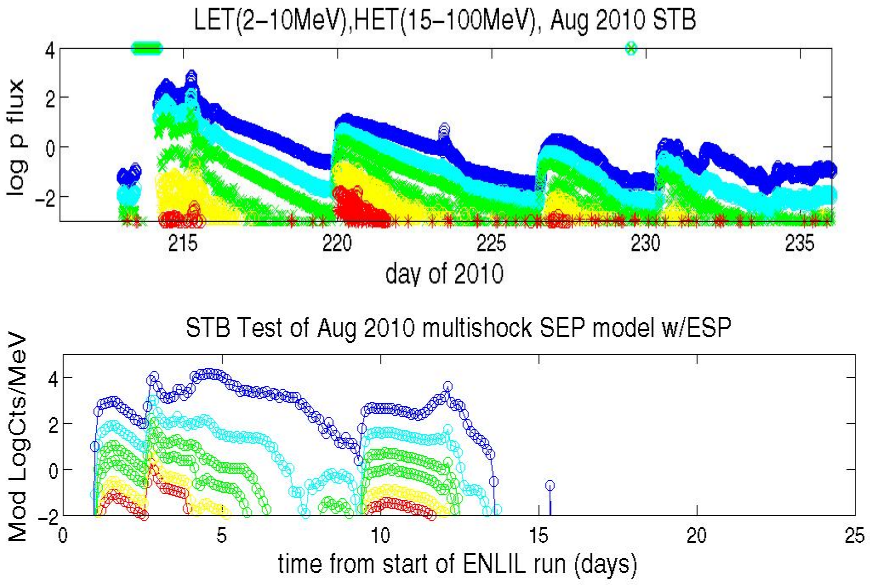
CCMC: P. MacNeice, M.L. Mays

Coupled SEP modeling at the CCMC
WSA-Enlil+SEPMOD

CCMC is facilitating some first steps to couple WSA-ENLIL with SEPMOD (model developers **D. Odstrcil** and **J. Luhmann)**



SEPMOD at STEREO B

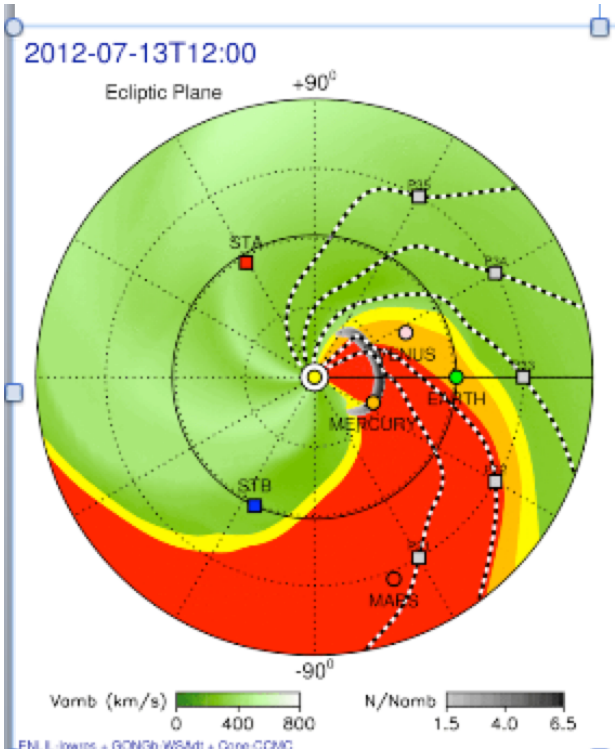


CCMC: P. MacNeice, M.L. Mays

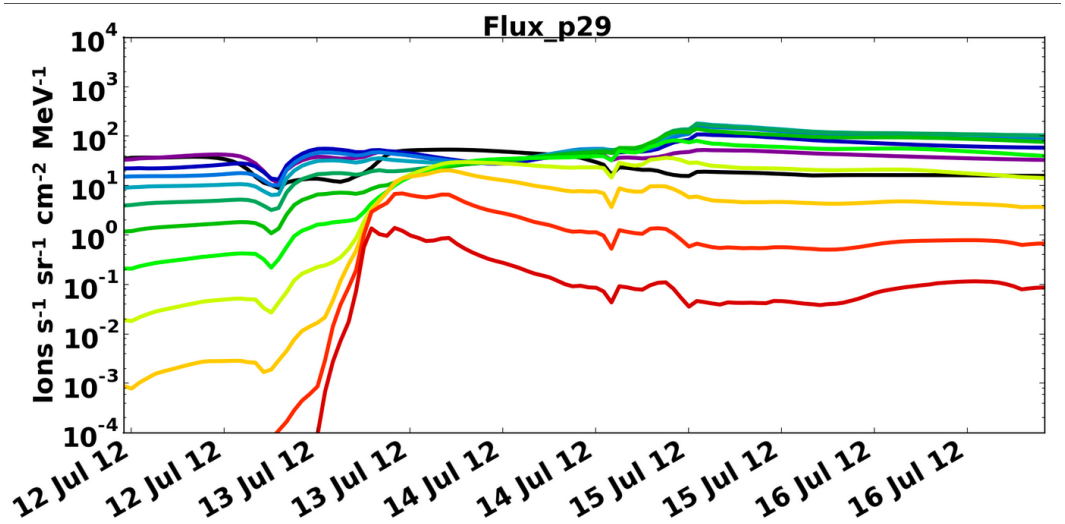
Coupled SEP modeling at the CCMC
WSA+Enlil+EPREM

CCMC is facilitating some first steps to couple WSA-ENLIL with:

– **EPREM** with model developers **D. Odstrcil, N. Schwadron** and **M. Gorby**

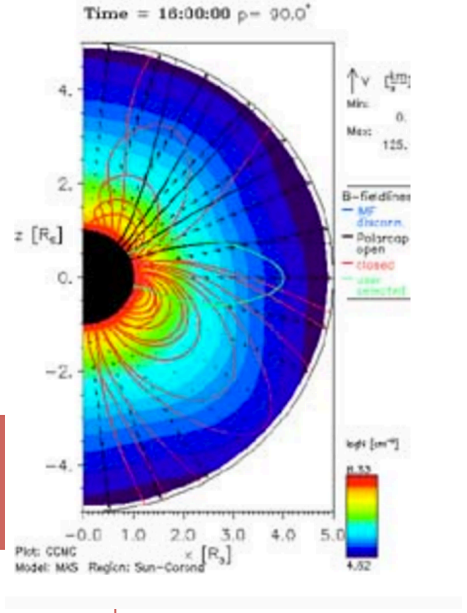


Monday, 5:10 pm: Matt Gorby et al.:
"Modeling Particle Acceleration with Coupled MHD and Focused Transport Simulations "



CORHEL Update

- Installed CORHEL V5.0.1
- Running at both CCMC and on PLEIADES



Run	Definition	Nproc	WallClock (HILO)	WallClock (Pleiades)
1	MASP, medium res	60	5 hrs 35mins	4 hrs 22mins
2	MAST, H1 Medium res	60	66hrs 13mins	Run still in progress ?
3	MAST, H2 Medium res	60	88hrs 49mins	66 hrs 15 mins (projected from incomplete run)
3+	MAST, H2 Medium res	240	-	11 hrs 56 mins

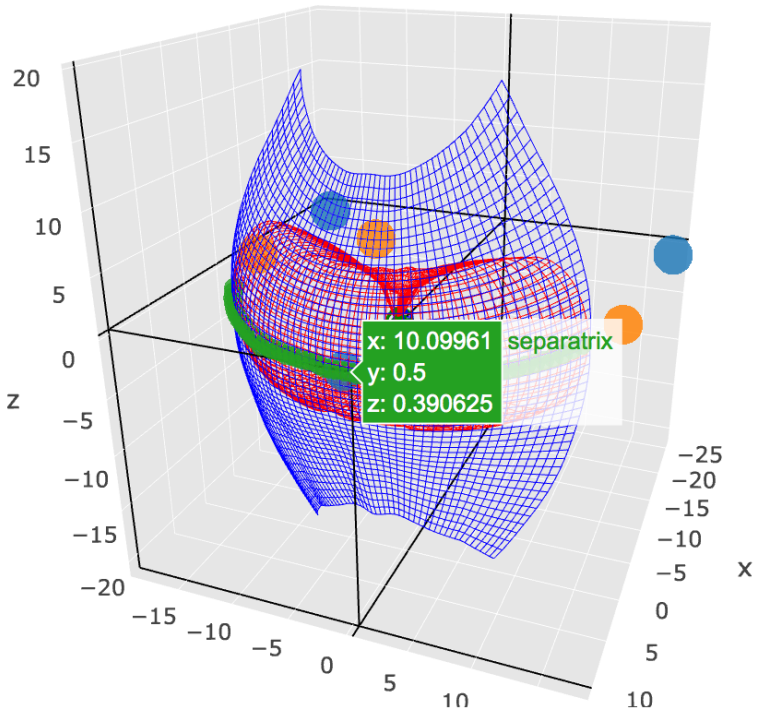
Modelers: J. Linker et al.

CCMC: P. Macneice

Global Magnetosphere Post Processing Models

RECONX, *A. Glocer (NASA/GSFC)*

Separatrix and Null Point Finder



CCMC: A. Pembroke, L. Rastaetter

AMPS: Partilce Tracer,

V. Tenishev (U. Michigan
Monday 5:45 pm:

Single particle position and velocity

X [R_E] 30.0 Y [R_E] 0.0 Z [R_E] 0.0
V_x [km/s] -400.0 V_y [km/s] 0.0 V_z [km/s] 0.0
Particle Species p

Upload file with particle position, velocity and species (X Y Z Vx Vy Vz Species) in each line:

Browse... No file selected.

The file size should not exceed 1Mb. Full path name to the particle position input file at your local disk should not contain any blank spaces or quotation marks. On DOS/Windows systems the recommended extension for the input file name is "txt". Please read the detailed **instructions on particle input file format**

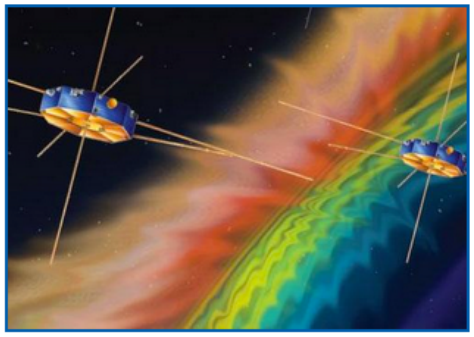
Initial particle data should be in GSM for SWMF, SM for LFM and GSE for GUMICS and OpenGGCM model runs to process

Spherical start region.

X_{center} [R_E] 0.0 Y_{center} [R_E] 0.0 Z_{center} [R_E] 0.0
Sphere Radius R [R_E] 0.0
Bulk velocity V_x [km/s] ($V=\sqrt{VX^2+VY^2+VZ^2}<298000$) -400.0 V_y [km/s] 0.0
V_z [km/s] 0.0
Tempertaure [eV] (<1 MeV) 10.
Number of particles N (≤ 1000) 100

Rectangular start region and particle distribution:

Xo [R_E] 30.0 Yo [R_E] 0.0 Zo [R_E] 0.0
X1 [R_E] 30.0 Y1 [R_E] 0.0 Z1 [R_E] 0.0
V_x [km/s] -400.0 V_y [km/s] 0.0 V_z [km/s] 0.0
Temperature T [eV] (<1MeV) 0.0
Number of particles N (≤ 1000) 100



Local Physics Models Results

LOCAL PHYSICS SIMULATION RESULTS

Perform advanced search or simple search in full database.

- **View ALL Local Physics Runs on Request**
- **View Runs for the following Model(s):**

  - ○ PAMHD
  - ○ PIC-Hesse
  - ◉ VPIC
  - ○ P3D

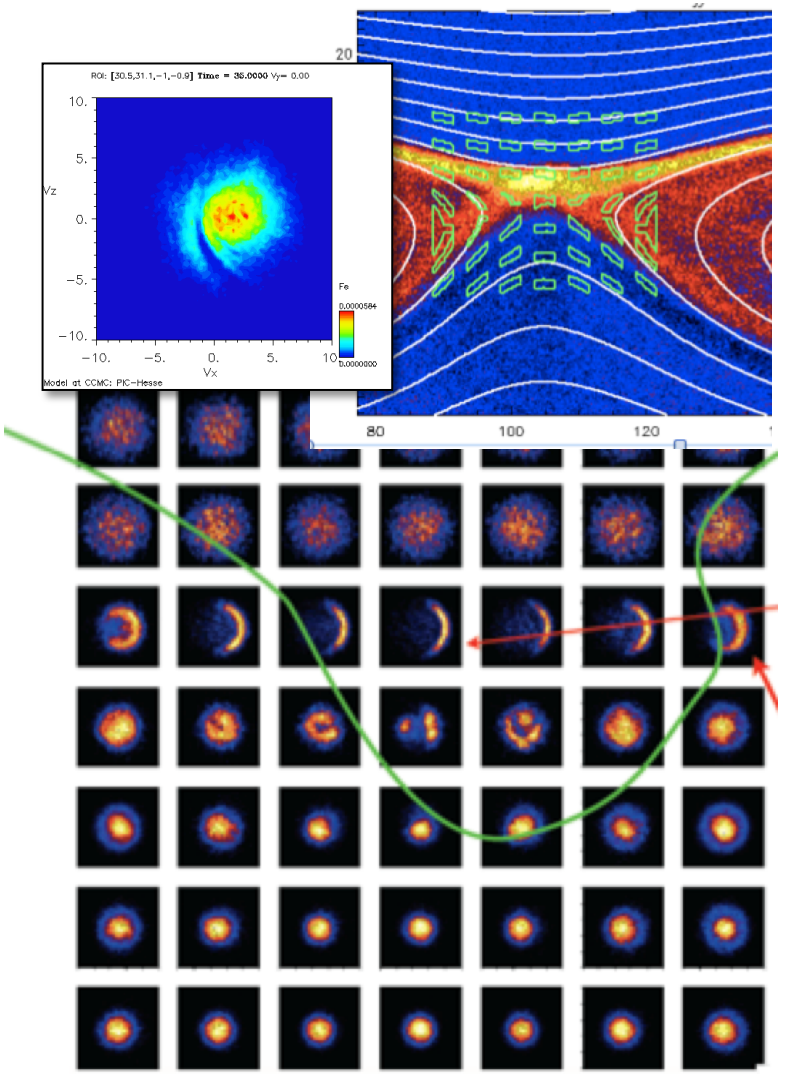
  VIEW RUNS

I. Honkonen
Wednesday, 2:00 pm
Local physics models at CCMC

Status	Run Number	Title	Key Words	Model	Model Version	Grid	Validation Level	Simulation Type
published	Vadim_Roytershteyn_20150529_LP_1	2D Asymmetric reconnection	MMS Support, 2D Asymmetric reconnection	VPIC	20150529	(1000)x(1)x(800)	0	Double Harris Sheet along X with added Bx (asymmetric B, densities and pressures)
published	Vadim_Roytershteyn_20150529_LP_2	2D Asymmetric reconnection	MMS Support, 2D Asymmetric reconnection	VPIC	20150529	(5120)x(1)x(2048)	0	Harris Sheet along X with added Bx
published	Michael_Hesse_20150219_LP_2	2D Asymmetric reconnection	MMS Support, 2D Asymmetric reconnection, SSW16	PIC-Hesse	20150219	(1000)x(1)x(800)		eet ith x tric ies s)

Results for a set of PIC simulations are available for on-line visualization

- **Fields, Plasma Parameters, Pressure Tensors (scalars, vectors, field lines)**
- **Distribution Functions (DF) Selection by Region-of-Interest (RoI).**
- **DF generation on request in RoI specified by user.**
- **Opportunity to modify simulation settings through Runs-on-request.**



Yi-Hsin Liu, L. Rastaetter et al.
Wednesday, 2:15 pm
Opportunities for expanding
kinetic simulation services at the CCMC

Assessments, Metrics, & Validation

Forecasting Methods ScoreBoards

Testing predictive capability before the event onset.

Examples:

CME Arrival Prediction
Storm onsets
Flare Forecasts
SEP Forecasts

Event-Based M&V to Trace Model Improvement

[2003] 10/27 - 10/30
[2006] 12/13 - 12/16
[2010] 04/04 - 04/07
[2011] 08/05 - 08/07

.....

A list of events.
High quality data.
A library of metrics.

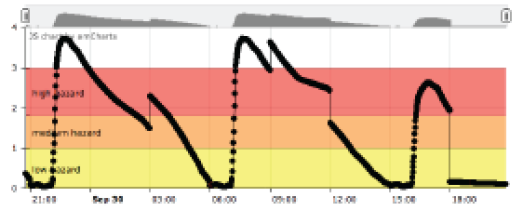
Simulate the same set of events over and over…

Examples:

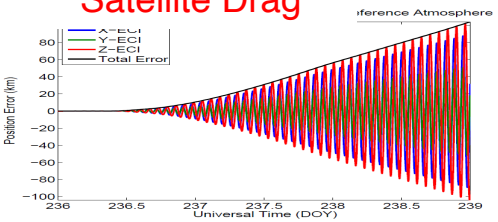
TEC, Neutral density, Auroral boundaries, Ground magnetic perturbations dB/dt

Correlate Impacts with Space Environment Events

Surface Charging



Satellite Drag



Components:

• database of space environment impacts
• database of events & forecasts

Ensemble Forecasting of Space Weather Events Onset

- Collecting and displaying event forecasts from multiple models & different sources in a **Scoreboard**
- Generate experimental international community-wide ensemble forecasts.
- Demonstrate operational potential to users.

Testing Predictive Capabilities Before Event Onset

ScoreBoard Discussion Meeting
Thursday, 5:30 pm

CME Arrival Prediction Scoreboard

- Initiated in 2013
- There are currently **19 registered methods** predicting CME arrival time, including entries from the CCMC, NOAA/SWPC, UK MetOffice, KSWC, SIDC
- Total CMEs in ScoreBoard: **108**

2016: 8 2015: 32 2014: 46 2013 (march start): 22

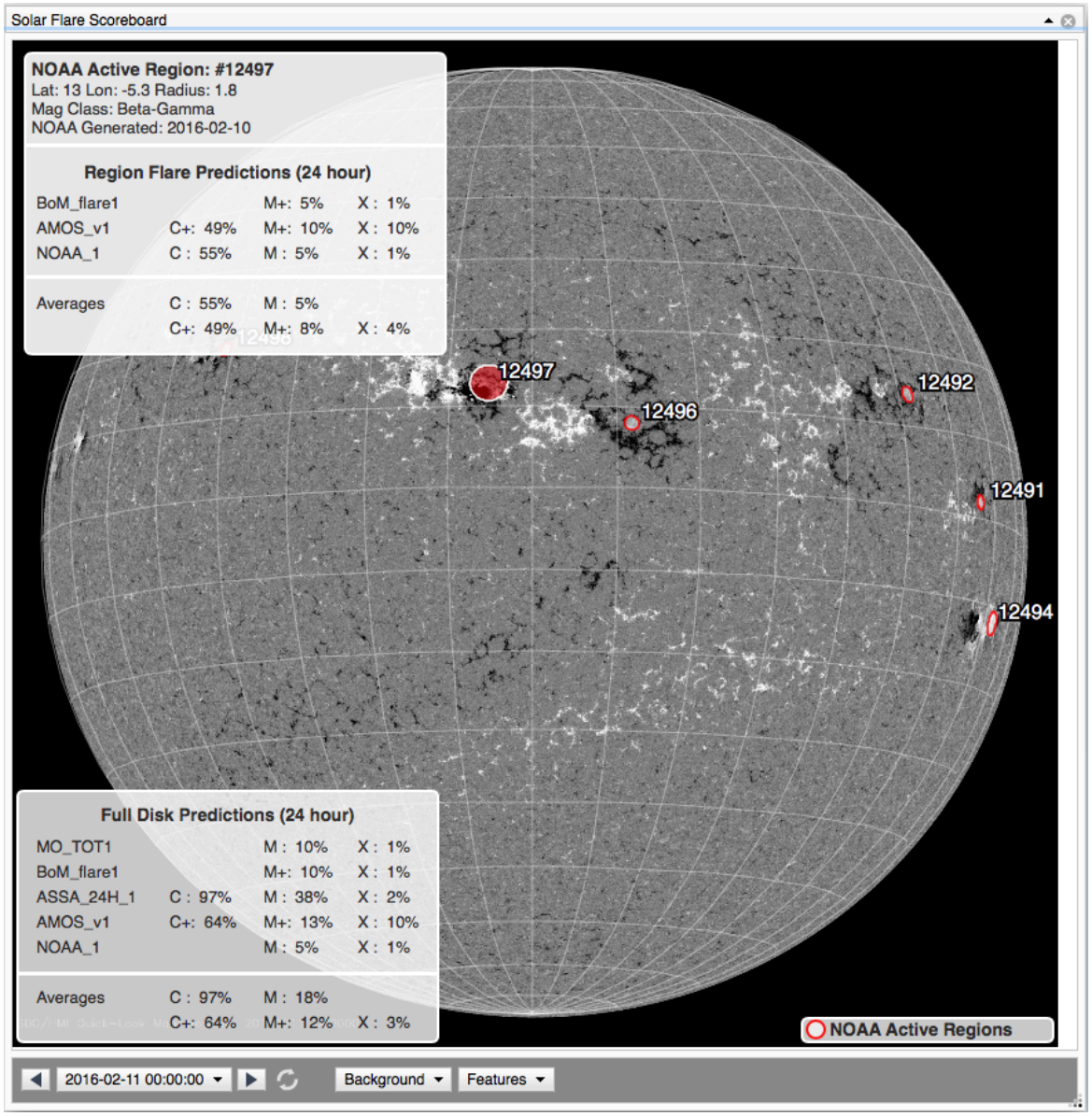
CME: 2015-06-21T02:48:00-CME-001

Actual Shock Arrival Time: 2015-06-22T17:59Z

Observed Geomagnetic Storm Parameters:
Max Kp: 8.0
Dst min. in nT: -195
Dst min. time: 2015-06-23T05:00Z
CME Note: From near disk center, AR 12371. Associated with M-class flares.

Predicted Shock Arrival Time	Difference (hrs)	Confidence (%)	Submitted On	Lead Time (hrs)	Predicted Geomagnetic Storm Parameter(s)	Method
2015-06-22T17:00Z (-12.0h, +12.0h)	-0.98	90.0	2015-06-21T10:26Z	31.55	Max Kp Range: 4.0 - 8.0	Other (SIDC)
2015-06-22T21:00Z	3.02	----	2015-06-22T01:00Z	16.98	Max Kp Range: 5.0 - 8.0	WSA-ENLIL + Cone (Met Office)
2015-06-22T21:43Z (-7.0h, +7.0h)	3.73	100.0	2015-06-22T03:25Z	14.57	Max Kp Range: 6.0 - 8.0	WSA-ENLIL + Cone (GSFC SWRC)
2015-06-22T19:03Z (-5.15h, +3.33h)	1.07	100.0	2015-06-22T03:32Z	14.45	Max Kp Range: 7.0 - 8.0	Ensemble WSA-ENLIL + Cone (GSFC SWRC)
2015-06-22T23:00Z (+7.0h)	5.02	100.0	2015-06-22T06:28Z	11.52	----	DBM
2015-06-22T22:50Z (-5.0h, +8.0h)	4.85	----	2015-06-22T09:20Z	8.65	----	ElEvo
2015-06-22T14:00Z	-3.98	----	2015-06-22T15:23Z	2.60	Max Kp Range: -- - 7.0	WSA-ENLIL + Cone (NOAA/SWPC)
2015-06-22T19:48Z	1.82	97.5	---	---	Max Kp Range: 5.5 - 7.8	Average of all Methods

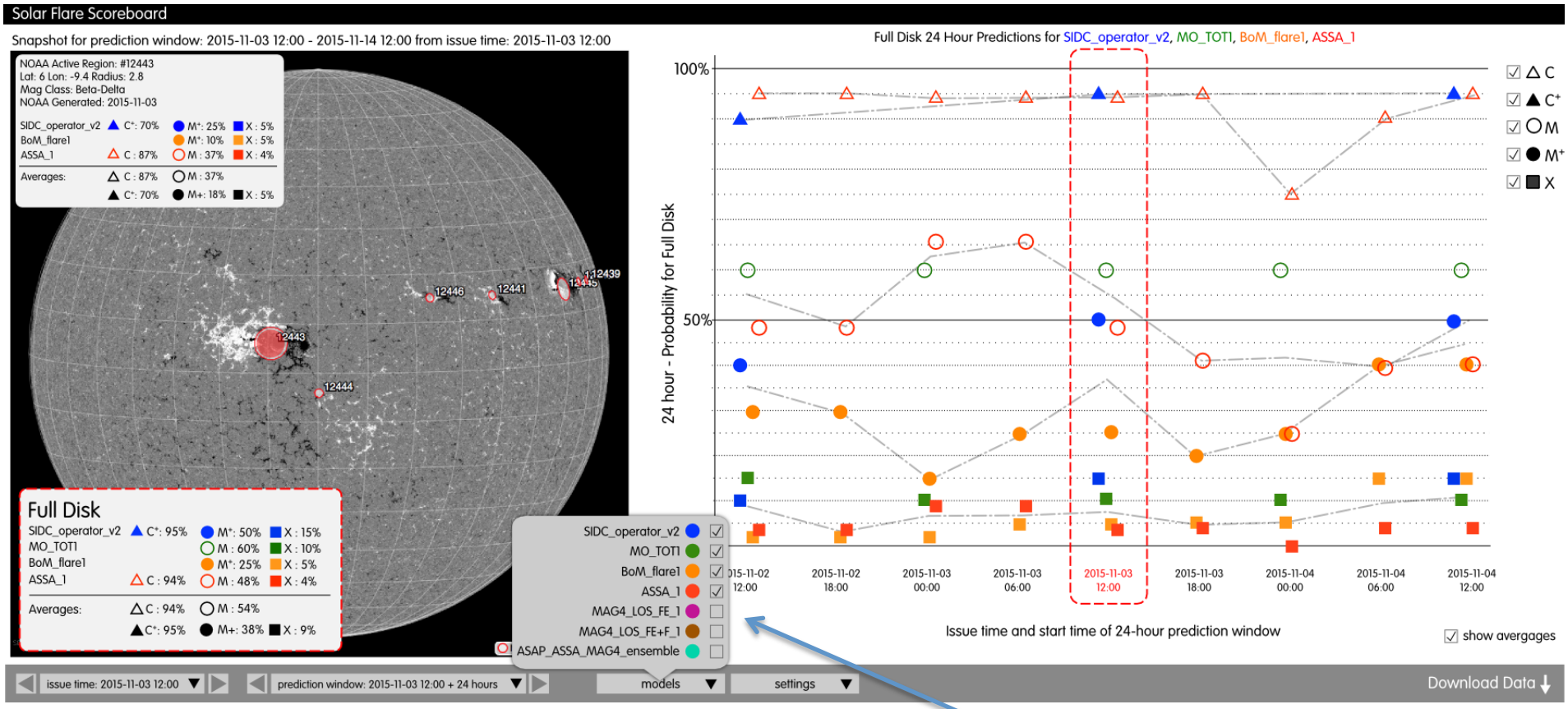
Flare Scoreboard: Ensemble Solar Flare Forecasts



Flare Scoreboard

Activity initiated in Nov 2014

Coming soon: http://ccmc.gsfc.nasa.gov/challenges/flare.php

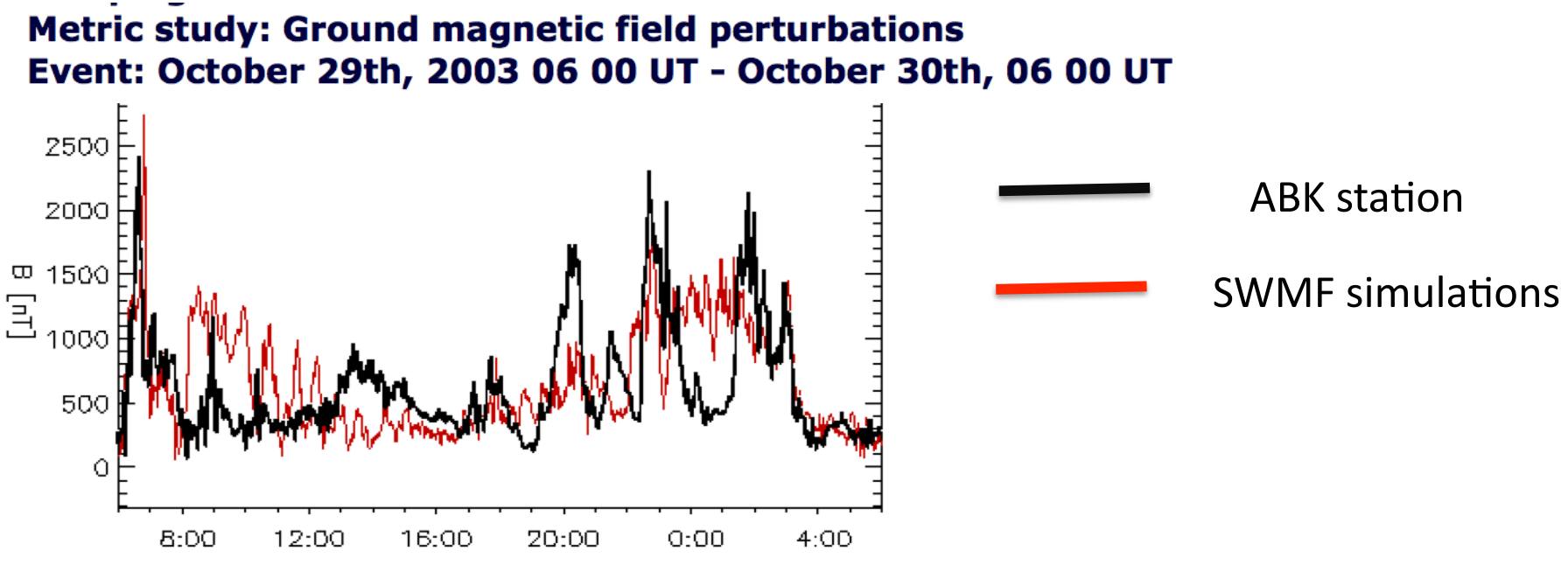


7 models, more are coming

Met Office · Royal Observatory of Belgium · RRA Korean Space Weather Center · Australian Government Bureau of Meteorology · University of Bradford · The University of Alabama in Huntsville

Assessment
is a Challenging Research Task

Example of discouraging & misleading Skill Scores

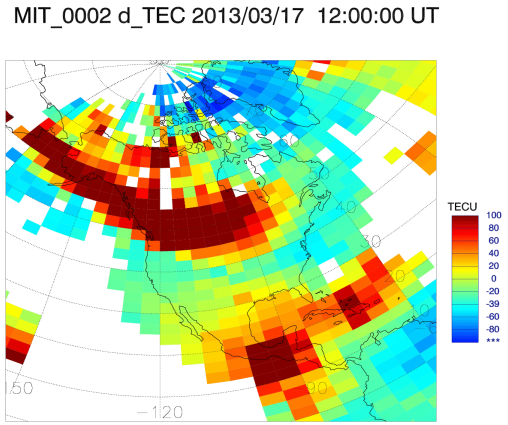


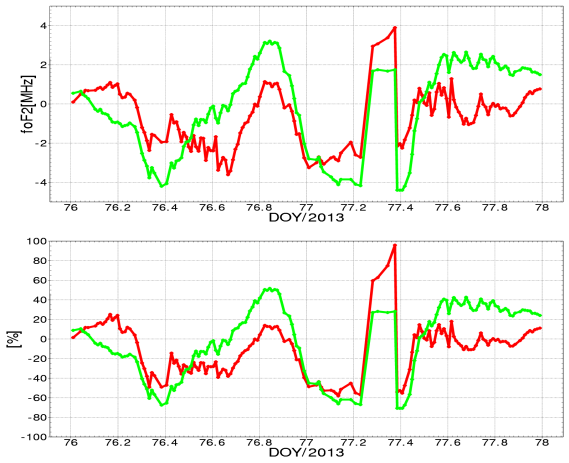
Negative Prediction Efficiency (based on RMS): **- 0.2**
(model performance is worse than "no perturbations" benchmark)

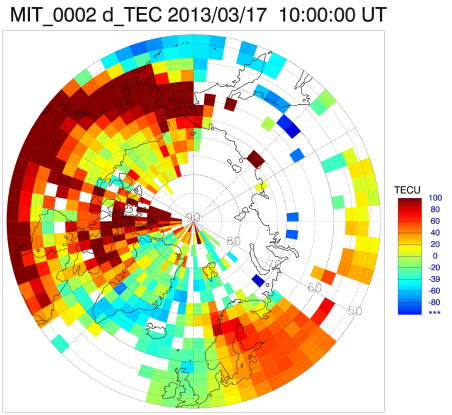
Metrics should reflect state-of-the-art and quantify useful information that can be derived from the model

Event-Based M&V Challanges

- Community-wide Modeling Challenges.
  - GEM (2008) – Magnetosphere,
  - CEDAR (2009) - Ionosphere
- CCMC facilitates Challenges and serves as a hub for collaborative development:
  - Organize discussion meetings, sessions, workshops.
  - **Develop web interfaces and analysis tools, maintain archives.**



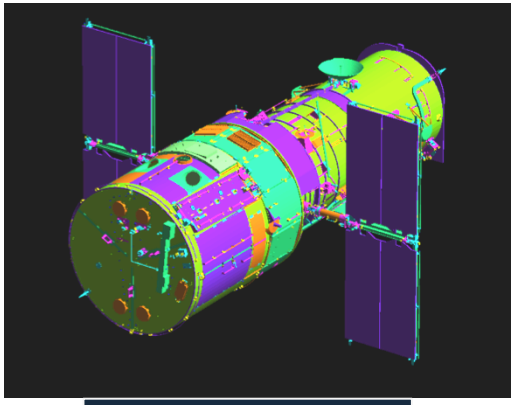




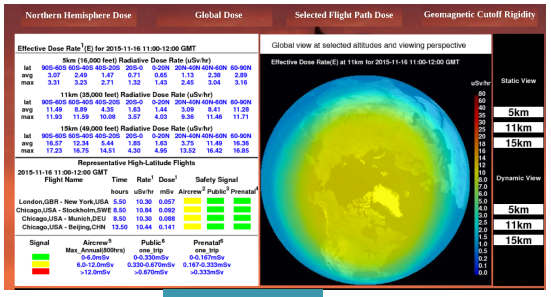
Ja Soon Shim et al, Thursday, 2:30 pm

Connecting Space Environment to Space Weather Impacts: Radiation Effects

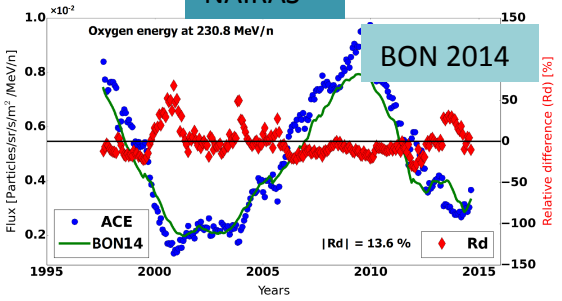
- **NOVICE**
  - Radiation effect code for spacecraft and/or component in complex geometries
- **NAIRAS** (Nowcast of Atmospheric Ionizing Radiation System)
  - Models and assesses radiation exposure levels for aviation from GCRs and SEPs
- **CARI-7**
  - Calculates radiation dose from GCRs received by airline passengers/crews
- **Badhwar-O'Neill (BON) 2014 GCR model**
  - Latest Badhwar-O'Neill model of Galactic Cosmic Rays



HST from NOVICE



NAIRAS



Modelers: , M. Xapsos, C. Martens, K.Copeland, P. O'Neill, S. Golge

CCMC: Y.Zheng

Space Environment Effects (SEE) Database

Database **O**f **N**otifications **K**nowledge **I**nformation (DONKI)

Allow mission specialists to submit SEE reports

Space Environment Effect Report Form

Project/Spacecraft Name: --- Select ---
System:
Orbit Type:
Enter SE Effect Time in UT (yyyy-MM-dd'T'HH:mm:ss'Z' i.e. 2012-02-02T05:30:00Z

--- Select ---
Chandra X-ray Observatory
International Space Station
Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations

--- Select ---
atomic oxygen
drag
radiation event
spacecraft charging
undefined

Space Environment Effect Report
Activity ID: 2012-03-07T05:30:00-CHANDRA-RAD-001
Project/Spacecraft Name: Chandra X-ray Observatory
System: instrument
Orbit Type: Elliptical
Effect Time (UTC): 2012-03-07T05:30:00Z

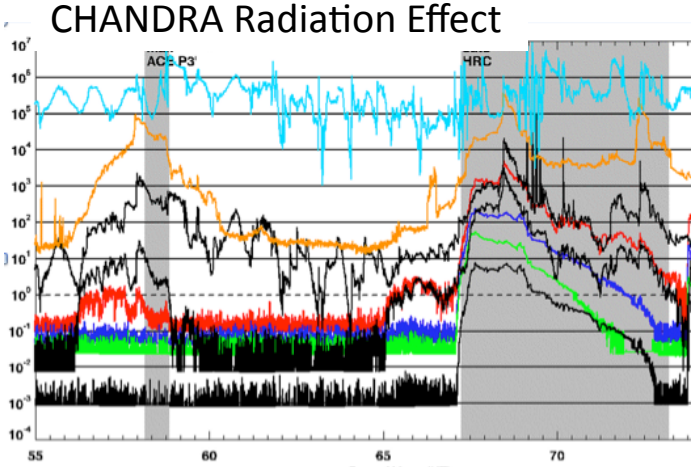
Search Space Environment Effect and Anomaly Archive

Allow users to search SEE archive

Report Type:
(Optional) Search start date from (e.g. 2013-01-31) : 2012-03-07
(Optional) Search end date to (e.g. 2013-06-30) : 2014-03-07
search

Activity ID	Project Name	System	Effect Time in UT	Orbit Type	Effect Type
2012-03-07T05:30:00-CHANDRA-RAD-001	CHANDRA	instrument	2012-03-07T05:30:00Z	Elliptical	radiation event
2012-03-09T12:00:00-ISS-CHRG-001	ISS	vehicle	2012-03-09T12:00:00Z	Inclined	spacecraft charging

CHANDRA Radiation Effect



Link SEE reports to space weather activities in DONKI database (Flare, CME, HSS, Geomagnetic Storms, etc)

CCMC: Chiu Wiegand

Mission Support Pages

Click on a mission below for specific support information:

Geocentric missions	Missions near-Earth	Heliospheric missions	Sounding Rockets	International
LEO: , RHESSI, IRIS, ISS, CALIPSO, Terra, AURA, AQUA, TRMM, FASTSAT, and NASA's EOS *GSO*: SDO *LEO/Highly Elliptical:* Chandra *Magnetosheric*: MMS, Van Allen Probes, THEMIS	ACE, SOHO, Wind, JWST	MESSENGER, STEREO, Spitzer Space Telescope, MAVEN, MSL, Dawn, Kepler, EPOXI, Juno, CASSINI, New Horizons, Voyager	STORM, VISIONS	SOTERIA, Venus

CCMC: Leila Mays

CCMC Databases Re-Architecture Models, Simulations and Beyond

Objectives:

- Address a need for a hub for the community to easily search and obtain simulations data for their own research
- Enable easy model-data comparisons
- Enable easy linkage between different CCMC databases (RoR, iSWA, DONKI, ScoreBoard)
- Enable community to build a wide range of tools and front-end applications utilizing simulation data from CCMC

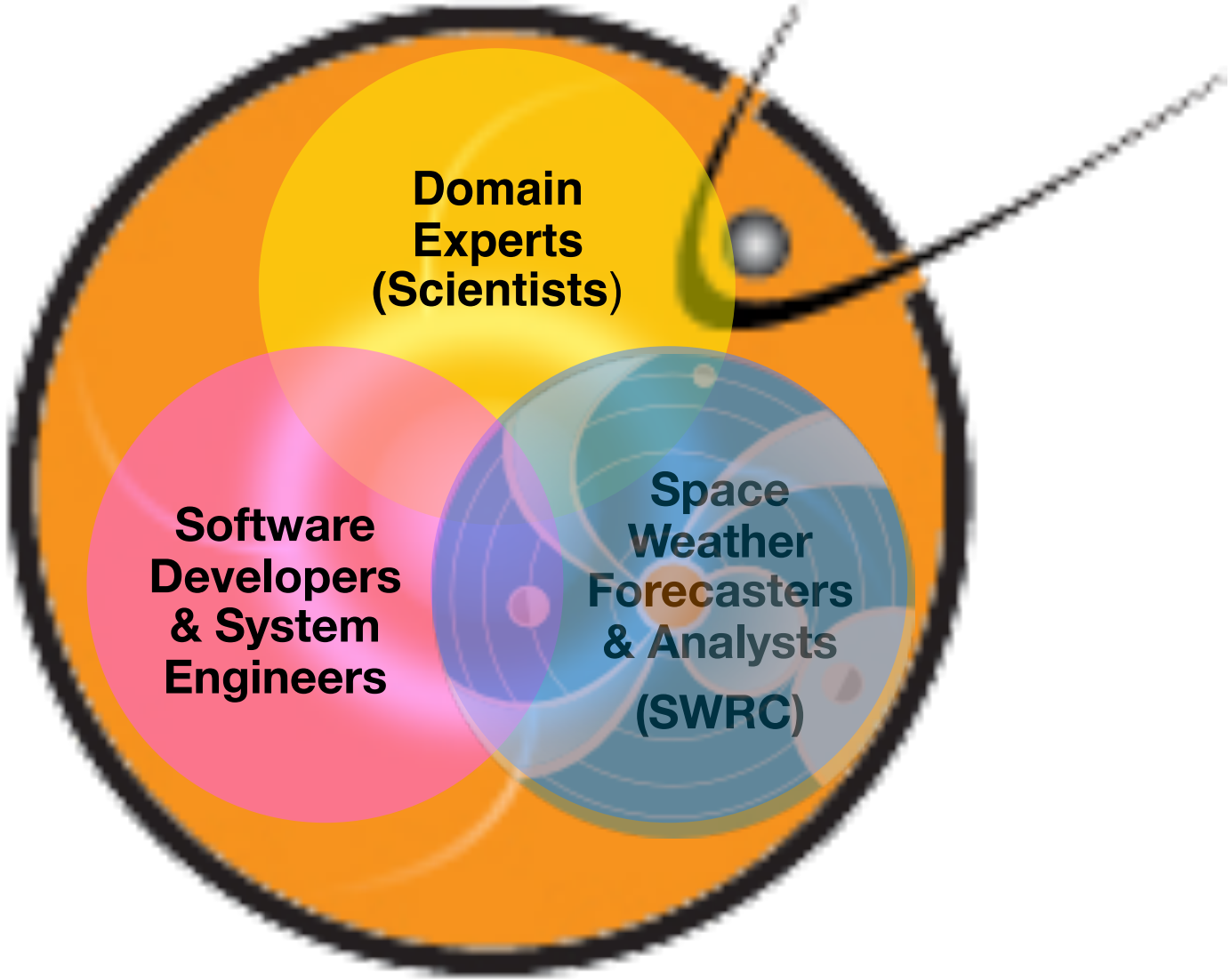
Status:

- Database design based on SPASE and IMPEx
- Web interface allowing to enter model information
- Web service interface allowing applications to obtain model information (JSON format)

Friday, 3:20 pm: Chiu Wiegand

CCMC Talent

represents the entire space weather community



CCMC Staff

NASA+NSF
~ 13 FTEs

S. Bakshi

Kiran Patel

M.Kuznetsova
(**Director**)

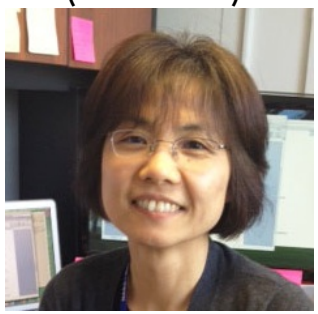
Leila Mays
(**Acting Deputy**)

Anna Chulaki

M. Mendoza

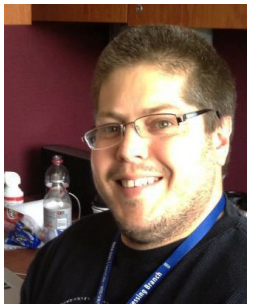
P. Macneice

L. Rastaetter


Ja Soon Shim

A. Pembroke

Chiu Wiegand


R.Mullinix

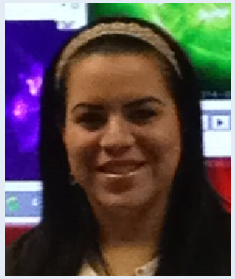
A. Taktakishvili

SWRC Team (GSFC ~ 1.5 FTEs)

B. Thompson

Yihua Zheng

A. Pulkkinen (**Lead**)


Y. Collado-Vega

J. Boblitt

+ post-docs
+students

Outlook

- CCMC is:
  - Asset of International Space Weather Community.
  - Assess point to state-of-the-art capabilities
  - Fast response unit to emerging community needs.
  - Playground for scientists (facilitate understanding).
  - Hub for collaborative research & development of Space Weather Analysis and Prediction Capabilities.
  - Resource for hands-on education.
- CCMC staff is a part of an expanding CCMC Community

Supplementary material

Models at CCMC: Installations, Upgrade, Status

5	SRPM	1.0	01/2016	A
	NLFFF Cartesian	1.0	01/2016	A
	NLFFF Spherical	1.0	05/2014	E
6	NLFFF Global	1.0	05/2014	E
8	Enlil+Cone Model	2.8a	03/2014	A
9	Enlil Time-Dependent	2.8f	02/2016	E
10	Enlil+Cone Ensemble	2.8a	03/2014	AD
11	Enlil + SEPMOD		03/2016	E
12	Enlil + EPREM		03/2016	E
13	DBM		01/2015	A
14	CORHEL	5.0.1	05/2014	A
16	IPS+Enlil+Cone Ensbl.		02/2015	D
20	SWMF/SH + EEGGL	2015-05	01/2015	D
30	MAG-4	ver 03/2014	03/2014	A
31	MAG4+ASSA Ensemble		01/2015	A
33	NAIRAS		01/2016	A
34	CARI-7		03/2015	E
35	GCR BON		11/2015	E
36	NOVICE		03/2015	E

44	SWMF+RCM+deltaB	2o14-06-11	06/2014	A
52	AE-9/AP-9 Radiation Belt	9.0	03/2014	E
53	Plasmasphere		01/2015	E
55	VERB		03/2014	E
59	IGRF	12.0	12/2014	A
65	GIC - Solar Shield		01/2015	DA
66	SAM		09/2015	E
68	CTIPe/Weimer	3.1, 3.2	03/2015	A
69	CTIPe/AMIE	2.0,3.1, 3.2	01/2014	DE
70	CTIPe/SWMF	2.0,3.1, 3.2	01/2014	DE
71	CTIPe Ensemble	2.0, 3.1,3.2	02/2015	D
72	TIE-GCM	2.0	03/2016	A
73	USU-GAIM	3.1.1	03/2016	E
76	ABBYNormal	V3.4	12/2014	A
	GITM	2.2	06/2014	A
80	GITM	2.3	01/2016	A
83	IDA4D		01/2015	E
86	COSGROVE-PF	1.0	07/2014	A
87	IMPACT		02/2016	E
88	GMAT	R2014R-2	03/2015	E
89	DTM	2013.0	01/2016	E

D – Collaborative Development
E – Evaluation **P – Pending**
A – Active **R – Retired**

> 30 upgrades or new deliverables

Model Type: Heliosphere
Model & Version: ENLIL 2.8f
Boundary Condition Type: Time-Dependent Sequence of Daily Update Maps (dt)
Inner Boundary Condition: from_WSA_V2.2_model
Run Objective: ambient_Solar_Wind
Observatory: GONGB (Standard QuickReduce Magnetogram Synoptic Map - mrbqs)
Carrington Rotation Start: 2055 **Carrington Longitude Start:** 008°
Start computation date (rundate_cal): 2007-04-27T00
Coronal observations date (obsdate_cal): null
Time unit = 86400. seconds **Relaxation start time relative to rundate (tstart):** -14. time units
Simulation stop time (tstop): 191 time units **Full 3D output cadence (tstep):** 14 time units
Outer Boundary: 2.1 AU (Mars inclusive; **radial span:** 2.0 AU, **region** 2 AU)
Simulation Grid: 1536x140x360 (0.1 to 2.1 AU radius; ±70° latitude, 20° to 160° co-latitude; 0° to 360° longitude)
Geometry: Spherical and Uniform **Coordinate System:** HEEQ+180°
Resolution: high **Number of Simulation blocks (nblk):** 1
Ambient wind conditions setting: a6b1mod **ratio of specific heats (gamma):** 1.6666667 **runpar**=g53q5
(**vfast**=700., **vslow**=200., **vrfast**=25., **vrslow**=100, **bfast**=300, **bscl**=2, **dfast**=200, **tfast**=2, **xalpha**=0.03, **nbrad**=1)
Rotation of the inner boundary: synodic

Multipurpose Tools, Systems, Databases, Interfaces

Data Management, Metadata, Standardization, Access

KAMELEON
CONVERSION ● ACCESS ● INTERPOLATION

- Science Data Formats, Metadata
- Data Conversion
- Access & Interpolation Library
- Reusable Data Model/Framework

FlexDIT — Flexible Data Ingestion Tool

- Designed to facilitate ingestion of disparate time series data from a variety of sources into CCMC's existing infrastructure
- Describe input data via XML for efficient dataset imports
- Generalized parser works with a variety of formats

Integrated Space Weather Analysis System

- Web-Based Space Weather Dissemination System
- User Configurable, Interactive Products
- Web Services
- Real-Time & Historical Model + Observational Data

StereoCAT CME Analysis Tool

- Determine CME kinematic parameters
- Create CME height-time measurements
- Create an ensemble of CME measurements
- Save and share measurement sessions

Database Of Notifications, Knowledge, Information

- Catalog of space weather phenomena
- Knowledgebase of interpretations, simulation results, and forecasting analysis
- Online tool for dissemination of forecasts, notifications, & archiving event-focused information

EEGGL Eruption Event Generator (Gibson & Low)

- Use observations defining the CME source region (location and flux rope orientation,
- Generate Gibson-Low flux rope parameters for the flux rope emergence models.

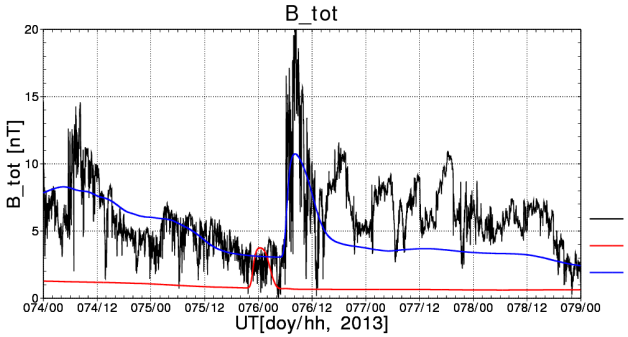
Space Weather Scoreboard

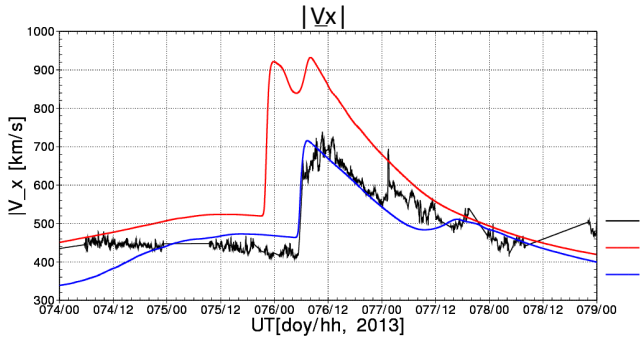
- Research-based forecasting methods validation
- Scientific community submits forecasts in real-time
- View and Compare all forecasting methods

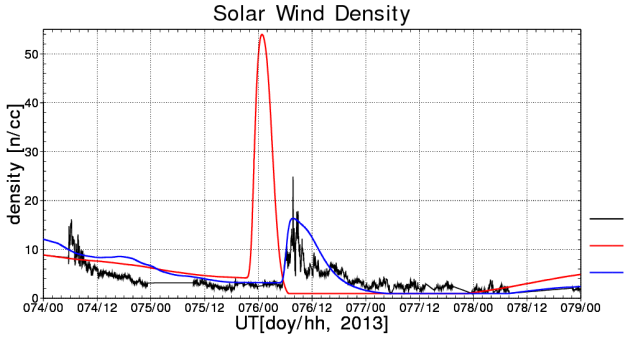
Space Environment Automated Alerts, Anomaly Analysis Assistant (SEA^5)

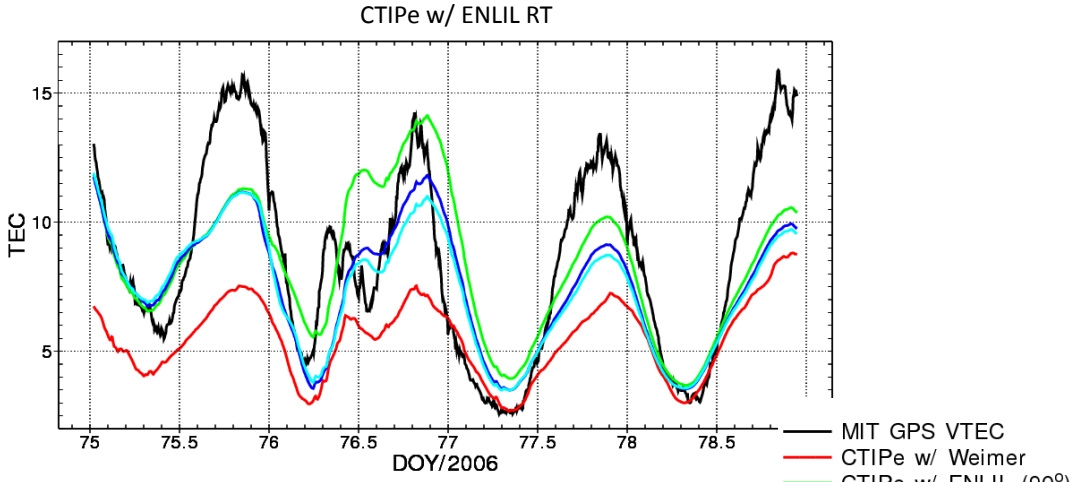
- Mission/Location Specific Space Environment Tool
- Automated/Custom Alerts & Notifications
- Assimilate & Display Anomaly Information

Regional TEC over North American Sector
Driven by Ensemble Enlil (Mean RT & Best Fit)

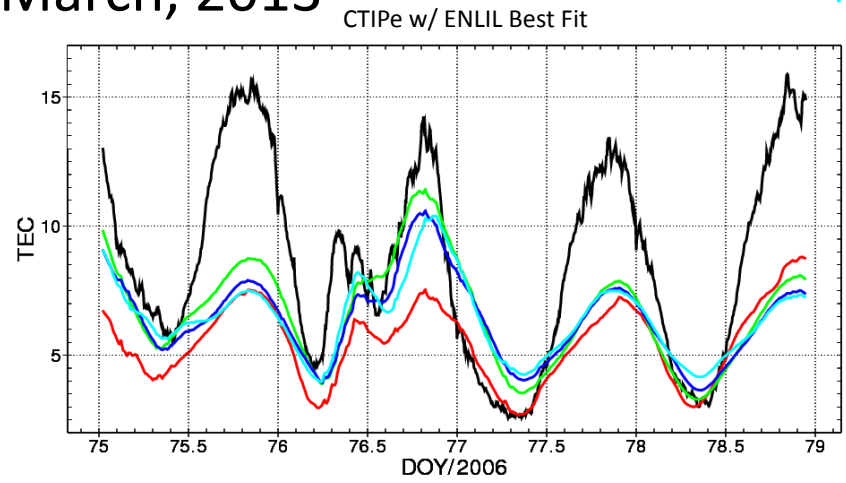








March, 2013



Modeler: T. Fuller-Rowell

CCMC: J-S. Shim

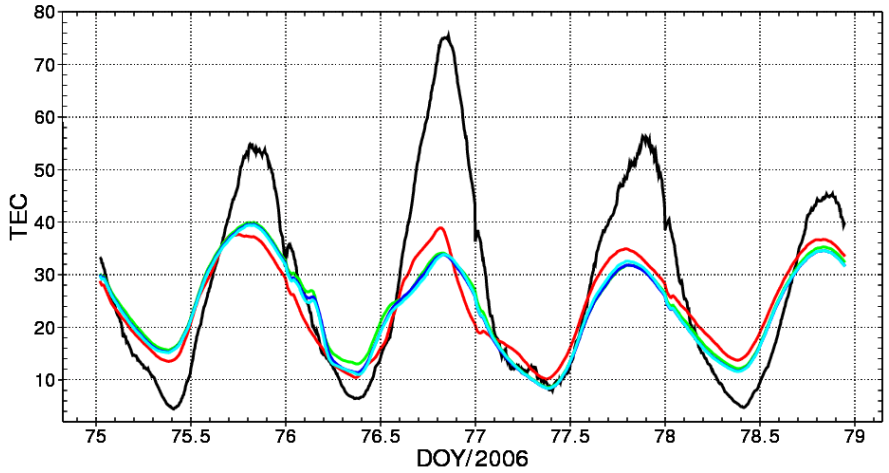
SRPM Irradiance Model

Status at CCMC

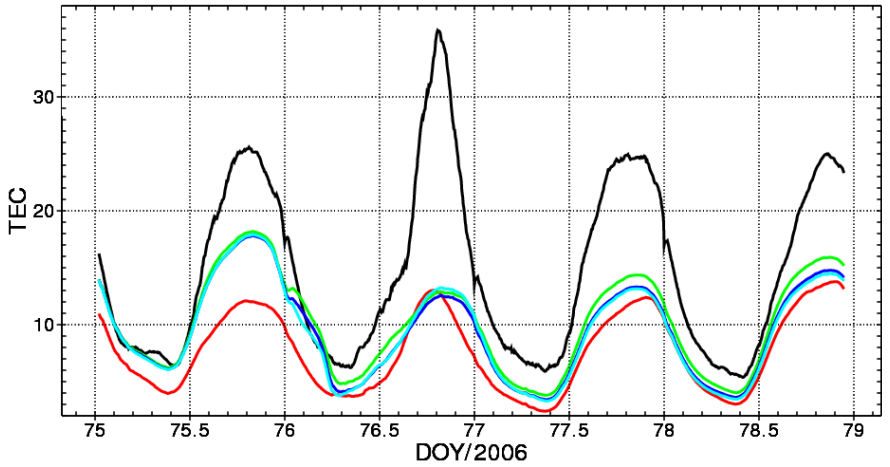
- Currently output EUV spectra between 1.8 and 200 nm with 1nm resolution
  - Most variable part of spectrum
- Posted at ISWA daily
  - iswa.gsfc.nasa.gov/iswa/iSWA.html
- Will extend to full spectrum in early 2016.
- Long term goals
  - Solar
    - ROR use – user supplied masks, customized resolution runs, archival runs etc
  - Stellar
    - Build ROR-like facility to generate irradiance spectra for use in modeling exoplanet atmospheres
    - Initially for solar like stars only
    - Later to support user modification to $\rho(r)$, $T(r)$ profiles of different feature types

Regional TEC over North American Sector
CTIPe driven by Enlil Cone Model Ensemble Forecasts

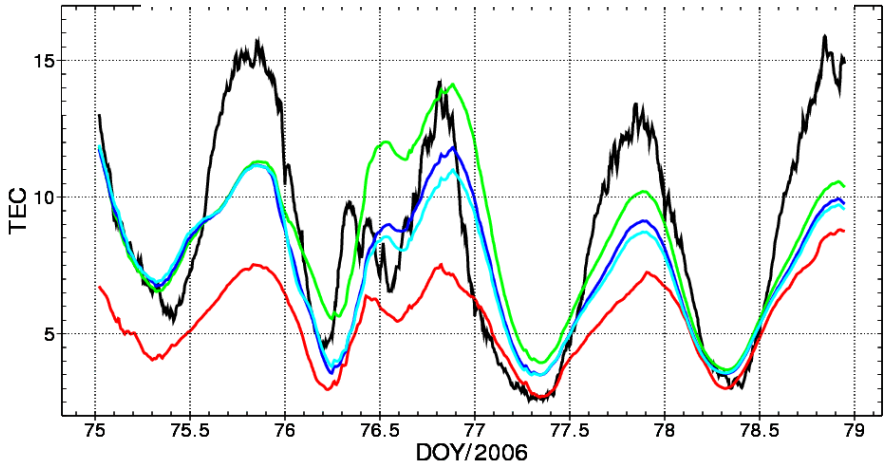
low lat (0°< lat < 25°)

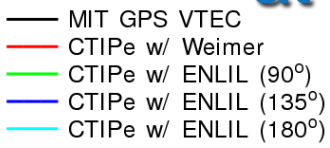


middle lat (25°< lat < 50°)



high lat (50°< lat)





IMF orientation uncertainty impact on regional TEC at different latitudes.

March, 2013

Modeler: T. Fuller-Rowell

CCMC: J-S. Shim