

# iSWA

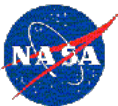
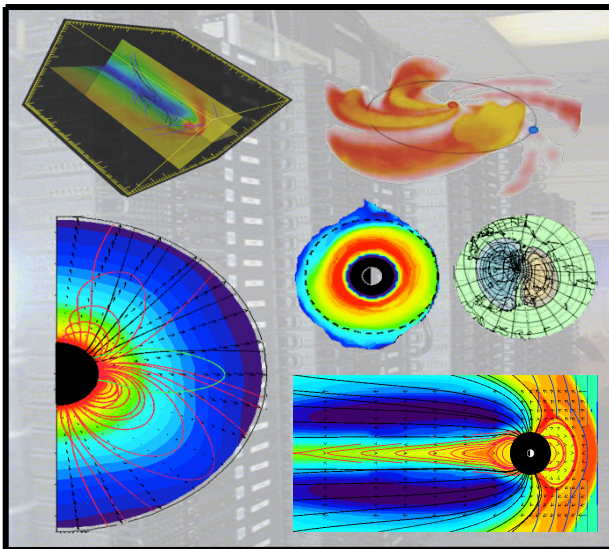
The iNtegrated  
Space Weather Analysis System

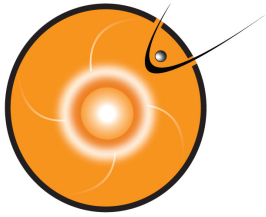
*Marlo Maddox*

The 6<sup>th</sup> CCMC Community Workshop  
January 19, 2012

<http://SWL.gsfc.nasa.gov>    <http://CCMC.gsfc.nasa.gov>  
<http://iSWA.gsfc.nasa.gov>    <http://twitter.com/NASAiSWA>

**NASA Goddard Space Flight Center**

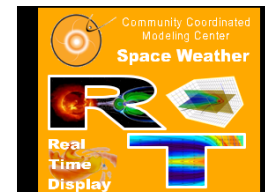
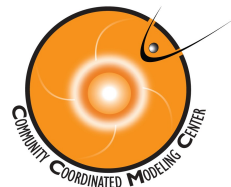
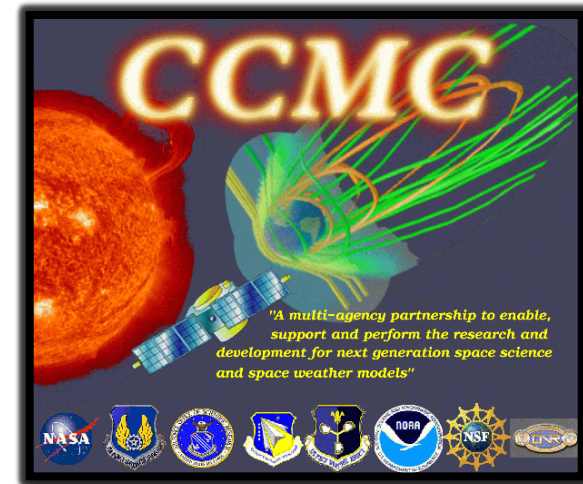


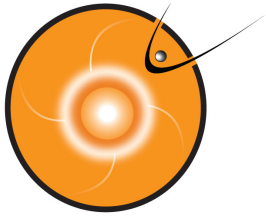


# Community Coordinated Modeling Center Products & Services

## What the CCMC provides:

- Model Coupling in collaboration with model owners
- Scientific Validation of Models
- Metrics implementations
- Model Runs on Request
- Data Format Standardization
- Advanced Visualization
- Real-Time Products
- Support for Space Weather Center at GSFC
  - Issue Alerts, Warnings, & Anomaly Reports
  - SWx Support - develop tailored space weather analysis tools in support of NASA missions, Operations, and Forecasters





# Model Simulation **Runs-On-Request**

<http://ccmc.gsfc.nasa.gov>



Requests

Results

## CCMC Center at NASA

Super Computing  
Clusters  
( 1100 CPU's )

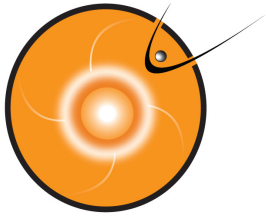
Dedicated  
Workstations

**CCMC**

427 Terra-Bytes of  
Data Storage

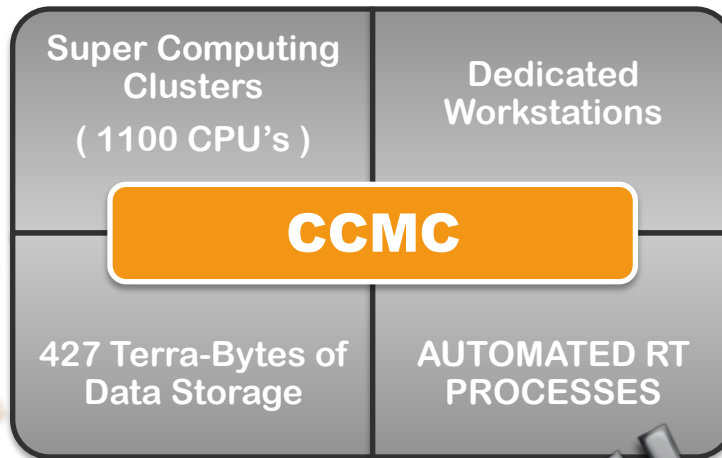
Online Analysis  
Tools

- 25+ Available Models ( covering from the Sun to Earth )
- User Configurable Input Parameters
- Data Downloads
- Simulation Archive
- Searchable Database
- Online Visualization Tools
- Downloadable Analysis Software
- Automated Movie Generation Tools



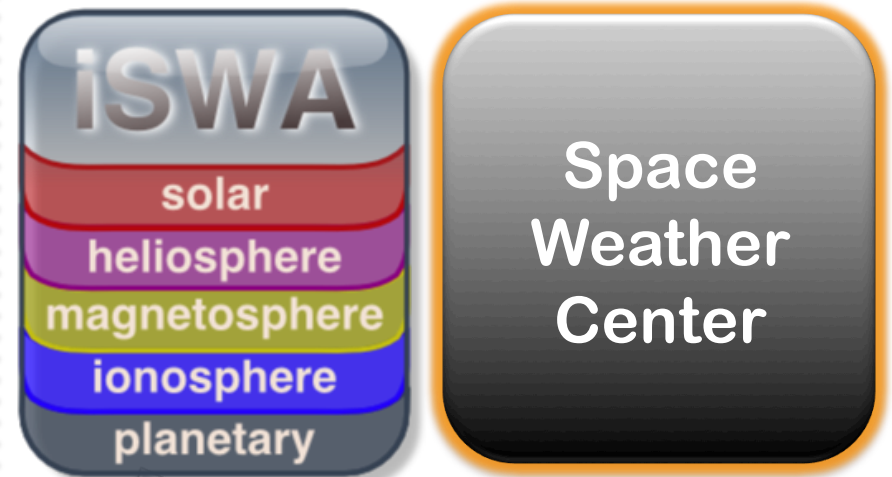
# Runs-On-Request vs. Real-Time Processing

## CCMC Center

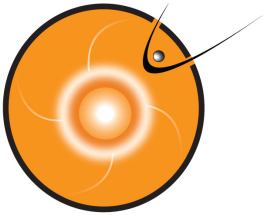


<http://ccmc.gsfc.nasa.gov>

## SWx Center



<http://iswa.ccmc.gsfc.nasa.gov>



# iSWA Project Overview

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## **OCE Technical Excellence Initiative Project**

- Partnership between NASA HQ OCE, SWL, CCMC, & AETD
- Address technical challenges in acquiring space weather environment information
- Began March 2008
- Version 1.0 deployed November 2009

## **Fundamental Challenges To Be Addressed**

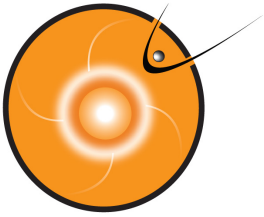
- Existing space weather resources are diverse and scattered
- Data accessibility
- Accurate real time now-casting & forecasting of the space environment
- Historical space weather impact analysis

## **Initial Requirements Gathering**

- GSFC SSMO, JSFC SRAG

## **Refined Requirements**

- Space Weather Workshops for NASA Robotic Missions

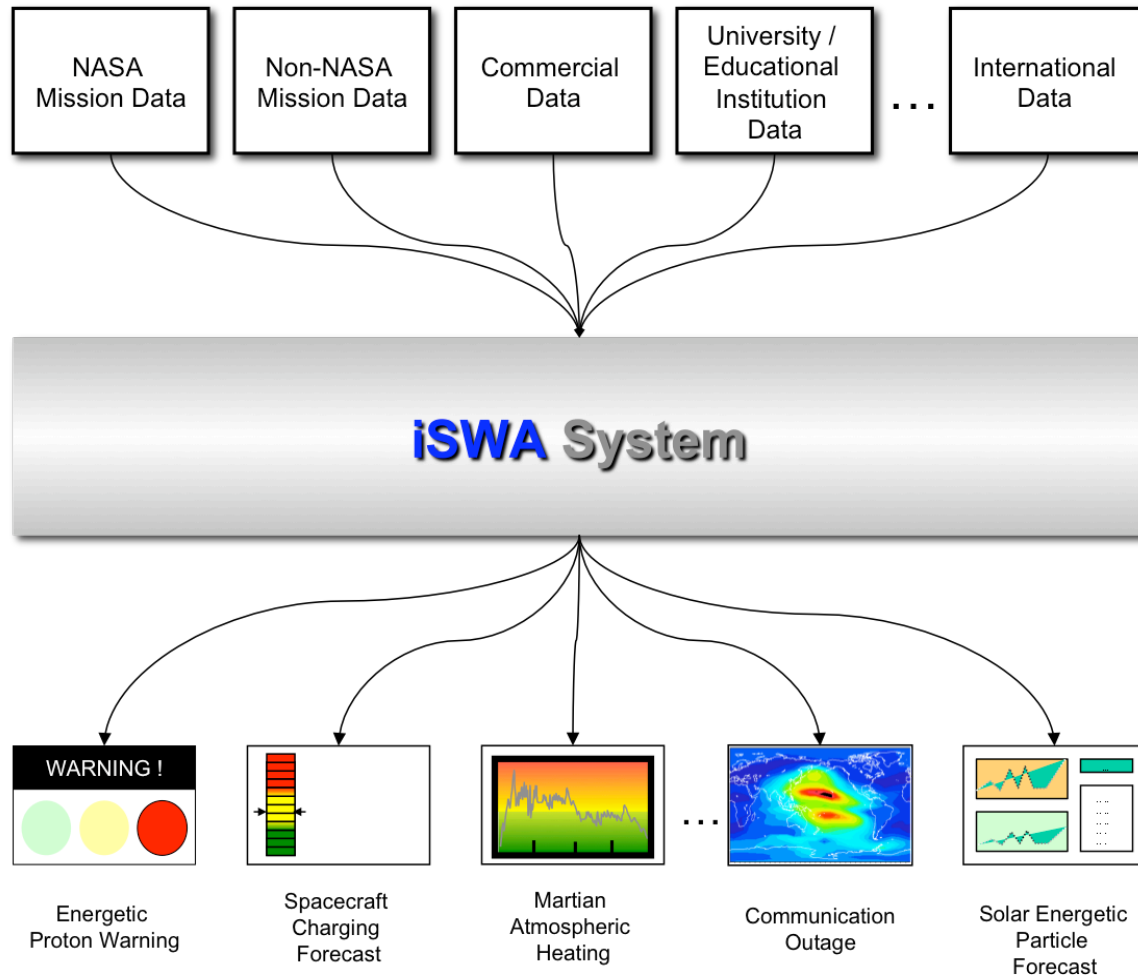


# iSWA Solution & Deliverables

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1. Acquire, ingest, and produce relevant space weather information
2. Utilize both observational and simulation/model data
3. Categorize and archive data for historical impact analysis
4. Produce and provide real-time data streams
5. Provide customizable and highly configurable displays
6. Disseminate through the most widely deployed and accessible interface – the web

# iNTEGRATED SPACE WEATHER ANALYSIS SYSTEM

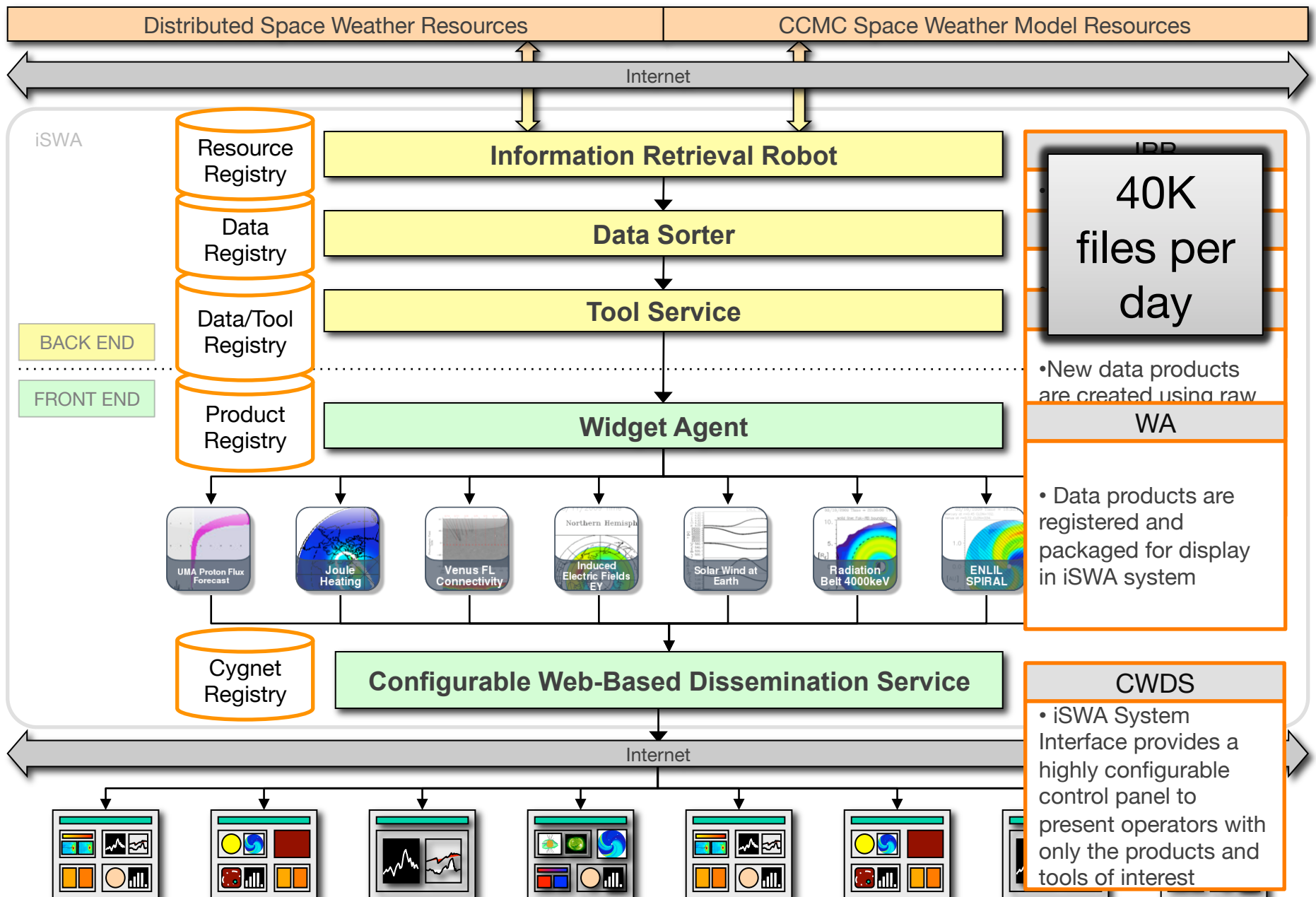


Highly diverse and distributed space weather data consisting of the latest observational data along with the most advanced space weather model simulation output.

iSWA system collects data from a large and evolving list of sources. Data is sorted, characterized, and processed into 'mission decision supporting' products in response to individual user queries.

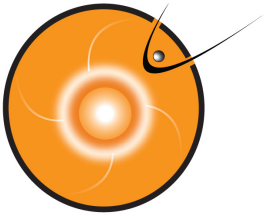
iSWA generates and provides a user-configurable display panel that can be accessed from a standard web browser. The end user can then customize their display to focus on specific products of interest.

# iNTEGRATED SPACE WEATHER ANALYSIS SYSTEM



• **370** Unique Data Feeds, **27** Million Files Registered and Archived, **283** Consumable Display Products currently managed in iSWA Cygnnet Catalog





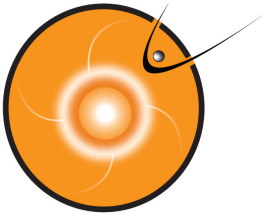
# iSWA Design Highlights

## BACK END

- **Comprehensive data model that drives the system**
  - Minimizes need for actual code modifications
  - Allows rapid additions and modifications to data feeds and display products
- **Every granule of data is registered, cataloged, and archived**
  - Access data products for any available time period
  - Generate new tools and functionality using multiple existing data products

## FRONT END

- **Consistent Interface with uniquely identifiable product icons**
- **Customizable layout**
  - automatically saved on browser exit
  - can be bookmarked and shared
- **Auto updating products and tools**
- **Individual and global date search functionality for historical impact analysis**
- **Movie mode functionality for all image-based cygnets**
- **Detailed descriptions for data products**



# iSWA Impact

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## NASA

- iSWA provides a new capability to quickly assess [past](#), [present](#), and [expected](#) space weather effects.
  - Mission operators have a resource to assist in both anomaly resolution as well as potential space weather impacts.
- iSWA has helped enable the Space Weather Laboratory to establish a new Space Weather Center [providing alerts](#), anomaly reports, and weekly space weather summaries based on iSWA tools and products.

## External Agencies

- Air Force Space Weather Agency can [monitor the iSWA system 24x7 for CME eruptions](#) and notifies the CCMC as soon as an event is detected. A notification triggers a CME Cone Model calculation at CCMC that [estimates the CME arrival time, duration, and expected impact on earth](#).
- iSWA has enabled numerous collaborations with data, model, and product developers/providers who want their tools to be available in iSWA.

## Science, Education, and Public Outreach

- Researchers, universities, and “citizen scientists” have access to a comprehensive suite of real-time and historical space environment data products.

iNtegrated Space Weather Analysis System ( iSWA Primary ) : Version 1.6.0 [AltoSax]

http://iswa.ccmc.gsfc.nasa.gov:8080/IswaSystemWebApp/

iNtegrated Space We... /manager MACFUSE\_FS\_SSHFS... blender.org - Featur... iNtegrated Space We... MCS Invoice Tracking Adams Pee Wee Foot... Restricting Access t... iNtegrated Space We... JIRA http://space.rice.edu... Overview (Google W...

iNtegrated Space Weather Analy...

Solar Flare Monitor

SOLAR FLARE PROBABILITY = 3.8%

Available Cygnets

Solar Heliosphere Magnetosphere Ionosphere Planetary/Spacecraft All Cygnets New Cygnets Events ALERTS

Joule Heating Precipitating Electrons (geomagnetic) Precipitating Electrons (geographic) CME Arrival Time Prediction Field Aligned Currents (geomag coord) Induced Electric Fields EX (movie)

Stereo Behind - EUVI 195 SDO - AIA 193 Stereo Ahead - EUVI 195

SOHO/Costep Proton Flux Forecast

SOHO/COSTEP real-time proton flux at CCMC

SOHO/COSTEP Proton Flux

Iono Flux 2.5 MHz Absorption

Planetary KP

Max KP Level: Normal

SWMF Magnetopause Position

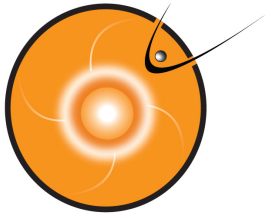
iSWA Interactive Timeline - GOES Primary Electron Flux

Ionospheric Joule Heating

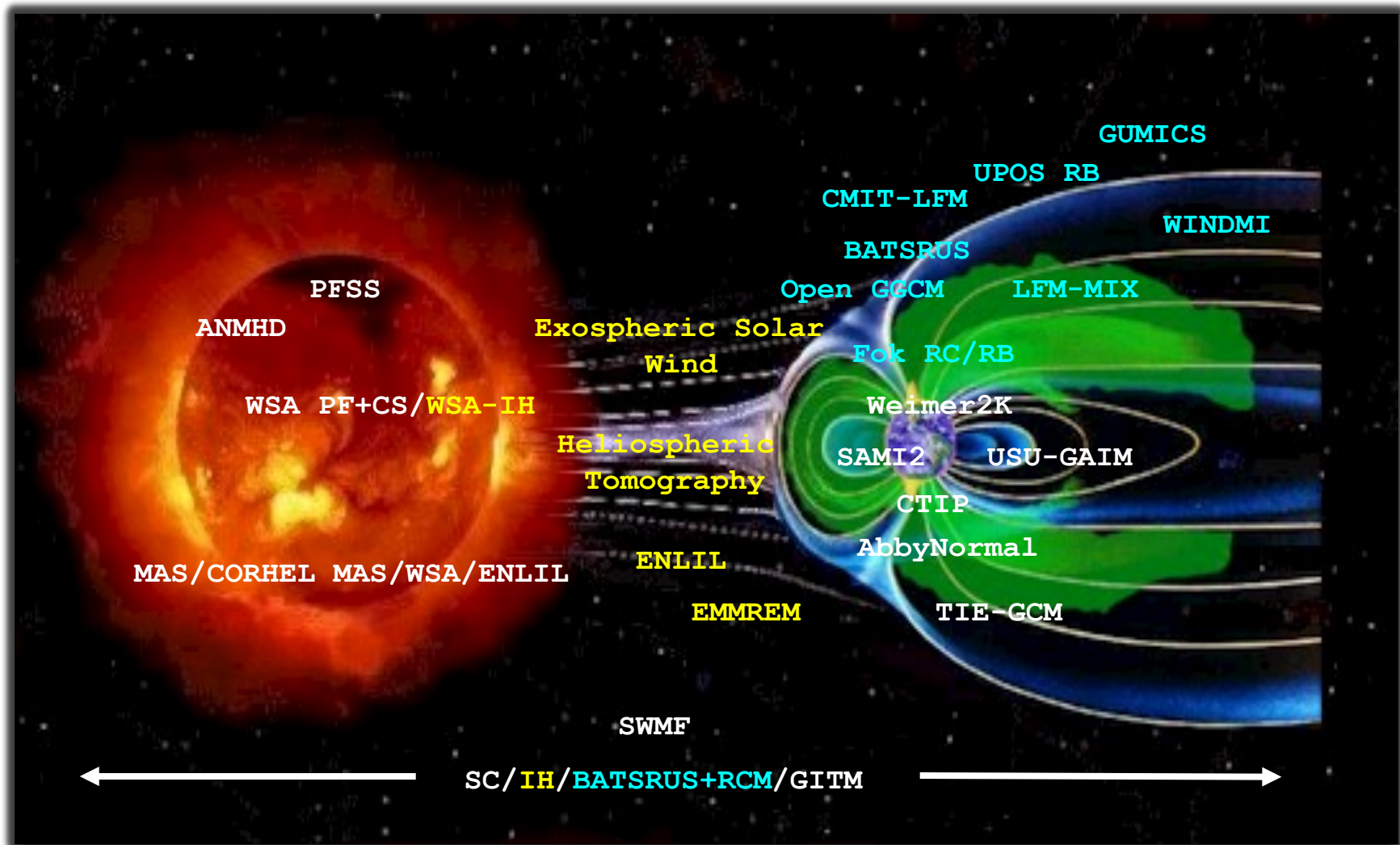
Done

<http://iswa.ccmc.gsfc.nasa.gov>

# **Supplemental Slides**



# Space Weather Models at the CCMC



<http://ccmc.gsfc.nasa.gov/models/>