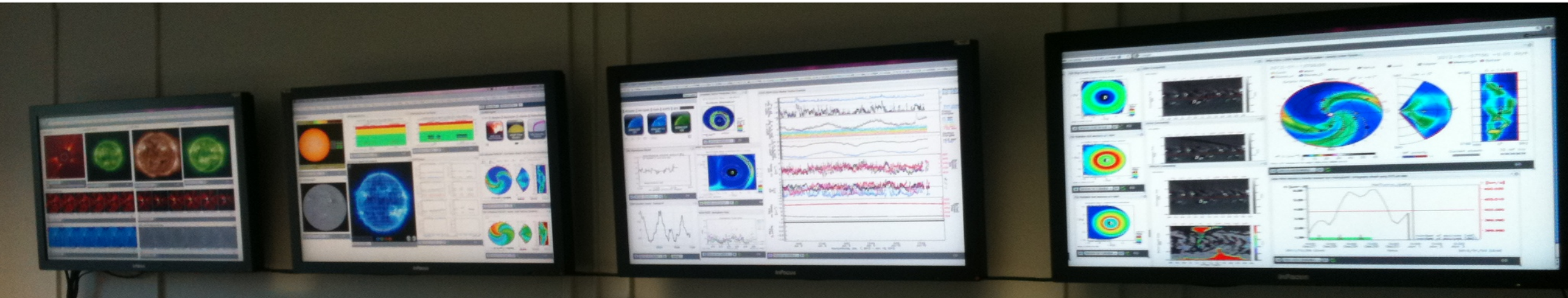
Integrated Space Weather Analysis System

A Software Perspective

Richard Mullinix



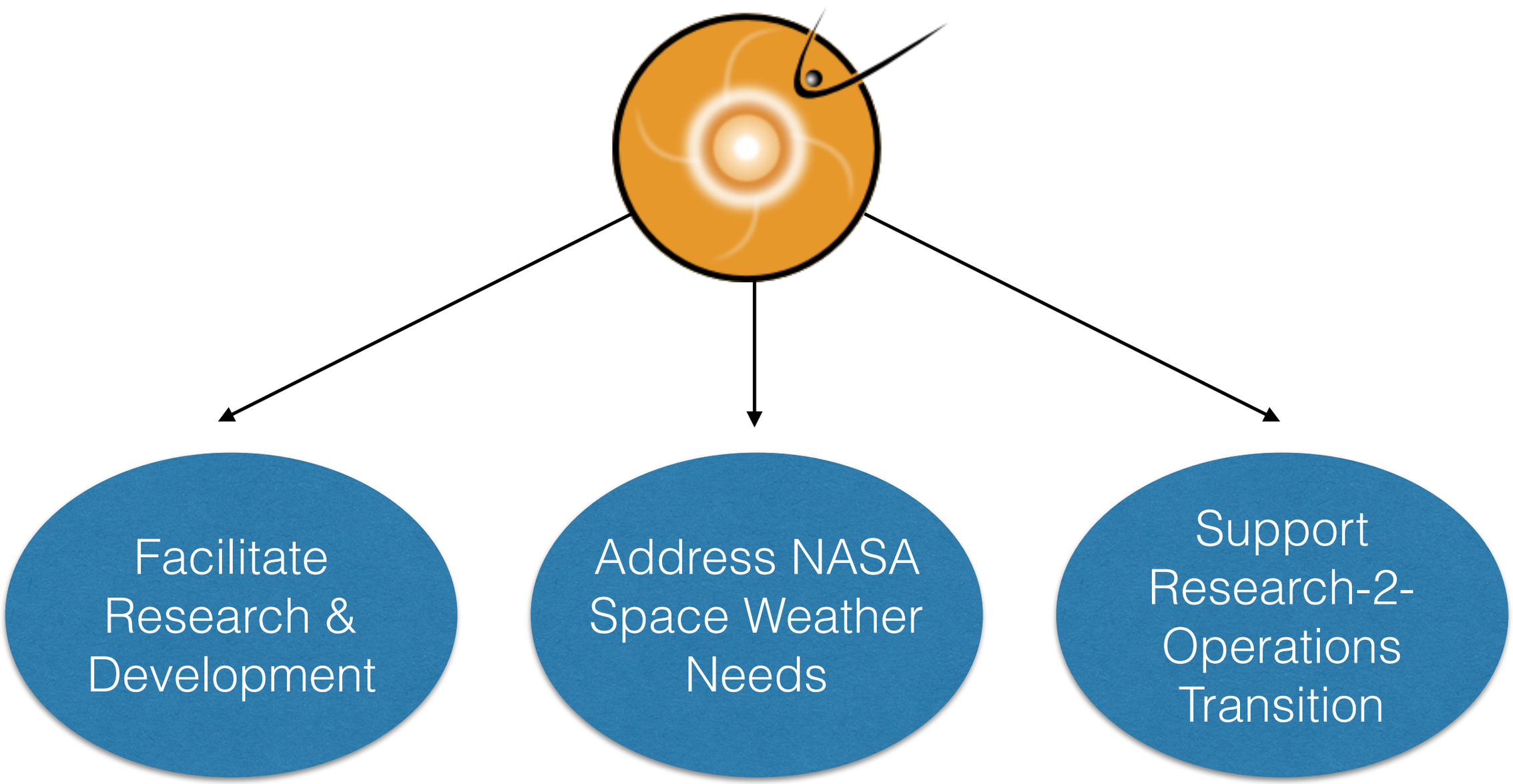
Outline

- Community Coordinated Modeling Center (CCMC)
- Demo
- Architectural design
- Widget Types
- Stats

About the CCMC

A multi-agency partnership to
support research and development
for next generation of space science & space
weather models

CCMC Goals


Facilitate Research & Development
Address NASA Space Weather Needs
Support Research-2-Operations Transition

CCMC Assets & Services:
Comprehensive Collection Of Space Weather Models

Corona

SWMF.SC
PFSS.Petrie
PFSS.Macneice
PFSS.Luhmann
ANMHD
UMASEP
SRPM
MAG4
ASAP
WSA
NAIRAS
MAGIC
ASSA
SNB3GEO
NLFFF.Wiegelmann

Heliosphere

ENLIL
ENLIL+Cone
ENLIL-C-SWEPA
Posner SEP
PREDICCS
EXO Solar Wind
EMMREM
CORHEL
Heltomo SMEI
ENLIL+Cone
Heltomo IPS
BRYNTRN
SWMF.SH
DBM

Magnetosphere

LFM-TING
GUMICS
LFM-MIX
GIC
OpenGGCM+CMIT
SWMF+RCM+deltaB
SWMF+RCM
SWMF+RCM+RBE
SWMF+RCM+CRCM
LFM-MIX-TIEGCM
WINDMI
LANLstar
IGRF
Tsyganenko
Weigel-deltaB
PS VP
Apex
AACGM
Ovation Prime

Inner Magnetosphere

RCM
Fok.CIMI
Fok.RBE
UPOS RB
AE-8/AP-8
AE-9/AP-9
VERB

Ionosphere/ Thermosphere

TIE-GCM
SAMI-3
GMAT
IMPACT
CTIPe
IRI
USU-GAIM
SWACI-TEC
ABBYNormal
NRLMSISE
GITM
PBMOD
TRIPL-DA
Weimer IE
Weimer-deltaB
JB2008
COSGROVE-PF

iSWA (2008): Fundamental Challenges

- Existing space weather resources are diverse and scattered
- Centralized location for accurate real time now-casting & forecasting of the space environment
- Historical space weather impact analysis

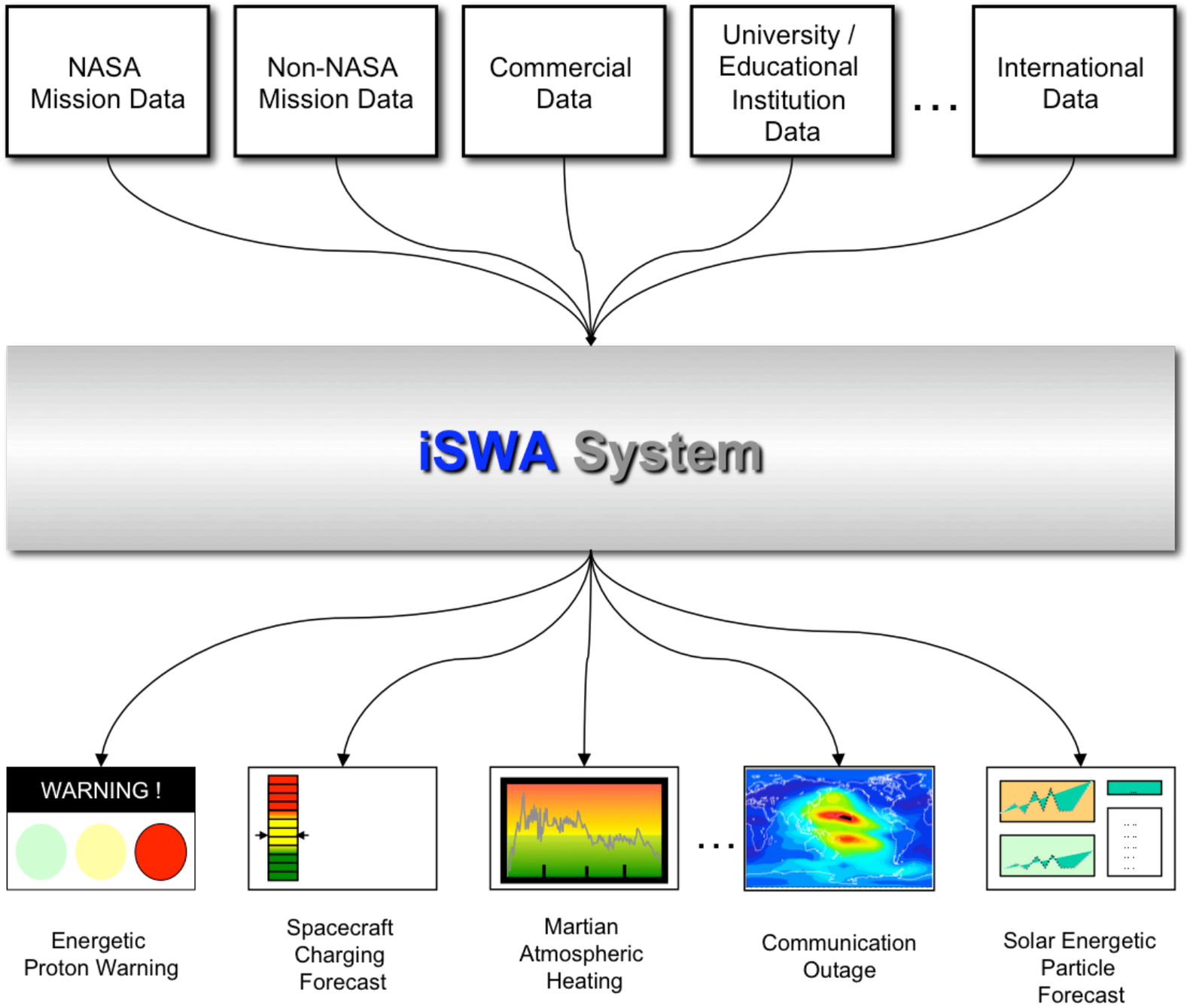
iSWA Solution & Deliverables

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

Demo

- General Layout
- Venus Transit (2012-6-6 4:22)
- March 15, 2012 Event

iNTEGRATED SPACE WEATHER ANALYSIS SYSTEM

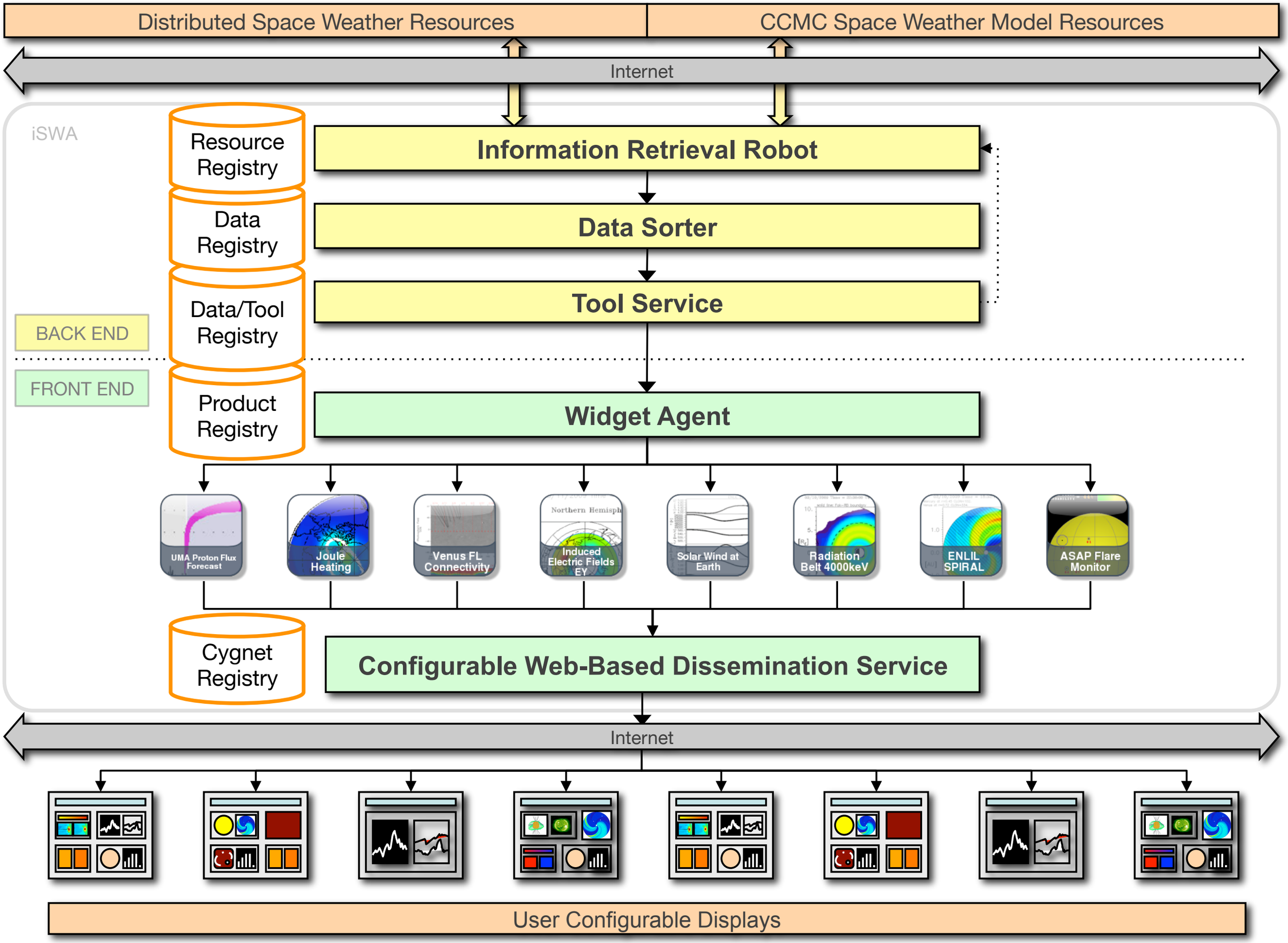


Highly diverse and distributed space weather data consisting of the latest observational data along with the most advanced space weather model simulation output.

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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CCMC Space Weather Model Resources
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iSWA
Resource Registry
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Product Registry
Information Retrieval Robot
Data Sorter
Tool Service
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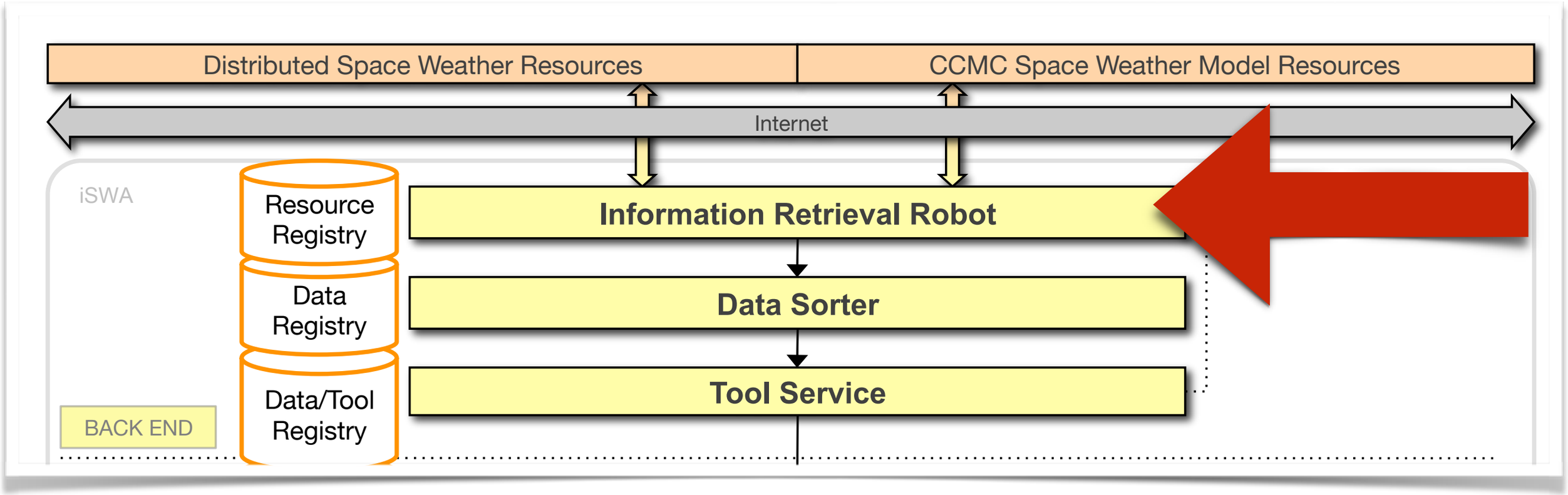
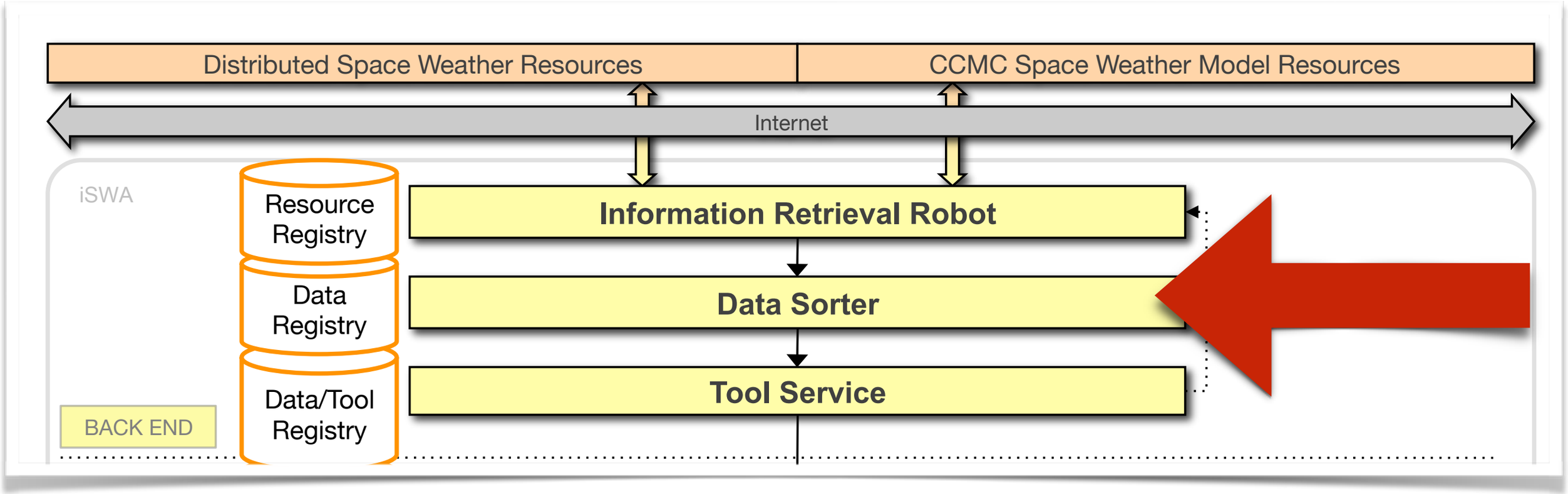
ENLIL SPIRAL
ASAP Flare Monitor
Cygnet Registry
Configurable Web-Based Dissemination Service
Internet
User Configurable Displays



Information Retrieval Robot

- Resources and specific feeds are registered
- Feeds are assigned priority and intervals
- Fetches and stages data feeds
- Composed of perl scripts, database, crontabs

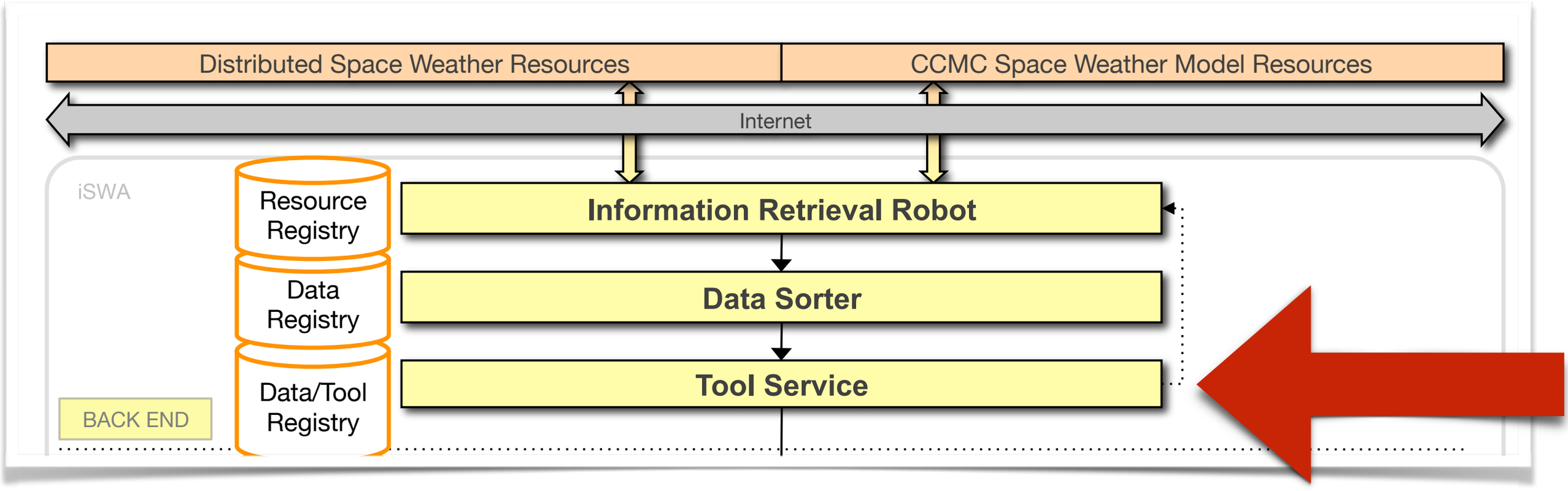


Data Sorter

- Places file in data tree
  iswa.ccmc.gsfc.nasa.gov/iswa_data_tree/
- Adds record to database with timestamp/path
- Composed of perl scripts, database, crontabs

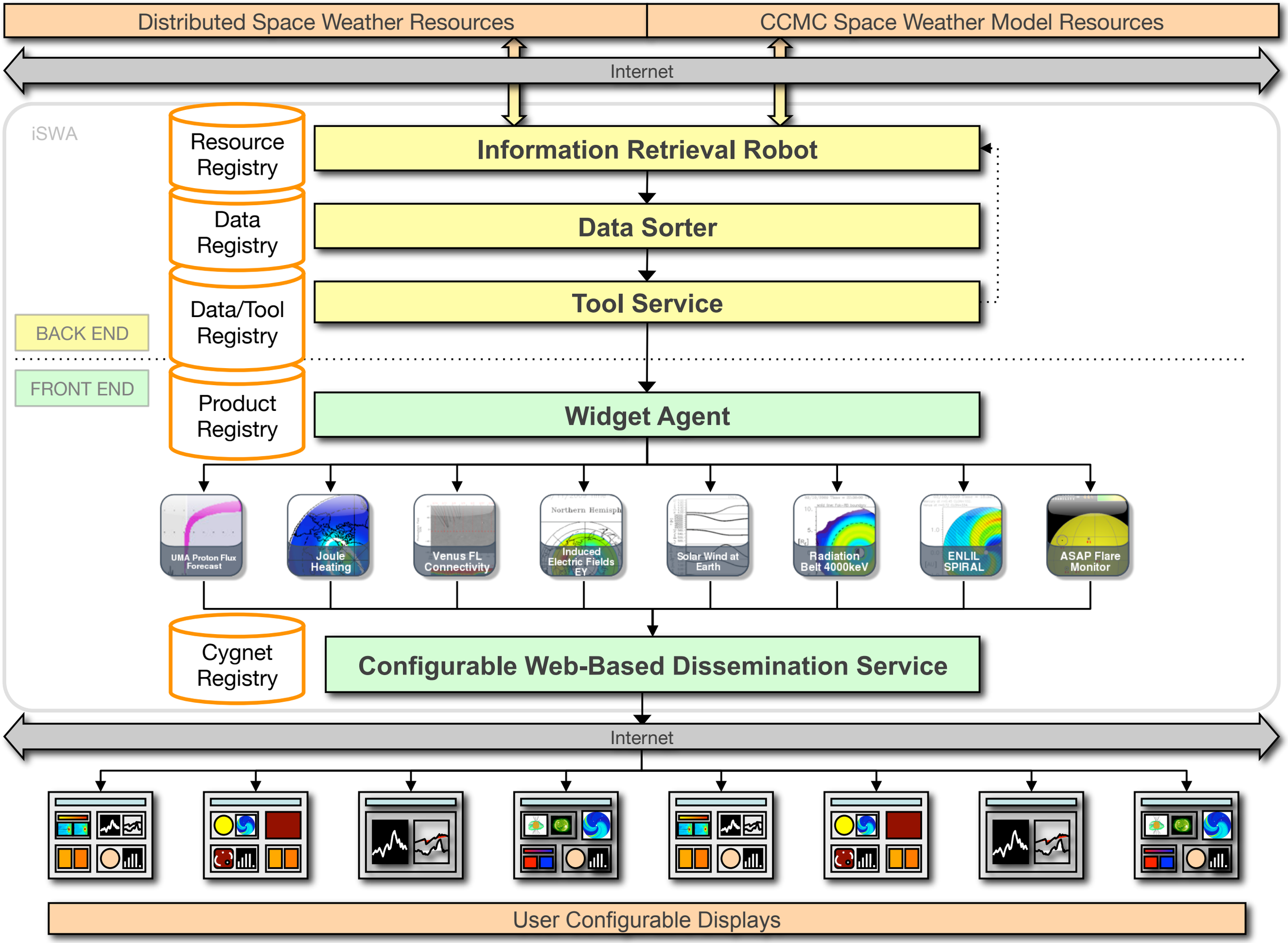
Types of Data

- Images, sets of images, ascii, fits, binary
- Some are ready to be consumed
- Additional processing needed to be consumed



Tool Service

- Provides hook for additional data processing
- ASCII parsing numerical data
- Unit conversions, Unzip, image creation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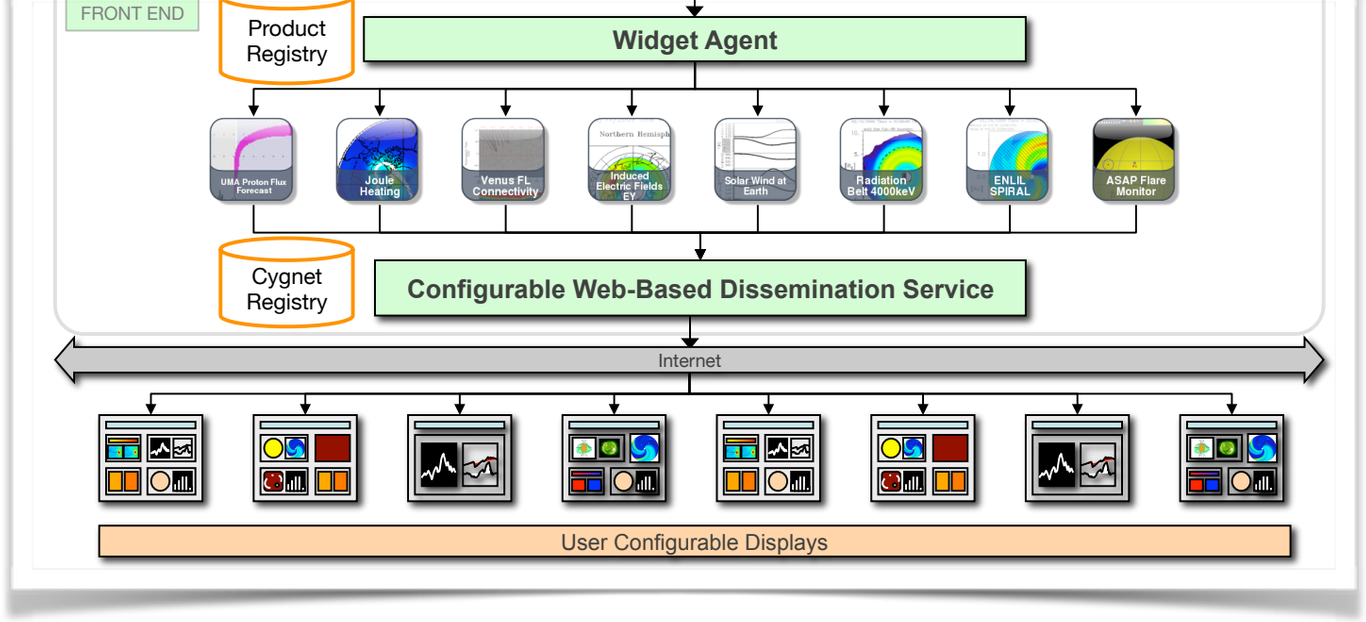


Cygnet (Widget) Registration

- Each cygnet has icon, name, title, description, category, type, associated data feeds

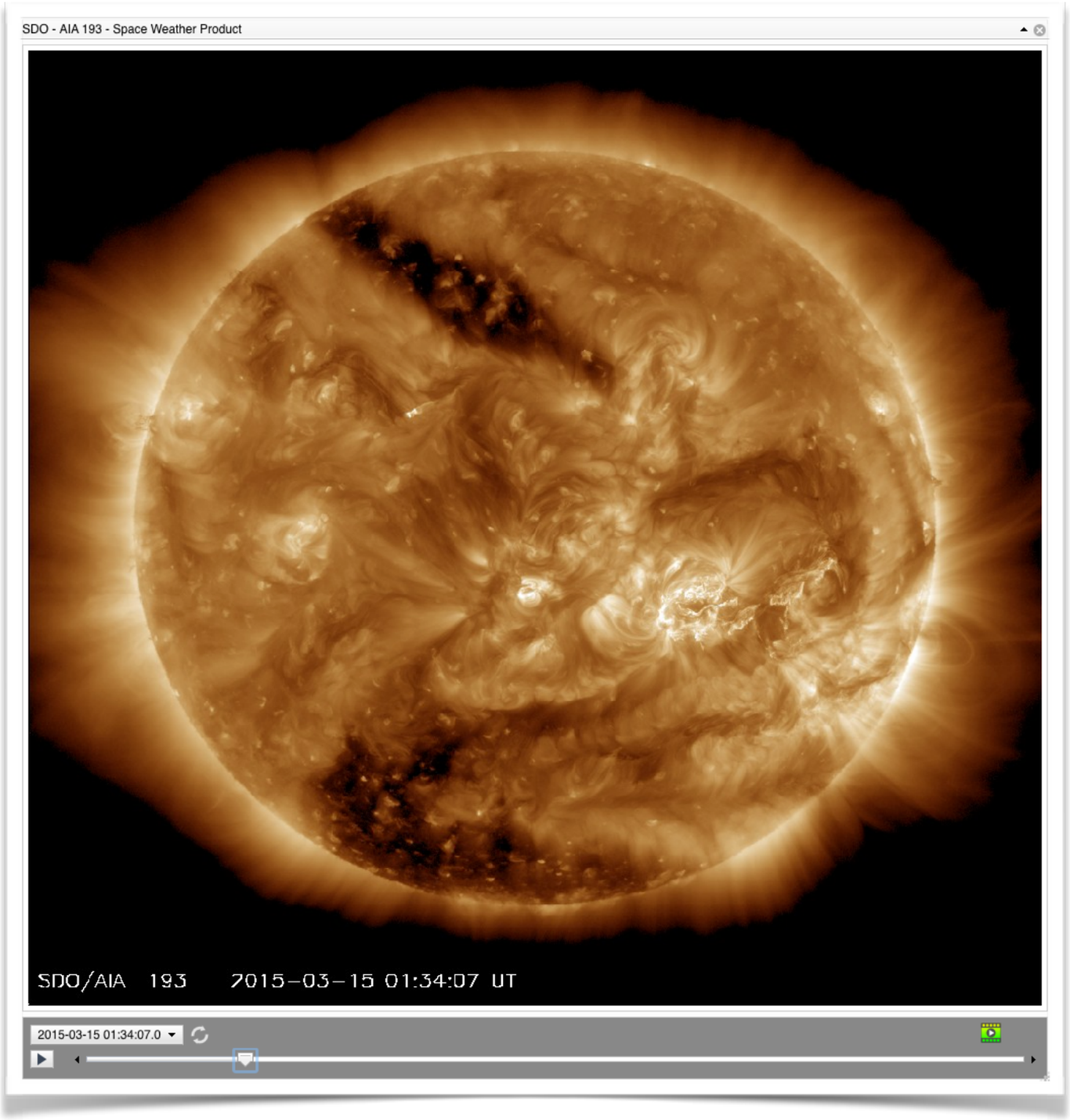
Frontend

- Combination of JSP, javascript (DOJO), and html5
- Talks to backend via servlets: populated cygnet catalog, fetch data (images, json, xml, urls)

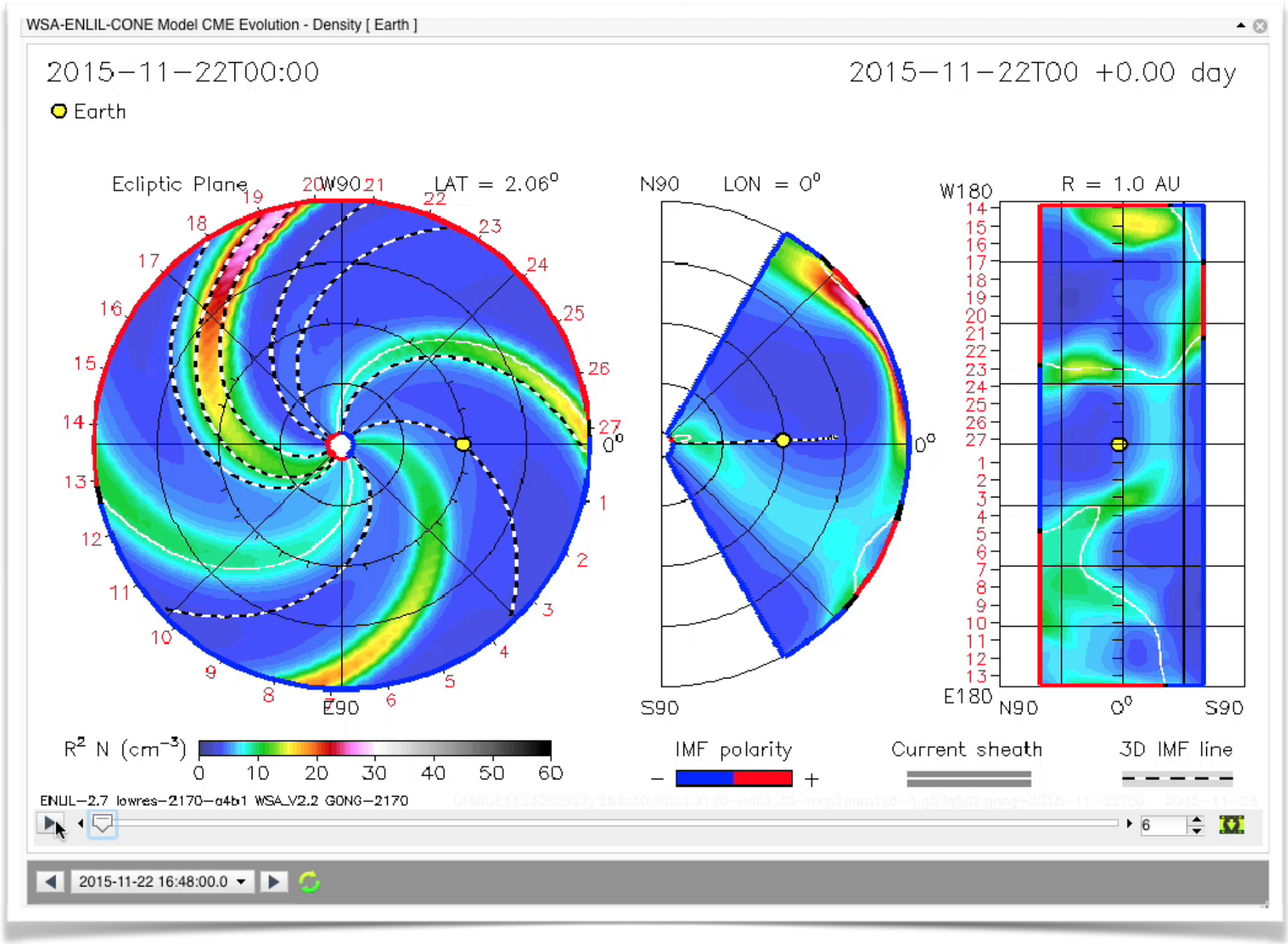
Cygnet

- Base Cygnet : Dojo extension of dijit.Widget
  - resize
  - set timestamp
  - get/set state
  - close
- Various types of Base Cygnets

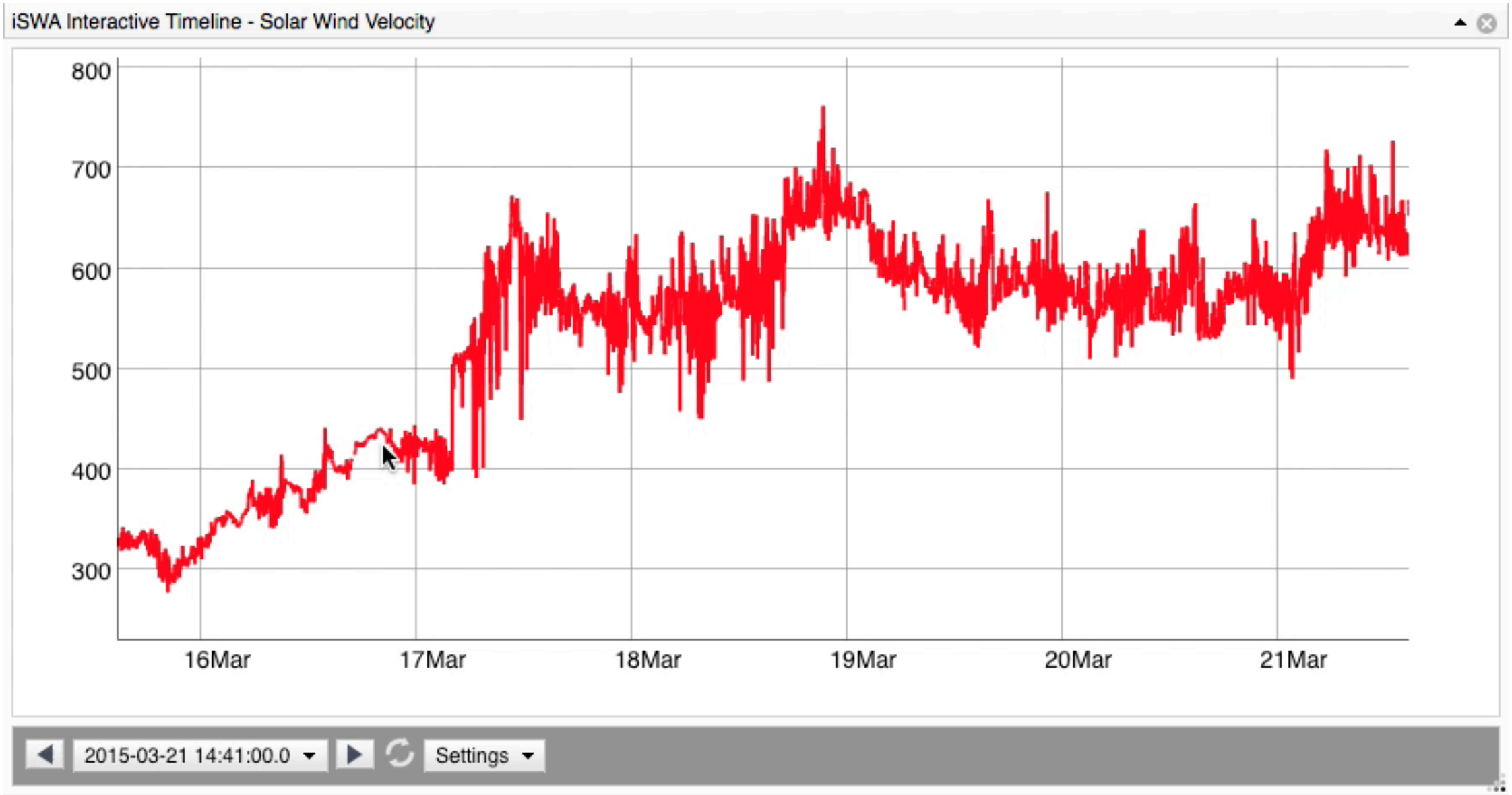
Cygnet Types: Image



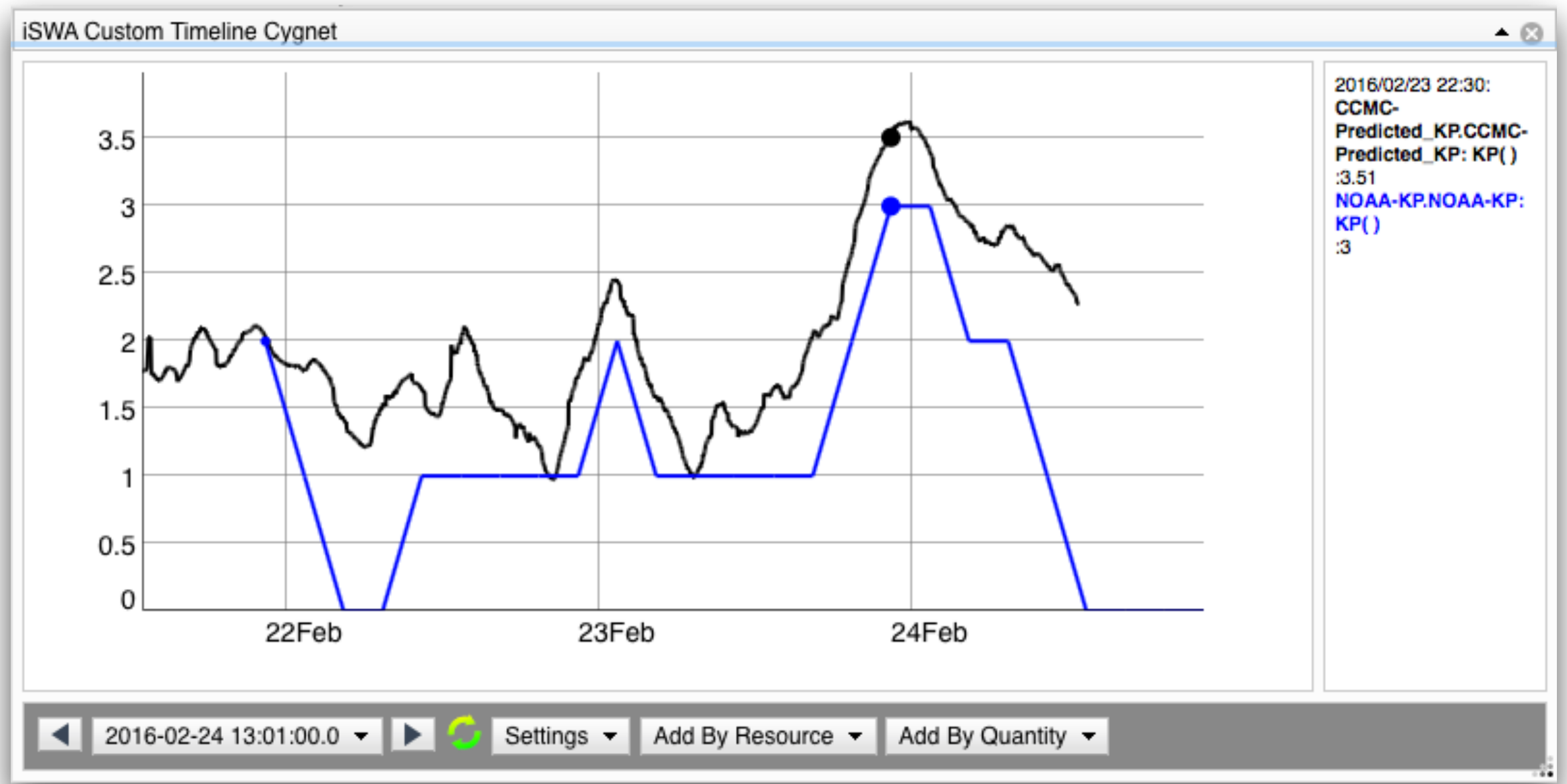
Cygnet Types: Event



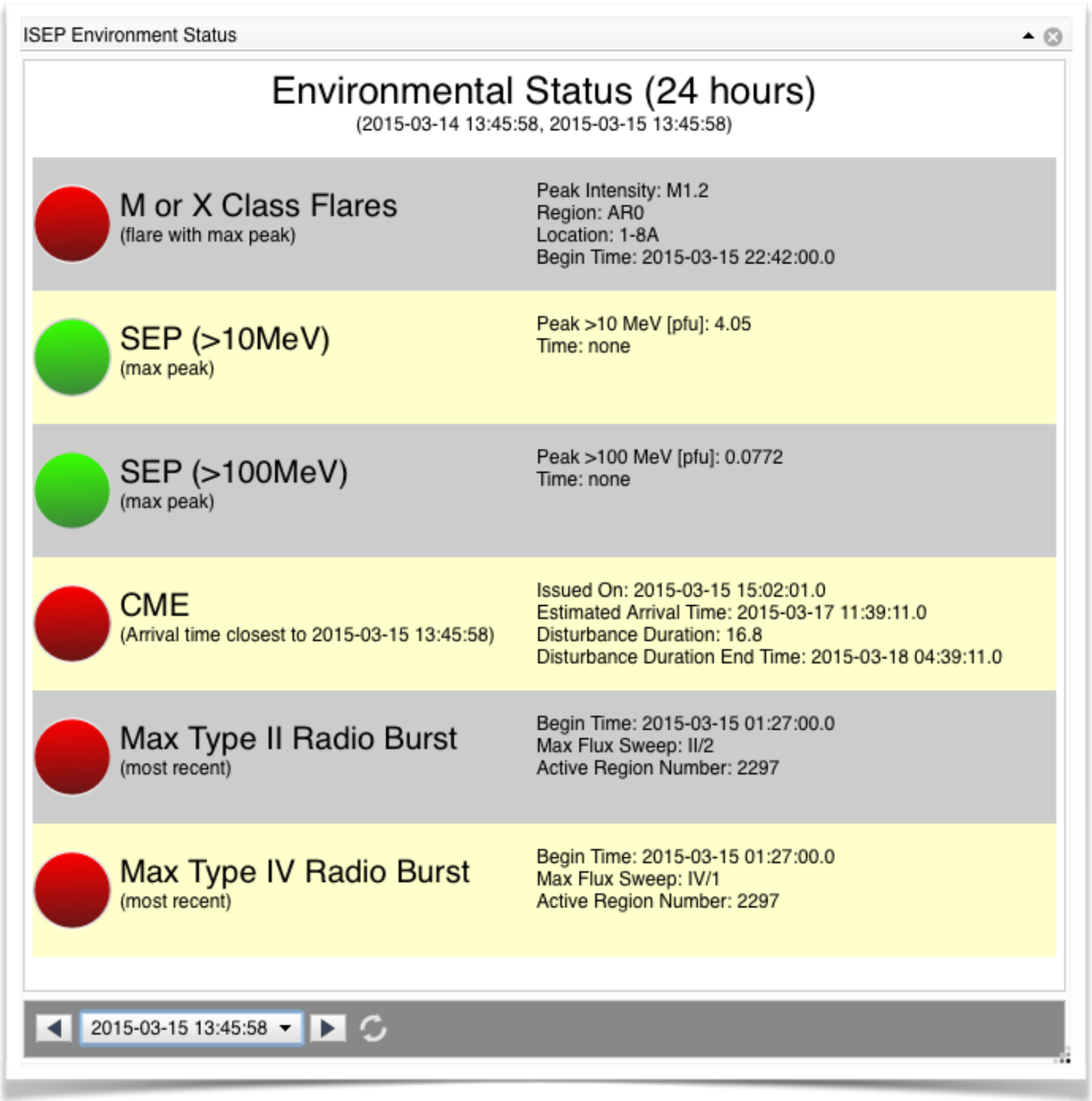
Cygnet Types: Timelines

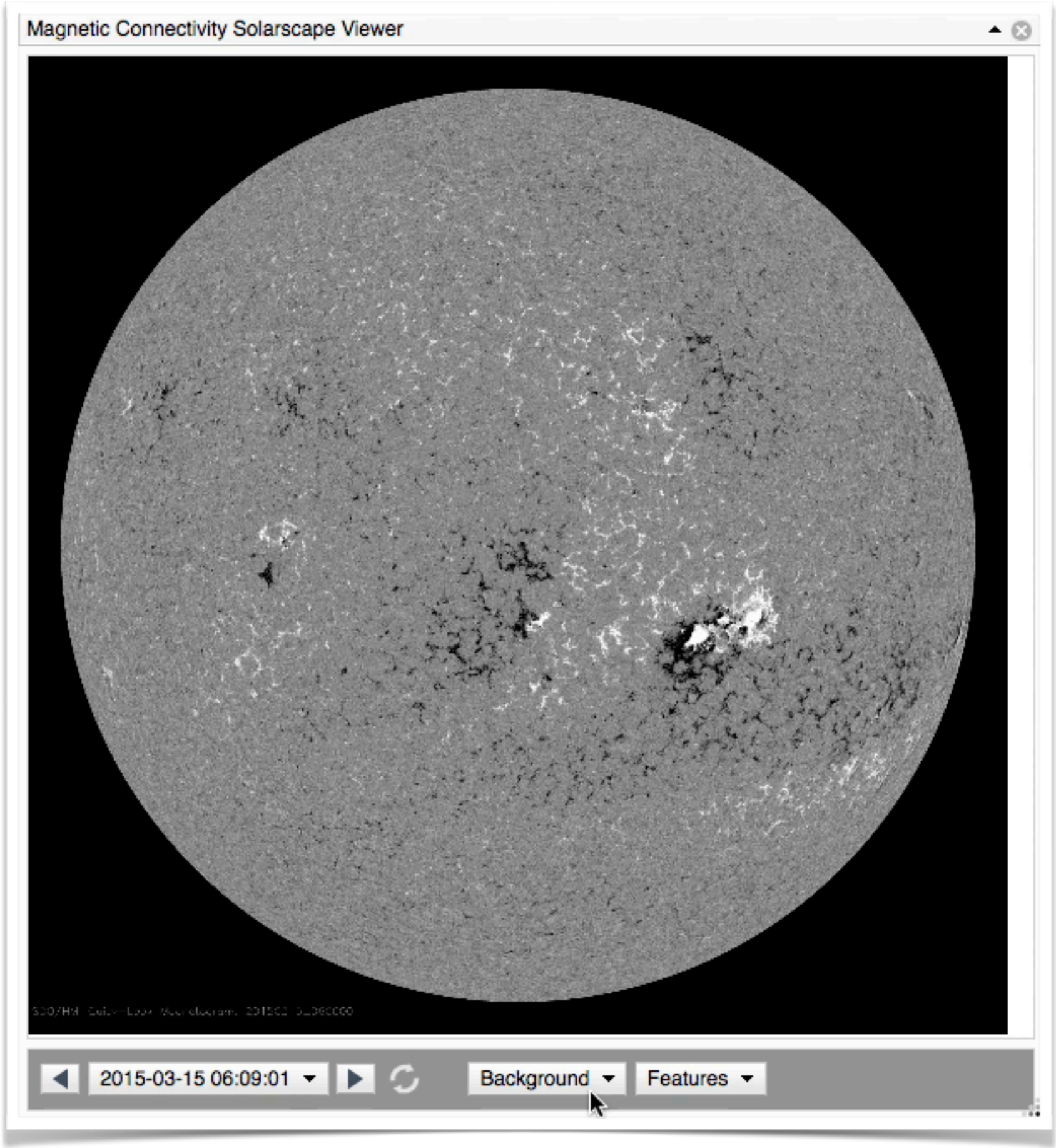


Cygnet Types: Custom Timeline



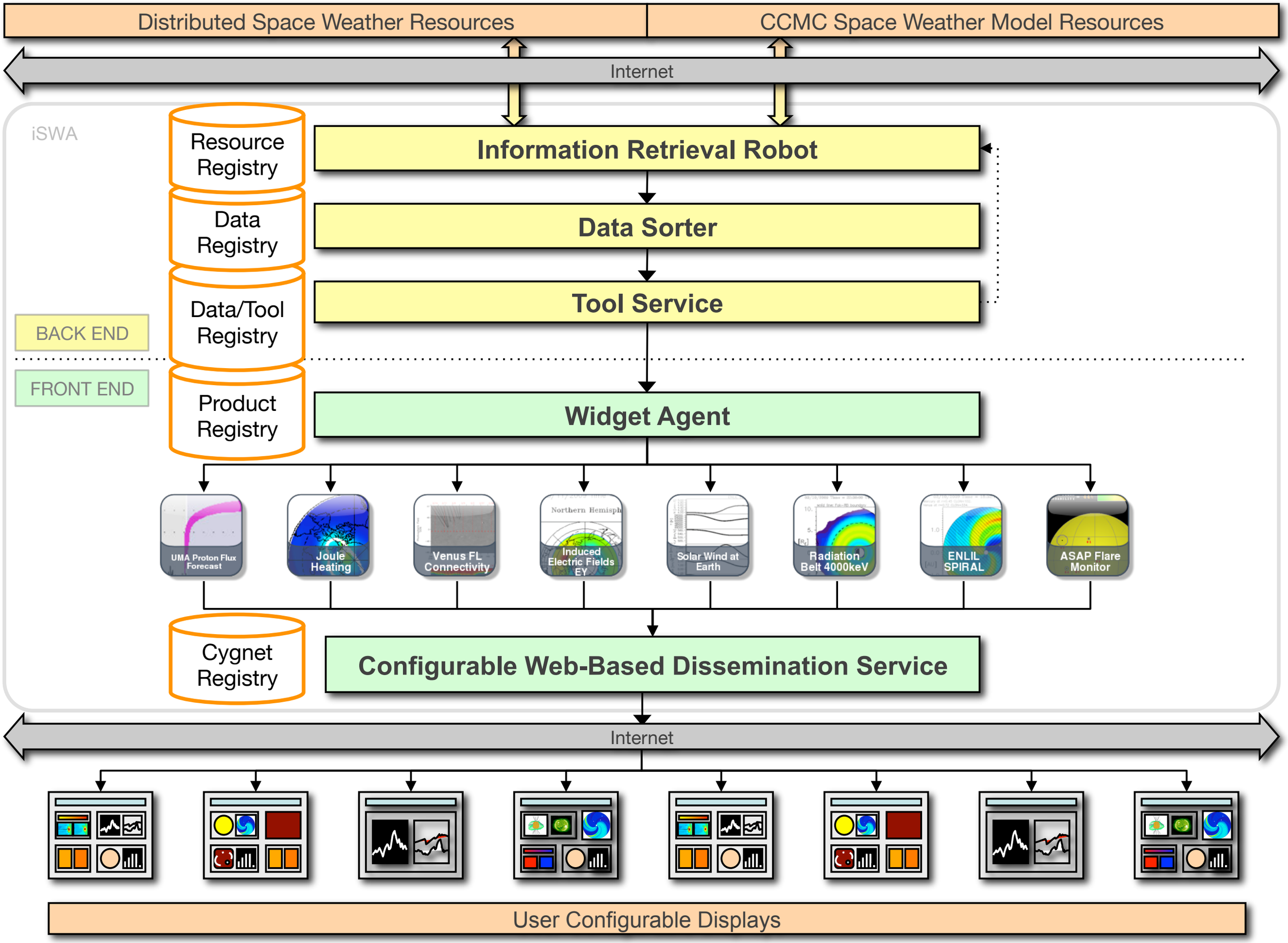
Cygnet Types: Composite




Magnetic Connectivity Solarscape Viewer
2015-03-15 06:09:01
Background
Features

Other Cygnet Types

- Image Gallery
- Simple Text
- Pure HTML
- Other Composite Types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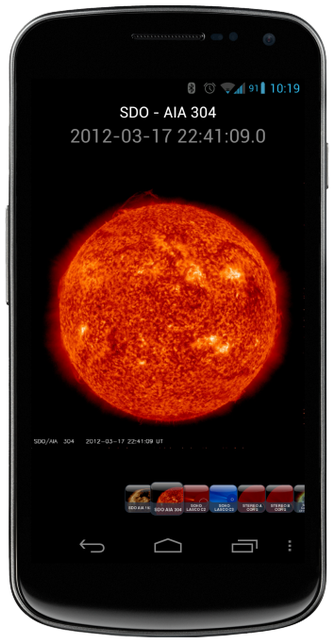
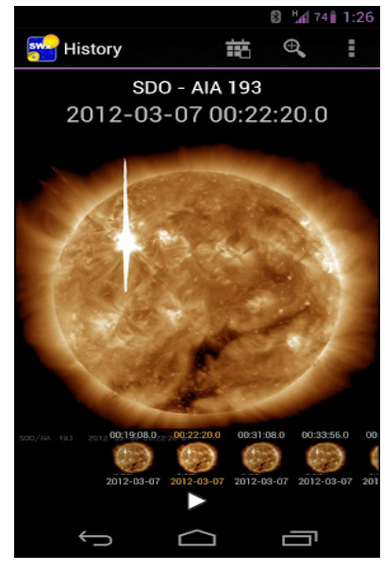
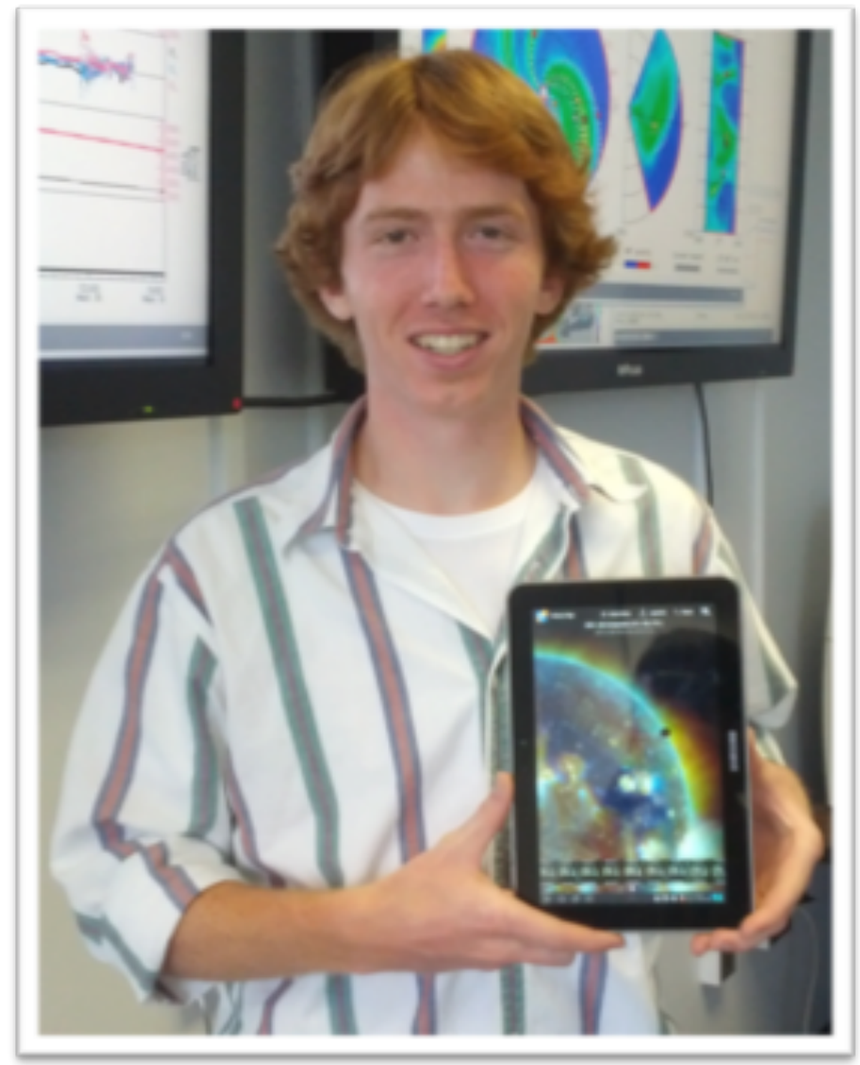
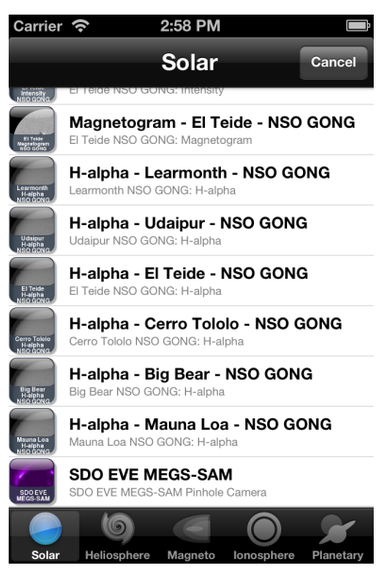
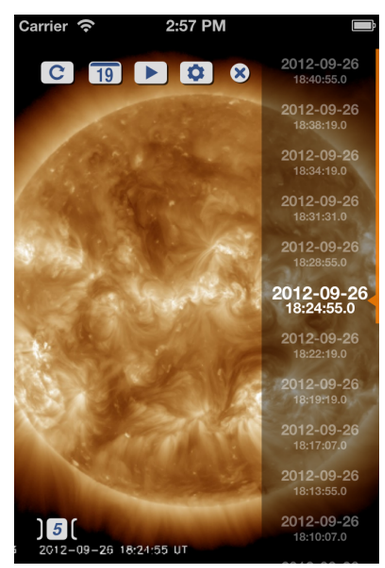
NASA Space Weather











Stats

- 569 Unique Data Feeds
- 84 Million Files Registered
- 408 Consumable Display Products
- 132k Android App Downloads
- 147k iOS App Downloads

?s