Integrated Space Weather Analysis System

A Software Perspective

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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 Heliosphere Magnetosphere

Inner Magnetosphere Ionosphere/Thermosphere

Comprehensive Collection Of Space Weather Models:
- SWMF.SC
- PFSS.Petrie
- PFSS.Macneice
- PFSS.Luhmann
- ANMHD
- UMASEP
- SRPM
- MAG4
- ASAP
- WSA
- NAIRAS
- MAGIC
- ASSA
- SNB3GEO
- NLFFF.Wiegelmann
- ENLIL
- ENLIL+Cone
- ENLIL-C-SWEPA
- Posner SEP
- PREDICCS
- EXO Solar Wind
- EMMREM
- CORHEL
- Heltomo SMEI
- ENLIL+Cone
- Heltomo IPS
- BRYNTRN
- SWMF.SH
- DBM
- LFM-TING
- LFM-MIX
- OpenGGCM+CMIT
- SWMF+RCM+deltaB
- SWMF+RCM
- SWMF+RCM+RBE
- SWMF+RCM+CRCM
- LFM-MIX-TIEGCM
- WINDMI
- IGRF
- Tsyganenko
- PS VP
- Weigel-deltaB
- AACGM
- Ovation Prime
- TIE-GCM
- GMAT
- IMPACT
- CTIPe
- IRI
- USU-GAIM
- SWACI-TEC
- ABBYNormal
- UPOS RB
- NRLMSISE
- GITM
- PBMOD
- TRIPL-DA
- Weimer IE
- Weimer-deltaB
- JB2008
- COSGROVE-PF
- TSI-GCM
- RCM
- Fok.CIMI
- Fok.RBE
- AE-8/AP-8
- AE-9/AP-9
- VERB
- TRPL-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
iSWA 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.
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
**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

iSWA Interactive Timeline - Solar Wind Velocity

- 2015-03-21 14:41:00.0
- Settings
Cygnet Types: Custom Timeline
Cygnet Types: Composite
Other Cygnet Types

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

CCMC Space Weather Model Resources

Internet

BACK END

FRONT END

iSWA

Resource Registry

Data Registry

Data/Tool Registry

Product Registry

Information Retrieval Robot

Data Sorter

Tool Service

Widget Agent

Configurable Web-Based Dissemination Service

User Configurable Displays
NASA Space Weather
Stats

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