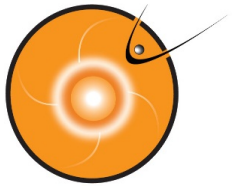
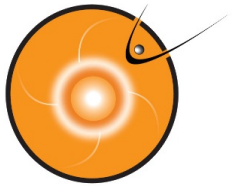


CCMC Overview, tools & databases, SPASE implementation

Darren De Zeeuw and Chiu Wiegand

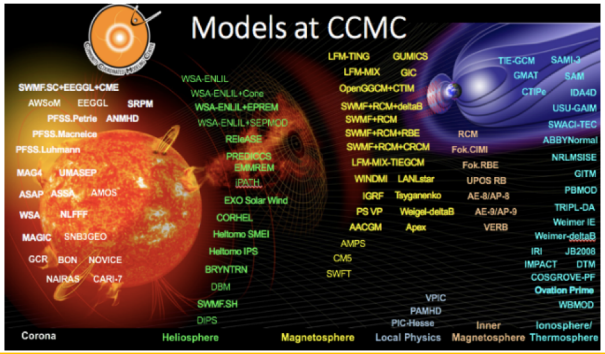


Topics

- CCMC Overview
- CCMC Metadata Registry
- CAMEL (Validation Framework)
- iSWA HAPI implementation
- Kamodo
- ISWAT – International Space Weather Action Teams

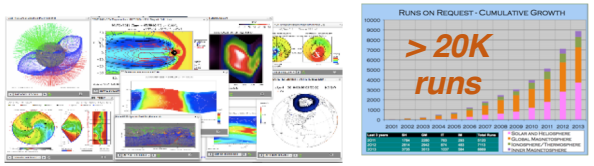
CCMC Overview

Models



Simulation

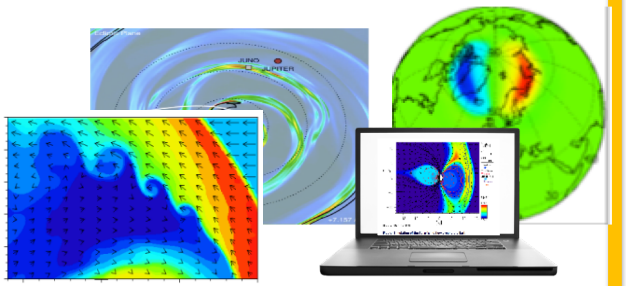
Services



Runs-on-Request

Real-time Runs

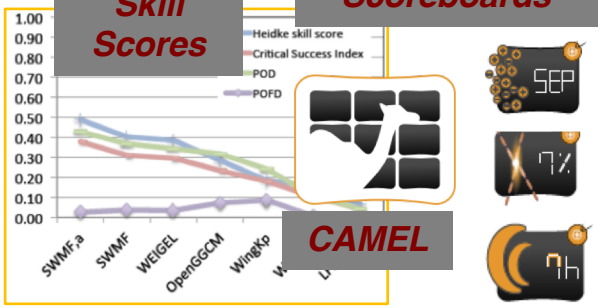
Visualization, Dissemination



Validation

Skill Scores

Scoreboards



CAMEL

NASA Missions & Community Support

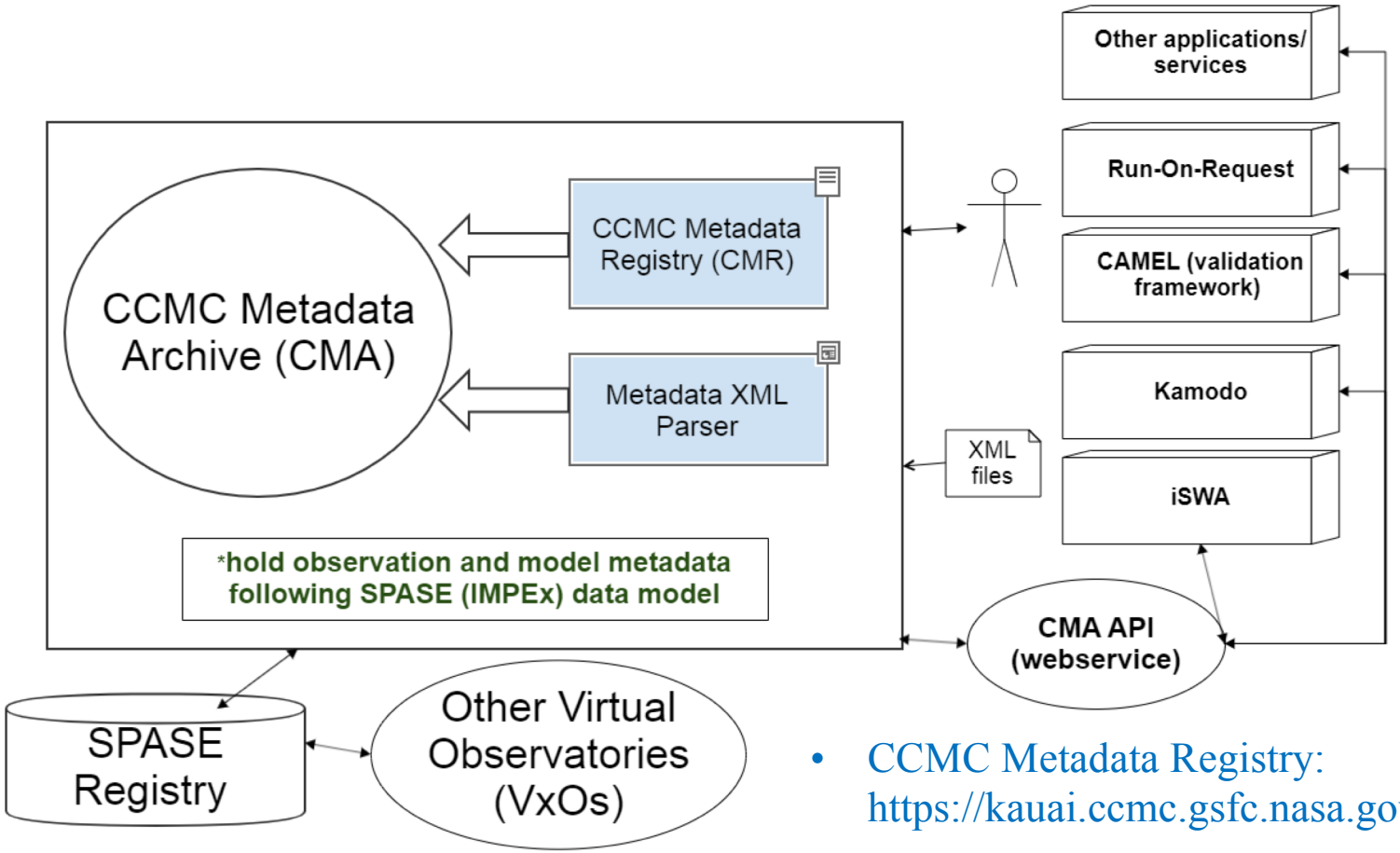
Information Architecture:

Archives

Interactive Interfaces

(Meta)data Standards

CCMC Metadata Registry



- CCMC Metadata Registry: https://kauai.ccmc.gsfc.nasa.gov/CMR
- Enter/View metadata stored in our database

Comprehensive **A**ssessment of **M**odels and **E**vents based on **L**ibrary tools

Events

- Event 1 : October 29th, 2003 06:00 UT - October 30th, 06:00 UT
- Event 2 : December 14, 2006 12:00 UT - December 16, 00:00 UT
- Event 3 : August 31, 2001 00:00 UT - September 1, 00:00 UT
- Event 4 : August 31, 2005 10:00 UT - September 1, 12:00 UT
- Event 5 : May 15, 2005 00:00 UT - May 16, 00:00 UT
- Event 6 : July 09, 2005 00:00 UT - July 12, 00:00 UT
- Event 7 : April 05, 2010 00:00 UT - April 6, 00:00 UT
- Event 8 : August 05, 2011 09:00 UT - August 6, 09:00 UT

Models

- Run 9_SWMF
- Run 2_LFM-MIX
- Run 4_OPENGGCM
- Run 6_WEIMER
- Run 3_WEIGEL
- Run 2_WEIGEL

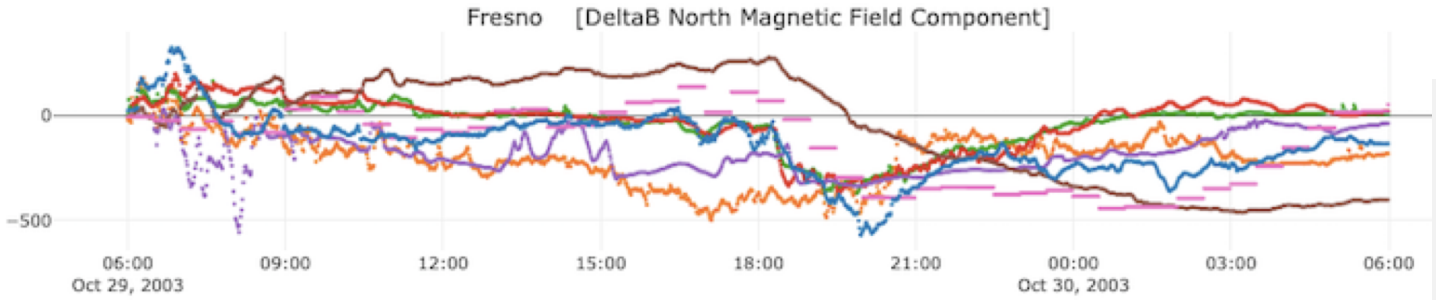
CAMEL

Locations

- Polar Latitudes: iqa - Iqaluit
- Polar Latitudes: hrn - Hornsund
- Polar Latitudes: ykc - Yellowknife
- Auroral Latitudes: abk - Abisko
- Auroral Latitudes: pbq - Poste de la Baleine
- Auroral Latitudes: mea - Meanook
- Auroral Latitudes: snk - Sanikiluaq
- Sub-auroral Latitudes: ott - Ottawa
- Sub-auroral Latitudes: new - Newport
- Sub-auroral Latitudes: wng - Wingst
- Mid Latitudes: frd - Fredericksburg
- Mid Latitudes: fur - Furstenfeldbruck
- Mid Latitudes: frn - Fresno

Interactive front-end web interface for display and analysis of evaluation results:

https://ccmc.gsfc.nasa.gov/camel/



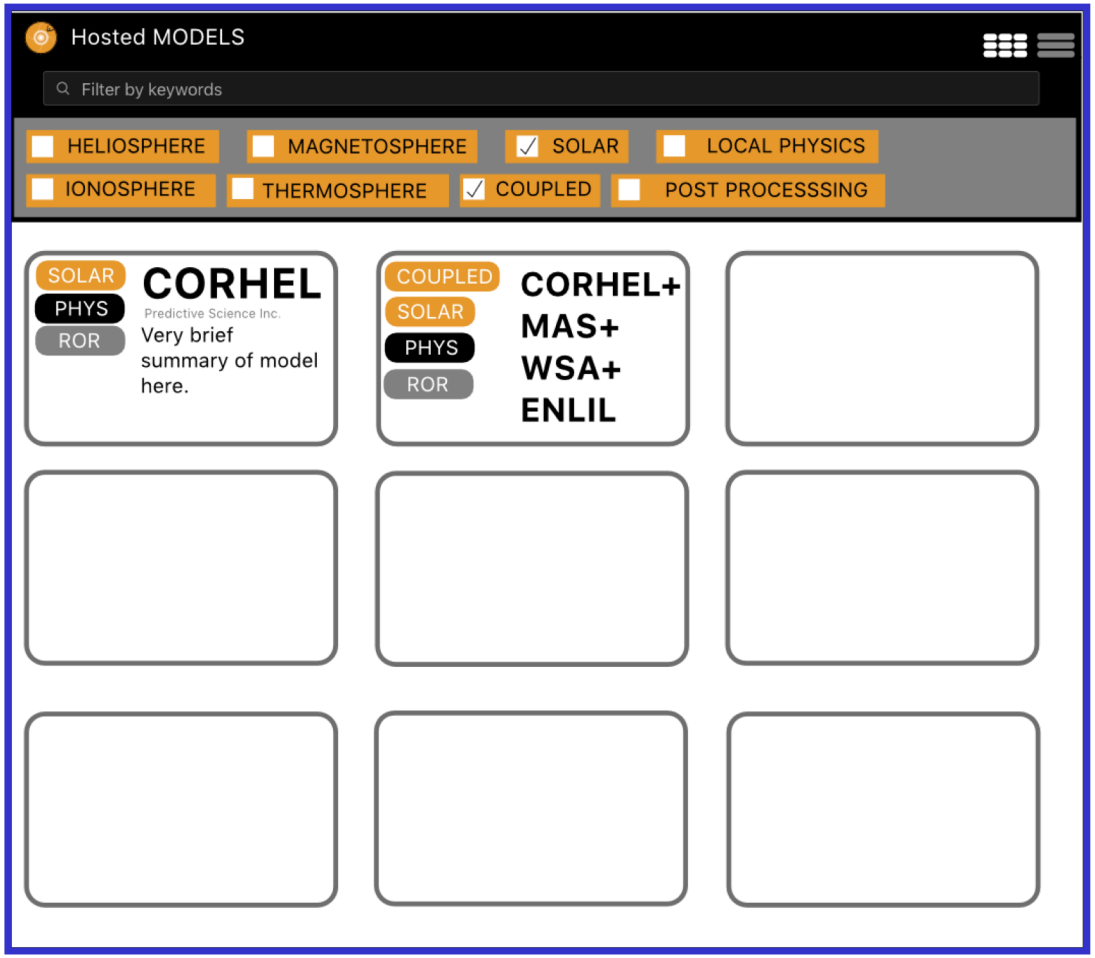
Database (with API access) of time series, derived from model output and observational data, for all validation studies.

iSWA HAPI Implementation

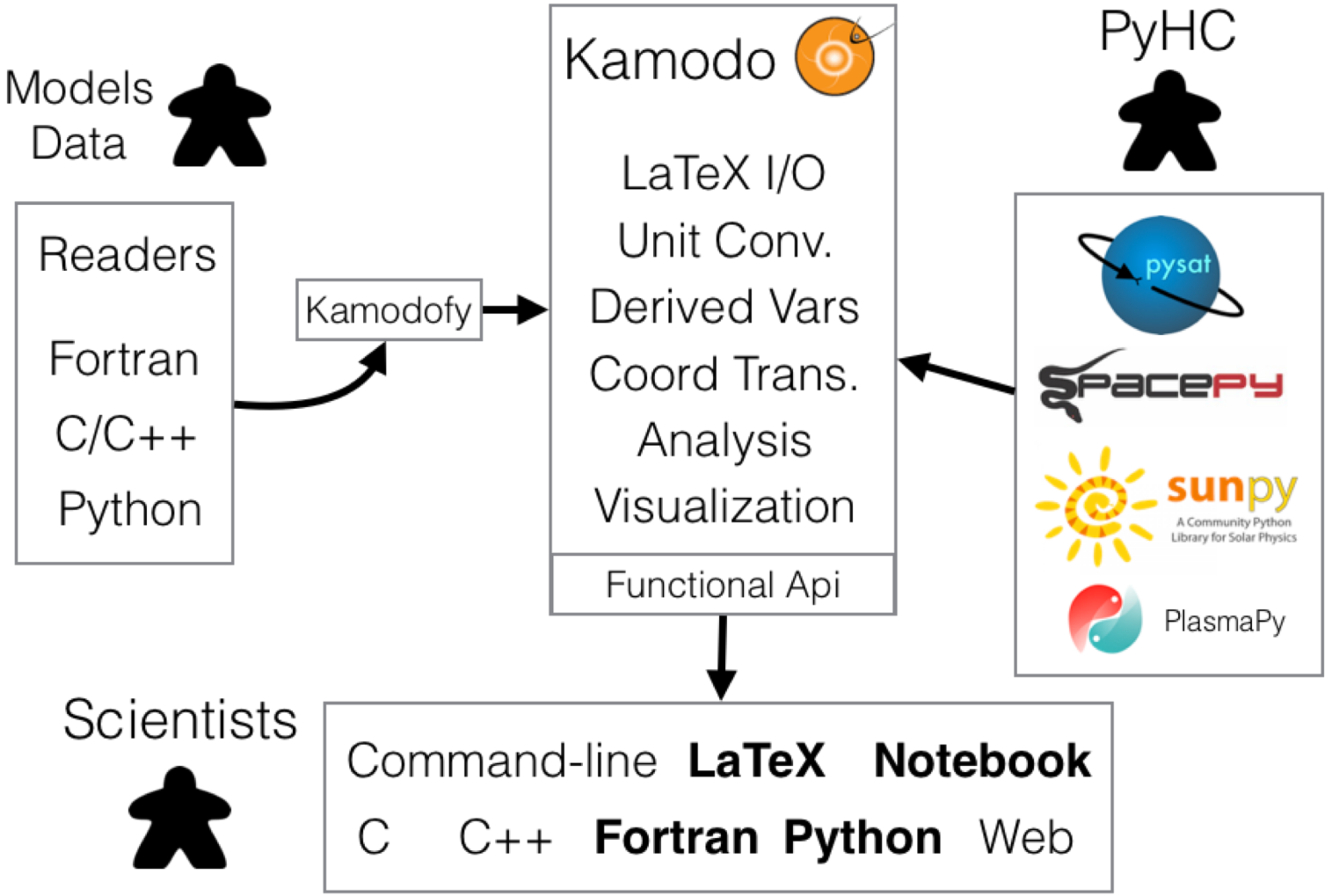
- iSWA supports the HAPI Data Access Specification (version 2.0) for delivery of time series data
  - Includes all data resources/parameters that are shown in iSWA super timeline cygnet
  - https://iswa.gsfc.nasa.gov/IswaSystemWebApp/hapi/

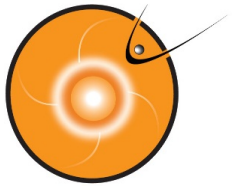
Models Display System

- Models Display System:
  - Backend:
    - Metadata about our hosted models stored in CMR (SPASE format)
  - Frontend:
    - Calls API from CMR to get details about the model



Kamodo Architecture





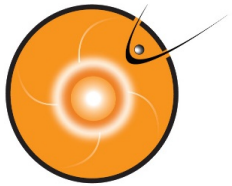
Kamodofication

- the process of exposing models and data to Kamodo

A model or data source is considered “kamodofied” when all scientifically relevant variables are exposed as Kamodo objects.

Prioritized Kamodofication requirements:

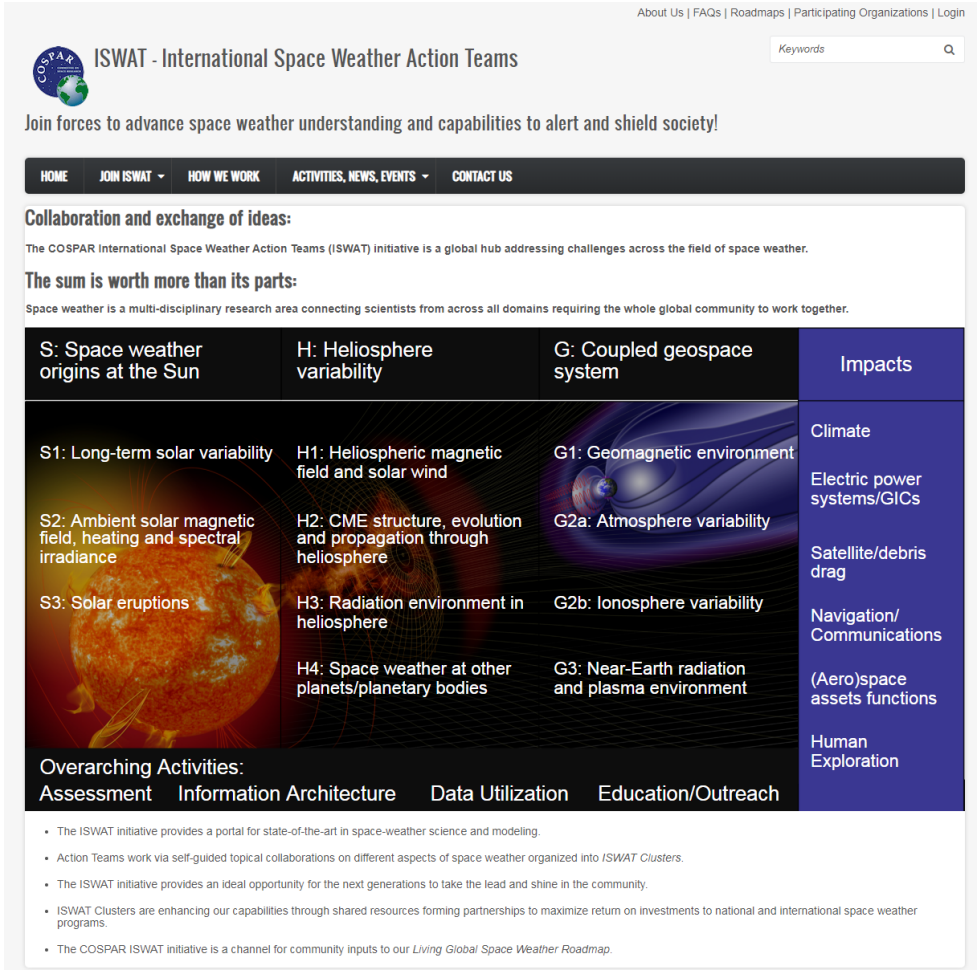
1. **Model must be accessible from python**
2. **Model must provide an interpolating function for each variable**
3. Interpolating functions should supply default values as arguments, indicating the valid domain for their inputs.
4. Variable names should follow Kamodo’s naming specification for LaTeX legibility.
5. Interpolating functions should contain the following metadata as attributes:
    1. meta - dictionary of {‘units’: ’kg’, ‘citation’ : ’Doe, J. et. al’}
    2. data – array
6. Class Methods should use “self” as the first argument.



Kamodo recent improvements

- Project page: https://ccmc.gsfc.nasa.gov/Kamodo
- Open source: https://github.com/nasa/Kamodo
- Field line integration (IVP solver)
- Kamodofied Kameleon readers
- Kamodofied MMS analysis
- Collaboration with PySat

ISWAT – International Space Weather Action Teams



- https://iswat-cospar.org
- Overarching Activities:
  - Information Architecture
  - Data Utilization
  - Responds to Recommendations of the COSPAR Panel on Space Weather (PSW):
    - PSW 2018 Metadata Resolution
    - PSW 2018 Data Access Resolution