SWx TREC: An Emerging Community Resource for Integrative Space Weather Data Access and Model / Algorithm R2O Promotion

https://www.colorado.edu/spaceweather/

SWx TREC

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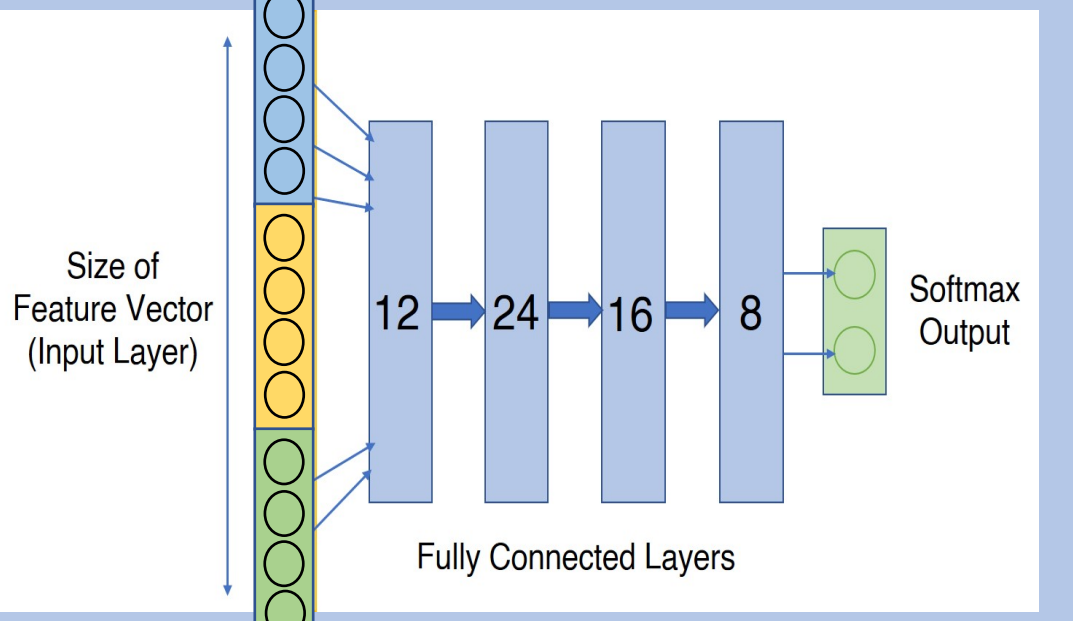
CU Grand Challenge
UNIVERSITY OF COLORADO BOULDER
SPACE WEATHER CENTER

The Space Weather Technology, Research, and Education Center (SWx TREC)
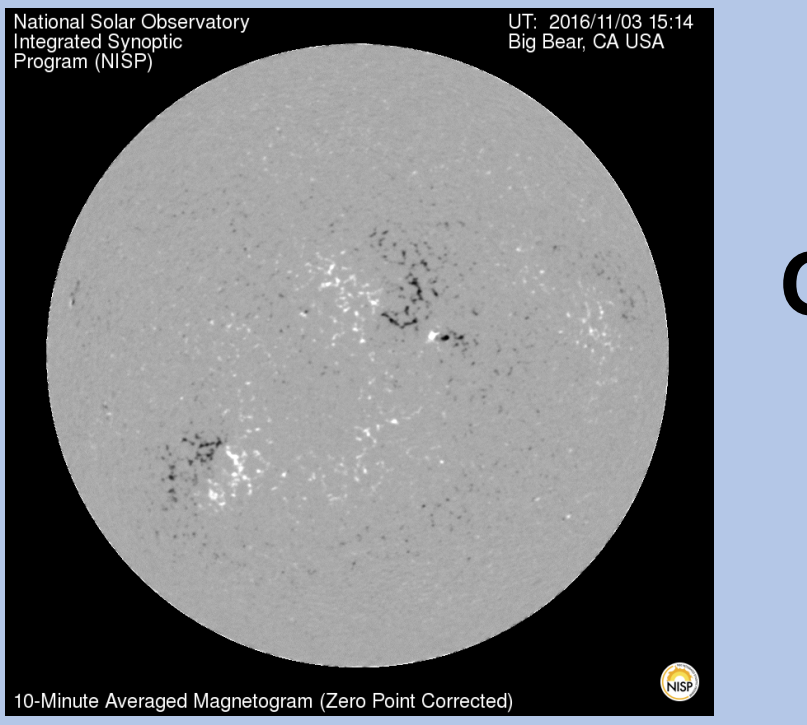
Research Enterprise

Conduct applied research in models, tools, and missions to ensure relevant forecasting advances (R2O)
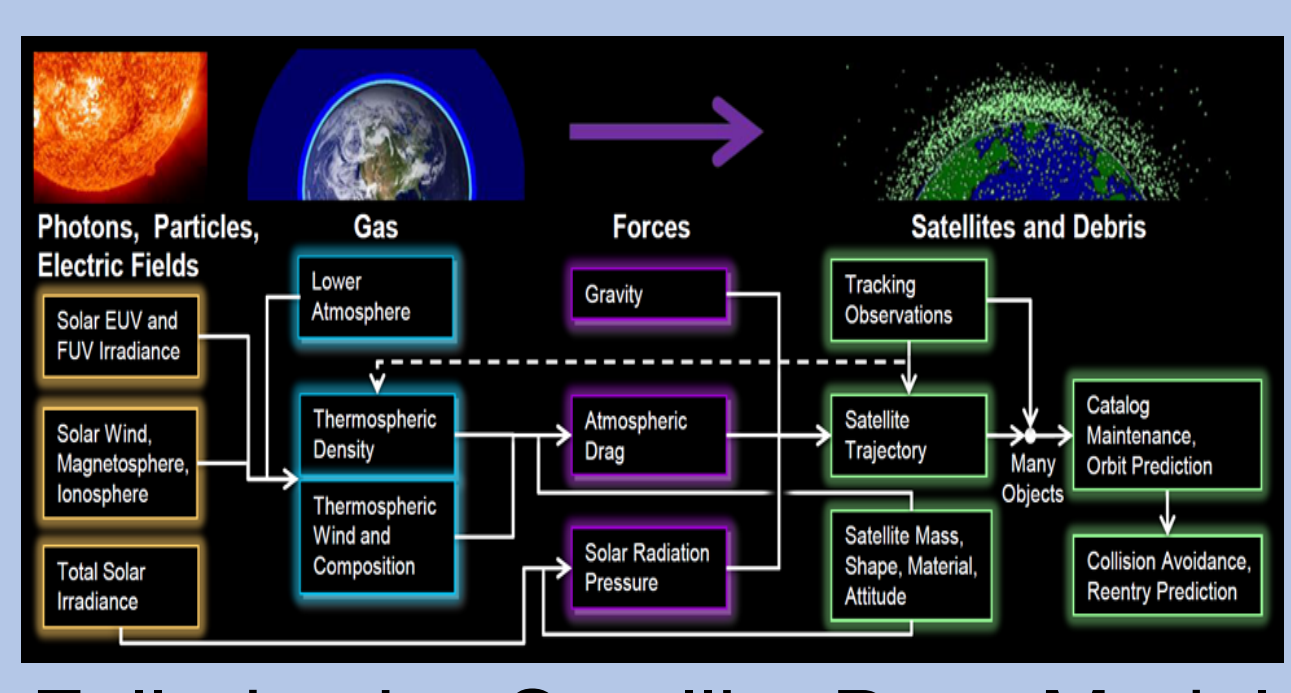
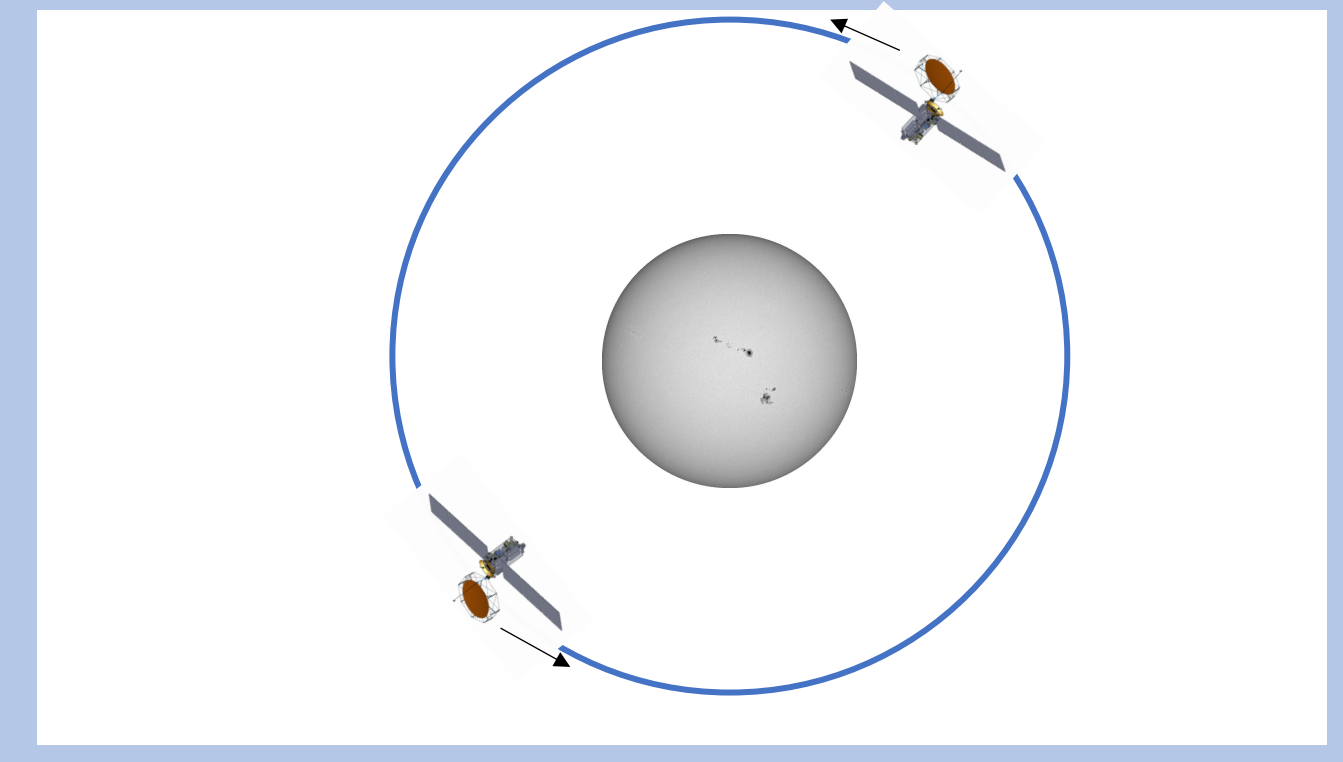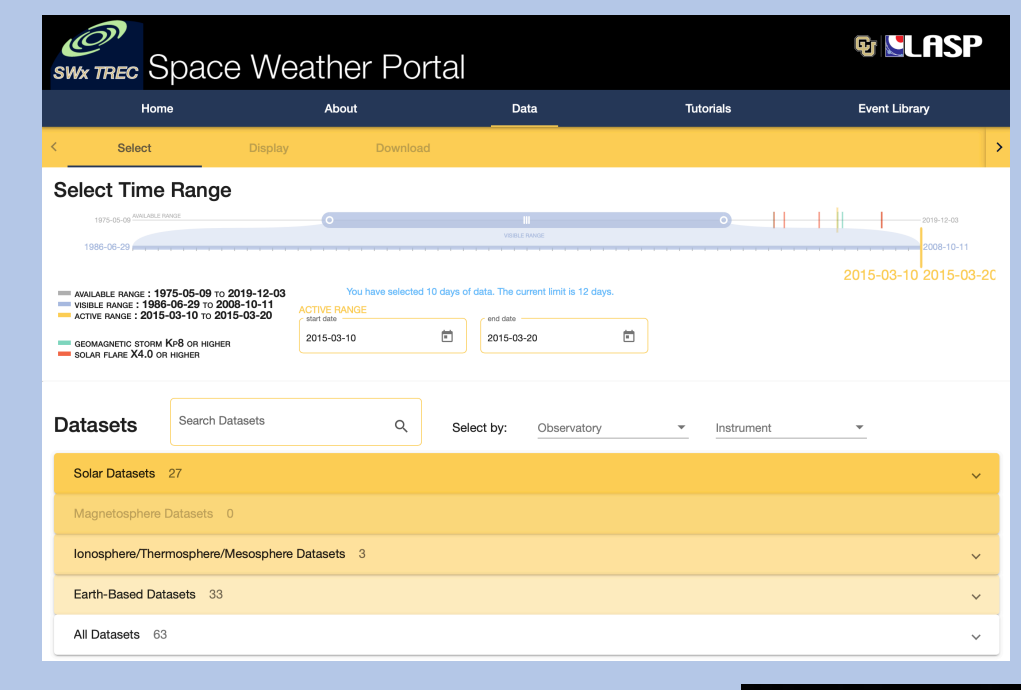Full-physics Satellite Drag Model

Deep Learning Laboratory

GONG Calibration (NASA O2R)

MADTech* Enterprise

Enable testing, maintenance, and upgrading of new and already operational models, tools, and data streams via the SWx Data Portal and TREC Testbed Environment
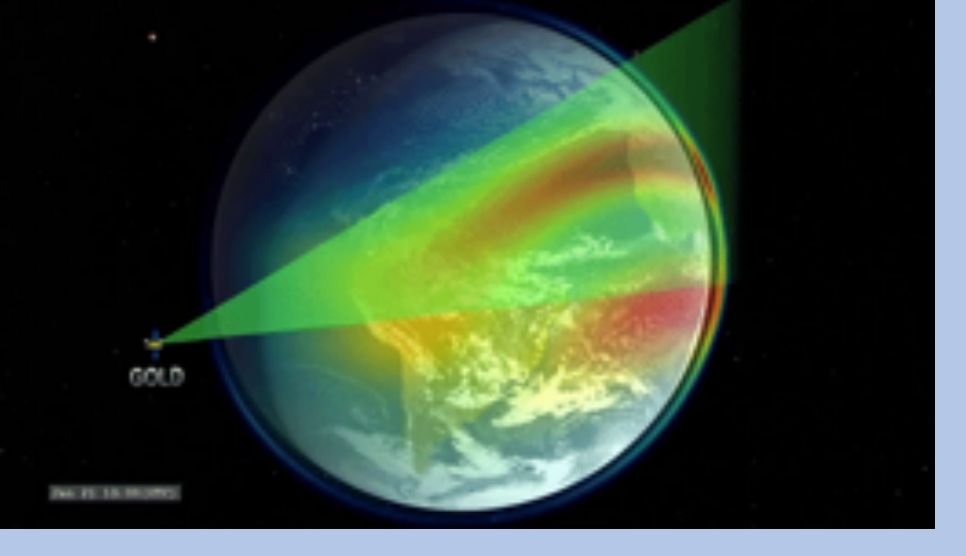
Hybrid Research-Operations Observing Platforms

Space Weather O2R Data Portal & Testbed
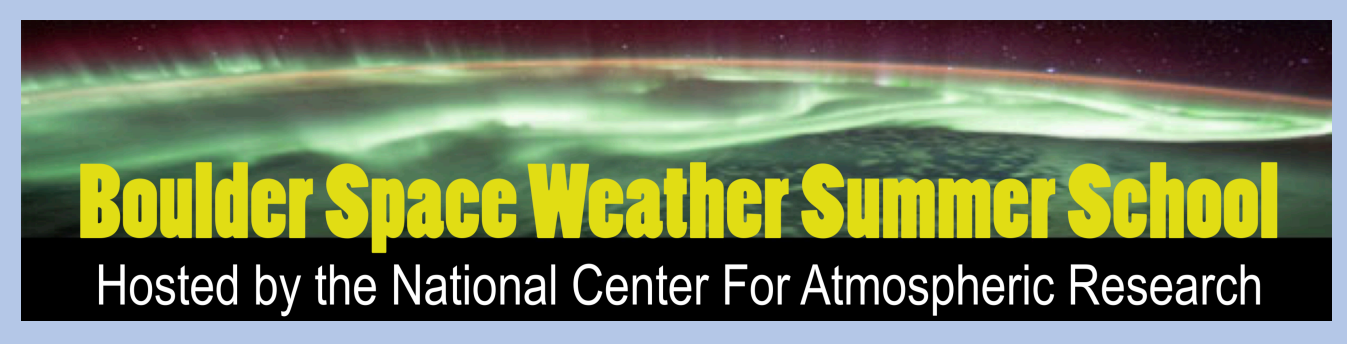
NASA Mission Data R2O:
GOLD
IMAP

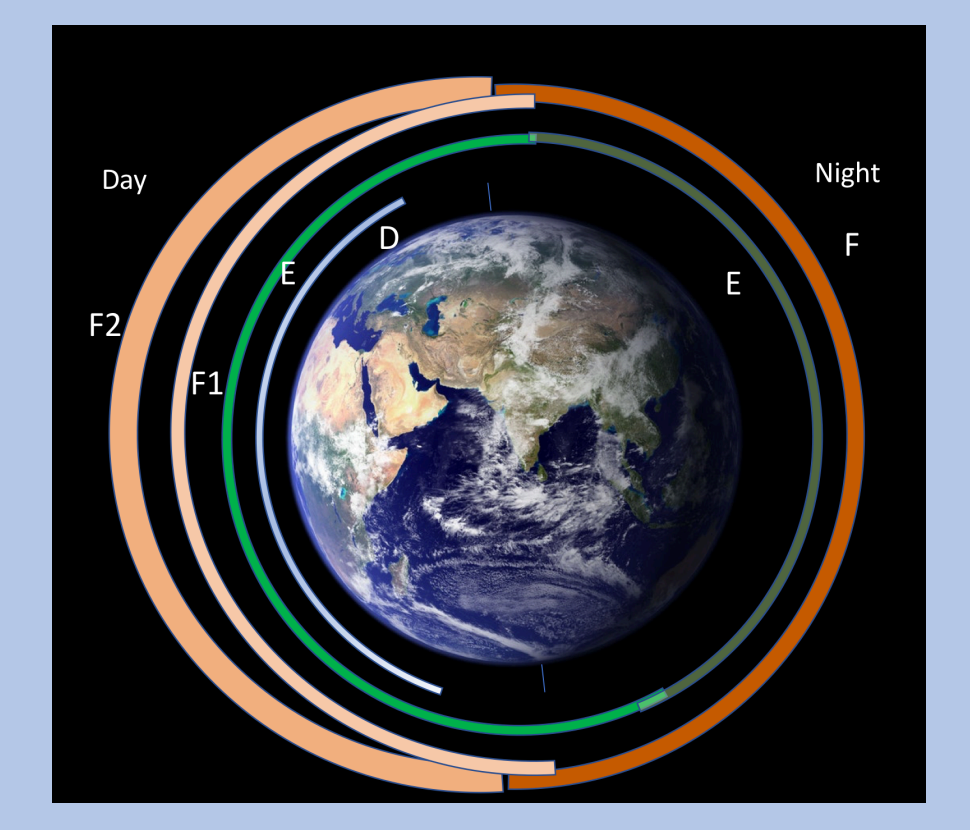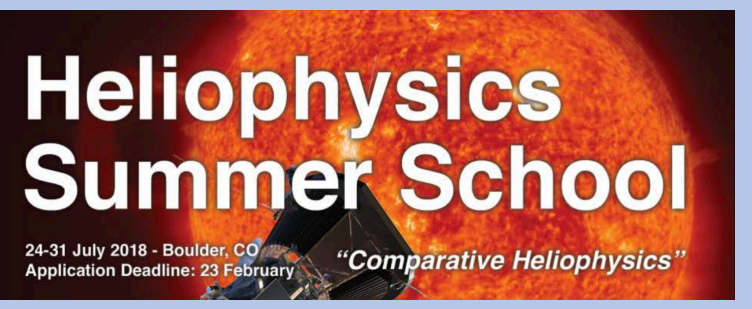*Missions, Applications, and Data Technology

Education Enterprise

Coordinate course work, administer certificates in space weather engineering and science, and plan workshops

Space Weather Graduate Certificate

Boulder Space Weather Summer School participation

Professional Development

The Problem

- Lack of Observations
- Need for improved "Full System" Coupled Models
- Need stronger Research-to-Operations (R2O) link
  - Models are designed for research
  - Data visualization tools are not forecast products
  - Long delays in getting research mission data and models to Forecast Offices
- Need stronger Operations-to-Research (O2R) feedback
  - Limited community access to operational models
  - Difficulty accessing disparate data products
  - End Users (e.g. forecasters and their customers) not always consulted in R&D strategy

The SWx TREC Solution

- Multi-disciplinary research, technology innovation, and education
- Enable collaboration among federal agencies, academia, and commercial sector
- Address evolving forecasting, mitigation, and response requirements
- New models, tools, missions, and data to advance understanding and prediction of SWx phenomena
- A **Data Portal** to lower barriers to broad data access
- A **Testbed environment** to
  - Lower barriers to working with operational and research models
 - Shorten the R2O promotion lifecycle

Space Weather Data Portal (http://lasp.colorado.edu/space-weather-portal)

The Problem

- Researchers now access data from multiple sites in multiple formats with varying availability
- Extensive time is spent just acquiring data and getting it into a usable form
- Inconvenient access to both Operational and Research data sets

The SWx TREC Solution

- A centralized portal to SWx products
- A "FAIR" data portal (Findable, Accessible, Interoperable, Reusable data)
- Interactive data discovery
- Interactive and customizable plots and "dashboards"
- User-selectable formats
- Persistence / Citations
- Session / Dashboard Recall
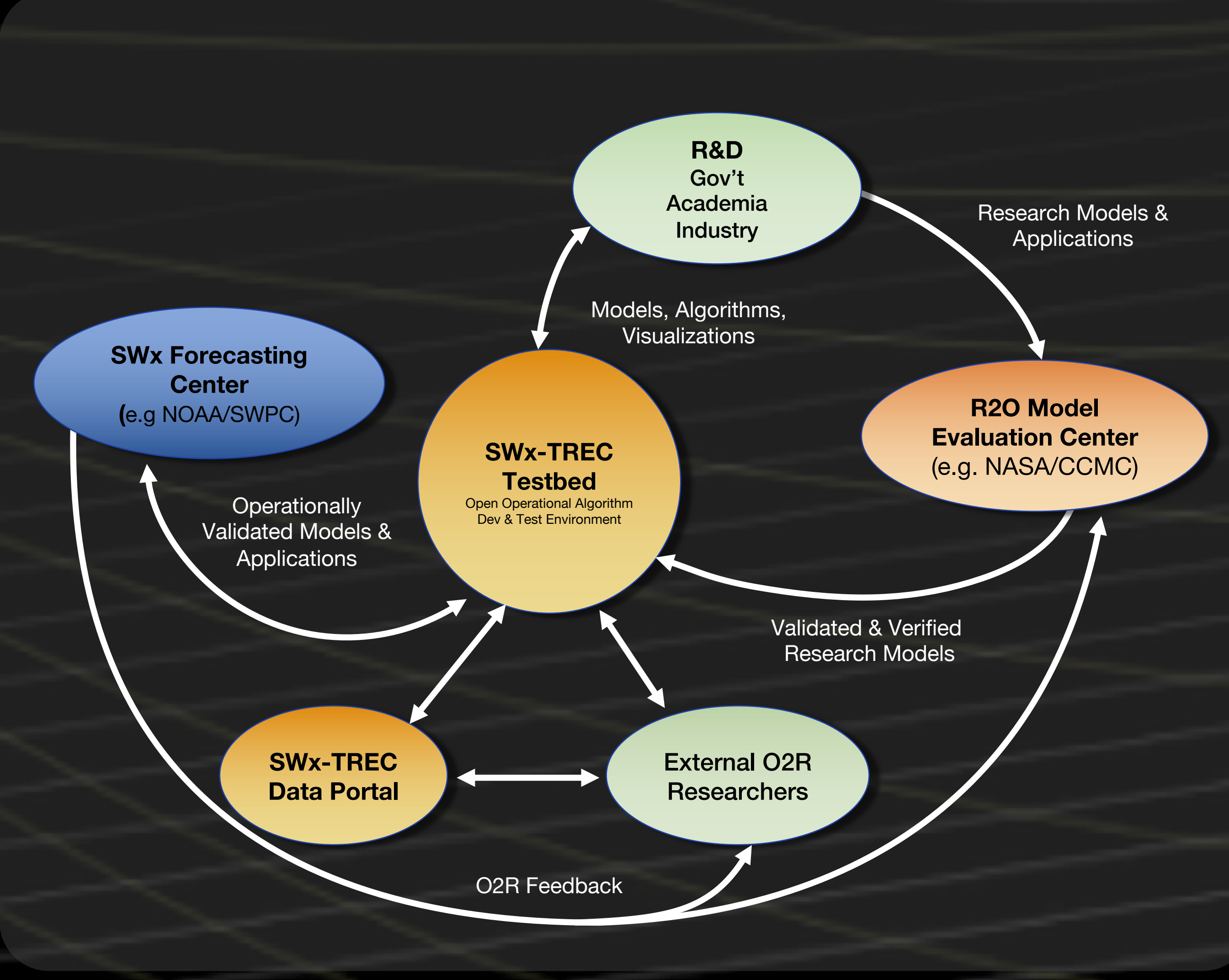- API-based access supporting RESTful, scriptable data access
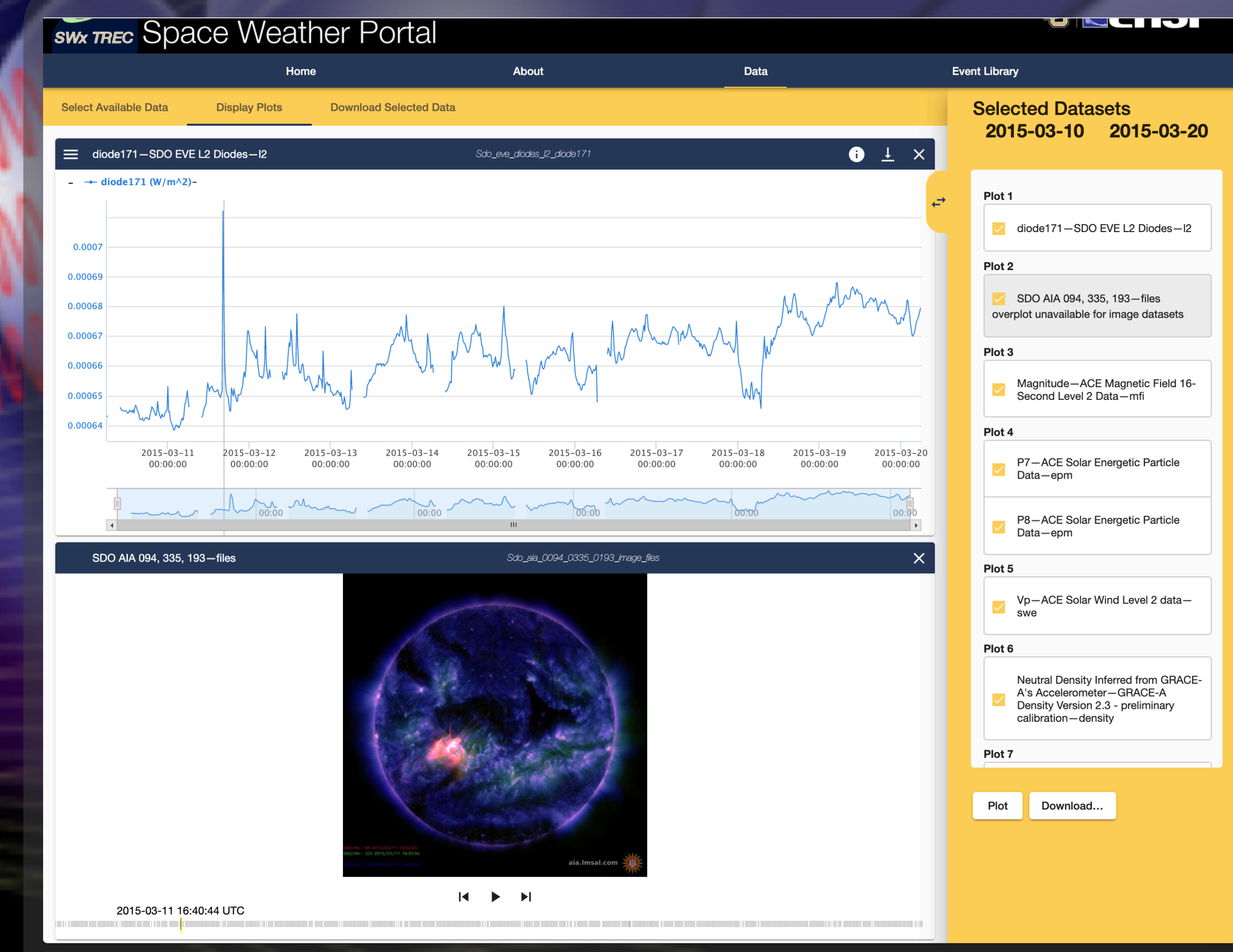
TREC Testbed Environment

The Problem

- Need to accelerate R2O, providing a bridge to the operational SWx environment
- Need to incubate and promote new model codes, data, tools, and information

The SWx TREC Solution

- Open computing environment to host 3rd party model, product, analysis, viz, or other codebases
- Hosted computing testbed for model development and testing
- Full lifecycle code management, deployment, and testing environment. Full ownership and control by researchers
- Versatile computing resources
- Tools, libraries, and environments tailored to specific models
- Initial deployment: WAM-IPE, TIEGCM, SWMF, USGS E-fields models.

Please see related posters