

National Aeronautics and
Space Administration



Space Weather Centers of Excellence and Open R202R

Dr. Genevieve Fisher
Program Scientist, NASA Heliophysics

CCMC Workshop
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Space Weather Centers of Excellence

Space Weather Research and Technology Applications (SPARTA) Center of Excellence

- PI: Keith Groves, Boston College

Space Weather Operational Readiness Development (SWORD) Center

- PI: Thomas Berger, University of Colorado, Boulder

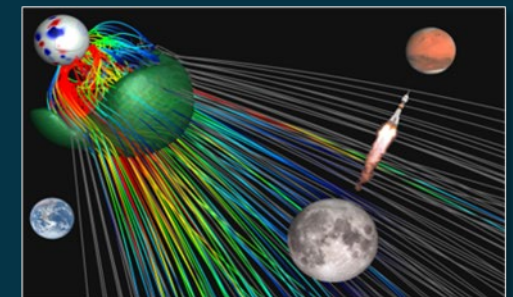
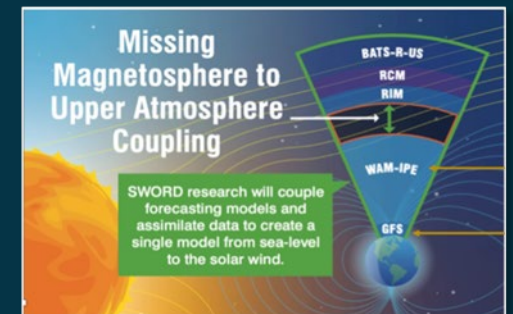
CLEAR: Center for All-Clear SEP Forecast

- PI: Lulu Zhao, University of Michigan, Ann Arbor

Joint Selection w/ Department of Commerce

Advanced Forecasting of Drag for Enhanced, Sustainable, and Conscientious Space Operations

- PI: Piyush Mehta, West Virginia University, Morgantown



The background of the slide is a dark blue space scene. On the left side, there is a vertical strip showing a yellow sun at the bottom, the Earth's horizon, the Moon, Mars, and Saturn with its rings. The rest of the slide has a dark blue background with white stars and a large, semi-transparent blue circle on the left side.

Purpose of the Centers

The purpose of the Centers is to provide significant long-term investment in research and infrastructure development to address major challenges in space weather in an integrated multidisciplinary fashion, explicitly and fundamentally incorporating R2O and O2R

- Efforts are highly ambitious and address critical challenges in space weather
- Supports research that cannot be effectively done by individual investigators or small teams
- Requires synergistic, coordinated efforts of a center

Organizations Involved

Boston College

Univ of Colorado Boulder

Univ of Michigan

UCAR

Univ of Iowa

Univ of Alaska, Fairbanks

Catholic University of America

CalTech

University of Alabama Huntsville

University of Arizona

MIT Haystack

Utah State University

Boston University

Cornell University

NASA

NOAA

AFRL

FAA

APL/JHU

NorthWest Research Associates

The Aerospace Corp

GeoOptics, Inc

Flyer Research LLC

Global Aerospace Corp

Muon Space Inc

LeoLabs

Lockheed Martin

SpaceX

Space Science Institute

Spire Global

University of Birmingham

University of New Brunswick

Space Science and Engineering LLC

UK Met Office

SANSA

National Institute of Information and
Communications Technology (Japan)

INGV (Italy)

Deutsches Zentrum Fuer Lefut-Ind
Raumfahrt E.V. (Germany)

Over 100 people involved across the Centers

NASA & Advisory Team

NASA SW Centers of Excellence Program Official: Genene Fisher

NASA SMEs: John McCormack–SWORD, Simon Plunkett–CLEAR, Esayas Shume–SPARTA

NASA Communications: Sarah Frazier and Desiree Apodaca

Transition & Technology Readiness Advisors (TTR)

SPARTA:

- TTR: Jonah Colman, AFRL
- SWPC: Tzu-Wei Fang, Tim Fuller-Rowell
- CCMC: Min-Yang Chou/Jia Yue

SWORD:

- TTR: Howard Singer/Astrid Maute
- CCMC: Masha Kuznetsova

CLEAR:

- TTR: Katie Whitman, NASA/SRAG
- SWPC: Eric Adamson, Hazel Bain
- CCMC: Leila Mays



Heliophysics Division (HPD) Science Data Management Policy

This policy is a supplement to SMD Policy Document (SPD)-41a: Scientific Information Policy for the Science Mission Directorate

Overarching principles essential to achieving the goals of HPD programs are:

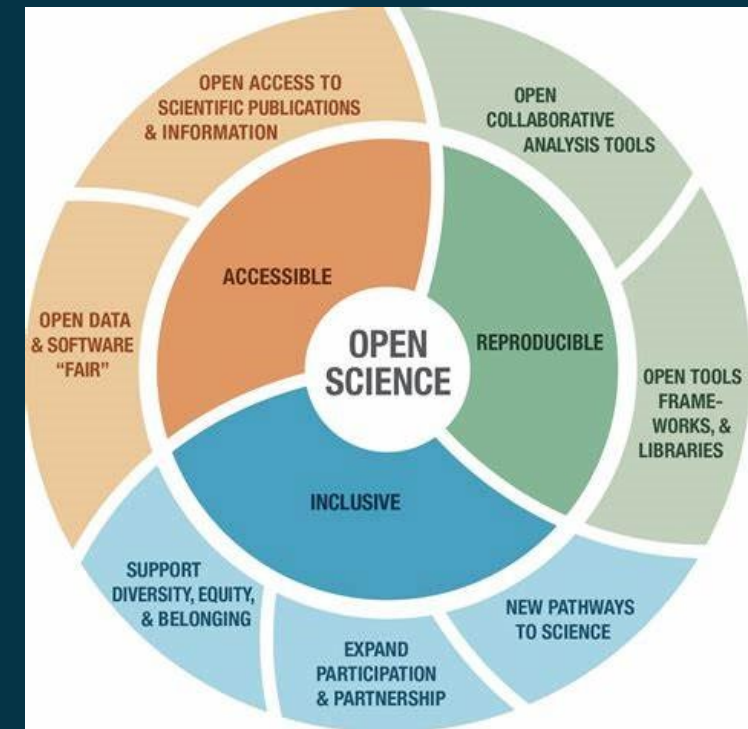
1. Implementing NASA's open data policy of making high-quality, high spatial and temporal resolution data publicly available as soon as practical
2. Adhering to the goal of early and continuing scientific data usability, which requires uniform descriptions of high-quality data products, adequate documentation, sustainable and open data formats, easy electronic access, appropriate analysis tools, and care in data preservation

Serves to articulate the governing principles and standards of the Heliophysics Digital Resource Library (HDRL) <https://hdrl.gsfc.nasa.gov/>

Heliophysics Data Policies - 1



1. HDRL shall commit to the full and open sharing of heliophysics data obtained from NASA HPD-sponsored programs with all users as soon as data become available.
2. HDRL and any HPD-funded missions and R&A activities will plan and follow data acquisition policies that ensure the collection and usability of long-term data sets needed to satisfy the research requirements of HPD.



Heliophysics Data Policies - 2



3. HDRL will collect a variety of metrics intended to measure or assess the efficacy of its data systems and services and assess user satisfaction. HPD will make those data available for review.

4. HDRL will enforce a principle of non-discriminatory data access so that all users will be treated equitably.

5. All NASA HPD missions, projects, and grants and cooperative agreements shall document their implementation of these data management policies.

- Research projects shall generate an Open Science and Data Management Plan (OSDMP)

The background of the slide is a dark blue space scene. On the left side, there is a vertical strip showing a bright yellow sun at the bottom, the blue and white horizon of Earth, and several other celestial bodies: a grey moon, a reddish planet (Mars), and a yellow planet with rings (Saturn). The rest of the background is a deep blue with scattered white stars and a faint nebula.

Centers - Data Management Plan

- Data Management plan describes how Centers will store, access, share and archive data, with emphasis on data sharing across collaborative teams
- Features such as how each team member will gain access to data in real-time
- How data will be archived and validated
- How new members will be integrated into plan in ways that enhance collaboration and synergy



HPD-SWxC Cooperative Interactions – Open Science

Permanent archive for the Center
datasets, software, publications

Repository of recommendations and
lessons learned contributed by the
Center, other Centers, NASA, and
team science researchers

Transition

Legacy output from the Centers

NASA-Centers Statement of Collaboration

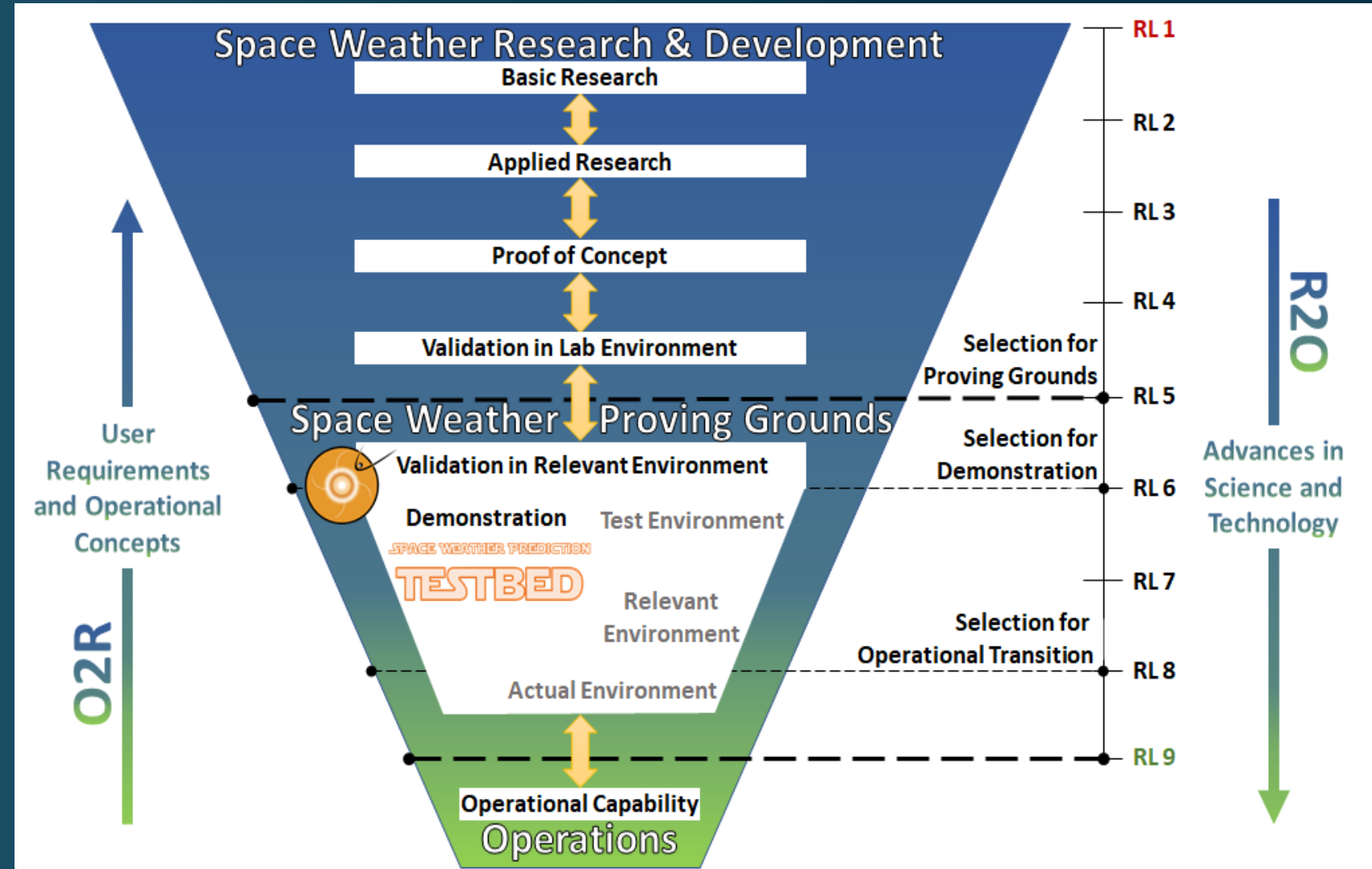
Cooperative Interaction	SW Centers	NASA
Permanent Archive	Work with NASA to create a living archive of legacy data, publications, software, models, and model output from Center to be completed by year 5.	Work with Centers to permanently archive data, publications, software, models, and model output to be completed by year 5.
Recommendations and Lessons-learned Repository	Contribute information about lessons-learned and recommendations periodically from the perspective of the Center with the aim of creating a comprehensive repository by year 5.	Contribute information from the Agency perspective. Combine with information from Centers and team science researchers to create a valuable comprehensive repository of recommendations and lessons-learned by year 5.

NASA-Centers Statement of Collaboration

Cooperative Interaction	SW Centers	NASA
Transition	Make the Center space weather capabilities available to the NASA CCMC, and as appropriate to the operational entities NASA/SRAG, NOAA/SWPC, DoD/DAF.	Coordinate the transition of the Center capabilities between Center and CCMC, and as appropriate, the operational entities NASA/SRAG, NOAA/SWPC, DoD/DAF.
Legacy Output	Specific to each Center in statement.	Maintain links and information on legacy outputs from Centers on its program-level website for open science and accessibility purposes and to create a resource highlighting new knowledge and unanswered questions moving forward.

Open R2O2R includes:

- Data
- Models
- Publications
- Reports



Where to find resources, templates, & documents

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Sun

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Heliophysics Data

SPDF | SDAC | Data Portal | DMP | PDMP | CMAD

Heliophysics research seeks to understand the nature and dynamic interactions of the Sun, the heliosphere, and the plasma environments of the planets and interstellar space. This research relies on observations – as well as models based on such observations – from a fleet of strategically placed NASA spacecraft, known as the [Heliophysics System Observatory \(HSO\)](#). The data from these missions are publicly available through the [Heliophysics Data Portal](#). The collection of this data, along with related documentation, tools, and services is termed the Heliophysics Digital Resource Library, or the HDRL.

NASA is working to update its Data Archive Strategic Plan document, created by the DASW, to meet the needs of the Heliophysics community. To ensure the use of standard formats and to enable the open sharing of software, data, and knowledge, the data policy also requires missions to maintain a [Project Data Management Plan \(PDMP\)](#) and a [Calibration and Measurement Algorithms Document \(CMAD\)](#), and for research projects to maintain an [Open Science and Data Management Plan \(OSDMP\)](#), all using the templates hyperlinked from this text or the policy document. As NASA moves toward a more collaborative environment, the Heliophysics Division is working to adopt an open source data analysis software model.

Data Policy

Templates

Heliophysics Data Webpage

- Templates for key documents such as:
 - Open Science Data Management Plan (OSDMP)
 - Project Data Management Plans (PDMP)
- Links to policies
 - Heliophysics Data Policy (further definitions and clarifications)
 - SPD-41a
- Shortcuts to Heliophysics Digital Resource Library (HDRL) repositories
 - Space Physics Data Facility (SPDF)
 - Solar Data Analysis Center (SDAC)

<https://science.nasa.gov/heliophysics/data>

The background of the slide is a composite of two astronomical images. The top half features a blue nebula with bright, star-like points of light. The bottom half features a green nebula with a dense field of yellow and orange stars. A dark blue horizontal band runs across the middle of the slide, containing the text.

QUESTIONS
genene.fisher@nasa.gov