Space Weather @ NASA
Community Coordinated Modeling Center (CCMC) &
Space Weather Research Center (SWRC)

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Space Weather: NASA's Role

NASA formulates and implements a national research program for understanding the Sun and its interactions with the Earth and the Solar System and how these phenomena impact life and society.
Space Weather: NASA's Role

NASA researches and prototypes new mission and instrument capabilities, providing new physics-based algorithms to advance the state of heliophysics and space weather modeling.
Space weather at NASA

• Due to its unique needs, NASA provides space weather services for its own missions.

• Two individual and closely collaborating NASA activities responsible for the services:
  
  • Johnson Space Center SRAG (Space Radiation Analysis Group).

  • Goddard Space Flight Center CCMC/SWRC.
Facilitate Community Research & Development

Address Unique Space Weather Needs of NASA

Support R2O Transition

Space Weather Research Center

CCMC in-house research-based SW analysis & prototyping team
CCMC Assets & Services:
Comprehensive Collection Of Space Weather Models

Corona
Heliosphere
Magnetosphere
Inner Magnetosphere
Ionosphere/Thermosphere
World-leading Modeling

SWx Tools

NASA, Other, Data Streams

Space Weather Research Center

Protecting NASA’s Missions

Notifications
Weekly Reports
Anomaly Analysis
Support
Workshops

Building space weather knowledge bases

Space Weather Related Research and Prototyping

Education and Training

Partnering with the US and international organizations

SWRC Concept of Operations
World-leading Modeling

Space weather tools

Data streams from NASA and other sources

Protecting NASA’s missions

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Innovative Dissemination: iSWA

iSWA has >300 products including modeling results and comprehensive sets of observational data.


http://iswa.gsfc.nasa.gov
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Partnering with US and international organizations
Engaging the whole community in forecasting CME arrival
Community Ensemble (from different CME models)

<table>
<thead>
<tr>
<th>Predicted Shock Arrival Time</th>
<th>Difference (hrs)</th>
<th>Submitted On</th>
<th>Lead Time (hrs)</th>
<th>Predicted Geomagnetic Storm Parameter(s)</th>
<th>Method</th>
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<tbody>
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<td>2014-01-09T19:26Z (-10.0h, +10.0h)</td>
<td>-0.10</td>
<td>2014-01-07T21:00Z</td>
<td>46.53</td>
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<td>STOA</td>
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<td>2014-01-09T00:38Z (-7.0h, +7.0h)</td>
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<td>2014-01-08T00:41Z</td>
<td>42.85</td>
<td>Max Kp Range: 6.0 - 8.0</td>
<td>WSA-ENLIL + Cone (GSFC SWRC)</td>
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<td>-11.53</td>
<td>2014-01-08T01:31Z</td>
<td>42.02</td>
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<td>WSA-ENLIL + Cone (NOAA/SWPC)</td>
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<td>2014-01-08T03:17Z</td>
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<td>-15.03</td>
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<td>WSA-ENLIL + Cone (GSFC SWRC)</td>
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<td>Max Kp Range: 6.0 - 7.625</td>
<td>Average of all Methods</td>
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</tbody>
</table>
SWRC Concept of Operations

World-leading Modeling

Space weather tools

Data streams from NASA and other sources

Protecting NASA’s missions

Space weather related research and Prototyping

Reporting and workshops

Building space weather knowledge bases

Education and training

Partnering with US and international organizations
Education

- Engage high school and college interns in space weather forecasting, research and tool development
- Provide space weather training for young scientists to broaden their research scope
- Educating mission operators/engineers and the public (e.g., teachers) about space weather
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Partnership

- AFWA (Air Force Weather Agency)
  - space weather information exchange pipeline was established at the beginning of SWRC
    - space weather training
- NOAA + plus other government agencies
  - model and tool prototyping
- Universities + commercial space and international entities
NASA Goddard’s Space Weather Research Center

- Proximity to state-of-the-art models and scientific expertise (~300 dedicated individuals in Heliophysics Division)

- Enable efficient (Research to Operations) R2O-O2R (Operations to Research).

- Quick and nimble (unconventional) forecasting procedures for the benefit of NOAA, NASA and other agencies

- Address NASA’s unique space weather needs - space weather across the solar system

- Pioneering tools and methods
Thank You!

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