The Space Weather Challenge: Putting Interest into Action

Dr. Stephen Volz, Assistant Administrator
NOAA Satellite and Information Service
1859 Geomagnetic Storm

A low probability event, but the consequences of such an event occurring today have generally continued to increase.

Map of reported aurora sightings; September 2, 1859; Cardenas et al. (2015)
Frame: FRAMEWORK

NATIONAL SPACE WEATHER ACTION PLAN

Product of the National Science and Technology Council

October 2015

Diagram:

Framework:
- National Science and Technology Council
- Space Weather Operations, Research, and Mitigation Subcommittee (SWORM)

Implementation:
- Space Weather Action Plan & SWORM

- FRAMEWORK IMPLEMENTATION
Space Weather Action Plan Goals

**Goal 1:** Establish Benchmarks for Space-Weather Events

**Goal 2:** Enhance Response and Recovery Capabilities

**Goal 3:** Improve Protection and Mitigation Efforts

**Goal 4:** Improve Assessment, Modeling, and Prediction of Impacts on Critical Infrastructure

**Goal 5:** Improve Space-Weather Services through Advancing Understanding and Forecasting

**Goal 6:** Increase International Cooperation
Space Weather Action Plan Details & Progress

Number of Actions By Lead Agency

- **Commerce**: 36 actions
- **DHS**: 29 actions
- **NASA**: 10 actions
- **Interior**: 9 actions
- **State**: 8 actions
- **Energy**: 2 actions
- **Transportation**: 2 actions
- **DOD, NSF, USPS**: 1 action each

### Action Status as of early June 2017

<table>
<thead>
<tr>
<th>Goal</th>
<th>Action</th>
<th>Percent Completed, Submitted, or On Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Establish benchmarks for space weather events</td>
<td>73</td>
</tr>
<tr>
<td>2</td>
<td>Enhance Response and Recovery Capabilities</td>
<td>92</td>
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<tr>
<td>3</td>
<td>Improve Protection and Mitigation Efforts</td>
<td>83</td>
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<td>4</td>
<td>Improve Assessment, Modeling, and Prediction of Impacts on Infrastructure</td>
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<td>5</td>
<td>Improve Space Weather Services through Advancing Understanding and Forecasting</td>
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<td>6</td>
<td>Increase International Cooperation</td>
<td>90</td>
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</tbody>
</table>

Decision:

- Yes
- No
Space Weather Observing System

USA
JAPAN
SOUTH KOREA
INDIA
CHINA
FRANCE
RUSSIA
NOAA
EUMETSAT
EUROPEAN COMMISSION
NATIONAL SPACE ORGANIZATION (NSPO)
EUROPEAN SPACE AGENCY
NASA

- GEOSTATIONARY ORBIT
- NEAR-POLAR ORBIT
- LAGRANGE POINT 1
Deep Space Observations

• Historically deep space space weather observing missions, have been conducted by research agencies

• Their primary focus on research and developing understanding of solar phenomena

• Many observations have proved essential as well for operational forecasting

• The Future observing system will include a mix of research and operational satellites

Image: NASA
Space Weather Prediction Center (SWPC)

Located in Boulder, Colorado
Website: www.swpc.noaa.gov
SWPC Customer Growth

Frequent Users:
- Emergency Responders
- Major airlines
- Drilling and oil exploration
- Satellite companies
- Transportation sector

50,500 (May 2017)
Space Weather R2O Examples

CORONAGRAPHS

- LASCO on SOHO
- Compact Coronagraph on TBD Mission

IN-SITU L1 OBSERVATIONS

- ACE
- DSCOVR

MODELING

- WSA-ENLIL (CME impacts)
- Geospace Model
- WAM/IPE (Ionosphere)
Planned NOAA Missions

- **JASON-3**: Operational July 1, 2016
- **DSCOVR**: Operational July 27, 2016
- **COSMIC-2**: COSMIC-2A - 2018
- **GOES-R SERIES**:
  - GOES-16 - Launched November 19, 2016
  - GOES-S - 2018
  - GOES-T - 2019
  - GOES-U - 2025
- **JPSS SERIES**:
  - JPSS-1 - 2017
  - JPSS-2 - 2021
  - JPSS-3 - 2026
  - JPSS-4 - 2031
Will we be ready?