Space Weather: A National Imperative

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

Space Weather Enterprise Forum
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Outline

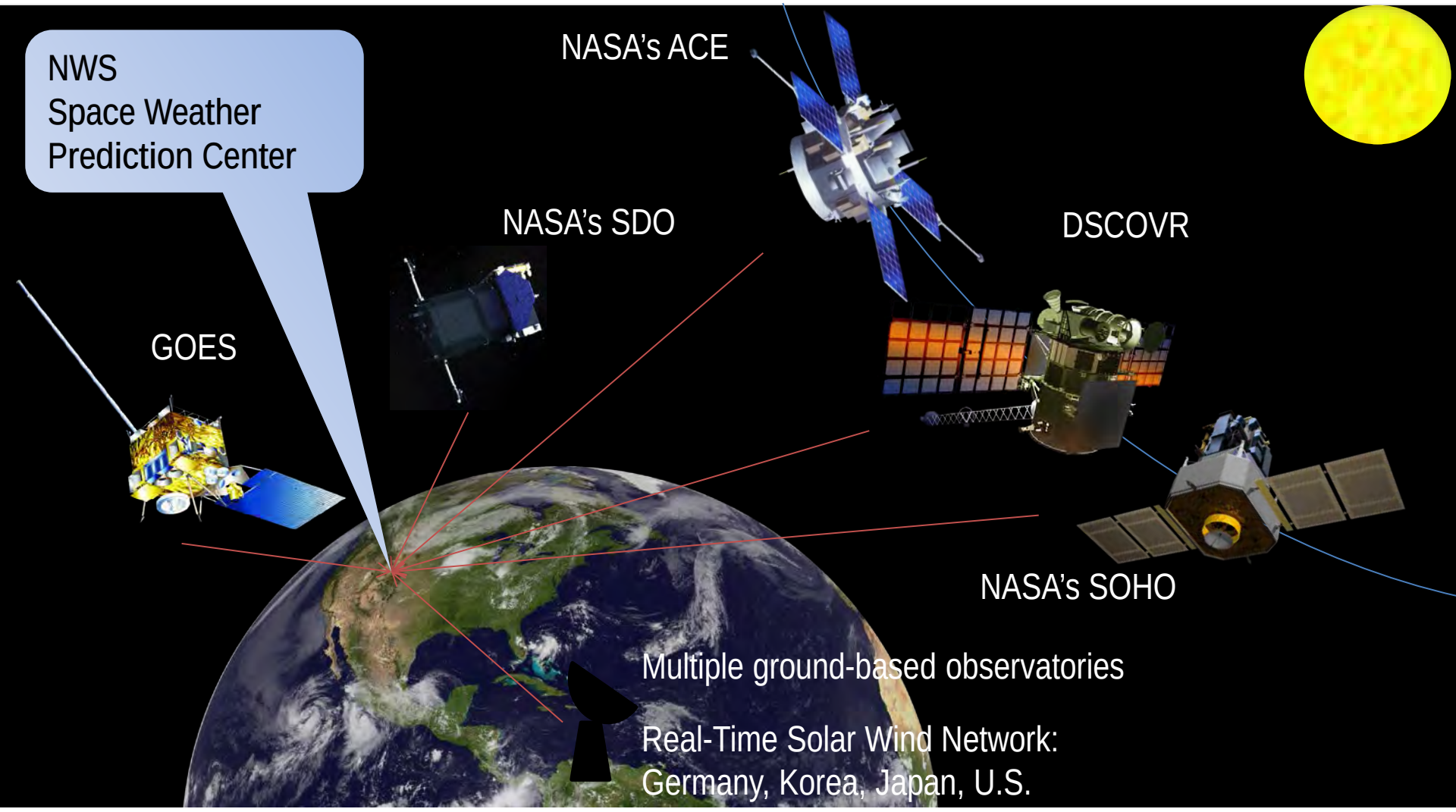
- **The Imperative**
- **Overview of NOAA's Role**
- **Where We Are Now**
  - Global space weather observing system
- **Looking to the Future**
  - New Administration commitment
  - New observations, models, and products
  - Planning for future observations

The Imperative

- **Space Weather impacts a wide variety of critical infrastructure elements**
    - Electrical power transmission
    - Air and Space transportation
    - Satellite operation
    - Space-Based Positioning, Navigation, and Timing (e.g. GPS)
    - Pipelines
    - Railways

- **Serious impacts to health, governance, and the economy could result from an extreme space weather event**
    - 1989 Quebec 9-hour blackout: >$500M impact
    - 2003 NYC 24-hour blackout: 100 fatalities

NOAA's Role: Operational Space Weather System



NOAA's Role: Building a Weather Ready Nation

- NWS imperative: protect life & property while enhancing commerce
- NWS strategic outcome:

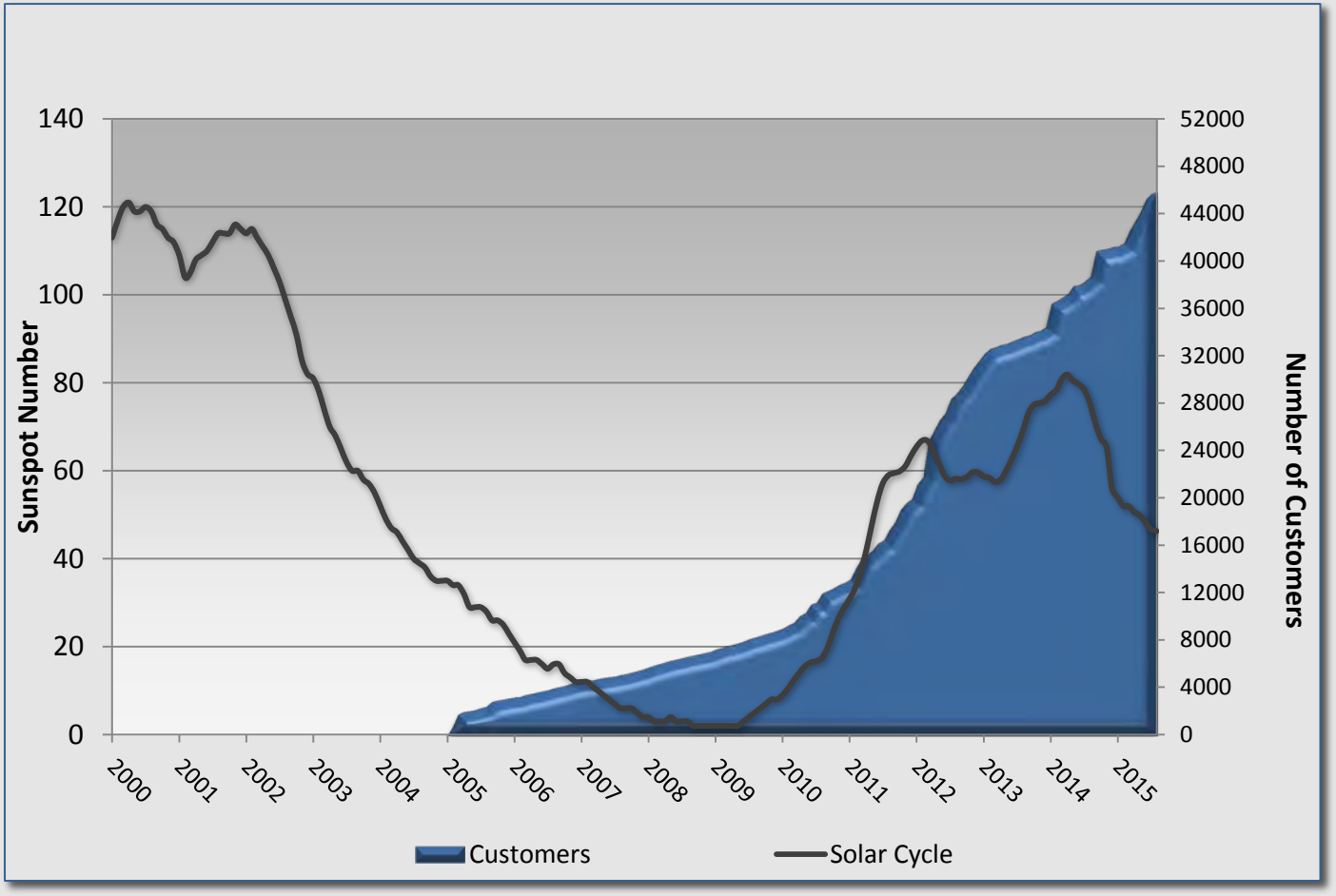
  "Ready, responsive, resilient"

- Extreme weather events arena remains the focus
- "Impact-based Decision Support Services" (IDSS) tailored to specific areas such as space weather

NOAA's Role: Reaching Users

SWPC customers currently include:

- Electric utilities
- Banking
- Emergency response
- Shipping
- Aviation
- Precision agriculture
- Surveying
- Oil drilling
- Satellite operators



Where We Are Now

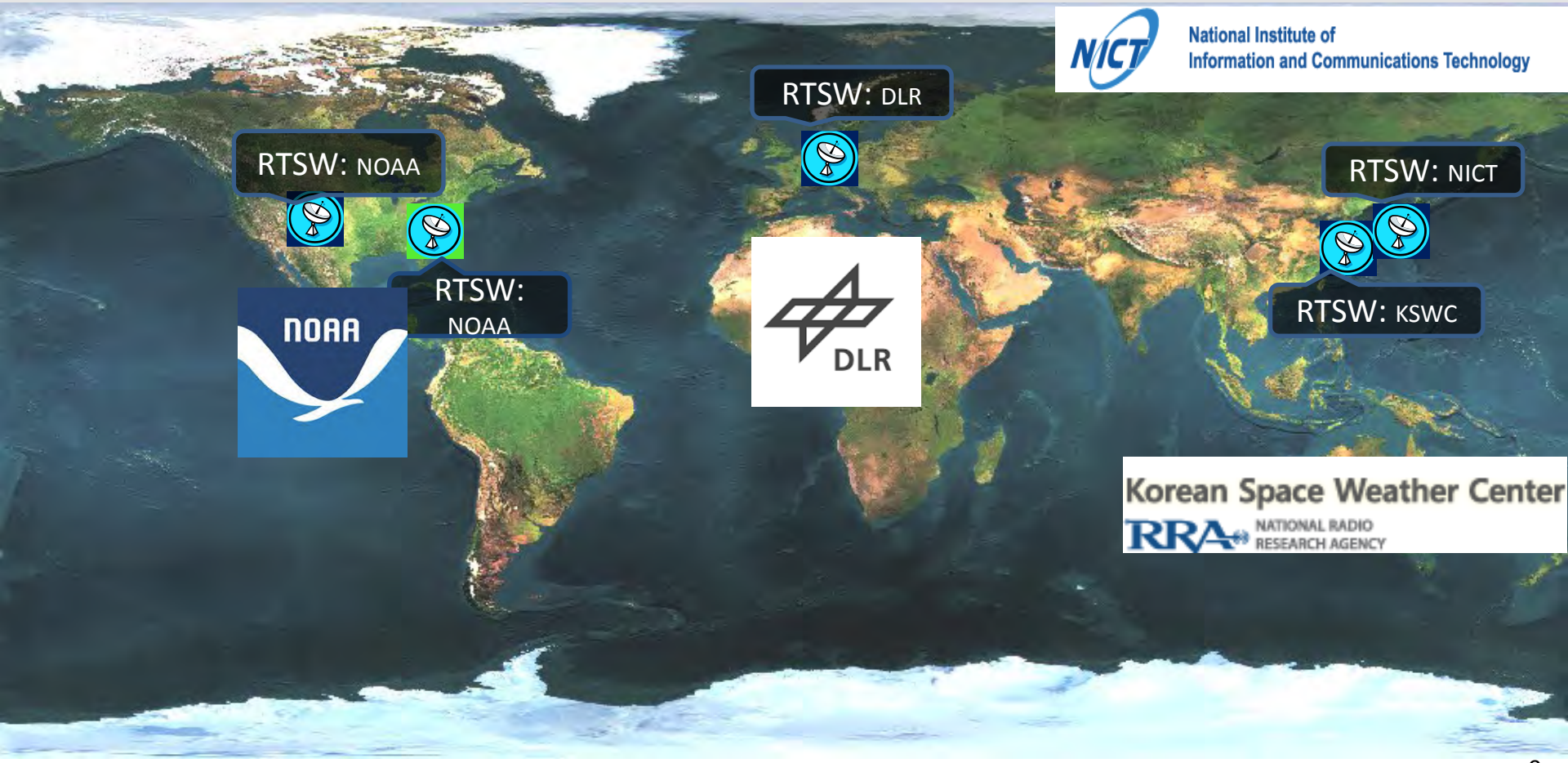
Global Space Weather Observing System: Interagency Partnerships

- Both NASA research and NOAA operational assets support NOAA's space weather forecasting mission
- SWPC uses U.S. Air Force contributions operationally
  - Including both data from USAF ground networks of optical and radio telescopes and USAF models
- Complementary research and operational flight opportunities exist
  - NOAA will coordinate with NASA Heliophysics regarding the potential use of future operational platform(s) to meet some of both agencies' objectives
- Development of new technologies will advance space weather forecasting capabilities
  - NOAA will continue to work with NASA Heliophysics and Space Technologies Mission Directorate on new sensors and new technologies

Global Space Weather Observing System: International Partnerships & the RTSW Network

Real-Time Solar Wind Network (RTSW)

Germany: DLR Korea: KSWC Japan: NICT US: NOAA



Global Space Weather Observing System: International Partnerships

Collaboration on Space Weather Forecasting and Services

Met Office

INTERNATIONAL CIVIL AVIATION ORGANIZATION
A United Nations Specialized Agency

World Meteorological Organization
Weather • Climate • Water

UNITED NATIONS
Office for Outer Space Affairs

ISES
International Space Environment Service

Looking to the Future

New Administration Commitment

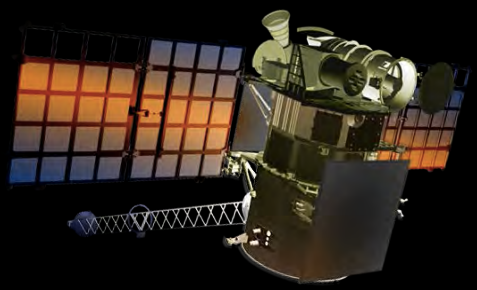
National Space Weather Strategy

Nov 2014 – Space Weather Operations, Research, and Mitigation (SWORM) Task Force is chartered at the White House/OSTP

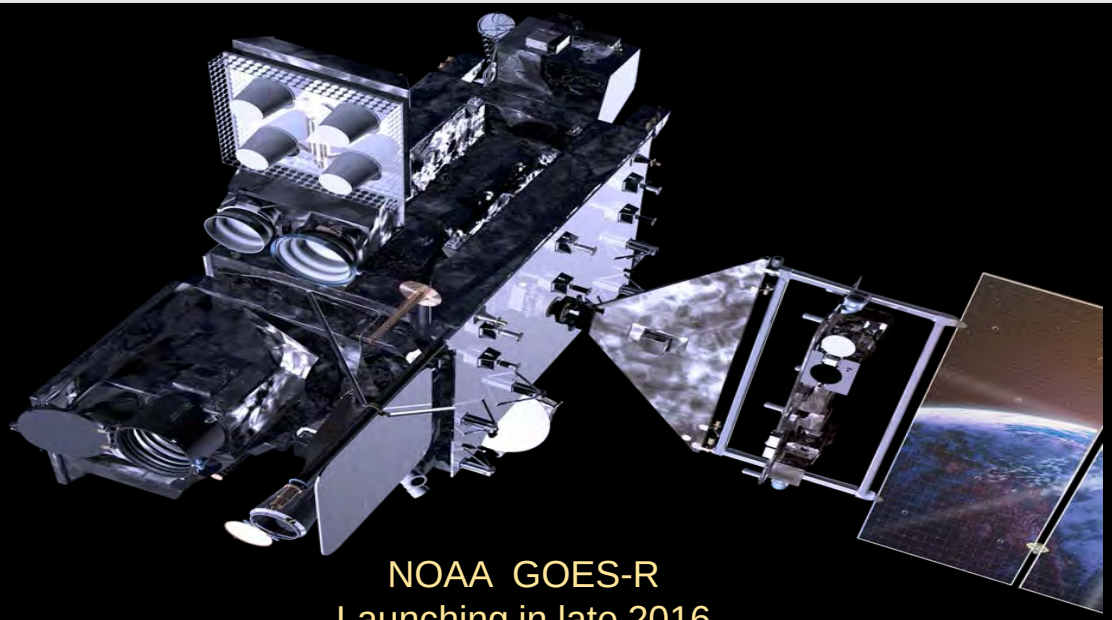
Tasked to develop:

- National Space Weather Strategy to ensure national readiness for an extreme space weather event.
- Space Weather Action Plan to implement strategy with a whole community approach.

New NOAA Observational Assets



NOAA DSCOVR
At L1 as of June
8, 2015



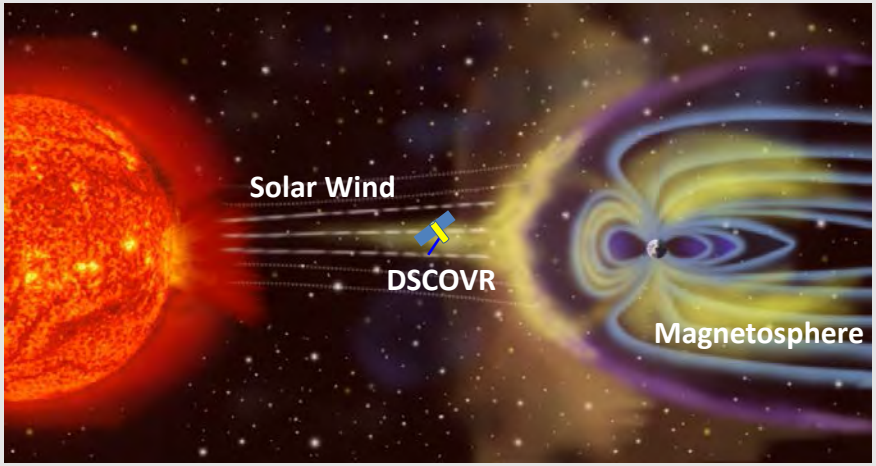
NOAA GOES-R
Launching in late 2016

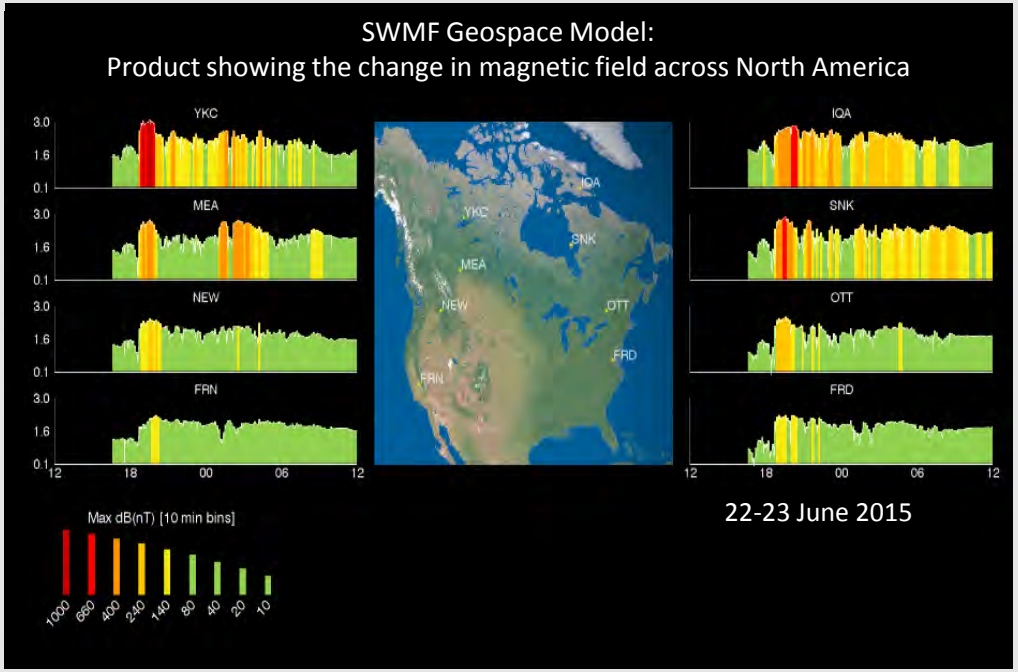
COSMIC-2
Launching 2016–2019

New Models and Products

Highlight: Geospace Model of Earth's Magnetosphere

- Developed in collaboration with U. Michigan and NASA/CCMC.
- Driven by solar wind data from DSCOVR
- Provides regional magnetic field changes
- Enables GIC predictions and regional products for the electric power industry



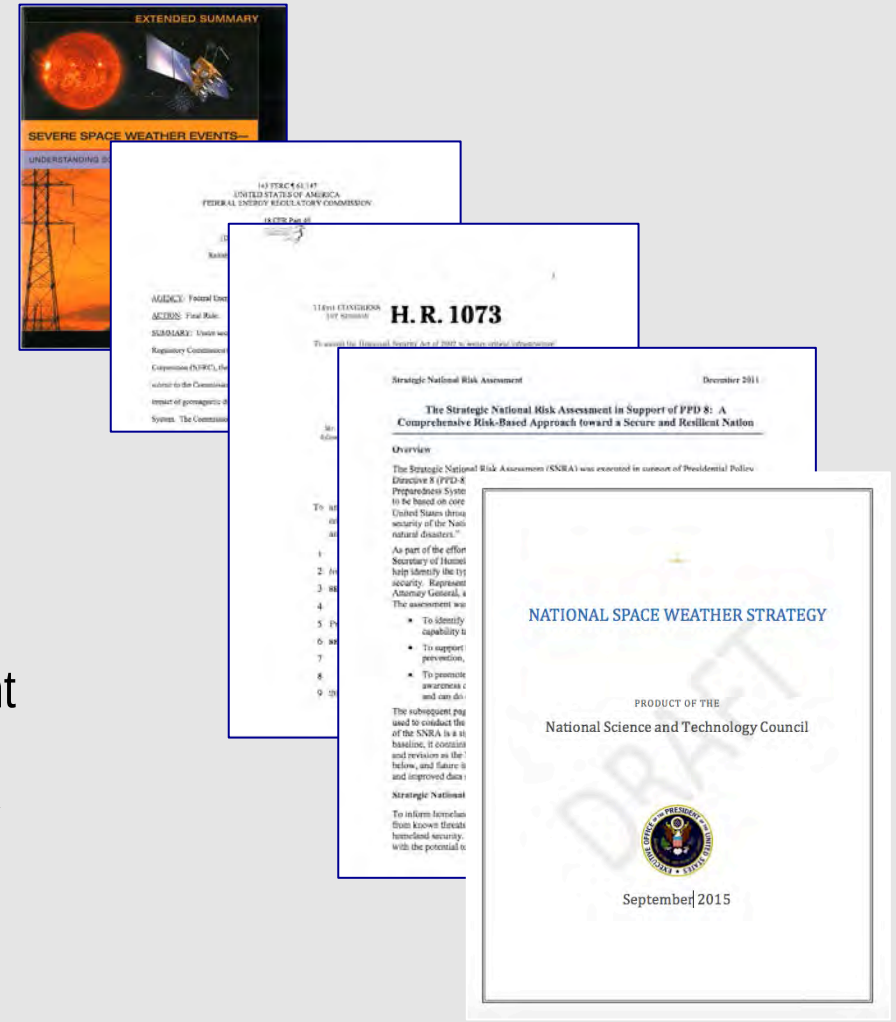


Future Observations Planning

- Space Weather Follow-on plan will provide continuity and improve on DSCOVR observations
  - Details of implementation will be driven by NESDIS architecture studies
- Key new observation will be coronagraph images from the sun-earth line
- NOAA will be coordinating with international partners as well on possible missions to explore options to improve the observing system
  - Such as off-sun-earth angle coronagraph images from L5 to continue STEREO improvements to forecasting.

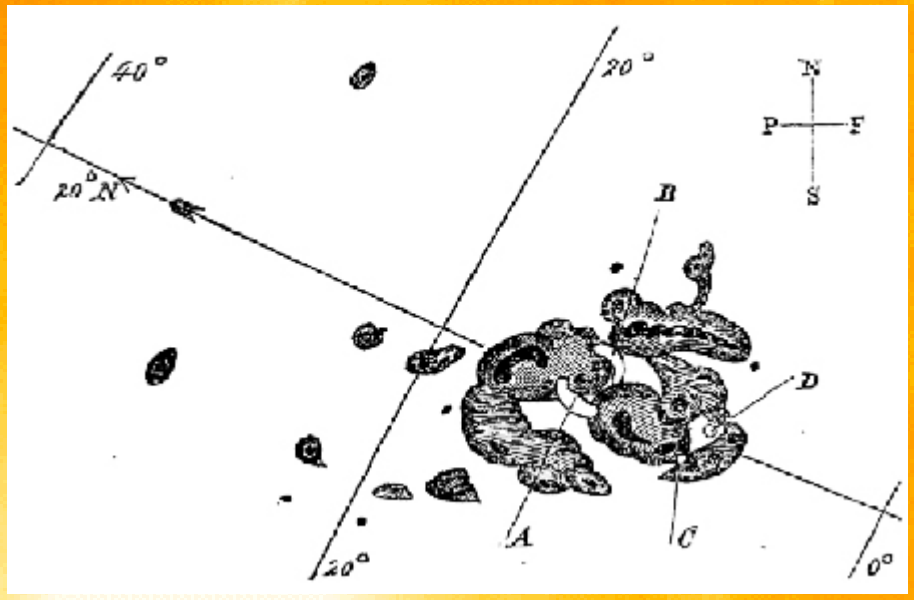
National Attention to Space Weather

- 2008, Severe Space Weather Events: Understanding Societal and Economic Impacts: A Workshop Report, National Academies Press.
- 2013, FERC Order 779 to electric power transmission operators: GMD protection mandate.
- 2015, House Resolution 1073: Critical Infrastructure Protection Act includes space weather threats.
- 2015, DHS Strategic National Risk Assessment includes space weather threats.
- 2015, OSTP National Space Weather Strategy and Action Plan.



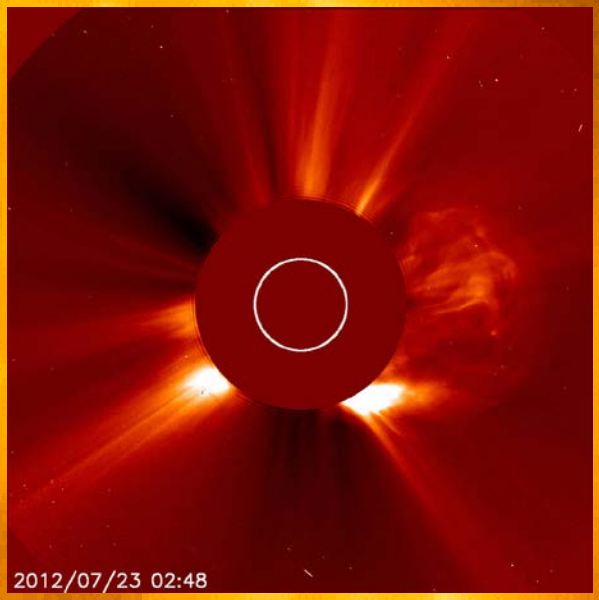
The Imperative Revisited

1859



Credit: Originally published by the British Royal Astronomical Society; provided by the NASA Astrophysics Data System.

2012



Credit: ESA&NASA/SOHO

Will we be ready?