

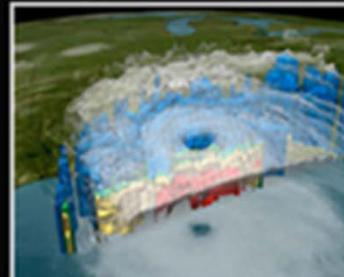
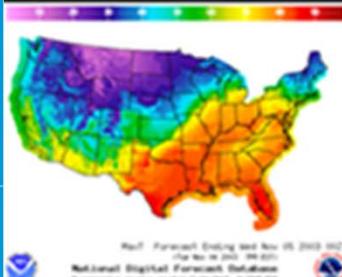
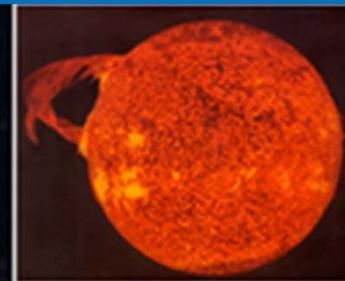
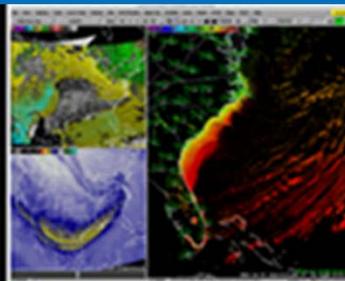


NOAA

National
Weather
Service

Vision on Implementation of Space Weather R202R – NOAA Perspective

Mary Erickson
Deputy Director





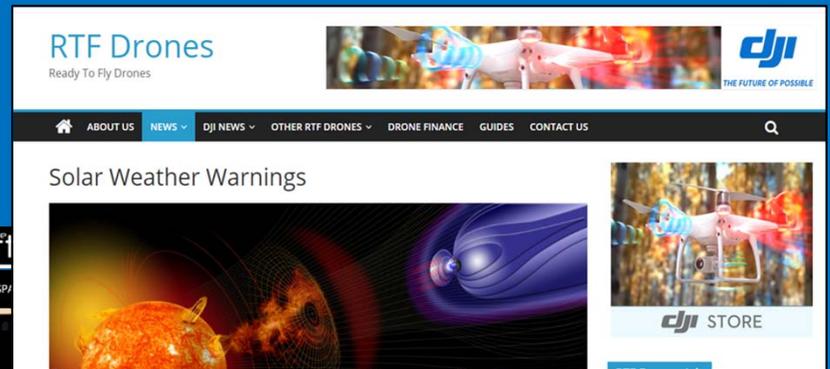
Adapting To Consumers Evolving Needs



Community must anticipate products to support needs of a rapidly evolving technological society



- Autonomous vehicles
- Advanced Rail Technologies - Positive Train Control (GPS-based safety system)
- Supersonic and Hypersonic transport
- Space Tourism
- Drone technology
- Deep space exploration



ENVIRONMENT SPA



Europe Is Preparing Its Railways For Extreme Space Weather

The solar flares could wreak havoc on driverless cars

DAVID NIELD

Solar storms could wreak havoc on driverless cars

March 16, 2018 @ 12:47 pm
Kyle Stock and Brian Sullivan
Bloomberg



Self-driving cars are still working to master the snow. It turns out that excessive sun can also pose a problem for the coming wave of robot drivers.





National and International Policy Driving SWPC Services



Space Policy Directive-1: Reinvigorating America's Human Space Exploration Program (Dec 2017)

Space weather observations and prediction critical for space travel



UN International Civil Aviation Organization (2019)

Implementing a space weather information service for global information



Space Weather Strategy Update (2019)

Identify mechanisms for sustaining and transitioning models and observational capabilities from research to operations





Ensuring Continuity of Critical Observations to Support Operations and to Inform and Validate Research



GONG – NOAA now supporting the Operations and Maintenance of the Observatories

- SWPC working with NSF/NSO and NOAA/IDP program to operationalize processing of GONG data



GOES – Currently Operational with GOES 14&15

- GOES-16 operational early FY20
- GOES-17 operational mid FY20



Space Weather Follow-On + Operational Coronagraph

- Host coronagraph on GOES-U, launch in 2024
- Rideshare to L1 with NASA's Interstellar Mapping and Acceleration Probe (IMAP) late 2024



(Updates from NESDIS tomorrow)





Critical Observations to Support Operations and to Inform and Validate Research



COSMIC-2A - six satellites into low-inclination orbits – launch in 2019



NOAA Commercial Weather Data Pilot - NOAA exploring demonstration projects to validate the viability of commercial environmental data for NOAA's models



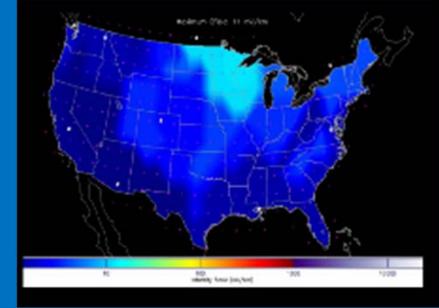
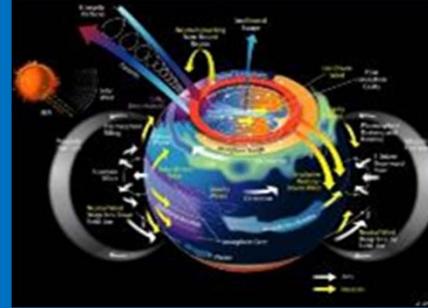
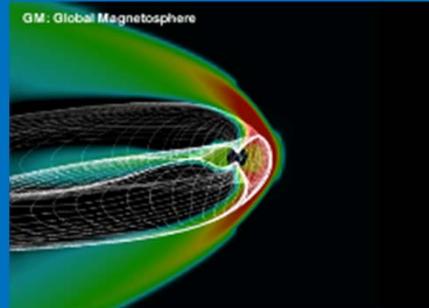
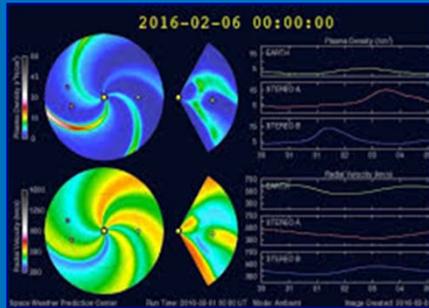
- NOAA selected GNSS radio occultation (RO)
- NOAA will evaluate commercial data to demonstrate quality and impact to models



(Updates from Spire Global, GeoOptics, and PlanetIQ tomorrow)



Operational Space Weather Modeling at NOAA – A Sun to Earth Continuum



**GMU/AFRL
WSA/Enlil**

**U. Michigan
Geospace**

**NOAA/CIRES
WAM-IPE**

**NOAA/USGS
E-field**

Understand the structure of the solar wind as it propagates from the Sun to Earth

Understand the geomagnetic response to changes in solar wind; provide regional predictions of geomagnetic storms

Understand details in the mesosphere, exosphere, and ionosphere, to understand links between the lower and upper atmosphere

Characterize and predict the regional electric field and the associated currents that impact electric power grid

Operational since 2011

Operational Sept 2016

Operational FY20

Operational FY19





Coordinated Interagency Space Weather Applied Research Funding



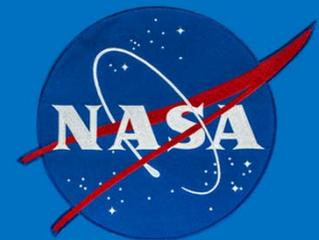
Tri-Agency NASA, NOAA, NSF Memorandum of Understanding
- Enables ongoing multi-agency coordination of research topics



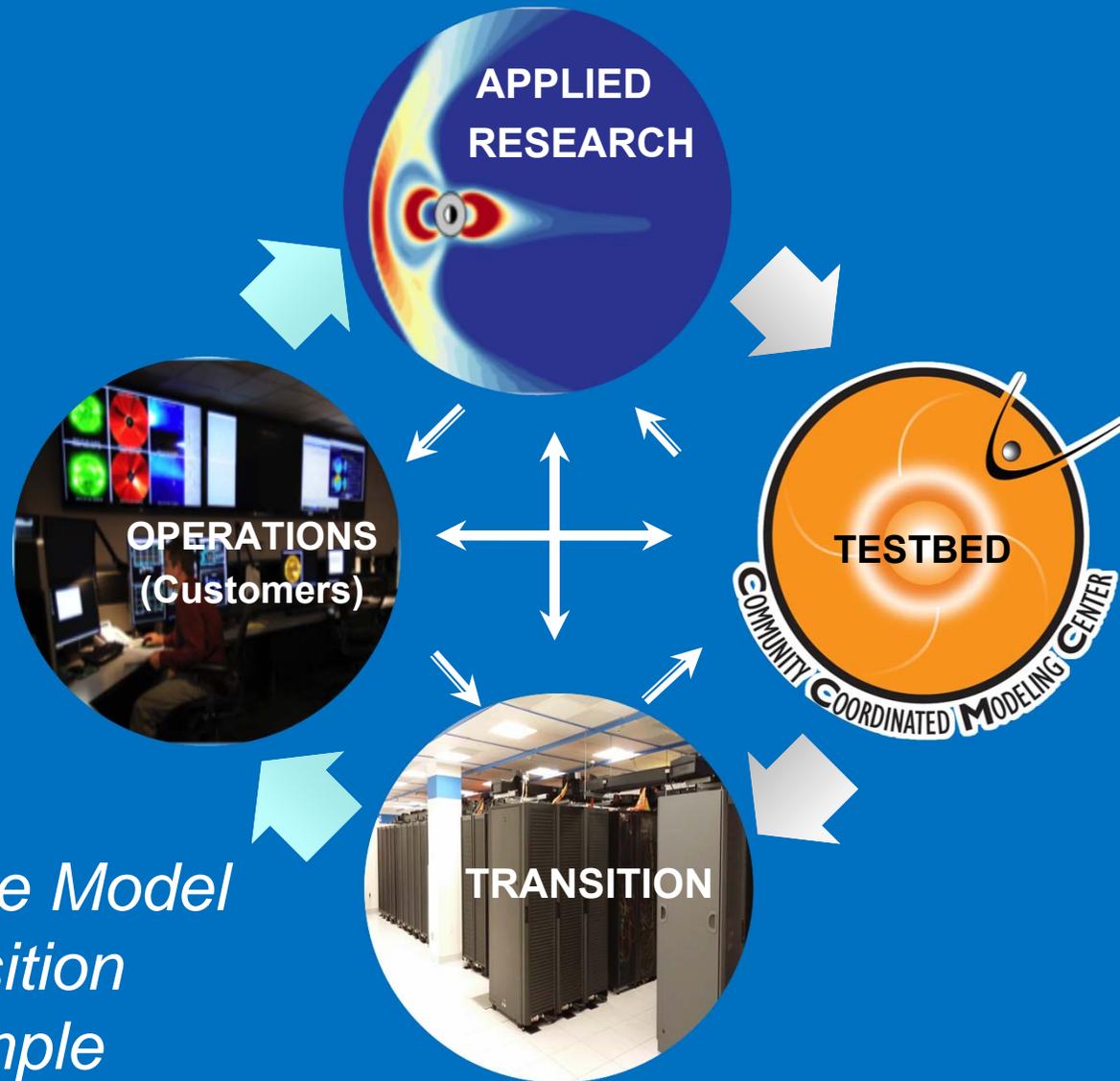
NASA Budget - "...enhancing the ability to forecast and characterize space weather events in collaboration with NASA's interagency partners."



Applied research projects look to provide a "Conveyer Belt" of solutions and capabilities for operational forecasting.



RESEARCH TO OPERATIONS TO RESEARCH CYCLE



*Geospace Model
Transition
example*

What is needed...

An improved R2O2R process for space weather that serves both operational forecasting and research needs

Existing process: Piecemeal, competing research efforts with little consideration or understanding for effort and expense involved in transitioning research models into an operational system. Multiple challenges:

- Intellectual property rights
- Distribution of codes
- Modification to models
- Verification and validation
- Documentation
- Lack of oversight
- Incorporating forecaster and user feedback



A Strategy:

Enhance existing capabilities

- Establish performance metrics and benchmarks
- Prioritize space weather research on operational needs and requirements
- Implement a prototype O2R project



Expand Federal capabilities to establish the fundamental elements of R2O-O2R activities

- Establish community models
- Support research and development on operational models
- Identify computational resources requirements





Conclusion

Forecasting Space Weather will advance through:



- New and sustained observations
- Advances in space science understanding and research in partnership with private sector and academia
- Improved/accurate numerical prediction models
- The transition to operations: improved models and post-processing through effective R2O2R



These actions, aligned with the needs of a growing customer base, will enable NOAA to serve the Nation with consistent, accurate, and actionable information

