

Extending Terrestrial Weather R2O/O2R to Space Weather at NASA's SPoRT Center

¹Bradley Zavodsky, ¹Ghee Fry, ²David Falconer,
³Kevin McGrath, and ²Anita LeRoy

¹ NASA/Marshall Space Flight Center, ²University of Alabama in Huntsville, ³ Jacobs

Presentation to 2018 Space Weather Workshop

April 19, 2018



SPoRT



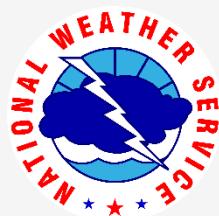
Short-term Prediction Research and Transition (SPoRT)

SPoRT is focused on transitioning unique NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts on a regional and local scale

Demonstrate utility of NASA sensors for real-time weather applications to benefit society

Founded in 2002

Funding through NASA ESD and NOAA's Satellite Proving Grounds



SPoRT

SPoRT Partnerships and End Users

Partner with NOAA / University community

End users

- regular interactions with:
 - 30+ National Weather Service (NWS) Weather Forecast Offices (WFO)
 - 8 NWS National Centers (7 meteorology; 1 space weather)
 - 3 River Forecast Centers (water/hydrology)
 - 3 Center Weather Service Units (aviation)

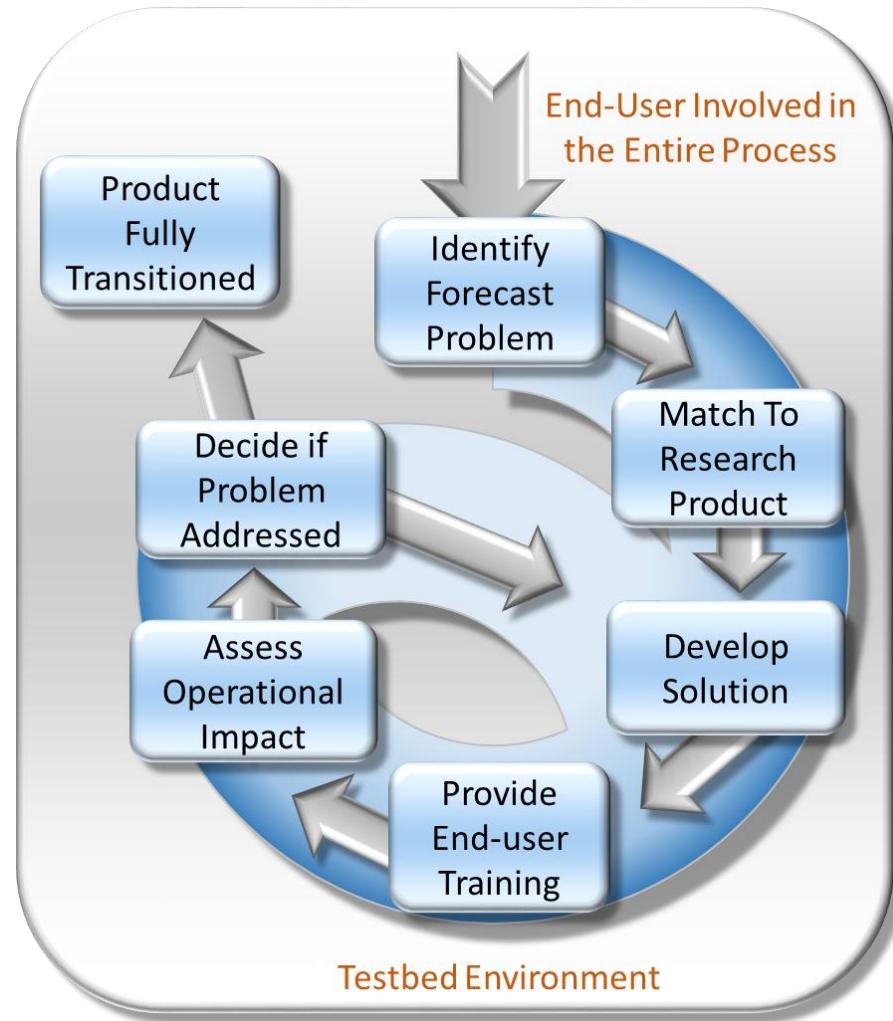


SPoRT

Established SPoRT R2O/O2R Paradigm

Keys to success:

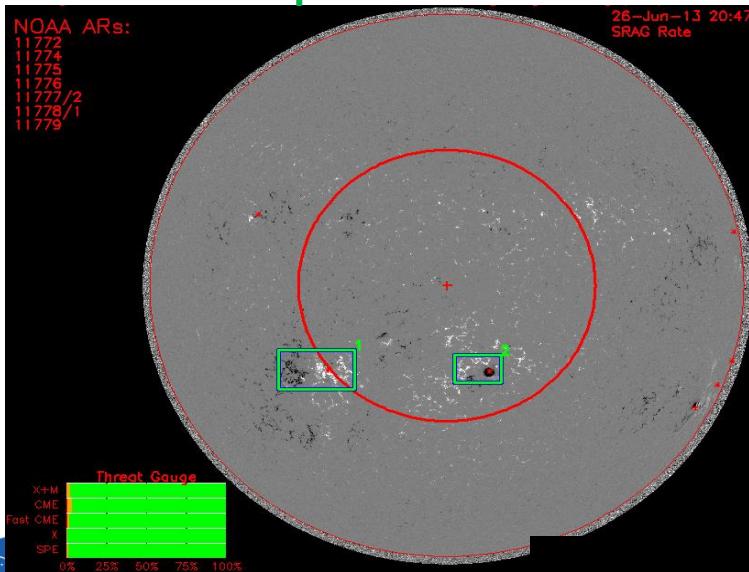
- **Proven paradigm for transitioning NASA research data across the “Valley of Death” (figure at the right)**
- **Collaborative interaction with end users to match forecast challenges to NASA data**
- **Integrate observations into end user decision support tools**
- **End-user focused training**



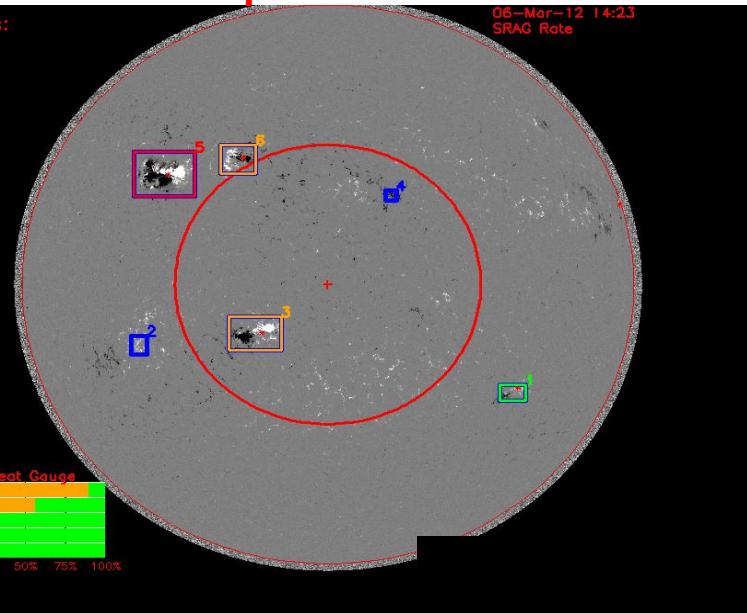
Overview of MAG4

- Uses empirical relationships between magnetic free energy and event rates to objectively categorize the current state of flare/CME risk on the Sun
- Probabilistic information on threat with quicker/easier analysis than current McIntosh approach for categorizing flare
- Complementary to WSA/Enlil in that it provides some guidance on pre-flare/CME probability whereas Enlil propagates the CME once observed/characterized

All Clear Example: 26 June 2013



High Threat Example: 7 March 2012



Ongoing Transition Activities at SWPC

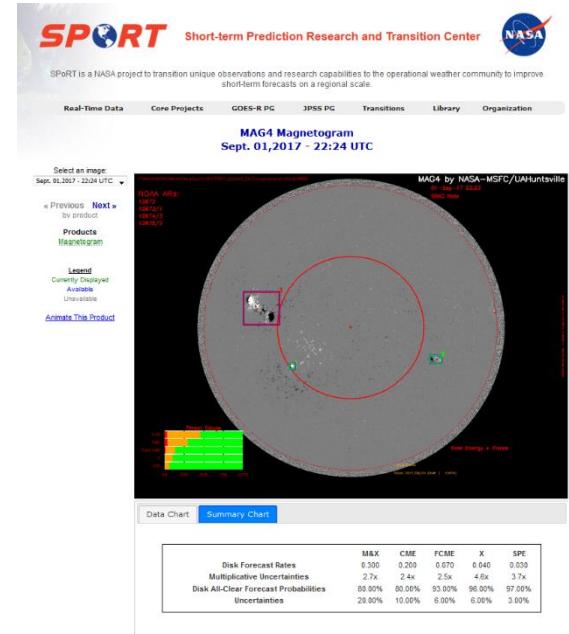
- NOAA/NCEP and SWPC management encouraged establishing low-level of effort collaborations to test drive the SPoRT paradigm as a potential approach for Space Weather R2O/O2R
- Team of Heliophysics/MAG4 SMEs and SPoRT personnel were selected for internal MSFC funding to take the initial steps to transition MAG4 to SWPC forecasters as an experimental product
- Site visit to SWPC in early August to learn forecast process and challenges:
 - MAG4 was seen as an important experimental product that forecasters would like to use but was not available consistently enough for their needs
 - Cadence of available output was too low
 - Forecasters wanted more details about the outputs from the model rather than just a graphic that was available from the website or from other online portals
 - Forecasters currently use a series of different websites to obtain both operational and experimental datasets, so currently no true DSS for integration



Ongoing Transition Activities at SWPC

- Website (top right) where real-time MAG4 output will flow once integrated into SPoRT processing; will allow animation
- Training slides (bottom right) on the use and interpretation of the product using instructional design techniques to reinforce learning concepts
- Testbed assessment this summer for forecasters to evaluate product impacts alongside other operational forecasting tools; short 5-minute Likert scale survey to capture feedback and communicate success metrics

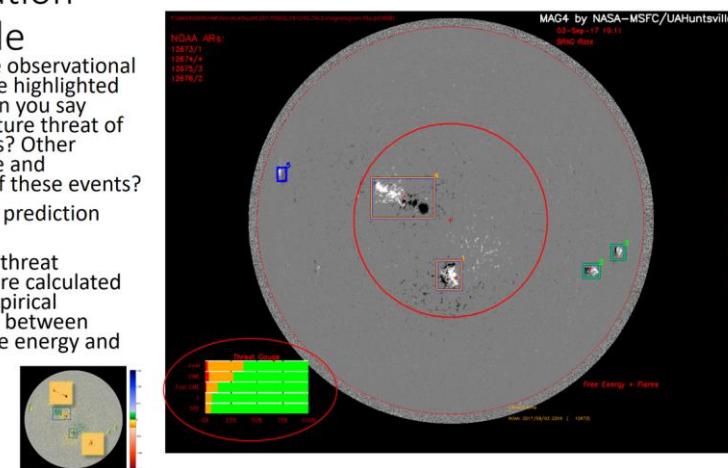
Slide from short training module for MAG4 developed at SPoRT



MAG4 Example on SPoRT website

Application Example

- Based on the observational data from the highlighted ARs, what can you say about the future threat of flares? CMEs? Other events? Rate and magnitude of these events?
- What is your prediction based on?
- With MAG4, threat predictions are calculated based on empirical relationships between magnetic free energy and event rates



Summary

- SPoRT's R2O/O2R paradigm that has resulted in 15+ years of success for terrestrial weather can be applied to space weather challenges
- Given strong collaborations with NOAA National Weather Service partners and seed-funded testbed activity, there is an opportunity to establish a bridge between research community and operational forecasters for near-Earth / space weather applications
- Starting local with strong space weather group at MSFC and MAG4 with opportunities to strategically expand interaction to other groups generating space weather projects within NASA, university, and private sector community



Questions/Comments/Discussion

Follow us!

Website: <http://weather.msfc.nasa.gov/sport/>

Blog: <https://nasasport.wordpress.com/>

Twitter: @NASA_SPoRT

Facebook: NASA SPoRT Center

Contact me for follow-on discussions/collaborative opportunities: brad.zavodsky@nasa.gov



SPoRT