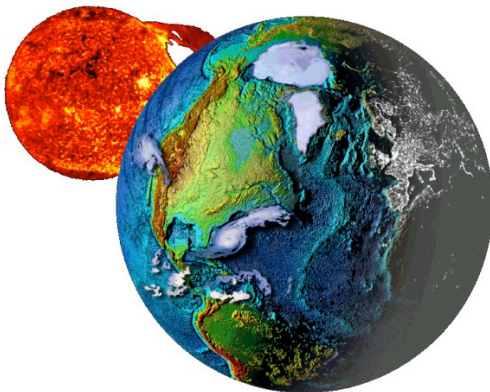
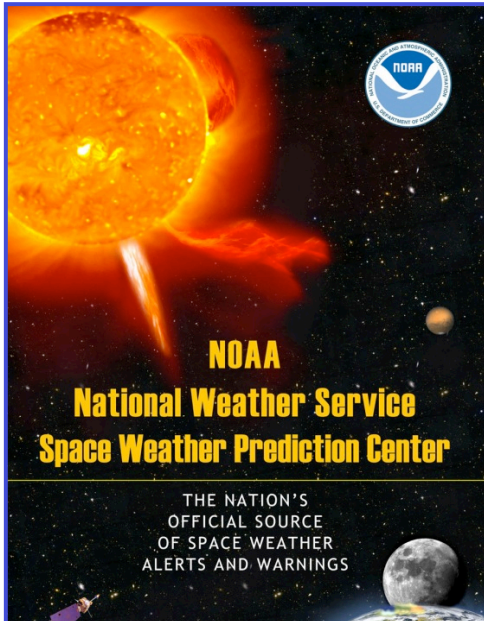




Operational Metrics for Geospace Models – Status Report



- **Goal:** Validation of Geospace prediction models to determine which model or models should be transitioned to operations at SWPC in 2012
- **Focus:** Models that can predict regional geomagnetic activity
- **Timeline:** About 12 months
- **First Steps:** CCMC leads evaluation; Build on GEM Storm Challenge; Establish partnerships; Decide on metrics; Conduct evaluation

Howard J Singer GEM Mini Workshop Dec 2009

Safeguarding Our Nation's Advanced Technologies

SWPC Customer Requirements – One Example Used to Establish Metrics that Represent Needs

ELECTRIC UTILITIES			
User Requirement	Timeliness	Customer	Rationale
K-7 Geomagnetic Storm Warnings	Minutes to hours Operators want as much lead time as possible, but any lead time is considered useful	North America Electricity Reliability Corp. Independent System Operator Electricity Reliability Coordinators	The Midwest Independent System Operator receives the K-index forecast. If the index is K-7 or higher, MISO notifies all NERC reliability coordinators concerning the level and expected duration of the specific event. These forecasts are shared with all power system operating entities throughout so that those power systems that are particularly susceptible to this phenomenon can institute preventive procedures
Geomagnetic Storm Warnings/ Watches	1-2 days >50% accuracy	Various Power Companies	Allows maintenance procedures that shut down some facilities to be rescheduled, thus maintaining the full reserve for emergency situations.
Geomagnetic Storm Warnings (K-5 through K-9)	2-3 hours >80% accuracy	Various Power Companies	Bring reserve or maintenance generation on line
Geomagnetic Storm Warnings (K-5 through K-9)	15-30 minutes >90% accuracy	Various Power Companies	Reduce loading: use more conservative margins
Geomagnetic Storm Warnings (K-5 through K-9)	5 minutes >99% accuracy	Various Power Companies	Desensitize SVAR device protective relay setting. These circuits are used in power grids to isolate problems that are unrelated to GICs but can also be tripped by a secondary reaction to GICs when the GIC magnitude is large but not in itself damaging.
Geomagnetic storm outlook	3-Day	Various Power Companies	Valuable tool for planning purposes
Real-time geomagnetic monitoring data for GIC confirmation.	Every 15 minutes	Various Power Companies	Real-time measurements from sensors located regionally would better assess the GIC threat for any given station



Planned Improvements

• The proposed way forward to develop improved space weather models to maximize solar wind and CME data for extended forecast and warnings

• Solar Wind Disturbance Propagation Model

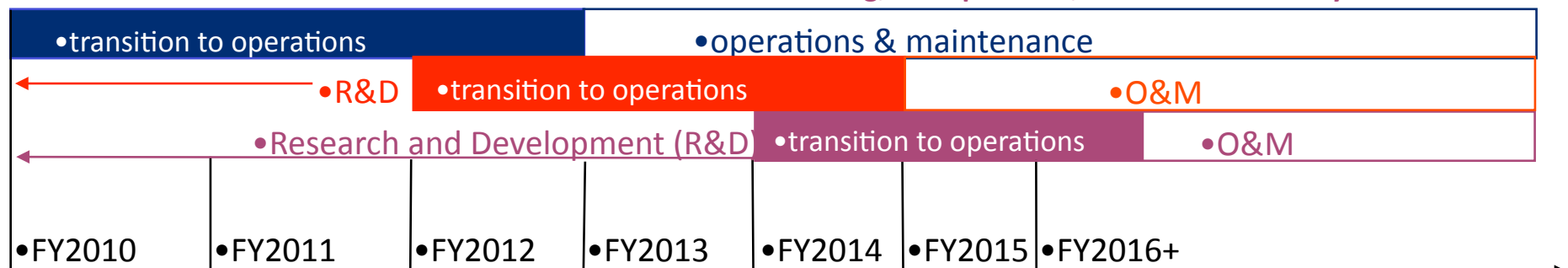
– Geomagnetic storm predictions go from ~1 hour to 18hr - 4 days

• Geospace Response Model

– Will replace limited value global predictions with actionable regional forecasts and warnings

• Energetic Particle Transport Model

– Model to predict radiation storm peak intensity, timing, and spectrum; no models currently exist!



•O&M includes Operation to Research (O2R) feedback to continuing R&D



Recent Activity and Next Steps



- **Beginning in April 2009:**
 - SWPC sends CCMC recommendations for performance measures and metrics to assess models for predicting regional geomagnetic disturbances
 - Validation of Geospace Models, and issues regarding proposed validation, circulated to the community
 - GEM summer meeting presentation on operational metrics
 - GEM lunch meeting with model developers and other interested members of the community results in valuable advice (focused options, need for clearly defined user metrics, capturing extreme events, community participation, model robustness limits choice of model parameters, models will likely have different performance strengths, feedback to research...)
 - SWPC Geomagnetic Activity Products document prepared
 - September meeting of opportunity with CCMC (Kuznetsova, Pulkkinen, and Singer) to discuss metrics, including “threshold” metrics
 - Fall AGU meeting: Antti Pulkkinen reports on his new “threshold” metrics and further discussion to establish next steps
- **All of these discussions are leading to developing appropriate metrics for validation of geospace models for operational purposes**
- **Need for meeting among SWPC, model developers, agencies... to finalize metrics, selection of events, and other details.**