

International Space Environment Service



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International Space Environment Service

Coordinating space weather services since 1962



ISES
International Space
Environment Service



World Meteorological
Organisation

- Endorsed by national governments as space weather service providers
- Network Member of the ICSU World Data Service
- Formal exchange of letters with the WMO
- Provide local users with targeted services
- Coordinated world-wide operational effort

18 Regional Warning Centers
4 Associate Warning Centers
2 Collaborative Expert Center





Mission: Improve, Coordinate, and Deliver Operational Space Weather Services

Four elements needed to improve space weather capabilities:

1. User Needs: Understand the risks and the actions that need to be taken
2. Targeted Services: Develop useable capabilities from basic science knowledge
3. Observing Infrastructure: Shared approach for long-term continuity
4. Global Coordination: Consistent, accurate message

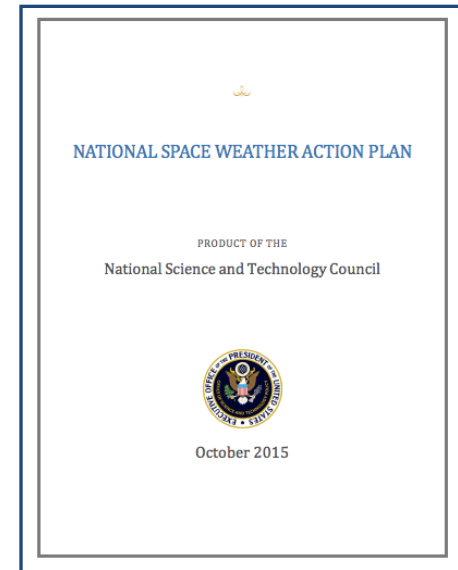


U.S. Perspective: Increase International Cooperation

Goal 6 of the U.S. National Space Weather Action Plan

Strengthen international coordination and cooperation on space weather products and services

- Sustain engagement with ISES
- Ensure global consistency during extreme events
- Sustain operational baseline observing capabilities



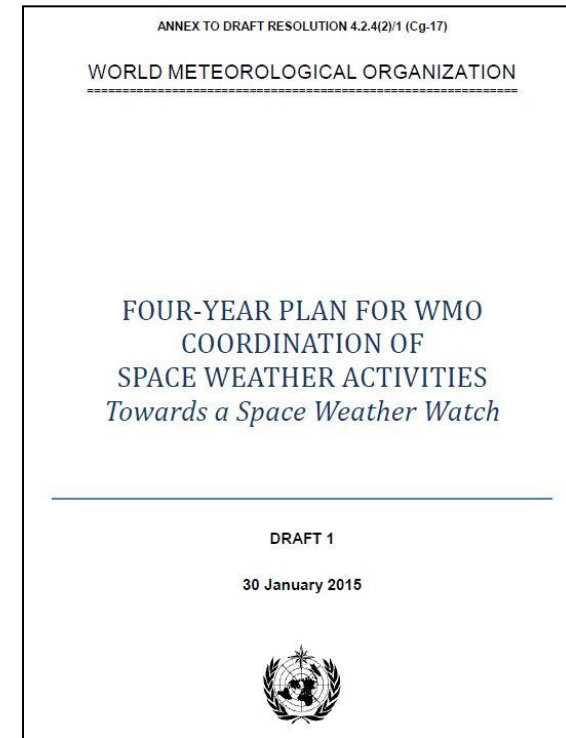


ISES in the Broader Context: World Meteorological Organization

Formal collaboration established between ISES and WMO

Goals within the WMO Four-Year Plan:

- Promote sustained observations essential for space weather services
- Improve exchange of data and information
- Support coordination of services for aviation and other major application sectors
- Improve emergency warning and global preparedness



WMO Space
Programme Elements:

Space-based
Observing System



Access to Satellite
Data and Products



Awareness and
Training



Space Weather
Coordination

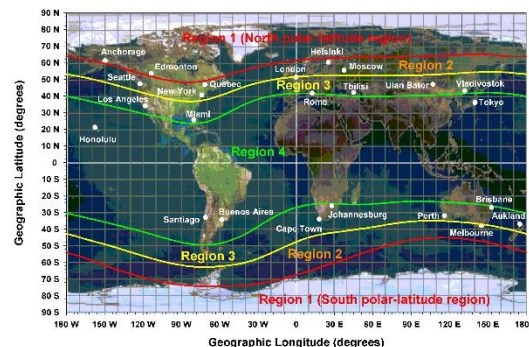
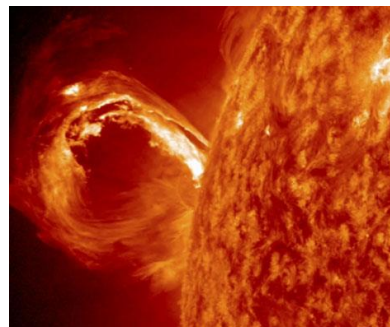
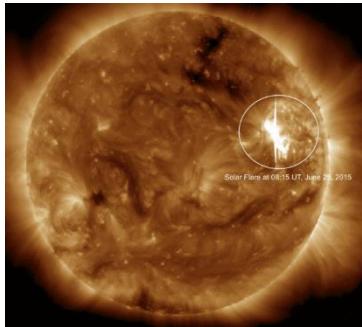




ISES Action – Rapid Access Information

Enable immediate access to key alerts and warnings from all
Regional Warning Centers

- Provide rapid situational awareness during extreme events
- Ensures immediate knowledge of regional events
- Supports National Space Weather Action Plan goal to ensure global consistency during extreme events

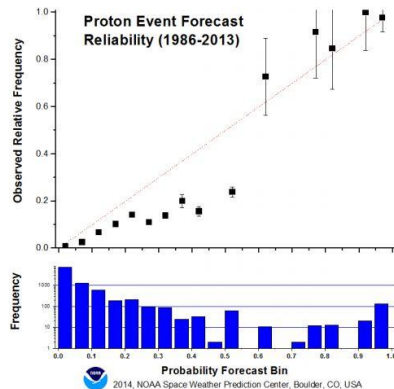




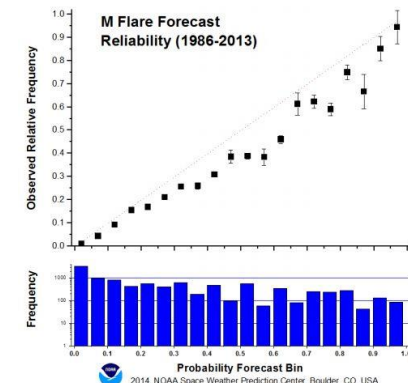
ISES Actions – Forecast Verification

Explore standard probabilistic forecasts and verification

- Value of standardized verification methods acknowledged
- Extensive expertise is available at ISES Centers
- Actions are underway to compare approaches and make recommendations on verification techniques



		K6 Observed	
		YES	NO
K6 Warning Issued	YES	HIT 194	FALSE ALARM 72
	NO	MISS 81	Correct Null 43,485





Recent Accomplishments

- New Members: - Mexico Regional Warning Center (2015)
 - Indonesia Regional Warning Center (2016)
- STFC Rutherford Appleton Laboratory – Collaborative Expert center (2017)
- Product inventory with metadata created – This will help with selection of key information for rapid availability during extreme events.
- Economic impact studies and user outreach activities conducted by numerous Members
- Ongoing progress on observations and product development



Space Weather User Workshops

Australia Bureau of Meteorology – ISES Regional Warning Center

- Meeting of stakeholders and customer survey
- Aviation Space Weather Services Workshop
 - Present prototype industry-specific products
 - Obtain feedback and industry requirements

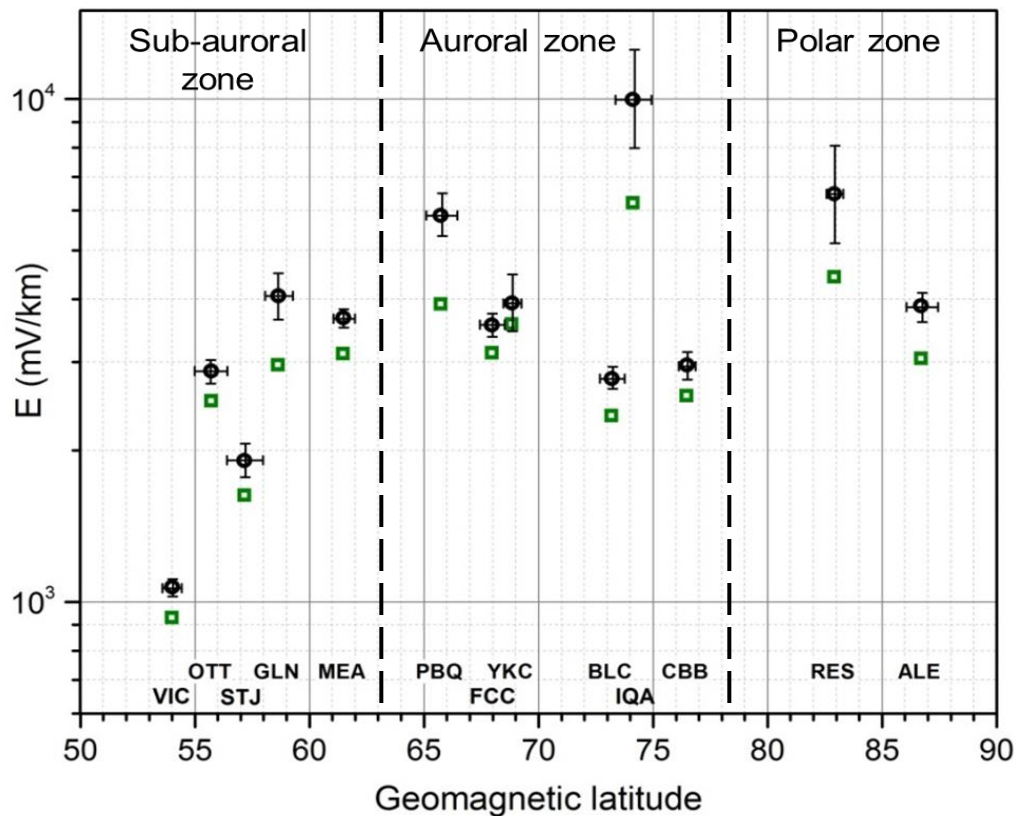




Characterizing Extreme Events

Natural Resources Canada – ISES Regional Warning Center

100 years estimation. Geoelectric field



- 40 year of data
- 13 Canadian magnetometers

■ Maximum measured
● Estimated extreme



Models, Products, and Services

China National Space Science Center – ISES Associate Warning Center

- ❑ Ionospheric Assimilation Models and Products
- ❑ Operational CME propagation forecast system
- ❑ Space Situation Environmental Awareness System
- ❑ Space Environment Teaching and Practice Software
- ❑ Space Environment Services for China Space Flight Missions
 - Tiangong II
 - Dark Matter Particle Explorer Satellite
 - The retrievable Shijian-10
 - Quantum Science Satellite



Summary

- International Space Environment Service - growing global network dedicated to operational space weather services
- Members are integrated with expanding international efforts
- Actions are under way to enhance global coordination
- Future directions:
 - Understanding social/economic impacts
 - Sharing user needs and post-event information
 - Rapid dissemination of event information
 - Common verification techniques and metrics
 - Sharing research/application developments