Building on ISWI to Improve Space Weather Services and Global Benefits to Society

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Space Weather Risks are Recognized - Mitigation Plans are being Developed

United Kingdom National Register Recognizes Space Weather Risks

CabinetOffice

National Risk Register of Civil Emergencies

2012 edition

United States Recognizes Space Weather as a Grand Challenge for Disaster Reduction

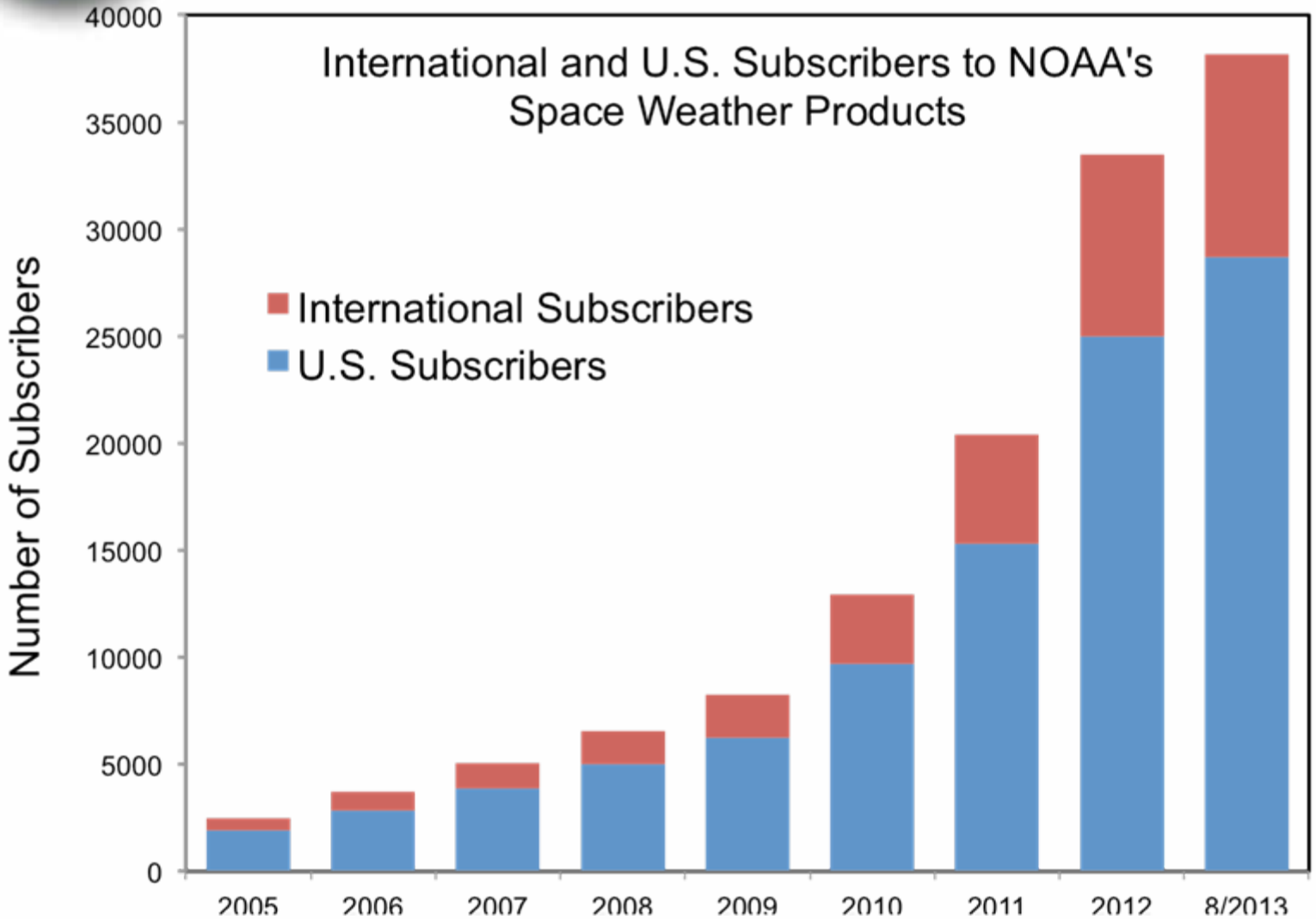
SPACE WEATHER

A report of the Subcommittee on Disaster Reduction

www.sdr.gov

An element of the National Science and Technology Council

International and U.S. Subscribers to NOAA's Space Weather Products



Overarching Goal: Strengthen Resilience Through Improved Services

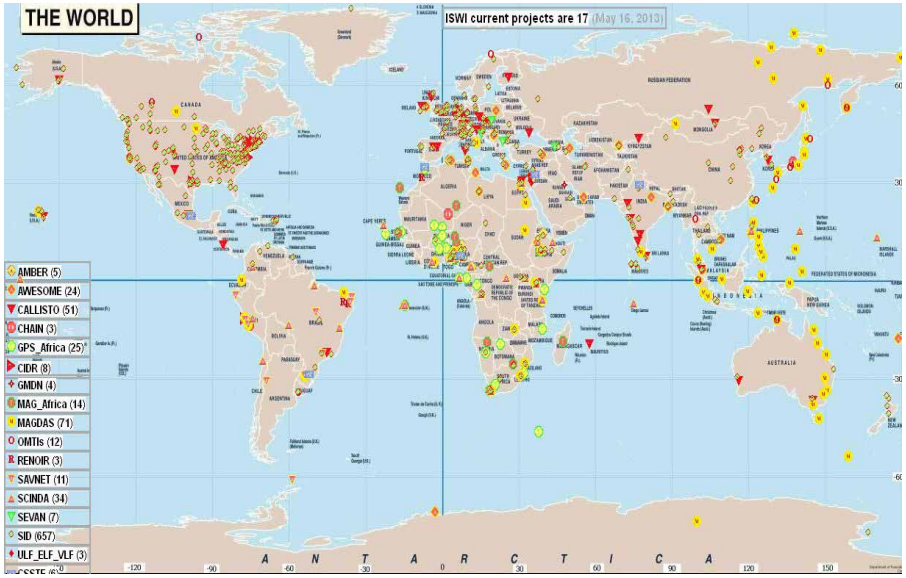
Space weather is more than space science. Space weather requires the application of science to specific societal needs.

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

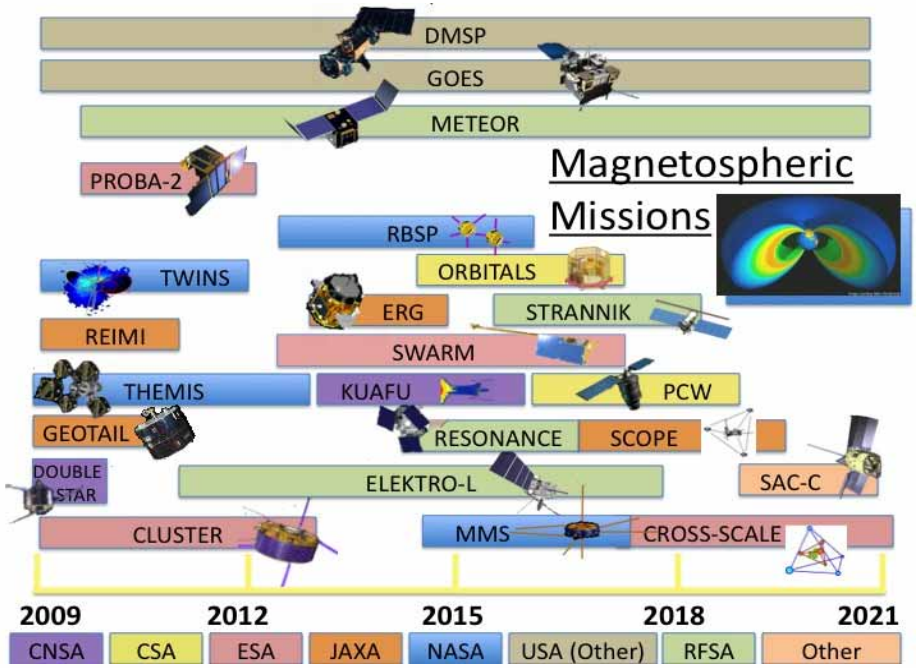
International Space Science Data

ISWI Ground-Based Data



~600 Instruments
More than 95 Countries

ILWS Space-Based Data



More than 25 Space Agencies

International Space Weather Services

ISES
International Space Environment Service

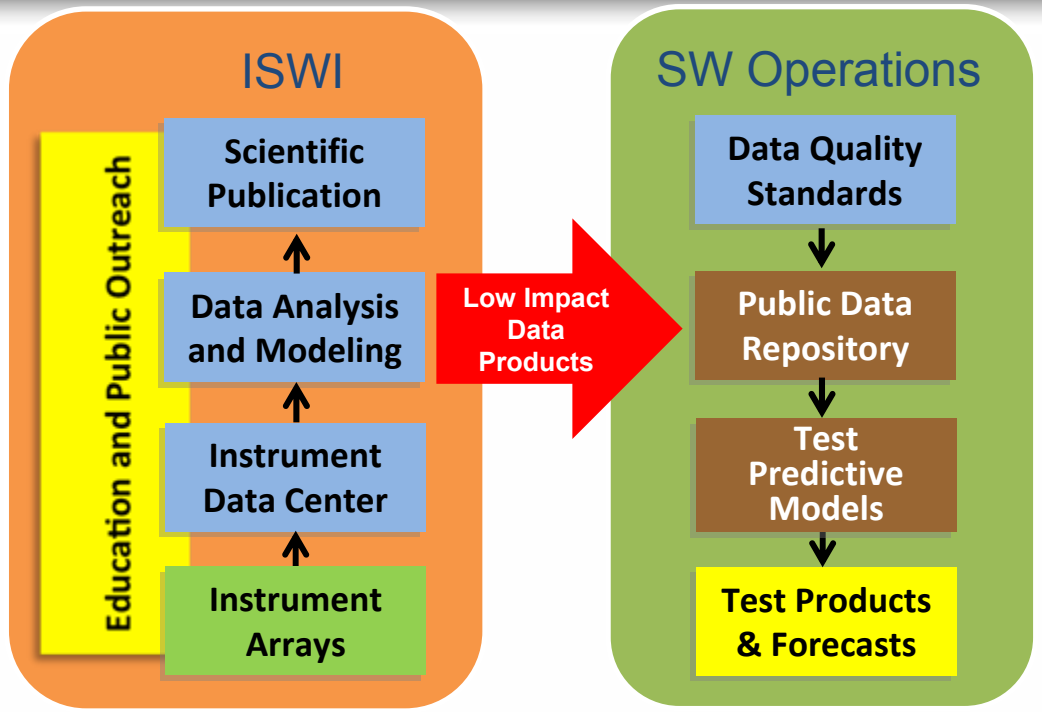
14 Regional Warning Centers
4 Associate Warning Centers
1 Collaborative Expert Center

World Meteorological Organisation

WMO Inter-Programme Coordination Team on Space Weather

21 Member Countries
7 International Organizations

ISWI Space Science Research



From **Abuja ISWI Resolution**, October, 2011:

4. Space weather work is roughly divided into two spheres:
   (1) Operational activities; (2) Research and educational activities.

- Operational work can be handled by already existing national space related institutions.
- The center recommended in this “Abuja ISWI Resolution” must be part of such an advanced research institution or university.

International Organizations Involved in Space Weather

International Space Environment Service – Global network of space weather service providers since 1962

World Meteorological Organization – Global observing and service infrastructure – combining meteorology and space weather

Coordination Group for Meteorological Satellites – Satellite observations and anomaly reporting – drafting Terms of Reference

International Civil Aviation Organization – Defining civil aviation needs and information flow

UN Committee on Peaceful Uses of Outer Space – New space weather agenda item – Research, observations, applications

International Space Environment Service

Coordinating space weather services since 1962

- Serves local users in local languages
- Encourages forecaster interaction
- ICSU-World Data System Network Member
- Agreement with WMO in development
- Members have endorsement of national governments

ISES
International Space Environment Service

World Meteorological Organisation

14 Regional Warning Centers
4 Associate Warning Centers
1 Collaborative Expert Center

World Meteorological Organization

Specialized Agency of the United Nations with 191 Members

Terms of Reference:

- Integration of space weather in global observing system
- Standardized service delivery
- Harmonized products for major application sectors
- Encourage research and operations dialogue

Representatives nominated by Permanent Representative of Member State

WMO Inter-Programme Coordination Team on Space Weather (ICTSW)

World Meteorological Organisation

20 Member Countries

7 International Organizations

International Civil Aviation Organization

Developing operational requirements for space weather products: ICAO International Airways Volcano Watch Operations Group (IAVWOPSG)

- Standards and Recommended Practices (SARP) for Space Weather Centres
- Document: Space Weather Impacts on International Air Navigation – To be the basis for space weather provisions
- Document: Concept of Operations for Space Weather Information in Support of International Air Navigation

Target endorsement: July 2014 ICAO Meteorological Divisional Meeting

World Meteorological Organisation

Coordination Group for Meteorological Satellites

- Host space weather instruments
- Routinely report on satellite anomalies
- Focus on operational issues
- Can facilitate integration of observing capabilities

CGMS

Near-term Actions:

1. Develop Terms of Reference for space weather activities

2. Work with WMO/ICTSW to develop procedure for collection and use of anomaly information

World Meteorological Organisation

United Nations Committee on the Peaceful Uses of Outer Space

Long-Term Sustainability of Outer Space Activities Working Group: Consensus report on best practices

- Space Weather Expert Team (1 of 4)
- Report to be finalized in 2014

COPUOS Scientific and Technology Sub-Committee

- Space Weather is a new agenda item for STSC (2013)
- Opportunity to expand ISWI activities

Expanding ISWI can accelerate research-operations linkage and encourage long-term continuity of key observations

Roles of the Various International Organizations

ISES: Focus on user needs, improved services, consistent message during extreme events, growth in service providers

World Meteorological Organisation

WMO: Work closely with ISES, leverage global infrastructure and membership, build capacity and increase service providers

COPUOS – Facilitate international participation in space weather research-to-operations and long-term continuity of observations

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ICAO – Refine aviation service requirements based on user needs and current capabilities, ensure consistent global/local message

CGMS

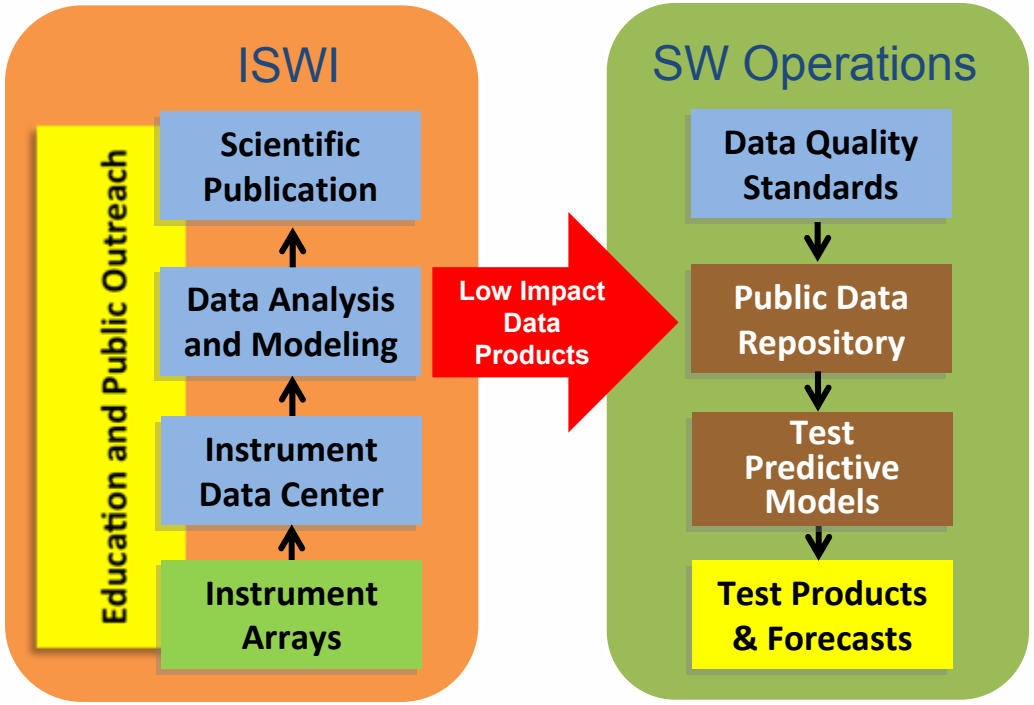
CGMS: Understand satellite user needs, improve products, utilize space-based measurements and promote long-term availability

Organizational Involvement in Space Weather

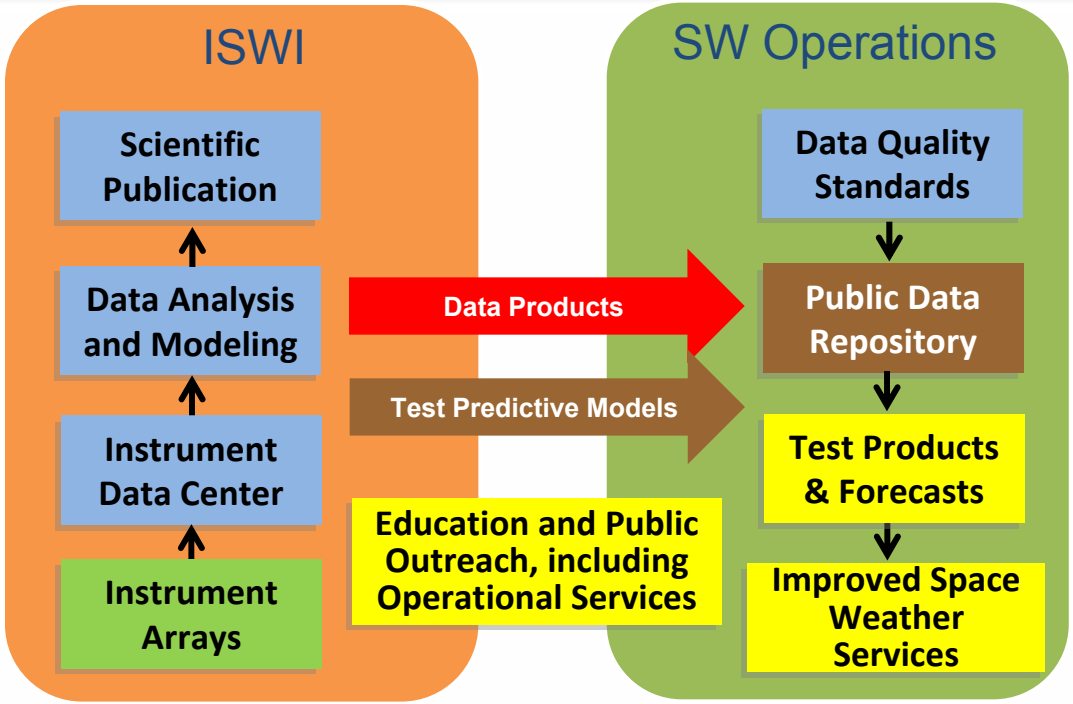
- User Needs: ISES, WMO, ICAO, CGMS
- Targeted Services: ISES, WMO, **COPUOS**
- Observing Infrastructure: ISES, WMO, **COPUOS**, CGMS
- Consistent Message: ISES, WMO

COPUOS is in a unique position to foster the improvement of space weather services, by encouraging research activities, data availability, and capacity building aligned with service needs.

ISWI Space Science Research



Expand ISWI to Include Research for Operations



- Motivate research based on high-priority space weather needs
- Challenge researchers to exceed current capabilities
- Provide capacity building to utilize current forecasting services
- Enable scientists and potential forecasters to serve local user needs

Summary

- Space weather is growing in importance around the globe
- Space weather services lag far behind what is needed to ensure the resiliency of our economic and security infrastructure
- Basic and applied research – both are required to improve our capabilities. Space weather is more than space science.
- Coordinated approach is required to maintain continuous, real-time ground-based and space-based observing assets
- COPUOS can foster the coordination of basic and applied research, encourage a shared approach to maintaining key observations, and develop expertise to expand service provision globally