

2012 Beijing Space Sustainability Conference (2012/11/09)

International efforts in space weather prediction and warning

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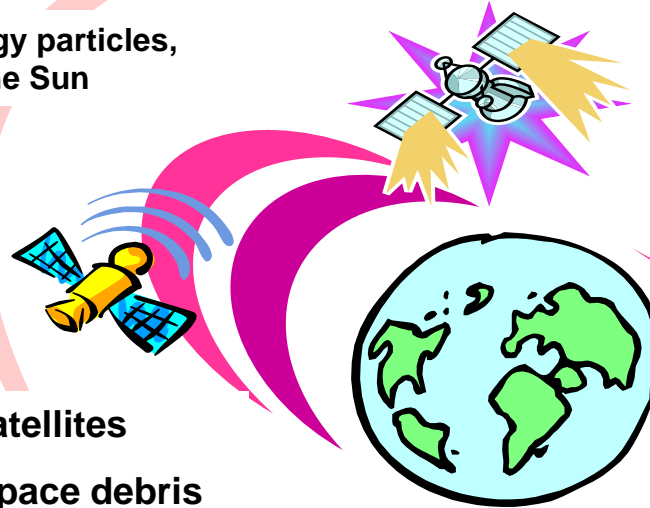
0. Space Weather ?
 1. International Space Environment Service (ISES)
 2. World Meteorological Organization (WMO)
 3. International Civil Aviation Organization (ICAO)
 4. UN/ Committee on the Peaceful Uses of Outer Space (COPUOS)
 5. Asia-Oceania Space Weather Alliance (AOSWA)

Effect of Space Weather: Space environment affects human and human-made systems.



X-ray, UV-radiation, high-energy particles, magnetic clouds form the Sun

- Surface and interior charging, solar cell damage
- Failure of satellites
- Radiation hazard of manned space mission

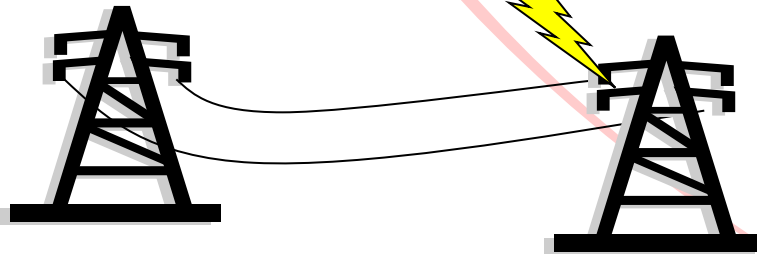


- Radiation hazard of aircrew
- HF radio communications
- Navigation system using satellites

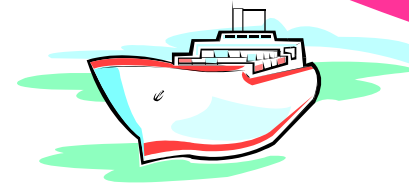


- Drag for low-orbit satellites
- Change of orbit of space debris

- HF radio communication
- Navigation system using satellites



- Power grid disruption
- Electric power blackout



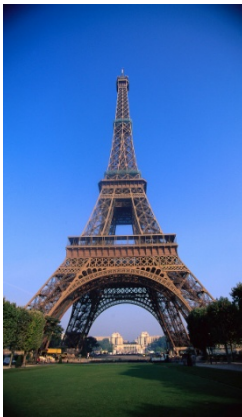
1. International Space Environment Service (ISES)

International Space Environment Service (ISES)

Oldest international organization of space weather

**URSI Central Committee of
URSIgram**

The URSI Central Committee of USRIgrams initiated for rapid international data exchange services in **1928**.
(HF radio communication)



Information of URSIgram was broadcasted from the Eiffel Tower in **1928**.

Information of Special World Interval (SWI) was exchanged for coordinated observations of the Sun and geophysical environment during **International Geophysical Year (IGY, 1957-1958)**.

Forecasts of geomagnetic storm within 24 hours were issued from **World Warning Agency (WWA)**, Boulder, CO. USA.

International World Days Service

The International World Days Service initiated in **1959** as part of International Geophysical Year (IGY).

1962

**International URSIgram and World Days Service
(IUWDS)**

1996

**International Space Environment Service
(ISES)**

International Space Environment Service (ISES)

Mission

The mission of the ISES is to encourage and facilitate **near-real-time international monitoring and prediction of the space environment** by: the rapid exchange of space environment information; the **standardization of the methodology for space environment observations and data reduction**; the uniform publication of observations and statistics; and the application of standardized space environment products and **services to assist users reduce the impact of space weather** on activities of human interest.

International Council for Science (ICSU)

- **World Data Centre (WDC)**

- WDC for Solar Terrestrial Physics (NOAA/NGDC)
- WDC for Solar-Terrestrial Science (IPS)
-
-

- **Federation of Astronomical and Geophysical Data Analysis Services (FAGS)**

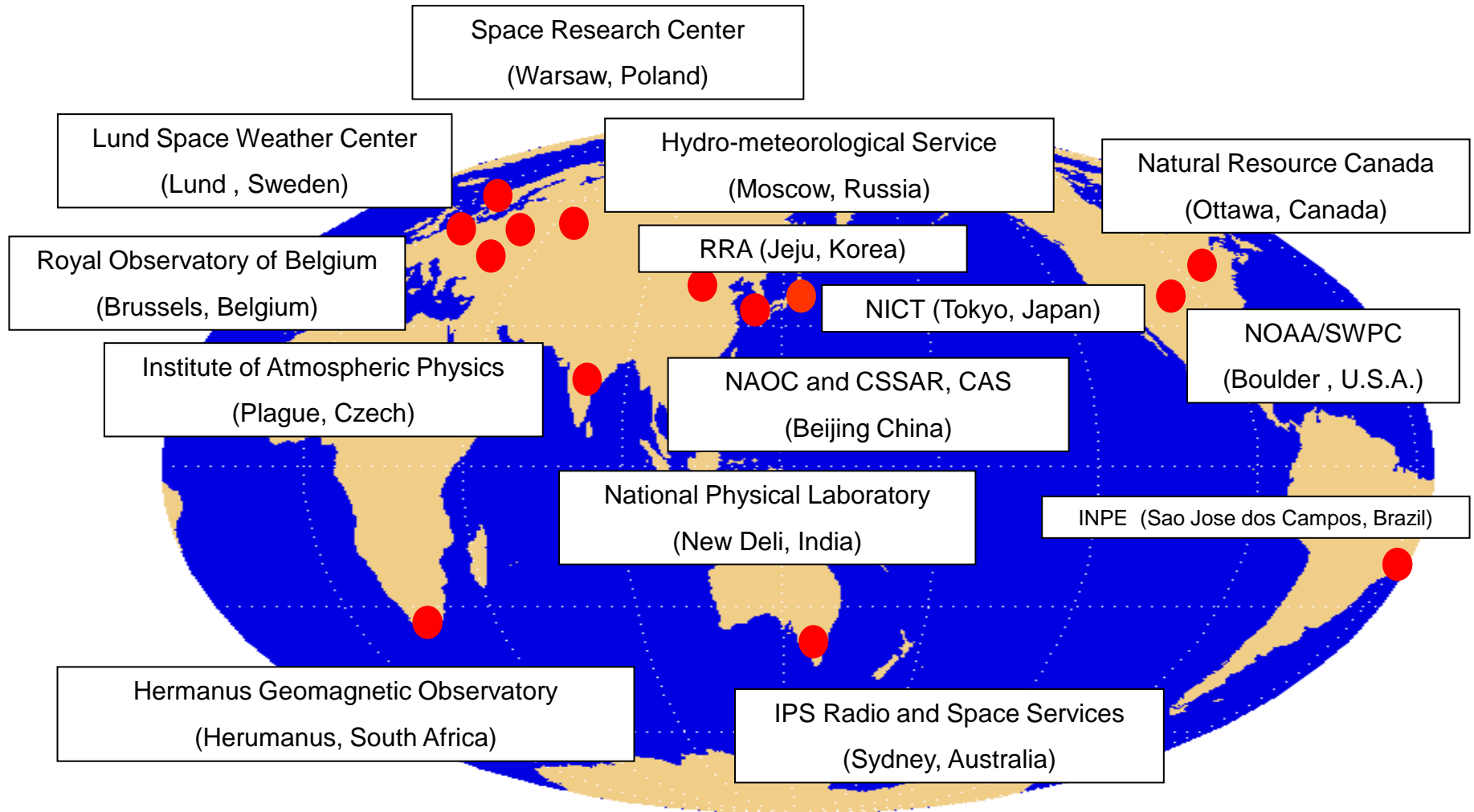
- **International Space Environment Service (ISES)**
- Solar Influences Data Analysis Center (SIDC)
- International Service of Geomagnetic Indices (ISGI)
- International GNSS Service (IGS)
-
-

since 2008

World Data System (WDS)

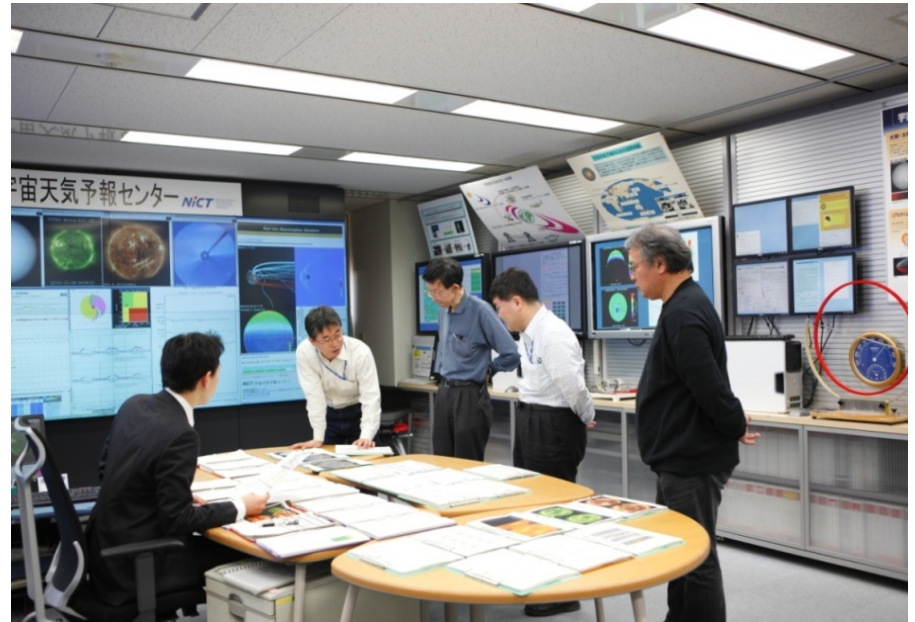
NICT hosts the International Program Office (IPO) of the WDS now.

Fourteen Forecast centers of International Space Environment Service (ISES)



NICT space weather forecast center of ISES

We have forecaster meeting every afternoon and make forecasts.



2. World Meteorological Organization (WMO)

WMO/Inter-Programme Coordination Team on Space Weather (ICTSW since May, 2010)

Co-chair: **Dr. Xiaoxin Zhang (CMA) and Dr. Terry Onsager (NOAA/SWPC)**

CMA: Chinese Meteorological Administration

[current member (**18 countries and 7 international organizations**)]

Australia, Belgium, Brazil, Canada, China, Colombia, Ethiopia, Finland, France, Germany, Japan, Korea, Pakistan, Russia, South Africa, UK, USA

ESA, ISES, ITU, ICAO, UN/Office of Outer Space Affairs, WMO, EC

Purposes of ICTSW

1. **Standardization** and enhancement of space weather **data exchange** and delivery through the WMO Information System (WIS)
2. **Harmonized definition of end products and services**, including e.g. quality assurance guidelines and emergency warning procedures, in interaction with aviation and other major application sectors
3. **Integration of space weather observations**, through review of space-based and surface-based observations requirements, harmonization of sensor specifications, monitoring plans for space weather observation
4. Encouraging the **dialogue between the research and operational space weather communities**

WMO space weather portal

http://www.wmo.int/pages/prog/sat/spaceweather-productportal_en.php

The screenshot shows the WMO Space Weather Product Portal website. The browser window title is "Space Programme | WMO - Windows Internet Explorer". The address bar shows the URL "http://www.wmo.int/pages/prog/sat/spaceweather-productportal_en.php". The website header features the WMO logo and the text "World Meteorological Organization Weather • Climate • Water". Below the header is a navigation menu with links for HOME, CONTACT US, LIST OF TOPICS, LINKS, CLIMATE STATISTICS, FAQ, and ACCESSIBILITY. The main content area is titled "Space Weather Product Portal" and includes a description of the portal's purpose and a "Search by Product Category" section with dropdown menus for Ionospheric, Geomagnetic, Energetic Particles, and Solar and interplanetary. A "Search by Organization" section lists various contributing organizations with their logos, including ISES, Bureau of Meteorology (Australia), Natural Resources Canada - Canadian Space Weather Forecast Centre, ESA (Europe), Institute of Applied Geophysics (Russia), DLR (Germany), RRA - Radio Research Agency (R. Korea), CMA (China), INPE (Brazil), FMI (Finland), NICT (Japan), Solar Influences Data Analysis Center, ROB (Belgium), NOAA (USA), and SANS / Hermanus Magnetic Observatory (South Africa). A sidebar on the left contains a navigation menu with links for About us, Governance, Members, Media centre, Programmes, GFCs, Meetings, Publications, Library, Learning, Publishing tools, Partnership, Themes, Vacancies, Visitors' info, and Youth corner. A search bar is located below the sidebar. The right sidebar contains a "Programme Overview" section with links for Home, Activities and objectives, Structure and Governance, News and External Announcements, Contact information, Calendar of events, and a list of products including Space-based GOS, Data access & use, Awareness & Training, and Space Weather. Regional activities and information resources are also listed.

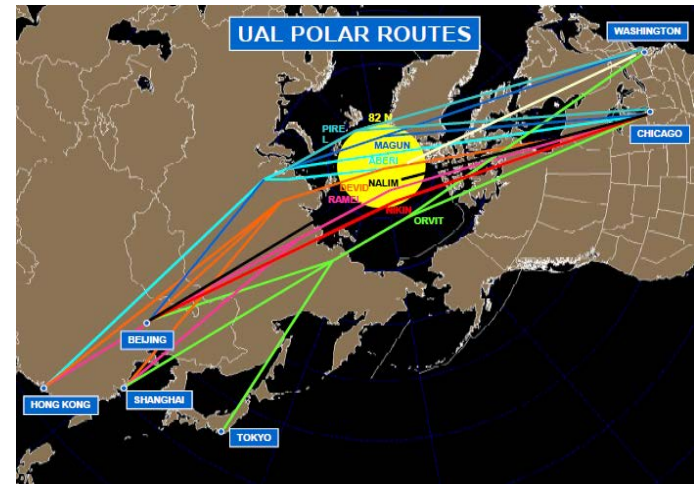
3. International Civil Aviation Organization (ICAO)

ICAO/International Airways Volcanic Watch Operations Group (IAVWOPSG)

<http://www.icao.int/safety/meteorology/iavwopsg/Pages/default.aspx>

The first draft was released on 15 February, 2011.
Draft Version 2.0 was released on 29 September, 2012.

“CONCEPT OF OPERATIONS (CONOPS) FOR INTERNATIONAL SPACE WEATHER INFORMATION IN SUPPORT OF INTERNATIONAL AIR NAVIGATION”



Michael Stills, United Airlines, “Polar Operations and Space Weather,” presentation to the space weather enterprise forum, (June 21, 2011)

Ionospheric Studies Task Force (ISTF) of ICAO Asia and Pacific Office

<http://www.bangkok.icao.int/cns/meeting.do>

Chair of Ionospheric Studies Task Force
 Dr. Susumu Saito, Electronic Navigation Research Institute
 (ENRI)

The task force will develop strategies for **collecting, analyzing and sharing ionospheric data** and will discuss other issues related to the ionospheric studies as a step towards the **implementation of GNSS applications including GBAS and SBAS.**

First Meeting of Ionospheric Studies Task Force (ISTF/1)
 February 27-29, 2012 in Tokyo

Second Meeting of Ionospheric Studies Task Force (ISTF/2)
 October 15-17, 2012 in Bangkok



"WORST CASE" FADING DEPTHS AT L-BAND

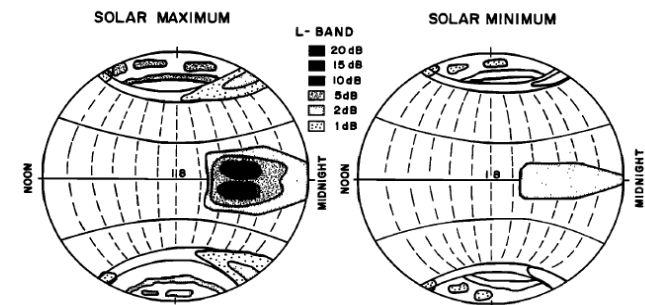


Fig. 9. Global variation of scintillation fades during solar maximum and solar minimum.

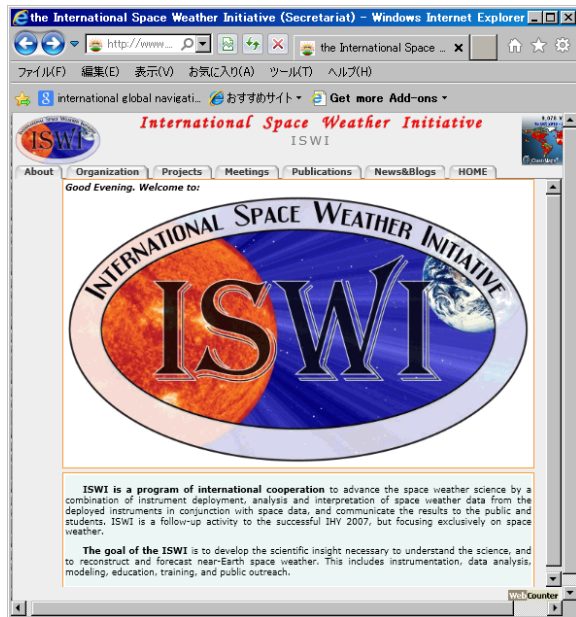
Basu et al., Radio Science, Vol.23, 1988

4. UN/Committee on the Peaceful Uses of Outer Space (COPUOS)

UN/Committee on the Peaceful Uses of Outer Space (COPUOS)

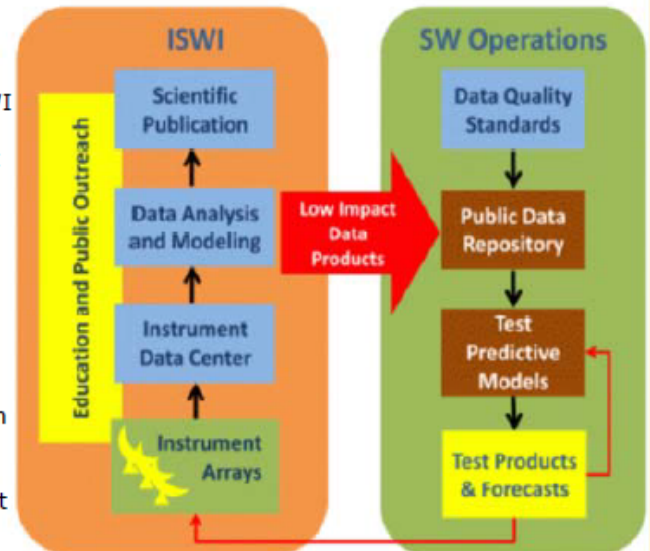
ISWI (International Space Weather Initiative) WG (2009-2012)
 (http://www.stil.bas.bg/ISWI/index_letter.html)

ISWI flows up IHY (International Heliophysical Year), which is a program of 50 anniversary of IGY



ISWI Objectives

- Instrumentation and data analysis
 - Expand existing instrument arrays
 - Deploy of new arrays
 - Expand data analysis effort for ISWI data and other relevant data bases
- Coordinate data products to provide input for physical modeling of the Sun-Earth System
 - Input instrument array data into physical models of heliospheric processes
 - Provide data products in a form useful for modelling
 - Enable Space Weather forecasting
- Promote Education, Training and Outreach
 - Encourage and support space science courses and curricula in Universities that provide instrument support
 - Develop public outreach materials unique to the ISWI, and coordinate the distribution



Print this

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UN/Committee on the Peaceful Uses of Outer Space (COPOUS)

ISWI (International Space Weather Initiative) WG (2009-2012)

The 1st UN/ESA/NASA/JAXA workshop on ISWI, 16-20 October, 2010, Luxor, Egypt
The 2nd UN/Nigeria workshop on ISWI, 17-21 October, 2011, Abuja, Nigeria
The 3rd workshop on the ISWI, 8-12 October, 2012, Quito, Republic of Ecuador

UN International Space Weather Science and Education Center started this April in Kyushu University (Prof. Kiyofumi Yumoto).

Instrument Projects

- 14 distributed instrument teams
- Approximately 1000 participating locations
- More than 100 countries participation



- GPS receivers
- Scintillation observations
- Optical observations of upper-atmosphere
- Magnetometers
- VLF observations
- Solar radio observations
- Solar optical observations
- Muon detectors
- Particle detectors

http://www.stil.bas.bg/ISWI/Projects/Instrument_map.html

UN/Committee on the Peaceful Uses of Outer Space (COPOUS)

Long-Term Sustainability WG (2010-2014)

Chair: Peter Martinez (South Africa)

Expert Group A: Sustainable space utilization supporting sustainable development on Earth

Expert Group B: Space debris, space operations and tools to support collaborative space situation awareness

Expert Group C : Space weather

Expert Group D: Regulatory regimes and guidance for actors in the space arena

Expert Group C: Space weather

Chair: Prof. Takahiro Obara (Tohoku University)

1. **Collection, sharing and dissemination of data, models, and forecasts**
2. Capabilities to provide **a comprehensive and sustainable network of key data in order to observe and measure space weather phenomena adequately in real or near-real time**
3. **Open sharing of established practices and guidelines** to mitigate the impact of space weather phenomena on operational space systems
4. **Coordination among states** on ground-based and space-based space weather observations in order to safeguard space activities

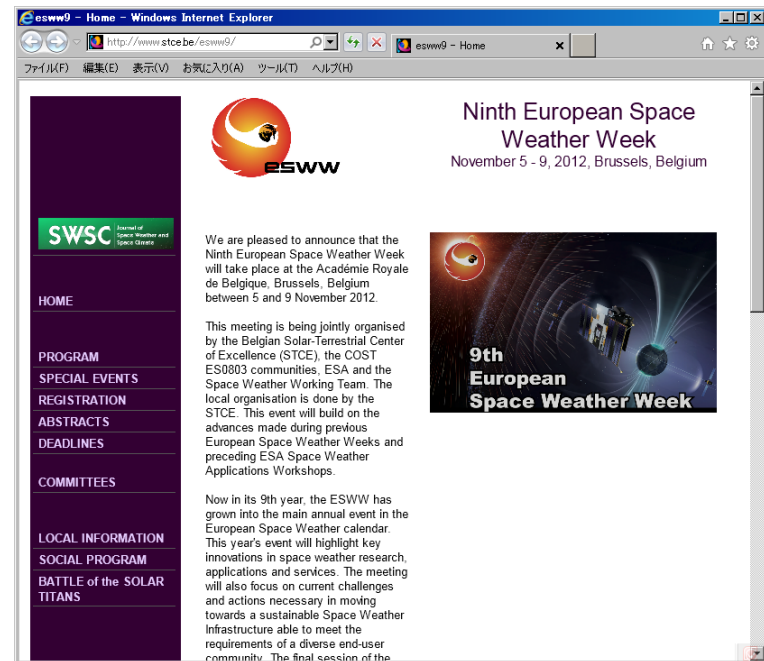
5. Asia-Oceania Space Weather Alliance (AOSWA)

Regional Space Weather Workshop

Space Weather Workshop @ USA since 1996



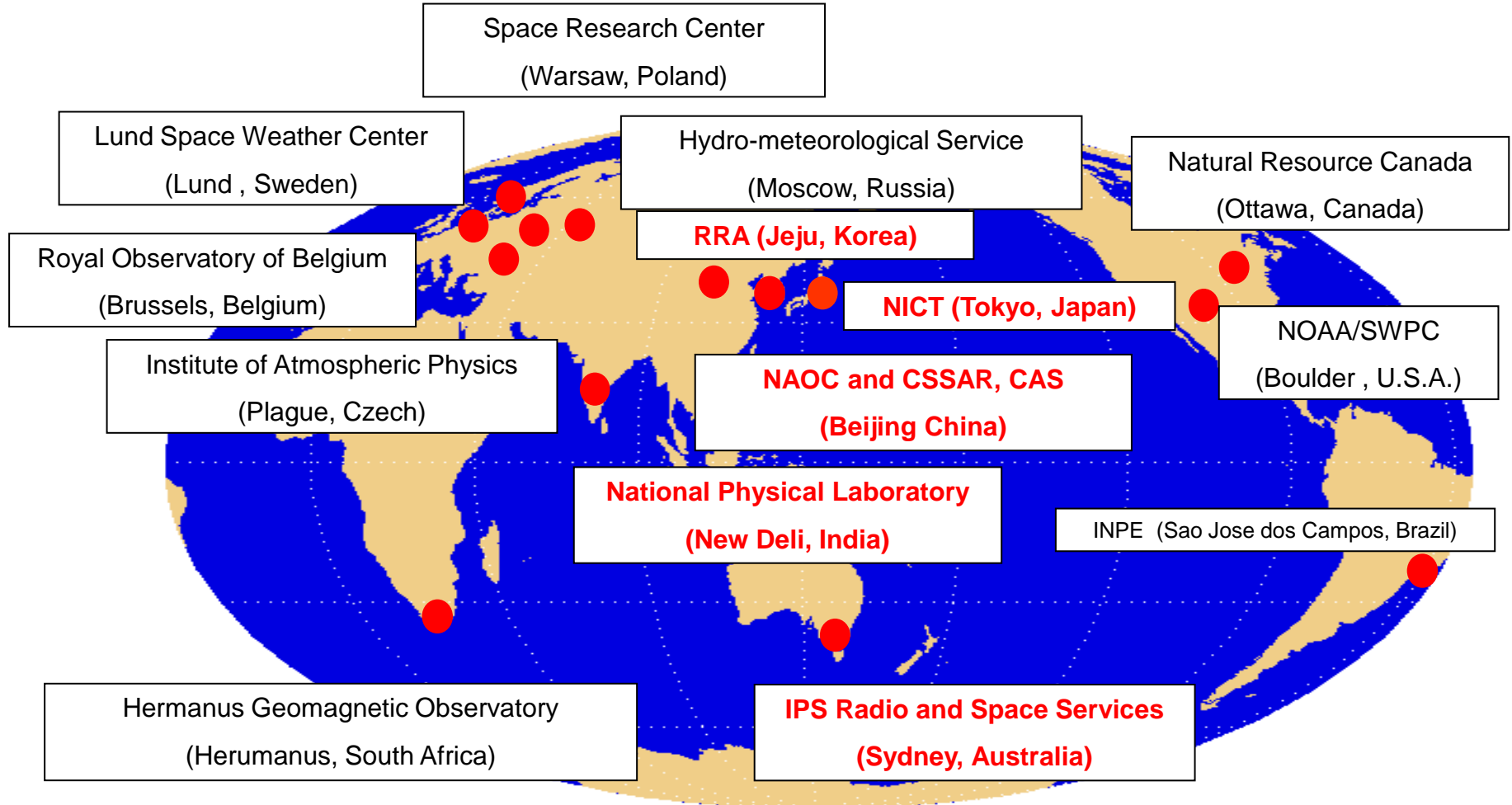
European Space Weather Week since 2004



Asia-Oceania regional space weather workshop since 2012



Fourteen Forecast centers of International Space Environment Service (ISES)



Indonesia: Space Weather Program is in progress at LAPAN.

Thailand: Princess Sirindhorn Neutron Monitor is providing data of energetic particles with the highest cut-off energy
GPS and Ionospheric Data Center is planned in KMITL., Thailand.

Operational Forecast and Data Preservation

Workshop/Collaboration/
Data Exchange

Practical Use

Research Works



Four functions

International Activities

**Education/
Capacity Building**

Information Exchange
(Web site/News Letter)

Space Weather School/
Text book & Contents

Current associate member is 18 institutes in 12 countries.

Australia, China, India, Indonesia, Japan, Korea, Malaysia, Pakistan, Philippines, Russia, Thailand, Vietnam

The 1st AOSWA Workshop (22-24 February 2012, Imperial Mae Ping Hotel, Chiang Mai, Thailand) 1st Asia-Oceania Regional Space Weather Workshop

Approximately 80 peoples from 30 institutes in 10 countries including the ICAO Asia and Pacific Office in Bangkok, Thailand



AOSWA
Asia-Oceania Space Weather Alliance



Next workshop is in China hosted by NAOC, CSSAR, and CMA

AOSWA Web site

http://aoswa.nict.go.jp

AOSWA
Asia-Oceania Space Weather Alliance
Preparatory Committee

Top | News | Introduction | Workshop | AOGS | Associates | Event | Application | Education | Contact | Link

Event Information

2012/10

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

2012/11

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Associates of AOSWA

Welcome to AOSWA

Welcome to the Asia-Oceania Space Weather Alliance (AOSWA) Web site.

For the development of research and practical operation of space weather, regional collaborations are inevitable. As have been conducted in the United States and Europe, space weather alliance is expected for a long time. Here we kicked off the regional alliance for space weather among Asian and Oceania countries.

The main objective of the AOSWA is to make a regional linkage of information of space weather for operations and researches. On this web site, event and project information are opened for every country and organization in this region (and other regions) concerning with space weather. You are welcomed to make contact with us for more information.

What's New

- [2012-09-26](#) Added Institute of Cosmophysical Research and Radio Wave Propagation of the Far-Eastern Branch of Russian Academy of Science (IKIR FEB RAS) on Associates page. **New**
- [2012-09-21](#) Posted AOGS2012 ST-26 Presentation files. **New**
- [2012-07-25](#) Report of AOSWA local meeting on 17th July, 2012
- [2012-07-19](#) Report of the First AOSWA Workshop (Article from the NICT News)
- [2012-07-05](#) We welcome new AOSWA mailing list members, Dr. Musa and Mr. Leong from Universiti Teknologi Malaysia.

Summary

- There are many international activities on space weather. e.g. ISES, WMO, ICAO, UN/COPOUS, AOSWA, ITU,
- Collaboration and harmonization are necessary among international activities.
- Asia-Oceania region becomes a big player of space weather now.

Thank you !!

2012年10月25日から10月31日の宇宙天気

NICT 情報通信研究機構

weekly space weather

太陽活動

10/25(木)	26(金)	27(土)	28(日)
やや活発	やや活発	やや活発	やや活発
29(月)	30(火)	31(水)	
静穏	静穏	やや活発	

NICT

太陽活動

“Weekly Space Weather News” delivered by YouTube NICT channel