Issue4, May 2014

We hope the AOSWA framework helps
our activities for improving space weather activities.

http://aoswa.nict.go.jp/

AOSWA *Link*

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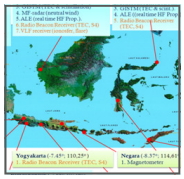

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Your contribution is always welcome!

If you should wish to submit an article, you are greatly appreciated. The articles should be approximately 500 words and contain either figures or pictures. Also It is available for use as a means of spreading information, such as upcoming conference and so on. Your feedback is always welcome.

Contact : sw-project-office@ml.nict.go.jp

About IPS

Rakesh Panwar and David Neudegg, Australian Bureau of Meteorology

IPS Radio and Space Services is the space weather branch of the Australian Bureau of Meteorology (BoM).

From its office in Sydney, IPS (Ionospheric Prediction Service), monitors and forecasts space weather conditions, which include solar activity, and geophysical and ionospheric conditions.

Space weather disturbances can interrupt HF radio, damage power grids, threaten satellite transmissions and instruments and reduce the life of satellites in low earth orbit and geostationary orbit. They can even put long- distance pipelines at risk by reducing the efficiency of anti-corrosion cathode systems. As reliance on technology grows, so does the impact of space weather events. The potential impact of solar activity is such that severe space weather events are ranked in the top four serious threats to the UK in its national risk register.

Realising the impact of solar variability on high-frequency radio communications, the Federal government of Australia set up the IPS within the Department of the Interior in 1947. It's remit has grown to encompass the wider space weather area and is now a part of BoM with it's role as an all-environmental hazard agency.

IPS manages an extensive network of observatories hosting magnetometers, ionosondes, solar observations and other sensors around the Australasian region and Antarctica. Observations are combined with data from satellites and other countries observations to monitor space weather and provide services and advice on space weather conditions for radio communications, satellite navigation and other operations. IPS is a member of International Space Environment Service (ISES), and operates the regional warning centre for the Australasian region. IPS is also a member of the World Meteorological Organisation (WMO) coordination team on Space Weather ICTSW.

IPS maintains a high profile in the international scientific community by actively collaborating with universities and other research organisations to conduct research into space weather, HF communications, satellite navigation and geomagnetic surveys. Staff regularly participate in national and international science conferences by presenting scientific papers, publishing and refereeing journal papers, contributing panel membership, and providing radio consultancy advice.

Consultancies are also provided for planning and operation of radio systems including antenna modelling, radio wave propagation and ionospheric characteristics. These have ranged across high-frequency communications systems, HF direction finding and trans-ionospheric propagation of GPS and Radio Astronomy. Software tools are also developed for the propagation of HF radio via the ionosphere, LF/MF radio via groundwave and VHF/UHF radio across terrain and buildings.

IPS also hosts the regional World Data Centre for Solar- Terrestrial Science, presents training about the effects of space weather on HF radio propagation and how to use IPS software tools to select the right frequencies for successful radio communication, and supplies data and information on the upper atmosphere and space weather to various scientific, research and commercial organisations.

Customer surveys identify potential new services. Innovations have included specialised radio frequency services for various airlines and several Federal and State Government Departments, and new web pages for different businesses.

IPS provides information about space weather

through daily/weekly/monthly reports and alerts and warnings as required by the space weather conditions. Many of IPS services are freely available via the IPS website and e-mail subscriptions at http://www.ips.gov.au/Products_and_Services/4/1

Using IPS services and information, people vulnerable to space weather disturbances may be able to minimise potential impacts by taking appropriate protective actions in planning and operations. IPS services enhance national security, defence, emergency services, public safety and industry.

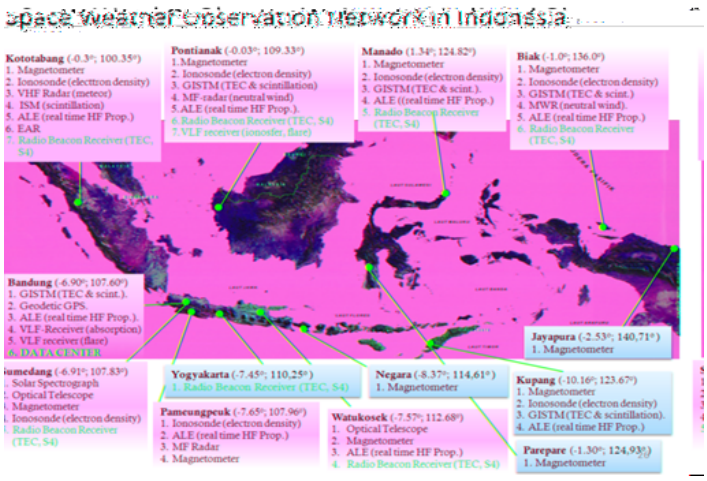
The attached photograph shows the Australian Space Forecast Centre. A Type II radio burst, indicative of a CME, can be seen on the monitor just above the duty forecaster

Space weather research and operations at Lapan Indonesia

Timbul Manik and Clara Y. Yatini,
Space Science Center-Lapan Indonesia

Space Science Center of Indonesian National Institute of Aeronautics and Space (Lapan) is the center with responsible to carry out space science research and development as well as the application for the user, which includes solar science, space environment including space weather, geomagnetic and magnetic space science, and solar system science including the Earth's ionosphere. Space Science Center is located in Bandung, West Java, approximately 200 km south east of Jakarta, and is supported by approximately 90 research professionals, assistants, technicians, and administrations.

One of the main activities of the Space Science Center is to provide space weather services, which include the space observation, space research and modeling, space weather forecasting, education, and building the information systems. To be able to carry out these activities, the center is supported by divisions of research and development, as well as the space observation stations spread over the Indonesia archipelago, ranging from Kototabang in West Sumatra to the west of Indonesia, to Biak Papua in eastern Indonesia. Observation equipments operated in the stations consisting of ground-based equipments such as radio and telescope observations of the sun, the ionosphere observation with active and passive radars, geomagnetic observations, etc. The observation devices are originated from self development devices, self procurement from the manufacturer abroad, as well as those derived from research collaboration with the institutions abroad.



The space weather observation network in Lapan

All the observation equipments are connected in space observation network which allow observation data to be transferred to data center located in Bandung in real time and/or in near real-time as shown on Figure 1. These observation equipments evolved from time to time in accordance with the demands of space weather research and development in Lapan.

The information of space weather is not presented only via website, but also by using space weather bulletin which is published regularly. Lapan also established a space weather control room to be able continuous space weather monitoring. By this facility, hopefully comprehensive and reliable information can be obtained more quickly.

Lapan has established fruitful research collaboration RISH Kyoto University since 1992. Based on this collaboration, the important facility, Equatorial Atmosphere Radar (EAR) has been Kototabang West Sumatra in 2001 with the aim to study the equatorial atmosphere dynamics. Other facilities were MF radar (at Pontianak 1996 and Pameungpeuk 2004) and Meteor radar (at Kototabang 2003 and Biak 2011).

The collaboration between Lapan and RISH Kyoto University is then growing to space weather research that, at present has become the focus of international communities. One of the activities carried out was Research Enhancement and System Establishment for Space Weather project in Indonesia that has been conducted in 2010 until 2013. This collaboration is very important and useful for Lapan since it is closely related to the main research activities at the center. Within this activity, the EAR can be operated for upper atmosphere and

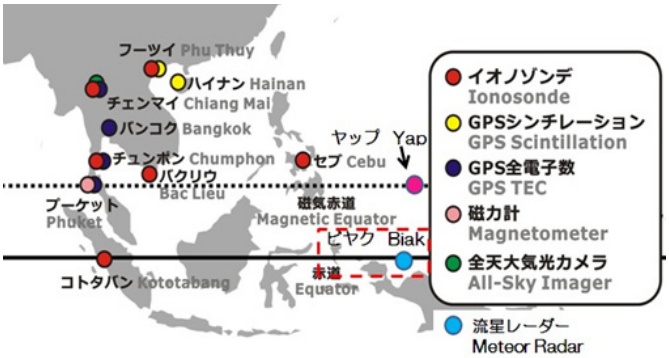
ionosphere observations at least for three years.

The Photo session during the Workshop on 2011 conducted based on Research Enhancement and System Establishment for Space Weather project in Indonesia

During this period, ionosphere research in Lapan has been developed by the establishment of satellite radio beacons network in several stations, as well as observations with GPS. Lapan also began the space weather services to the public and to some institutions in Indonesia by conducting comparative studies with related institution in Japan. Under this collaboration, Lapan actively participated in Asia Oceania Space Weather Alliance (AOSWA), which is discussed and established in Bandung on 2010 to strengthen the space weather network in the region. Lapan also take advantage of this collaboration for capacity building in space weather for Lapan personnel.

Since 2005, along with NICT (National Institute of Information and Communications Technology) of Japan, an FM-CW ionosonde has been installed and operated at Kototabang West Sumatera as a part of a SEALION (Southeast Asia Low-latitude IOnospheric Network) as shown on Fig. 3. To strengthen the collaboration with NICT, very recently Lapan and NICT have signed the Memorandum of Understanding (MoU) with the aim to continue the cooperation related to ionosphere research and space communication using Frequency Modulated Continuous Wave (FM–CW) ionosonde equipment in Kototabang to observe the equatorial ionosphere dynamics, and to facilitate a mutual research and operation on space weather data and information by using the equipment of Lapan and NICT.

In the near future, the mutual collaboration will cover study and research on space weather, including the ionosphere dynamics and space communications; jointly operate the space weather monitoring equipments; share and exchange space weather data and information; training of Lapan personnel in processing and application of space weather data and information; and conduct scientific meetings (workshops, seminars and conferences) to report the scientific results related to the collaboration.



The latest locations of several instruments in SEALION

Lapan also established several international collaborations such as: with IPS (Australia) on the Study on Space Weather, with ICSWSE Kyushu University (Japan) on MAGDAS Geomagnetic Observation and Data Acquisition, with JAXA (Japan) on the utilization of JEM “Kibo” on ISS and also public outreach. Lapan also conducted International events such as ISWI and MAGDAS School for space science on September 2012, and recently the IAU regular agenda, ISYA School on August-September 2013.

Moreover, to be the center of information for space weather in national level, and to have more active contributions in international level, Lapan plan to enhance research and development on application of solar physics, space environment, geo and space magnetic science, and ionosphere science, especially related to satellite orbit, space telecommunication, navigation based on satellite system; to improve integrated monitoring of space debris, space weather, as well as solar activity, geomagnetic and ionosphere variation; to enhance database, data acquisition, data network, and real time observation system; to improve dissemination and services to the public; and to provide capacity building for Lapan scientists and engineers. (@Space Sceince Center-Lapan)

The new antenna systems in NICT

Renewal of antenna system to receive real-time solar wind data

Shinichi Watari, NICT

Real-time upstream solar wind data are important data for space weather to estimate the effect on magnetosphere and ionosphere of the Earth in advance. Space Weather and Environment Informatics Laboratory, National Institute of Information and Communications Technology (NICT) in Japan contributes to receive the real-time solar wind data since the lunch of the Advanced Composition Explorer (ACE) mission.

ACE was lunched by the National Aeronautics and Space Administration (NASA) in August, 1997 and has measured solar wind, interplanetary magnetic field, and higher energy particles at the L1 libration point. ACE has a mode broadcasting real-time solar wind data according to the proposal of the National Oceanic and Atmospheric Administration (NOAA). For 24-hour coverage of the real-time data, several ground stations are necessary to receive the data from ACE.

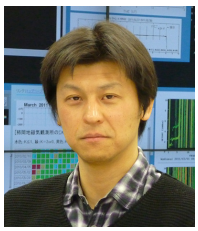
The previous antenna system was built in 1989 in Kashima center, NICT to receive ionospheric observation data from ISIS-I (Canada) and DE-1 (USA). Then the system was moved from Kashima center to Koganei, headquarter of NICT in 1996 to receive real-time solar wind data from ACE. The system became old because it passed approximately 25 years since its production. Deep Space Climate Observatory (DSCOVR) following on mission of ACE is planned to be launched in January, 2015 and it is necessary for us to prepare for data from DSCOVR. We decided to renew the system. The new system completed in March, 2014.

The 11.3 meter antenna system to receive real-time solar wind data from ACE and DSCOVR

The Antenna control and data receiving system

New solar radio spectrograph at Yamagawa, NICT

Yûki Kubo, NICT



Monitoring solar radio bursts is one of the most important activities for space weather forecasting. As the MHz to GHz frequency solar radio bursts can be observed by ground-based observation facilities, a lot of solar observatories around the world have monitored the solar radio bursts from the ground by radio spectrograph. Our solar radio spectrograph called HiRAS installed at Hiraiso solar observatory, NICT has been used for space weather forecasting. However, the HiRAS system has been decrepit due to long operation for over 20 years. We have developed a new solar radio spectrograph as a successor of the HiRAS system since 2013.

The MHz and GHz solar radio bursts are closely related each other through the high-energy electrons accelerated at a solar flare and a coronal shock, wide-frequency range solar radio observation with high time resolution is required to comprehensively understand high-energy phenomena in solar corona. Our new solar radio spectrograph covers from 70 MHz to 9 GHz in frequency, and has high time resolution of 8 milliseconds, so the new spectrograph can be used for not only monitoring solar radio bursts but also investigating the high-energy phenomena in solar corona.

The new spectrograph is installed at Yamagawa radio observation facility, NICT, where is located at the southernmost parts in Kyushu area. Routine operation starts at the spring in 2016 until when the system is in test operation.

The 16 meters in diameter radome. The radome shields a parabolic antenna from typhoon and volcanic ash

The 8 meters in diameter parabolic antenna inside the radome to observe solar radio wave

Editor's notes

Yuko Uchida, Editor of AOSWA LINK

As we are working on "Space Weather Forecast", do you believe there is "Cherry Blossom Forecast" in Japan?

Each year Japan Meteorological Agency announces "Bloom Forecast" informing when cherry blossoms are blooming in each area throughout Japanese Island. Because Japan appears on the map as a vertically long island, the best time for blooming varies depending on the location and weather. So you could watch "Cherry Blossom Forecast" on TV, just like a normal weather forecast .

Though the cherry blossom is an extremely fragile blossom that buds for a very small time, there are cherry trees everywhere throughout Japan and we really love to enjoy its beautiful but fragile moment. During this season, many of Japanese people enjoy viewing bloom by gathering under trees of cherry blossoms to hold parties over lunch and drinks.

Normally the peak occurs around early April . If you have a chance to come to Japan at that time, you can enjoy watching not only cherry blooming but also its forecast.

The cherry blossom in the yard of NICT
(photo by Mr. Imai @NICT)

AOSWA LINK is issued by AOSWA Secretariat

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