

*Issue5, March 2015*

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

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

# AOSWA *Link*

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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@mi.nict.go.jp](mailto:sw-project-office@mi.nict.go.jp)

# KASI's contributions to Space Weather over the past 10 years

**Kyungsuk Cho,**  
Group leader Solar and Space Weather Group,  
Korea Astronomy and Space Science Institute, Korea

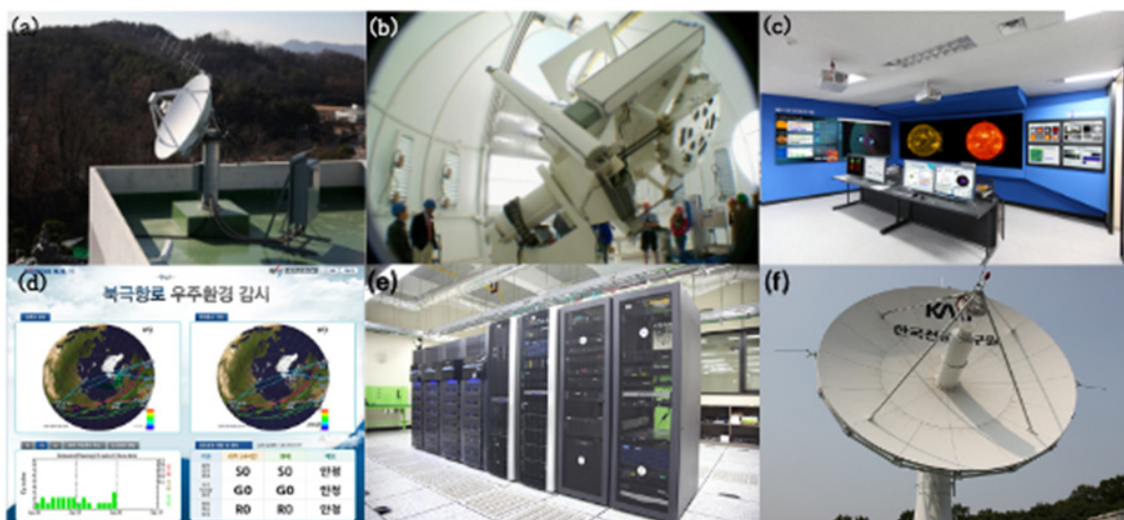


For the past decade, supported by the Korean government, the solar and space weather group of Korea Astronomy and Space Science Institute (KASI) has been researching towards the prevention of hazardous effects on Korean satellites, the stability of wireless telecommunications, and the safety of polar route aviation. So far, we have collaborated with NJIT and NASA, and established a Space Weather Prediction Center, with which we have been developing a more advanced models for space weather forecasting. Alongside that, we have continued our research on solar activities and the Sun-Earth connection.

In 2004, KASI initiated a solar project with NJIT, the New Jersey Institute of Technology. The project, consisting of two parts, involved the development of the Korean Solar Radio Burst Locator, Korea's first solar telescope to be able to locate position of radio bursts (KSRBL, Fig1a), and the construction of 1.6 m New Solar Telescope, the world's largest solar optical telescope (NST, Fig1b). The project was completed in early 2009. The KSRBL and NST have been installed the following year at KASI and the Big Bear Solar Observatory respectively. In 2007, the group started a new space weather project to establish a Korean Space Weather Prediction Center (Fig1c). The scope of the project included the extension of the ground observation system, the construction of the space weather database, and the development of prediction models. Through the project, several space weather products have been developed, and forecasting services have been provided to a satisfied domestic clientele such as Korean Air (Fig1d).

In 2010, KASI turned its main scientific focus to space observation. As a part of the efforts, KASI made an agreement with NASA to set up of the data system to store, use, and disseminate the Solar Dynamic Observatory (SDO) data for the Asian region (Fig 1e). The SDO center has three subsystems; the first is the data transfer system (DTS) to transfer SDO data from Stanford University to KASI via the 10 Gbps GLORIAD network. The second is the data archive system (DAS) to archive and manage JP2 data (30 TB since 2010, Sep.) and Fits data (800 TB since 2012, March) of SDO, which was designed in consideration of the compatibility and scalability of the system so that we can extend its capacity and performance at any time by adding more storage and cluster gateway, respectively. We hope that we will be able to provide free and unfettered access to the SDO for the AOSWA community after developing of various applications for data quarry and analysis for space weather. KASI built a 7-meter parabolic antenna in 2012 to receive space weather broadcast data from the Van Allen Probes (VAP) mission (Fig 1f). KASI utilizes the VAP real time data to forecast space weather, protecting national space assets from severe space environment.

KASI pursues international collaborations in hopes of developing the sciences, services, and technologies of space weather. We believe, based on our experiences over the past 10 years, that we may contribute to the future advances of AOSWA.



KASI's instruments for space weather research and forecast

# An Introduction to ANGKASA, UKM

Nurul Hajjah Hair & Mardina Abdullah  
Space Science Centre (ANGKASA),  
Institute of Climate Change, Universiti Kebangsaan Malaysia  
Malaysia.

## History

Space Science Centre (ANGKASA) or previously known as the Institute of Space Science (ANGKASA) was established on 1<sup>st</sup> August 2003. On 16<sup>th</sup> December 2013, ANGKASA was merged with 3 other entities, namely the Institute of Climate Change Research (IKP), Earth Observation Centre (EOC) and Research Centre for Tropical Climate Change System (IKLIM) and was then nestled under the Institute of Climate Change (IPI), Universiti Kebangsaan Malaysia (UKM).

ANGKASA was founded as a multidisciplinary research centre, conducting teaching at the postgraduate level and research in the field of space science, space technology, space technology applications and space governance. Our missions are to develop capacity for space research and industry, to develop space science and technology for peaceful applications, to promote the importance of space science for national development, and to support the national space programs.

## Postgraduate Programs & Research

On 4<sup>th</sup> October 2010, Malaysia's Department of Higher Education approved the master's and doctorate programs in ANGKASA UKM. Currently, the programs offered are M. Sc. (Space Science), M. Sc. (Astronautic), M. Sc. (Space Management and Policy), Ph. D. (Space Science), Ph. D. (Astronautic), and Ph. D. (Space Management and Policy). However, ANGKASA has only been producing students registered under its M. Sc. (Space Science) program up until now. Nevertheless, there are also students registered under the Faculty of Engineering and Built Environment (FKAB)

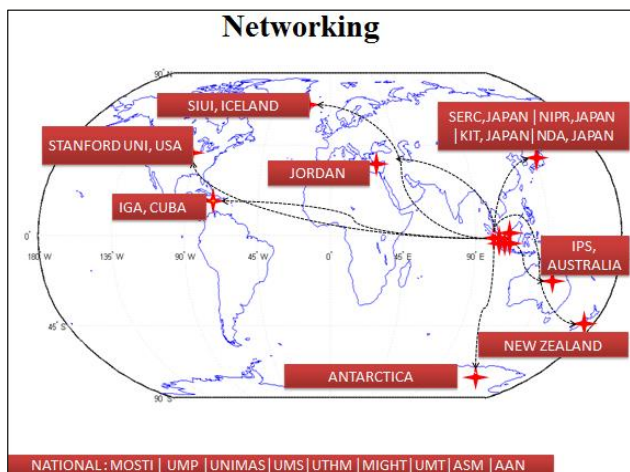
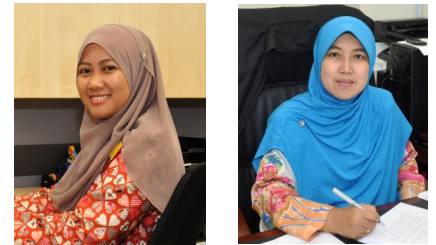


Figure 1: Research network linkage of ANGKASA UKM



doing multidisciplinary research related to Space Science and Technology.

ANGKASA has also been actively involved in the setting up of an international network of collaboration to further its research agenda in space science. ANGKASA has a lot of experience in working with various other research and industrial collaborators through networking as illustrated in Figure 1.

Its research network comprises of studies in the fields of the upper and lower atmospheric layers, climate change, meteorology, solar radiation impact on the Earth's atmosphere (space weather), radio signal propagation and the related space engineering aspects such as antenna communication and satellite technology.

UKM has also been involved in several microgravity experiments conducted at the International Space Station (ISS) in conjunction with Malaysia's success in sending her first astronaut into space in 2007. These experiments and associated outreach activities were conducted by researchers from UKM's Medical Molecular Biology Institute (UMBI), Faculty of Science and Technology, and Faculty of Education. It is also worth noting that the first Malaysian Astronaut, Dato' Dr. Sheikh Muzaffar is also a Principal Research Fellow of ANGKASA, UKM. Additionally, in conjunction with the UKM In Space program on 20<sup>th</sup> October 2014, we had successfully hosted a research discussion on future space research with an Astronaut from Japan, Chiaki Mukai and representative from Japan Aerospace Exploration Agency (JAXA).



Figure 2: Research discussion on future space research with Chiaki Mukai and representative from JAXA.

## Facilities

ANGKASA is committed in providing facilities and research equipment that are conducive and supportive of teaching and learning activities. Thus, all staff, academicians, and students are provided with workplace, laboratories, general function room, meeting room and discussion areas which are located at the Research Complex in UKM, Bangi. These facilities come complete with research equipment such as Radio Telescope, Ground Station, Network Analyzer, GNSS Ionospheric Scintillation and TEC Monitor (GISTM), Very Low Frequency (VLF) Receiver, Anechoic Chamber, Equinox Telescope and many others. Additionally, ANGKASA has also installed research equipment outside the main campus such as the Trimble NetR8 with Zephyr Geodetic 2 Antenna in Universiti Malaysia Sabah, and the Magnetic Data Acquisition System (MAGDAS), and GNSS Ionospheric Scintillation and TEC Monitor (GISTM) both installed in Langkawi. Meanwhile, we have also installed the Trimble GPS Receiver in Scott Base, Antarctica, and the GPS Leica System in Husafell.



Figure 3: Research Facilities of ANGKASA

## Community Activities

In the effort to promote space research and technologies, UKM has been actively engaged in organizing a wide-range of conferences, seminars and workshops such as the biennial conference, International Conference on Space Science & Communications (ICONSPACE), National Astronaut Public Lecture, ASE Planetary Congress, UKM in Space, United Nation Human Space Technology Expert Meeting, ANGKASA Research Seminar (SPSA), 2013 Space Weather Innovation Competition and many others. Promotional events such as these are ex-

pected to stimulate the interests of more young talents in the field of science and technology, particularly in the rapidly advancing scientific fields such as space science, where these programs are not only organised for the university community but also suitable for the younger generation from outside the university.



Figure 4: 2011 United Nation Human Space Technology Expert Meeting



Figure 5: Presentation given by participants of the 2013 Space Weather Innovation Competition

ANGKASA was born out of a vision to be a leader in space science and technology research in Malaysia. We believe with the strong support from everyone, ANGKASA will be able to continuously contribute to the development of science and technology, not only academically through its successful graduates, but also through its scientific research and remarkable research publications. These efforts are in line with the university's mission that practices the 5P culture to be the "Guardian of the Nation" in keeping with its role as the National University.

For more information on research, postgraduate programs offered and upcoming international conference ICONSPACE 2015, kindly visit

<http://www.ukm.my/angkasa>.

# Internship Trainee Program at NICT

## Overview

NICT accepts competent young researchers and university students from overseas as internship trainee for the purpose of promoting the collaborative researches and establishing the international research networks with their affiliated research organizations and universities.

As a general rule, the candidate has to be recommended by his/her supervisor in the research organization or university.

## Training Period

The training period has to be more than one month but not exceeding one year.

## Experience in Space Weather Environment lab, NICT

**Suhaila M Buhari**

**Universiti Kebangsaan Malaysia , Malaysia**

I am currently enrolled in a PhD program in Space Science at Universiti Kebangsaan Malaysia. I am working in Space Science Centre, Institute of Climate Change under the supervision of Prof. Ir. Dr. Mardina Abdullah. In our group, we are focusing on the ionospheric research using various instruments such as GNSS Ionospheric Scintillation and TEC Monitor (GISTM), very low frequency (VLF), GPS receivers and others. My personal research interest is the observation of ionospheric irregularities using high-density GPS networks in Southeast Asia (SEA). The GPS networks are the Malaysia Real-Time Kinematics GNSS Network (MyRTKnet), the Sumatran GPS Array (SuGAr), and the International GNSS Service (IGS) networks. The high-density GPS receivers in SEA have an advantage of providing time continuous representation of the ionospheric irregularities with high spatial resolution and broad geographical coverage.

While a normal PhD student would spend the whole study period in their universities, I was lucky to have an opportunity to live and work in Japan. Therefore, I would like to thank NICT for the Internship Research Fellowship Award that allows me to do part of my research in Space Environment Informatics Laboratory from 1 April 2014 – 31 March 2015. During my stay in NICT, I have learn how to obtain the spatial structure and temporal evolution of ionospheric irregularities using GPS data with the help of researchers in NICT and Dr. Yuichi Otsuka from Nagoya University. I am using NICT cloud computing named Science Cloud to derive total electron content (TEC) maps from the GPS data. The Science Cloud environment allows me to use the IDL license and large data storage with high speed network. The first observation of equatorial plasma bubbles (EPBs)



Research discussion with an instructor, Dr. Tsugawa

using the high-density GPS receivers in Southeast Asia (SEA) was successfully computed. The result was published in Buhari et al., (2014), Continuous generation and two-dimensional structure of equatorial plasma bubbles observed by high-density GPS receivers in Southeast Asia, J. Geophys. Res. Space Physics, 119, doi:10.1002/2014JA020433.

The internship began with the feelings of low self-esteem as I am the only student in the laboratory. However, working in NICT was an incredible learning process and I gained an overwhelming knowledge about the ionospheric research. I was also taught about the solar activity and had an opportunity to attend the space weather forecast meeting that became my daily routine in NICT. I have learned a lot about solar activity variability and how does it affect the ionospheric irregularities. I became far more aware of the ionospheric surroundings and the appropriate parameters to examine the ionospheric irregularities. Now, I am confident about my data and

the direction of my future research.

Furthermore, during my internship program in NICT, I was able to attend an international conferences such as the Japan Geoscience Union 2014 and the Society of Geomagnetism and Earth, Planetary and Space Sciences Fall Meeting 2014 which were held in Yokohama and Matsumoto, Japan. Besides, I also attended the conferences abroad such as the URSI General Assembly and Scientific Symposium 2014 in Beijing and the AGU Fall Meeting 2014 in San Francisco. During the meeting, I had a chance to interact with many researchers who are doing the ionospheric research from all over the world. Although I just a beginner in this field, I gained a lot of knowledge from the discussions that may came from the very recent studies.

As I am going to leave Japan soon, I want to thank everyone in NICT for the most memorable and enjoyable research experiences. I am extremely grateful for the opportunities to work with such amazing and hardworking researchers and co-workers in Japan. The knowledge and experience that I received has been so much more than I expected. For those who have helped me, I will be forever indebted to you. May God will repay everyone of you with many blessings ahead. Thanks everyone!!

I hope NICT will keep on supporting and promoting the international collaboration on space weather forecast for operational and research in Asia-Oceania region. I look forward to contributing to the NICT's effort as best I could.

# United Nations / Japan Workshop on Space Weather “Science and Data Products from ISWI Instruments” March 2 - 6 2015, The Luigans Spa & Resort Fukuoka, Japan

Hosted by the  
International Center for Space Weather Science and Education of Kyushu University (ICSWSE),  
on behalf of the Government of Japan

Co-sponsored by the  
Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT),  
Ministry of Foreign Affairs of Japan (MOFA),  
Japan Society for the Promotion of Science (JSPS),  
National Institute of Information and Communications Technology (NICT),  
International Research Institute of Disaster Science of Tohoku University (IRIDeS),  
Solar-Terrestrial Environment Laboratory of Nagoya University (STEL),  
International Space Weather Initiative Program (ISWI)  
Science Committee on Solar-Terrestrial Physics (SCOSTEP),  
National Aeronautics and Space Administration, (NASA)  
Fukuoka Convention and visitors Bureau (FCVB)

The objective of this workshop is to provide a global forum in which participants discuss how to encourage capacity building, global observation, and science/education on space weather --- by building on the achievements of the International Space Weather Initiative (ISWI). Therefore, this workshop is similar in format to the United Nations ISWI workshops that were conducted in 2010 (Cairo), 2011 (Abuja), and 2012 (Quito). Concrete objectives of the 2015 workshop in Japan will be to: (a) Assess the status of space weather instruments (in-situ, space-borne), data access, availability and collection and modeling efforts to advance space weather research improve space weather forecasting. (b) Support the continued the deployment of ground-based ISWI instrument arrays and data exploitation. (c) Continue efforts in space weather education, especially also for students from developing nations. IHY and ISWI have contributed to significant progress in the development of space science schools that encourage students to consider a career in space science. (d) Review international cooperation activities and the role of international cooperation in addressing space weather-related issues, such as possible further cooperation towards a truly global space-weather monitoring capabilities (e) Identify opportunities for international cooperation in the standardization, sharing and wider, timely use of data, also for operational purposes; data interoperability and formats will be considered, as those are important aspects for any standardization.

The observations and recommendations emanating from the Workshop will be disseminated in form of report of the Committee on the Peaceful Uses of Outer Space to the United Nations General Assembly.

The United Nations Office for Outer Space Affairs (UNOOSA) will select through a standard screening process a number of participants. Detailed information of workshop is at this website:

<http://www.unoosa.org/oosa/en/SAP/act2015/japan/index.html>.

The venue of this workshop will be at the beautiful Luigans Spa and Resort located across Hakata Bay from Fukuoka City. The month of March is a pleasant time of the year – cold winter is over but uncomfortable summer has not yet started.

The host institution of ICSWSE was able to secure the rights to host his workshop because of its extremely active role in IHY and ISWI. In addition, the primary activity of IHY and ISWI is the global deployment of ground-based instrumentation for the advancement of space weather research. In this regard, ICSWSE is a major contributor to IHY/ISWI with its MAGDAS network of 72 real time magnetometers installed around the globe. Geomagnetic data from these sites flow into ICSWSE on a continuous basis via the Internet.



## Profile of Author

Dr. Akimasa Yoshikawa  
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**Domestic Collaborative Symposia**  
**supported by the Solar-Terrestrial Environment Laboratory,**  
**Nagoya University, Japan**  
**March 2-4, 2015, The Luigans Spa & Resort Fukuoka, Japan**

Kyushu University hosts three domestic Collaborative Symposium supported by the Solar-Terrestrial Environment Laboratory (STEL) of Nagoya University, Japan every year in Fukuoka. (Japanese language is mainly used throughout this symposium except Space Weather Event Report, but presentations in English are also welcome.)

**Symposium on Electromagnetospheric Physics , March 2-3 , 2015**

This symposium is meant for researchers who are studying Terrestrial electromagnetic phenomena in the global framework. All manners of doing this type of research (such as observations, data analyses, simulations, theoretical studies and methodologies) are covered by this symposium. Scientific aspects and future plans of this type of research are discussed to promote this research direction in Japan. This symposium also welcome presentations on the solar phenomena and solar-wind phenomena, understanding of which is important for understanding the above-stated Terrestrial phenomena in the context of the space weather. This symposium has been held for seven years in a row. It has been hosted by Kyushu University, because many researchers in Kyushu university are conducting global observations and simulations.

Conveners: Hideaki Kawano (ICSWSE, Kyushu University) and Kazuo Shiokawa (STEL, Nagoya University)

**Workshop on Regional Network for Space Weather Observation and Education,**  
**March 2-3 , 2015**

Conveners: Manabu Shinohara (Kagoshima National College of Technology)

**Space Weather Event Report (STE Events Report and Analysis Workshop),**  
**March 5 , 2015**

Space Weather Event Report meeting (STE Events Report and Analysis Workshop) is promoting collaborative analysis of observation and simulation data to study latest space weather events for understanding solar-terrestrial connection. This activity has continued for several decades in Japan. Two event report meetings are held in a year in NICT, Tokyo and Kyushu University, Fukuoka. The most recent events that occur in the first half of the year and the latter half of the year are reviewed in each meeting. Latest three or four scientifically interesting events are selected and are studied in the meeting. One workshop is held for analysis of a specific topic such as extreme space weather events.



Space Weather Event Report meeting

Conveners: Shinichi Watari (NICT), Nozomu Nishitani (STEL, Nagoya University), Shuji Abe (ICSWSE, Kyushu University), and Yusuke Ebihara (RISH, Kyoto University)

## Editor's notes

*Yuko Uchida, Editor of AOSWA LINK*

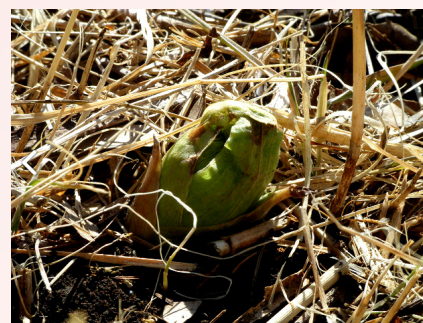
It is said that February is the coldest month in Japan and sometimes we have snow, but it's true at the same time we can feel the sign of spring .

After the Risshun; “立春” in Japanese and Chinese, “입춘” in Korean, “Lập xuân” in Vietnamese which means the start of spring in solar term, a calendar of twenty-four periods and climate to matches a particular astronomical event or signifies some natural phenomenon, we find the small emerging buds of trees and brightness of the sun, even though the air temperature is still cold. Those sign remind me the beautiful and enjoyable spring blooming and make me happy.

AOSWA-3 is coming soon and this would be the one of the best time to visit to Japan, especially Fukuoka. Because the destination of Excursion “Dazaifu Tenmangu” is the one of most popular sight seeing place well known for “plum blossoms ” and now is the best season. I would like the attendee to enjoy the various sign of spring in Japan. I look forward to seeing you in Fukuoka!



Buds of Japanese apricot  
in Risshun :Feb 4



Butterbur Sprout from the ground  
in Usui :Feb 19

All Photos taken in the NICT yard  
by Mr. Y Imai

## AOSWA LINK is issued by AOSWA Secretariat

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