

# **WORLD METEOROLOGICAL ORGANIZATION**

## **REGIONAL ASSOCIATION II (ASIA)**

**THE FOURTH MEETING OF THE COORDINATING GROUP OF THE WMO REGIONAL ASSOCIATION II (RA II) WIGOS PROJECT TO DEVELOP SUPPORT FOR NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES (NMHSs) IN SATELLITE DATA, PRODUCTS AND TRAINING**

SONGDO(INCHEON), KOREA, 28 OCTOBER 2016



**FINAL REPORT**



### **Participants in the fourth meeting of the Coordinating Group**

(Back row) Raju Dhar Pradhananga, Hilal Salim Al-Hajri, Mikael Rattenborg, Sergey Klimov, Bodo Zeschke, Mazahir Hussain, Karl Loots, Kazumi Kamide, Sosten Sos, Asmadi Abdul Wahab, Murray Kwapena, Nguyen Manh Linh, Jerry Timothy Gogon, Feng Lu

(Middle row) Hyesook Lee, Amanjol Bulkhai, Ryskeldi Asankhodzhaev, Ali Shareef, So Chi-Kuen, Sinthaly Chanthana, Kesrin Hanprasert, Linda Tonawane, Riris Adriyanto, Tavau Vaaia

(Front row) Agnes Lane, Dohyeong Kim, Stephan Bojinski, Hiroshi Kunimatsu, Jae-Gwang Won, Xiang FANG

## GENERAL SUMMARY

### 1 OPENING

The Fourth Meeting of the Coordinating Group of the WMO Regional Association II (Asia) WIGOS Project to develop support for National Meteorological and Hydrological Services (NMHSs) in Satellite Data, Products, and Training was held at Hotel Sheraton in Songdo, Korea on 28 October 2016. The list of participants is attached in Annex I.

#### 1.1 Welcome address

Dr. Jae-Gwang Won on behalf of Dr. Hoon Park, Director-General, National Meteorological Satellite Center of KMA welcomed all participants. He highlighted that not only in RA II but also in RA V, this WIGOS project will be an opportunity to share meteorological satellite data to meet each countries' needs of weather forecasting, climate change detection and early warning system on natural disasters by strengthening meteorological satellite network in the Asia-Oceania region. He concluded by wishing a most fruitful and rewarding meeting.

#### 1.2 Opening address

On behalf of WMO, Dr. Stephan Bojinski welcomed all participants in the fourth meeting and expressed his appreciation to KMA for hosting the meeting and to KMA and JMA, co-coordinators of the project, for organizing this meeting. He emphasized the importance of the meeting for identifying and documenting user requirements, and to provide an interface between users and satellite operators. Dr. Stephan Bojinski also stressed that this meeting is important in the sense that representatives from both RA II and RA V participate. He concluded his address by wishing a fruitful discussion and successful meeting.

#### 1.3 Adoption of the agenda

The meeting adopted the agenda and the work programme as given in Annex II. The participants agreed the arrangement for the meeting. RA II WIGOS project website is now under operation by JMA. All documents and presentations submitted for the meeting will be posted on the project website:

[http://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/ra2wigosproject-intro\\_en\\_jma.html](http://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/ra2wigosproject-intro_en_jma.html)

### 2 STATUS OF PROJECT

#### 2.1 Accomplishment, current status and work plan of the Project

Dr. Dohyeong Kim, one of the co-chairs of the Coordination Group, introduced the accomplishments in the first to fourth phases of RA II Pilot Project (Sep. 2009 – Aug. 2013);

1. Quarterly newsletters for RA II Members
2. Establishment of the RA II Pilot Project Webpage on the WMO Space Programme

(WMOSP) website (hosted by WMOSP)

3. Establishment of the Portal Site for accessing satellite imagery, data and products as well as training on the Webpage
4. RA II Pilot Project questionnaire survey conducted to understand the needs of satellite data users in RA II with the newly introduced web-based questionnaire system
5. Operating on-site “Training Program” of satellite data processing, utilization and application as part of VLab.

He summarized progress of the RA II WIGOS Project since Sep. 2013 as follows:

1. Quarterly Newsletters
  - Newsletters have been issued almost quarterly since September 2009
2. Coordinating Group Meetings
  - The 1<sup>st</sup> meeting in Tokyo, Japan, 21-23 February 2011
  - The 2<sup>nd</sup> meeting in Jeju, Korea, 8 October 2012
  - The 3<sup>rd</sup> meeting in Tokyo, Japan, 14 November 2015
3. Progress and Plan of the RA II WIGOS Project
  - RA II WIGOS Project webpage was operated by JMA
4. Convening the series of Asia/Oceania Meteorological Satellite Users' Conference
  - 4th conference, held in Melbourne, Australia in October 2013
  - 5th conference, held in Shanghai, China in October 2014
  - 6th conference, held in Tokyo, Japan in November 2015
  - 7<sup>th</sup> conference, held in Songdo (Incheon), Korea in October 2016
5. Future plan
  - Supportive activities for preparation of satellite data users to the new generation of geostationary meteorological satellites
  - 8<sup>th</sup> Asia/Oceania Meteorological Satellite Users' Conference will be held in Vladivostok, Russia in 2017 (hosted by ROSHYDROMET)
  - Issuance of quarterly newsletters is also continued

He concluded his presentation leaving “2017-2020 Implementation Plan” to be discussed in session 4.2.

## 2.2 Information on relevant activities

Ms. Agnes Lane, Australian Bureau of Meteorology (AuBoM), briefed the detailed activities of the RA V Task Team on Satellite Utilization, including a plan for the distribution of a questionnaire to identify user requirements in relation to satellite data.

## 2.3 WMO Space Programme update

Dr. Stephan Bojinski delivered a presentation on WMO Space Programme Update focused on input to RA II Satellite User Mechanism and Capacity Building. WMO Space Programme

is divided into 4 categories, as follows:

1. Observations
  - Coordinate satellite observing systems, orbits, instruments for WIGOS
  - Develop the Architecture for Climate Monitoring from Space
2. Products
  - Set standards on quality and consistency of satellite-based products
3. Data Dissemination and Access
  - Coordinate rapid, integrated global dissemination of satellite data, consistent with WIS
4. Training and Awareness
  - Promote readiness of members to new generation satellites (2015-2020)
  - Maintain resources and regional project; provide advice and guidance

WMO Space Programme 2016 Highlights are ;

- The release of Vision of WIGOS Space in 2040 – Draft v1.0
- OSCAR/Space updates (<http://oscar.wmo.int/space>)
- Preparation for new satellite generations
- Satellite Data Dissemination Strategy : Guide to DBNet completed
- Satellite Data Dissemination Strategy : Metadata standards for WIGOS and WIS developed
- SCOPE mechanisms
- Regional groups for satellite data requirements
- Space Weather : 4 year plan of action approved in Executive Council
- Staff changes
  - ✓ Toshiyuki Kurino new Chief of Space-Based Observing Systems Division (replacing Jérôme Lafeuille)
  - ✓ Wenjian Zhang promoted to Assistant Secretary-General of WMO

He also mentioned the efforts for enhancing satellite data utilization as follows:

1. Regional user mechanism
2. AOMSUC Memorandum (June 2016)
3. Questionnaire on user of new-generation satellite data

Also, as an example for successful identification of user requirements, he described RA III/IV activities and in particular a table produced by the WMO Coordination Group on Satellite Data Requirements for Region III and IV with a prioritized list of satellite datasets and description of provider, update cycle, distribution mechanism, etc. The Group also identified satellite-related reception, distribution and visualization tools, and related training needs. The consolidated set of Regional satellite user requirements has led to a very effective dialogue with the satellite operator NOAA in making these datasets available to the Region. He suggested that a similar approach should be pursued in RA II (and RA V), and information provided in Annex III is an excellent start. He also summarized results from the WMO 2016 survey on the use of satellite data.

He concluded his presentation introducing WMO tool of improving user knowledge of

available data, tools and resources and RA II WIGOS Project Access Guide is available through WMO website.

## 2.4 Review of AOMSUC-7 results and Country Report

Dr. Dohyeong Kim, one of the meeting co-chairs, reviewed the AOMSUC-7 conference and summarized RA II/RA V country reports based on 3 categories, which are 1) major historical meteorological disaster events, 2) top hazardous weather of concern, 3) satellite data collection and processing capability.

### 2.4.1 AOMSUC-7 Conference

The 7<sup>th</sup> Asia-Oceania Meteorological Satellite Users' Conference was held in conjunction with 2<sup>nd</sup> AMS-Asia and 2<sup>nd</sup> KIMSC from Oct. 24<sup>th</sup> to 27<sup>th</sup> 2016 at Hotel Sheraton, Songdo city. More than 230 scientists, users and satellite operators representing for 37 countries participated in the conference. 7<sup>th</sup> AOMSUC was focused on the areas of:

1. Promoting the importance of satellite observations and highlighting their utility,
2. Advancing satellite remote sensing science by enabling information exchange between scientists from the Asia Oceania region with a focus on regional issues,
3. Providing a means for satellite operators and the user community to interact directly regarding current and future satellite related activities/plans and strengthening the operator response to the requirements of those users,
4. Engaging young scientists entering the fields. These four areas will continue to be a focus of the AOMSUC.

The 7<sup>th</sup> AOMSUC in conjunction with 2<sup>nd</sup> AMS-Asia and 2<sup>nd</sup> KIMSC was organized into 10 sessions<sup>1</sup>.

### 2.4.2 RA II/RA V Country Reports

The major part of country report consists of 1) Major historical meteorological disaster events, 2) Top hazardous weather of concern and 3) satellite data collection and processing capability. Country reports were summarized correspondingly. Those results were summarized in Annex III.

On behalf of WMO, Dr. Stephan Bojinski commented that the summary and update of country reports were a good start and will be very useful for WMO. Mr. Riris Adryanto from BMKG suggested to deliver satellite data using a wider range of channels and higher

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<sup>1</sup> 1) Current and future meteorological satellite programs, 2) Expectations from the next generation satellites and users' broad needs in Asia/Oceania, 3) Preparing for the next generation of meteorological satellites, 4) Program plans, data access and utilization, 5) Atmospheric parameters derived from satellite observations, 6) Applications of satellite data to weather analysis and disaster monitoring, 7) Application of satellite data to data assimilation and NWP, 8) Application of satellite data calibration/validation and climate/environmental monitoring, 9) Land surface and ocean parameters derived from satellite observations, 10) Capacity building and training activities

resolution of data for optimal utilization in some countries including Indonesia. BMKG including other developing countries nevertheless face challenges in the use of satellite data given meteorological satellites are now entering into their next generation. Mr. Bodo Zeschke from AuBoM (BMTTC) agreed that higher resolution data is very important specially for the tropical region like in the use of convective cloud analysis.

On behalf of Maldives Meteorological Service, Mr. Ali Shareef requested CMA data and Dr. Feng Lu from CMA said that CMA will take user requirements for FY-4. Dr. Feng Lu mentioned that it is required to discuss how to disseminate the observation data in coordination with KMA and JMA, given that the data volumes will be substantially larger than from current satellites. JMA announced that Himawari-8 data is being disseminated through a commercial telecommunications satellite.

Some of countries request the case study using satellite data for training purpose.

Dr. Jae-Gwang Won from KMA suggested considering the possibility to make a DVD with training material and sample datasets, because of limited internet accessibility in some countries. Ms. Agnes from AuBoM proposed that a feedback mechanism be included while Mr. Sosten Sos from Federated States of Micronesia agreed DVD training material will be helpful considering the internet speed. Mr. Bodo Zeschke suggested using the existing on-line resources.

Dr. Dohyeong Kim suggested that the user requirements identified by the RA V user group can also be commonly used in RA II.

Dr. Mikael Rattenburg from WMO said that it is very important to consolidate all user requirements and make satellite operators to understand which information is necessary for the user countries.

### **3 USER AND PROVIDER PERSPECTIVES**

#### **3.1 User requirements for satellite data utilization and for the training events during AOMSUC**

##### **3.1.1 Round-table discussion : RA II/RA V user requirements**

(Vietnam) Mr. Nguyen Manh Linh appreciated KMA's efforts in organizing the meeting. NHMS of Vietnam has been using various remote sensing data. More frequent and regular satellite data dissemination will be useful for detecting rapid convective clouds.

(Japan) Mr. Kazumi Kamide suggested continuous training on physical basics of remote sensing, in addition to how to use application such as getting RGB images.

(China) Xiang FANG suggested CMA will provide more observation data for cooperative activities.

(China) Feng Lu suggested for KMA and JMA to consider the share the information about training among the different regions.

(Indonesia) Mr. Riris Adryanto suggested designating the focal point for on-line training.

(Malaysia) Mr. Asmadi Abdul Wahab requested weather service and event-oriented practical training.

(Micronesia) Mr. Sosten Sos appreciated the training course provided by KMA, and this kind of training is continuously provided.

(New Zealand) Mr. Karl Loots mentioned that the Regional Specialized Meteorological Center has the responsibility for the Southeast Pacific for tropical cyclone forecast for aviation. Training on the extreme event is very beneficial. Access to Himawari-8 data has been very useful to analyze the Southeast Pacific area.

(Papua New Guinea) Mr. Murray Kwapena appreciated the organization of conference in coordination with training.

(Vanuatu) Mr. Jerry Timothy Gogon made the request for ocean and marine applications of satellite data to be included in training course.

(Solomon Island) Ms. Linda Tonawane mentioned Solomon Islands Meteorological Service has only been using Himawari-8 data. She mentioned more satellite data is necessary from KMA and CMA.

(Tuvalu) Ms. Tavau Vaaia appreciated the training. She mentioned it was very useful training but it would be much better if more hands on activities were included.

(Uzbekistan) Mr. Sergey Klimov requested to share the information to expand the area of satellite data utilization like in agriculture and hydro-meteorology.

(Thailand) Ms. Kesrin Hanprasert mentioned that satellite data is getting important and in that sense, the training was very beneficial. She will encourage more people from Thailand to participate in this training course.

(Pakistan) Mr. Mazahir Hussain mentioned that the training course on satellite data utilization including Himawari-8 data was very beneficial. PMD doesn't have much experience on the utilization of satellite data. The duration of training course is too short. PMD requested to extend the duration of the training.

(Oman) Mr. Hilal Salim Al-Hajri thanked KMA, JMA and WMO for organizing the meeting with the training.

(Nepal) Mr. Rahu Dhar Pradhanaga explained the status associated with satellite data and he said they do not have much experience. They need the training on satellite data utilization.

(Mongolia) Mr. Amanjol Bulkhbai said the training course was very effective.

(Maldives) Mr. Ali Shareef said two days of training is too short. Ocean area data is more



important to Maldives. Maldives suggested for training session to start after the Conference because some participants missed the training before the Conference due to visa or other issues.

(Laos) Ms. Sinthaly Chanthana explained the status of satellite data receiving and utilization. Laos received the satellite data from KMA, JMA and also through CMAcast. It is very important to receive and access the data, continuously.

(Kyrgyz) Mr. Ryskeldi Asankhodzhaev explained the status of satellite data utilization and application in Kyrgyzstan.

(Hong Kong) Mr. So Chi-Kuen suggested for training to be more focused on how the satellite data to use for weather service.

(Australia) Ms. Agnes Lane mentioned the WMO and RA II surveys on training which are important to identify requirements and training guideline. The participation on the survey will be the guideline for the training in the future.

(EUMETSAT) Dr. Ken Holmlund mentioned that the thematic training was quite successful. Based on the survey, more focused training is likely to be even more useful. He pointed out that we need information from the Group to anticipate for the training and to prepare the test data for the training activities. New instrument characterization needs to be taken into account in the training. Based on the user survey, it would be helpful if satellite operators understand users' needs about the combination of satellite and ground data then we can expand the training area.

Mr. Bodo Zeschke cited the combined case study of Korea and Australia and highlighted it is very important the collaboration between the organization for the case study.

### 3.1.2 An Introduction to Australian VLab Centre of Excellence Training Activities and Training Resources

Mr. Bodo Zeschke gave a short presentation about the monthly Regional Focus Groups meetings as conducted by the Australian VLab Centre of Excellence, and the post-session recordings were presented. Additional training resources pertaining to the National Himawari-8 Training Campaign were shown. The audience was encouraged to explore these resources and to give feedback to the Australian VLab Centre of Excellence Point of Contact.

### 3.1.3 Survey on WMO RA II/RA V Training (2012-2016)

Dr. Hyesook Lee from KMA summarized the results of survey on RA II/RA V training events from 2012 to 2016. A total of 35 trainees including KMA-KOICA training events participated on the survey. KMA-KOICA training event was held from 11<sup>th</sup> Oct. to 1<sup>st</sup> Nov. 2016 and it was jointly held with RA II/RA V training event from 21<sup>st</sup> to 22<sup>nd</sup> Oct. 25 people among them have experience to participate in RA II/RA V training events. Most of participants wanted for speaker to be more interactive and the training session to be more focused on practical and real-time analysis. In supportive terms, more than 68% of participants chose "Interpreting

Satellite Imagery” course as the most useful training course in 2012-2016 training events and “Real time weather exercise/analysis”, “Practical Training on Utilization of Himawari-8/-9”, and “Tropical Storm Analysis” among training courses performed from 2012 to 2016 were followed as 54.3%, 51.4% and 45.7%, respectively. Most of institutes from Asia-Oceania region have used more than 2 satellite data types (or more than 10 at most) and mostly answered that satellite data have been used for “nowcasting”, “tropical storm analysis” and “convective cloud analysis”.

## 3.2 Requirements for Severe Weather Forecasting (SWFDP)

### 3.2.1 Preliminary study using multi-Geo-satellites

Dr. Dohyeong Kim presented a preliminary study on pseudo-rapid scan images using multi-GEO satellites. He introduced channel characteristics, location and observation schedule of GK2A AMI and Himawari-8 AHI, and suggested the possibility of simultaneous use of both satellites focused on typhoon and developing convective clouds. Dr. Kim showed the results of multi-Geo-satellite data using COMS and MTSAT-2 data applying for the case of typhoon and developing convective cloud. For typhoon cases, it showed parallax of around 10-15km, but AMI/AHI is expected to reduce the effect. For the case of developing convective clouds, the use of COMS and MTSAT showed benefits for monitoring detailed developing steps and analysis.

### 3.2.2 SCOPE-Nowcasting

Dr. Stephan Bojinski delivered a presentation on SCOPE-Nowcasting covering its background, benefits, pilots and next steps. The concept of SCOPE-Nowcasting arose from discussion in the 5<sup>th</sup> meeting of the WMO Expert Team on Satellite Utilization and Products (ET-SUP-5). During ET-SUP-7, the criteria of **SCOPE-Nowcasting projects** was outlined as:

1. Use of multi-satellite data
2. Dataset formats can be read by standard tools
3. Concise product documentation
4. Open and easy access
5. Available in near-real time (< 6 h)
6. Availability of training information
7. An official commitment from all agencies involved in the project

The first meeting of the SCOPE-Nowcasting Team in November 2013 was held and four pilot projects were established in the area of 1) RGB composites, 2) Volcanic Ash Products, 3) Blended satellite global precipitation product (GEO+LEO), 4) Dust Monitoring and Prediction Products. Dr. Stephan Bojinski highlighted the achievement of four pilot projects and its next steps:

1. Pilot projects will continue through 2016
2. Formalization of the SCOPE-Nowcasting Steering Group
  - Nominations will be sought from CGMS members
  - Expert members will also be required

- First meeting in early 2017
3. Decision on pre-operational phase from 2017 onward  
He also invited participants to make recommendations regarding additional pilot project as per the criteria of **SCOPE Nowcasting projects**.

### 3.2.3 SWFDP-CA current status part in Kyrgyzstan

Mr. Ryskeldi Asankhodzhaev from Kyrgyzhydromet provided an overview of the current status of Severe Weather Forecasting Demonstration Project for Central Asia (SWFDP-CA). He explained the Central Asia SWFDP is targeted at strengthening the ability of the Central Asia NHMSs to forecast severe weather events, to improve the reliability and lead-time of alerts about high-impact hydrometeorological events and to strengthen the interaction of the NMHSs with disaster management and civil protection agencies, local communities and media, thereby improving public service delivery. He continued to explain the cascaded flow of Numerical Weather Prediction (NWP) products, which is the basis of SWFDP projects. NWP products from Global NWP centers are provided to the Regional Centers for Limited Area Model (LAM) processing and interpretation, which are, in turn, form the basis upon which to issue early warnings. He described the SWFDP-CA unified web-site for the whole region including links to NWP centers websites, synoptic maps of the Central Asia region, weather satellite images, interactive ALARM CA system, and data archive. Mr. Ryskeldi Asankhodzhaev summarized the activities of SWFDP-CA. He cited the recommended LAM products for the SWFDP project as at 2-meter height; wind speed at 10-meter height; maximum and minimum temperatures; gust; surface pressure; cloudiness at mid and low levels; convective cloud base height; snow depth and snow water equivalent; new snow depth for 6 and 24 hours; 925, 850, 700 and 500 hPa levels weather parameters; vertical wind velocities at 850, 700 and 500 hPa levels; instability indices such as K-index, CAPE, CIN, Showalter index, and Skew-t Log-p diagram.

Mr. Ryskeldi Asankhodzhaev continued to give the presentation on Meteorological Satellites activities of Kyrgyzhydromet. He introduced the multifunction Meteorological Complex (MMK) "MITRA", which is the system for receipt and transmission of hydro-meteorological information including satellite data. Kyrgyzhydromet has the satellite data receiving system of EUMETCAST and CMACast. Those data are visualized through Kyrgyzhydromet visualization program like GISMETEO and TMETVIS. He stated the utilization of METEOSAT7 data for validation of WRF model simulation results and concluded his presentation showing IT system which delivers the satellite data to forecaster.

### 3.3 Relevant training activities in cooperation with RA II and RA V

Dr. Dohyeong Kim stated KMA's training activities since 2007. KMA has participated in WMO VLab program and contributed to the WMO VLab Technical Support Officer through the WMO Trust Fund from 2012. KMA firstly supported Sri Lanka to build ground and data processing system from 2010 to 2012 and provided the training course of H/W system and S/W algorithm from 2011 to 2012. KMA ran the training program of "Analysis of COMS data"

from 2007 to 2013 and around 20 people from 11-14 countries participated. KMA established a new training course of “Improvement of Meteorological Satellite Data Analysis and Application Capacity” as three year project starting in 2016. He concluded his presentation introducing the contents of training program, which are Korean Meteorological Satellite Program; COMS data processing and products; Satellite imagery interpretation; Application of GEO and LEO satellite data; KMA’s GEO-KOMPSAT-2A satellite; Next generation satellite data processing tools.

## **4 COLLABORATION AND FUTURE PROJECT WORK PLAN**

### **4.1 Collaboration with RA V following the Jakarta Declaration**

#### **4.1.1 A feasibility study on Himawari-8 event-driven rapid-scan**

Dr. Hiroshi Kunimatsu, one of the Group co-chairs, gave the presentation on the feasibility study on Himawari-8 event-driven rapid-scan. AHI on board Himawari-8 has the ability to take “target-area” of observations focused on tropical cyclones and active volcanoes under the responsibility of RSMC Tokyo Typhoon Center and the Tokyo Ash Advisory Center (VAAC Tokyo), respectively. One of the goals of the Jakarta Declaration adopted at the Joint RA II/RA V Workshop on WIGOS for Disaster Risk Reduction in October 2015 is the development of a protocol for NMHSs of countries in the region on requests for event-driven rapid-scan imagery. Accordingly, JMA collaborated with AuBoM to test a request-based cyclone tracking system by “Target Area” observation during high season for cyclones whereas low season for typhoon. The target area designated by AuBoM was successfully observed, and the data obtained were collected by AuBoM on a real-time basis.

Dr. Hiroshi Kunimatsu concluded his presentation that the feasibility study was conducted by JMA and AuBoM in February and March 2016 and the six days of test observation for the target area went as per AuBoM’s expectations but no cyclone occurred within the area of responsibility of AuBoM. Mr. Riris Adryanto from BKMG wanted to know if JMA considered this event-driven rapid-scan as special observation of Himawari-8 even if the region was outside the area of responsibility of JMA. JMA responded that the agency would always give the highest priority to the observation for RSMC Tokyo Typhoon Center and the VAAC Tokyo, but if there would no such phenomena, other natural disaster could be considered as events. Mr. Mikael Rattenborg, based on EUMETSAT’s experiences, pointed out the importance that the satellite operator would define an anticipation period for satellite operators to reconfigure satellite system and to establish operating process, that member countries, based on their forecasts, would make a request to the satellite operator with the anticipation time, and that there should be a dedicated network among member organization. Dr. Jae-Gwang Won emphasized the rationale of this initiative but stressed that countries need to build a new system to process and visualize the rapid scan data and that they need to provide reasons why more frequent data than the regular 10 minutes interval was required.

#### **4.1.2 The future strategy of the RAI WIGOS project**

Dr. Dohyeong Kim delivered a presentation on the outcome from Joint RA II/V Workshop on WIGOS for DRR held in Jakarta, Indonesia from 12 to 14 October 2015. He explained that the Joint RA II/V Workshop aimed at enhancing the exchange of observations across Southeast Asia region and to improve the availability and quality of most relevant observations for DRR such as early warning systems for severe weather events. He reviewed the workshop as representatives from 8 RA II and 6 RA V WMO members reported on their national observing networks and participated in the discussions. The following specific topics presented by 8 invited speakers were discussed:

- Weather forecasting and warnings,
- Radar observations,
- Lightning detection systems,
- Satellite observations,
- GSM (Global System for Mobile communications) attenuation by rain,
- Special talk on the OSCAR tool.

The major outcome of the workshop was the Jakarta declaration and it proposed to develop 2 WIGOS projects across RA II/V, which were 1) Satellite Data project and 2) Radar Data project.

1. Satellite Data project aimed at (1) strengthening the capabilities of all Members to use geostationary satellite images and derived products in support of DRR, (2) developing a protocol for the NMHSs in the project countries to request event-driven rapid-scan imagery for their respective national areas of interest.
2. Radar Data project aimed at (1) improvement of data quality of existing radars, (2) development and expansion of national radar networks, (3) near real time international exchange of radar data, (4) development of sub-regional radar data centres.

He concluded his presentation giving a summary on the Jakarta declaration:

- Recommends:
  - The WMO SG to support the projects with technical assistance within available resources
  - Satellite operators provide the necessary support via CGMS
- Encourages:
  - Satellite operators of the Rep. of Korea, China and Japan to make digital data at the full resolution available to all Members involved in the "Satellite Data project" and to support it in any way they can
  - All participating Members to freely share their radar data products with other project Members, according to the project plan

Dr. Jae-Gwang Won suggested it is important that the RA V satellite activities are coordinated with the RA II WIGOS satellite project. Ms. Agnes Lane pointed out RA V does

not have WIGOS project but she agreed that RA V support the collaboration through the RA V Task Team on Satellite Utilization.

#### 4.2 Work plan 2017-2020

Dr. Jae-Gwang Won suggested that AOMSUC would be included since AOMSUC is already WMO program based on Memorandum during WMO-EC in Geneva, June 2016 (see Annex IV).

Mr. Rattenborg suggested that not only geostationary satellite but all earth measurement satellite requirements from RA II/RA V need to be included when identifying Region-based requirements for satellite datasets.

### 5 SUMMARY OF THE MEETING

Dr. Dohyeong Kim presented the action items in the light of the discussion as follows:

- Based on the **Survey Results of RA II/RA V Training Event**, co-coordinators of RA II WIGOS project and the Chair of the “RA-V Task Team on Satellite Utilization” provide WMO and host country of AOMSUC and training event with the requirement from trainees which can be reflected in the next Conference.  
(Action: JMA, KMA, AuBoM)
- With regard to **Further Study for using multi-GEO-satellites**, co-coordinators would conduct the additional cases of typhoon and rapidly developing thunderstorm to investigate the feasibility using multiple GEO satellites (e.g. COMS, Himawari-8, FY-4) for preparation of next generation imagers over Asia-Oceania region.  
(Action: KMA, JMA, CMA, AuBoM)
- Associated with **Collaboration of RA II/RA V Training**, co-coordinators of the existing “RA II WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training” and the chair of the “RA-V Task Team on Satellite Utilization” will attend at the respective meeting on a reciprocal basis, and collaborate one another for developing the possible integration of two Projects in future.  
(Action: JMA, KMA, AuBoM)
- With regard to **Implementation Plan (2017-2020)**, the co-coordinators of the “RA II WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training” submit the WIGOS Implementation Plan (2017-2020) reflecting feedback from this meeting.  
(Action: JMA, KMA)

- Development of a protocol for event-driven rapid scanning should be done starting in 2017 within the RA II WIGOS Project, in collaboration with the RA V Task Team on Satellite Utilization, and as a contribution to the WMO SCOPE-Nowcasting initiative (pilot project 1)

## **6 CLOSING**

Dr. Stephan Bojinski thanked the co-coordinators, Mr. Dohyeong Kim and Dr. Hiroshi Kunimatsu for organizing the meeting and he also expressed his appreciation to KMA staff for their hard work on organizing the 7<sup>th</sup> Asia/Oceania Meteorological Satellite Users' Conference. The 4<sup>th</sup> Coordinating Group Meeting for Regional Association II (RA II) WIGOS Project to Develop Support for National Meteorological and Hydrological Services (NMHSs) in Satellite Data, Products and Training was closed at 1600 on Friday, 28 October 2016.

**THE 4<sup>th</sup> MEETING OF THE COORDINATING GROUP OF THE RA II WIGOS PROJECT TO  
DEVELOP SUPPORT FOR NMHSS IN SATELLITE DATA, PRODUCTS AND TRAINING  
(Songdo, Republic of Korea, 28 October 2016)**

**List of Participants**

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## ANNEX I

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**ANNEX I**

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**THE 4<sup>th</sup> MEETING OF THE COORDINATING GROUP OF THE RA II WIGOS PROJECT TO  
DEVELOP SUPPORT FOR NMHSS IN SATELLITE DATA, PRODUCTS AND TRAINING  
(Songdo, Republic of Korea, 28 October 2016)**

**AGENDA**

**1. OPENING**

- 09:00~09:10
- 1.1 Welcome Address
  - 1.2 Opening address (WMO)
  - 1.3 Adoption of the agenda

**2. STATUS OF PROJECT**

- 2.1 Accomplishments, current status and work plan of the Project
- 09:10~10:40
- 2.2 Information on relevant activities
  - 2.3 WMO Space Programme update
  - 2.4 Review of AOMSUC-7 results and Country Reports

10:40~11:00 Coffee Break

**3. USER AND PROVIDER PERSPECTIVES**

- 3.1 User requirements for satellite data utilization, and for the training events during AOMSUC
- 11:00~12:00
- 3.2 Requirements for Severe Weather Forecasting (SWFDP)
    - ✓ Preliminary study of using multi-geo-satellites
    - ✓ SCOPE-Nowcasting
    - ✓ SWFDP-CA current status part in Kyrgyzstan
  - 3.3 Relevant training activities in cooperation with RA II and RA V

12:00~13:30 Lunch Break

**4. COLLABORATION AND FUTURE PROJECT WORK PLAN**

- 4.1 Collaboration with RA-V following the Jakarta Declaration”
  - a) A feasibility study on Himawari-8 event-driven rapid-scan
  - b) The future strategy of the RAI WIGOS project
- 4.2 Work plan 2017-2020

14:20~14:30 **5. SUMMARY OF THE MEETING**

14:30~ **6. CLOSING**

**THE 4<sup>th</sup> MEETING OF THE COORDINATING GROUP OF THE RA II WIGOS PROJECT TO  
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**RA II/RA V COUNTRY REPORT**

1. Major Historical Met. Disaster Events : RA II/RA V

Region	Nation	Meteorological Disaster	
RA II	Hong-Kong, China	<ul style="list-style-type: none"> <li>- Typhoon and storm surge</li> <li>- Flooding and landslide due to severe thunderstorms and rainstorm</li> </ul>	
	Sultanate of Oman	<ul style="list-style-type: none"> <li>- Tropical Cyclone</li> <li>- Flash Flood</li> </ul>	<ul style="list-style-type: none"> <li>- Tsunami</li> <li>- Dust Storm</li> </ul>
	Lao PDR	<ul style="list-style-type: none"> <li>- Local Storm (Whirlwind)</li> <li>- Drought</li> </ul>	<ul style="list-style-type: none"> <li>- Flood/Local Heavy Rain</li> <li>- Typhoon/Hail</li> <li>- Landslide/Earthquake</li> </ul>
	Vietnam	<ul style="list-style-type: none"> <li>- Rain Season</li> <li>- Typhoon</li> </ul>	<ul style="list-style-type: none"> <li>- Flash flood</li> <li>- Thunderstorm</li> </ul>
	Maldives	<ul style="list-style-type: none"> <li>- Thunderstorm/Lightening</li> <li>- Heavy Rain and Flood</li> <li>- Strong Winds (Gusts, Funnel Cloud, Water Spouts)</li> </ul>	<ul style="list-style-type: none"> <li>- Tidal and Swell Waves</li> <li>- Tropical Cyclones</li> </ul>
	Pakistan	<ul style="list-style-type: none"> <li>- Monsoon</li> <li>- Flood</li> </ul>	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Cyclone</li> </ul>
RA V	Federated States of Micronesia	<ul style="list-style-type: none"> <li>- Typhoon</li> <li>- Landslide</li> </ul>	
	Indonesia	<ul style="list-style-type: none"> <li>- Floods</li> <li>- Landslide</li> </ul>	<ul style="list-style-type: none"> <li>- Fires/Wildfires</li> <li>- Drought</li> </ul>
	Solomon Islands	<ul style="list-style-type: none"> <li>- Tropical Cyclone</li> <li>- Flash flood</li> </ul>	
	Malaysia	<ul style="list-style-type: none"> <li>- Flash flood</li> <li>- Monsoonal floods</li> </ul>	

2. Network of Observation

Nation	Observation Station
Hong-Kong, China	<ul style="list-style-type: none"> <li>- Surface stations, Upper-air, Remote sensing, etc.</li> <li>- Doppler Weather Radar (C-band, S-band, X-band)</li> </ul>

Sultanate of Oman	- Tsunami Early warning system	- 20 seismic stations - 20 GPS station - 10 sea level height and temperature - 12 wave Radars
	- Tropical Cyclone Early warning system	- 71 weather stations - 5 weather radar - Access to the satellite image - NWP Modeling
	- Flash Flood	- Working in Flash Flood Guidance model (FFG)
Lao PDR	<ul style="list-style-type: none"> <li>- Synergize Version 3.4.0 for Met. Service</li> <li>- NWP products from ECMWF for Severe Weather monitoring and forecasting</li> <li>- Doppler Radar data</li> <li>- Satellite Imageries</li> </ul>	
Vietnam	<ul style="list-style-type: none"> <li>- Weather Radar : Conventional radar and Doppler radar</li> <li>- Upper air Obs./Synoptic obs.</li> <li>- Rain gauges/Hydro/Climate</li> </ul>	
Maldives	<ul style="list-style-type: none"> <li>- 5 meteorological stations manned 24/7. Synoptic, climate, aviation reports done in 5 stations. One of them is categorized for upper-air observation</li> <li>- Rainfall Observation : Accumulated rainfall for 25 hours are collected from 7 rain gauge stations for national use</li> <li>- Meteorological Telecommunication – GTS</li> <li>- Doppler Weather Radar</li> <li>- NWP model</li> <li>- Ocean Observing System</li> </ul>	
Pakistan	<ul style="list-style-type: none"> <li>- Meteorological Observing Stations (more than 150)</li> <li>- Automatic Weather Stations (about 65 stations)</li> <li>- Weather Surveillance Radar Network (4 stations)</li> <li>- QPM Radars (3 stations)</li> <li>- Satellite Ground Receiving Stations (APT, HRPT, DVBS etc.)</li> </ul>	
Federated States of Micronesia	<ul style="list-style-type: none"> <li>- 23 operational observation meteorological stations</li> </ul>	
Indonesia	<ul style="list-style-type: none"> <li>- Surface station</li> <li>- Upper-air, Remote sensing and marine</li> </ul>	
Solomon Islands	<ul style="list-style-type: none"> <li>- Daily and extended weather and marine forecast</li> <li>- Tropical cyclone, flood and Tsunami warnings</li> <li>- Climate data analysis for socio Economic Developments</li> <li>- Seasonal (three month) forecast on rainfall and temperatures</li> <li>- Aeronautical forecast and weather information for aviation</li> </ul>	

- 24/7 weather observations across the country
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### 3. Satellite Data Collection : RA II /RA V

Region	Nation	LEO	GEO
RA II	Hong-Kong, China	- NOAA - MetOp - Aqua/Terra MODIS - NPP	- MTSAT (HRIT) - FY-2G (VISSR) - Himawari-8 (HimawariCast & internet Cloud service)
	Sultanate of Oman	- MetOp-A/-B - NOAA-18/-19 (Direct reception)	- Meteosat-7/-9/-10 (EUMETCAST)
	Lao PDR	-	- Himawari-8 - COMS - FY
	Vietnam	- NOAA (not in use) - FY-1 (not in use)	- MTSAT (not in use) - CMAcast (not in use) - Himawari-8
	Maldives	-	- CMACast (FY-2E & 2D)
	Pakistan	- NOAA-15	- INSAT - FY-2E - Meteosat-7
RA V	Federated States of Micronesia	- NOAA satellites	- Himawari-8 (HimawariCast & internet Cloud service)
	Indonesia	- Aqua/Terra MODIS - NPP	- Himawari-8 - FY-2D/E/F
	Solomon Islands	- NOAA satellites	- Himawari-8
	Tuvalu	- NOAA satellites	- GOES - Himawari-8 (HimawariCast & internet Cloud service)
	Malaysia	- NOAA-18/-19 - Aqua/Terra MODIS - NPP - MetOp-A/-B - FY-3	- Himawari-8 (HimawariCast & internet Cloud service) - FY-2E/-2G/-2F

### 4. Satellite Data Visualization and Processing

Nation	Observation Station
Hong-Kong, China	- Use METEOR program to analyze and display satellite data - 10-level Tropical Cyclone warning signals - 3-level Rainstorm warning signals
Sultanate of Oman	- Data collection : PCWINSAT - Data visualization : PCWINDSAT, Visual Weather
Maldives	- The application software MICAPS to display satellite pictures, surface & upper air data, NWP products and overlay difference products and analysis of various weather phenomena

Pakistan	<ul style="list-style-type: none"> <li>- Scarcity in the ground and upper air observation network</li> <li>- Rapidly changing climate (Global and regional warming)</li> <li>- Prediction of extreme weather events which have increased due to 1) population growth/urbanization, 2) land use change</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>- Weather forecast : <ul style="list-style-type: none"> <li>a) Cloud cover images, b) RGB Images, c) Rainfall Estimation, d) Atmospheric Motion Vector</li> </ul> </li> <li>- Aviation Meteorology (Public &amp; Defense) : <ul style="list-style-type: none"> <li>a) Cloud Cover Images, b) RGB Images</li> </ul> </li> <li>- Marine and Oceanography Activities : <ul style="list-style-type: none"> <li>a) Sea Surface Temperature, b) Chlorophyll Concentration, c) Cloud Cover Images</li> </ul> </li> <li>- Environmental Monitoring : <ul style="list-style-type: none"> <li>a) Hotspot, b) Aerosol, c) Smoke &amp; Haze, d) Volcanic Ash</li> </ul> </li> <li>- Agrometeorology : <ul style="list-style-type: none"> <li>a) Vegetation Index , b) Rainfall Estimation</li> </ul> </li> <li>- Others : a) R&amp;D</li> </ul>

## 5. Needs and Gaps

Nation	Needs and Gaps
Pakistan	<ul style="list-style-type: none"> <li>- Multi-spectral band : Multi-spectral bands, Drought</li> <li>- Rapid scanning : Cyclone</li> <li>- Feature of new generation Geo. Met Satellite <ul style="list-style-type: none"> <li>a) Training in imagery analysis</li> <li>b) Training in the basics of multi-spectral observation</li> </ul> </li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>- Complex terrain/topography of Indonesia region versus distribution of the existing observation systems → representative observation data for all terrain types → impacts to forecast products</li> <li>- Telecommunications infrastructures are varied from region to region → timeliness of real-time data (especially radars) from remote areas to be used for weather diagnostics</li> <li>- Limited in-situ observation at sea and remote areas need to be addressed by the use of remotely sensed data (either surface-radars, or airborne-remote sensing-satellite)</li> <li>- Radar calibration with ground-based observations and QPE from satellite/radar are challenges for the near future</li> </ul>
Vietnam	<ul style="list-style-type: none"> <li>- Lack of observational stations</li> <li>- Radar network not dense enough ; not synchronous ; unknown data format ; no more secondary products</li> </ul>



	<ul style="list-style-type: none"> <li>- Not regional / local data of lightening</li> </ul>
Federated States of Micronesia	<ul style="list-style-type: none"> <li>- Internet accessibility is very low</li> <li>- Optic Fiber capability not yet a reality</li> <li>- Tracking of typhoons on a daily basis by personnel at the working site is a challenge because of technical expertise and technological disadvantages</li> <li>- Insufficient knowledge and skills of staff to meet the challenges</li> </ul>
Tuvalu	<ul style="list-style-type: none"> <li>- Internet connection for downloading satellite images and animation</li> <li>- Power problem of the office: weather observation sites</li> <li>- Coastal inundation modeling</li> <li>- Improved communication and early warning system</li> <li>- More capacity building trainings in satellite meteorology training</li> <li>- Installation of AWS on outer stations</li> <li>- Financial assistance for awareness activities and programs</li> </ul>
Solomon Islands	<ul style="list-style-type: none"> <li>- Internet infrastructure: much rely on the website (internet) for data collection</li> <li>- Higher imager spatial resolution – Our Islands are smaller in sizes</li> <li>- Training – for the understanding images, specific satellite analysis training is necessary</li> <li>- More AWS – more observation station is required in order to weather analysis</li> </ul>

**Draft 2017-2020 Work Plan for the RA II WIGOS Project**

Project Title	RA II WIGOS Project to Develop Support for NMHSs in Satellite Data, Products and Training
Subproject Title	Facilitating the timely provision of satellite-related information by satellite operators to NMHSs in RA II, and capacity building to use satellite images and derived products
Type	Regional Implementation Project (RA II)
Status	Draft Design
Overview	<p>The unique meteorological and geophysical nature of the Asia region is characterized by frequent high-impact phenomena such as typhoons, severe convective weather and volcanic eruptions. The National Meteorological and Hydrological Services (NMHSs) play the essential role in support of Disaster Risk Reduction (DRR) to protect lives and property in this densely populated region.</p> <p>The 14th session of WMO Regional Association II (RA II) in 2008 adopted a resolution to establish a pilot project for the development of support for NMHSs in the areas of satellite data, products and training. At the 15th session of RA II in 2012, it was decided that the pilot project should continue and become the RA II WIGOS Project from 2013 in light of its importance in improving dialogue between satellite providers and users in the Region.</p> <p>This project will include following activities:</p> <ul style="list-style-type: none"> <li>(a) To facilitate the timely provision of satellite-related information by satellite operator to NMHSs in RA II including developing countries via the project web page, newsletters, user's conference, etc., aligning with VLab activities to optimize assistance to NMHSs in RA II and coordinating training activities on use of satellite data/products;</li> <li>(b) To identify requirements and current and planned utilization capabilities of NMHSs in RA II regarding data and products of earth observation satellite including new generation geostationary meteorological satellites in support of their weather services, including forecasts and warnings, providing a gap analysis in which the capabilities are matched against the requirements so as to develop an action plan to close the gap;</li> <li>(c) To strengthen capabilities of NMHSs in RA II to use the routine images and derived products from the earth observation satellite including new generation geostationary meteorological satellites, of Himawari-8/9, FY-4 series and GEO-KOMPSAT-2 satellites by user training and guidance on</li> </ul>

	<p>upgrading processing software/hardware, information and tools;</p> <p>(d) (i) To develop a protocol for NMHSs of the countries in the region to request event-driven rapid scan imagery and (ii) to assist NMHSs to utilize rapid scan data in support of DRR in response to their requests;</p> <p>(e) To continue the issuance of the quarterly newsletters.</p>
Aim(s)	<p>This project assists NMHSs in RA II to make better use of satellite-related information, in collaboration with all relevant satellite operators. It is necessary to establish close coordination and create synergy between other ongoing projects such as the WMO-CGMS Virtual Laboratory (VLab), and the RA-V Task Team on Satellite Utilization, and to provide greater benefits while avoiding duplication of effort.</p>
Benefits	<p>Facilitating the timely provision of satellite-related information by satellite operators to NMHSs in RA II, and capacity building to use satellite images and derived products</p>
Key Regional Player	<p>Coordinating Group:</p> <p>Japan (Co-coordinator), Republic of Korea (Co-coordinator) and other satellite operators (China, India and Russian Federation) in RA II and, as an observer, EUMETSAT.</p>
Partners / Participants	<p>Coordinating Group:</p> <p>Japan (Co-coordinator), Republic of Korea (Co-coordinator) and other satellite operators in RA II and, as an observer, EUMETSAT.</p> <p>Participants:</p> <p>All the other RA II and RA V Task Team on Satellite Utilization members.</p>
Relationship with existing project(s)	<p>To link with Asia/Oceania Meteorological Satellite Users' Conference which is recognized as formal international basis by signed the Memorandum at the 16th WMO Executive Council.</p> <p>To establish a close coordination with the RA-V Task Team on Satellite Utilization, in particular following up the Jakarta Declaration which was adopted in the Joint RA-II/V Workshop on WIGOS in 2015.</p>
Funding Source(s)	<p>Regular activities of this project and relevant training activities rely on existing budget allocations at the national level. Additional funding will be needed to hold the regular Coordination Group meetings and training events.</p>
Overall Costs	<p>(TBD)</p>
Timescale	<p>2017-2020</p>
Expected	<p>- Reports on requirements of NMHSs regarding satellite imagery, data</p>

## ANNEX IV

Key Deliverables / Key responsible body	products, and training - Improvement on access to information on satellite data/products, - Improvement on capacity in use of satellite data/products and facilitation of training datasets and toolboxes.
Main risk(s)	- Lack of resources(funds/expertise)
Website	<a href="http://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/ra2wigosproject-intro_en_jma.html">http://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/ra2wigosproject-intro_en_jma.html</a>
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