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RA II WIGOS Project Newsletter

DEVELOPING SUPPORT FOR NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES IN SATELLITE DATA, PRODUCTS AND TRAINING

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12th Asia – Oceania Meteorological Satellite Users' Conference (AOMSUC-12) report

The 12th Asia – Oceania Meteorological Satellite Users' Conference (AOMSUC-12), hosted by the Japan Meteorological Agency (JMA), was held online from 11th to 18th November 2022 on the theme of Full Exploitation of Today's Advanced Global Meteorological Satellite Observing System, with the following schedule:

1. Satellite data and product application training
   Nov. 11th and 14th
   Attendees: 123
2. 12th Asia – Oceania Meteorological Satellite Users' Conference (AOMSUC-12)
   Nov. 15th – 17th
   Attendees: 187
3. Joint RA II – RA V Coordination Meeting
   Nov. 18th
   Attendees: 83

・Total attendees registered for any conference: 205

Agenda and presentation materials:
https://www.data.jma.go.jp/mscweb/en/aomsuc12/presentations.html

The AOMSUC-12 (JMA) secretariat coordinated the agenda and schedule in collaboration with the International Conference Steering Committee (ICSC, consisting of representatives from co-hosting organizations and academic experts from each country), who set the basic policy for the conference.

1. Satellite data and product application training

Bodo Zeschke from Australia's Bureau of Meteorology Training Centre (BMTC), acting as a liaison appointed by the ICSC co-chair, advised the Secretariat on interactive online training techniques to avoid one-way presentation. In this regard, the Secretariat asked all instructors to create time for active discussions with all attendees, and also shared questionnaire feedback from them.

On the first day, Dr. James Purdom (co-chair of ICSC) and Dr. Bernie Connell (co-chair of the World Meteorological Organization (WMO) and the Coordination Group for Meteorological Satellites (CGMS) Virtual Laboratory (VLab – a global network of specialized training centres and meteorological satellite operators working together to improve the use of data and products from meteorological and environmental satellites throughout WMO Member countries)) gave keynote presentations. The China Meteorological Administration (CMA), the Korea Meteorological Administration (KMA) and JMA, provided training on the use of data from their own satellites.

On the second day, presentations were given by the Bureau of Meteorology (BoM) on tropical cyclone analysis, the National Oceanic and Atmospheric Administration (NOAA) on inundation product creation, and the Indonesian Agency for Meteorological, Climatological and Geophysical Agency (BMKG) on precipitation estimates.

In Joint Australia-China VLab Centres of Excellence Regional Focus Group interaction, CMA and BoM reviewed the satellite image viewer used by regional focus groups in the past and efforts for analysis in collaboration with relevant organizations for significant cases. The Secretariat issued joint certificates of attendance to trainees under the names of WMO, ICSC and JMA jointly.

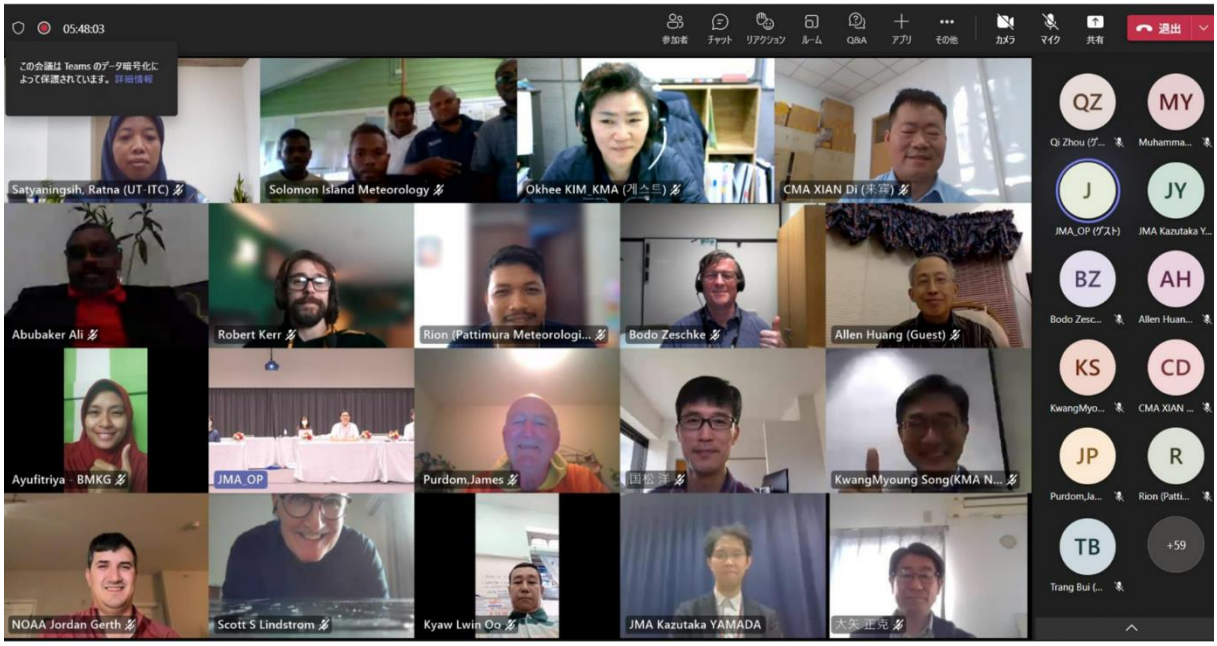

Figure 1. Group photo of Satellite data and product application training

2. The 12th Asia – Oceania Meteorological Satellite User's Conference (AOMSUC-12)

The opening ceremony featured comments from JMA's Director-General, WMO's Assistant Secretary General and the ICSC co-chair. Attendees presented on and discussed matters in sessions relating to six specialized themes. The Secretariat asked all presenters to submit pre-recorded presentation files in advance to keep the conference on time, and essentially played the files live with time for subsequent Q&A. The session structure and particularly noteworthy points were as noted below.

Session 1:
Space program and data access updates

Co-sponsor organizations gave comprehensive reports on their efforts.

BoM reported on the development of satellite data products (combined satellite precipitation data, cloud analysis data and other information), the vision for an Australian Earth Observation roadmap, and other matters.

CMA presented on FY-4B, operational geostationary satellite workings and FY-3E, as well as early-morning operation of its polar-orbiting satellite. The presentation also covered high-frequency acquisition imager video and drawing application using related data.

The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) reported on plans for the first Imager Satellite of the Meteosat Third Generation Program (MTG-I), which was launched on December 13th, 2022. EPS-SG missions and a satellite application facility were also covered.

JMA announced plans for the Himawari-8 to -9 switchover, scheduled to take place on December 13th, 2022, and outlined its readiness for a follow-on satellite to become operational in FY2029 and an infrared sounder as a potential payload sensor.

KMA reported on AI-based imagery for its GK-2A geostationary meteorological satellite, and detailed plans for its GEO-LEO satellite program in addition to LEO satellite technology with a microwave sounder.

NOAA overviewed its current satellites and related plans, as well as reviewing major partnerships and providing examples of its products and applications of potential interest to users in Asia and Oceania. These include the Tonga volcanic eruption of 2022 and monitoring of large-scale fires and coral reef conditions.

Session 2:
JAXA's coordinated efforts for the earth observation for environmental monitoring

The keynote presentation given by Dr. Riko Oki from the Japan Aerospace Exploration Agency (JAXA)/Earth Observation Research Center (EORC) covered product distribution of the GCOM satellite series, contribution to JMA/MRI's database for localized heavy rainfall in Japan, and satellite launch plans relating to EarthCare and GCOM-GW. Aspirations were expressed for product development based on GSMaP data from RSMC Tokyo along with collaborative activities between JAXA and JMA.

Session 3: Space weather

The keynote presentation given by Dr. Mamoru Ishii of the National Institute of Information and Communications Technology (NICT) reported on the establishment of the Committee for the Advancement of Space Weather Forecasting under the Ministry of Internal Affairs and Communications (MIC) and the publication of related reporting in June 2022.

NICT also presented on the Charging and Radiation Monitoring for Space Weather (CHARMS) mission, simultaneous monitoring of space radiation, spacecraft charging on the next Japanese geostationary meteorological satellite, and international contribution to the development of space weather information services.

Session 4:
Application for weather analysis and nowcasting

The keynote presentation given by Dr. Jinho Shin from KMA focused on convection initiation (CI), rapidly developing thunderstorms (RDTs), typhoons and fog, which strongly affect nowcasting, and highlighted satellite products generated by individual agencies. Updates and plans for KMA products were also provided.

The University of Wisconsin-Madison USA presented on the current status and usage of the Community Satellite Processing Package, which is widely used to decode satellite data.

BMKG reported on the accuracy of nowcasting in Indonesia using rainfall potential, enhanced water vapor and rapidly developing cumulus area (RDCA) products.

Kyushu University reported on the development of cirrus cloud detection via the 1.38 um band, which strongly details water vapor absorption.

Session 5:
Application for land surface, sea surface, and climate monitoring

The keynote presentation given by Dr. Mitch Goldberg from NOAA highlighted the organization's useful GEO/LEO satellite data products and services provided in relation to climate crisis factors. These include global products providing flood area extents for situational awareness, drought products for monitoring of agricultural productivity, an experimental automatic fire alarm system based on AI machine learning, and ocean/coast monitoring information.

BoM gave an outline and an update on its application of solar irradiance data generally used in the solar energy industry, which is rapidly expanding in Australia, and presented validation results along with key statistics for the Australian region.

Session 6: Application for numerical weather prediction

The keynote presentation given by Dr. Fiona Isobel Smith from BoM reviewed the status of satellite radiance data assimilation in numerical weather prediction (NWP) centres. The content also referenced challenges relating to radiance observations usually delivering high effects in assimilation systems and the related critical dependence of forecast skill.

Despite the challenges of holding the conference entirely online, 6 sessions and 72 presentations were provided. In its role as the next host, KMA announced that AOMSUC-13 will be held as an in-person event on Jeju Island or Busan in Korea from November 3rd to 11th, 2023.

Figure 2. Group photo of AOMSUC-12

Figure 3. Group photo of JMA

3. Joint RA II - RA V Coordination Meeting

As part of WMO reorganization work, the Joint Meeting of the RA II WIGOS Project and RA V TT-SU for RA II and RA V NMHSs held until last year was reformed as the Joint RA II - RA V Coordination Meeting.

The WMO Secretariat highlighted a new working structure at its regional office in Region II (Asia) and Region V (South-West Pacific) and related operating plans, and reported on the current status of a global survey on satellite data utilization. Commonalities and differences in regional responses, timings and methods of survey result publication were also discussed. A total of 10 Members (*) gave reports.

As a result of discussions at the 5th meeting of the Expert Team on Space Systems and Utilization (ET-SSU-5) held in September 2022, representatives from RA I (Africa) and RA III (South America) attended the conference to discuss activities, satellite utilization and other matters.

BoM, CMA, KMA and BMKG subsequently reported on recent training activities. BMKG expressed its willingness to be registered as a training Centre of Excellence (CoE) in VLab, and presented on its training facilities and training implementation performance.

(*) Members submitting reports:
Bangladesh, Bhutan, China, Hong Kong, Indonesia, Myanmar, Qatar, Singapore, Thailand, Vietnam

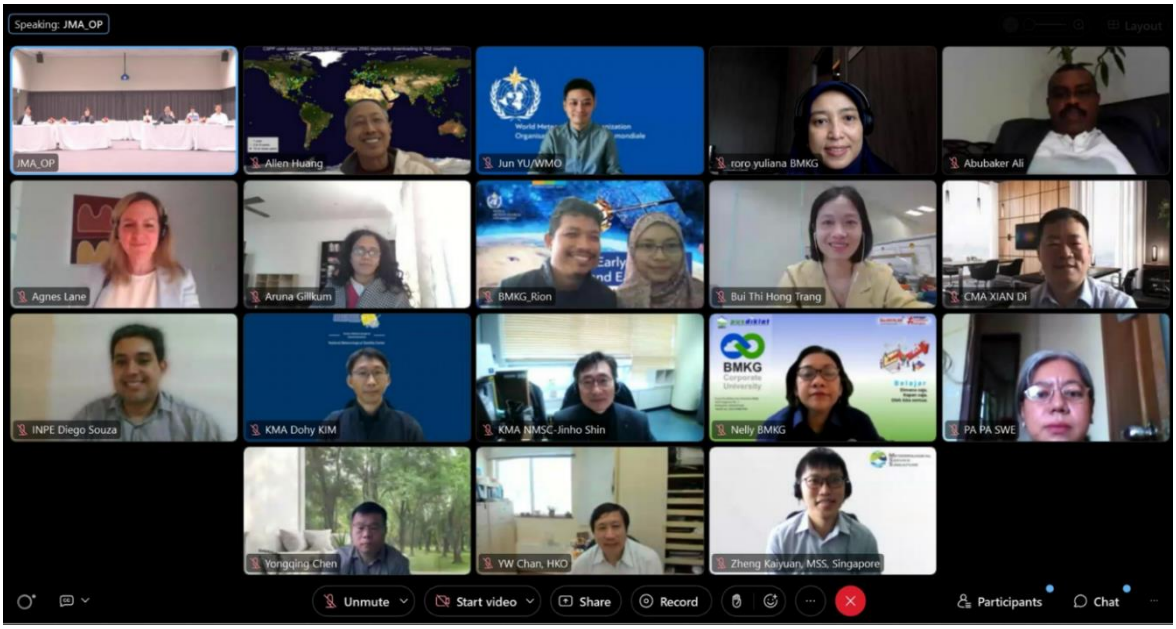

Figure 4. Group photo of Joint RA II - RA V Coordination Meeting

Operational Satellite Switchover from Himawari-8 to Himawari-9

The Japan Meteorological Agency switched operation from its Himawari-8 satellite to its Himawari-9 unit on 13th December 2022.

Himawari-9 carries the same Advanced Himawari Imager (AHI) sensor equipment as Himawari-8, and conducts observation from the same orbital position (140.7°E) with the same observation sequence.

For technical details, see
https://www.data.jma.go.jp/mscweb/en/oper/switchover.html

(Reiko HARADA, JMA)

Rapid Detection of Forest Fire by GK2A in KMA

1. Satellite products for forest fire at KMA

National Meteorological Satellite Center (NMSC) of Korea Meteorological Administration (KMA) has been producing space based various information that can be used in the fields such as weather forecast, ocean, environment, and land surface using Geo-KOMPSAT-2A (GK2A) satellite since 2019. GK2A's Advanced Meteorological Imager (AMI) observes the earth with 16 channels included visible, near-infrared, and infrared wavelengths every 10 minutes for Full Disk (FD) and every 2 minutes for Extended Local Area (ELA) over east Asian area and for Local Area (LA) over Korean peninsula with spatial resolutions of 1 km for visible and 2 km for infrared channels.

As one of the space based monitoring elements for disaster prevention in the KMA, a monitoring system using forest fire detection with GK2A named as Forest Fire (FF) is in operation with other products such as Fire Risk, Fire Radiative Power, and so on.

The fundamental principles of the forest fire detection using the GK2A is based on the difference of brightness temperature between near-infrared and infrared channels. So, GK2A FF retrieval is produced using 4 channels (0.64, 0.87, 3.8, and 11.2 ㎛) observation data and also using cloud detection information, topography information as an auxiliary data.

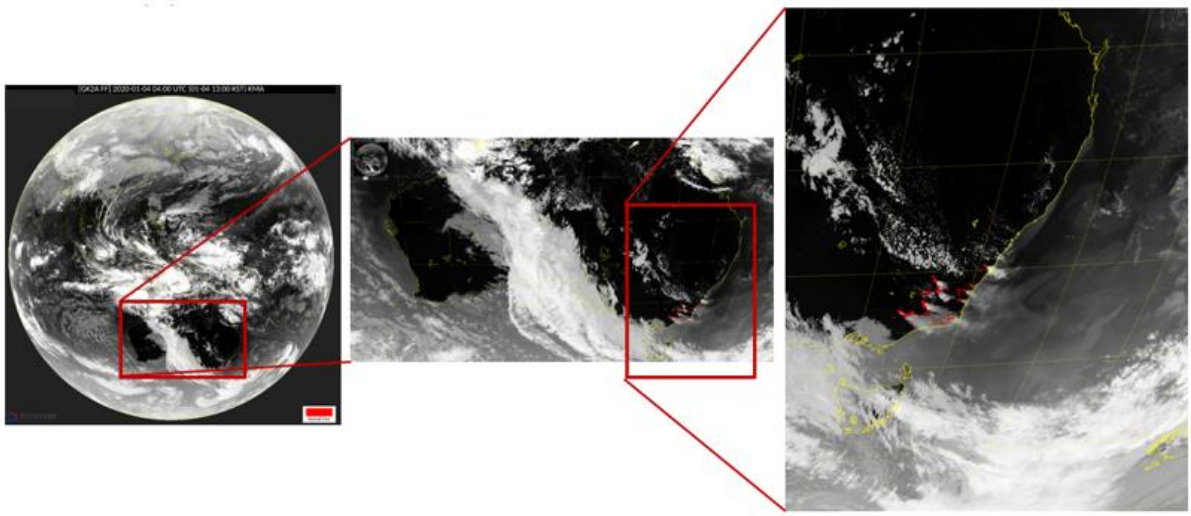

Figure 1. Australian wildfires detected by GK2A observations in 2020

2. Rapid detection product for forest fire with GK2A

In order to extinguish forest fires quickly and to reduce damage out of the fire disaster, it is necessary to detect forest fire quickly. For this reason, KMA developed new Forest Fire which was produced every 10 minutes in previous operation system, to be newly informed every 2

minutes to detect rapidly only for east Asia since 2022.

The 2-minute Forest Fire system was effective to detect the fires quickly compared with 10-minute detection over Korean peninsula in 2022. It shows the results that forest fire was detected 2 to 10 minutes earlier than 10-minute detection system.

The more information about Forest Fire using GK2A observation: Visit the website http://nmsc.kma.go.kr

(Jae-Young Byon, KMA)

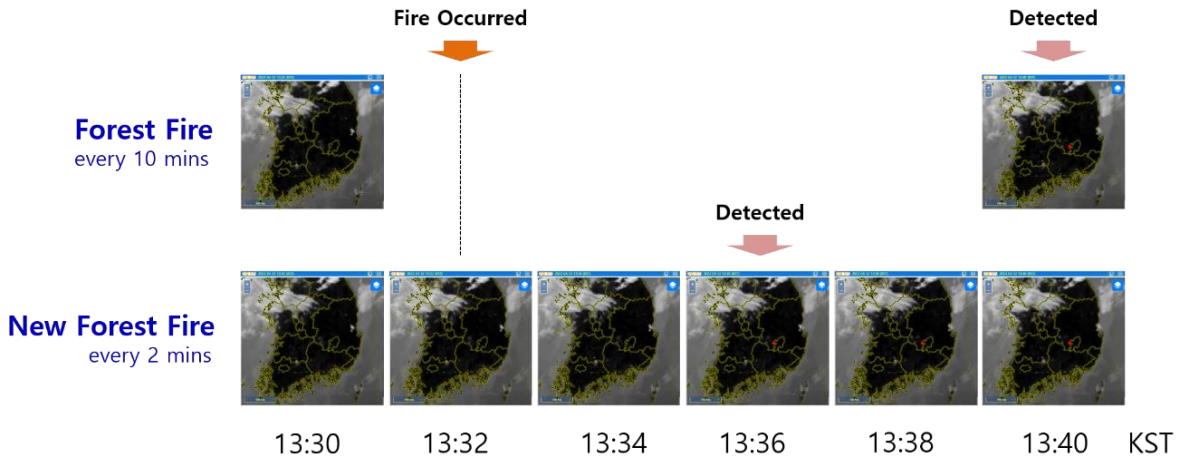

Figure 2. Forest fire detection time comparison between 10-minute FF and 2-minute FF

FY-3E and FY-4B Data Released to International User

1. INTRODUCTION

On 1st December 2022, China Meteorological Administration (CMA) announced to release two new Fengyun meteorological satellites data, FY-3E and FY-4B, to international users. According to the WMO Unified Data Policy (Cg Ext 2021) and CMA's data policy, international users can obtain data and products through various ways, including Fengyun satellite data center website, CMACast, GTS, direct broadcasting system, and so on. CMA also provide Fengyun-3 preprocessing software packages for Fengyun-3E data direct broadcasting system. Based on bilateral agreement between CMA and other organizations, Fengyun-3E and Fengyun-4B will be listed into the exchange catalog. CMA will continue to promote the international application of Fengyun satellites as an action to contribute to disaster preparedness and response to climate change.

2. INTRODUCTION TO FY-3E

FY-3E, the world's first early-morning-orbit meteorological satellite for civil use, was launched successfully at the Jiuquan Satellite Launch Center on 5 July 2021. FY-3E is the fifth satellite, among the second generation of the Chinese meteorological satellites, in a near-polar, sun-synchronous orbit (hereafter referred to as the polar). It is the first early morning orbit meteorological satellite for civil use in the world. Filling in the observing gap in the early morning, FY-3E will join FY-3C and FY-3D to realize the coverage of early morning, morning, and afternoon orbits. They will provide global data coverage for numerical weather prediction (NWP) at 6-hour intervals, and effectively ramp up global NWP accuracy and time efficiency, which is of great significance to improving the global earth observation system.

There are 11 instruments onboard the Fengyun-3E satellite, as listed in Table 3. Specifically, only one instrument, the Microwave Humidity Sounder-II (MWHS-II), is identical to the one flown on the Fengyun-3D mission. The three

brand-new instruments include the dual-frequency wind radar (WindRad), the solar spectral irradiance monitor(SSIM), and the solar X-ray and extreme ultraviolet imager(X-EUVI). Seven improved instruments consist of: the medium resolution spectral imager with low-light capability (MERSI-LL), the microwave temperature sounder (MWTS-III), the hyperspectral infrared atmospheric sounder (HIRAS-II), the global navigation satellite system occultation sounder with a reflectometry technique(GNOS-II), the solar irradiance monitor (SIM-II), the space environment monitor (SEM), and the ionospheric photometer with three view angles (Tri-IPM). Table 1 shows the main characteristics of the onboard instruments.

Table 1. Instruments onboard the FY-3E and their primary characteristics.

Instruments	Spectral range	Spatial Resolution	Primary Purpose
MERSI-LL	0.5–12.5 μm	0.25–1 km	dynamic range imaging, land surface temperature/sea surface temperature, atmospheric precipitable water
HIRAS-II	650–2550 cm^{-1}.	14 km	Numerical weather forecast, atmospheric temperature and humidity profiles, surface temperature, atmospheric composition, greenhouse gases, dust, cloud cover, etc
MWHS-II	89−190 GHz	15−30 km	Atmospheric temperature and humidity profiles, assimilation in NWP and reanalysis, precipitation detection
MWTS-III	23.8−57 GHz	33 km	Atmospheric temperature profile
GNOS-II	1575.42, 1227.6, 1561.098, 1268.52 MHz	25 km (GNSS-R), 1–3 km (ion-RO), 150–300 m (atm-RO)	Atmospheric profile, wet atmospheric profile, electron density profile, sea surface wind speed
WindRAD	5.4, 13.256 GHz	10 km, 20 km	Sea surface wind vector including wind speed and wind direction, sea ice
SIM-II	0.2–20 μm	−	Total solar irradiance
SSIM	165–1650 nm	−	Solar spectra irradiance
X-EUVI	0.6–8.0 nm; 19.5 nm	−	Full disk solar X-ray and ultraviolet images, to enhance the forecasts of space weather
Tri-IPM	135.6 nm; 150–160 nm	32 km	OI and N_2 LBH airglow radiation intensity
SEM-II	30 eV– 300 MeV	−	Satellite security designs, scientific studies, development of radiation belt models, space weather monitoring, and disaster warning

3. INTRODUCTION TO FY-4B

China sent the meteorological satellite into planned orbit from the Xichang Satellite Launch Center in Sichuan Province on June 3, 2021. FY-4B, which is the first of China's new-generation meteorological satellites in geostationary orbit, is used for weather analysis and forecasting, and environmental and disaster monitoring. Fengyun-4B has updated payloads and improved performance based on Fengyun-4A. Fengyun-4B has added a few new functions such as the water vapor detection channels in the geostationary orbit radiation imager and improved the spectrum of some channels. Fengyun-4B, together with Fengyun-4A, will form a dual-satellite network, jointly conducting

high-frequency monitoring of the atmosphere and clouds to obtain atmospheric vertical information from clear skies and thin cloud areas.

The payloads of FY-4B satellite include: Advanced Geostationary Radiation Imager(AGRI), Geostationary Interferometric Infrared Sounder(GIIRS), Geostationary High-speed Imager(GHI) and Space Environment Monitoring Instrument Package(SEP). FY-4B adds new water vapor detection channels in its radiation imager, improved spectrum detection capabilities, and is capable if providing more accurate atmospheric radiation and temperature and humidity profiles. Fengyun-4B also has a "newly equipped fast imager" with a resolution of about 250 meters, to better monitor typhoons, rainstorms, and other extreme weather events.

Table 2. Instruments onboard the FY-4B and their primary characteristics.

Instruments	Spectral range	Spatial Resolution	Primary Purpose
AGRI	0.45-13.6μm	Visible / near-infrared:0.5-1km Infrared:2-4 km	Cloud, atmosphere and surface detection, etc
GIIRS	Long wave:680-1130cm^{-1} Medium wave:1650-2250 cm^{-1} Visible:0.55-0.90μm	Visible: 1km Infrared:12 km	Hyperspectral atmospheric radiation and temperature and humidity profile, etc
GHI	0.445-0.495 m; 0.52-0.57μm; 0.62-0.67μm; 1.371-1.386μm; 1.58-1.64μm; 10.3-12.5μm;	Panchromatic:250m Visible/ near-infrared: 500km Infrared:2 km	Typhoon, rainstorm, mesoscale disastrous weather, etc
SEP	–	–	Provide direction of high, medium and low energy particles and popularize space magnetic field information for space weather early warning and forecast

4. RESULT

According to the evaluating results of FY-3E and FY-4B on-orbit data, new instruments shows good performance and can be used in weather forecasting, NWP modeling and climate analysis. With all kinds of data distribution means, CMA will share baseline data and new products of these new satellites to international users via internet, DB station, CMACast system and other means. More evaluation results and scientific research results are welcome to feed back to us. More information can be found on the National Satellite Meteorological Satellite (NSMC) website (http://www.nsmc.org.cn). The evaluation result will be published and reported by NSMC during CGMS-51, FYSUC 2023, AOMSUC-12 and other conference.

(XIAN Di and JIA Xu, CMA)

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From the Co-editors

The co-editors invite contributions to the newsletter. Although it is assumed that the major contributors for the time being will be satellite operators, we also welcome articles (short contributions of less than a page are fine) from all RA II Members, regardless of whether they are registered with the WMO Secretariat as members of the WIGOS Project Coordinating Group. We look forward to receiving your contributions to the newsletter.
(Dohyeong KIM, KMA, and Kotaro BESSHO, JMA)

RA II WIGOS Project Home Page
http://www.jma.go.jp/jma/jma-eng/satellite/ra2wigosproject/ra2wigosproject-intro_en_jma.html

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