Vol. 5 No. 1, March 2014

RA II WIGOS Project Newsletter

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

Contents of this issue

KMA launch contract for GK2A space weather mission

KMA in coordination with KARI selected Kyunghee University to develop the space weather mission for Geo-KOMPSAT-2A, which is scheduled to inherit COMS meteorological mission 2017.

The contractor will provide the KSEM (Korean Space Environment Monitor) suite of instruments and post-delivery support for the assembly and integration test, pre- and post- launch test of Geo-KOMPSAT-2A. The suite of KSEM instruments consists of particle detector (PD); magnetometer (MAG); and satellite charging monitor (SCM). The sensors is used to monitor the space environment 6 the severe space weather information of high-impact space storms, the radiation environment hazardous to spacecraft, aircraft and radio communication for 24 hours/7 days during 10 years mission life time.

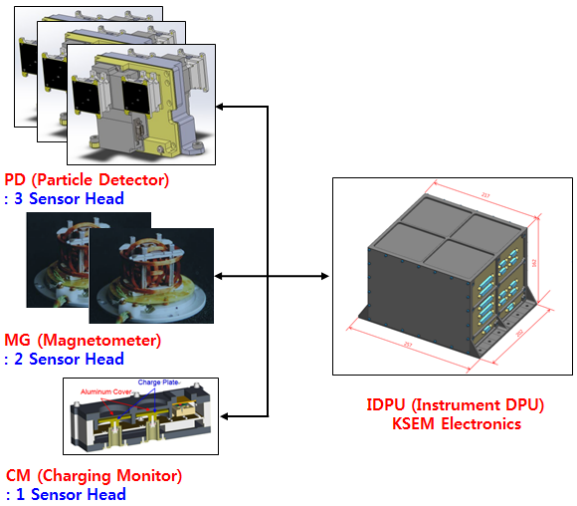

Figure 1: KSEM components: **Particle detector** of which design inherited from THEMIS SST. **Magnetometer** shown above is THEMIS FGM (FluxGate Magnetometer). The detailed design of KSEM magnetometer will be decided. The bottom of left side shows the **Charging Monitor**, which measures the satellite internal charging. Right side shows on-board Instrument Data Processing Unit.

- Particle detector (PD) consists of 3 detector head (Figure 2) and measures the differential energy flux of electron and ion with the energy range of 100 keV and 2 MeV, which are trapped within earth's magnetic field.
- MAG measures three components of near earth magnetic field with the range of ±350nT and monitors those variations caused by space storm and high-speed stream.
- SCM measure the satellite internal charging current with the range of ±3 pA/cm2 due to high energy particles and provides advance warning of possible electrical discharge.

Space Weather Data Processing System

KMA plans to develop KSEM associated ground data processing system. KSEM ground data processing system will receive the raw data and generate Level 1 and Level 2 products. Level 1 data is the calibrated data. Calibration refers to the process of converting and correcting raw measurements into science data units with the specified level of accuracy. Level 1 data will be available to users and for the next level of data processing to produce level 2 data in a timely manner consistent with the latency requirements. KSEM ground data processing system will derive the products in combination with KSEM level 1 data, other space-based observation data and models.

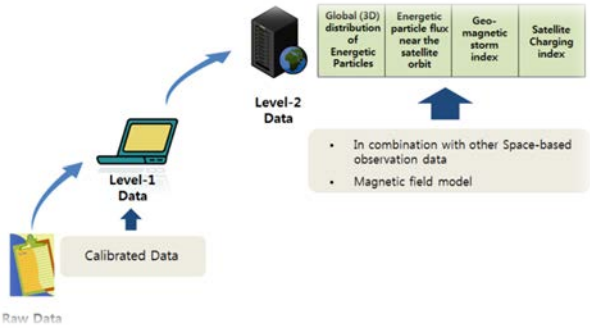

Figure 2: KSEM Ground Data Processing System: KSEM ground data processing system plays role of data receiving from Satellite and generate level 0, level 1 and level 2.

KSEM is the first Korean space weather mission aboard Geostationary satellite. Like Galaxy 15 anomaly on 2010, Geostationary satellites are easily exposed to the risk due to severe space weather. It is expected that KSEM data will contribute to secure the satellite operation and high-tech ground infra-structure. KSEM Kick-Off and System Requirement Review meeting is scheduled on the middle of March.

(Hyesook Lee, NMSC/KMA)

Successful launch of GPM core observatory

The launch of the H-IIA Launch Vehicle No. 23 with the core observatory for the Global Precipitation Measurement (GPM) mission aboard was successfully performed (Figure 3). It was launched from the Tanegashima Space Center on February 28, 2014, and flew normally and separated the GPM core observatory at about 16 minutes after liftoff.

Figure 3: Launch of GPM core observatory (Image Credit: JAXA)

The GPM core observatory (Figure 4) was jointly developed by Japan and the U.S. Two observation instruments are onboard the core observatory. One is the Dual-frequency Precipitation Radar (DPR) developed by JAXA, and the other is the GPM Microwave Imager (GMI) developed by the NASA.

It is performing normally and will have two month on-orbit check out period to ensure the healthy operation of the spacecraft and instruments. Precipitation data will be released no later than 6 months post-launch, after the science teams verify their accuracy.

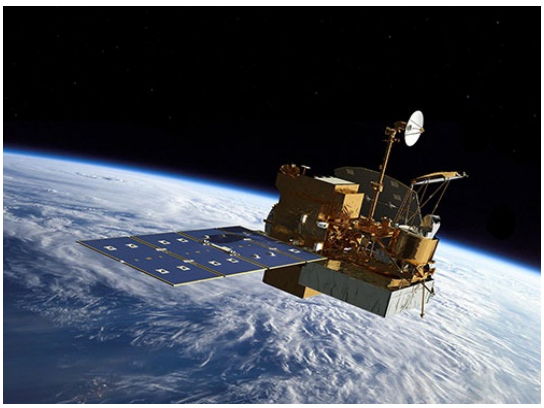

Figure 4: Artist's depiction of GPM core observatory (Image Credit: NASA)

Recently, JAXA and NASA have released the first images captured by GPM core observatory. One of the images shows precipitation falling inside a March 10 cyclone over the northwest Pacific Ocean, east of Japan (Figure 5). It is collected by the DPR, which imaged a three-dimensional cross-section of the storm.

The GPM core observatory will be able to observe not only the tropical zone but also mid to high latitude areas by having an orbit inclination of 65 degrees. In addition, with its non-sun-synchronous orbit, it can capture changes in precipitation in one day.

The DPR is a successor of the Precipitation Radar (PR) loaded onto the GPM's predecessor, the Tropical Rainfall Measuring Mission (TRMM). The 35.5 GHz radar was additionally installed onto the PR at 13.6 GHz for high accuracy observation. The GMI is also a successor of the TRMM's microwave imager (TMI) with four additional high-frequency channels (on 166 GHz and 183 GHz) in addition to the TMI's nine frequency bands.

The DPR's swath width is about 245 km for the 13.6 GHz radar, and about 125 km for the 35.5 GHz radar. The two radars will synchronously work when their scanning swaths are overlapped. On the other hand, the GMI will perform conical-scanning and its swath width is about 900 km.

The core observatory's role is to improve its precipitation observation accuracy for microwave imagers on a constellation of satellites by simultaneously conducting observations with the radar and the microwave imager.

Latest information of the GPM core observatory is available from the following mission websites:
http://www.jaxa.jp/projects/sat/gpm/index_e.html
http://www.nasa.gov/gpm

(Riko Oki, EORC/JAXA)

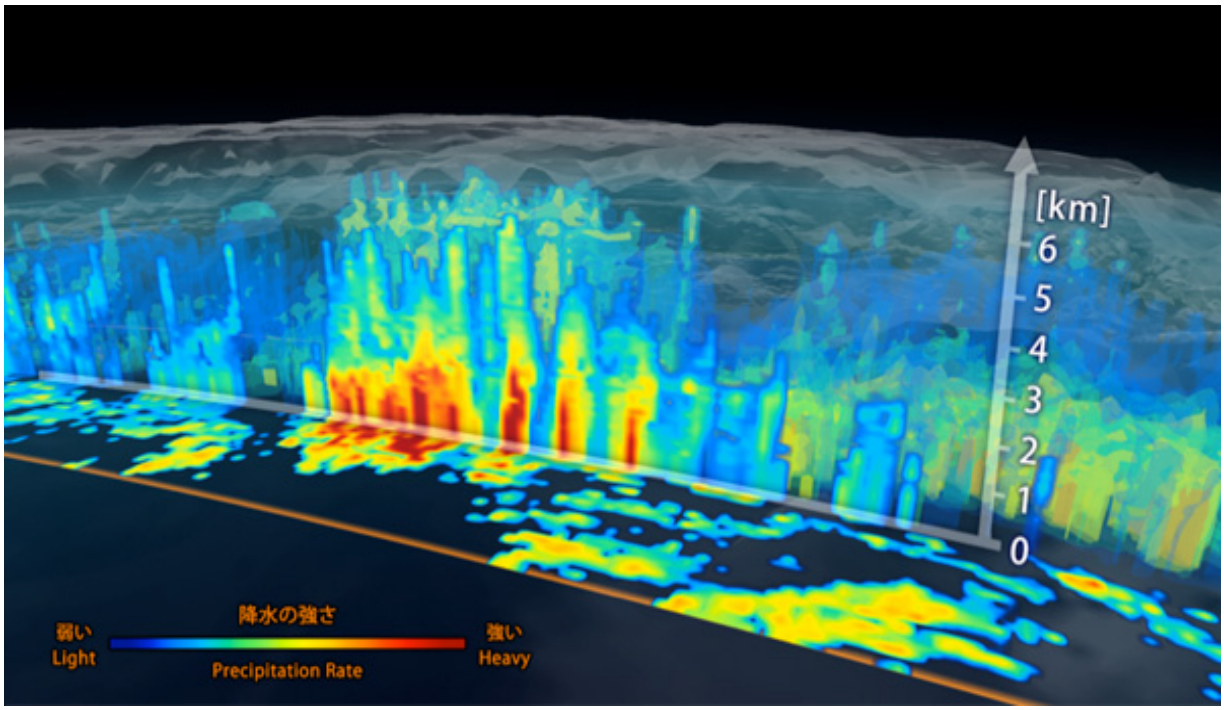

Figure 5: 3D view inside an extra-tropical cyclone observed off the coast of Japan, March 10, 2014, by GPM's Dual-frequency Precipitation Radar. The vertical cross-section approx. 7 km high show rain rates: red areas indicate heavy rainfall while yellow and blue indicate less intense rainfall. (Image Credit: JAXA/NASA)

Planning ground segment development for the Geo-KOMPSAT-2A of KMA

As announced in various international meetings, the National Meteorological Satellite Center (NMSC) / Korea Meteorological Administration (KMA) has a plan to launch COMS follow-on, Geo-KOMPSAT-2A(GK2A) in 2018 to ensure continuity of COMS meteorological mission.

NMSC/KMA is planning to develop the ground segment that will receive data from GK2A spacecraft, generate real-time GK2A meteorological/space weather products and disseminate data via GK2A broadcasting. The top-notch Information & Communication Technologies and scientific capabilities will be applied to handle the vast volume of GK2A data in real-time manner consistent with user requirements. The data dissemination mission via GK2A will include all sixteen channels meteorological data in Ultra HRIT (tentatively named as UHRIT) format as well as HRIT/LRIT broadcasting corresponding to five channels of COMS.

Currently, the preparatory processes to establish GK2A ground segment is being led by NMSC/KMA. The preliminary studies for basic design of ground segment and meteorological data processing system have been carried out from 2011 to 2013 and based on the results of those studies, the development project will be carried out for 5 years from 2014 to 2019 including in-orbit test period after GK2A launch.

The GK2A ground segment is accomplished via developing core techniques and systems as

follows;

- Meteorological and space weather data receiving, processing and dissemination system
- Satellite control system
- Data management and service system
- Meteorological/space weather products algorithm
- Satellite-based data application techniques

For non-stop operation and real-time data service, back-up systems will be equipped for all components and the remote data storage concept will be implemented for enhancing data security.

The timeline of GK2A ground segment development consists of three phases as below:

- Phase 1 (2014~2015) : System Design and Algorithm development
- Phase 2 (2016~2017) : Implementation and Integration
- Phase 3 (2018~2019) : In-orbit ground test and preparation of normal operation

The Figure 1 displays the time schedule of GK2A ground segment development, which might be modified according to the GK2A satellite development progress and budgeting for this project.

After successful establishment of GK2A ground segment, high spatial and temporal resolution image data and various meteorological products will be provided to users over East Asia and those data can be utilized for weather forecast , natural disasters reduction by severe weather and researches on climate change, typhoon etc.

The GK2A ground segment development will be kicked off in the first half of 2014 and more details on this project including GK2A data service policy will be shared in future.

(Hyunjong Oh, NMSC/KMA)

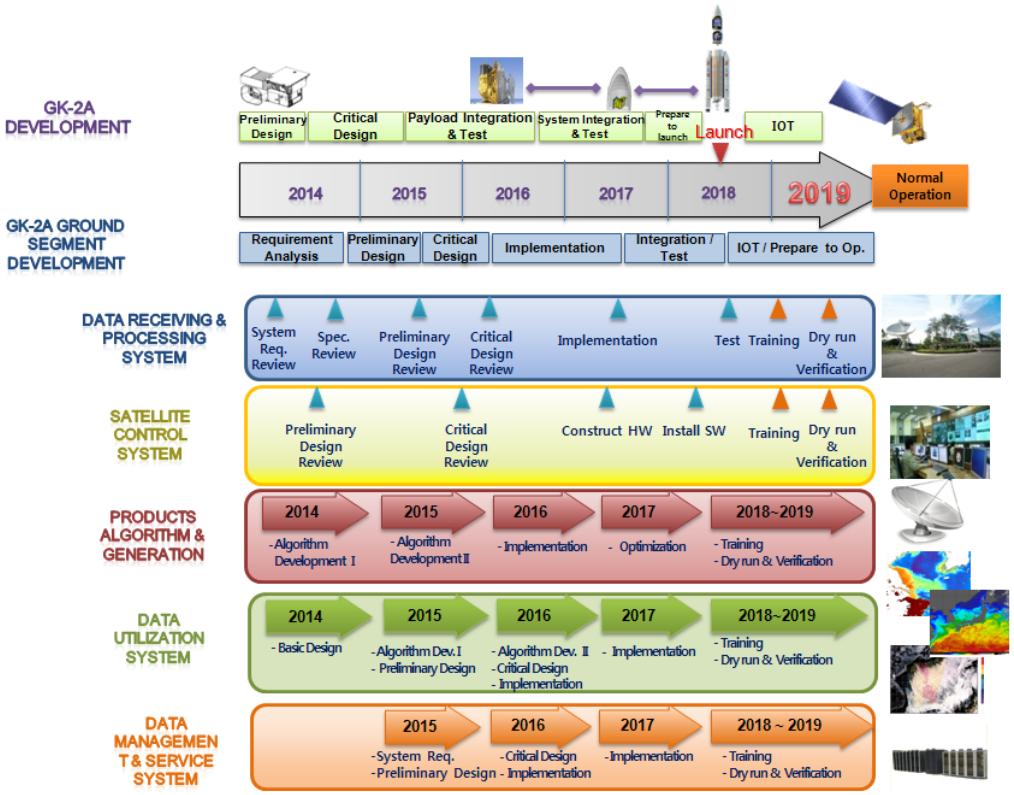

Figure 6: Schedule of GK2A ground segment development

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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 Tomoo OHNO, JMA*)

RA II WIGOS Project Home Page

http://www.wmo.int/pages/prog/sat/ra2pilotproject-intro_en.php
(To be updated)

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