KMA Report on Status of the current and future satellite systems

Presented to CGMS-46 plenary session, agenda item [D.4]
COMS(Communication, Ocean, and Meteorological Satellite)
- Orbit: 128.2E (Launched on June 26, 2010)
  * Two years extended operation (1 April 2018~31 March 2020)

** MI: 5 Channel VIS/IR Meteorological Imager**
- MI data Service via Satellite: Broadcast to M/SDUSs with H/LRIT
- 16 products (AMV, CLD, SST, TPW, CTT/CTH, CA, AOD, OLR, RI, Fog, LST….)
- Service via Landline [Website] KMA/NMSC homepage (for registered users)
  [FTP] Access to NMSC FTP (for organization with MOU)

** GOCI: Geostationary Ocean Color Imager**
- 0.5km X 0.5km (ground sampling distance) with 1hr (8 times/day)
- L1B RGB, Chlorophyll, Colored dissolved organic matter, Suspended solid
- [http://kosc.kordi.re.kr/processingsoftware/gdaps/onlinehelp.kosc](http://kosc.kordi.re.kr/processingsoftware/gdaps/onlinehelp.kosc)
- [http://map.naver.com](http://map.naver.com) (for Public user)
## Meteorological and Environmental Geo-Satellites: Future

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<th>Sector</th>
<th>Satellite in Orbit</th>
<th>Operator</th>
<th>Location</th>
<th>Launch date</th>
<th>Environmental payload and status</th>
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<td>West Pacific</td>
<td>GEO-KOMPSAT-2A</td>
<td>KMA</td>
<td>128.2°E</td>
<td>Nov. 2018</td>
<td>Advanced Meteorological Imager (AMI), Space Environmental monitoring payload Direct broadcast via UHRIT/HRIT/LRIT</td>
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<td>GEO-KOMPSAT-2B</td>
<td>MOF(Ministry of Ocean and Fisheries), ME(Ministry of Environment)</td>
<td>128.2°E</td>
<td>October 2019</td>
<td>Advanced Geostationary Ocean Colour Imager(GOCI-II), Geostationary Environmental Monitoring Spectrometer(GEMS)</td>
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- GEO-KOMPSAT-2A, AMI (Advanced Meteorological Imager)
  - Multi-channel capacity: 16 channels
  - Temporal resolution: within 10 minutes for Full Disk observation
  - Flexibility for the regional area selection and scheduling
  - Lifetime of meteorological mission: 10 years
GEO-KOMPSAT-2A: Activities of Meteorological Products

- **Current Status**: The pre-launch version of meteorological algorithms were completed in May 2018.

- **Activities of Development and Utilization**
  - **Algorithm Improvement** by regular review meeting of developers and the International Review Team (IRT) and NMSC algorithm working group
  - **Integrated Algorithm Tests for Product Validation** using Himawari-8/AHI data
    - evaluating product maturity
  - **User Readiness and Training**
    - Implementing pre-operational monitoring system of GK-2A meteorological products using Himawari-8 AHI data internally
    - Application feedbacks from users (e.g., forecasters)
    - Training of how to utilize and analyze the products

- The prototype algorithms of application products were prepared in December 2017 and these will be optimized for the operational use in 2018.
- All of application products developed in this program will included on the “Meteorological Data Analysis system” of ground segment systems until 2018
- The analysis guidance will be provided to the users

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<td>• Optimization of ADT and ARCHER for the East Asia</td>
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<td>• Estimating the intensity change of tropical cyclone</td>
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<td>• Ocean monitoring(Ocean Front, Upwelling, Ocean eddy, Vessel Icing, SST change)</td>
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<td>• Satellite-based 3D winds</td>
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<td>Hydrology &amp; Forest &amp; Supporting Studies</td>
<td>• Soil moisture, Drought and Flood</td>
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<td>• Verification, Satellite data Blending and Downscaling</td>
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<td>• Greenhouse gases, atmospheric composition</td>
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<td>• Air Quality model applications</td>
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[Via GK-2A broadcast]
- Broadcast all 16 channels data (**UHRIT, full resolution**) of meteorological observations
- Maintain **L/HRIT broadcast** corresponding to COMS five channels

[Via Landline]
- **Real-time cloud service similar to HimawariCloud** will be implemented (completed in 2018)
- GK-2A data also will be available in DCPC-NMSC (http://dcpc.nmsc.kma.go.kr)

[L1 Data Format]
- netCDF4(for each channels), with GSICS information

[L2 Data Format]
- netCDF4(for each products)

**L1 Data Header Structure**

- General Information
- Output Information
- Pixel File Information
- Projection Information
- Star Measurement Information
- INR Characteristics Information
- Image Geometry Quality Information using Star Measurements
- Registered Image Information
- Quality Area Image Information
**Data Service Plan: LDUS System Development (Under detail design)**

**[MDUS]**
- AMI 16ch data will be serviced by CCSDS formatted UHRIT Telemetry on DVB-S2 Broadcasting Standard
- **Service Area is same as COMS** (El > 10°) but required antenna diameter depends on the rain degradation margin.

**[SDUS]**
- LRIT service is redesigned for using on a ship mounting with an Omni directional antenna.
- Minimized SDR (Software Defined Radio) Receiver
- Contents will be satellite images, weather fax, etc.

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**[MDUS]**
- Downscaled 5 ~ 14ch data (TBC) will be serviced by COMS compatible HRIT telemetry.
- Compact SDR (Software Defined Radio) Receiver built in Receiving Server
GK-2A 10-minute Timeline

1 FD (Full Disk) + 5 ELA (Extended Local Area) + 5 LA (Local Area)

10 min. Timeline

Full Disk
Every 10 min

ELA
Every 2 min
(3800 X 2400 km)

LA
Every 2 min
(1000 X 1000 km)
GK-2A 10-minute Timeline

- KMA will operate 3 different observation areas with 10-min schedule
  - FD: Full Disk
  - ELA: Extended Local Area centered Korean Peninsular
  - LA: Target Area which can observe any area by user request

- The official request of target area observations by global users over the Asian Pacific region (RA II and RA V) will be available
  - The first priority is the disasters monitoring over Korean Peninsular, such as typhoon, wild fire etc
  - Global users submit official request form defining specific measurement area via designated web page (or email)
  - Decision will be made before disseminating images via designated web page
Korean Space wEather Monitor (KSEM) on Geo-KOMPSAT-2A

Development Status of KSEM and its Ground System, SWDPS

- **KSEM** successfully completed PER (July of 2017), PSR (Aug. of 2017) and FAR (Jan. of 2018). **KSEM FM** has been integrated into GK2A and now GK2A is in environment test.

- **SWDPS** (Space Weather Data Processing Subsystem) is in the integrated system test including data pre-processing for **L1** and **L2** retrieval subsystem.

LV1: Reconstructed, Processed instrument data at full resolution, time-referenced annotated with ancillary information including calibration coefficients and georeferencing parameters applied

LV2: Product retrieved using additional algorithm or model with LV1 data
FUTURE LEO SATELLITES for meteorological use

- **Current status** of KMA LEO satellite program
  - Under the process of specific feasibility test

- **Specifications of MW sounder**
  - Altitude/orbit: ~800km / Sun-synchronous, dawn-dusk orbit
  - Satellite: ~500kg / Instrument: ~150kg
  - Possible Instrument: MW Sounder
  - Limited number of payloads due to the weight of satellite
Thank you