The Current Status of COMS MI Data Processing and Service in NMSC


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1. Introduction of COMS and MI
2. COMS MI Ground Systems
3. COMS MI Operational Result
4. COMS MI Data Service via Web
5. Promotion of COMS MI Data Utilization
6. Summary and Conclusion
The 4th Asia/Oceania Meteorological Satellite Users’ Conference

1. Introduction of COMS and MI

COMS Development Program

COMS is the first multi-purpose geostationary satellite for Korea in the application of Meteorology, Ocean and Communication

- Meteorological Mission: Continuous Meteorological Observation to support weather forecasting and early detection of severe weather phenomena
- Period: 2003 - 2010 (8 yrs)
- Orbit: 128.2°E over equator (35,000 km)
- Mass: 2,500 kg
- Design life: 7 years

Communication, Ocean and Meteorological Satellite

<table>
<thead>
<tr>
<th>Channel</th>
<th>Band (μm)</th>
<th>Spatial Resolution (km)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible</td>
<td>0.55-0.80</td>
<td>1</td>
<td>Cloud, Dust, Fire, Fog detection</td>
</tr>
<tr>
<td>SWIR</td>
<td>3.50-4.0</td>
<td>4</td>
<td>Fog, Low Cloud, Fire detection, LST</td>
</tr>
<tr>
<td>WV</td>
<td>6.5-7.0</td>
<td>4</td>
<td>Upper Air Humidity &amp; Temperature</td>
</tr>
<tr>
<td>IR1</td>
<td>10.3-11.3</td>
<td>4</td>
<td>Cloud &amp; Dust detection, SST, LST</td>
</tr>
<tr>
<td>IR2</td>
<td>11.5-12.5</td>
<td>4</td>
<td>Cloud &amp; Dust detection, SST, LST</td>
</tr>
</tbody>
</table>

LST: Land Surface Temperature
SST: Sea Surface Temperature

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1. Introduction of COMS and MI

Observation Schedule for COMS

- **Full Disk**: Every 3 hrs
- **Northern Hemisphere**: Every 15 min
- **Korea Peninsular**: 4 times/hr

➤ Support for early detection of severe weather phenomena

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2. COMS MI Ground Systems

Image Data Acquisition and Control System

◆ Data Receiving System
- Cassegrain antenna (13m) and Radio Frequency system
- Data Acquisition and Transmission Subsystem (DATS)
- Data signal goes through Low Noise Amplifier and converters after then will be demodulated by Modem B/B

◆ Data Processing System
- Image Preprocessing Subsystem (IMPS)
- Data processed go through the usual procedures with many modules
Image Data Acquisition and Control System

**Data Dissemination System**
- L/HRIT Generation Subsystem (LHGS)
- RF systems and Antenna
- User who has M/SDUS can get the data

<table>
<thead>
<tr>
<th>HRIT</th>
<th>LRIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3Mbps</td>
<td>~512Kbps</td>
</tr>
<tr>
<td>Data Rate</td>
<td></td>
</tr>
<tr>
<td>Image (VIS, IR1, IR2, SWIR, WV)</td>
<td>Alpha-numeric text Encryption Key Message</td>
</tr>
<tr>
<td>Data Type</td>
<td></td>
</tr>
<tr>
<td>FD, ENH</td>
<td>FD, ENH</td>
</tr>
<tr>
<td>Mode</td>
<td></td>
</tr>
<tr>
<td>MDUS (Medium Scale Data User stations)</td>
<td>SDUS (Small Scale Data User stations)</td>
</tr>
</tbody>
</table>

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2. COMS MI Ground Systems

COMS L/HRIT Dissemination Schedule

- Station keeping (Orbit maintenance): 2 times/week (N-S(Tue.), E-W(Thr.))
- Wheel Offloading (Attitude maintenance): 2 times/day (00:45, 06:45, 15:21 UTC)
- Albedo monitoring: 1 time/day (Around 21:35 UTC)
- Dark image observation: 1 time/3 months
- Moon observation: 1 time/month
COMS MI operation results in NMSC are based on the data processing and service (dissemination) success rates.

**Data Processing Success Rate**
- Subject Period: Apr., 2011 ~ Aug., 2013. (29 months)

<table>
<thead>
<tr>
<th>Processing data</th>
<th>Number of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>151,347</td>
</tr>
<tr>
<td>Fail</td>
<td>799</td>
</tr>
<tr>
<td>Rate (%)</td>
<td>99.47</td>
</tr>
</tbody>
</table>

Maintenance of antenna & Instability of System

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3. COMS MI Operational Result

*COMS MI operation results in NMSC are based on the data processing and service (dissemination) success rates.*

◆ Data Service Success Rate
- Subject Period: Apr., 2011 ~ Aug., 2013. (29 months)

<table>
<thead>
<tr>
<th>L/HRIT data</th>
<th>NMSC only</th>
<th>NMSC + KARI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>71,215</td>
<td>74,404</td>
</tr>
<tr>
<td>Fail</td>
<td>3,329</td>
<td>140</td>
</tr>
<tr>
<td>Rate (%)</td>
<td>95.53</td>
<td>99.81</td>
</tr>
</tbody>
</table>
4. COMS MI Data Service: Concept

- Satellite Dissemination
  - Users
  - HRIT/LRIT
  - Transmission System
  - Database
  - Data Request

- Landline Service
  - HTTP service (Web)
  - FTP service
  - E-MAIL service
  - DCPC
  - OpenADDE
  - Satellite Dissemination
  - HRIT/LRIT
  - Transmission System
  - Database
  - Data Request

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4. COMS MI Data Service: Image Domain

- Service Area and Projection
  - Full Disk, Extend Area Northern Hemisphere, East Asia, and Korea
  - Polar stereo and Lambert conformal
4. COMS MI Data Service: **Registration as M/SDUS**

**Registration of receiving station and COMS MI Data decryption process**

http://nmsc.kma.go.kr

Join NMSC Web site

Registration of receiving station

Receive EncryptionKeyMessage.bin by e-mail (*Encrypted*)

Encrypted XRITE File

Decrypt

**<MDUS/SDUS User>**
The NMSC provides COMS level 1B data of all five channels and level 2 products to users by posting the processed data on NMSC website (http://nmsc.kma.go.kr/jsp/eng/contents/main/main.jsp). All registered members of the website can log on, search, and download COMS data once the formal request is approved. Here is the list of COMS meteorological products open to users.

<table>
<thead>
<tr>
<th>Products</th>
<th>Resolution</th>
<th>Period</th>
<th>Start Date of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloud analysis (cloud type, phase and amount)</td>
<td>4 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Cloud top pressure/temperature/height (CTP/CTT/CTH)</td>
<td>4 km</td>
<td>15 min.</td>
<td>1 Apr. 2011</td>
</tr>
<tr>
<td>Atmospheric Motion Vector (AMV)</td>
<td>64 km</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>Cloud detection (CD)</td>
<td>4 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Fog (FOG)</td>
<td>4 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Aerosol index (AI)</td>
<td>4 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Sea surface temperature (SST)</td>
<td>4 km</td>
<td>1-, 5-, 10-day composition</td>
<td>10 Aug. 2011</td>
</tr>
<tr>
<td>Rain intensity (RI)</td>
<td>4 km</td>
<td>15 min.</td>
<td>10 Aug. 2011</td>
</tr>
<tr>
<td>Outgoing longwave radiation (OLR)</td>
<td>4 km</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>Upper tropospheric humidity (UTH)</td>
<td>36 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Land Surface Temperature(LST)</td>
<td>4 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Snow and Sea Ice (SSI)</td>
<td>4 km</td>
<td>1 day/8 day</td>
<td>10 Feb. 2012</td>
</tr>
<tr>
<td>Total Precipitation (TP)</td>
<td>4 km</td>
<td>15 min.</td>
<td></td>
</tr>
<tr>
<td>Clear Sky Radiance (CSR)</td>
<td>28 km</td>
<td>15 min.</td>
<td></td>
</tr>
</tbody>
</table>
4. COMS MI Data Service: DCPC-NMSC

NMSC accomplished the construction of DCPC-NMSC and started normal operation on 29th March 2013 for providing COMS MI data as below list:

- All five channels level 1B in binary and graphic file format
- Ten level 2 products in binary and graphic file format
  1. Cloud detection
  2. Land surface temperature
  3. Total precipitable water
  4. Cloud analysis (cloud top temperature/pressure/height, cloud type, cloud amount, cloud phase, cloud optical thickness)
  5. Fog
  6. Rainfall Intensity
  7. Atmospheric motion vector
  8. Sea surface temperature
  9. Sea ice/snow cover detection
 10. Outgoing longwave radiance

http://dcpc.nmsc.kma.go.kr
5. Promotion of COMS MI Data Utilization

Support MDUS/SDUS installation
- Domestically 9 stations supported by KMA
  : Air Force, National Fisheries Research and Develop Institute, Seoul emergency Management Center, etc.
- Internationally 1 station supported by KMA
  : Sri ranka meteorological agency
5. Promotion of COMS MI Data Utilization: Support COMS receiving system

Plans of COMS data receiving/analysis system support program for the Philippines as a follow-up project for Sri Lanka accomplished in 2012.

- Funded US $4M by KOICA (Korea International Cooperation Agency)
- Period: 2013 ~ 2014 (2 years)
- Scope of project
  - Establishment of COMS receiving, processing and analysis system at PAGASA headquarter and only analysis system at 4 local sites
  - Technical Training
  - Dispatch of Korean Experts

Hardware Configuration of COMS receiving, processing and analysis system for PAGASA

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6. Summary and Conclusion

NMSC has kept up the systems expertly for data processing and service.

- Exclusive of the early stage of satellite and ground station operation, and also sun interference effect, COMS MI observation data receiving and processing success rate is almost perfect.

- Until now, the service success rate of the COMS MI data is over 99.81%.

- KMA will support COMS receiving, processing systems and education program for the Philippines and plan to extend this project to any other Asian user countries.

☞ To use the COMS MI data by on-line,
   Access to http://nmsc.kma.go.kr or Send E-mail kmasod@korea.kr