CMA Perspectives on Data Policy in the Context of Future Space Based Observing System

Presented to Stakeholder Consultation 3: Satellite Data and WMO Data Policy

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Outline

• FengYun Satellites Current Status
• Current Data Services
• FengYun Vision in 2025 and 2035
• Data Policy and Perspectives
1. FengYun Satellites Current Status

**FENGYUN Satellite Family**

**Polar System**
- First Generation: FY-1 A, B, C, D
- Second Generation: FY-3 A, B, C, D
- FY-3E, F, G, H planned until 2025

**Geo. System**
- First Generation: FY-2 A, B, C, D, E, F, G, H
- Second Generation: FY-4A
- FY-4B, C planned until 2025
7 Fengyun satellites operating in orbit
Global Data Receiving Network of Fengyun Satellites

Domestic: Beijing, Guangzhou, Urumqi, Jiamusi and Kashgar, 5 ground stations
The Antarctic Pole: TrollSat station, Norway
The Antic Pole: Kiruna station, Sweden

Global data access time is better than 2 hours.
Cloud & Radiation (17)
- Cloud Mask
- Cloud Amount
- Cloud Classification
- Cloud Top Temperature/Cloud Top Pressure
- Cloud Optical Depth
- the Effective Radius of Cloud
- Outgoing Longwave Radiation
- Polar Winds
- Water leaving Reflectance
- Cloud Liquid Water Content

Fengyun Products

Atmosphere (33)
- Aerosol
- Aerosol optical thickness
- Aerosol over Land Surface
- Total Precipitable Water
- Precipitation
- Rain Type
- Rain Phase
- Radar Rain Rate
- Atmospheric bending angle
- Atmospheric refractive index
- Atmospheric density
- Electron density profile
- Total sulfur dioxide column
- Total Nitrogen Dioxide column
- Atmospheric humidity profile (GNOS)
- Atmospheric temperature profile (MWTS-III/MWRI, GNOS)
- Atmospheric temperature and humidity profile (MWTS-III/MWRI, GNOS)
- Atmospheric temperature and humidity profile (HIRAS/MWHS-II/MWTS-III)
- Atmospheric temperature and humidity profile (MWRSII/HIRAS)
- Atmospheric temperature and humidity profile (MWTS-II/HIRAS)
- Atmospheric temperature and humidity profile (MWHS-II/MWTS-II/MWRI)
- Total oxygen column
- Carbon dioxide mixing ratio
- Methane mixing ratio
- total ozone column
- Nadir Ozone vertical profile
- Limb Ozone vertical profile

Ocean (7)
- MERIS Sea Surface Temperature
- MWR Sea Surface temperature
- MWR Sea surface wind direction
- GNOS Sea surface wind Speed
- PR Sea surface wind Speed
- PR Sea surface wind direction
- Sea Ice
- Snow Cover
- Snow Depth
- SWE
- Polar Sea Ice Cover

Ice & Snow (4)

Land (12)
- Land Reflectance Factor
- Land Surface Temperature
- Land Surface Bidirectional Reflectance/Albedo
- Land Cover
- Dust Product
- Area-Constant Contrast Image
- City Light/Urban low-light background mosaic
- Land Surface Temperature
- Soil moisture content
- Surface pressure
- surface reflectance

Space Weather (13)
- zeta potential
- Radiation dose
- Magnetic field
- particle (Medium and high energy proton, Electronic three-directional flow, Particle throw angle)
- scan imaging
- Push-broom scan imaging
- Aurora egg morphology
- Particle sedimentation
- IPM night product
- IPM daytime product
- IPM multi-angle product
- Solar extreme ultraviolet imager
- solar x ray imager

Biology (4)
- Leaf area index
- Fraction of Photosynthetically Active Radiation
- Net Primary Production
- Chlorophyll fluorescence

Operational Product
Research product
2. Current Data Services

**FENGYUN Satellite Data Sharing and Service Capability**

**NSMC:**
One of the largest satellite data sharing centers in China.

Over 19PB data, Average daily growth 10TB data, Total data services about 5.4PB in 2019.

Global Openness, Real-time Sharing
Integrated Space and Ground Based FY Satellite Data Service System

- **Real time**
  - Direct Broadcast
  - CMACast

- **Non-Real Time**
  - Website
  - Cloud Service
  - FTP Service
  - Manual Service
Space-based Services

- Over 2700 DVB-S users
- Over 500 Utilization Stations of Geostationary Meteorological Satellite
- Over 3000 Data User Terminals
- Over billions people viewing Satellite Cloud Images through TV and Internet
- Over 100 countries and regions

FENGYUN DB Users (29 countries)

CMACast Users (20 countries)
Application Tools

SATs: New Observation Capability

Weather monitoring and analysis
---Geostationary Satellite data (FY-2/FY-4)

Satellite Weather Application Platform
SWAP

Natural disaster and environment monitoring and analysis
---Polar orbiting Satellite data

Satellite Monitoring Application Remote sensing Toolkit
SMART

Users: New Applications
NSMC has launched 2 mobile applications on WeChat platform in 2018, *FengYun Earth View* for LEO satellites and *FengYun Live* for GEO satellites.

**FengYun Earth View** WeChat Applet release the latest 7 days global true color earth image captured by the MERSI-II instrument onboard FY-3D.

**FengYun Live** WeChat Applet shows the time-series live cloud images taken by AGRI onboard FY-4A.
FY-ESM: the Belt & Road Initiative

CMA Announced "Emergency Support Mechanism for International Users of Fengyun Meteorological Satellites in Disaster Prevention and Mitigation" on April 24, 2018
## Examples of Emergency support for some countries

<table>
<thead>
<tr>
<th>Start Date</th>
<th>Country</th>
<th>Type</th>
<th>Requestor</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/01/2018</td>
<td>Philippines</td>
<td>Volcano</td>
<td>CHARTER</td>
</tr>
<tr>
<td>12/02/2018</td>
<td>Pacific islands</td>
<td>Typhoon</td>
<td>China-GEOSS</td>
</tr>
<tr>
<td>29/07/2018</td>
<td>Indonesia</td>
<td>Earthquake</td>
<td>China-GEOSS</td>
</tr>
<tr>
<td>16/08/2018</td>
<td>Venezuela</td>
<td>Forest fire</td>
<td>CHARTER</td>
</tr>
<tr>
<td>12/09/2018</td>
<td>Vietnam</td>
<td>Typhoon</td>
<td>FY_ESM, UN-SPIDER</td>
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<tr>
<td>30/09/2018</td>
<td>Indonesia</td>
<td>Earthquake</td>
<td>China-GEOSS</td>
</tr>
<tr>
<td>30/10/2018</td>
<td>Philippines</td>
<td>Typhoon</td>
<td>FY_ESM</td>
</tr>
<tr>
<td>23/12/2018</td>
<td>Indonesia</td>
<td>Tsunami</td>
<td>CHARTER</td>
</tr>
<tr>
<td>30/01/2019</td>
<td>Brazil</td>
<td>Dam collapse</td>
<td>China-GEOSS</td>
</tr>
<tr>
<td>28/03/2019</td>
<td>IRAN</td>
<td>Flood</td>
<td>China-GEOSS</td>
</tr>
<tr>
<td>06/04/2019</td>
<td>Korea</td>
<td>Forest fire</td>
<td>CHARTER</td>
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Pioneer Planning for Fengyun Satellite Application (2020-2021)

Data & Product preparation
- FY-3E: WindRAD, GNOS-2, MERSI-LL and Sounder instrument data and product
- FY-4B: GFI L1 data and basic product
- Platform preparation: SWAP, SMART, and MICAPS
- Data service: internet, DB station software packages

For users who want to attend this project, NSMC will open a registration webpage in September 2020 on NSMC website ([http://data.nsmc.org.cn/pi.html](http://data.nsmc.org.cn/pi.html)).
3. FENGYUN Vision in 2025 and 2035

- FY-3 EM, AM, PM
- FY-3 Rainfall Mission
- FY-4 East, West
- FY-4 Microwave
- FY-3 Continuity
- FY-4 Continuity
- FY-5
- FY-6
- Radiometric Benchmark Mission

WMO DATA CONFERENCE PREPARATION WORKSHOPS

![Satellite Network Diagram]

- FY-3 Continuity
- FY-4 Continuity
- FY-5
- FY-6
- Radiometric Benchmark Mission

WMO DATA CONFERENCE PREPARATION WORKSHOPS

![Satellite Network Diagram]
4. Data Policy and Perspectives

Management Measures for FengYun Meteorological Satellite

- Data Policy compliance with "Management Measures for FengYun Meteorological Satellite", released by China Meteorological Administration (CMA) in 2018
- Specifies FY Meteorological Satellite Basic Data Catalog
- Highlight: international and domestic users can have free access to basic observation data and quantitative products of 16 instruments of FY-2, FY-3, and FY-4 operational satellites.

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Instrument</th>
<th>Data and Products</th>
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<tbody>
<tr>
<td>FY-2&lt;sup&gt;o&lt;/sup&gt;</td>
<td>VISSR&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1, L2 and L3&lt;sup&gt;o&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>MERSI&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1, L2 and L3&lt;sup&gt;o&lt;/sup&gt;</td>
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<td>VIRR&lt;sup&gt;o&lt;/sup&gt;</td>
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<td>MWRI&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1, L2 and L3&lt;sup&gt;o&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>MWTS&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1&lt;sup&gt;o&lt;/sup&gt;</td>
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<td>MWHS&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1, L2 and L3&lt;sup&gt;o&lt;/sup&gt;</td>
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<td></td>
<td>* GNOS&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1 and L2&lt;sup&gt;o&lt;/sup&gt;</td>
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<td>* SBUS&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1&lt;sup&gt;o&lt;/sup&gt;</td>
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<td></td>
<td>* TOU&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1, L2 and L3&lt;sup&gt;o&lt;/sup&gt;</td>
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<td>* ERM&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1&lt;sup&gt;o&lt;/sup&gt;</td>
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<td>* SIM&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1&lt;sup&gt;o&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>* ERBM&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L2&lt;sup&gt;o&lt;/sup&gt;</td>
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<tr>
<td>FY-3&lt;sup&gt;o&lt;/sup&gt;</td>
<td>AGRI&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1 (Full disk and regional observation), L2 and L3&lt;sup&gt;o&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>GHIRS&lt;sup&gt;o&lt;/sup&gt;</td>
<td>L1 and L2&lt;sup&gt;o&lt;/sup&gt;</td>
</tr>
<tr>
<td>FY-4&lt;sup&gt;o&lt;/sup&gt;</td>
<td>* Data accessed via internet only</td>
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According to the content of Fengyun meteorological satellite sharing data can be classified:

1. **Internal use Data**: Level 0 data.
   - Internal use data is only provided to satellites and instruments R&D users.

2. **Basic Data**: level 1, level 2 and level 3 data automatically generated by the Fengyun Meteorological Satellite Ground System.
   - Basic data can be provided to all users free of charge.

3. **Customized Data**: Derived data or product by reprocessing on basic data according to the specific requirement of users.
   - Customized data is provided according to user’s requirement.
FY Meteorological Satellite Data Policy For International Users

• The National Meteorological Services (“NMSs”) of the WMO Members States can obtain all Basic Data for their official duty use at no cost based on the related WMO resolutions. Customized data requirement should consulted with CMA.

• Other international & regional organizations can obtain all Basic Data after sign a bilateral agreement with CMA.

• For non-commercial activities (public welfare education, science popularization, scientific research etc.), the users can obtain Basic Data at no cost with the prescribed procedures. For Customized Data, the cost of data processing and service support shall be charged.

• For commercial activities that require the use of Fengyun meteorological satellite data shall sign a official service contract with CMA.
4. Perspectives

• Continue to implement the open sharing data policy, WMO Members can obtain FY meteorological satellite data through Direct broadcast, CMACast and website.

• Precise Data Classification and User Segmentation:
  – WIGOS consists of tiered observing networks: comprehensive, baseline and reference
  – The space-based observing data should be precise classified to support segmented users’ requirement.

• New data sharing trend requires data policy update:
  – Traditional data sharing: Move data to user.
  – Data volume increases rapidly, New trend: Move user’s application to data by using cloud technology.

• Encourage private sectors to develop space-based observation to fill the spatial, temporal and spectrum gaps, complementary with traditional observation.
Make the data better and easier to use!