Use of Satellite Data in Emergency Situations in CMA

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Outline

• Emergency Response to natural disasters in China

• Use of Satellite data in Emergency Situations in China

• Suggestions
Emergency Situations in China

Natural disaster

Major Natural disasters Map in China

Economic loss of different disasters

Emergency events in China
In the west of China, the natural disasters happened frequently, but the ground stations and radar sites are quite scarce and not enough in this large area.
The advantages of satellite data in emergency events

- Full area coverage
- High spatial-temporal resolution
- Plentiful observation information
The Observation and Data service of FY Satellites

- Global observation---FY-3 series
- High frequency and Specific regional rapid scan mode---FY-2 series
- Real-time data dissemination via CMACast, Website ....
Use of Satellite data in Emergency Situations in China

Multi-mode emergency response mechanisms

- Active Mode
- Emergency Response Mechanisms
- Passive Mode
- Cooperative Mode
Passive Emergency Response Mode

Users Requirement → Prepare Data → Distribute Data and Products

Severe Sudden hazards & coming disastrous weather → Start Emergency Response

CMA/relative administrative department

Instruction → Report disaster information

Data processing

NSMC

Data processing Product Making (Total Time: 1-3h)

Validation disaster Provide product → Feedback

Local department

Information collection Disaster investigation Data processing

Users

Analysis report of Monitoring and evaluation of Disaster Monitoring Image of satellite Thematic map of monitoring and evaluation
Chan-hom landed to Zhejiang province on Jul. 10\textsuperscript{th}, brought heavy rainfall and disasters.
NMC request Rapid Scan mode

NSMC adjust FY-2F observation to Regional Rapid Scan (RRS) — within 1 h

- Improving the accuracy of Typhoon center location.
- Enhancing the time effectiveness of typhoon position in 10-15 minutes.
- Promoting the precipitation forecasting accuracy.
Rapid Data Distribution for Chan-hom

- FY-2F RRS data compressed from 200M to 10M
- Broadcasted through special channel of CMACast
- Users receive data no more than 2 min.
Compositional analysis for Chan-hom

NSMC supply compositional analysis products for typhoon forecasting

Three-dimension thermal structure

Precipitation estimation

Atmospheric motion vector
Passive Emergency Response Mode in 2015

• During 2015, CMA started **21 times passive Emergency response** for severe weather events (typhoon and rainstorm).

• Meteorological Satellite provided powerful support.

• **24h forecasting error of typhoon reduced to 67km.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Passive Emergency of CMA</th>
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</thead>
<tbody>
<tr>
<td>25-27, May</td>
<td>Rainstorm III</td>
</tr>
<tr>
<td>26-28, June</td>
<td>Rainstorm III</td>
</tr>
<tr>
<td>1-3, July</td>
<td>Typhoon III</td>
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<tr>
<td>8-10, July</td>
<td>Rainstorm III</td>
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<tr>
<td>11-14, July</td>
<td>Typhoon I</td>
</tr>
<tr>
<td>16-19, July</td>
<td>Rainstorm III</td>
</tr>
<tr>
<td>18-19, July</td>
<td>Typhoon IV and Rainstorm III</td>
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<tr>
<td>1-2, August</td>
<td>Typhoon IV</td>
</tr>
<tr>
<td>12-15, August</td>
<td>Typhoon II</td>
</tr>
<tr>
<td>12, August</td>
<td>Rainstorm IV</td>
</tr>
<tr>
<td>21-22, August</td>
<td>Typhoon III</td>
</tr>
<tr>
<td>19-22, September</td>
<td>Typhoon II</td>
</tr>
<tr>
<td>29-30, September</td>
<td>Typhoon IV</td>
</tr>
<tr>
<td>4-7, October</td>
<td>Typhoon II</td>
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<tr>
<td>12-15, October</td>
<td>Typhoon III</td>
</tr>
<tr>
<td>1-5, November</td>
<td>Typhoon III</td>
</tr>
<tr>
<td>8-11, November</td>
<td>Typhoon III</td>
</tr>
</tbody>
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Forecasting distance errors comparison

24h error of typhoon path prediction

**KM**

**2010** | **2011** | **2012** | **2013** | **2014** | **2015**
Active Emergency Response mode

Daily monitoring ➔ detect disasters ➔ start emergency response ➔ products distribution

Generally, The whole information preparation is no more than 3 hours.
The preplan of grass land fire emergency response from Agriculture Ministry

1. **NSMC/CMA**
   - Inform fire spot

2. **Local office of Grass Land Fire Prevention**
   - Report fire event
   - Validate fire
   - Validate & feedback

3. **Headquarter Office of Grass Land Fire Prevention**
   - Report grass land fire apply for initiating certain level of preplan
   - Instruction

4. **Headquarters of Grass Land Fire Prevention**
   - Work out information
   - On duty of Agriculture administration
   - Instruction

5. **State Council**
FY-3A found a big grass land fire in the east part of Mongolia, it spread very fast, 2 hours later, it was quite close to the boundary. NSMC soon informed the grass land fire prevention office, they start the emergency response immediately, then the local fire fighting department received the instruction and went to the boundary to prevent the fire spreading.
FY-2E monitor a grassland fire in one hour frequency (April 19 to 20)
Distribution of satellite information for emergence response

During the emergence response, the monitoring result of meteorological satellite was distributed to the website of Management system of Agriculture Ministry for grass land fire prevention.

Meteorological satellite plays a significant role in the emergency response of grassland fires. It was estimated, since the beginning of this century, the loss caused by grassland fire on China reduce about 400 million RMB.
Thematic Products in Active Mode of Emergence Response

In China, many kinds of disasters, such as snow disaster, flood, drought, volcano eruption can be detected by meteorological satellite in the early stage, administrative departments often start emergency response based on the satellite information.
Cooperative mode

International Charter
Space and Major Disasters

Responding time (<12 hours)

Major disaster in China

Disaster analysis
(location, data source requirement)

International Charter
Space and Major Disasters

Meteorological satellite data,
Chinese high spatial resolution
satellite data (GF, HJ)

Data-sharing platform
Other countries satellite
data processing

Emergency product(images, figures, reports)

Product distribution

Feedback
Quickly response to The flood in Heilongjiang province in 2013

Lots of high spatial resolution data, including Landsat-8, RADARSAT-2, TerraSAR-X, RISAT-1 be used.
Quickly responding to the Mud-rock Flow in Zhouqu County, west of China

Barrier lake

Mud-rock flow body
Suggestion

Disadvantages of current emergency response modes

National issue

• Products are quite simple
• Data transmission ability is insufficient

International issue

• Who wants it?
• What do they need?
• How to get it?
Super typhoon HAIYAN landed to the northeast Vietnam at 04:00 on November 11, 2013, it brought great disaster to Vietnam.

Established Emergency mode

24 h before landing

Passive emergency mode

FY-2F 6 min RRS

HAIYAN intensity and position monitoring and forecasting

WMO: FY-2F data transmission requirements to Vietnam

Exchange TC information by Email

Failed for real time data transmission

Users requirement when global disasters happened

The issue of international cooperation in typhoon HAIYAN
Future plan for enhancing data transmission ability in China

Mobile terminal will be used for receiving satellite information. More professional information will be developed to the features of specific disasters.
Based on this mechanism, the disaster information and product sharing platform will be built.
Thank you