



Use of Satellite Data in Emergency Situations in China

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Coordination Group for Meteorological Satellites
22 May. 2014, Guangzhou, China

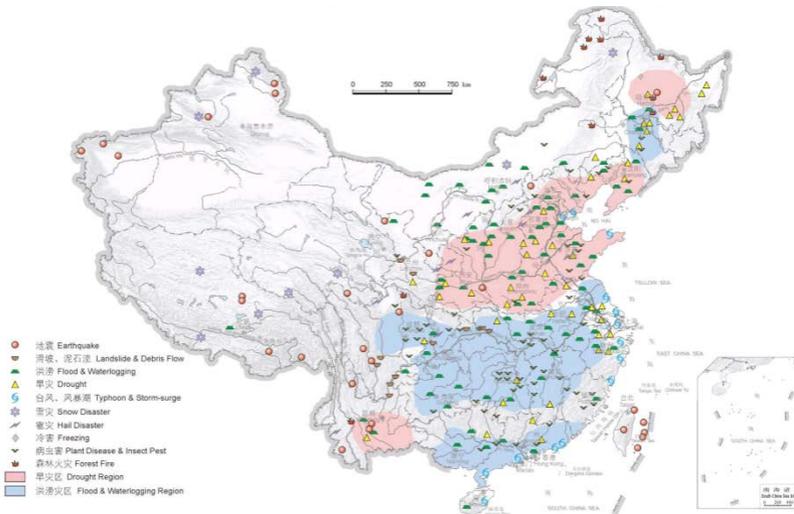


Outline

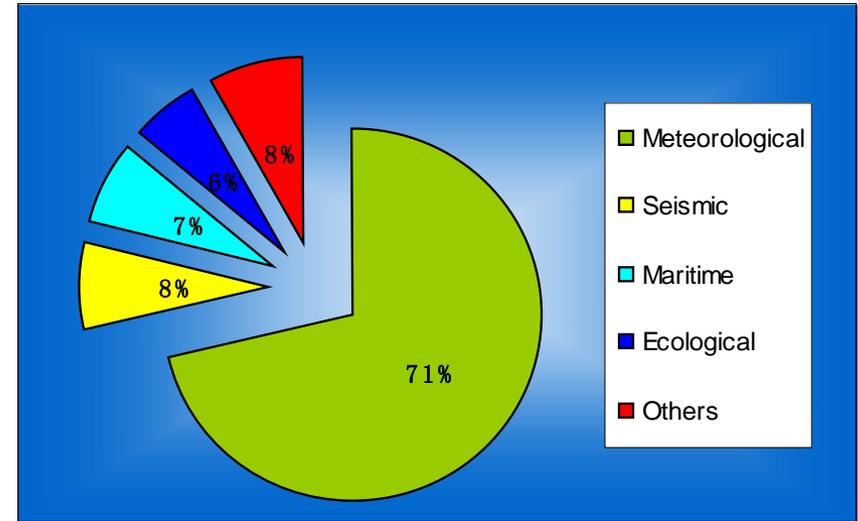
- **Emergency Response to natural disasters in China**
- **Use of Satellite data in Emergency Situations in China**
- **Suggestions**

Emergency Situations in China

Natural disaster



Major Natural disasters Map in China



Economic loss of different disasters

Emergency events in China



Meteorological Observation Network

- Ground stations
- Doppler Radars
- Meteorological satellites



Ground station network



New generation Doppler Radars network

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.

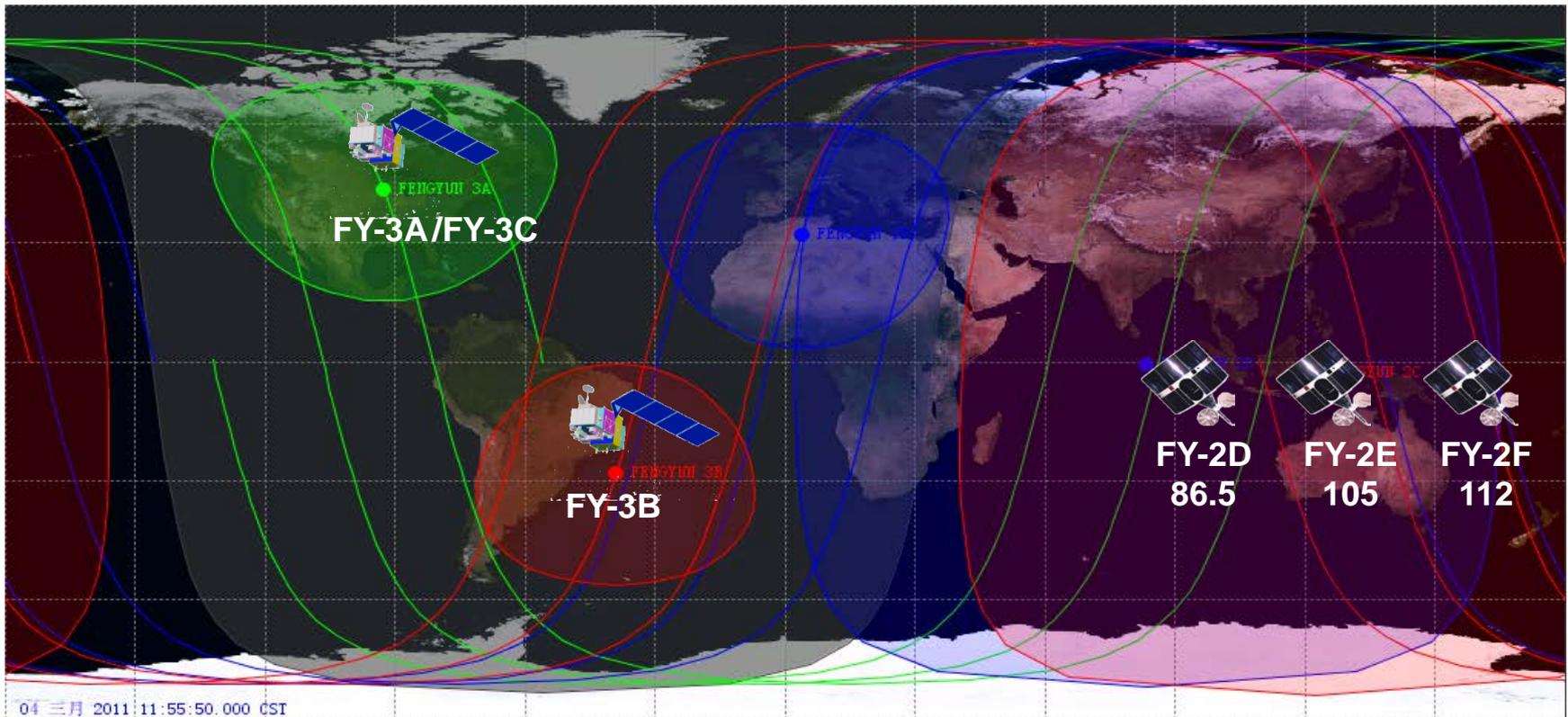
The advantages of satellite data in emergency events

- ✓ Full area coverage
- ✓ High spatial-temporal resolution
- ✓ Plentiful observation information



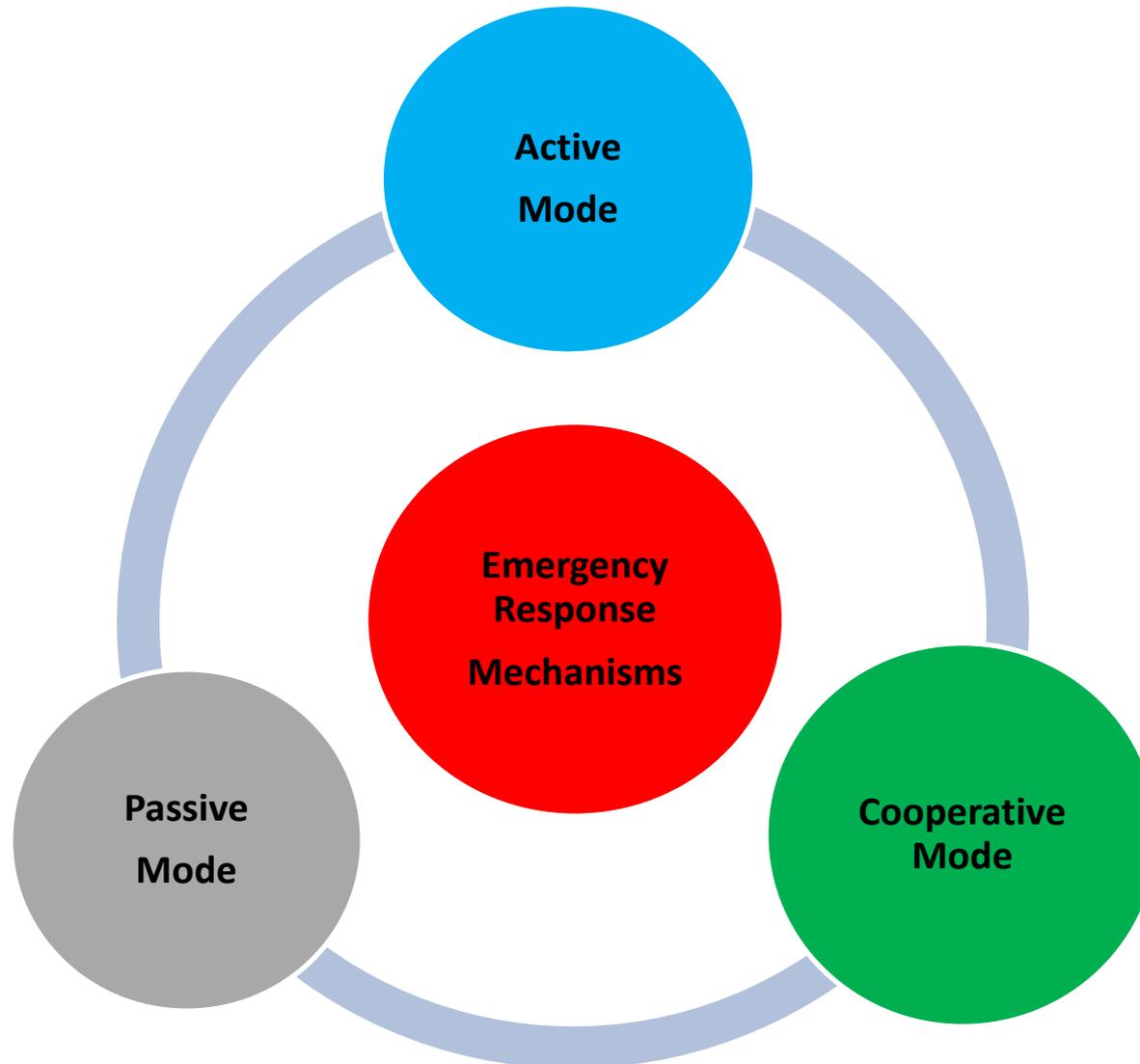
The Observation and Data service of FY Satellites

- 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

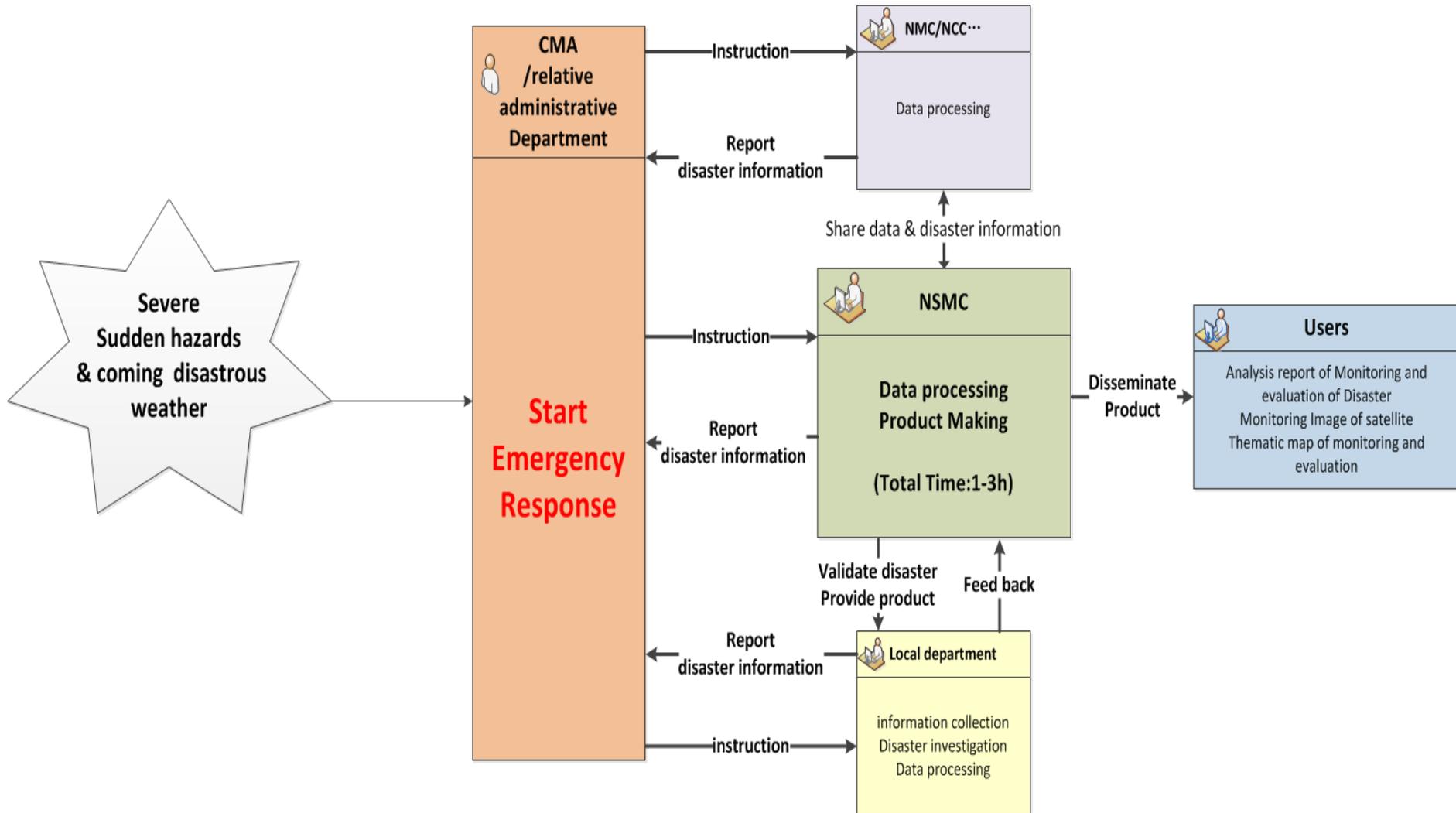


Passive Emergency Response Mode

Users Requirement

Prepare Data

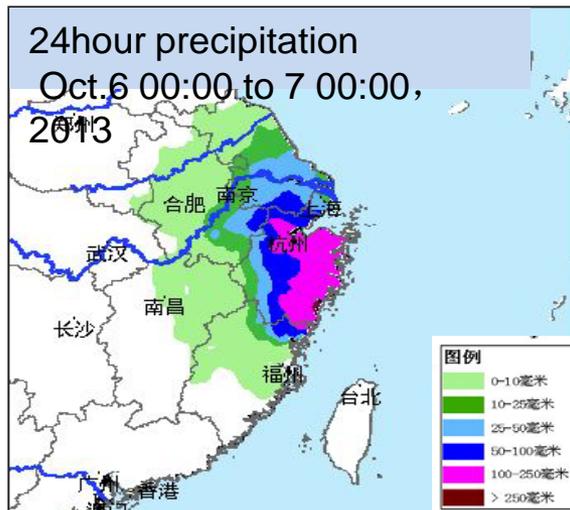
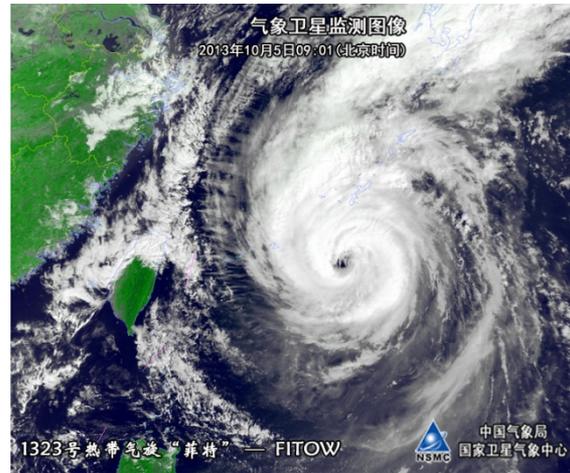
Distribute Data and Products



Passive Emergency Response Mode

— Typhoon FITOW (No.23,2013)

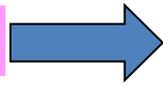
FITOW landed to Fujian province on Oct. 7th, brought heavy rainfall and disasters.



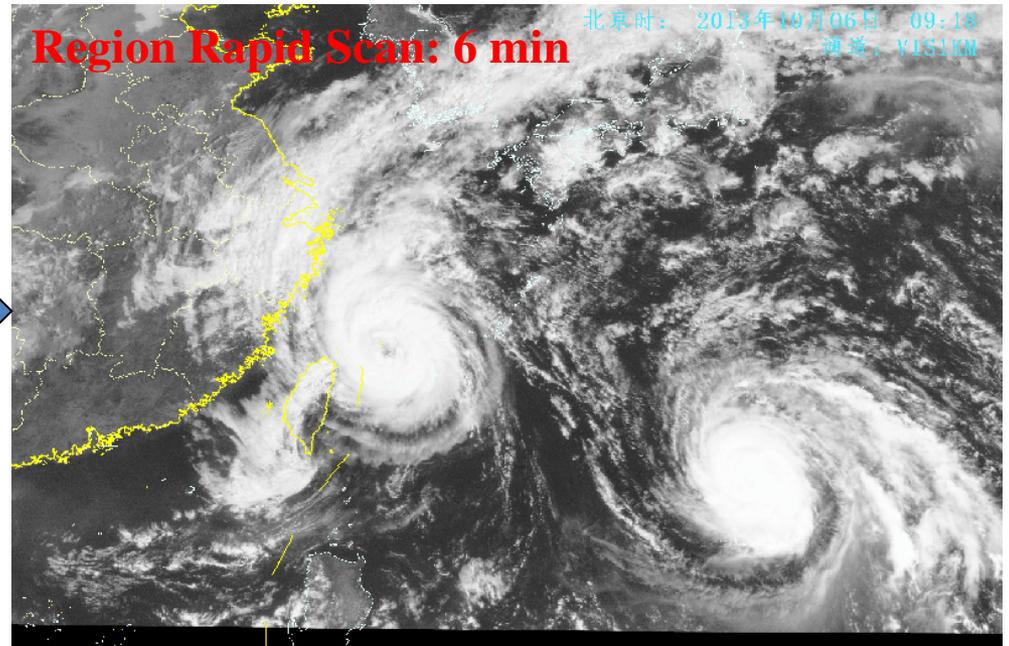
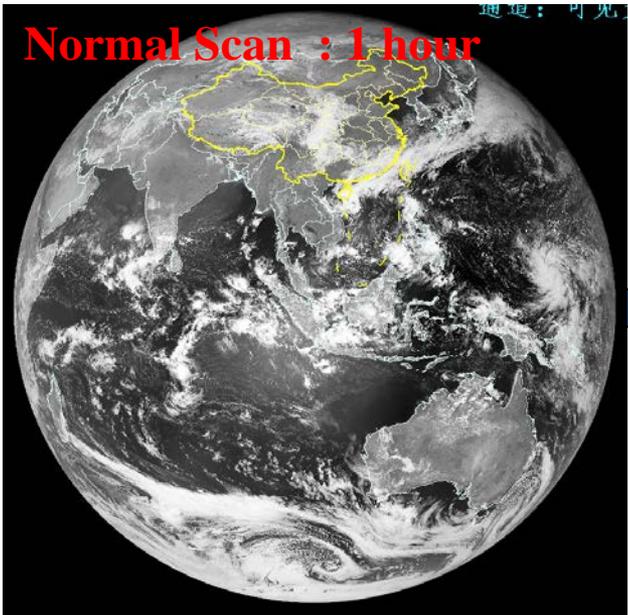
**CMA start
emergency
response II**

FY-2F Observation mode adjustment for FITOW

NMC request Rapid Scan mode



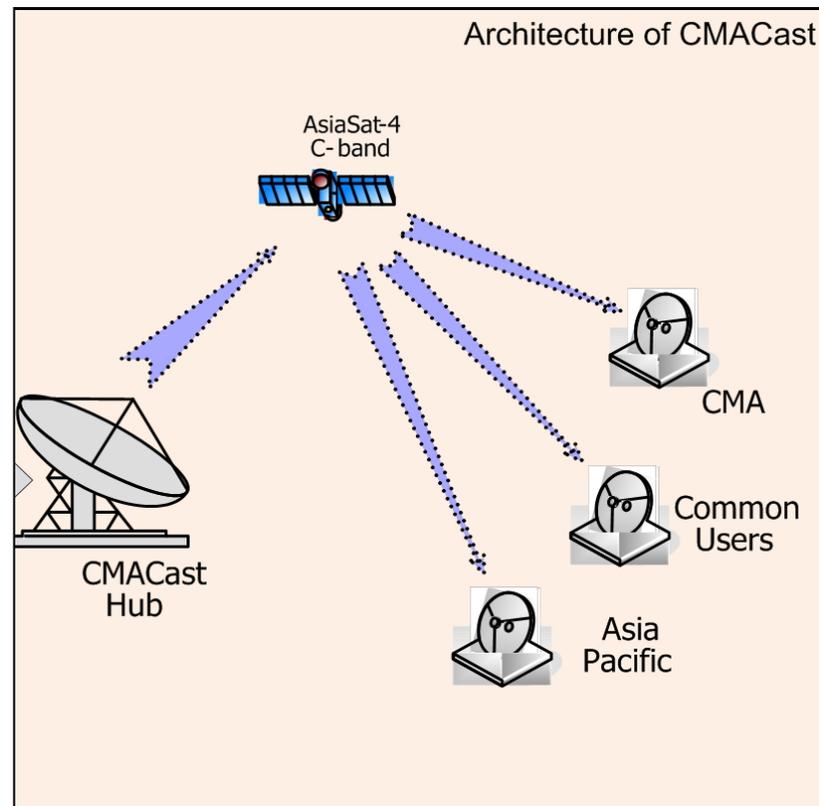
NSMC adjust FY-2F observation to Regional Rapid Scan (RRS) — **within 1 h**



- Improving the accuracy of Typhoon center location.
- Enhancing the time effectiveness of typhoon position in 10-15 minutes.
- Promoting the precipitation forecasting accuracy.

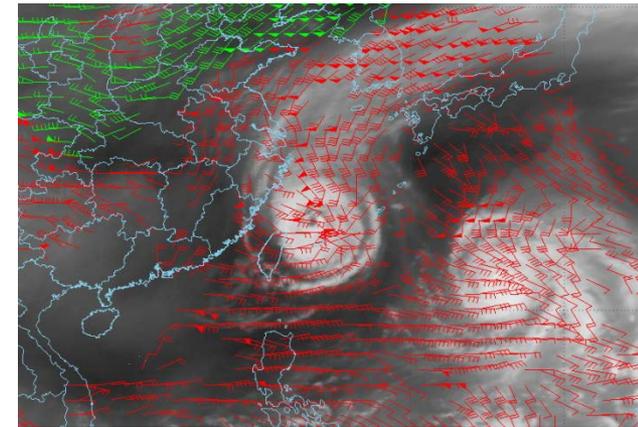
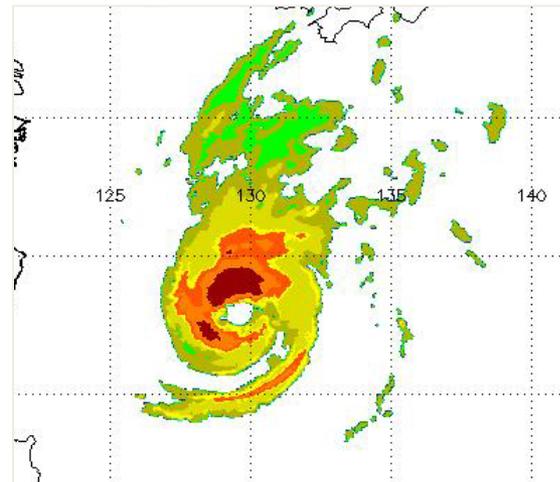
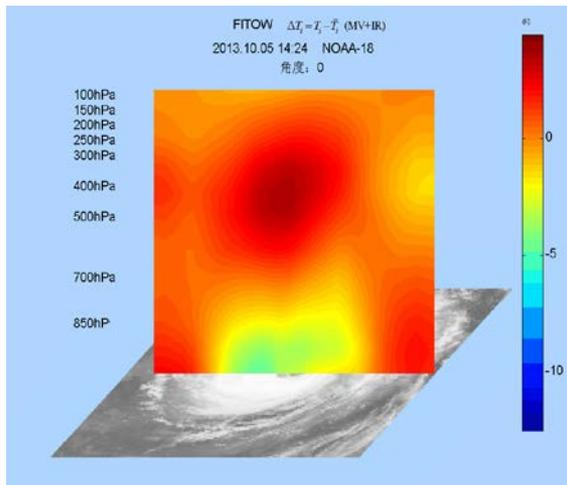
Rapid Data Distribution for FITOW

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



Compositive analysis for FITOW

NSMC supply compositive analysis products for typhoon forecasting



Three-dimension thermal structure

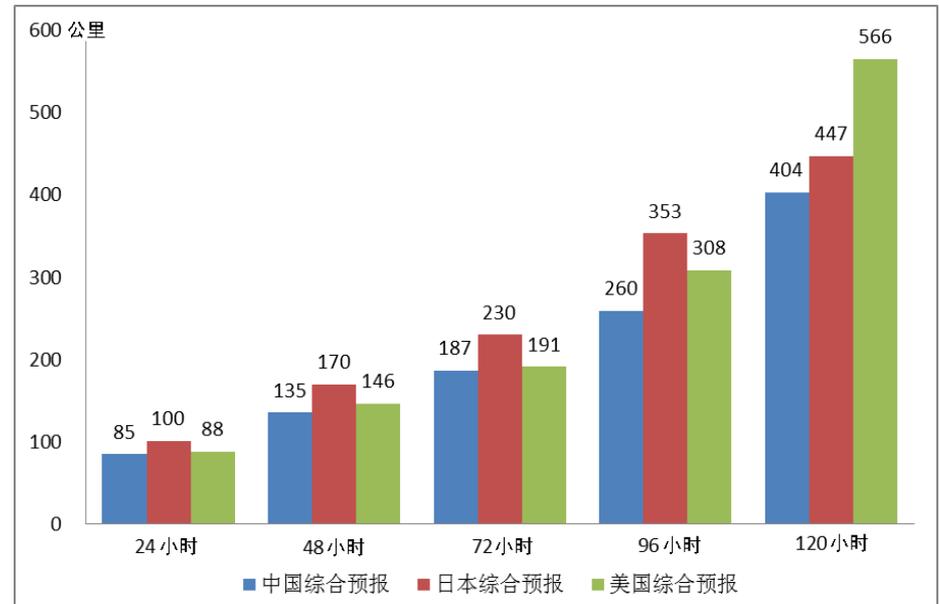
Precipitation estimation

Atmospheric motion vector

Passive Emergency Response Mode in 2013

- During 2013, CMA started **22 times passive Emergency response** for severe weather events (typhoon, rainstorm and earthquake).
- Meteorological Satellite provided powerful support.
- 24h forecasting error of typhoon reduced to **85km**.

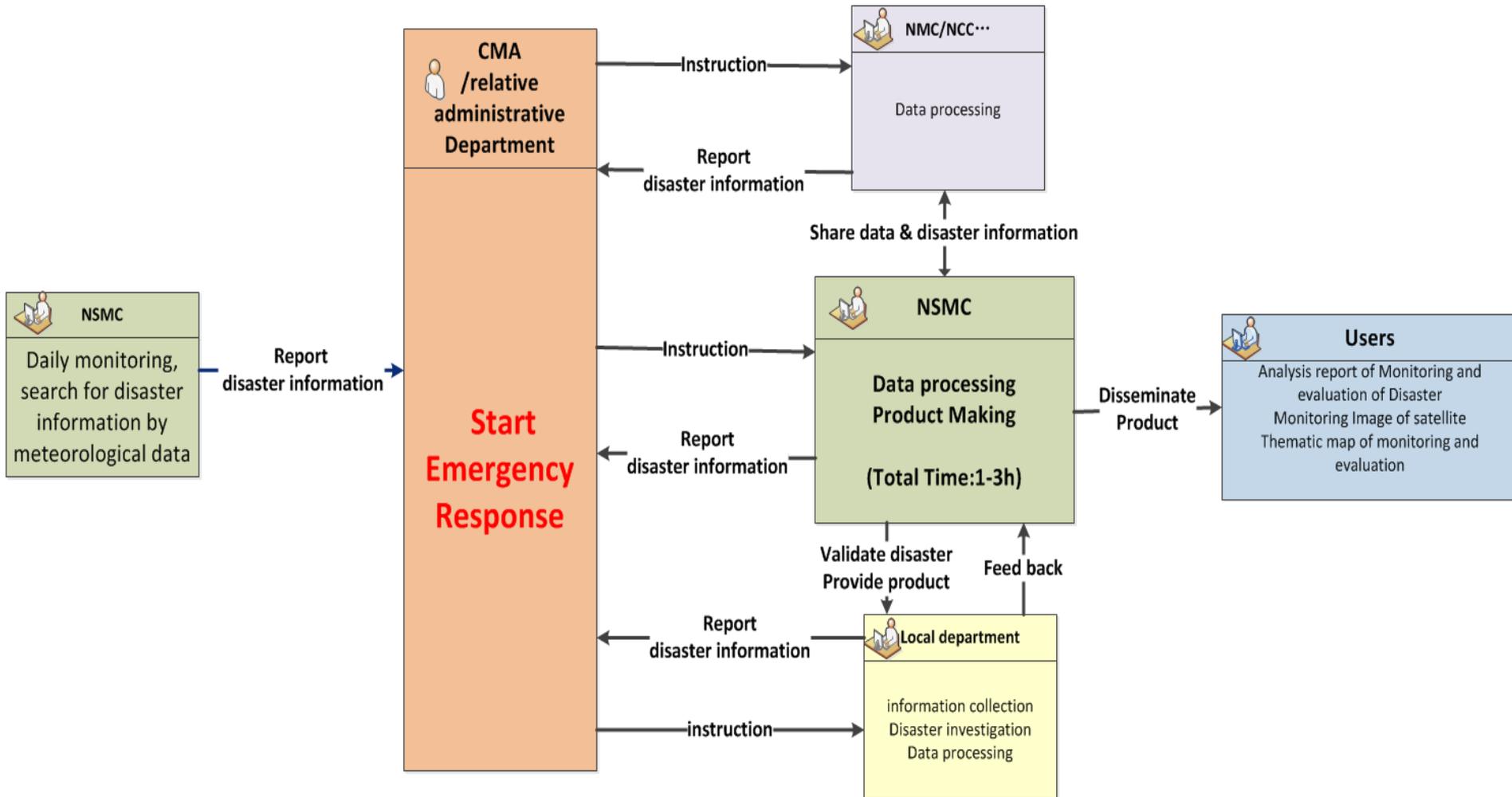
Date	Possible Emergency of CMA
25-27, May	Rainstorm III
26-28, June	Rainstorm III
1-3, July	Typhoon III
8-10, July	Rainstorm III
11-14, July	Typhoon II
16-19, July	Rainstorm III
18-19, July	Typhoon IV and Rainstorm III
1-2, August	Typhoon IV
12-15, August	Typhoon II
12, August	Rainstorm IV
21-22, August	Typhoon III
19-22, September	Typhoon II
29-30, September	Typhoon IV
4-7, October	Typhoon II
12-15, October	Typhoon III
1-5, November	Typhoon III
8-11, November	Typhoon III
20, April	Earthquake III
22-25, July	Earthquake III



Forecasting distance errors comparison

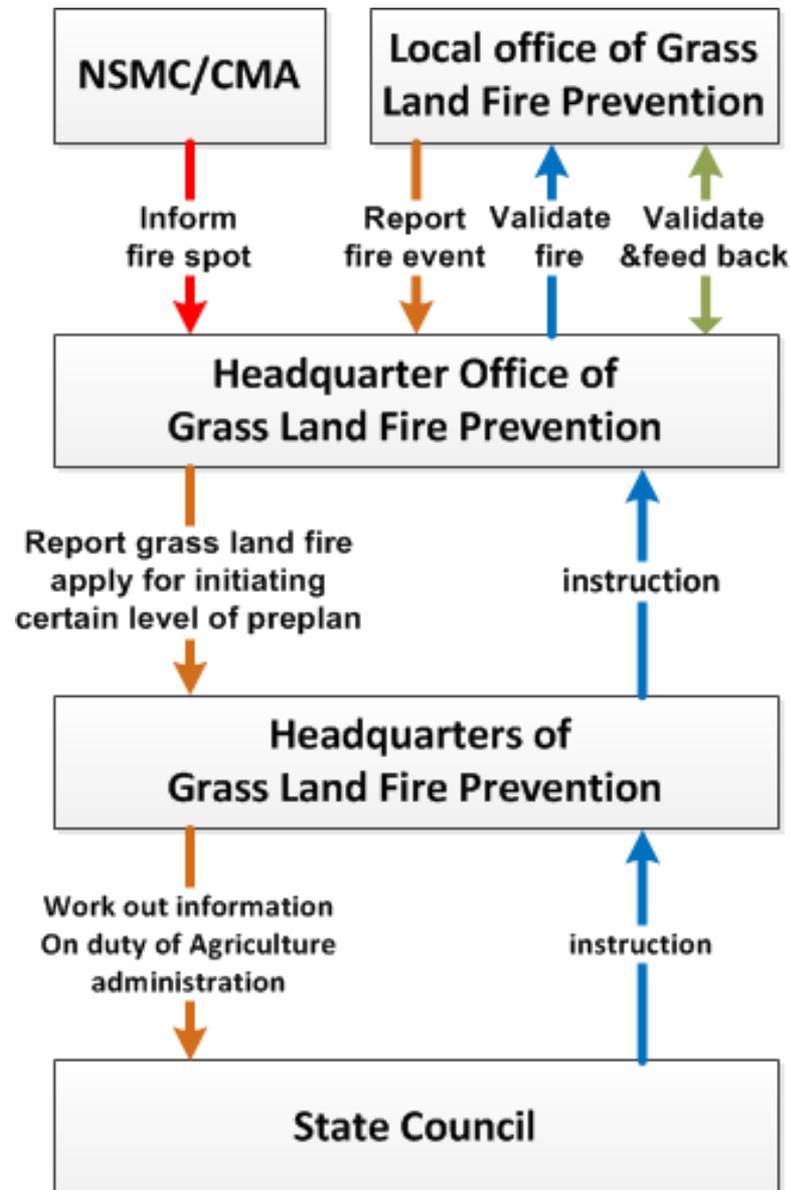
Active Emergency Response mode

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

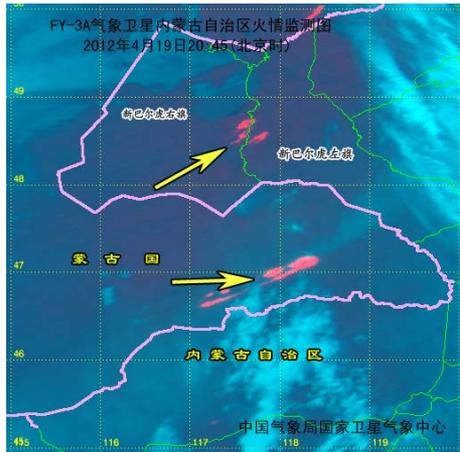


Generally, The whole information preparation is no more than 3 hours.

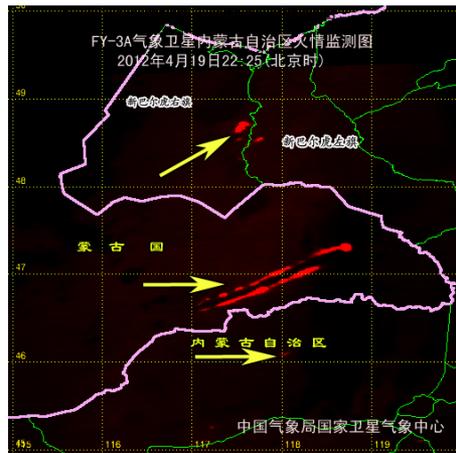
The preplan of grass land fire emergency response in Agriculture Ministry



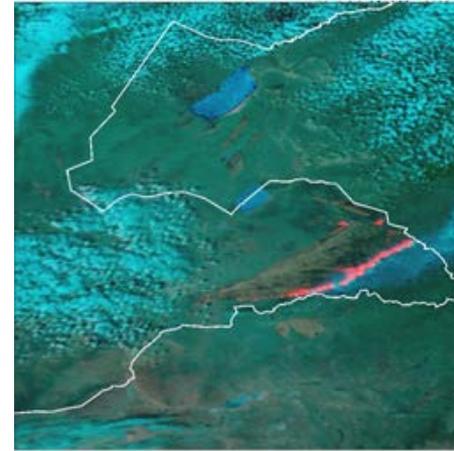
Grass land fire Emergence Response to a big grass land fire April 19, 2012



20:46 of April 19



22:25 of April 19



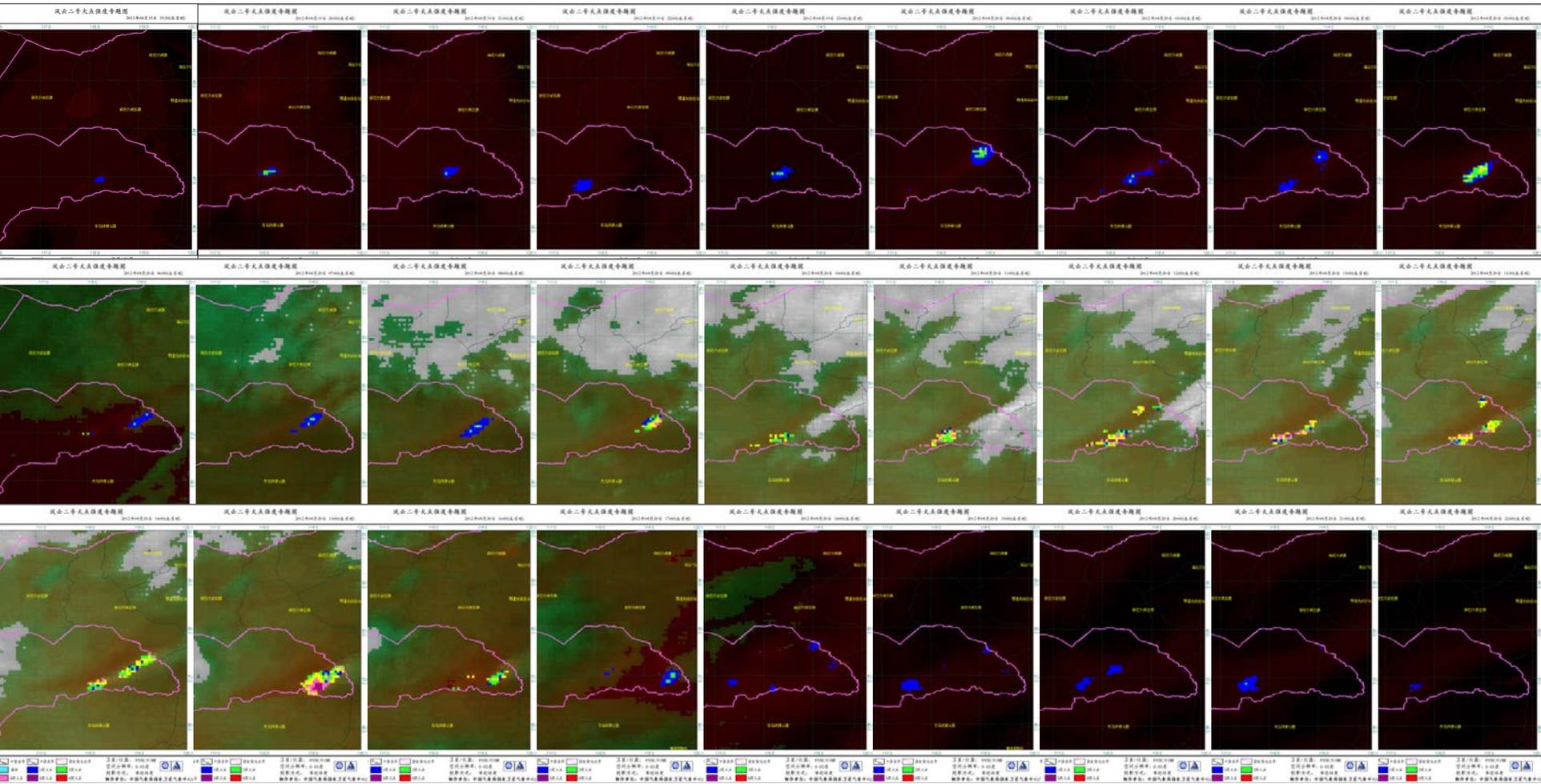
13:33 of April 20



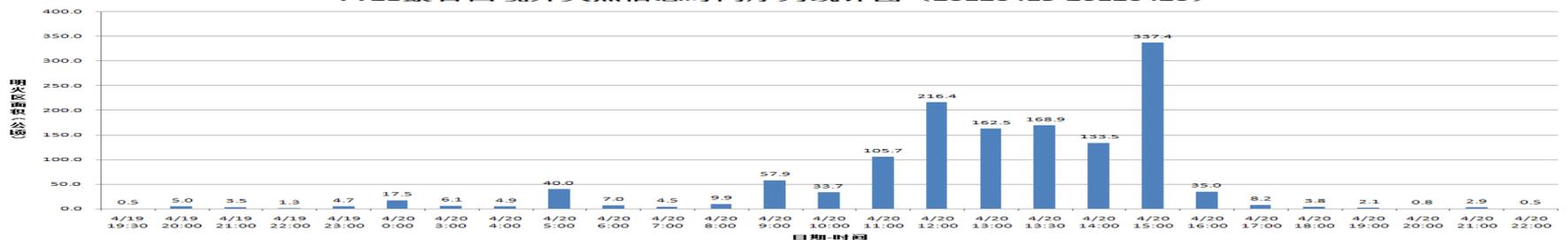
13:14 of April 22

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)



FY2E 蒙古国境外火点信息时间序列统计图 (20120419-20120420)



Distribution of satellite information for emergency response

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



国家卫星气象中心草原防火信息发布系统 防火值班 文献管理 热点管理

监测信息发送

已发信息浏览

监测卫星管理

火险预警图发布

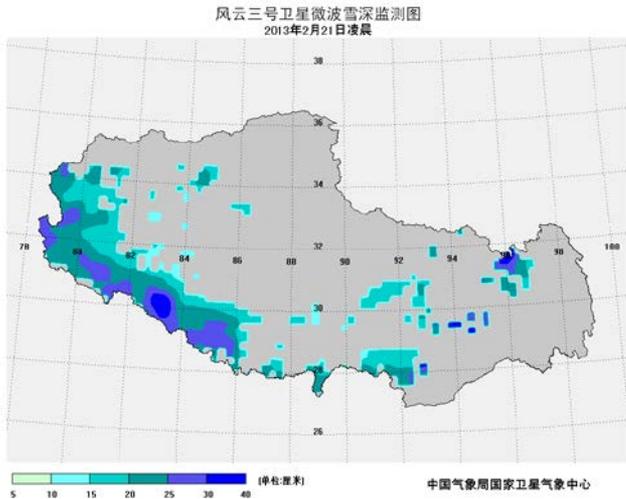
监测图像浏览

第 1 页 共 1 页 共 5 条

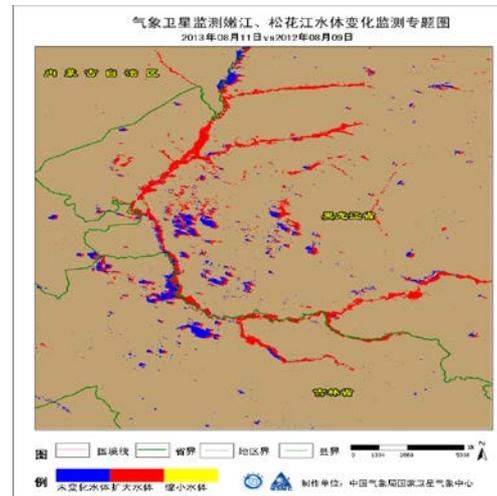
卫星标识	卫星入境时间
NOAA-18	2010-09-26 12:26
NOAA-18	2010-09-26 14:01
NOAA-18	2010-09-26 12:10
NOAA-18	2010-09-25 14:00
NOAA-18	2010-09-01 12:47

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 .

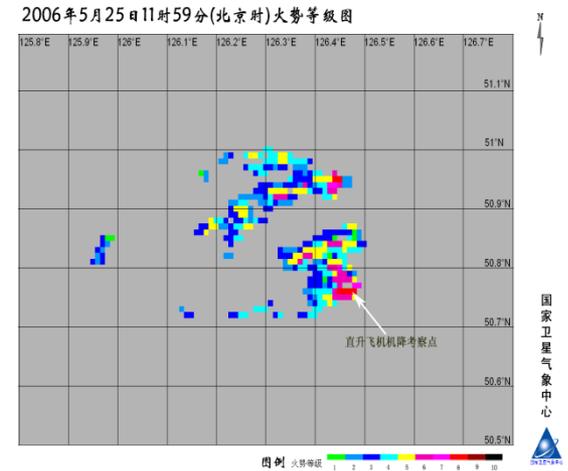
Thematic Products in Active Mode of Emergency Response



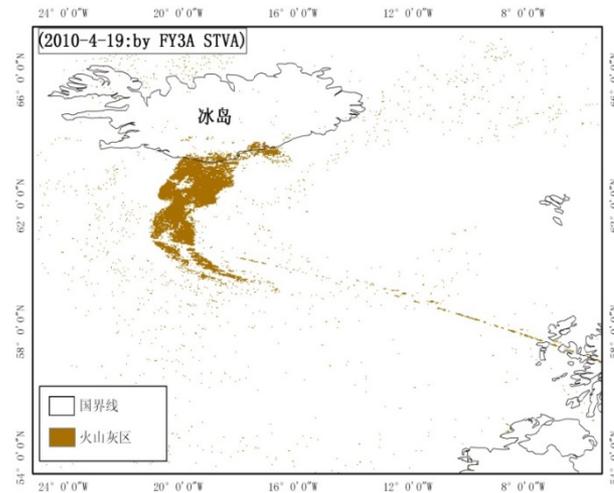
Snow storm monitoring



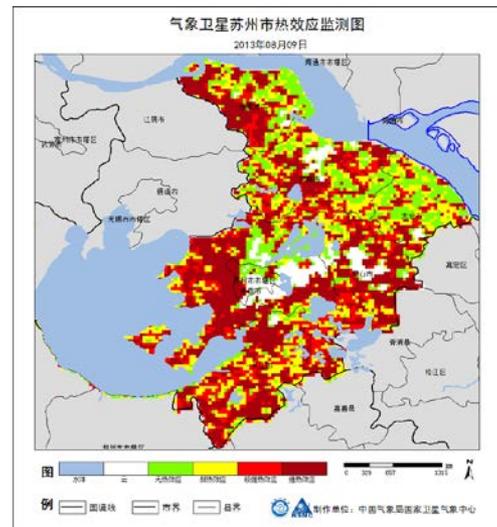
Flood monitoring



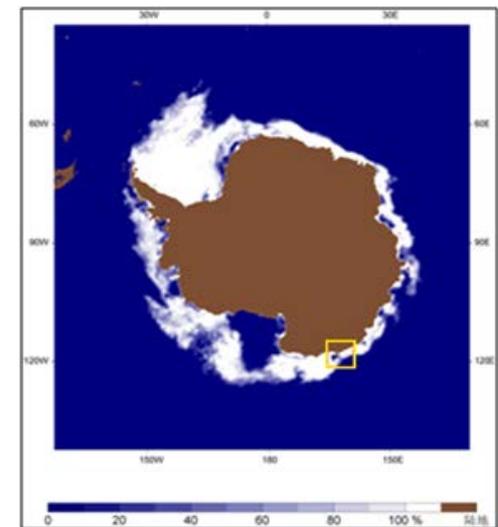
Forest fire intensity



Volcano ash clouds



High temperature weather



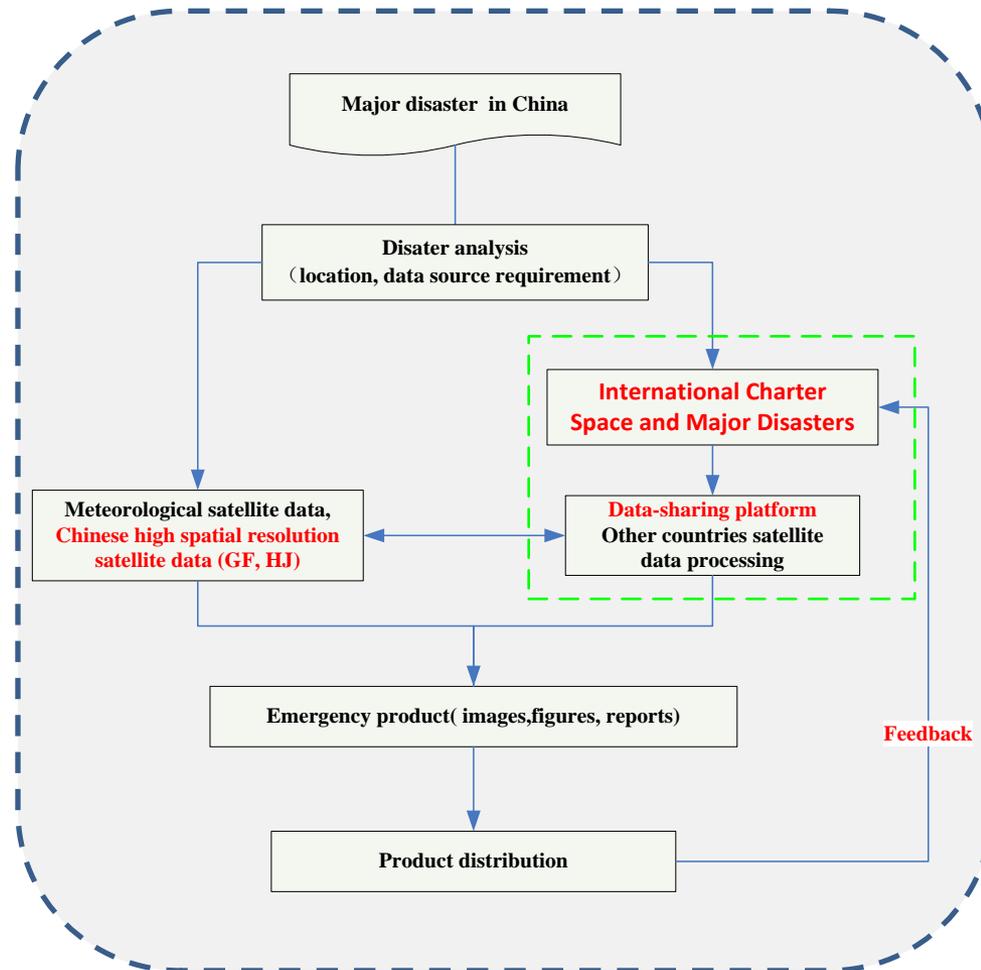
Sea ice in South Pole

Cooperative mode



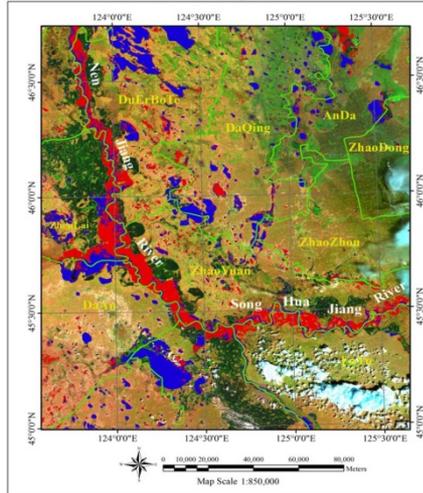
International Charter Space and Major Disasters

Responding time (<12 hours)



Quickly response to The flood in Heilongjiang province in 2013

Flood in northeast China (August 2013)
Water surface extension at 2013-8-17
Nen Jiang River and Song Hua Jiang River Basin
Charter Call ID: 447 Date: August 16, 2013



Area Location

Legend

- Satellite image extent
- River
- Lakes
- Province Boundary
- Post-Disaster Flooded Areas
- Pre-Disaster Water Extent

Description

The post-disaster flood extent was estimated from Radarsat-2 SAR in ScanSAR Narrow with HH polarization at 12.5m resolution acquired at 17/8/2013 09:37 UTC.

The pre-disaster water extent was estimated from Landsat-8 images at 30m resolution acquired at 17/6/2013 02:29 UTC.

The Landsat-8 images (Path: 119 Row: 28, 29) acquired at June 17, 2013 in RGB composit (R: band 7, B: band 5, G: band 3) show the pre-disaster conditions.

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Cartographic Information

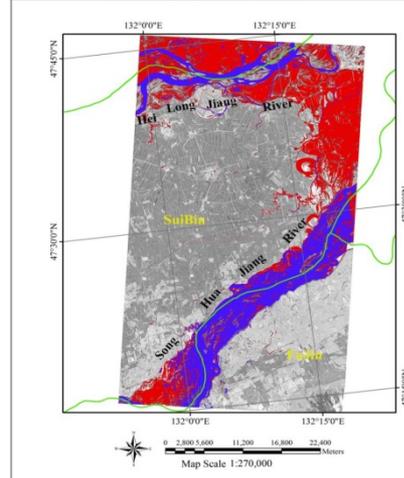
Map Projection: UTM
Datum: WGS84
Units: Meter

Map Production

Map was generated on August 2013
by the National Satellite Meteorological Center (NSMC),
China Meteorological Administration (CMA).
<http://www.nsmc.cma.gov.cn/>

The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Flood in northeast China (August 2013)
Water surface extension at 2013-8-19
Song Hua Jiang River and Hei Long Jiang River Basin
Charter Call ID: 447 Date: August 16, 2013



Area Location

Legend

- Satellite image extent
- River
- Lakes
- Province Boundary
- Post-Disaster Flooded Areas
- Pre-Disaster Water Extent

Description

The post-disaster flood extent was identified from TerraSAR-X in Strip model with HH polarization at 3.25m resolution acquired at 22/8/2013 21:24 UTC.

The pre-disaster water extent was estimated from Landsat-8 image at 30m resolution acquired at 23/7/2013 04:48 UTC.

The pre-disaster and post-disaster Water bodies which detected from Landsat-8 and TerraSAR-X images are superposed to TerraSAR-X image (backscatter intensity values in gray scale).

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"TerraSAR-X/TanDEM-X © 2012 German Aerospace Center (DLR), 2012 Astrium Services / Infoterra GmbH"

Cartographic Information

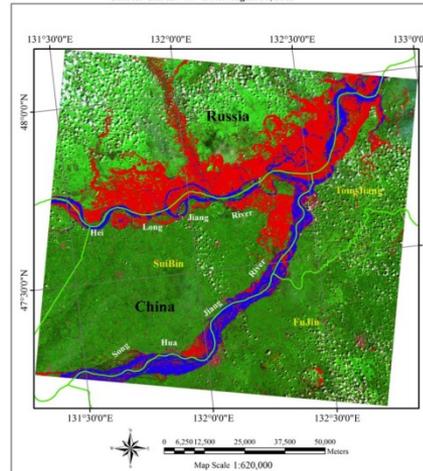
Map Projection: UTM
Datum: WGS84
Units: Meter

Map Production

Map was generated on August 2013
by the National Satellite Meteorological Center (NSMC),
China Meteorological Administration (CMA).
<http://www.nsmc.cma.gov.cn/>

The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Flood in northeast China (August 2013)
Water surface extension at 2013-8-21
Song Hua Jiang River and Hei Long Jiang River Basin
Charter Call ID: 447 Date: August 16, 2013



Area Location

Legend

- Satellite image extent
- River
- Lakes
- Province Boundary
- Post-Disaster Flooded Areas
- Pre-Disaster Water Extent

Description

The post-disaster flood extent was obtained from Radarsat-2 SAR in standard mode with HH polarization at 12.5m resolution acquired at 21/8/2013 21:30 UTC.

The pre-disaster water extent was estimated from Landsat-8 images at 30m resolution acquired at 23/7/2013 04:48 UTC.

The Landsat-8 image (Path: 115 Row: 27) that acquired at July 23, 2013 in RGB composit (R: band 7, B: band 5, G: band 3) show the pre-disaster conditions.

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Cartographic Information

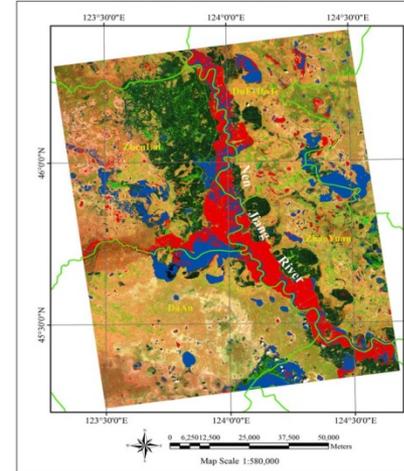
Map Projection: UTM
Datum: WGS84
Units: Meter

Map Production

Map was generated on August 2013
by the National Satellite Meteorological Center (NSMC),
China Meteorological Administration (CMA).
<http://www.nsmc.cma.gov.cn/>

The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Flood in northeast China (August 2013)
Water surface extension at 2013-8-17
Nen Jiang River Basin
Charter Call ID: 447 Date: August 16, 2013



Area Location

Legend

- Satellite image extent
- River
- Lakes
- Province Boundary
- Post-Disaster Flooded Areas
- Pre-Disaster Water Extent

Description

The post-disaster flood extent was identified from TerraSAR-X in ScanSAR mode with HH polarization at 8.25m resolution acquired at 17/8/2013 09:48 UTC.

The pre-disaster water extent was estimated from Landsat-8 images at 30m resolution acquired at 17/6/2013 02:29 UTC.

The Landsat-8 images (Path: 119 Row: 28, 29) acquired at June 17, 2013 in RGB composit (R: band 7, B: band 5, G: band 3) show the pre-disaster conditions.

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Cartographic Information

Map Projection: UTM
Datum: WGS84
Units: Meter

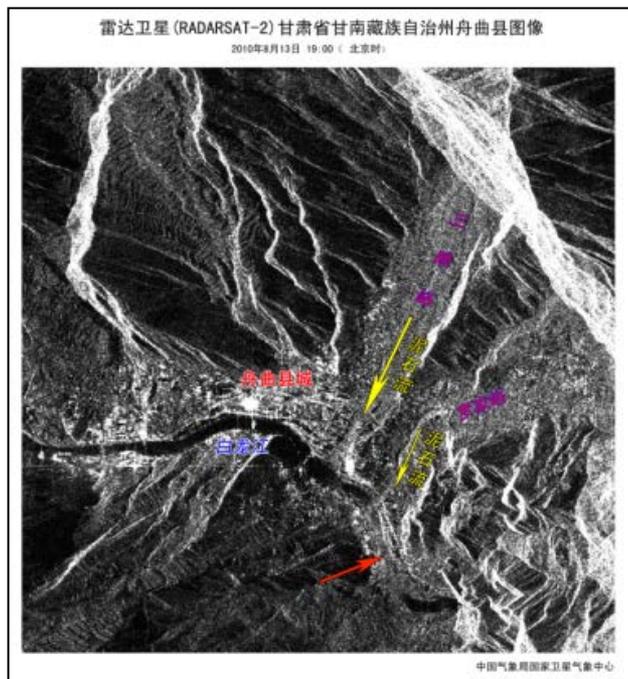
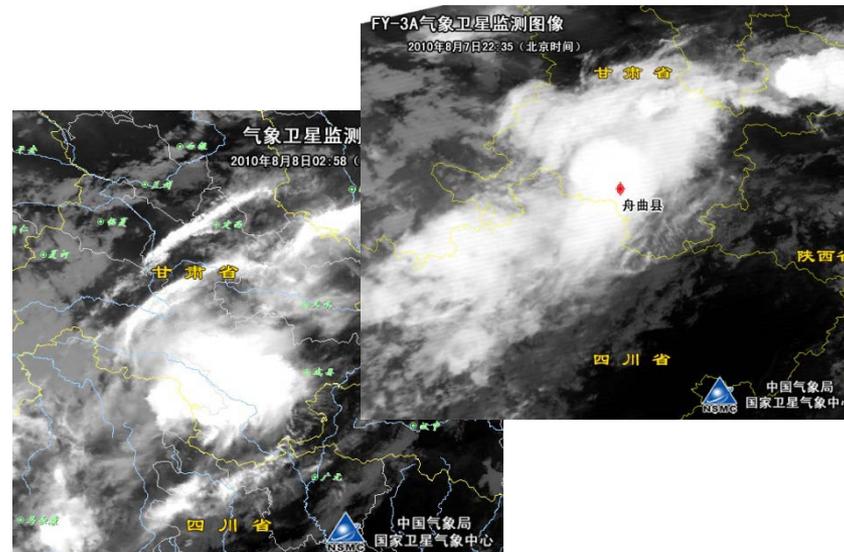
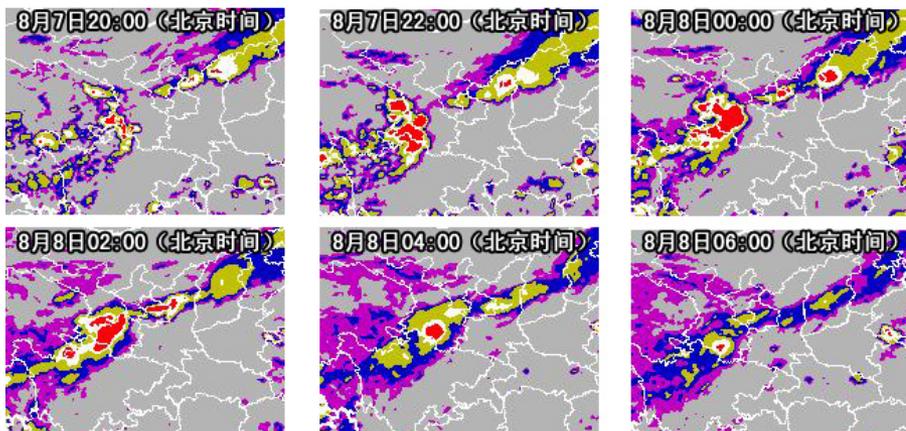
Map Production

Map was generated on August 2013
by the National Satellite Meteorological Center (NSMC),
China Meteorological Administration (CMA).
<http://www.nsmc.cma.gov.cn/>

The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Lots of high spatial resolution data, including Landsat-8, RADARSAT-2, TerraSAR-X, RISAT-1 Landsat-8 be used.

Quickly responding to the Mud-rock Flow in Zhouqu County ,west of China



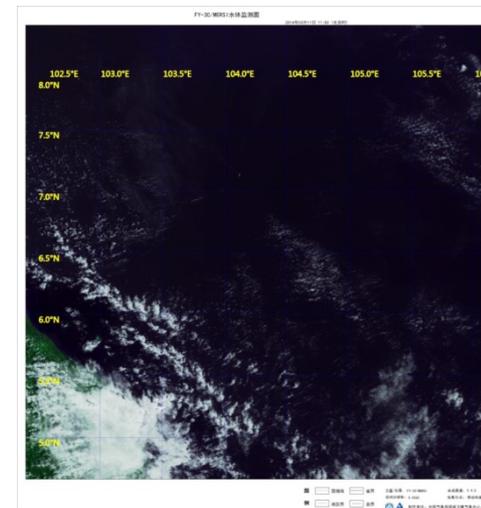
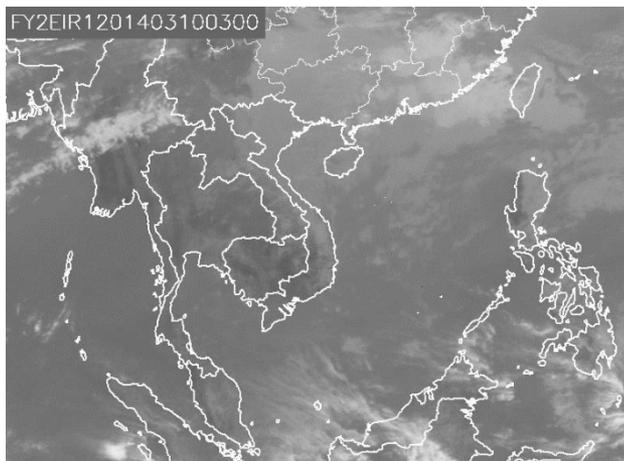
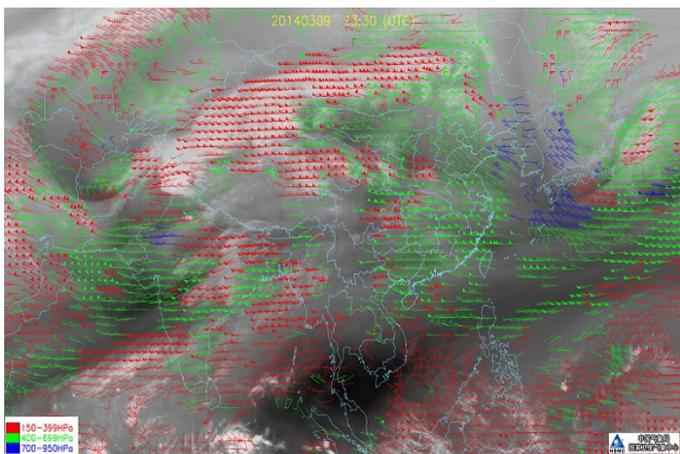
Barrier lake

甘肃省舟曲县泥石流灾害遥感监测图(2) Mud-rock Flow Monitoring Map in Zhouqu County (2)



Mud-rock flow body

Quickly responding to the event of missing Malaysia Airlines Flight 370

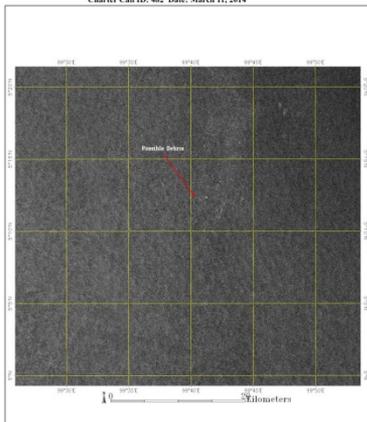


Possible Debris of Missing Aircraft

2014-03-13

Possible debris found at Strait of Malacca

Charter Call ID: 482 Date: March 11, 2014



Area Location

Legend

- Satellite image extent
- Lakes
- Lakes

Description

The TerraSAR-X images acquired at March 13, 2014 show the possible debris of the missing aircraft (MH370) found at the Strait of Malacca.

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Cartographic Information

Map Projection: UTM
Datum: WGS-84
Units: Meters

Map Production

Map was generated on March 2014 by the National Satellite Meteorological Center (NSMC), China Meteorological Administration (CMAA).
<http://www.nsmc.cma.gov.cn/>

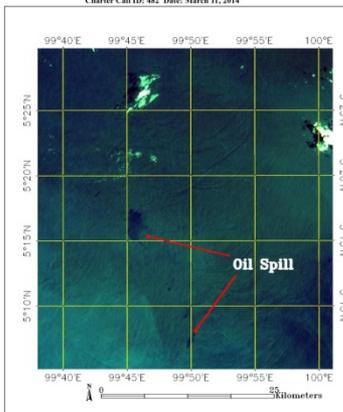
The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Suspected oil spill of missing aircraft

2014-03-15

Oil spill found at Strait of Malacca

Charter Call ID: 482 Date: March 11, 2014



Area Location

Legend

- Satellite image extent
- Lakes
- Lakes

Description

The Landsat-8 images acquired at March 15, 2014 in RGB composit (R: band 4, B: band 3, G: band 2) show the suspected oil spill of the missing aircraft (MH370) found at the Strait of Malacca.

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Cartographic Information

Map Projection: UTM
Datum: WGS-84
Units: Meters

Map Production

Map was generated on March 2014 by the National Satellite Meteorological Center (NSMC), China Meteorological Administration (CMAA).
<http://www.nsmc.cma.gov.cn/>

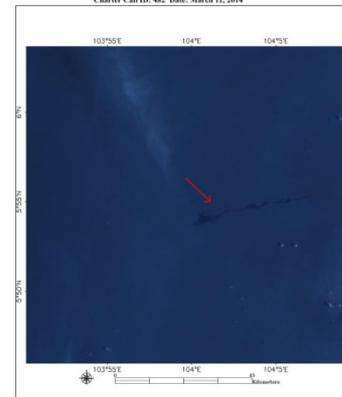
The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Suspected oil spill of missing aircraft

2014-03-09

Oil spill found at South China Sea

Charter Call ID: 482 Date: March 11, 2014



Area Location

Legend

- Satellite image extent
- Lakes
- Lakes

Description

The ASTER images acquired at March 09, 2014 in RGB composit (R: band 3, B: band 1, G: band 1) show the suspected oil spill of the missing aircraft (MH370) found at the South China Sea.

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Cartographic Information

Map Projection: Geographic: Lat/Lon
Datum: WGS84
Units: Degrees

Map Production

Map was generated on March 2014 by the National Satellite Meteorological Center (NSMC), China Meteorological Administration (CMAA).
<http://www.nsmc.cma.gov.cn/>

The satellite data in this map were provided under the International Charter "Space and Major Disasters".

Using the TerraSAR-X, Landsat-8, and ASTER images to detect the oil spill and possible debris of the MH370.

Suggestion

Disadvantages of current emergency response modes

National issue

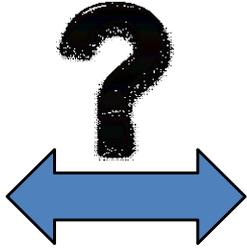
- Products are quite simple
- Data transmission ability is insufficient

International issue

- Who wants it?
- What do they need?
- How to get it?

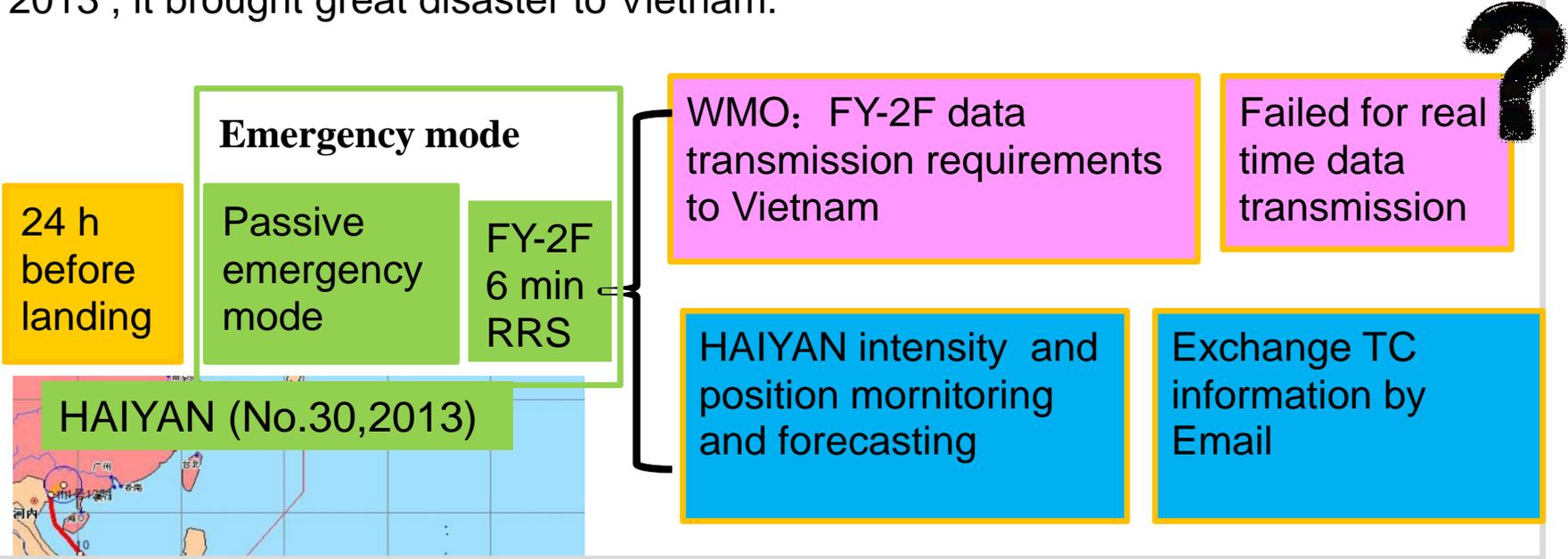
The issue of international cooperation in typhoon HAIYAN

**Established
Emergency mode**

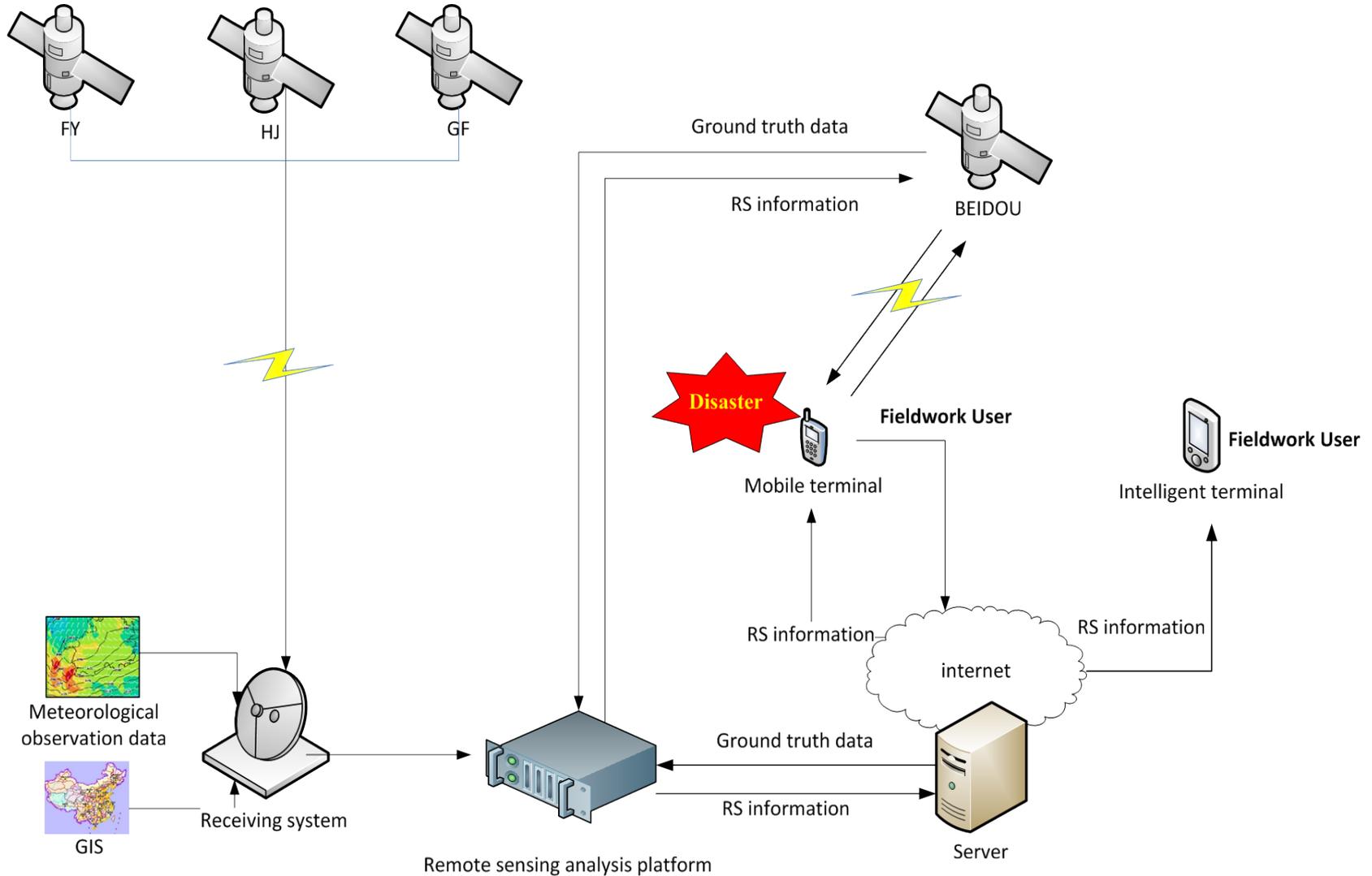


**Users requirement when
global disasters happened**

Super typhoon HAIYAN landed to the northeast Vietnam at 04:00 on November 11, 2013 , it brought great disaster to Vietnam.

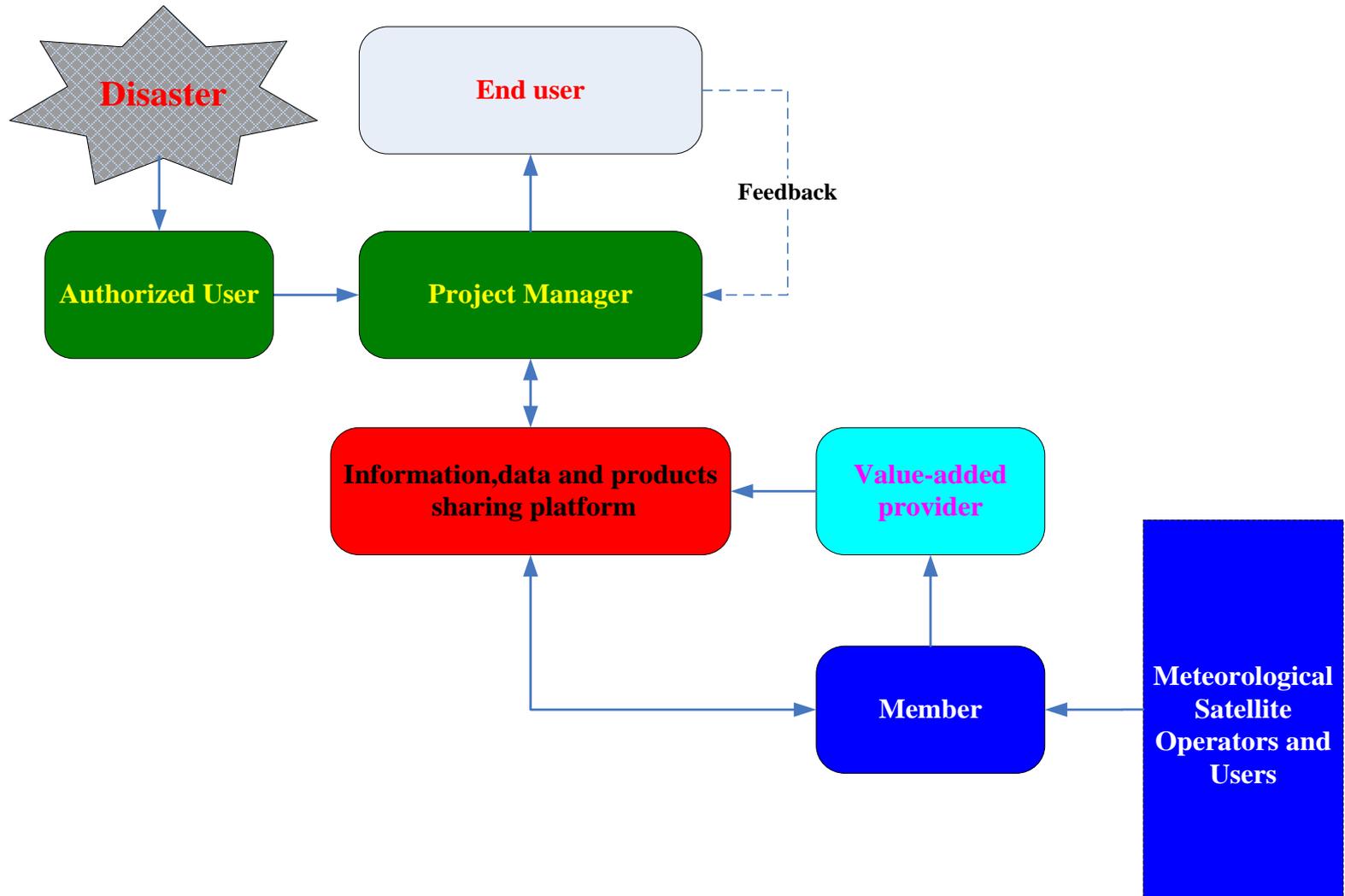


Future plan for enhancing data transmission ability in China



Mobile terminal will be used for receiving satellite information.
More professional information will be developed to the features of specific disasters.

International disaster emergency response mechanism of meteorological satellite





Thank you