

Construction and Development of China High-Resolution Earth Observation System

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Outlines

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- Overview of the Space-based System in the CHEOS
- Application of CHEOS Satellites
- Preliminary Achievements of GaoFen-1(GF-1)
- International Cooperation and Promotion of the CHEOS

■ Introduction

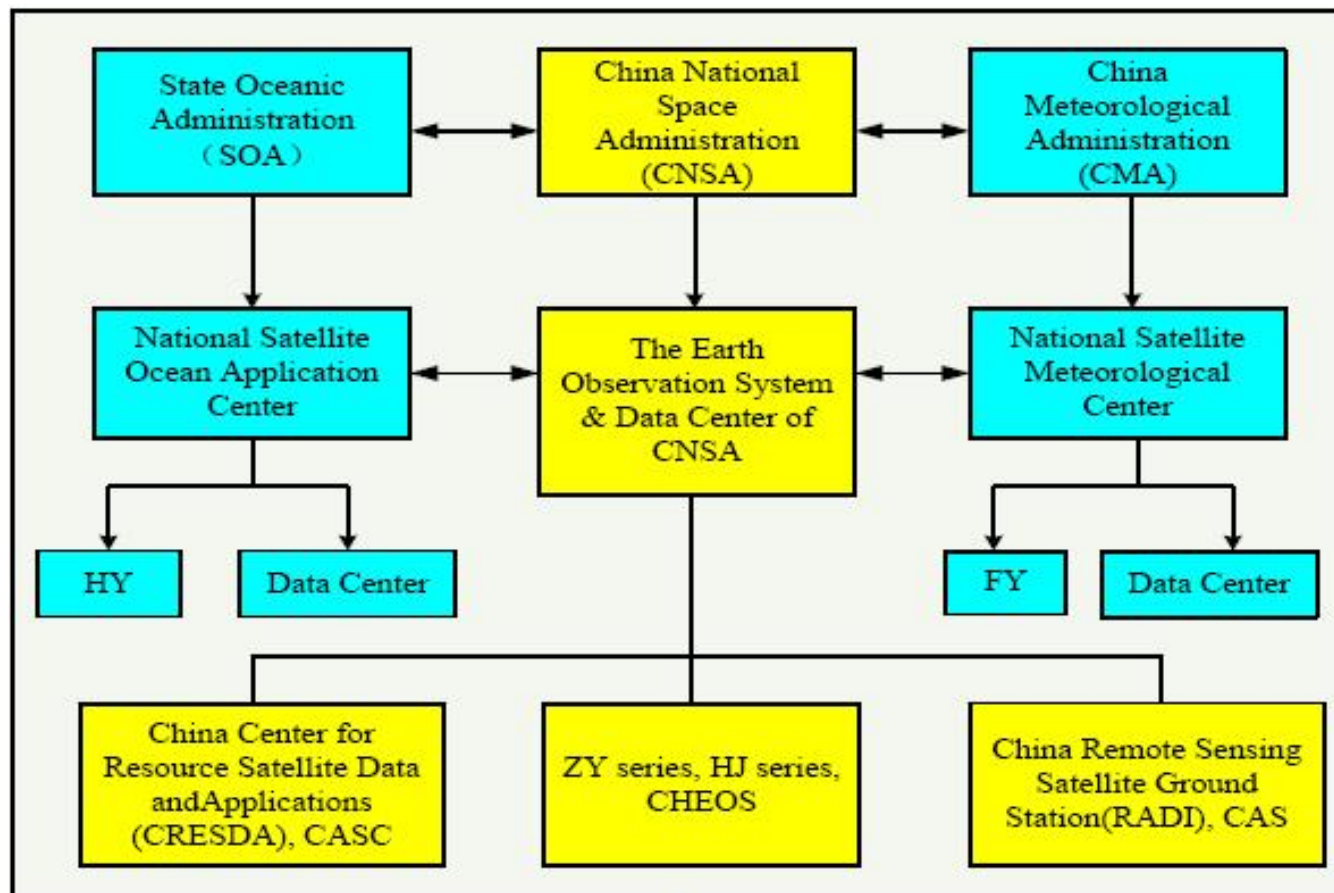
China High-resolution Earth Observation System

- In May 2010, China officially launched construction of Major Special Project – the China High-Resolution Earth Observation System (CHEOS), which is established as one of the major national science and technology projects.
- The Earth Observation System and Data Center of China National Space Administration (EOSDC-CNSA) is responsible for organizing the construction of the CHEOS.

Earth Observation System and Data Center, China National Space Administration(EOSDC)

- The Earth Observation System and Data Center, China National Space Administration was established in Mar. 2010. The Center is principally responsible for organizing and implementing as well as managing CHEOS. It is also responsible for EO application services, commercial development, technology consultant and international cooperation.

Earth Observation System & Data Center, China National Space Administration(EOSDC)



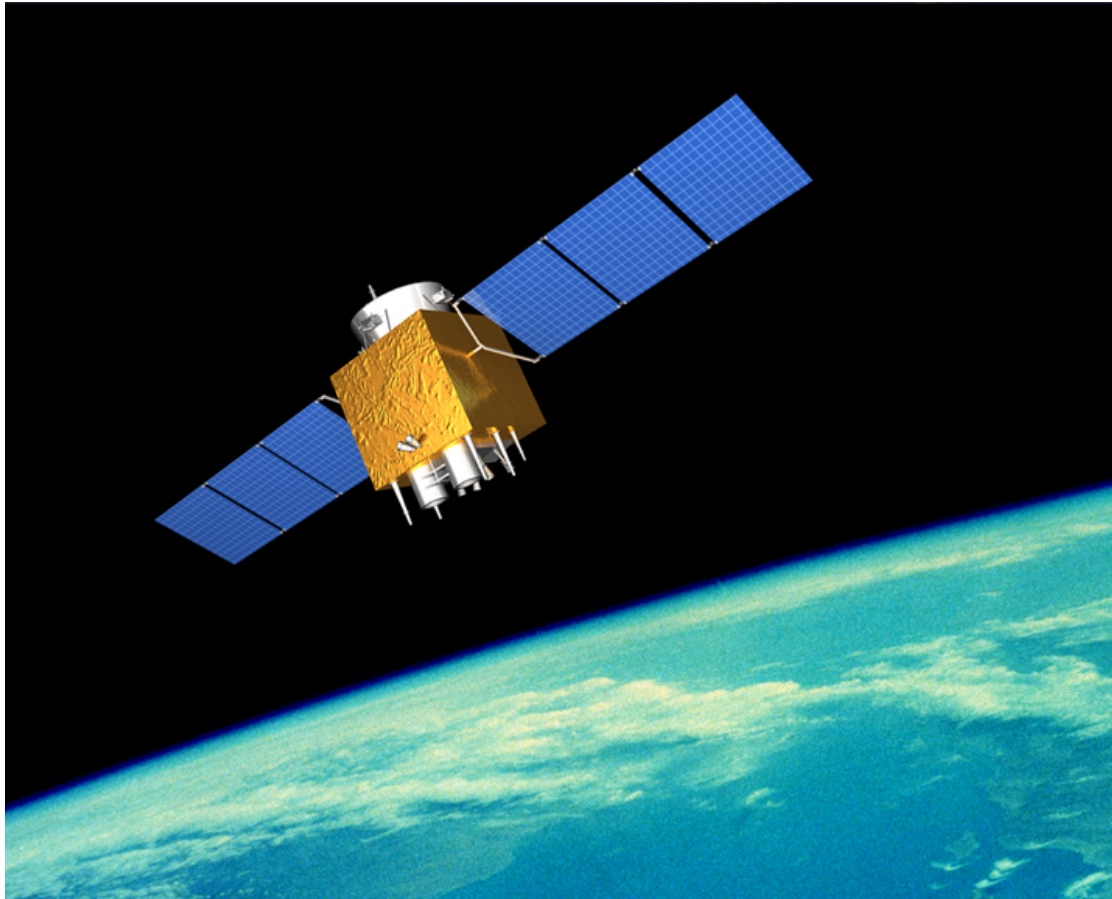
■ Overview of the Space-based System in the CHEOS

Mission of CHEOS

- By following an arrangement of integral observation from space, air and ground, the CHEOS develops space-based system, near-space system, aerial system, ground system and application system as a whole to materialize earth observation at high temporal, spatial and spectral resolution, which is now in smooth progress. Overall, to meet the strategic demands of the national economic development and social progress.
- This report will highlight the space-based system under construction and development, including 5 satellites at present.

GaoFen-1(GF-1)

- GF-1 employs CAST2000 bus, configured with one 2m panchromatic/8m multi-spectral camera and one 16m multi-spectral medium-resolution and wide-view camera.
- GF-1 realizes an integration of imaging capacity at medium and high spatial resolution and with large swath, with designed lifespan of over 5 years.
- Launched into orbit on 26th Apr. 2013, after in-orbit test, GF-1 has been working in good condition.



GF-1 Satellite

**Coordination Group for
Meteorological Satellites**



GaoFen-2(GF-2)

- GF-2 employs CS-L3000A bus, configured with one 1m panchromatic/4m multi-spectral camera, with designed lifespan of over 5 years.
- Currently GF-2 is well under development and construction and is scheduled to launch in the second half of 2014.

GaoFen-3(GF-3)

- GF-3 employs CS-L3000B bus, configured with multi-polarized C-band SAR at meter-level resolution, with designed lifespan of 8 years.
- GF-3 is scheduled for completion of development and construction in 2015.

GaoFen-4(GF-4)

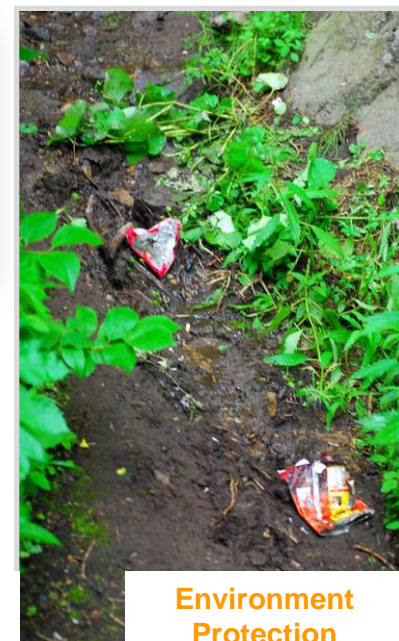
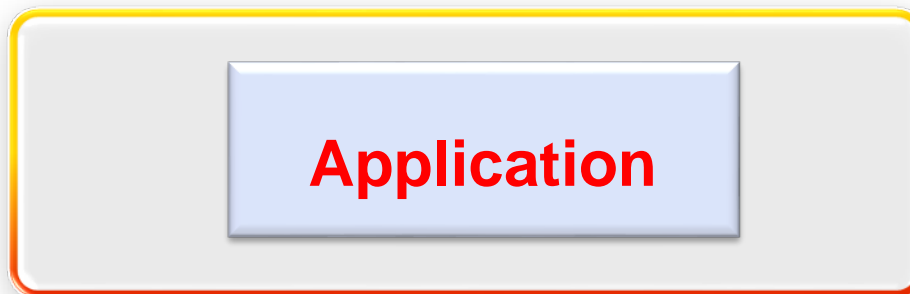
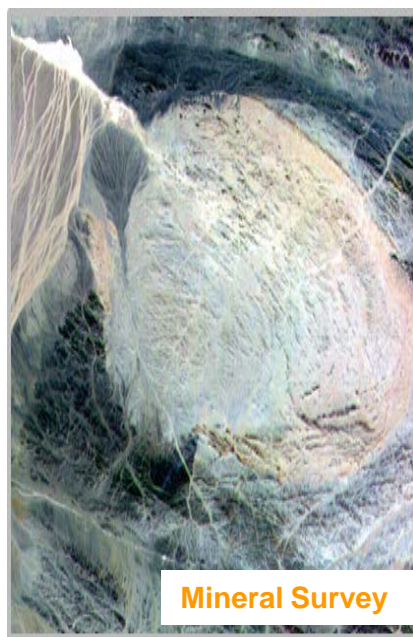
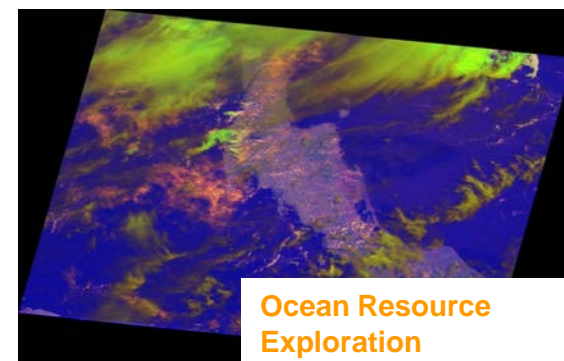
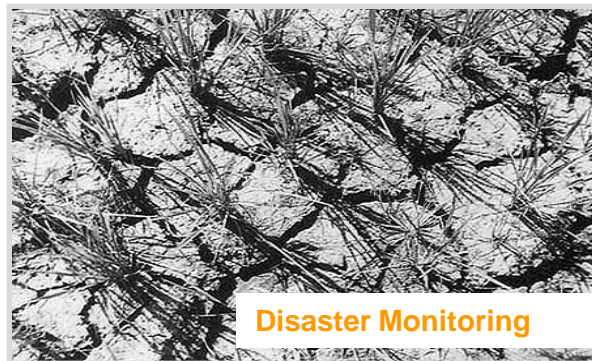
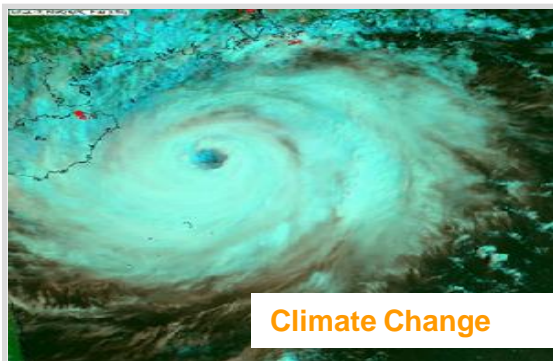
- GF-4 employs GEO remote sensing bus, configured with a 50m staring camera, operating on the geo-synchronous orbit.
- GF-4 can provide an imaging area of $7000\text{km} \times 7000\text{km}$ with individual scene covering an area of $400\text{km} \times 400\text{km}$, and with capacity for high temporal resolution remote sensing monitor at minute-level.
- GF-4 is designed for 8 years and is currently well under development and construction and is scheduled to launch in 2015.

GaoFen-5(GF-5)

- GF-5 employs SAST5000B bus, configured with six types of payloads, including visible and short-wave infra hyper-spectral camera, spectral imager, greenhouse gas detector, atmospheric environment infrared detector at very high spectral resolution, differential absorption spectrometer for atmospheric trace gas, and multi-angle polarization detector.
- GF-5 is designed for 8 years and is scheduled to launch in 2016.

■ Application of CHEOS Satellites

- **CNSA extremely values promotion of data and application of the CHEOS satellites.**
- **During implementation of the CHEOS, along with the construction of satellites, we develop main application demonstration system on different levels, i.e. sector application, regional application, industrialized demonstration and common technology development, to structure application demonstration system and thematic product system, to realize effective conversion from data to information and knowledge, and to promote large-scale industrialized application of remote sensing data.**

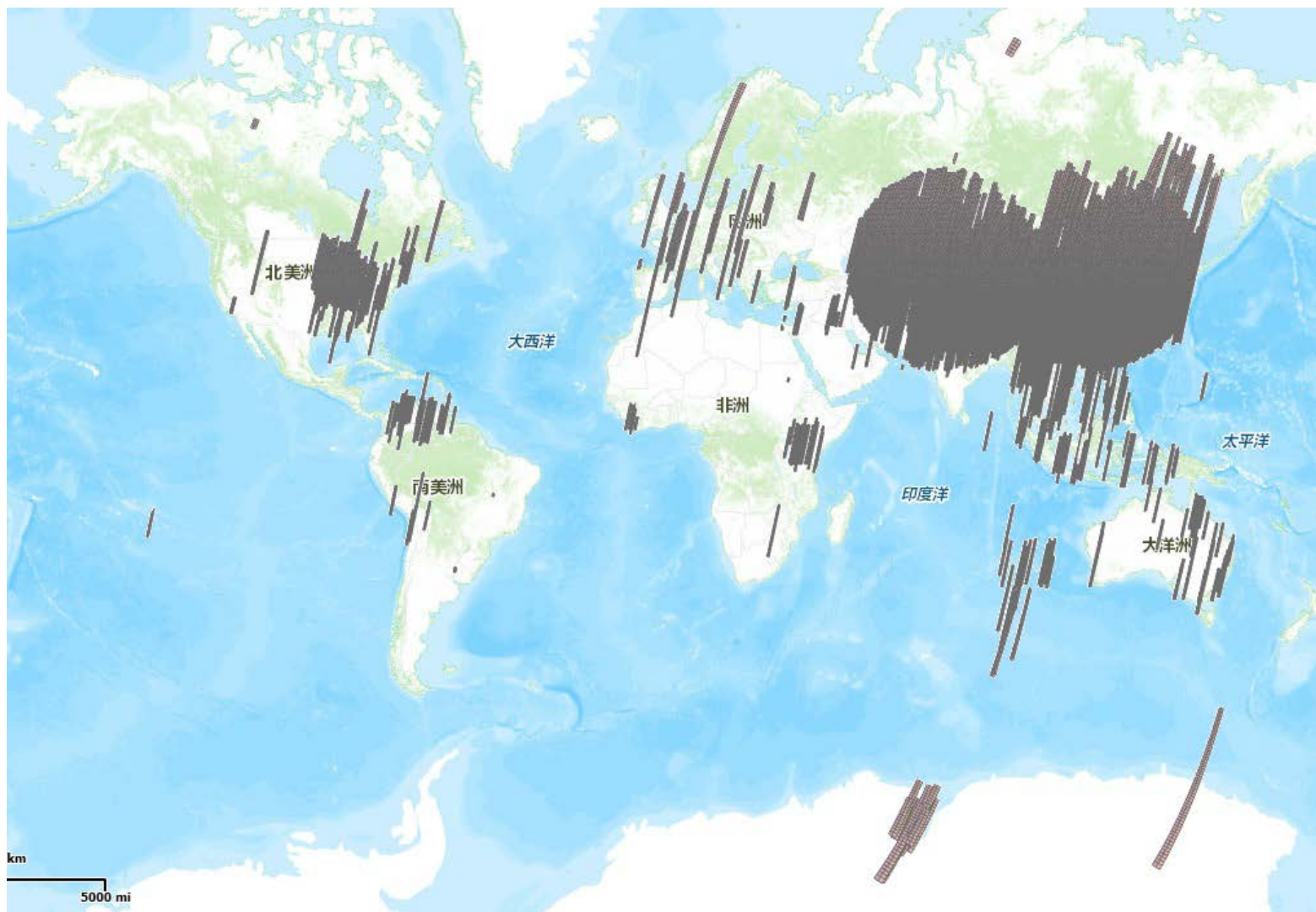


■ Preliminary Achievements of GaoFen-1(GF-1)

- In line with the promotion direction of the CHEOS remote sensing data and application, preliminary achievement of GF-1 application is presented on the following aspects, including data distribution, land resource investigation, mineral resource management, atmospheric and water environment quality monitor and natural disaster emergency respond and monitor.

Data Distribution

- EOSDC-CNSA facilitate and provide GF-1 data to various clients including tens of national ministries and agencies, local governments, research institutions, universities, enterprises and organizations in China.
- By the end of March 2014, an amount of 550 000 scenes have been delivered. Among them, the 2m panchromatic and 8m multi-spectral data cover an approximate 93% area of China effectively; the 16m multi-spectral data cover China over 10 times effectively.

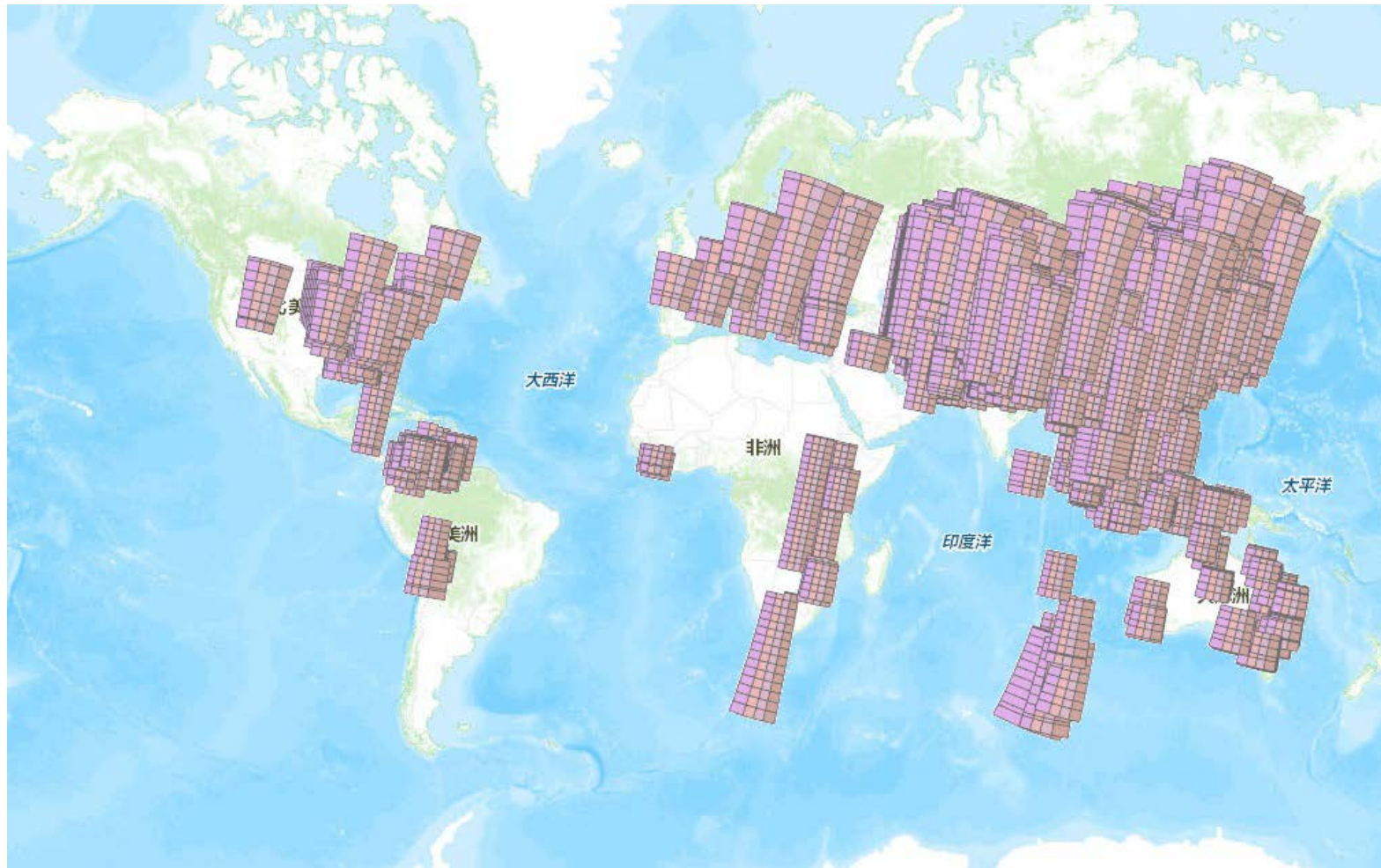


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2m and 8m data cover area

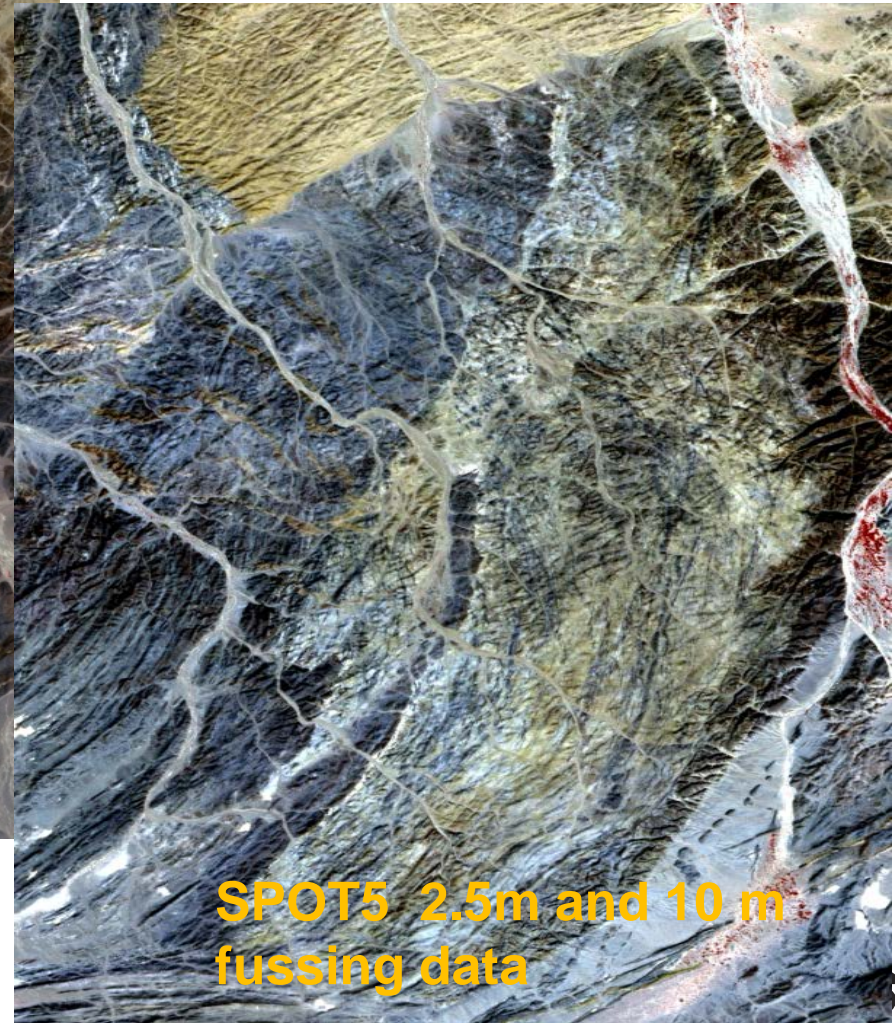
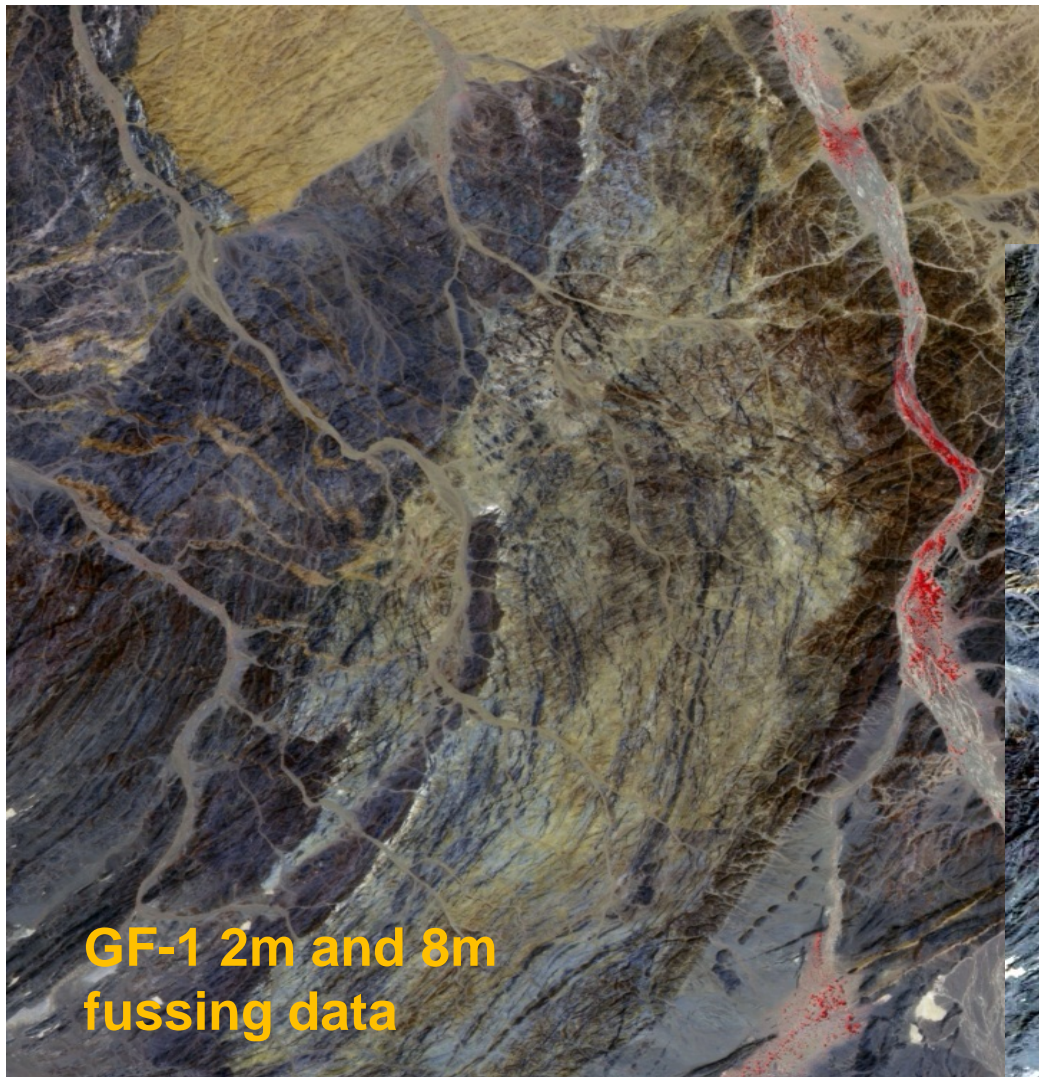


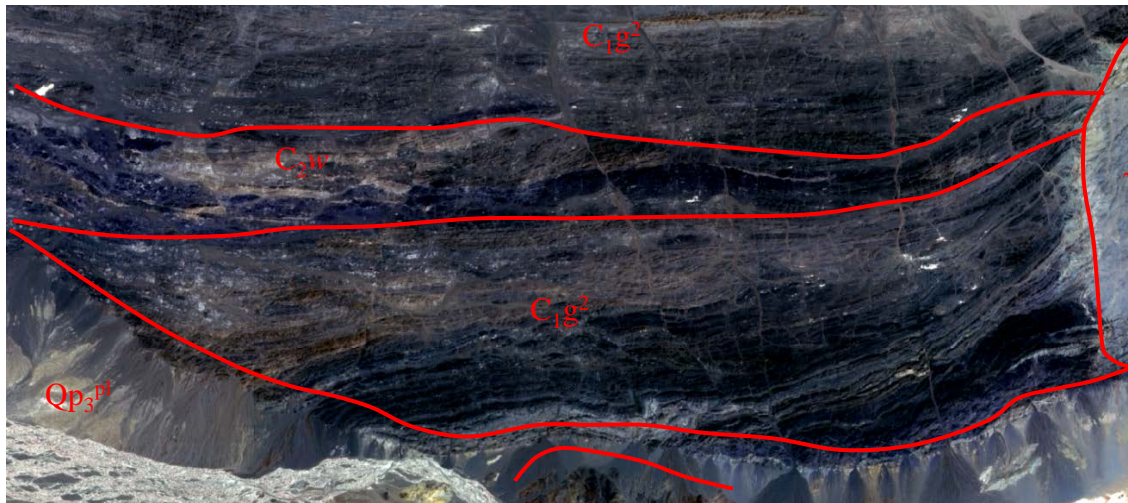
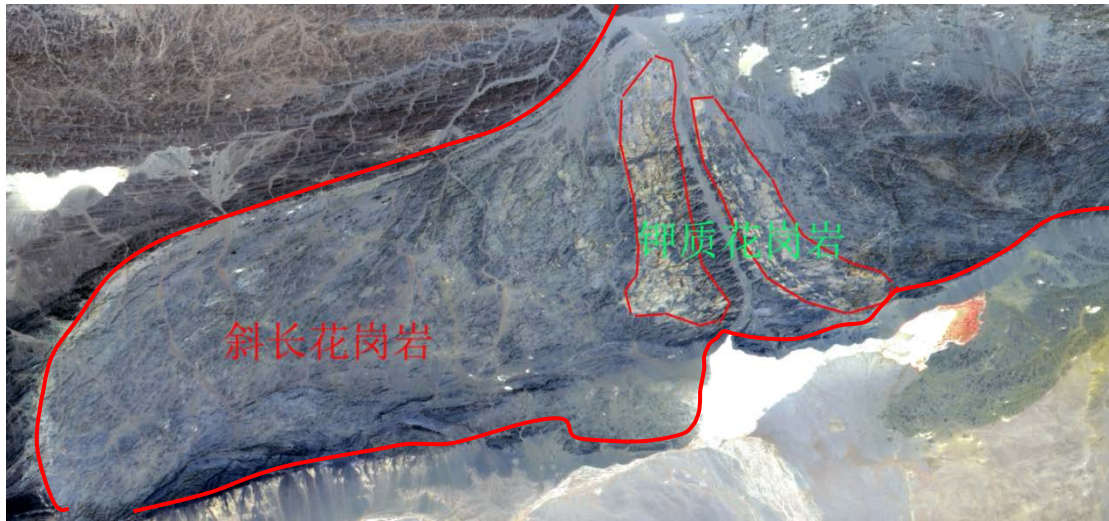
CGMS



Land and Mineral Resource Management

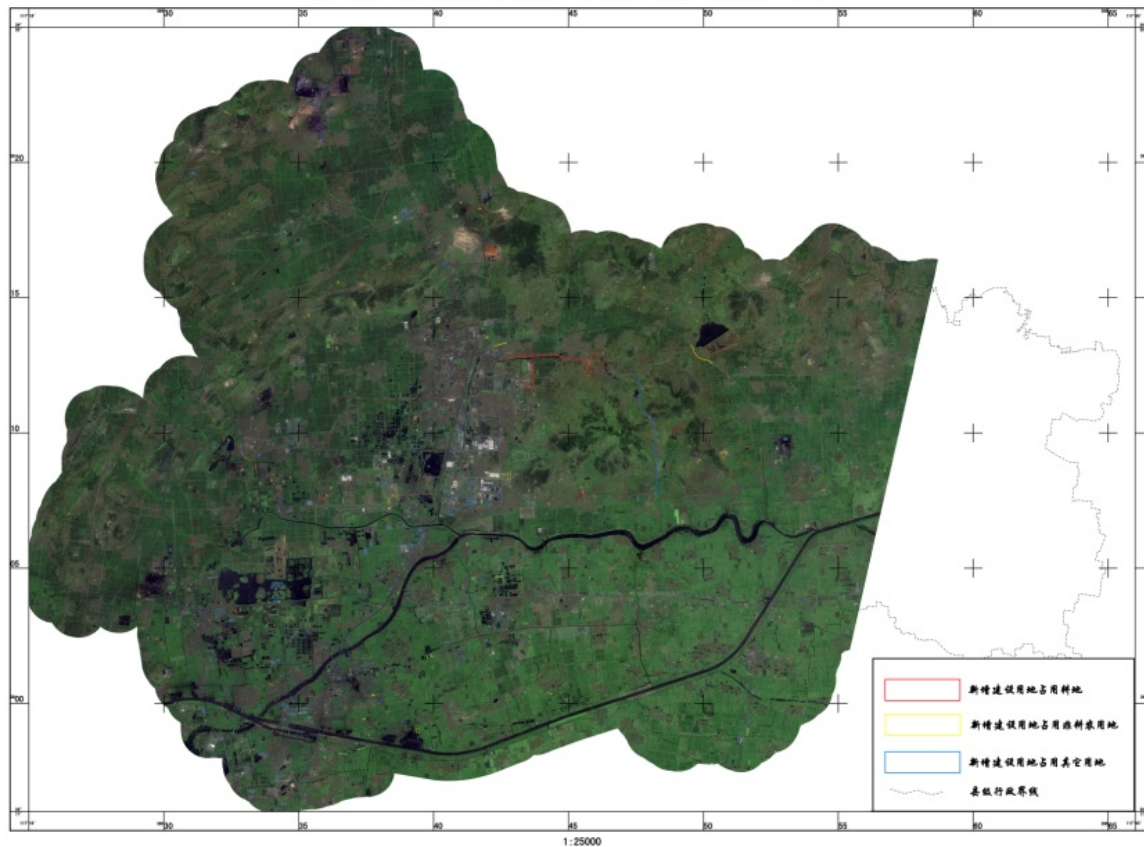
- On the aspect of land and mineral resource management, demonstrate the achievements from following examples - The eastern Tianshan Mountains of Xinjiang Autonomous Region and Jiawang District in Xuzhou City of Jiangsu Province.



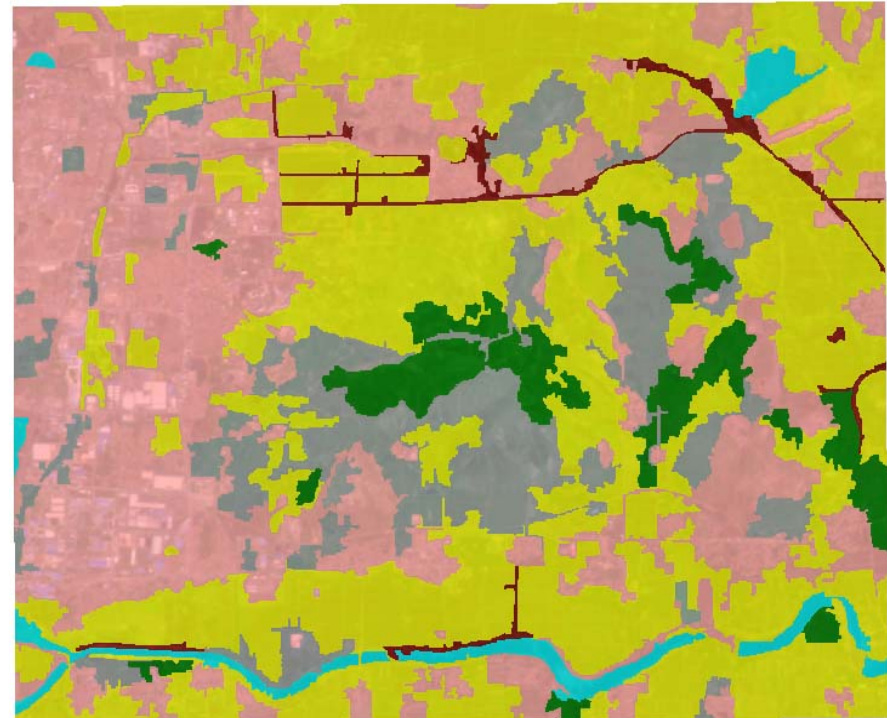


Using 2m and 8m fusing data, we can analysis and evaluate the properties, morphology, contact relationship of strata, rock, tectonic and other geological features, in accordance with the relevant technical requirements of 1:50000 remote sensing of regional geological survey.

江苏省徐州市贾汪区新增图斑分布图



The smallest pattern recognition area is 0.5 Mu(0.0333 hectares)

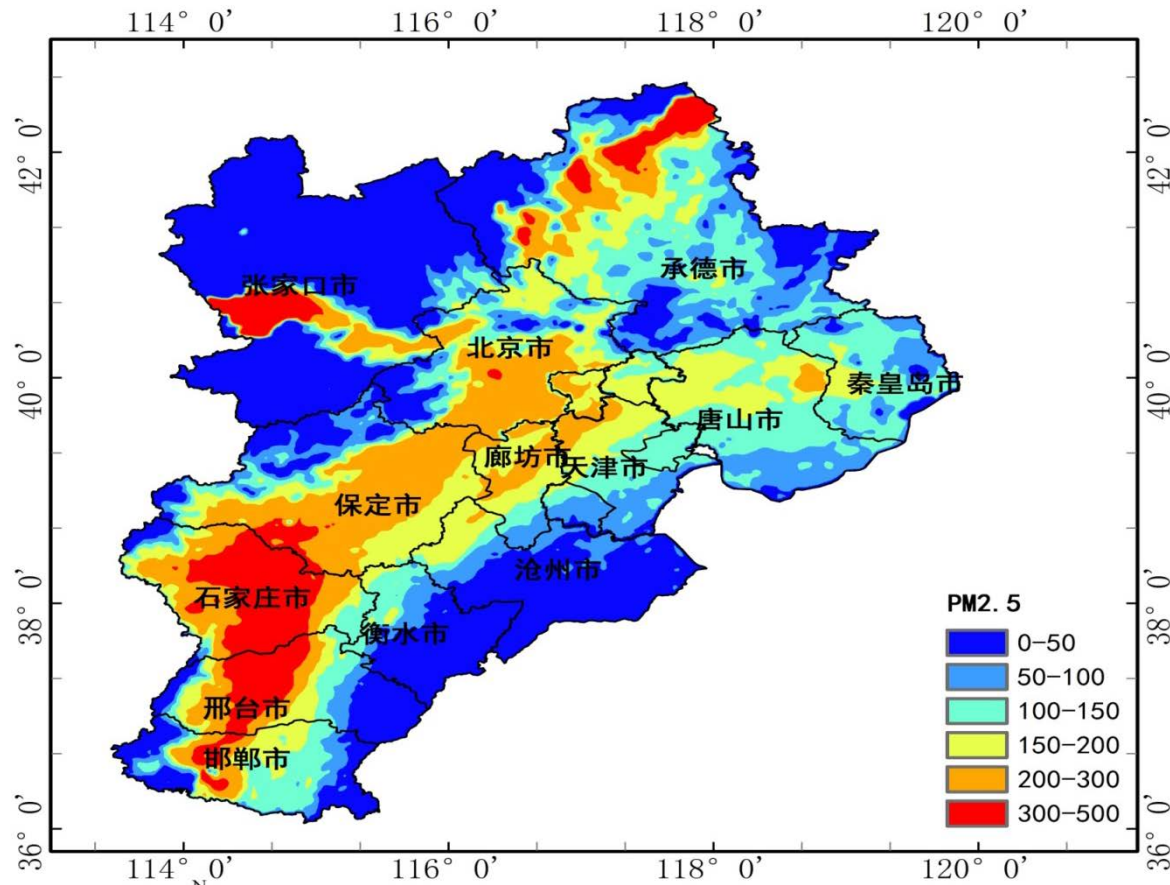


Interpretation ability of current land using: The classification of cultivated land, traffic land, urban, village, industrial land and others is basically correct.

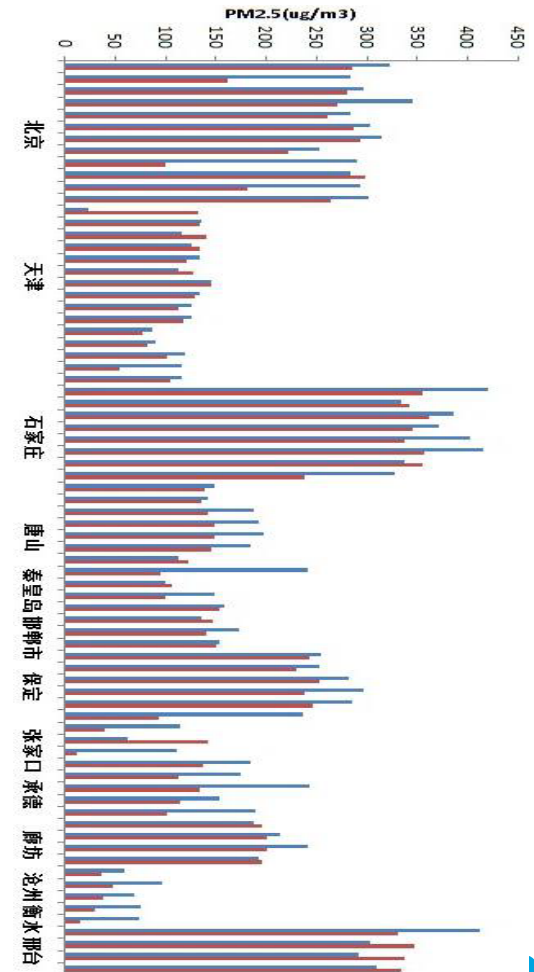
Atmospheric and Water Environment Quality Monitoring

- On the aspect of atmospheric and water environment quality monitor, demonstrate the achievements from following examples
 - aerosol monitoring of Beijing-Tianjin-Hebei region and water quality monitoring of Taihu Lake, Chaohu Lake and Jiajiang of Nanjing City.

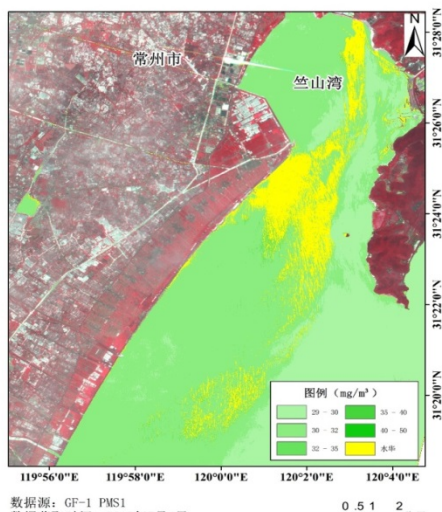
Beijing-Tianjin-Hebei region PM2.5 remote sensing monitoring image (Oct. 2013)



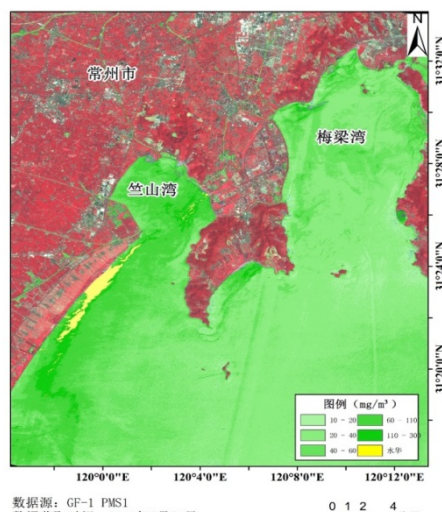
Comparison and Validation



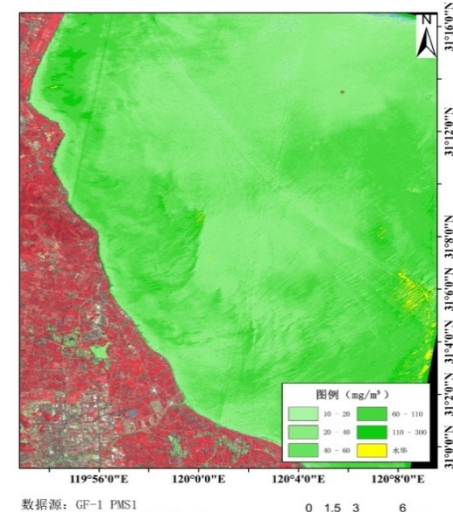
Chlorophyll a concentration monitoring of Taihu Lake



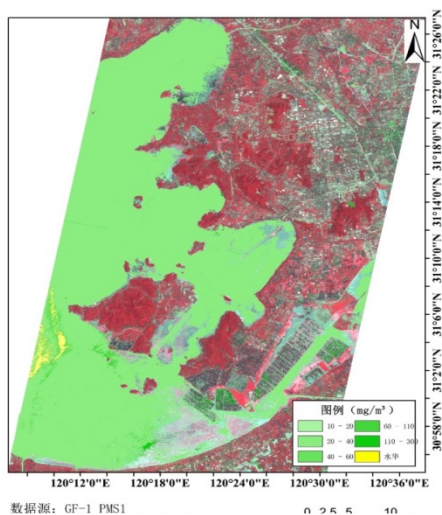
2013.07.04西部



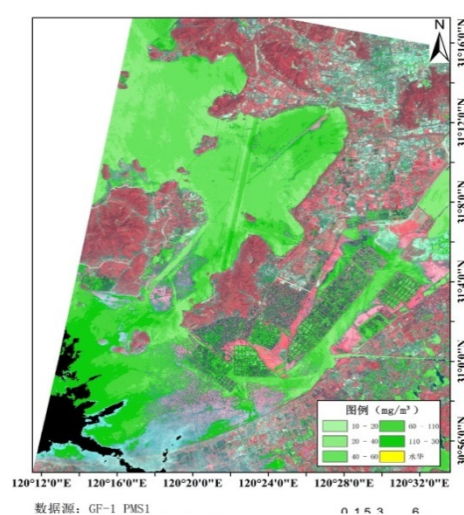
2013.07.24西北部



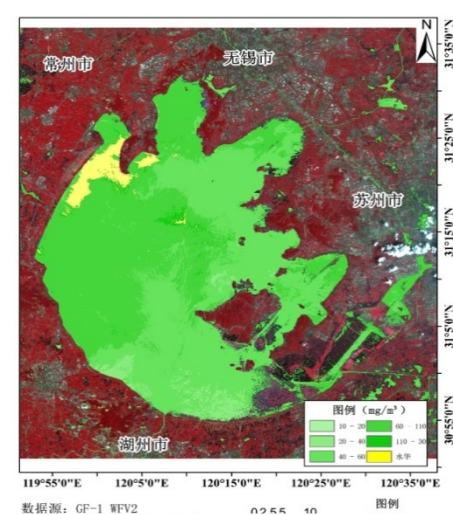
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2013.07.24东部

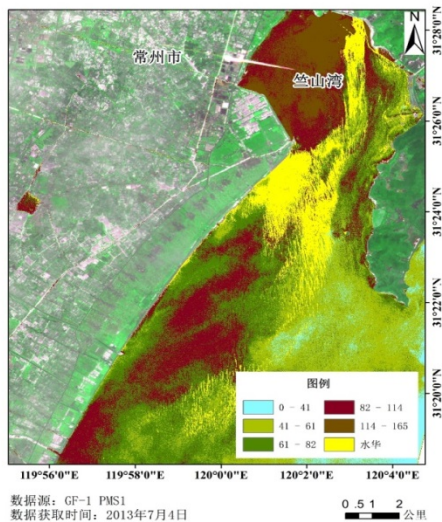


2013.08.13东南部

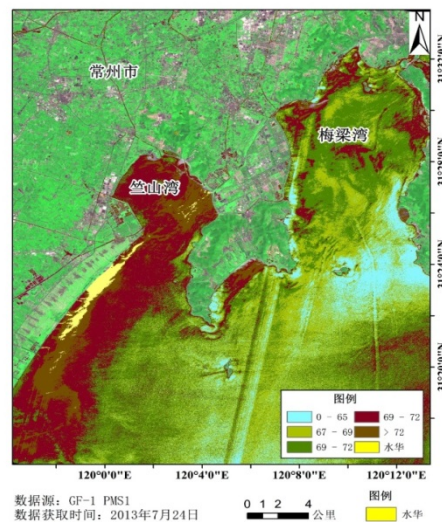


2013.08.09全景

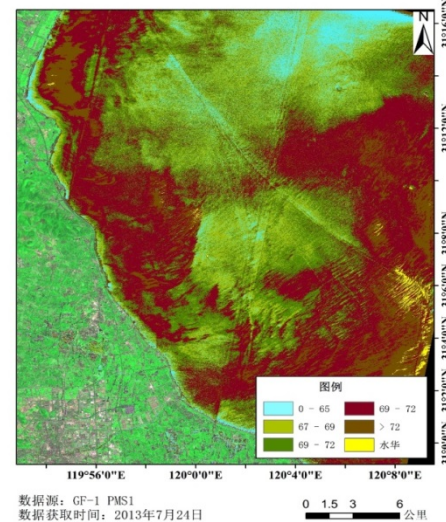
The eutrophication index monitoring of Taihu Lake



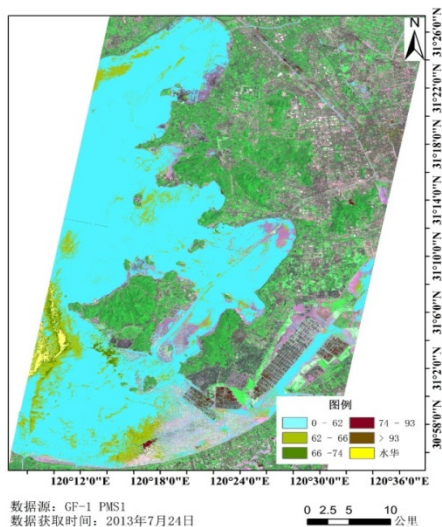
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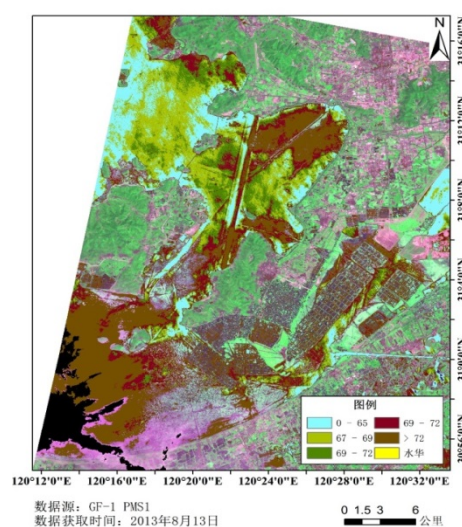
2013.07.24西北部



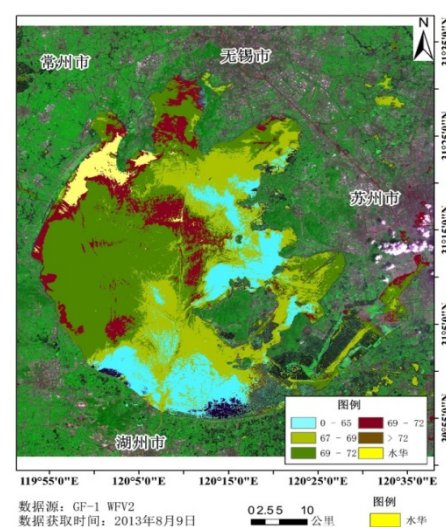
2013.07.24西南部



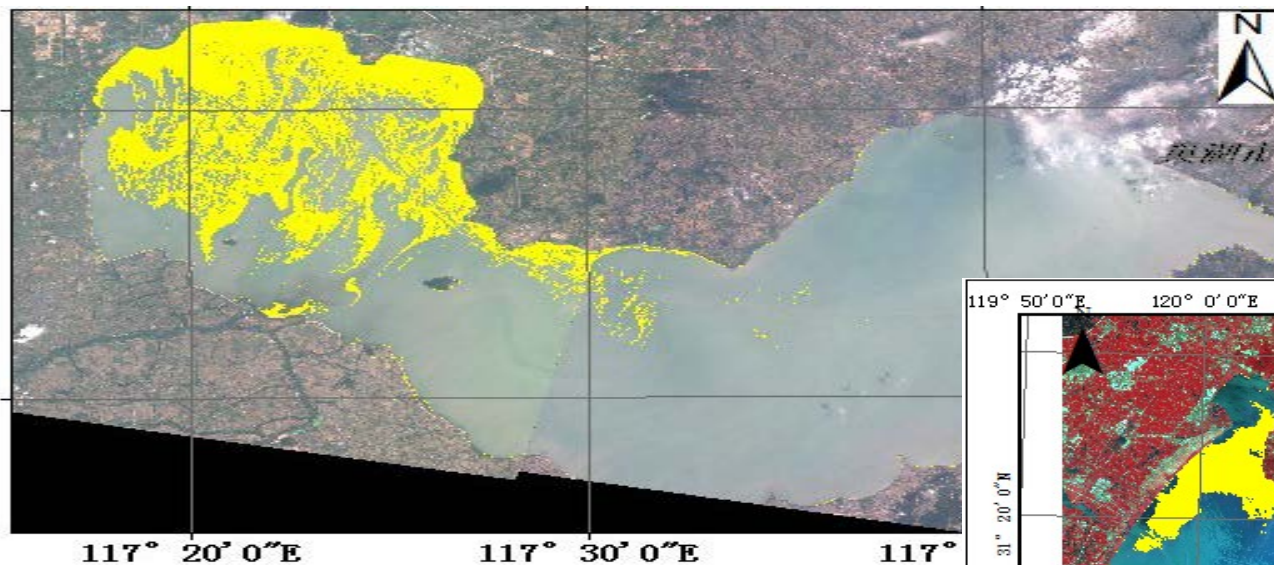
2013.07.24东部



2013.08.13东南部



2013.08.09全景

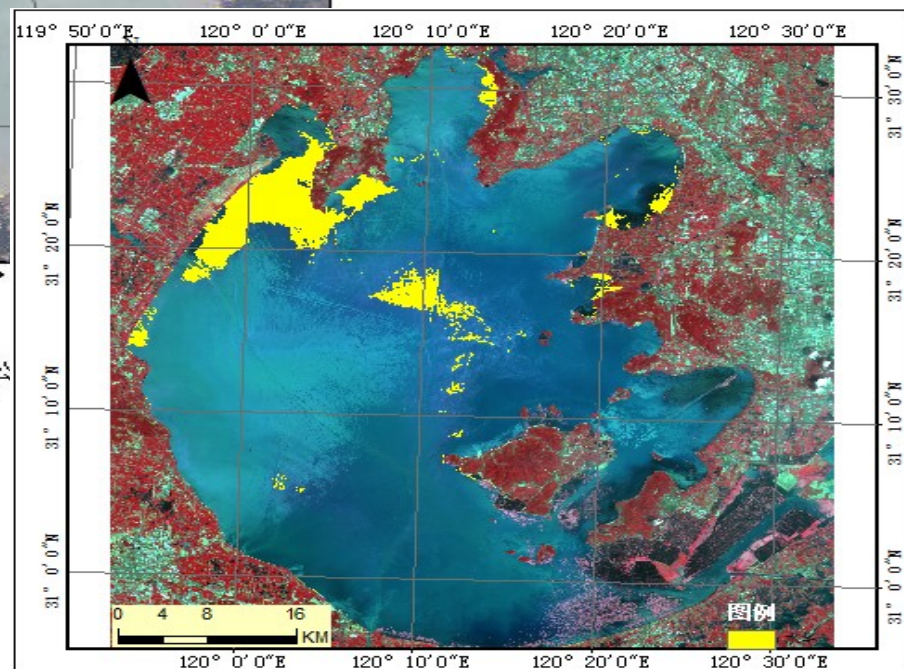


数据源: GF-1 PMS

数据获取时间: 2013年6月18日

0 2.5 5 10 公里

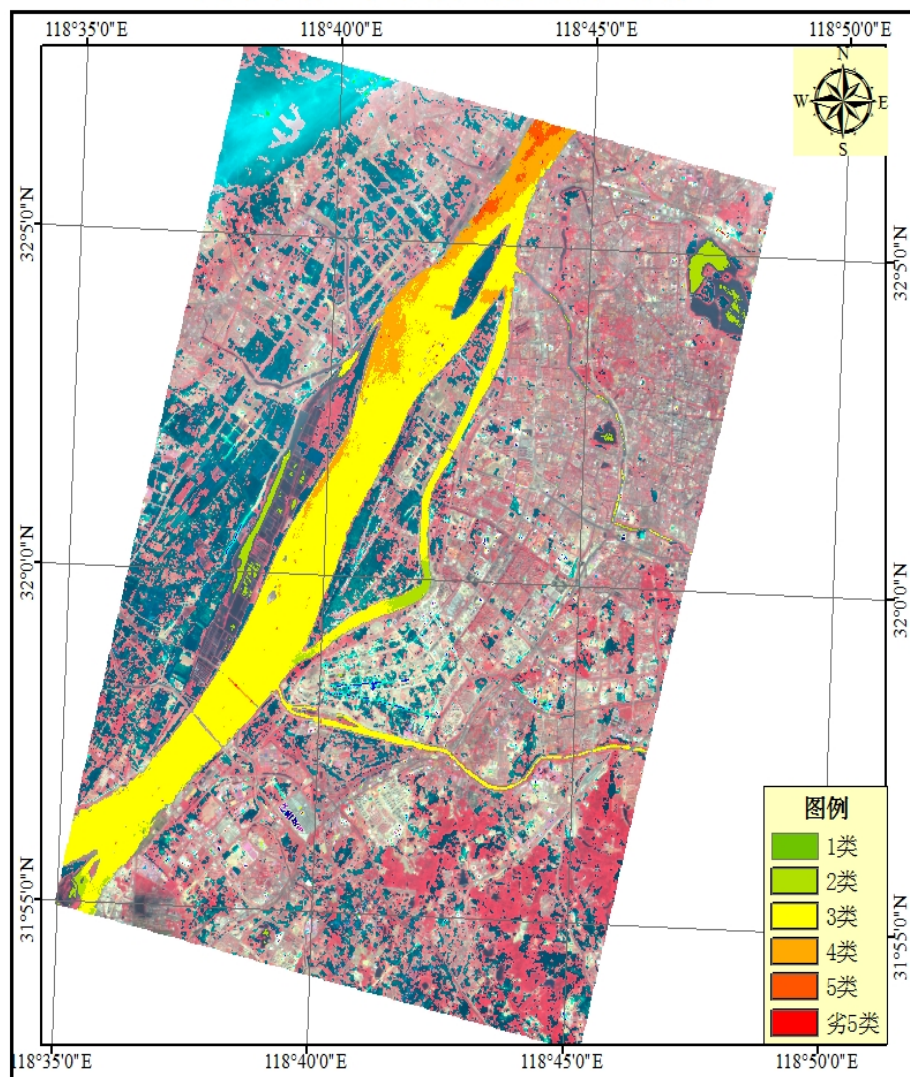
Distribution of bloom in Chaohu Lake
(8m, Jun. 2013, 69.09Km²)



Distribution of bloom in Taihu Lake
(16m, Aug. 2013m, 137.5Km²)

南京夹江水质分级遥感监测图

Chemical Oxygen
Demand (COD)
concentration
monitoring of
Jiajiang, Nanjing
City



数据源：高分一号
获取时间：2013年08月13日

0 1.5 3 6 千米
比例尺：1:135,000

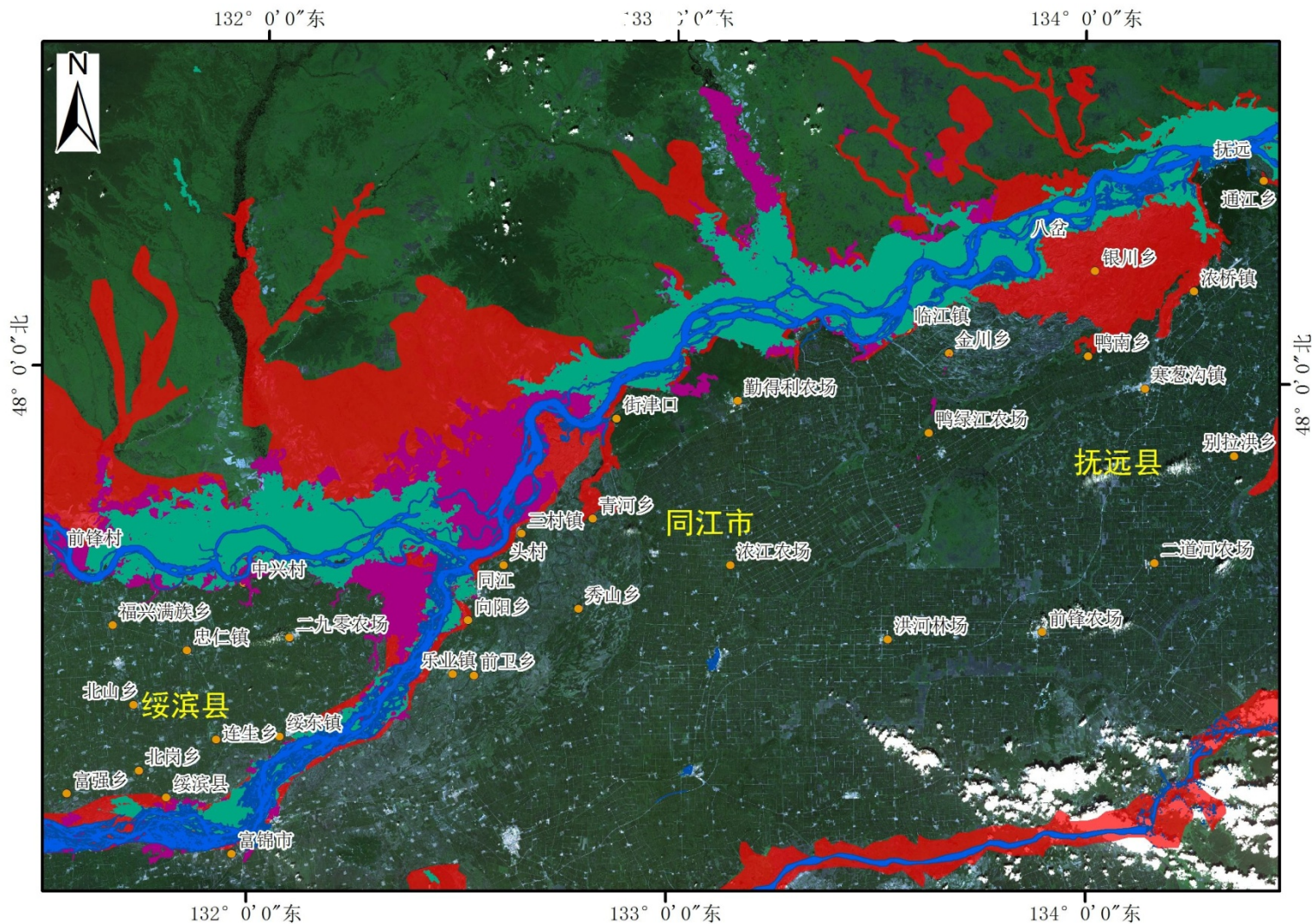
环境保护部卫星环境应用中心

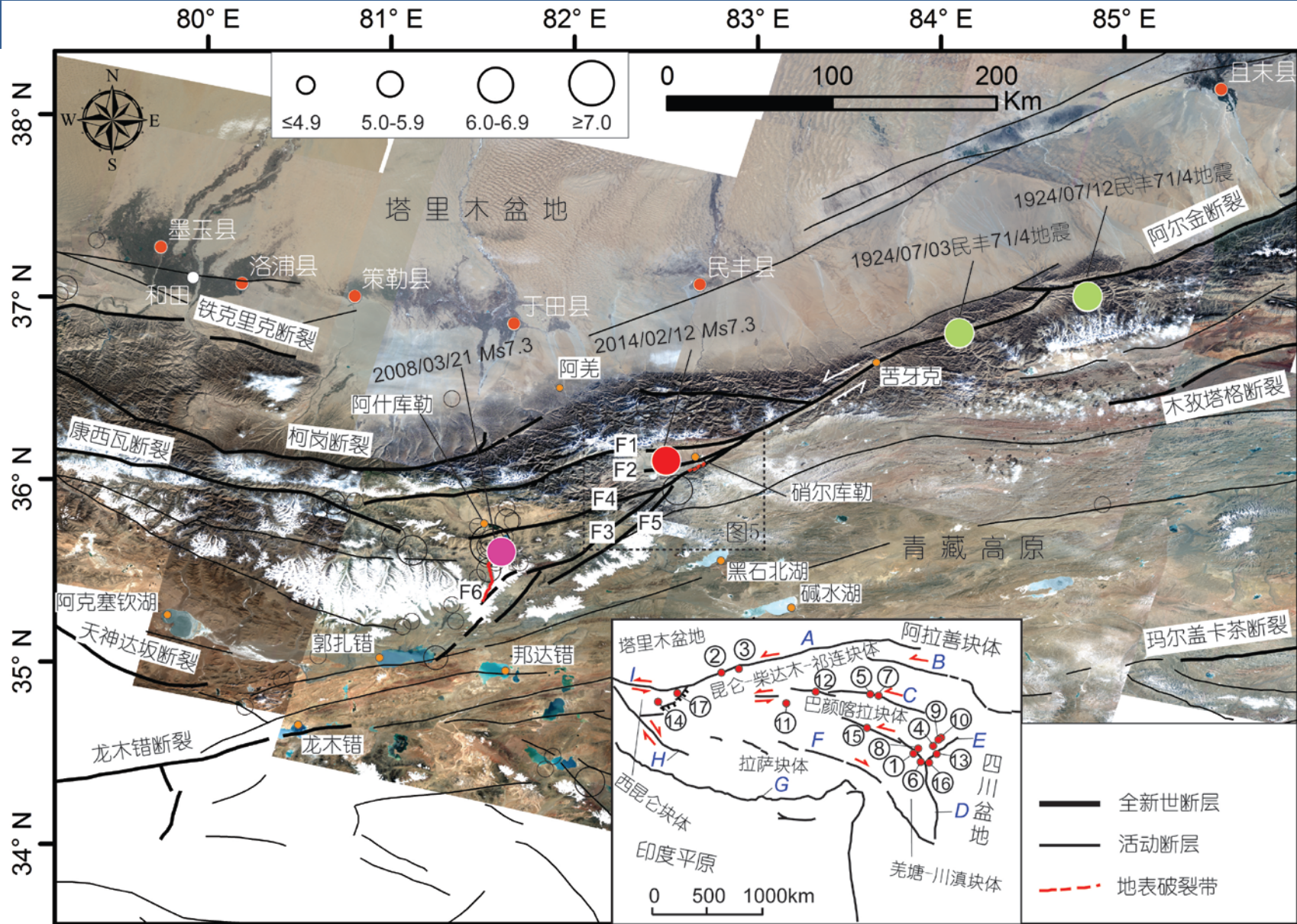


Natural Disaster Emergency Responding

- On the aspect of natural disaster emergency responding, demonstrate achievements from following examples - floods in Heilongjiang Province and earthquake in Yutian area of Xinjiang.

- **In the Northeast China flood, 2013, EOSDC timely provide GF-1 available data to the Ministry of Water Resources, Chinese Academy of Sciences, Hei Longjiang Province, etc.**
- **What's more, EOSDC organized to process and interpret data timely and to product various thematic maps, which provided important supports to agricultural loss assessment, housing damage assessment, material support, transport facilities rush to repair, water conservancy facilities monitoring of Hei Longjiang Province.**





82°30'E

82°35'E

82°40'E

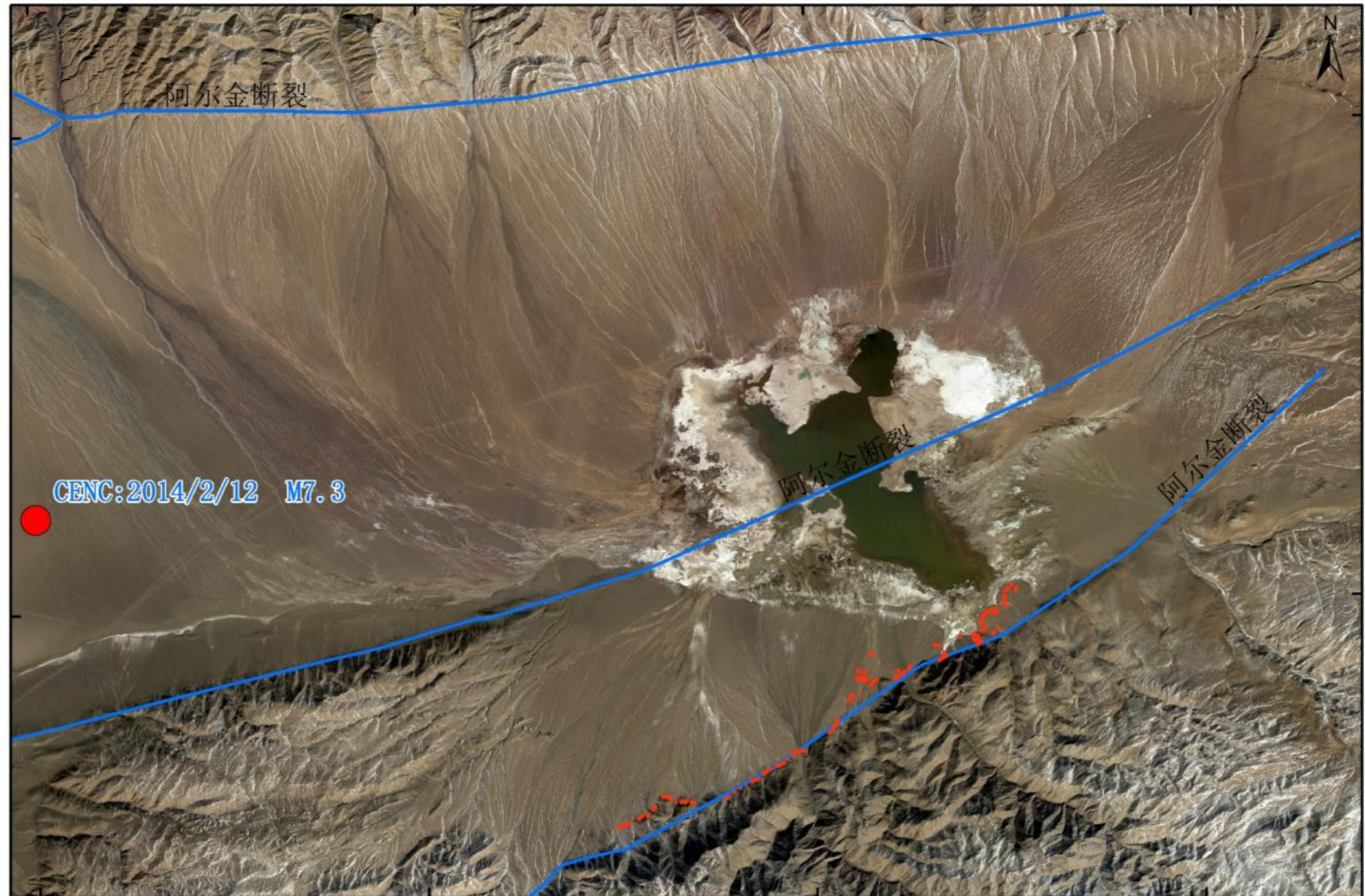
82°45'E

36°10'N

36°10'N

36°5'N

36°5'N



82°30'E

82°35'E

82°40'E

82°45'E

图例



震中



地表破裂带



断层

0 1 2 4 Km

Coordination Group for
Meteorology

Coseismic surface rupture zone interpretation map of
Yuntian Region based on GF-1

GMS

■ International Cooperation and Promotion of the CHEOS

- **CNSA is extraordinary willing to impel large-scale and industrialized satellite data application with all members together.**
- **EOSDC-CNSA is responsible to undertake international cooperation of development and construction of satellites and application in the CHEOS.**

- With CHEOS progressed, the data from GF-4 and GF-5 will be extensively applied to resource and environment, disaster prevention and relief, and public security, which will also be significant means in meteorology, climate, hydrology and global change monitor.
- We hope to exploit the platforms of CGMS and WMO to explore potentials of satellite application, and to joint-construct satellite monitoring system.

Thanks for your attention !