China Space International Cooperation : Future Plans and Prospects

China National Space Administration

Vienna, Austria, June 2023

CONTENTS

Vision on China Space International Cooperation

Overview

01

PART ONE

Responsibilities of CNSA

China National Space Administration (CNSA)

- A governmental organization of People's Republic of China
- Responsible for the management of civil space activities
- International space cooperation

Space Policy

China's Space Activities will be reviewed in each five-year period and planned for next in White Paper, issued by the Chinese government.

- 5 White Papers issued separately in 2000, 2006, 2011, 2016 and 2021
- States the Purpose, Vision, Principles and Cooperation Policy of China's Space Activities

Space Treaties and Agreements

UN TREATIES

- **Outer Space Treaty** -Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (ratified by China in 1983)
- **Rescue Agreement** -Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched Into Outer Space (ratified by China in 1988)
- **Liability Convention** -Convention on the International Liability for Damage Caused by Space Object (ratified by China in 1988)
- **Registration Convention** -Convention on Registration of Objects Launched into Outer Space (ratified by China in 1988)

International Space Cooperation

135 space cooperation agreements

46 countries and regions

6 international organizations

Principles of International Space Cooperation

Peaceful utilization of outer space

Cooperation on equality and mutual benefit

Inclusive development

Safeguarding the central role of the **United Nations** in managing outer space affairs

Contributing to **address global common challenges**

Ensuring space S&T benefits the participating countries under **the Belt and Road Initiative**, especially developing countries

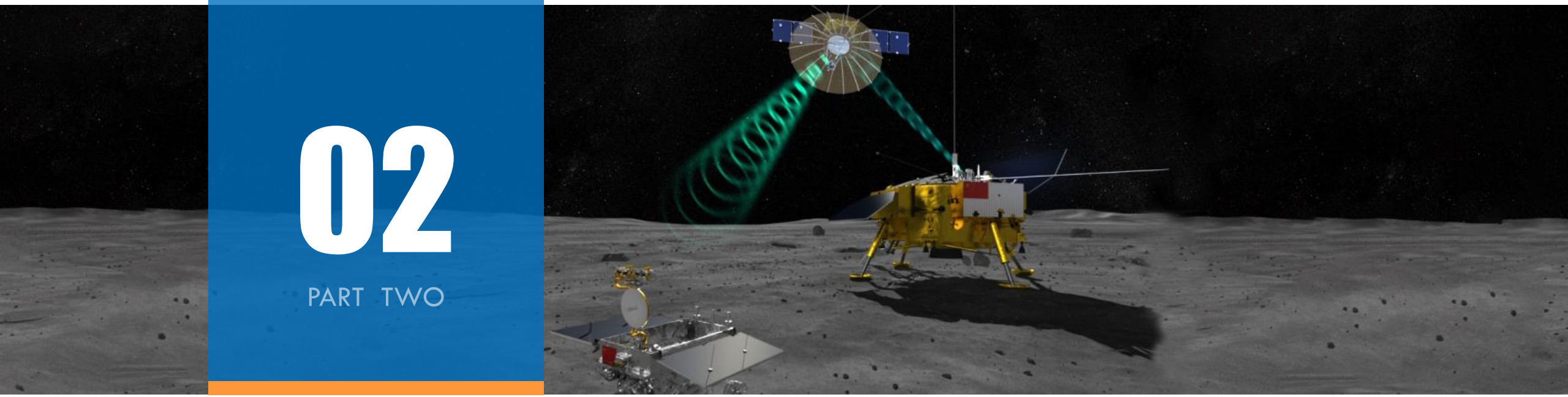
Supporting space cooperation with UNOOSA, APSCO ,BRICS , G20, Shanghai Cooperation Organization and others

Encouraging Chinese **institutes, universities, enterprises and NGOs** to engage in international space exchanges and cooperation

Opportunities for Bilateral Cooperation

02

PART TWO



China's space capacity

- Lunar and Deep Space Exploration
- Manned Space
- Space Infrastructure
  - Communication Satellite
  - Navigation Satellite
  - Remote Sensing Satellite
- Space Application
- Space Science
- Launcher

Over 520

Launches, with a

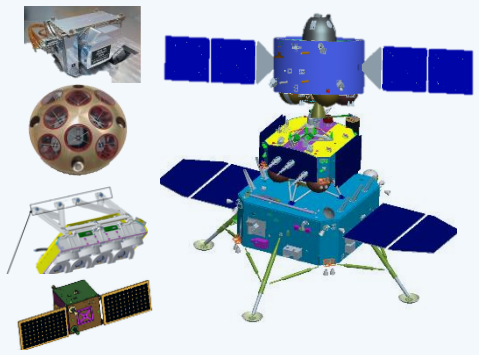
success rate of **96%**

for LM series vehicles

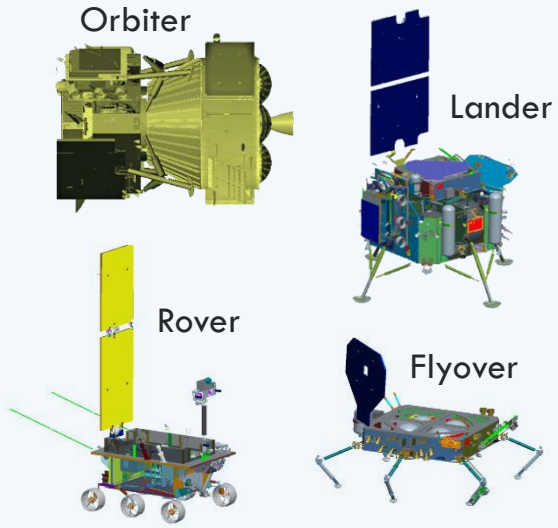
2.1 Lunar & Deep Space Exploration

Project	Launch window	Mission Descriptions
Chang'E-6	2025	Sample return from South Pole-Aitken Basin on the far side of the moon
Chang'E-7	2026	Resources and environment survey of Lunar South Pole
Chang'E-8	2030	Joint /multi explorations by a complex mission with Chang'E-7, establishment of command & control center, and verification on the in-situ utilization of lunar resources

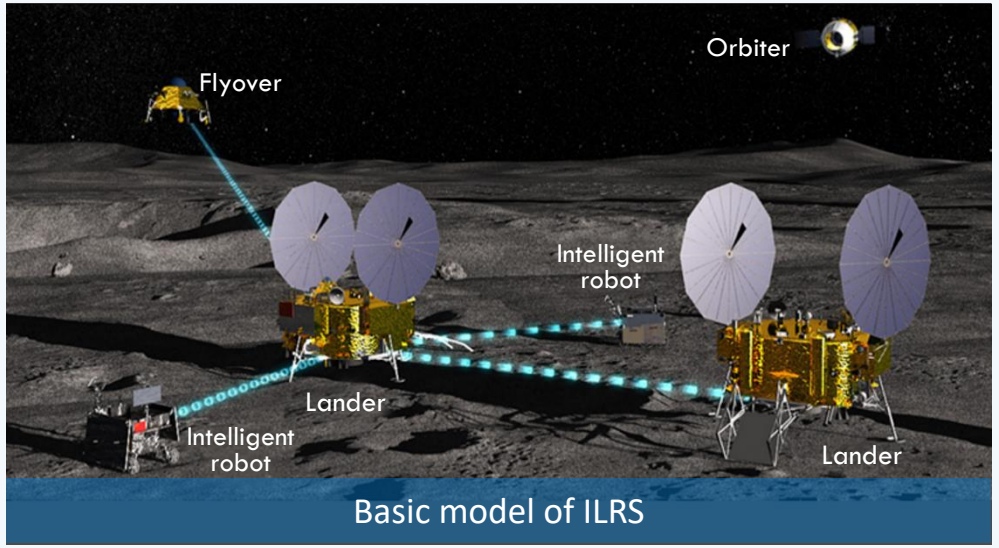
System Configurations



Chang'E-6



Chang'E-7



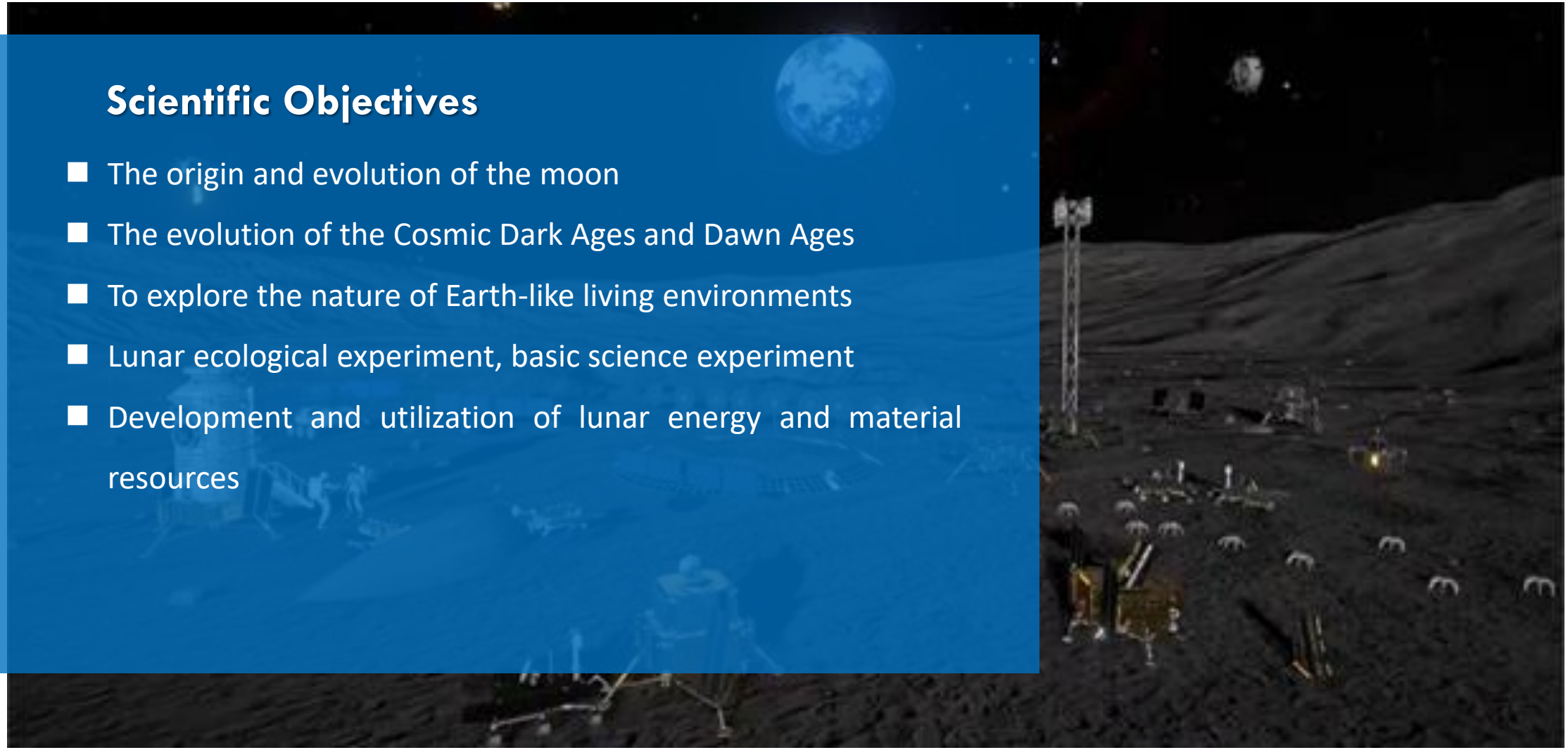
Chang'E-8

2.1 Lunar & Deep Space Exploration (Cont'd)

International Lunar Research Station(ILRS)

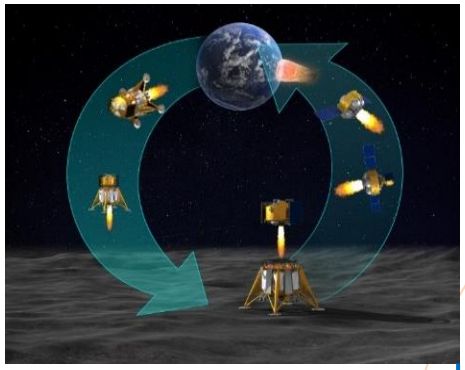
Scientific Objectives

- The origin and evolution of the moon
- The evolution of the Cosmic Dark Ages and Dawn Ages
- To explore the nature of Earth-like living environments
- Lunar ecological experiment, basic science experiment
- Development and utilization of lunar energy and material resources

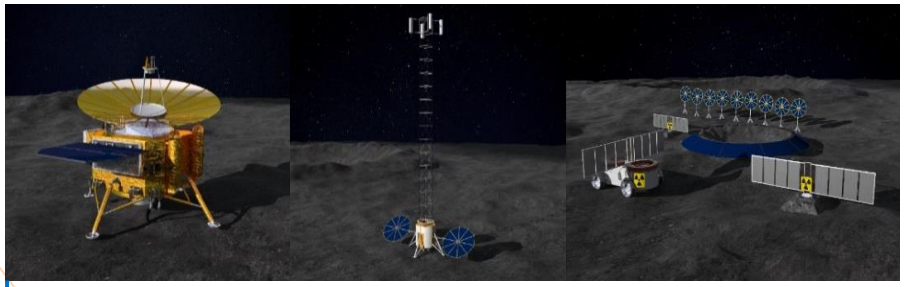


2.1 Lunar & Deep Space Exploration (Cont'd)

Break down of ILRS



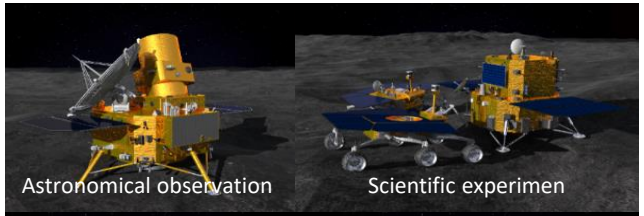
Cislunar transportation facility

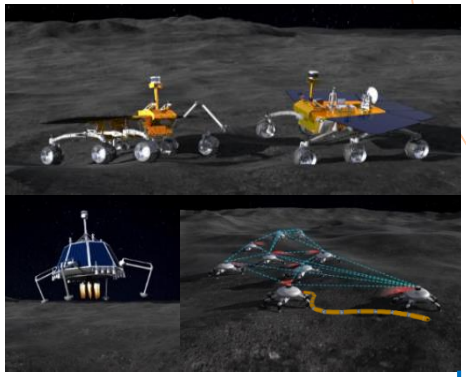


Long-term support facility

ILRS

Scientific facility





Lunar surface transportation and operation facility

Ground support and application facility

2.1 Lunar & Deep Space Exploration (Cont'd)

Examples

System engineering

- TT&C supporting from ESA Argentina, Namibia, and Pakistan
- Mission coordination between Chang 'E-7 and Luna-26

Scientific payloads

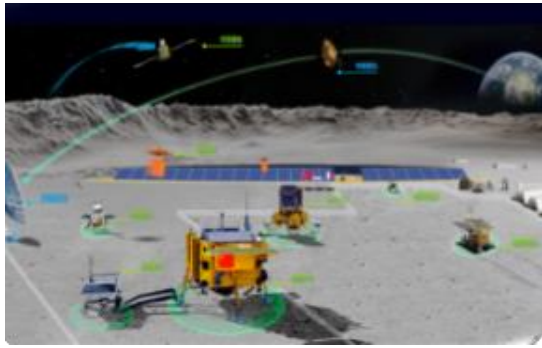
- Instrument from Sweden, Germany, Netherlands and Saudi Arabia, piggy back by Chang'E-4 mission
- Announcement of Opportunities in Chang'E-6,7 and Tianwen-2 missions

Scientific data

- Scientific data of China Lunar Program and Planetary Exploration released to public
- Mars orbiter ephemeris data exchange mechanism with the NASA, ESA

International Lunar Research Station

- June 2021, Released the International Lunar Research Station Guide for Partnership (V1.0)
- Completion of conceptual design
- Feasibility study ongoing

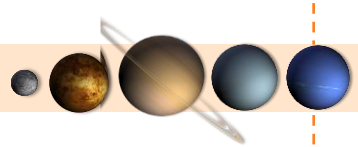


2.1 Lunar & Deep Space Exploration (Cont'd)

Plan of deep space

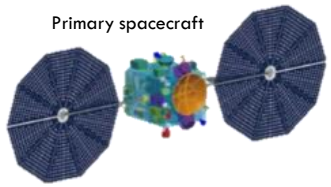
2030

2040



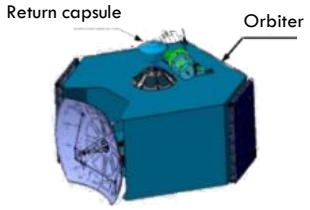
TIANWEN-2

- Launched around 2025
- Asteroid sample return

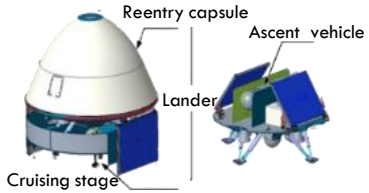


TIANWEN-3

- Launched around 2028
- Mars sample return



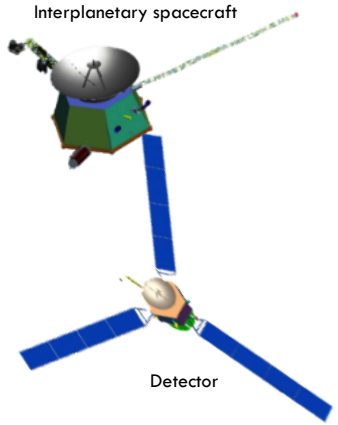
Assembly of service



Assembly of lander

TIANWEN-4

- Launched around 2029
- Jupiter system& interstellar exploration



TIANWEN-5……

- Ice giant、Venus…

2.2 Space Technology

Opportunities for satellite manufacturing from system to equipment level

Solutions		GEO	HEO	IGSO	MEO	LEO
Communication Satellites	Broadcasting	open	open	N/A	N/A	N/A
	Broadband	open	open	N/A	open	open
	Mobile	open	open	N/A	open	open
	Relay	open	open	N/A	open	open
Navigation Satellites		open	N/A	open	open	open*1
Remote Sensing Satellites	Optical*2	open	open	open	open	open
	Microwave*3	open	open	open	open	open

*1LEO satellites of navigation are for signal augment.
*2 PAN, Multispectral and Hyper-spectrum cameras.
*3 Synthetic aperture radar(SAR) included.

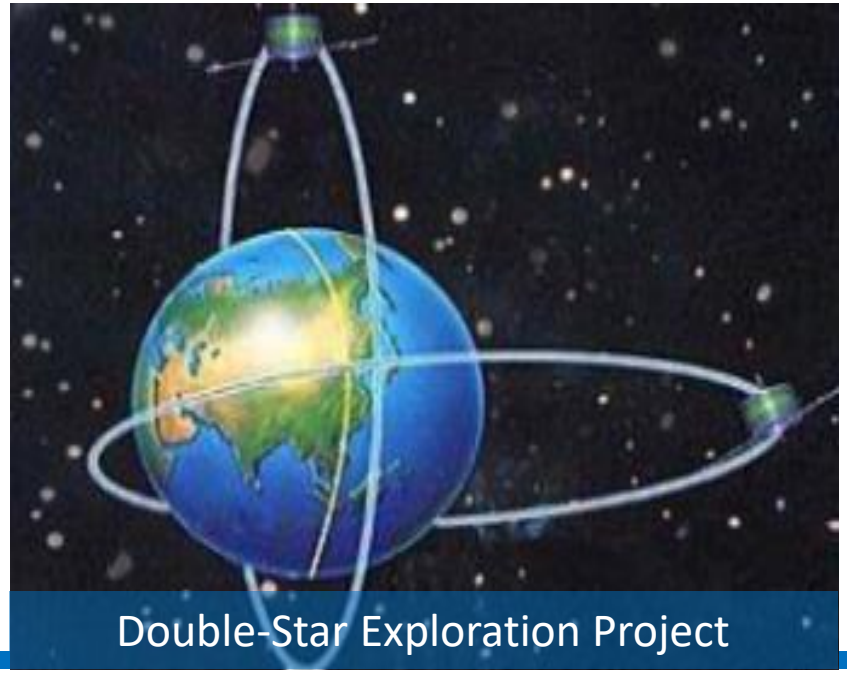
2.2 Space Technology (Cont'd)

Opportunities

		Turn-key Solution	Equipment Supply	Access to Chinese Facilities
Ground Facilities	Ground Station	open	open	open, onsite operation need to be detailed under agreement
	Facility for Satellite Manufacturing	open	open	open, onsite manufacturing need to be detailed under agreement

	Master Degree	Bachelor Degree	Internship
Education & Training	open	open	open, onsite training

Double-Star Exploration Project



Double-Star Exploration Project

- The agreement was signed 2001.
- The first spaceflight occurred 2003.
- The second spaceflight occurred 2004.

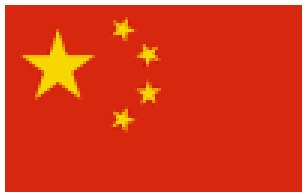
2.2 Space Technology (Cont'd)

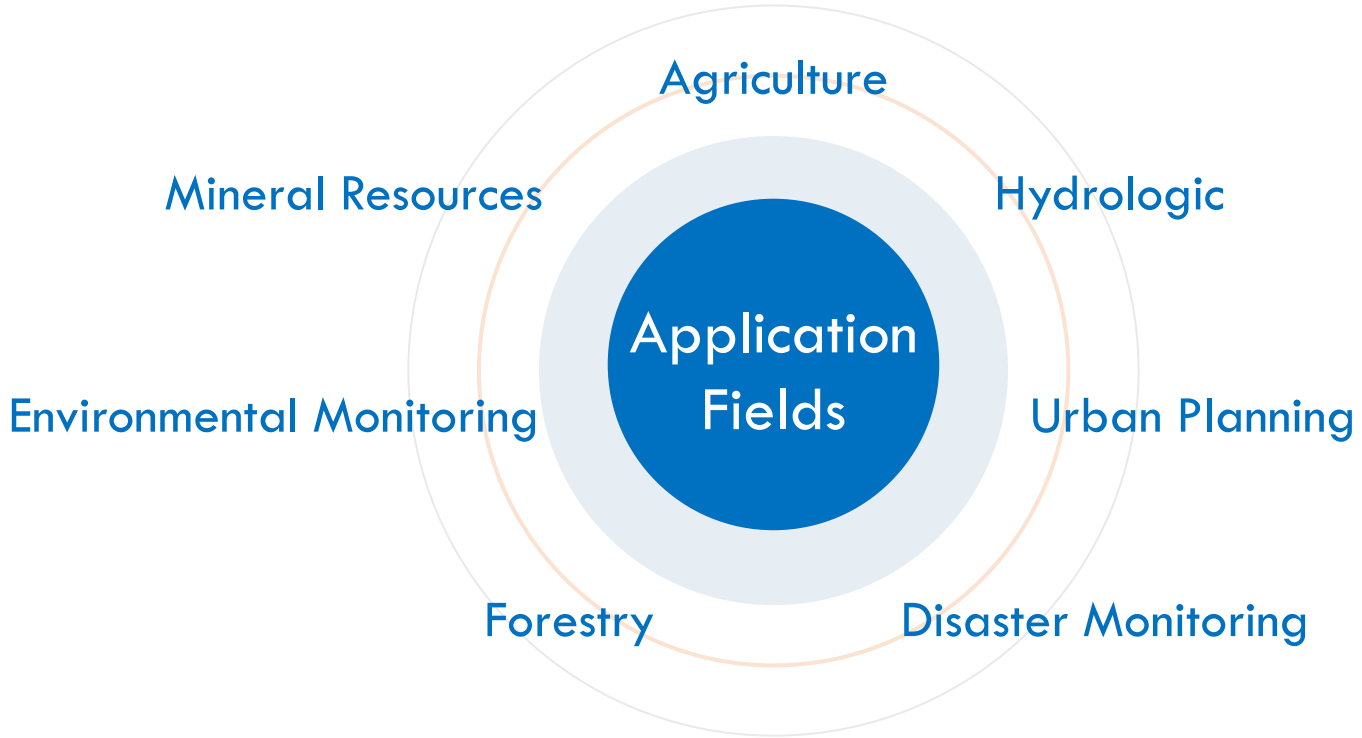
Examples

CBERS

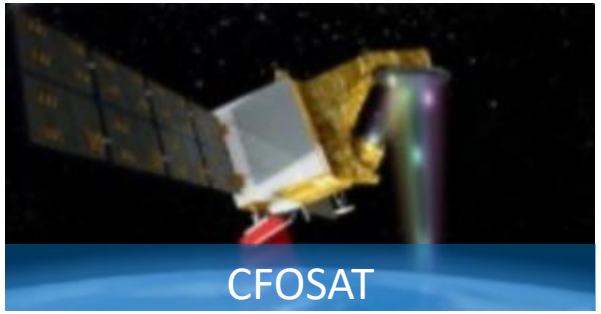
1999 CBERS-01
2003 CBERS-02
2007 CBERS-02B
2013 CBERS-03
2014 CBERS-04
2019 CBERS-04A
CBERS-06
CBERS-05

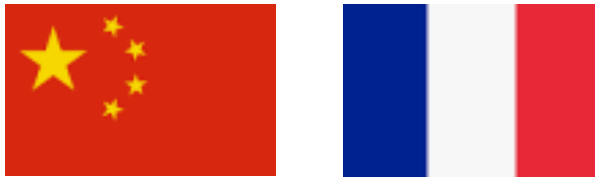

CBERS





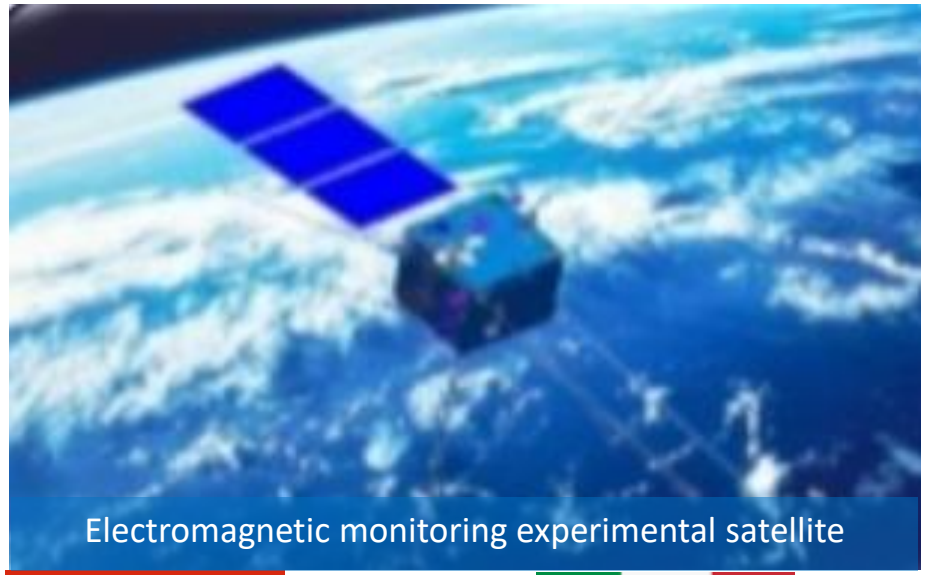
China France Ocean Satellite (CFOSAT) & Space-based Multiband Astronomical Variable Objects Monitor (SVOM)





- Agreements signed between CNSA and CNES 2006.
- CFOSAT was launched 2018, to study ocean surface winds and waves for reliable oceanic dynamics and yield new insights into ocean-atmosphere interactions.
- Under the agreement among CNSA, CNES and EUMETSAT 2019, the data from CFOSAT distributed to EUMETSAT's 30 Member States and the European Centre for Medium-Range Weather Forecasts in near-real time and perform additional processing of the data.
- SVOM satellite is ongoing, to be launched next March.

Electromagnetic monitoring experimental satellite



Electromagnetic monitoring experimental satellite

- The cooperation agreement was signed between CNSA and ASI in 2013.
- Electromagnetic monitoring experimental satellite 01, a high-energy particle detector from Italy, launched 2018.
- Electromagnetic monitoring experimental satellite 02, a high-energy particle detector from Italy, is to be launched 2024.

BeiDou Navigation System Applications

Global

Asia-Pacific Region

Positioning accuracy: <5m

Positioning accuracy: ~1m

PNT

Single message length: 560 bits

Single message length: 14000 bits

SMC

Search & Rescue

Successfully joined COSPAS-SARSAT

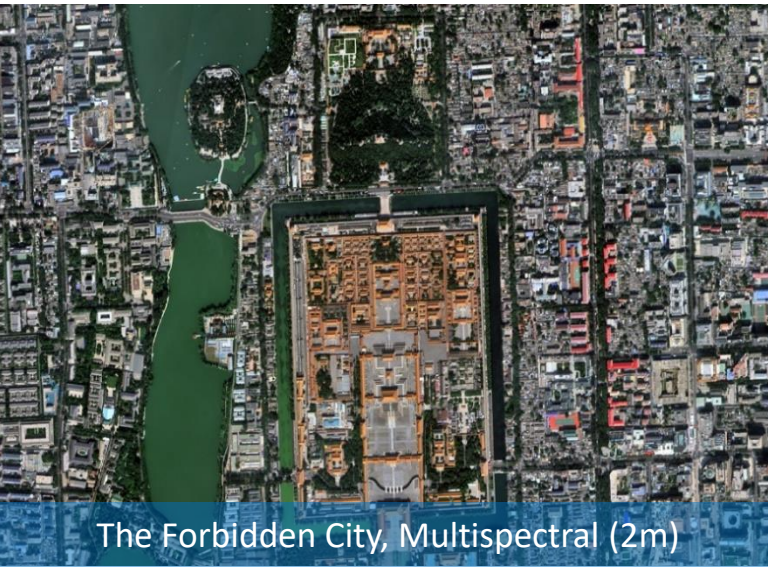
2.3 Space Application - Remote Sensing Area

Remote Sensing Data will be widely applied in Agriculture, Natural Resource, Environment Protection, Disaster Management and Climate Change

Satellite	Agriculture & Fishery	Natural Resource	Environment Protection	Disaster Management	Climate Change	City Planning
Land Survey GF-Series SAT	Applicable (drought, pest, yield)	Applicable	Applicable	Applicable	Applicable (greenhouse gas)	Applicable (transportation, public facility)
Ocean Monitoring HY-Series SAT	Applicable (pollution)	Applicable	Applicable	Applicable	Applicable	Applicable (coastal zone)
Meteorology Monitoring FY-Series SAT	Applicable	N/A	Applicable	Applicable (extreme weather)	Applicable	Applicable

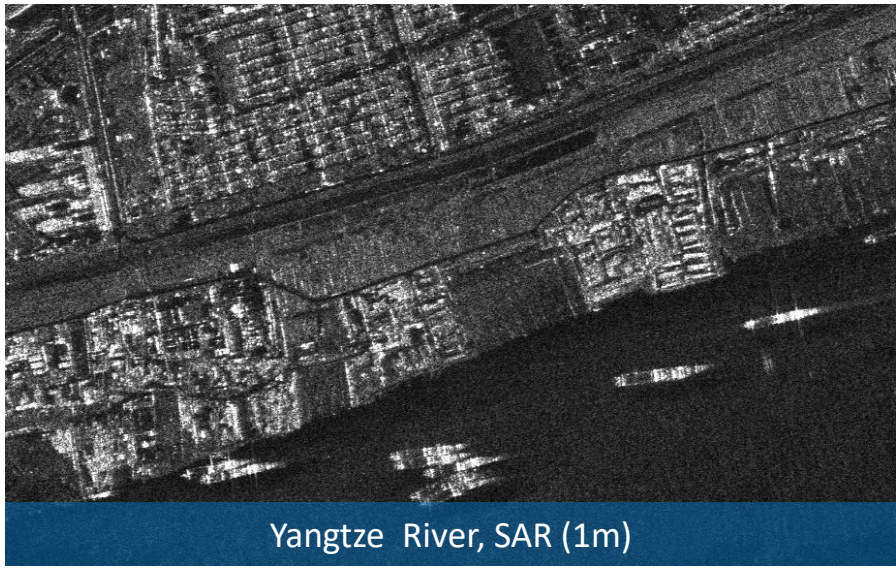
2.3 Space Application - Remote Sensing Area (continued)

Data Policy



The Forbidden City, Multispectral (2m)

Bird Nest, PAN(0.5m)



Yangtze River, SAR (1m)

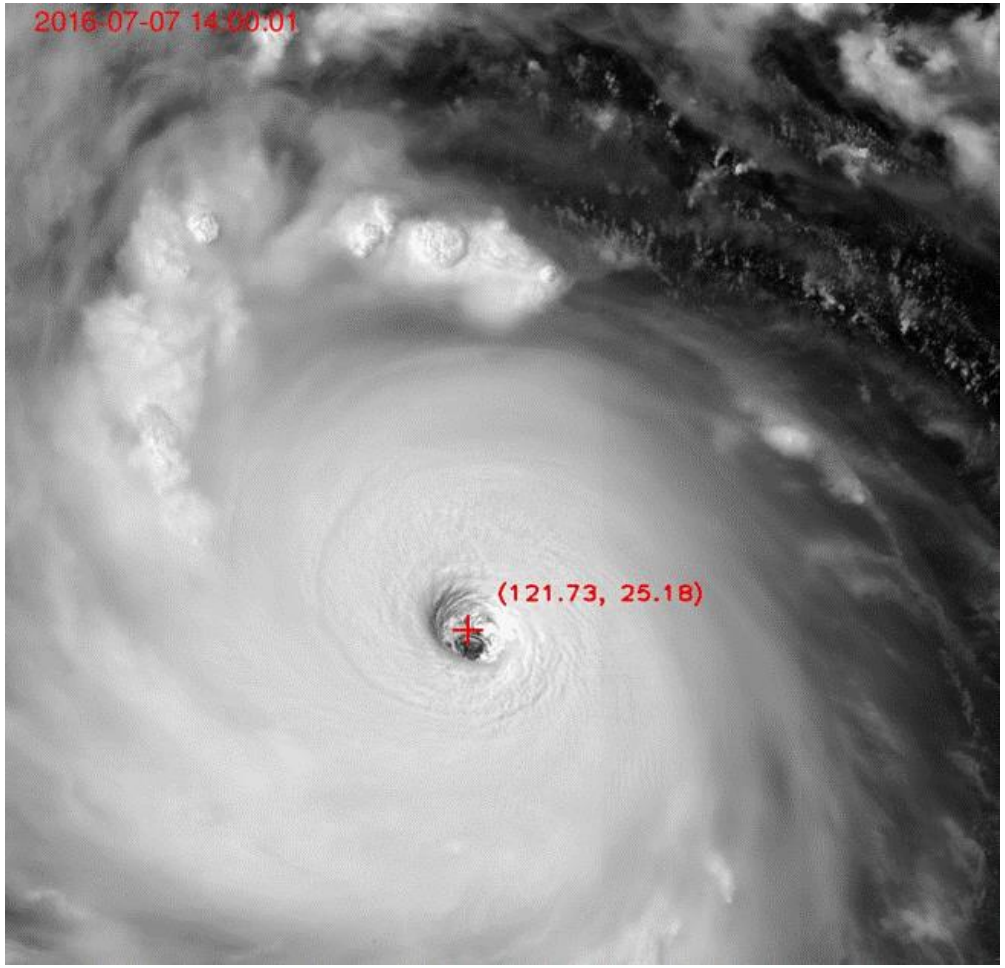
Resolution limit

- Panchromatic data with ground pixel resolution, higher than 0.5 meter (not included)
- Multispectral data with ground pixel resolution, higher than 2.0 meter (not included)
- Microwave image data with ground pixel resolution, higher than 1.0 meter (not included)

To be detailed in document of *Interim Measures for International Cooperation Administration of National Civil Remote Sensing Satellite Data*, released by CNSA 2022.

2.3 Space Application - Remote Sensing Area (Cont'd)

Typical Cases in Application

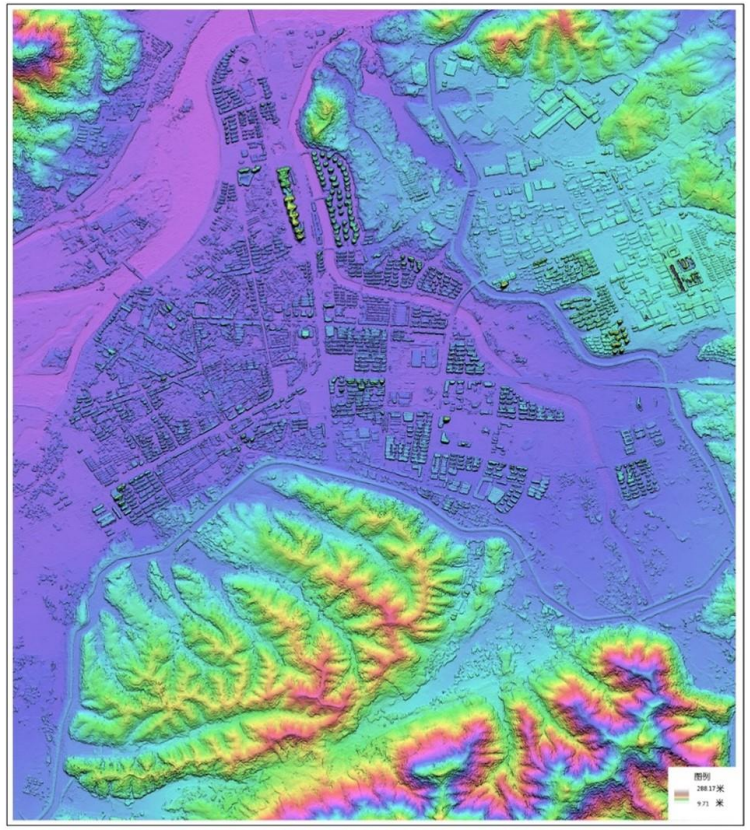


Typhoon Eye Observation by FY-4

Mountain Fire by GF-4

2.3 Space Application - Remote Sensing Area (Cont'd)

Typical Cases in Application

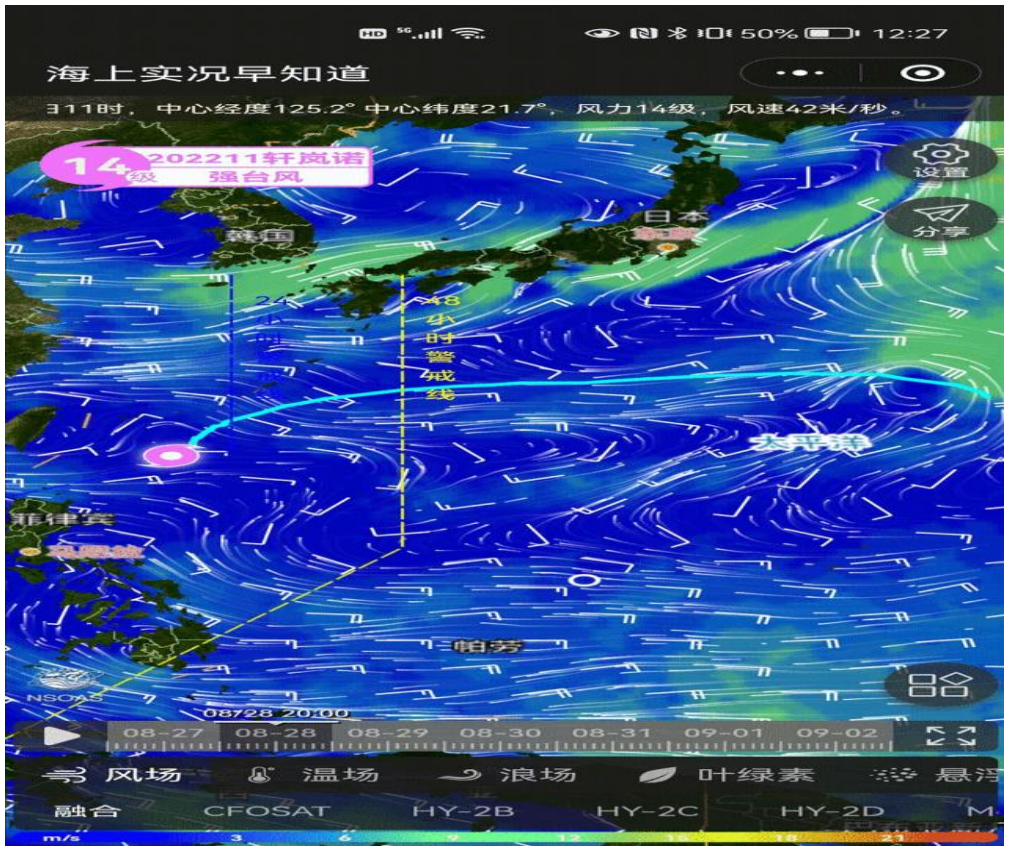


GF-7 with resolution of 0.65m, to locate the geographic level and elevation

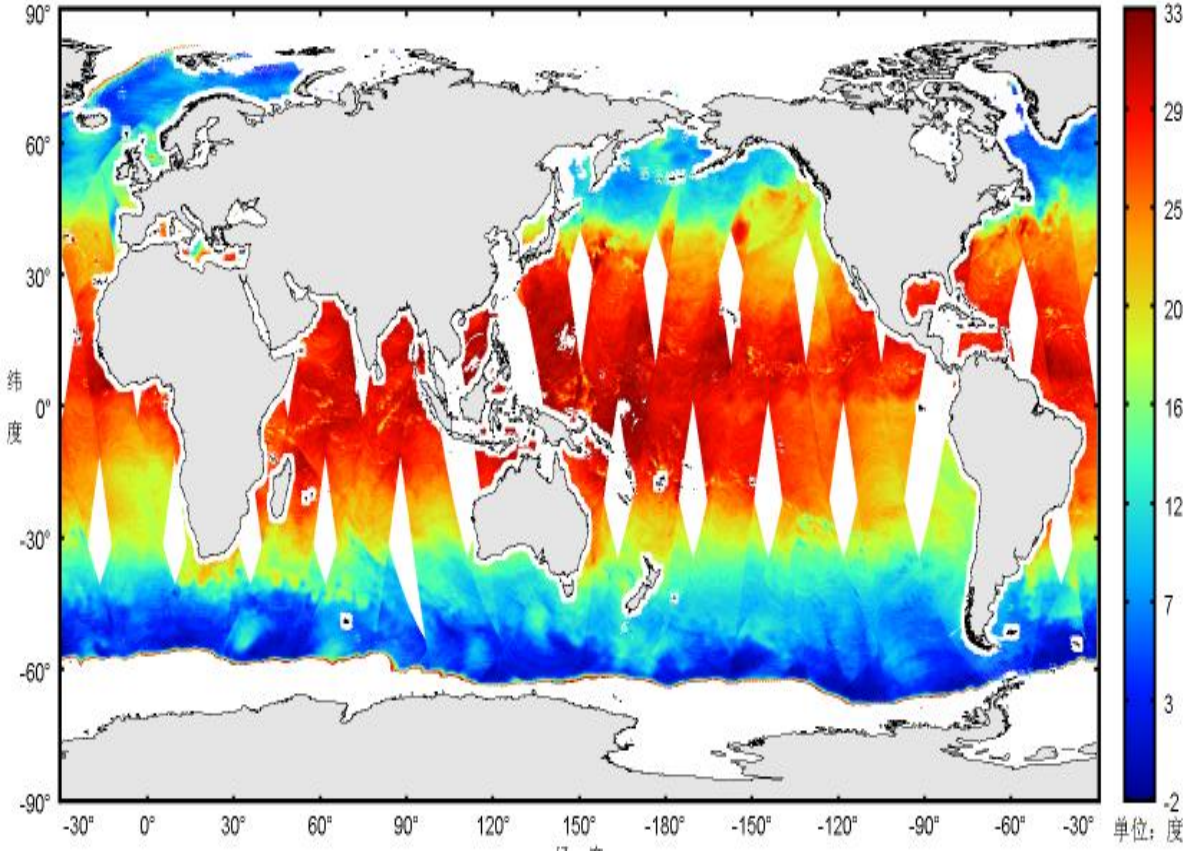
Digital Building Model in Shenyang city, Liaoning province , based on GF-7 data

2.3 Space Application - Remote Sensing Area (Cont'd)

Typical Cases in Application

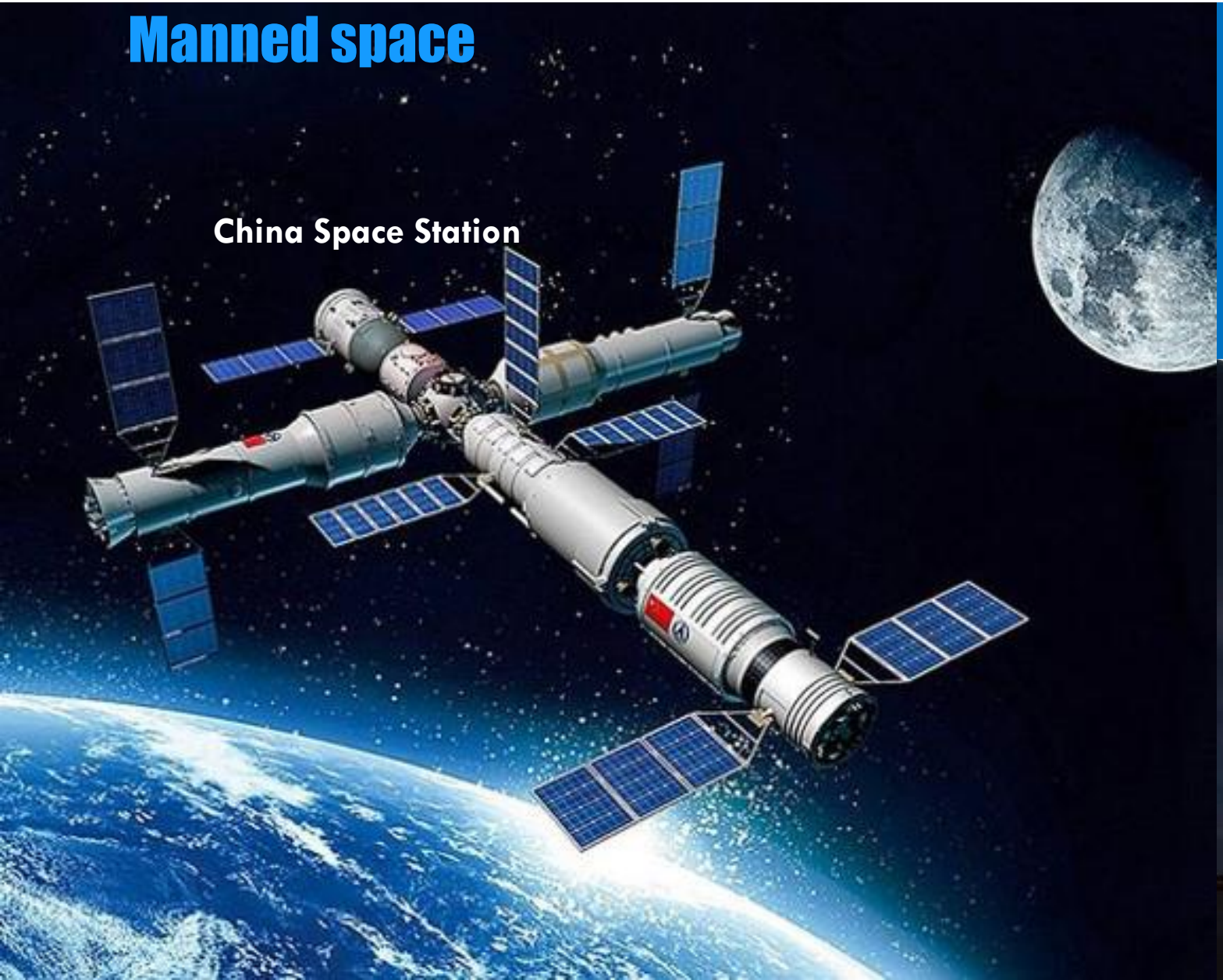


Sea surface wind field monitoring by CFOSAT



Sea surface temperature monitoring by HY-2

2.4 Space Science (continued)



- China Space Station fully completed in 2022
- Long-term scientific study and experiment in biology, life science, medicine and materials etc.

2.4 Space Science

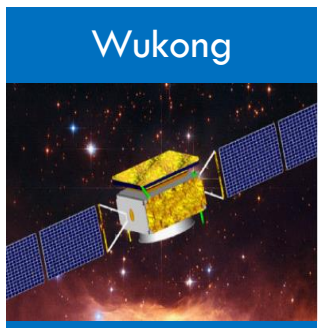
Opportunities

	Missions for	System	Subsystem	Equipment	Application
Experiments under Space	China Space Station or Spaceship	N/A	N/A	open (such as new materials, or scientific instrument)	open
Space Science	Space astronomy	open*	open	open	open
	Lunar and planetary science	open*	open	open	open
	Space earth sciences	open*	open	open	open
	Space physics	open*	open	open	open

*Definition of scientific objectives and areas, system level cooperation are also included.

Missions for Space Science

- Dark matter detection, dark energy detection
- Black hole
- Origin of universe, celestial bodies and life
- Quantum communication, gravitational wave detection



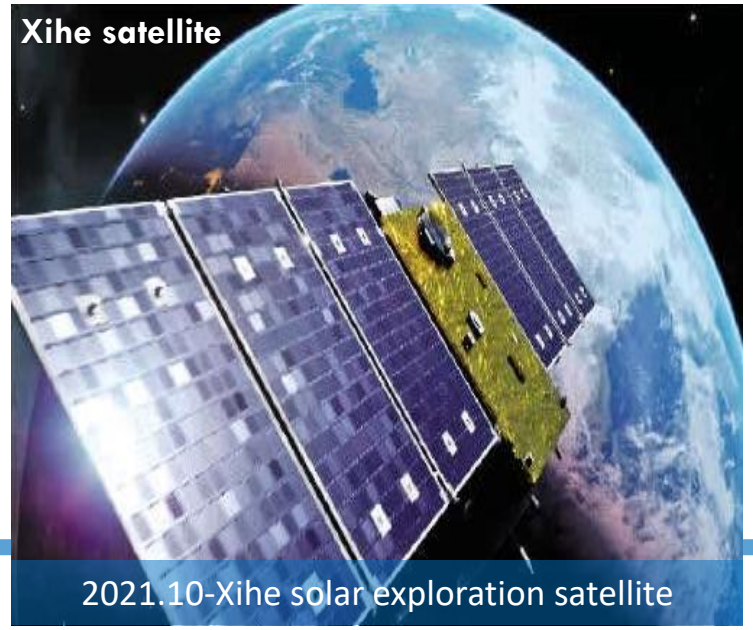
2015.12

2016.8

2017.6

2019.8

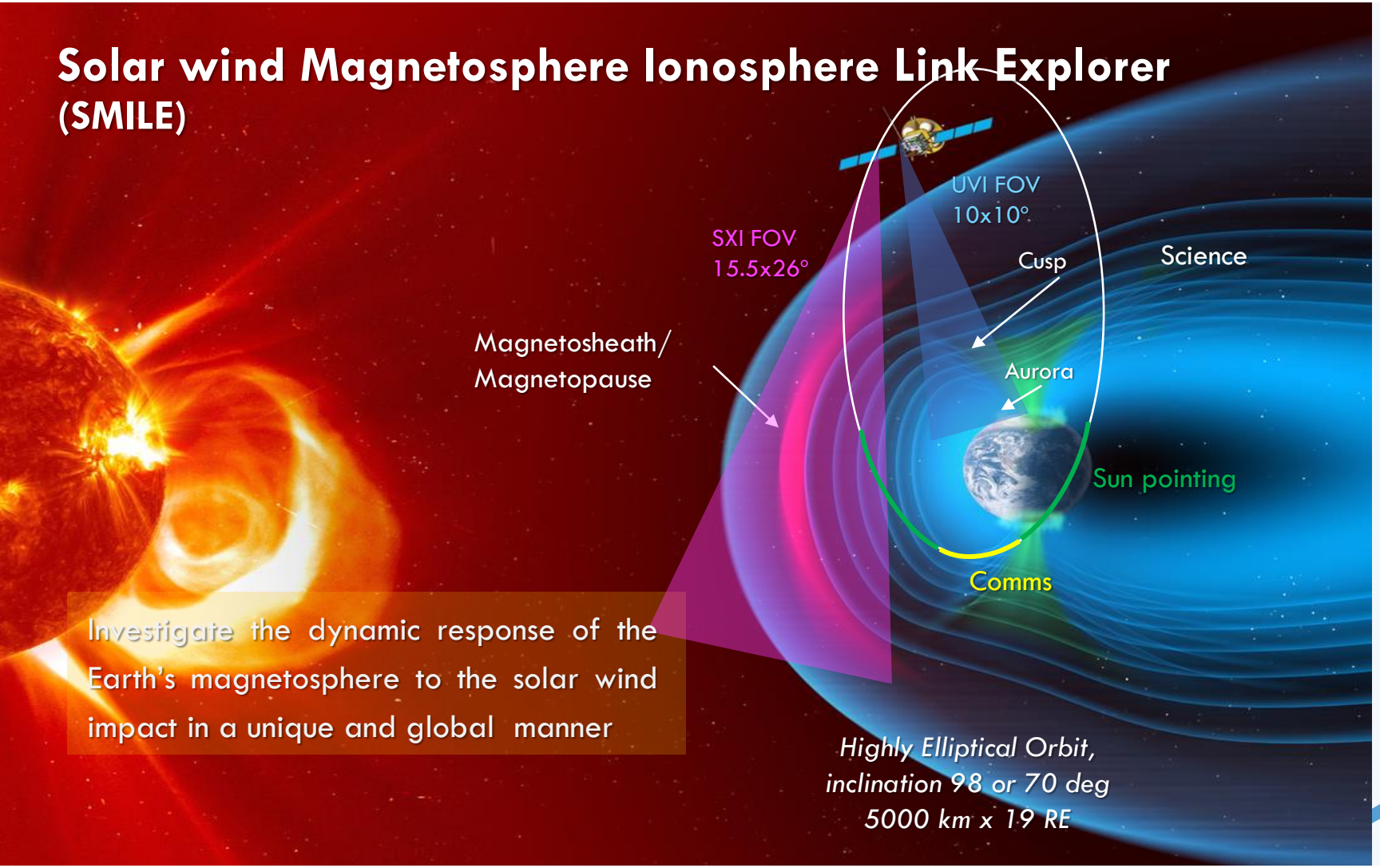
2019.12



2021.10-Xihe solar exploration satellite

Examples

SMILE (ESA-China Joint Mission)



Multilateral Cooperations

03

PART THREE

Multilateral cooperation under UN

REGIONAL CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN ASIA AND THE PACIFIC(BEIJING, CHINA)

As of September 2021, total 319 students, from 27 developing countries, graduated with MASTA&DOCSTA.

Regional Centre for Space Science and Technology Education in Asia and the Pacific (China)
联合国附属空间科技教育亚太区域中心(中国)

Specialty includes

- Remote Sensing
- Geographic Information System (RS&GIS)
- Satellite Communications,
- Global Navigation Satellite Systems
- Micro-satellite Technology
- Space Law and Policy,
- Space Science and Environment, etc.

UN-SPIDER（BEIJING, CHINA）

UN-SPIDER

UN-SPIDER is a programme of the United Nations Office for Outer Space Affairs (UNOOSA), with offices in Vienna, Beijing and Bonn.

The Beijing office focuses on Asia but also contributes to the work in the Pacific and Africa since 2011.

Cooperation with APSCO

ABOUT APSCO

- A non-profit, international, inter-governmental organization， to promoting multilateral cooperation in space science, technology and applications
- China is the Host Country， Headquarters located in Beijing
- 12 Members

Full Members: Bangladesh, China, Iran, Mongolia, Pakistan, Peru, Thailand, Türkiye

Signatory: Indonesia (ratification in process)

Associate Member: Egypt (ratification in process)

Observer: Mexico, Inter - Islamic Network on Space Sciences and Technology (ISNET)

Example

- Student Small Satellite (SSS)
- Launched by LM-2D Oct 2021

Cooperation Areas with APSCO

- Space science, lunar & deep space exploration
- Space technology, space capacity building
- Space application, remote sensing data sharing and application

BRICS Remote Sensing Satellite Constellation

Aug 2021

- The agreement among BRICS'S space authorities on Remote Sensing Satellite Constellation signed.

Outcomes of 2022, CNSA acted as host authority

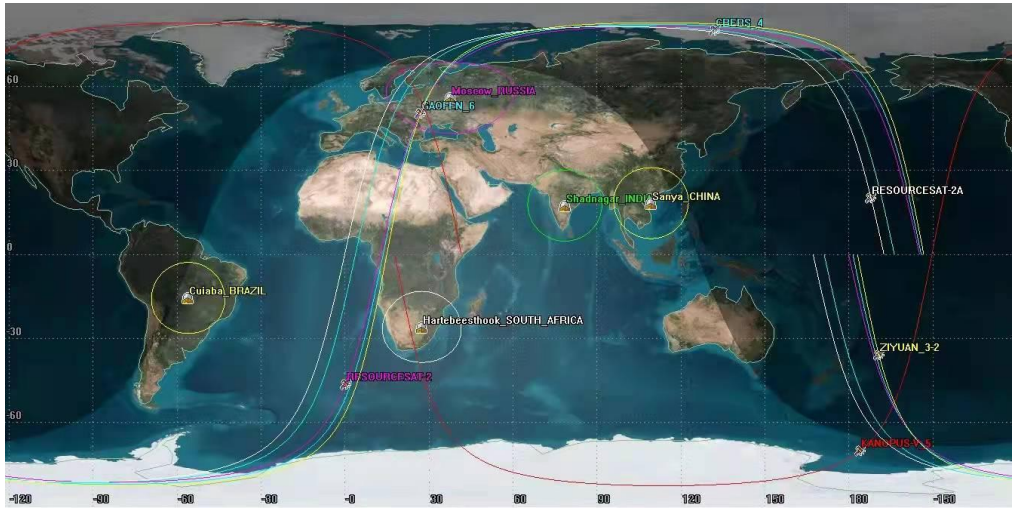
- Terms of Reference for the Joint Committee on BRICS space cooperation.
- Rules of Procedure for the implementation of the Agreement on cooperation on BRICS remote sensing satellite constellation.
- Best practices for the constellation application, data exchange among partners, seminar for application.
- Annual report on the BRICS Remote Sensing Satellite Constellation.

Status of 2023, SANSA acts as host authority

- The first Working Group Meeting was held on April 13.
- Discussion of annual work 2023, including the data exchange programme, the BRICS space capacity catalogue. and the BRICS Space Technology Roadmap, which were proposed by South Africa.

BRICS Remote Sensing Satellite Constellation (continued)

6 satellites in orbit & 5 ground stations



List of 5 Ground Stations

- Brazil: Cuiaba (15.552S, 56.073W)
- Russia: Moscow (55.86N, 37.63E)
- India: Shadnagar Earth Station (17.028N, 78.188E)
- China: Sanya City, Hainan Province (18.312N, 109.309E)
- South Africa: Hartebeesthook, Krugersdorp, Gauteng (25.89S, 27.42E)

List of 6 Satellites

- CBERS-04（China-Brazil）
- Kanopus-V-type (Russia)
- Resourcesat-2 (India)
- Resourcesat-2A (India)
- GF-6 (China)
- ZY-3/02 (China)

The Belt and Road Space Information Corridor (Cont'd)

Lancang-mekong River Space Information Cooperation Center Project

Provide Lancang-Mekong countries with:

- Remote sensing data storage
- Advanced processing
- Production of special product
- Product distribution, etc.

Cover seven remote sensing application fields:

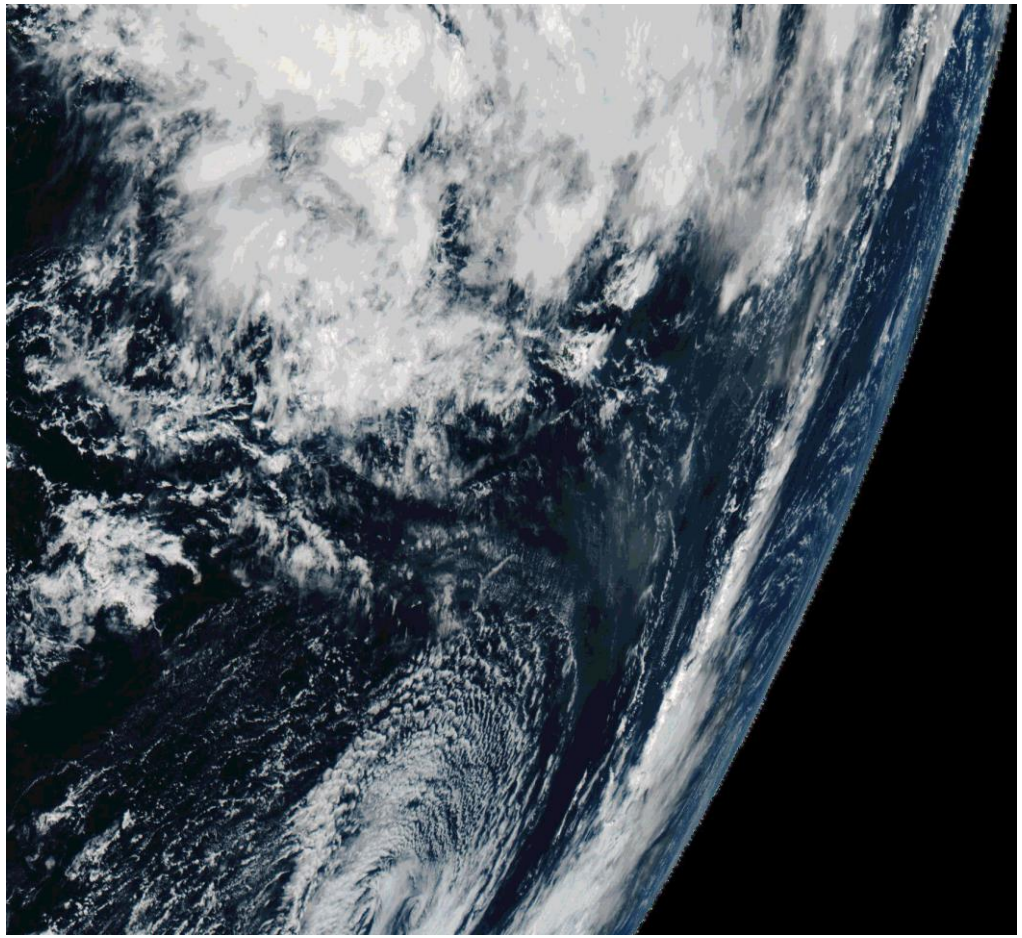
- Agriculture
- Forestry
- Water resources
- Coastal zone
- Offshore oil spill
- Drought monitoring
- Flood monitoring

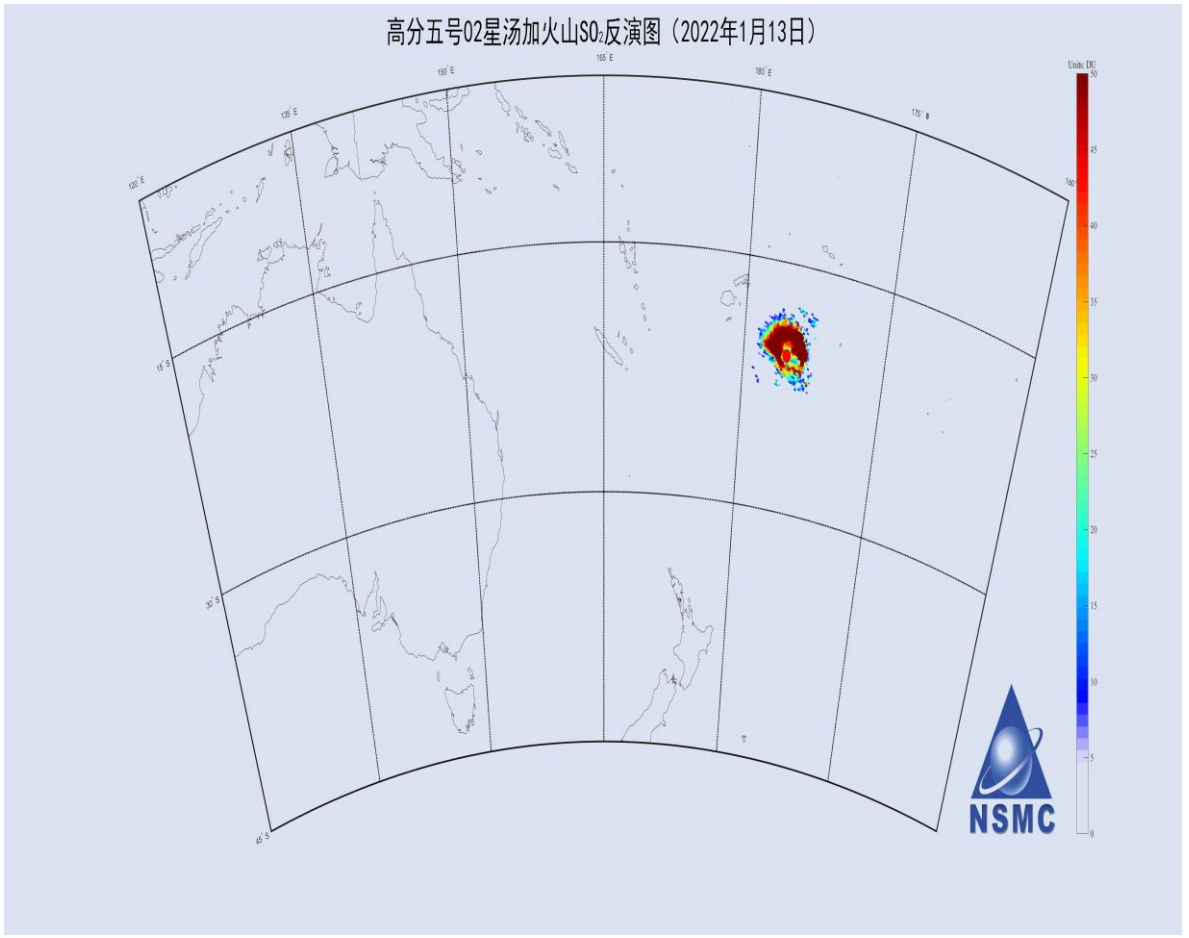
The Project Serves Four Countries
Laos, Cambodia, Thailand and Myanmar

The Belt and Road Space Information Corridor (Cont'd)

China Meteorological Data Global Service

For over 120 countries and regions

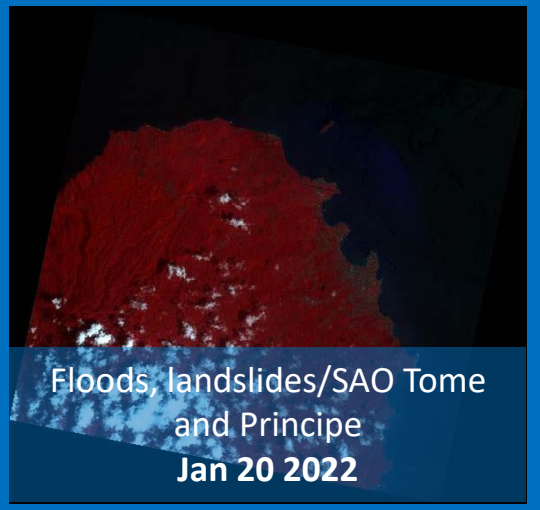


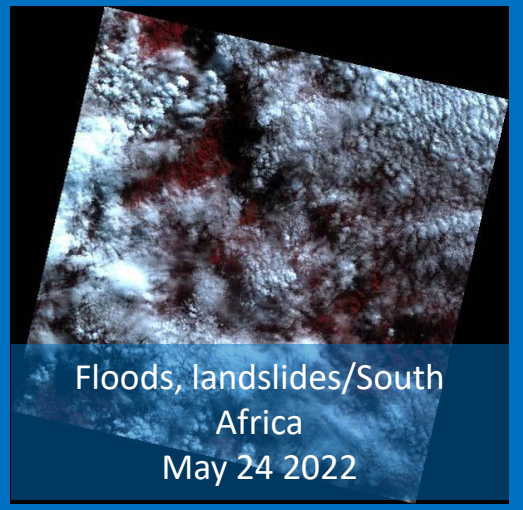


The Volcano Eruption Monitoring over Tonga (2022-01)

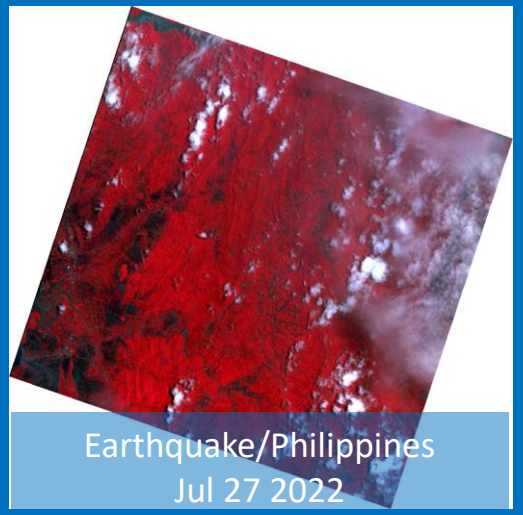
Space and Major Disasters International Charter (CHARTER)

17 satellites from China applied in operation of CHARTER.


Floods, landslides/SAO Tome and Principe
Jan 20 2022


Floods, landslides/South Africa
May 24 2022


Oil spill/Peru
Jan 20 2022


Earthquake/Philippines
Jul 27 2022

2022 to now (over 2000 scene data)

Space Climate Observatory (SCO)

SCO, initialed by CNES , CNSA and others, launched in 2019 which aims to gather public and private entities involved in the Earth Observation (EO) sector.

MOU between CNSA and CNES on the Application of Space Technology to Climate Change Research and Space Exploration Jan 2018.

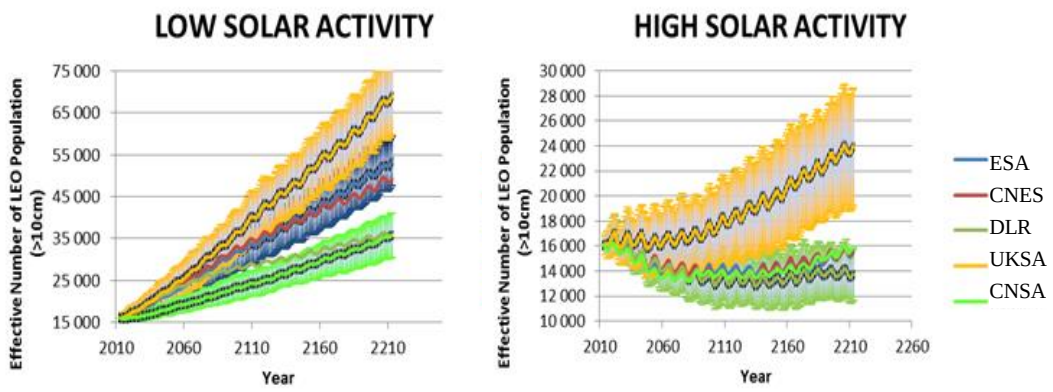
Implementation Agreement between the CNSA and CNES on the Implementation of the Space Climate Observation Platform Initiative Jun 2018.

Charter of SCO signed by CNSA Jun 2022, more than 30 space agencies and international organizations also included.

Cooperation under IADC

Participate in IADC joint research activities on modeling and database

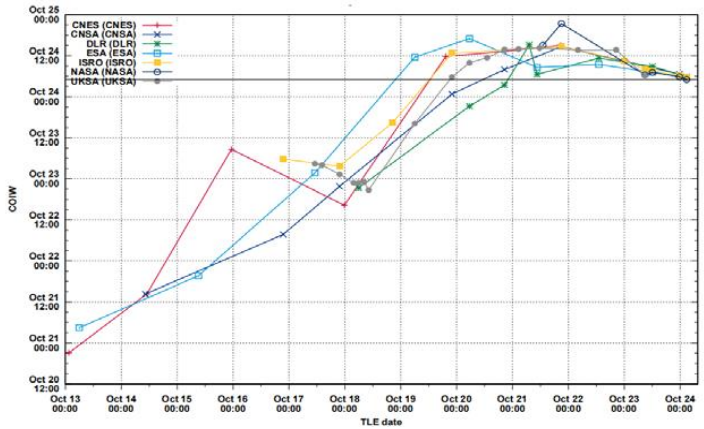
- Joint study on long-term evolution model of space debris environment
- SOLEM (Space Objects Long-term Evolution Model) established by China



The evolution of space debris quantity in different space environments of each IADC member

Participate in IADC re-entry prediction campaign

- Proposed Starlink-24 as a candidate joint observation object in 2022



The predicted re-entry results of Starlink-24 uploaded by each IADC member

Contact Information

04

PART FOUR

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