



44th CGMS, Biot France



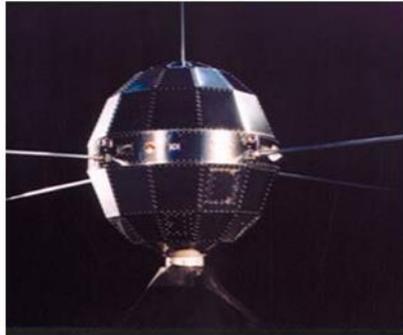
New Era, System Capacity, Global Contribution, the Vision and Future of China Space

China National Space Administration

Wang Cheng, Jun 9 2016



Three Milestones of China's Space



DFH-1 Satellite



Manned Space
Program

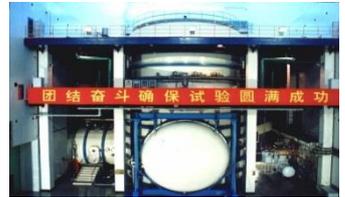
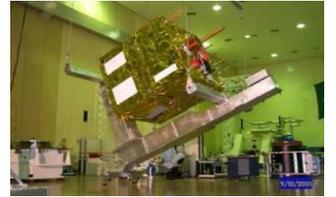
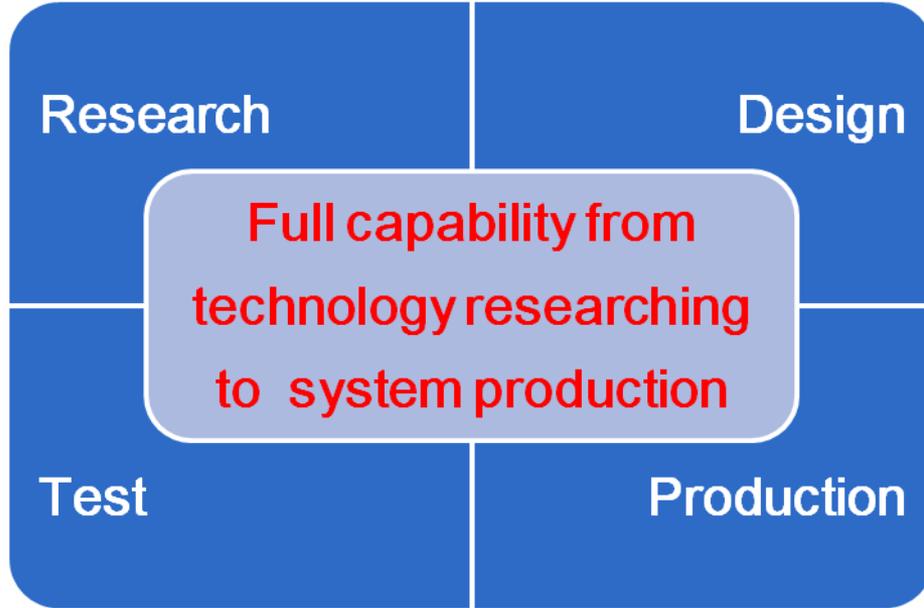
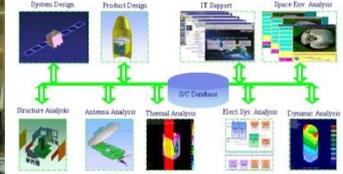
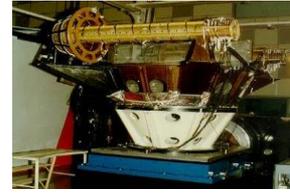


Lunar Exploration
Program

*60 years of China's Space activity is symbolized historic missions such as **DFH-1 satellite, Shenzhou manned space program and Cheng-e lunar exploration program.***



Space Industry System





Space Transportation System

12 versions

9500kg (LEO)

5500kg (GTO)

228 Launch





Space Transportation System



New Generation CZ-5 and CZ-7, LEO TO 25, GTO TO 14 by CZ-5 ,2016

Current EOS of China



- **CNSA devotes to construct an EOS for continuous and stable Earth observations, including:**
 - **meteorology series satellites**
 - **ocean series satellites**
 - **resource series satellites**
 - **environment and disaster small satellite constellation (HJ) series.**
- **CNSA make great efforts to enhance the ground receiving and processing system of EOS, to improve the EOS serving capability so as to push operational services forward.**
- **CNSA increases inter-connection with other countries and boosts the serving capability of its satellite dataset.**
- **RS images and dataset have been used in different application fields**
 - **mineral and resource**
 - **land use, environment protection**
 - **ecosystem control**
 - **flood and drought monitoring**
 - **city management, et al.**

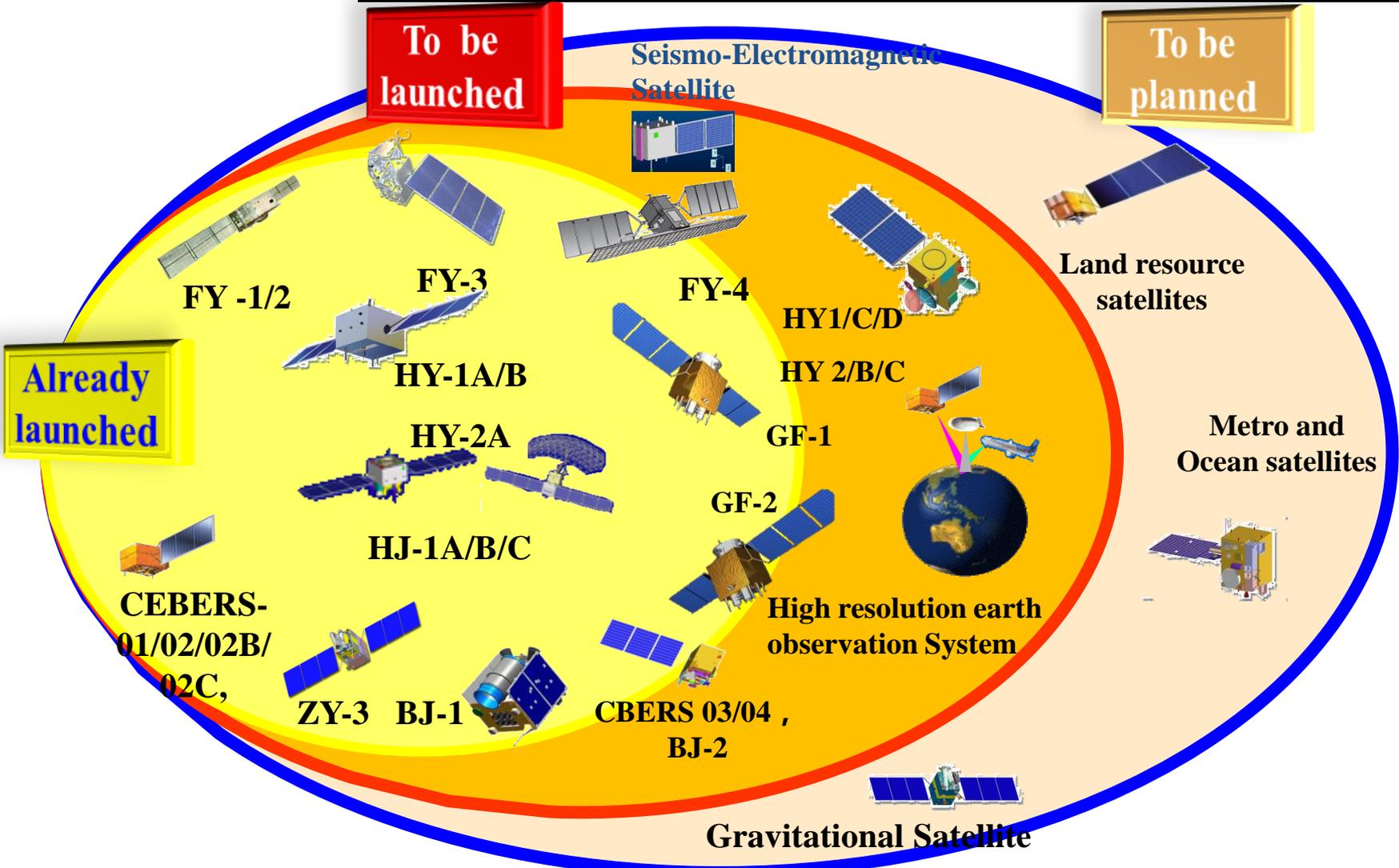
Current EOS of China

Currently, 11 satellites are on-orbit, including **HY-1B, HY-2A, HJ-1A/B, HJ-1C, ZY-3A,B ,CBERS04,GF-1 ,GF-2 and GF-4** (and with FY series)

Satellites	Space Agency	Equator Crossing Time + Altitude	Launch Date	Instrument	Status, applications and other information
HY-1B	CNSA	10:30 (D) 798 km	Apr11, 2007	4-band CCD Camera Ocean Colour and Temperature Scanner (OCTS)	Ocean monitoring
HJ-1A	CNSA	10:30 (D) 650 km	Sep 6, 2008	Two 4-band CCD camera, Hyperspectral camera	Land, resource and environment monitoring
HJ-1B	CNSA	10:30 (D) 650 km	Sep 6, 2008	Two 4-band CCD camera, IR camera	Land, resource and environment monitoring
HY-2A	CNSA/ NSOAS	06:00 (D) 964 km	Aug 16, 2011	Microwave Altimeter, radiometer, and Scatterometer	Ocean monitoring
ZY-3	CNSA		Jan 9, 2012 May,30,2016	3dimention camera	mapping and resources survey
HJ-1C	CNSA		Nov, 19, 2012	S-band SAR	
CBERS-4	CNSA +AEB	10:30 (A) 778 km	Dec, 7, 2014	Land monitoring CCD camera, IRMSS, WFI	
GF-1	CNSA	10:30(D) 640 km	Apr 26, 2013	2m panchromatic and 8m multispectral sensor 16m multispectral sensor	
GF-2	CNSA	10:30 (A) 631 km	Aug 19, 2014	1m panchromatic and 4m multispectral sensor	
GF-4	CNSA	36000km	Dec, 29, 2015	50m optical sensor 400 m medium wave infrared	

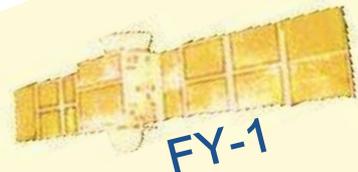


Satellites Schedule





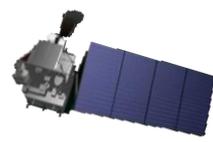
Meteorological Satellites



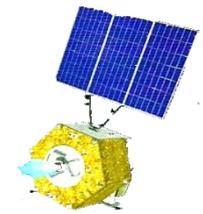
FY-1



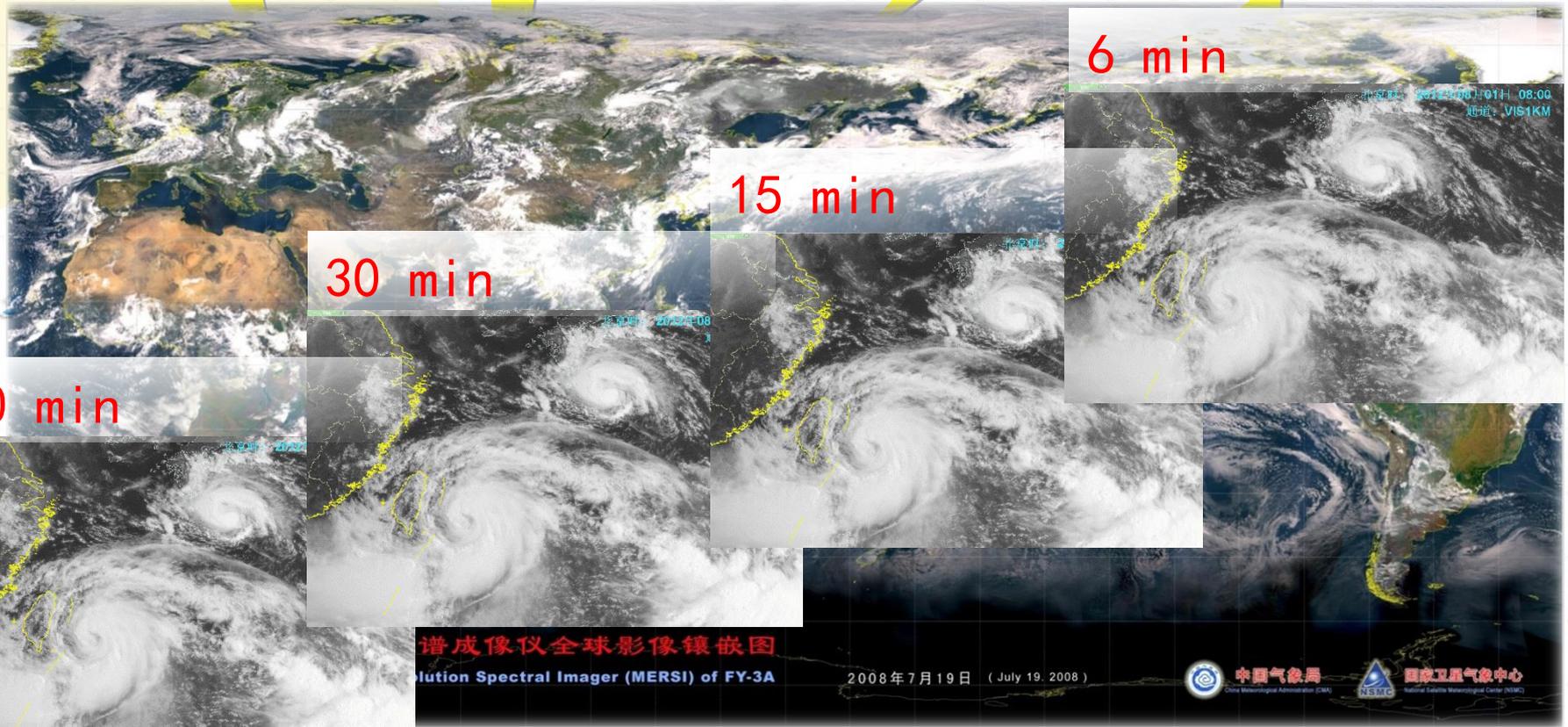
FY-2



FY-3



FY-4



6 min

15 min

30 min

60 min

谱成像仪全球影像镶嵌图

Resolution Spectral Imager (MERSI) of FY-3A

2008年7月19日 (July 19, 2008)



中国气象局
China Meteorological Administration (CMA)

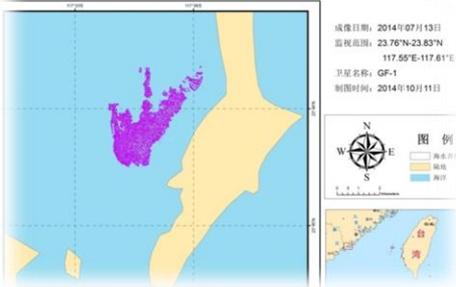


国家卫星气象中心
National Satellite Meteorological Center (NSMC)

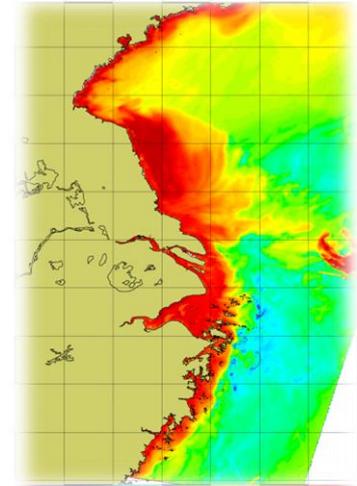


Ocean Satellites

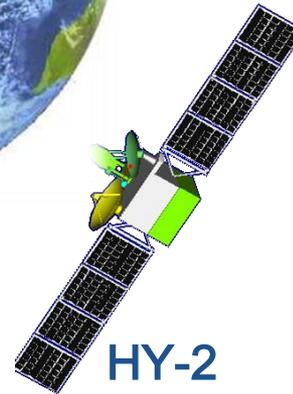
福建漳州海水养殖监测专题图 (HY-HSYZ)



CFOSAT

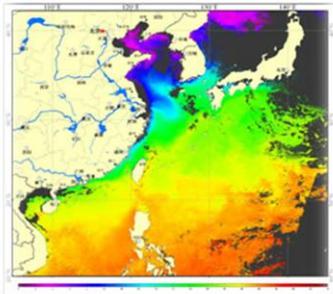


HY-1



HY-2

HY-1B卫星遥感海面温度专题图

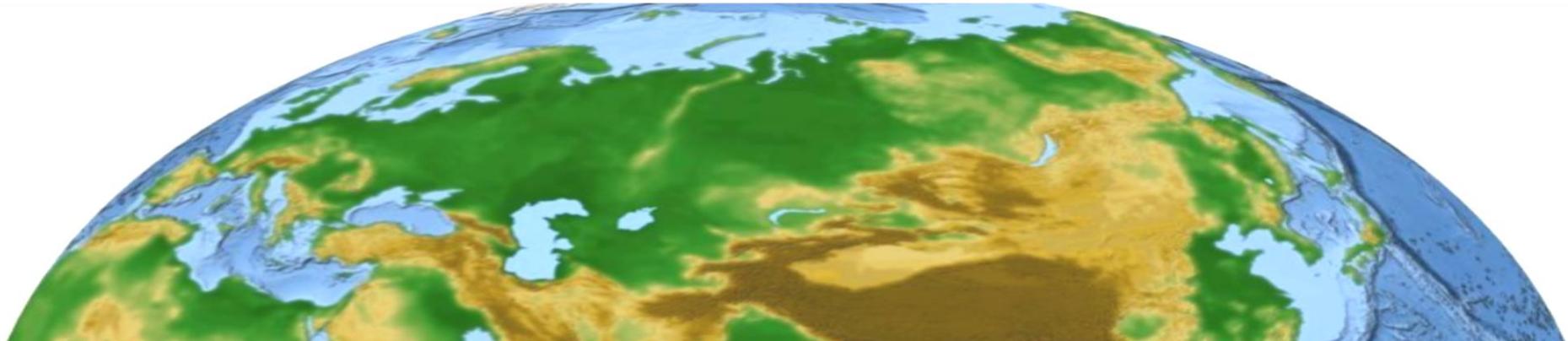
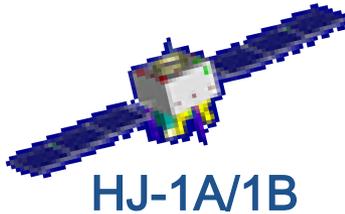


卫星遥感海面温度 (2010年01月01日—01月31日)
 制作时间: 2010年03月18日
 地图投影: 墨卡托投影 (WGS-84)



Land Satellites

Medium resolution satellites: HJ-1A/1B/1C, CBERS-04, etc.



Dongting Lake chlorophyll a concentration distribution map by using HJ-1A data

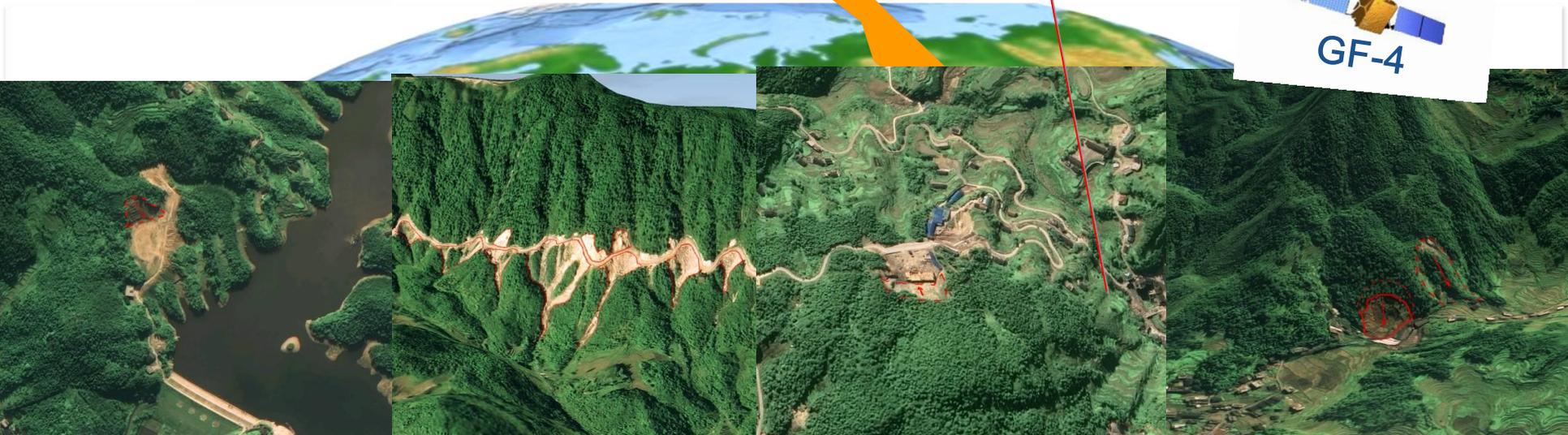


GF Series

High resolution satellites: GF-1/2/3/4, etc.



Xinhua Hunan landslide
three-dimensional monitoring
by using GF-2 data





China High-Resolution Earth Observation System(CHEOS)



composed of five major
ing space-based system,
ace system, air-born
observation, system, ground system
and application system, focusing on



CNSA are organizing tens of departments and provinces of China government to promote application of CHEOS data, and has formed hundreds of data and information products and corresponding services and standards, which have been issued on Comprehensive Information Service and Sharing Platform of CHEOS Application.



www.cheos.org.cn

Current EOS of China



- China EOS plays an important role in the national development, environmental protection, disaster detection and so on.
- CNSA currently works at the transition stage of changing R&D satellite to operating satellite. A set of R&D satellites are gradually converting into operational mode after on-orbit tests.
- CGMS provides an excellent opportunity for CNSA to communicate and share our experiences with other members.
- CNSA is devoted to explore new EOS technology and sensors, and make more contributions for the optimization of global EOS.



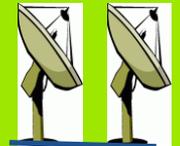
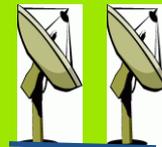
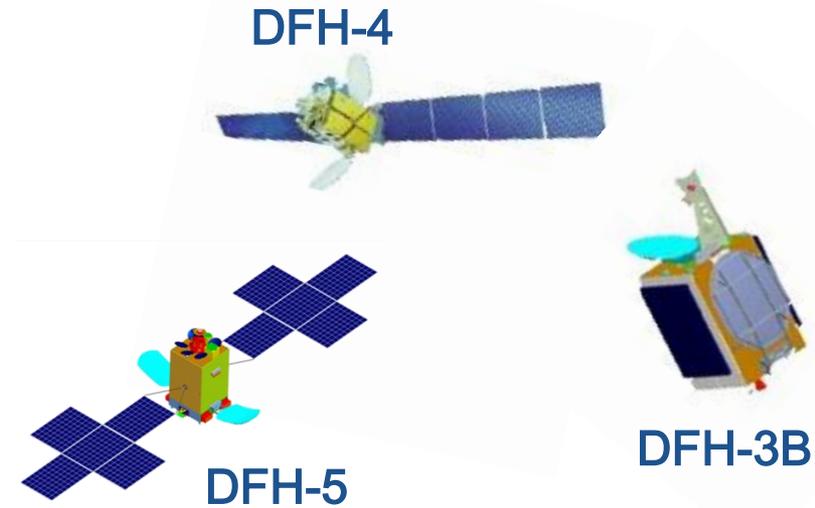
Communications & Broadcasting Satellites

More than 10 communications & broadcasting satellites operational in orbit.

DFH-3B satellite platform with 500kg payload capability, 5kW overall output power, and 15 years design lifetime.

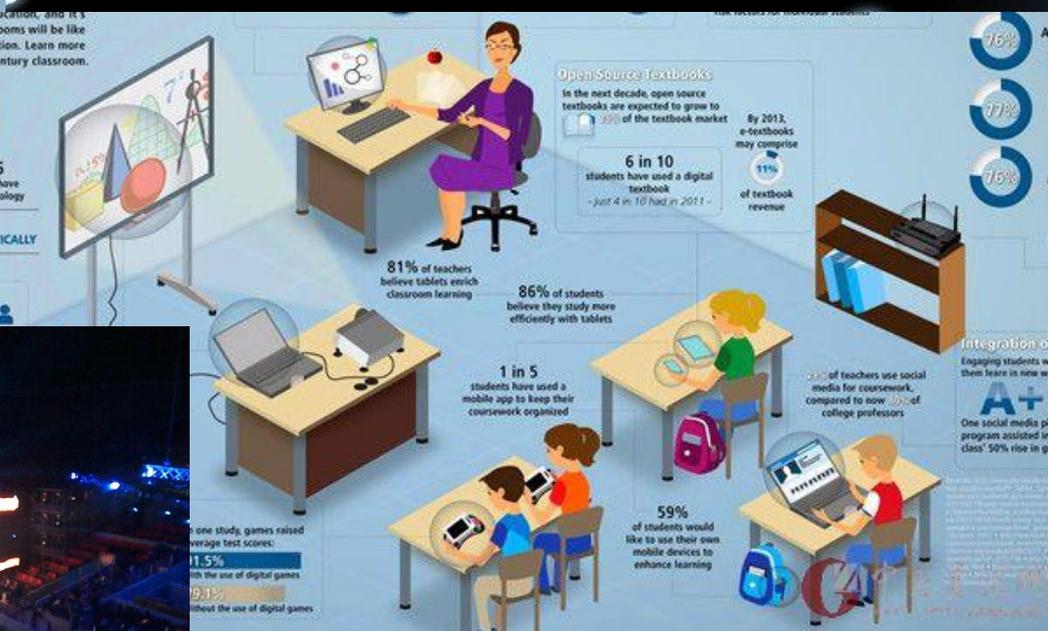
DFH-4 satellite platform with 1000kg payload capability, 11kW overall output power, and 15 years design lifetime.

New-generation DFH-5 satellite platform with 1500kg payload capability, 18kW overall output power, and 16 years design lifetime, is under development and scheduled to be launched in 2019.





Communication Satellite Application





Navigation Satellites

Beidou Regional Satellite Navigation System composed of 14 satellites has been accomplished and is currently providing services to China and its surrounding regions.

Beidou Global Satellite Navigation System is under development. By 2020 or so, the global system composed of more than 30 satellites will be completed which can services for global users.

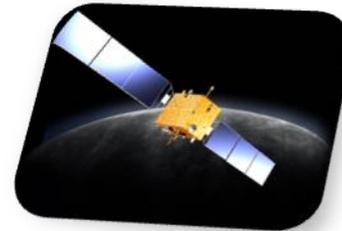




Lunar Exploration Program

China will also conduct the lunar base construction in the future.

Chang'e-1, 2 and 3 missions have realized the targets of "orbiting" and "landing" of the Lunar Exploration Program.



First step:
Orbiting



Second step:
Landing



Third step:
Returning

Chang'e-5 will realize the targets of "sample returning" and will be launched in 2017.

Chang'e-4, as the pioneering satellite for the later lunar exploration missions, will land on the far side of the moon.



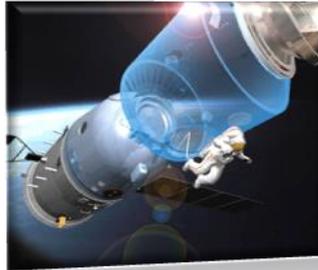
Manned Space Program

First step :

Launch manned spaceships



Second step :
build a Spacelab



Three-Step strategy

Chinese Space Station
(by 2022)

Spacelab
(accomplished)

Humanmission
(accomplished)

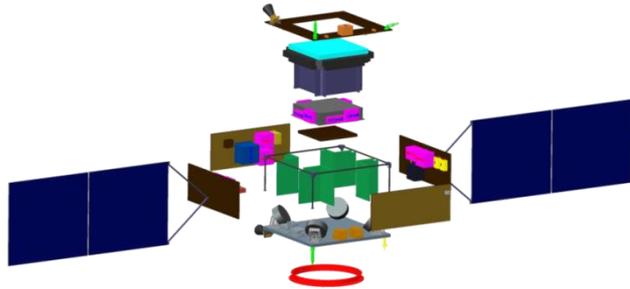


Third step:
build a Space Station





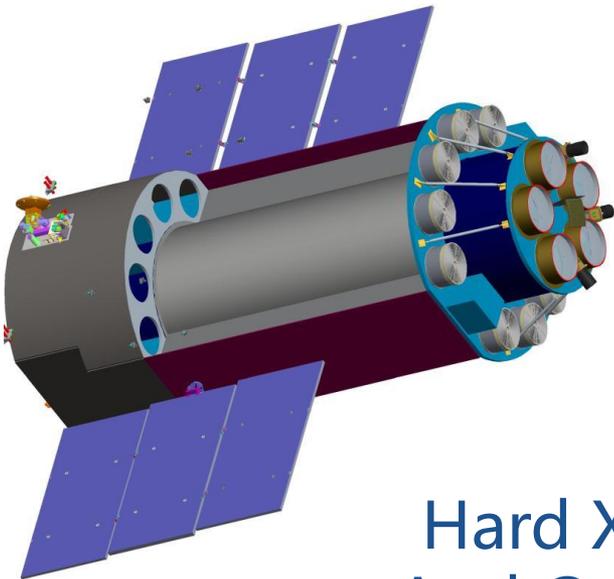
Space Exploration



DARk Matter Particle Explorer (DAMPE), 2015



Recoverable Satellite for Microgravity and Space Life Sciences (SJ-10), 2016



Hard X-ray Modulation Telescope (HXMT) And Quantum Comm Satellite, 2016 Launch



Mars Exploration



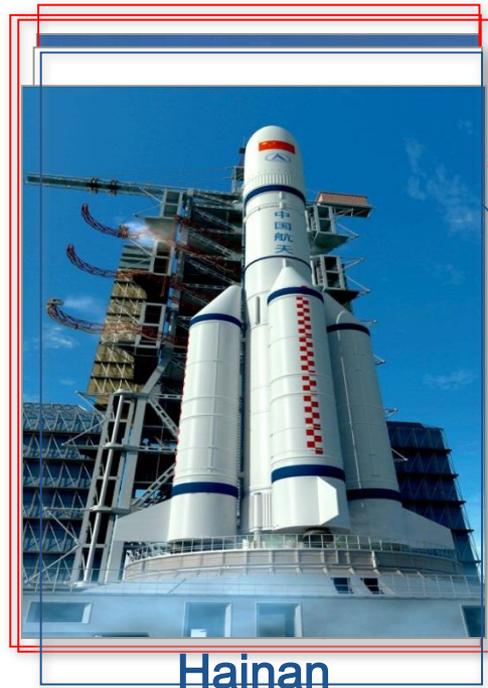
China Mars Exploration program has been gradually started in 2016, the primary plan is schedule for launch in July 2020, First reach the Mar' s orbit, then orbiter and lander & rover detach, orbiter will carry out two year' s detection and relay data service for the lander & rover, Lander & rover will soft land on the surface of the Mars and carry out detection around the landing zone for 3 months.



Space Launch Site

Jiuquan, Xichang and Taiyuan launch sites in service

Hainan launch site under construction



Hainan





Space TT&C

Providing TT&C support for missions such as satellite, manned spaceflight and deep space exploration.



Miyun ground station



Command & control center



Yuanwang instrumentation ship



Kashi ground station



Sanya ground station



Ground station





1.National Space Infrastructure



Medium and Long Term Development Plan for National Space Infrastructure (2015-2025) which plans to build a world integration space facility that serving users in remote sensing, communication and broadcasting, navigation and other services in the next 10 years, Providing strong information support for national modernization and sustainable development of economy and society.

2 Overall Framework and Development Objectives

Development Objectives

To establish major framework of national civil space infrastructure, operational satellite development pattern, service mechanism and national data policy

To establish three systems including satellite remote sensing, satellite communication, satellite navigation and positioning; To establish national civil space infrastructure system providing continuous and stable operation services; To complete data share service mechanism, provide standard regulation system, establish commercialization development pattern with the ability of international services

To establish an advanced, global and effective national civil space infrastructure system; To achieve internationally advanced level for business, marketing, industrial development; To gradually improve mechanism of innovation driving, requirement guiding, market configuration; To strongly support economy and society development, effectively participate in internationalization development

2015 or Beyond

2016-2020

2021-2025

3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System

Remote Sensing Satellite System

According to the development concept of multiple usage of one satellite, network of multiple satellites, coordination of multiple networks, based on the technological characteristics and user requirements characteristics of observation missions, **land observation, ocean observation and atmosphere observation** should be developed for focus, with the construction of remote sensing satellite system composed of **seven constellations and three sorts of specific satellites**. Remote sensing satellite stations network, data center, share network platform and generic application supporting platform should be constructed, global receiving and services ability of remote sensing satellite data can be developed.



3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System

Remote Sensing Satellite System -Space System

Land, ocean and atmosphere series satellites should be manufactured, gradually developing the comprehensive and effective global observation capability with a reasonable configuration of high, medium and low resolution, as well as an optimal portfolio of multiple observation methods.

1 Land Observation: construction of three observation constellations of high resolution optical, medium resolution optical and SAR, as well as development of earth physical field satellite.

2 Ocean Observation: construction of ocean color and ocean dynamic satellite constellation, as well as ocean monitoring satellite.

3 Atmosphere Observation: construction of weather observation and climate observation satellite constellation, and atmosphere composition investigation satellite

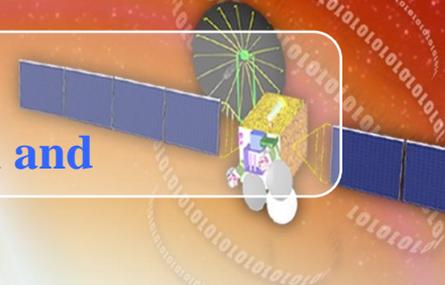
3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System

Remote Sensing Satellite System-Ground System

According to the requirements of effective networking, cooperative operation, integrated services, using the existing resources of ground resources, to construct ground facilities such as remote sensing satellite receiving stations network, data center, generic application supporting platform, share network platform and so on.



3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System



Remote Sensing Satellite System-Ground System

Receiving Stations Network

To coordinate all sorts of requirements, establish domestic and polar low earth orbit, polar orbit antenna, as well as receiving facility at sea, to realize coordination among multiple stations and integrative receiving for global data

Data Center

To upgrade existing land, ocean, weather satellite data center, support with each other, promote effective usage and share of satellite, data, calculating resource

Generic Application Supporting Platform

Including public supporting platform for calibration and verification field network, generic technology development

Share Network Platform

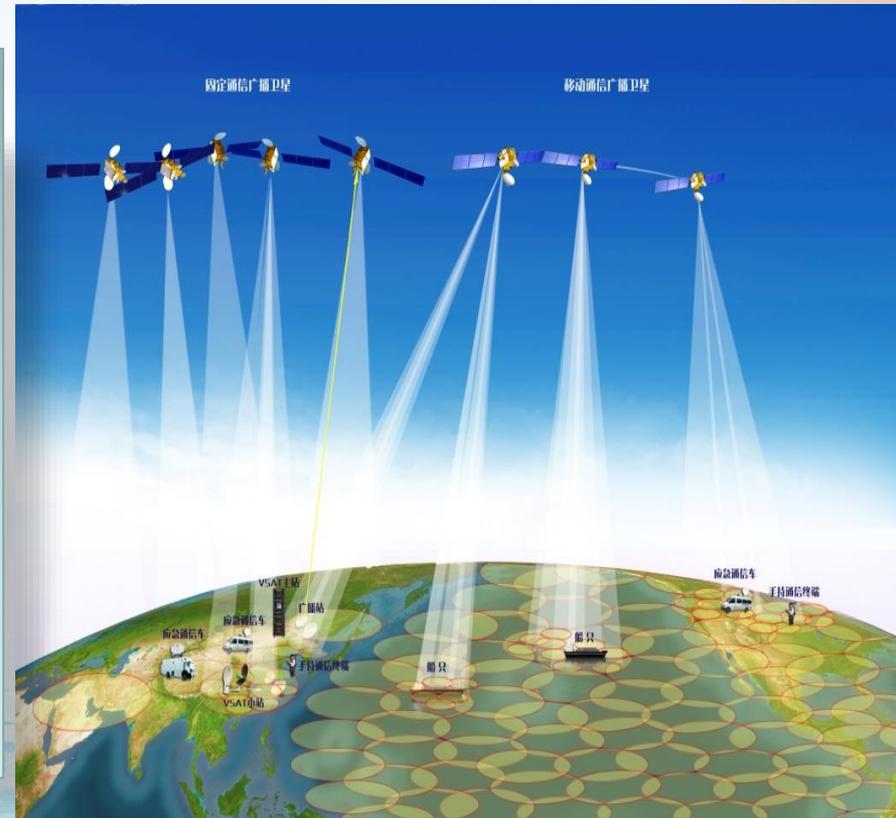
To connect three data centers and all levels of application systems, distribute satellite operation status and user observation requirements in time, effectively use all sorts of calculating and data resource, providing business services for users



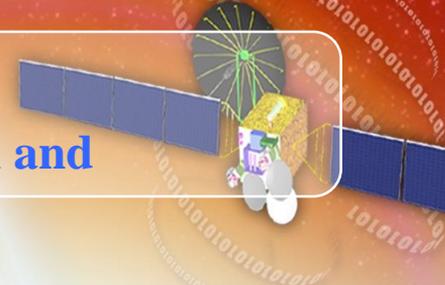
3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System

Communication Satellite System

Aiming at industrial and market application, focusing on commercialization, guaranteeing commonweal requirements, to develop fixed communication satellites and mobile communication satellites, synchronously construct ground facilities such as TT&C station, gateway station, uplink station, calibration field and so on, achieve services abilities of broadband communication, fixed communication, DTH, mobile communication, mobile multimedia broadcasting. To gradually construct global satellite communication and broadcasting system combining communication network covering worldwide main regions, provide services for Broadband China and Globalization strategy, promote international propagate ability.



3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System



Communication Satellite System-Space System

To construct three sorts of satellites including fixed communication, DTH and broadband communication, provide fixed communication and broadcasting services for the country, neighborhood and other regions.

Fixed Communication Satellite

- Focusing on the industrial requirements of telecommunication, broadcasting and TV, ocean, petroleum, based on the current satellites in-orbit, to rapidly develop fixed communication satellite system and maintain continuous improvement of fixed communication capability

DTH Satellite

- To develop DTH satellite system on the current basis for the purpose of DTH realization

Broadband Communication Satellite

- To develop broadband communication satellite system with broadcasting and digital distribution capability for two-way communication business such as remote education, telemedicine, rural and agriculture informatization, internationalization development and so on

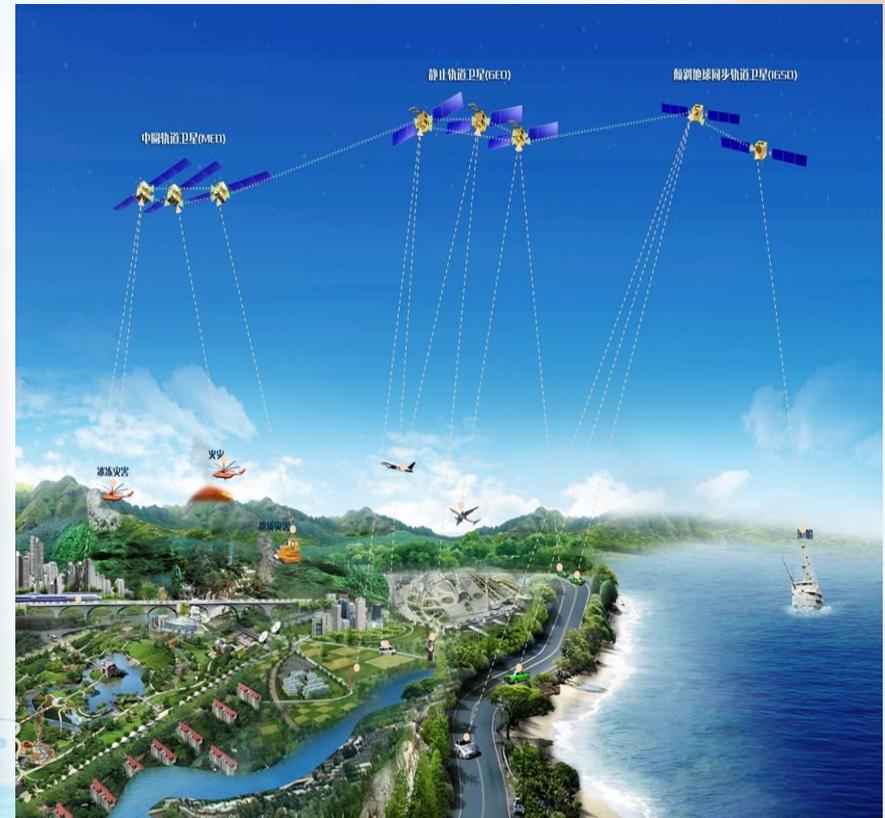


3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System

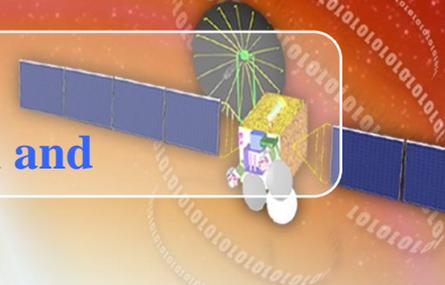
Navigation and Positioning System

Satellite navigation space system and ground system construction belongs to nation's science and technology major project of China's second generation satellite navigation system.

By 2020, Beidou global satellite navigation system of 35 satellites will be completed, with positioning accuracy of 10m, timing accuracy of 20ns.



3 Construction of Remote Sensing, Communication, Navigation and Positioning Satellite System



Government R&D

Climate Change, Global Warming, Ecological Balance, Atmosphere Environment Monitoring, Grain Yield assessment, C&CO2 discharge, Ocean Salinity Observation etc.

Government Operational

Meteorological, Ocean, Land Observation, Surveying and Mapping

PPP

High Resolution Earth Observation, Multimedia Satellite Broadcasting

Commercial

Earth observation, Global Communication



4 Active Promotion on Major Applications

According to business requirements and specific application objectives, to use diverse constellations, different series of satellite and data resources, construct satellite comprehensive application system and realize continuous acquirement and application multiple resource information .

Resource,
Environment
and Ecological
Protection

Disaster
Mitigation and
Emergency
Response

Society
Management,
Public Service
and Safe
Production

New
Urbanization
and Regional
Sustainable
Development,
Integration
Across Areas

Mass
Information
Consumption
and
Industrialization

Global
Observation and
Earth System
Science

Internationaliz
ation Service
and
Application

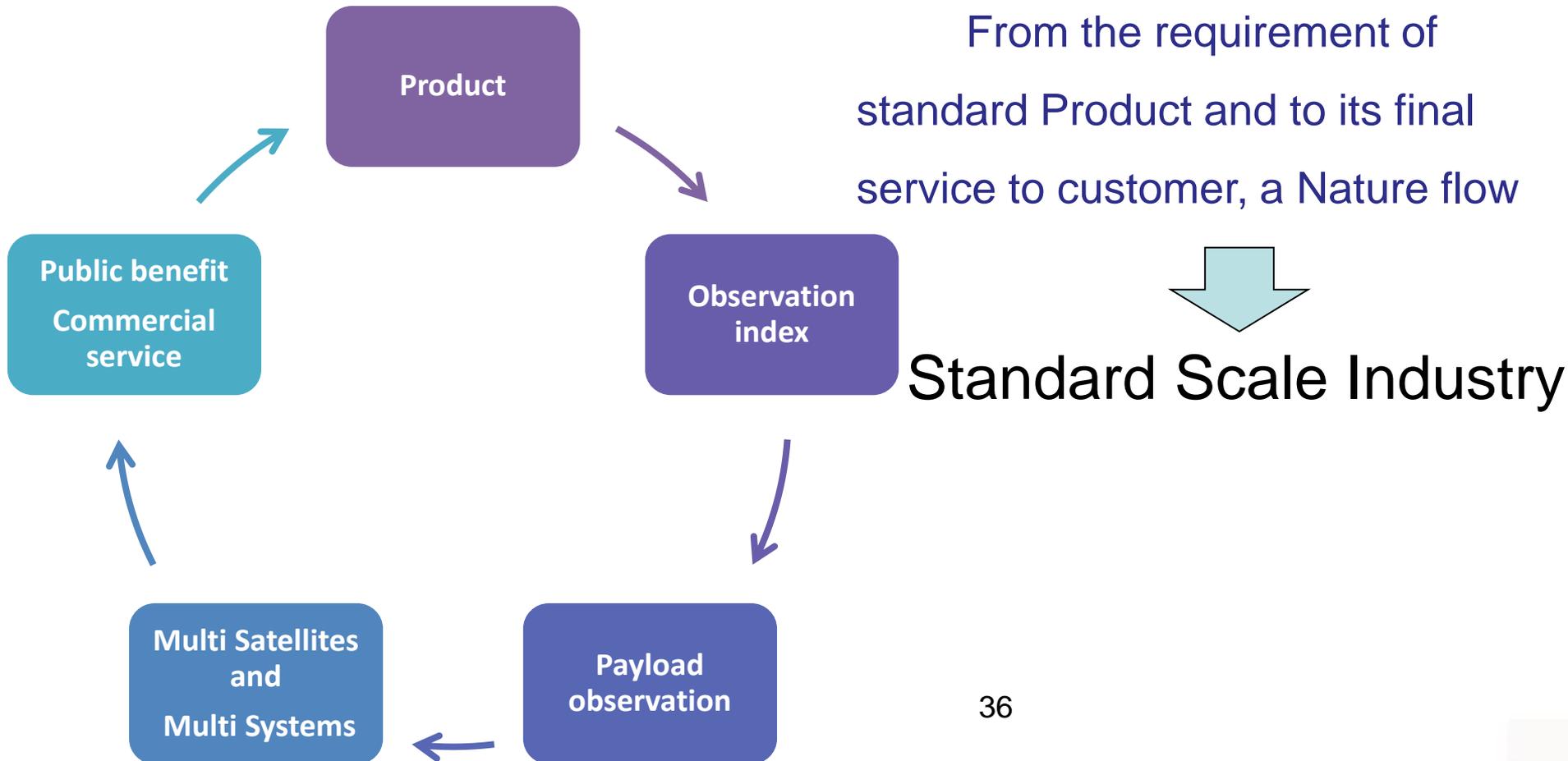
5 Policies and Measures on International Cooperation

Encouragement
of
International
Development

- ✓ To study the specific measures of internationalization development, promote the utilization of domestic and foreign resources, domestic and foreign markets;
- ✓ To carry out international coordination, actively participate in related international organizations and the establishment of important international regulations and standards. To extend international cooperation, carry out international cooperation on technology development, satellite development, system construction and data application;
- ✓ To encourage and support the construction of international cooperation comprehensive services, promote the export of satellite, data and services, improve internationalization capability and application benefits.

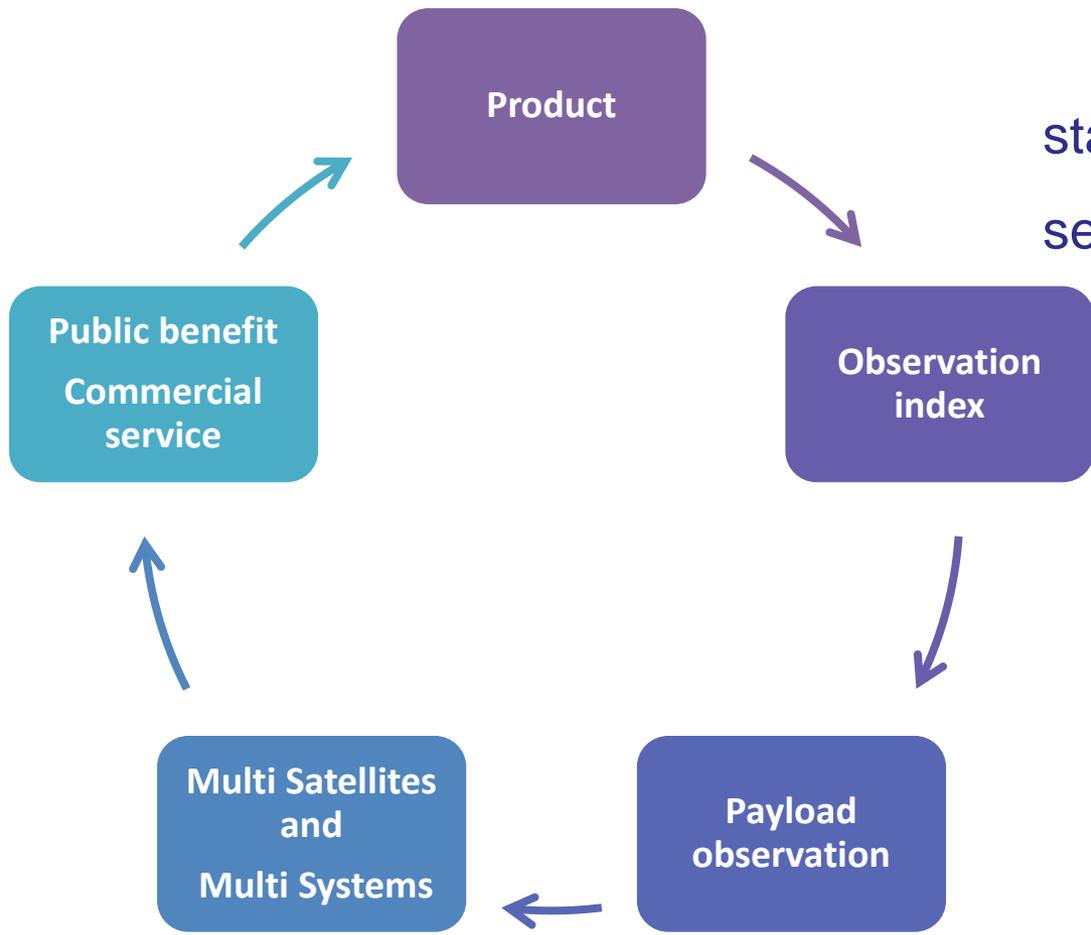
6. Concerns

Overall information flow from requirement extract to satisfy

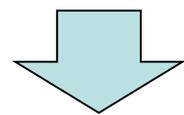




Overall information flow from requirement extract to satisfy



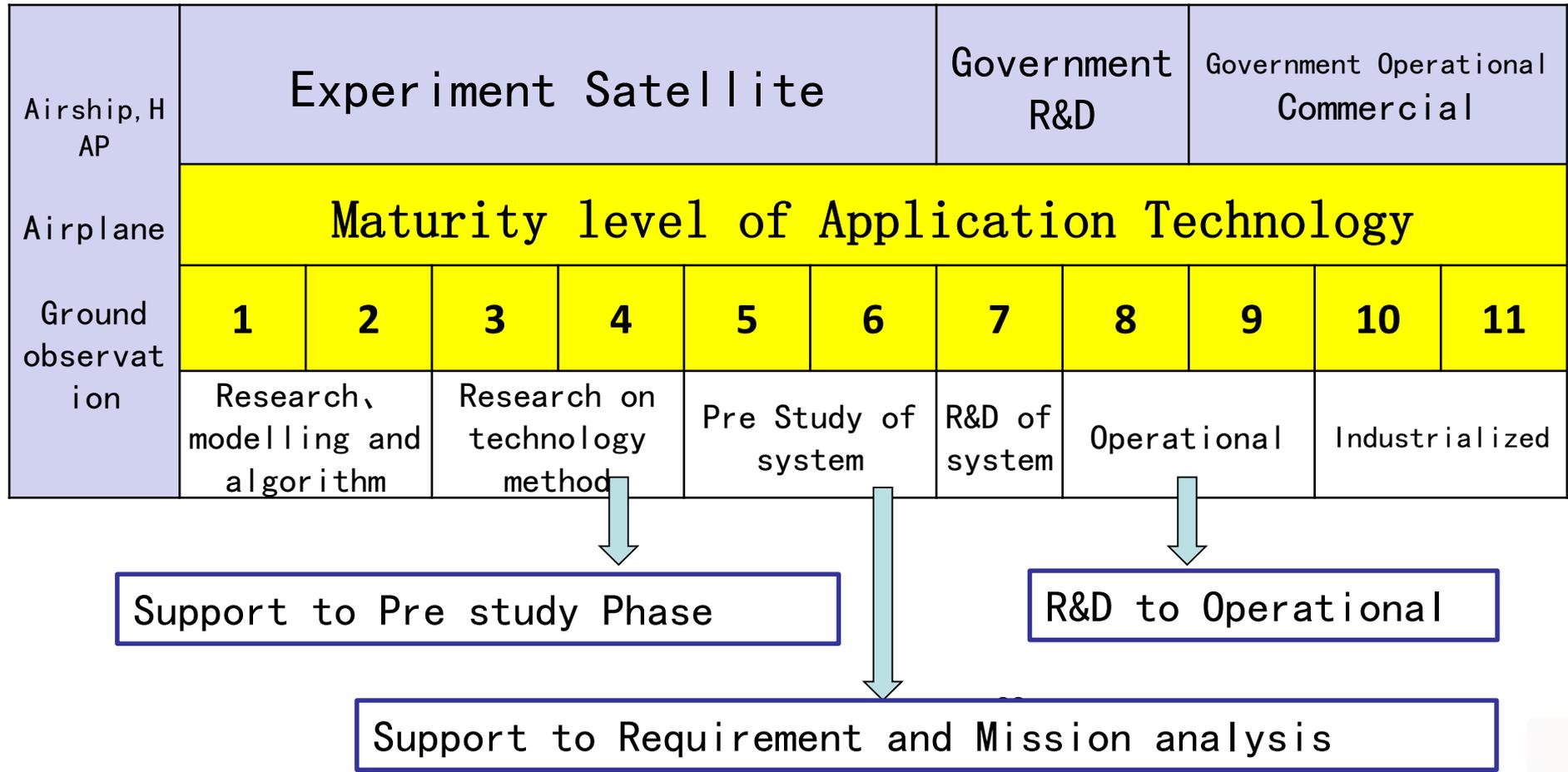
From the requirement of standard Product and to its final service to customer, a Nature flow



Standard Scale Industry

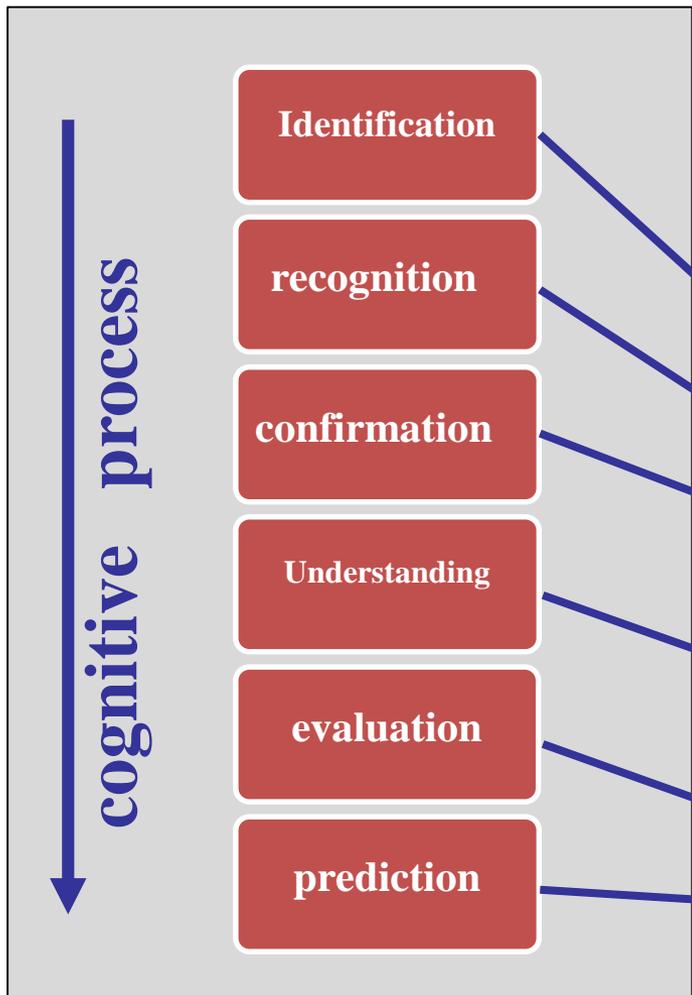


Maturity level of products and its influence to system





product level



level	name
0-2	Data grade product
3	Image grade product
4	Target remote sensing properties
5	Target physical properties
6	Target feature level product



7.Global Contribution

China has signed more than 100 space cooperation agreements with 30 countries, space agencies and international organizations. Signed agreements with APSCO and UN on earth observation data sharing.



国际合作网络

International Cooperation Network



7.Global Contribution

The Chinese government has always attached great significance to global contribution of its space system. CNSA is willing to share our experiences and achievements from space technology, science and application with other nations and organizations.





Merci !

Wang Cheng

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China National Space Administration