

Latest development of Space Science Programs of China

WANG Chi

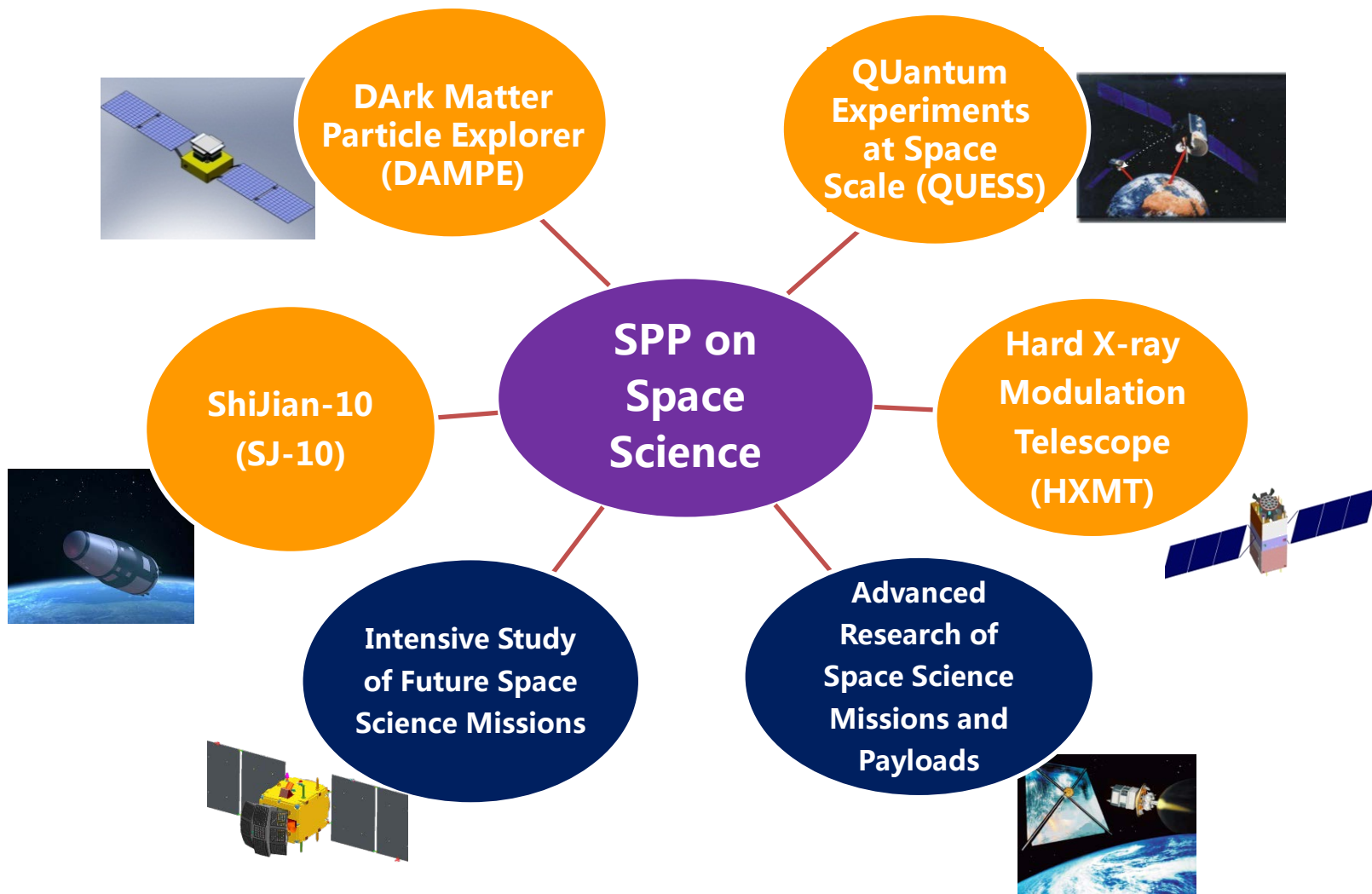
National Space Science Center, CAS

Feb. 2, 2017

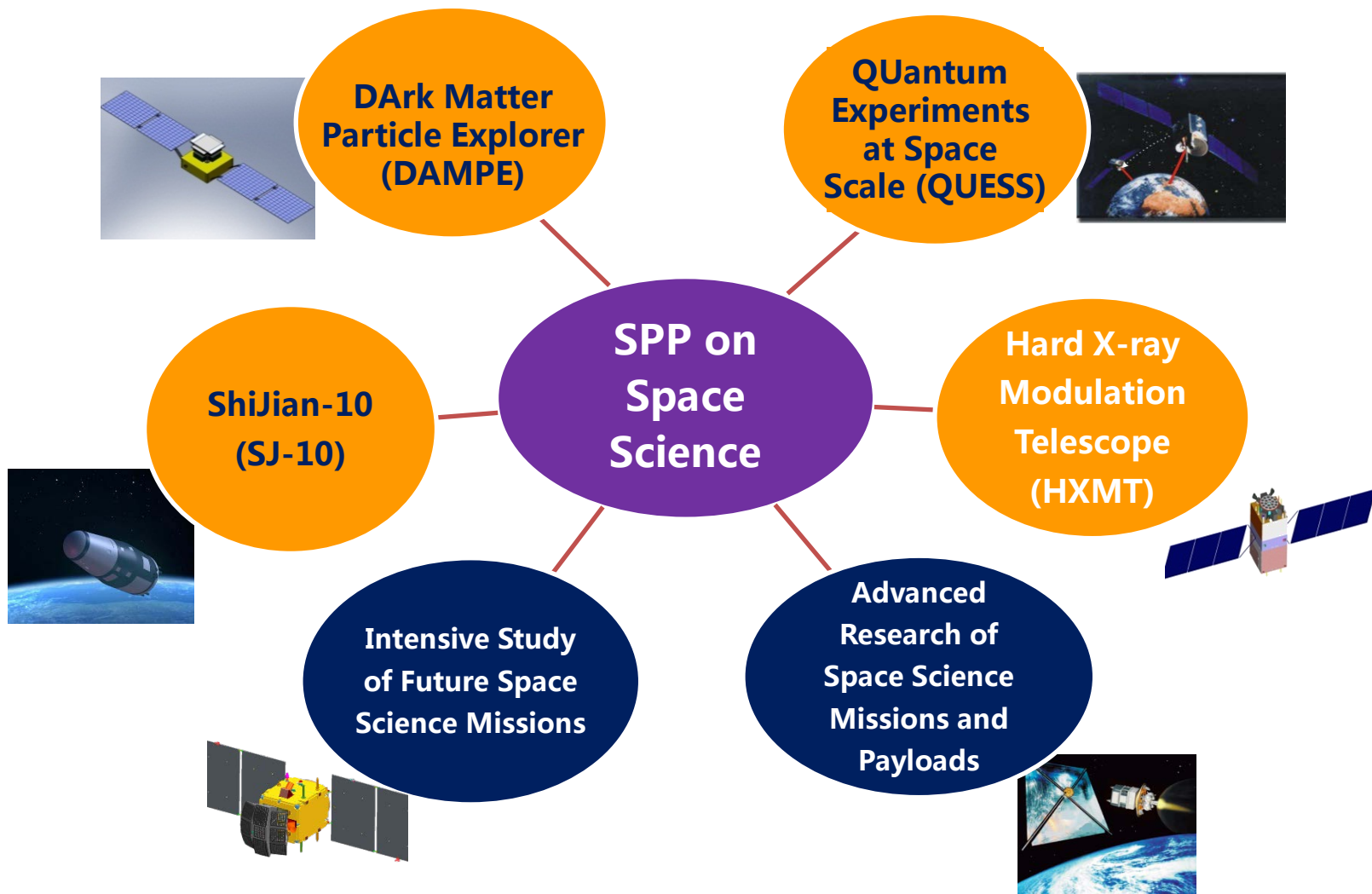
Table of Contents

- ❑ Strategic Priority Program on Space Science 2011-2016
- ❑ New Space Science missions 2017-2022

Strategic Priority Program on Space Science (2011-2016)



Strategic Priority Program on Space Science (2011-2016)



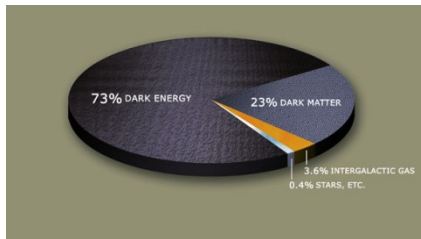
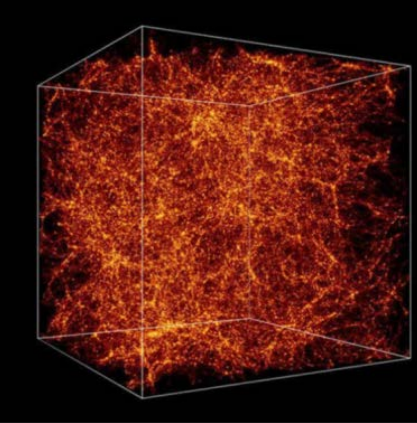
Strategic Priority Program on Space Science (2011-2016)

DARk Matter Particle Explorer (DAMPE) launched 17 Dec. 2015

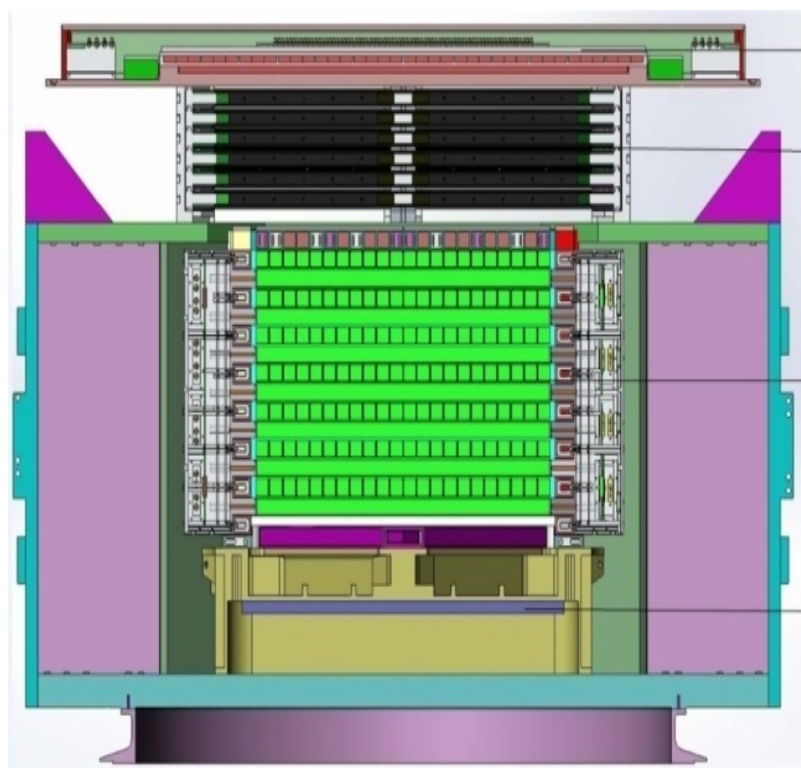
[Wukong / Monkey King]



Scientific Objectives



- Find and study dark matter particle through high-resolution observation of high energy electron, gamma-ray spectrum and its space distribution
- Study the origin of cosmic ray through observation of high energy electron spectrum and anisotropy above TeV
- Study the propagation and acceleration mechanism of cosmic ray through the observation of its heavy ion spectra



- Plastic scintillation hodoscope array
- Si
- Silicon-Tungsten tracker
- BGO Calorimeter
- Neutron detector





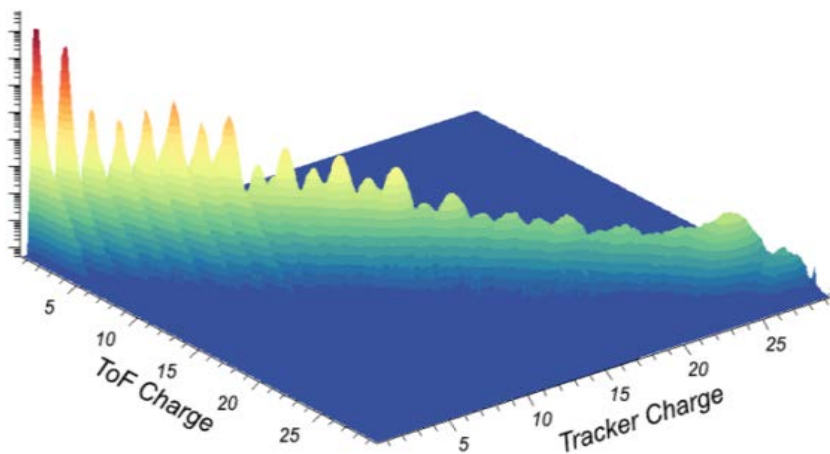
The lift-off of DAMPE satellite

08:12, December 17, 2015

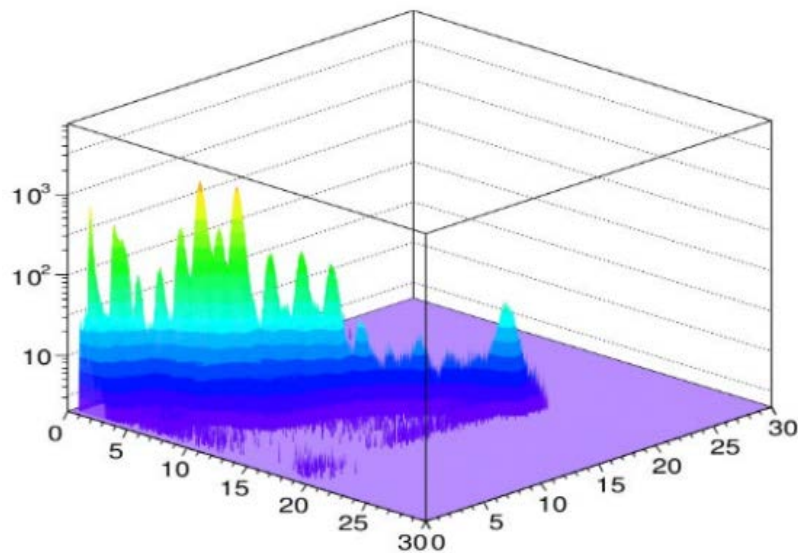
@Jiuquan Satellite Launch Center

- **Electric charge : equivalent to AMS**

The resolution of O: 0.185; Fe: 0.389



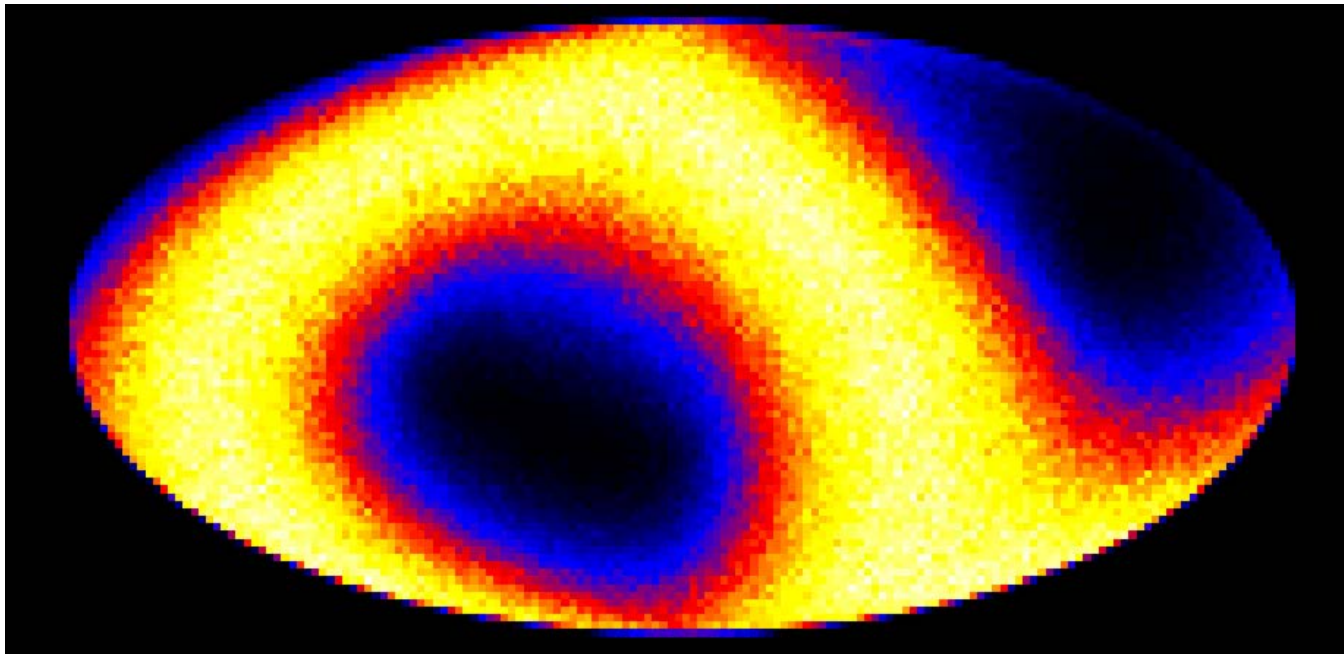
AMS



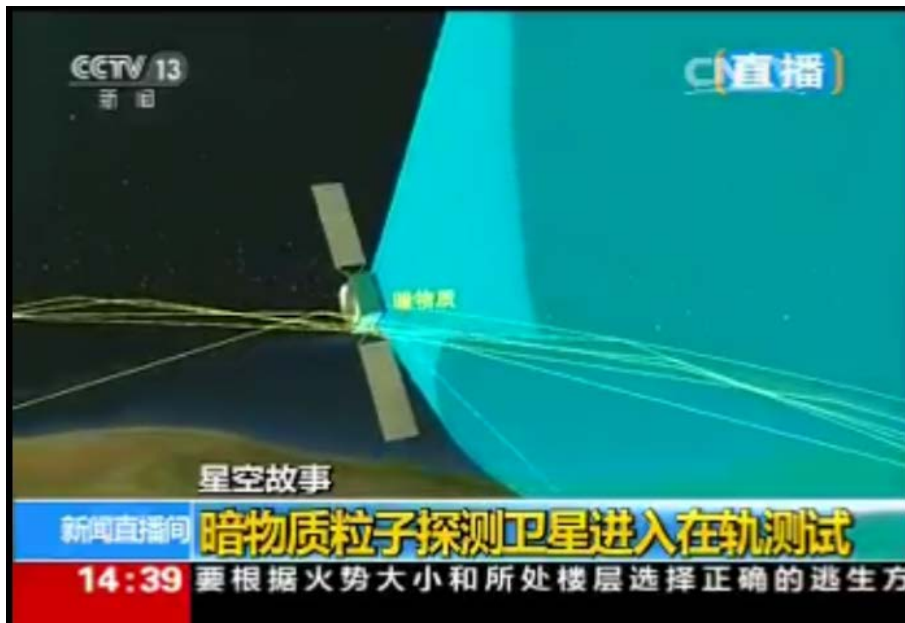
Results after 1-month observation

- **Direction measurement**

The gamma-ray sky map fits well with FERMI's, proving its ability to identify direction measurement particle



- **Data through in-orbit test** : with **all sky survey completed**
~1.48 billion high energy particle analyzed, 7.10T data downed
(up to October 20, 2016)

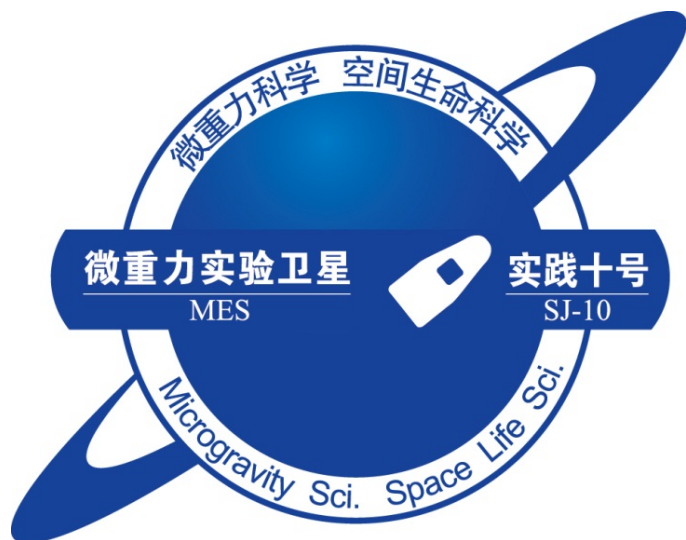


First scientific publication
on dark matter will be in
this March.

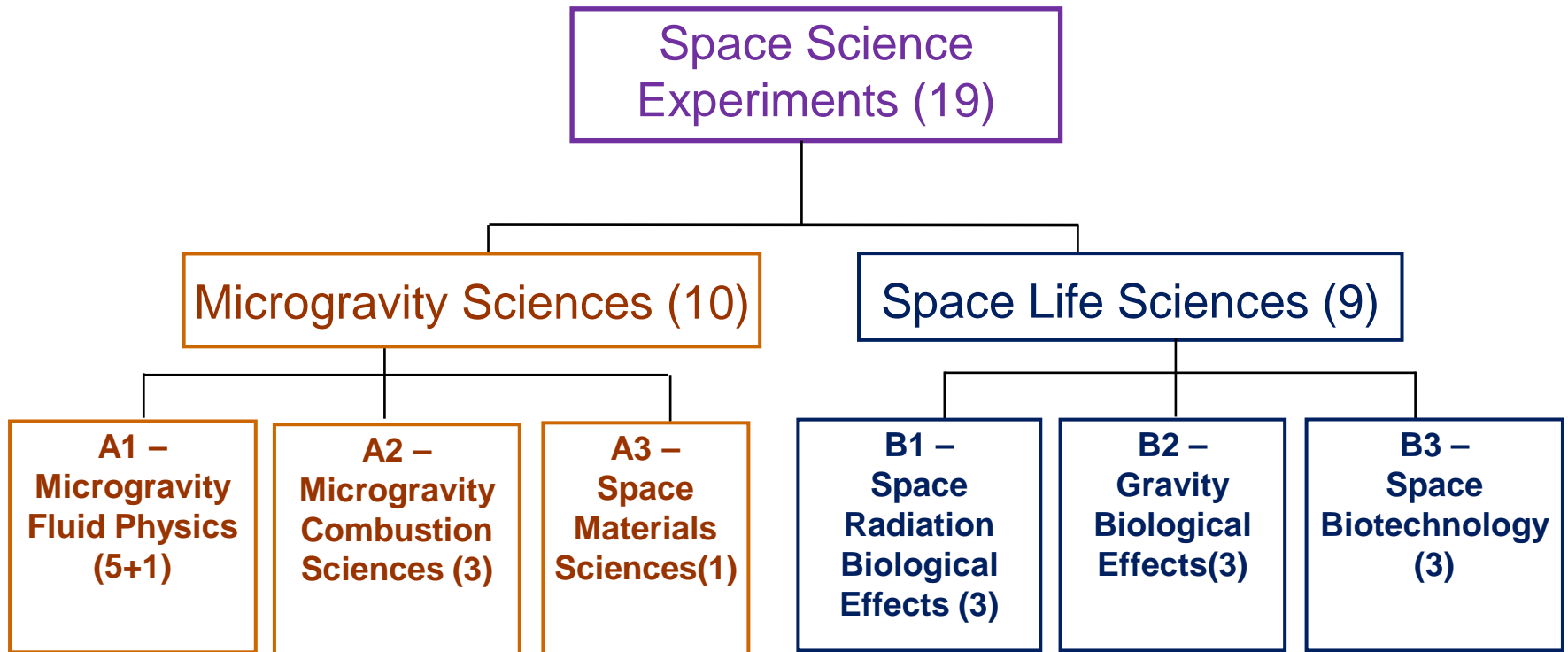
Strategic Priority Program on Space Science (2011-2016)

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

Mission carried from 6-18 April, 2016



SJ-10, the 24th recoverable satellite of China, provides a mission of **19 space microgravity experiments**.



8 experiments aboard the orbit capsule + **11** aboard the reentry capsule



The launch of SJ-10 satellite

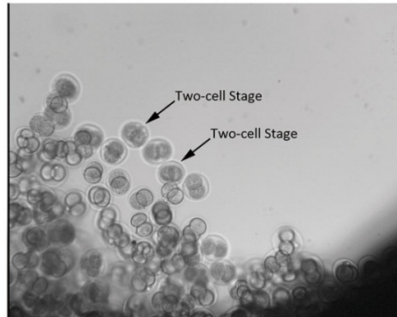
01:38, on April 6, 2016
@Jiuquan Satellite Launch Center



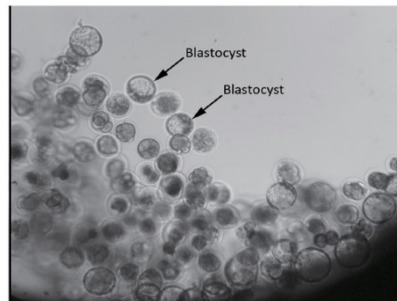
The landing of **SJ-10 re-entry capsule**
in Inner Mongolia on April 18, 2016

NSSE 15 experiments were carried out for the first time

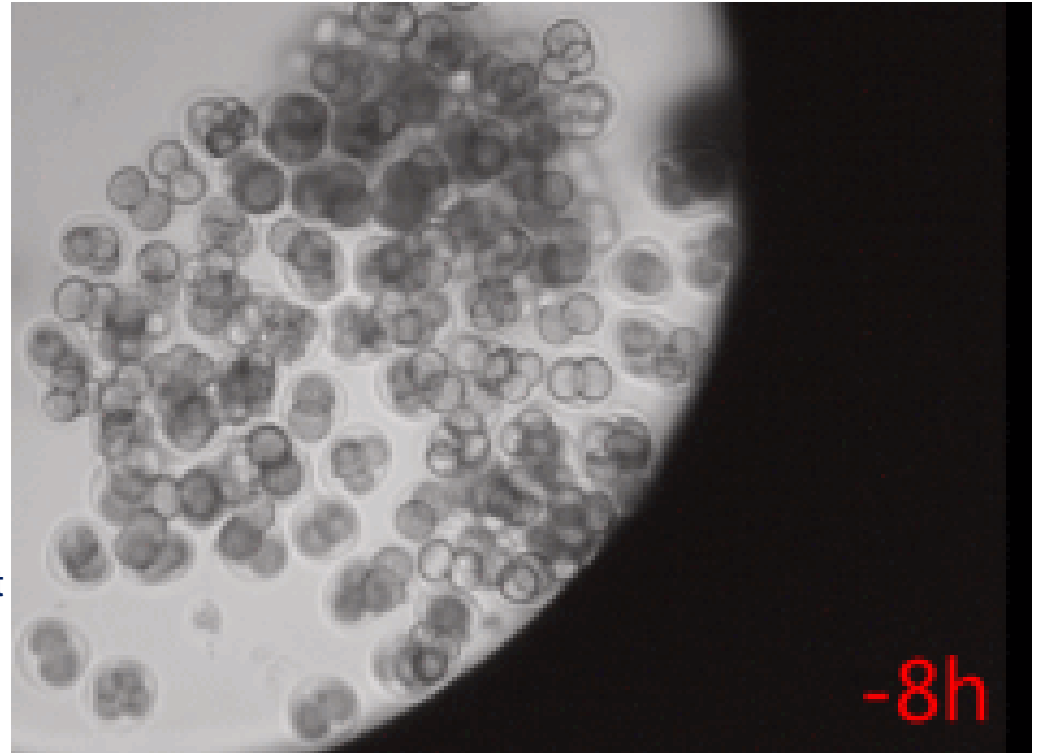
Mammal embryos developed in space



Two-cell mouse embryos, four hours before launch



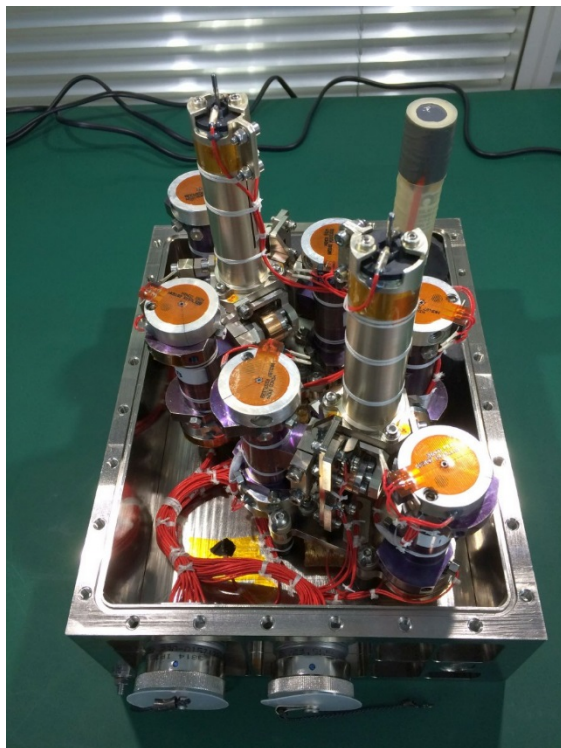
Mouse embryos that developed into blastocyst 80 hours after the launch



China-ESA oil experiment up and running in space



European Space Agency

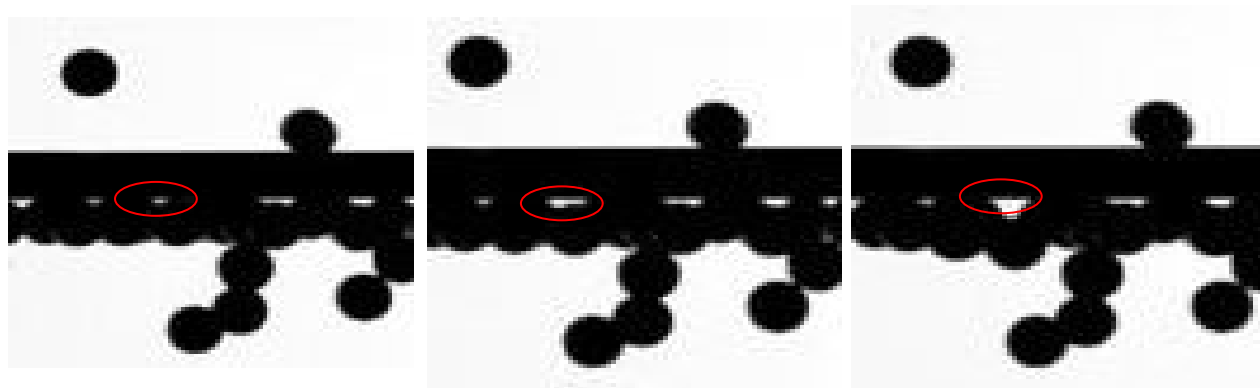


Soret Coefficient in Crude Oil (SCCO), designed to sharpen understanding of deep crude oil reservoirs

Chinese and European colleagues work on installation of SCCO



Coal combustion in space



Vibration, exciting granular flow experiments systematically carried out on a long microgravity time scale for the first time

The scientific research monograph will be published in Sep., 2017

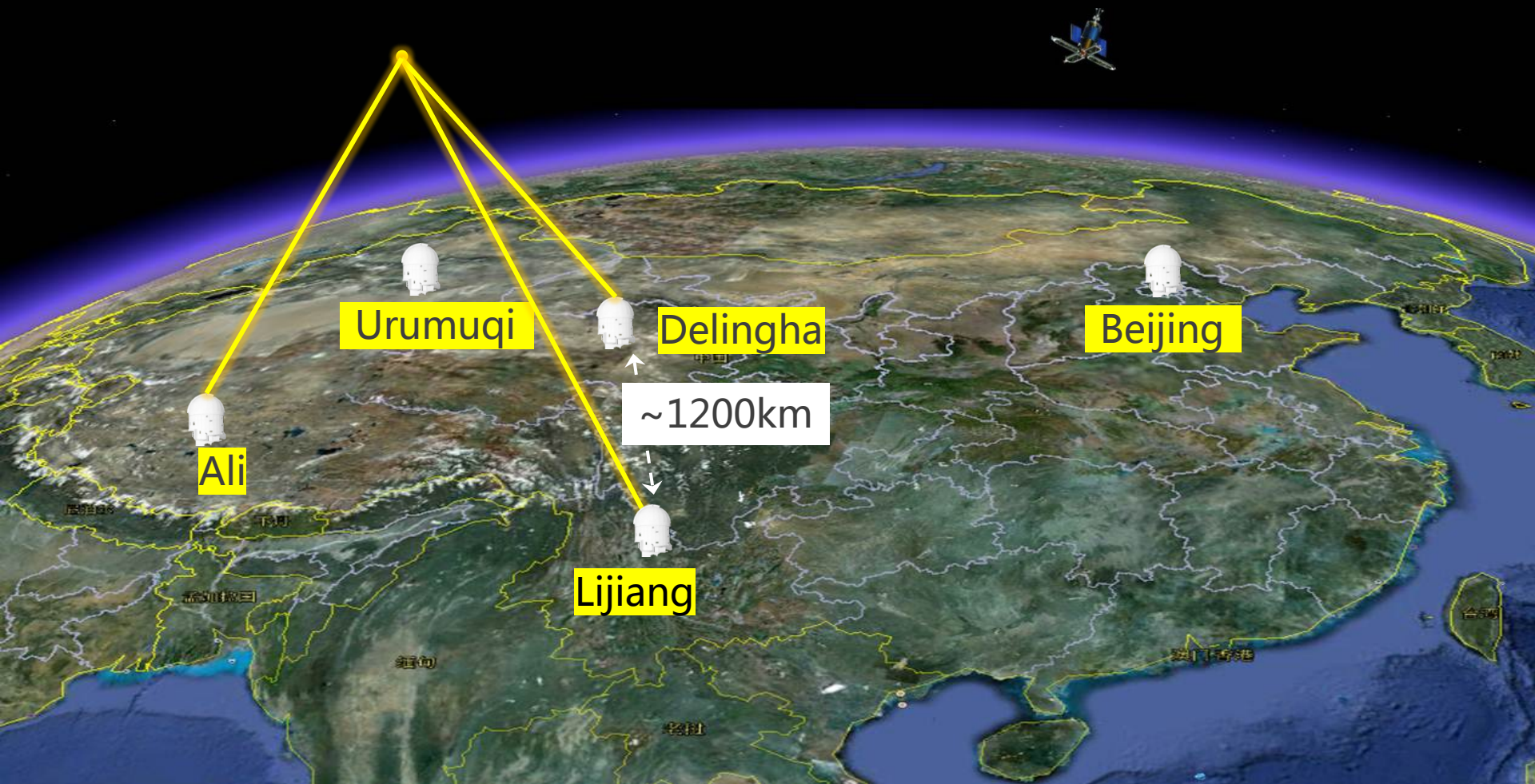
Strategic Priority Program on Space Science (2011-2016)

QUantum Experiments at Space Scale (QUESS) Launched 16 August, 2016



Micius/Mozi
from ~BC 468 to ~BC 376

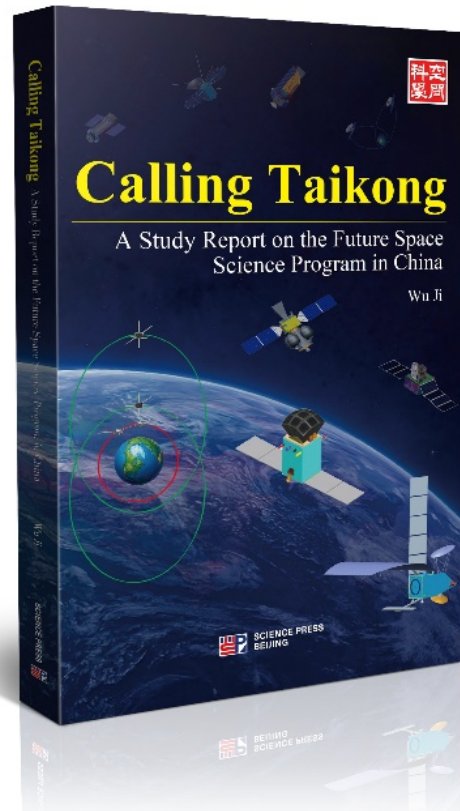
- High-speed quantum key distribution between satellite and ground station
- Quantum entanglement distribution
- Quantum teleportation





Established link with Ali station

Future Space Science Programs in China



It was published by Science Press in June 2016, and will be published by Springer.

- Content
 - poses the scientific questions to be addressed by Chinese space science community in 2016-2030, and proposes **the strategic goals, space science programs and missions**
- It is expected that:
 - science popularity
 - input for China's future space science planning and decision-making
 - a bridge for international cooperation

Table of Contents

- Strategic Priority Program on Space Science 2011-2016
- New Space Science missions 2017-2022

Einstein-Probe (EP)

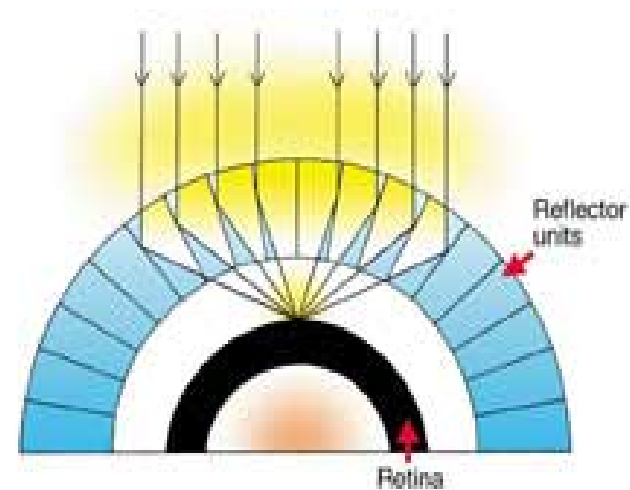
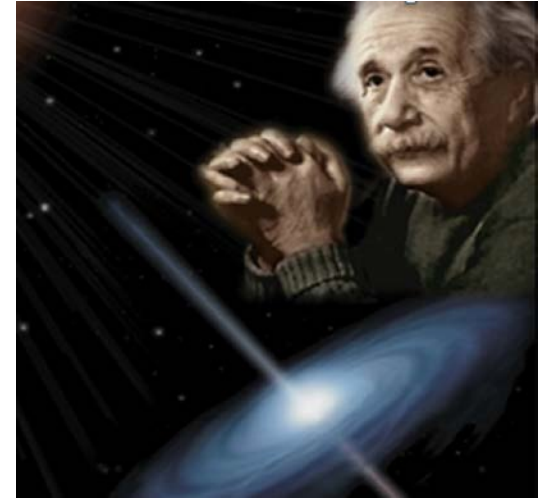
Scientific Objectives: Time-domain census of soft X-ray transient and variable sources in the universe

Satellite Specifications

- Orbit: 600km, circular, 30°
- Mass: 380kg
- Life time: 5 years

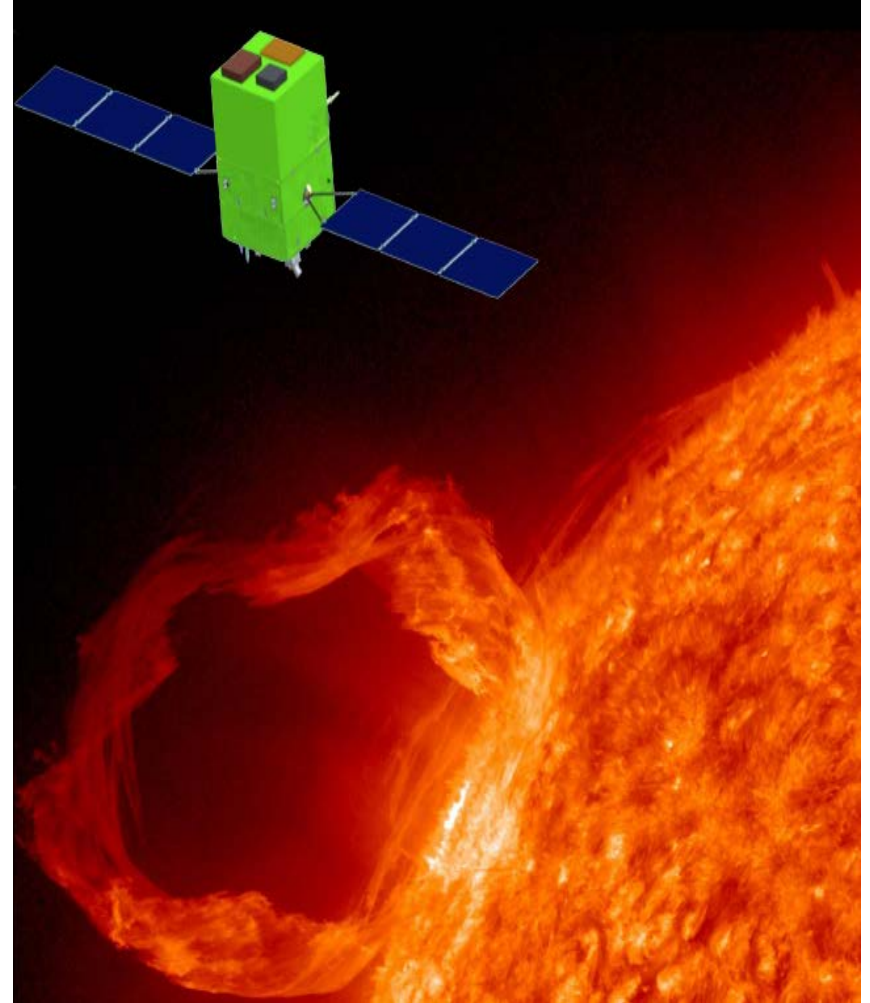
Payloads

- Wide-field X-ray telescope (WXT)
- Follow-up X-ray telescope (FXT)



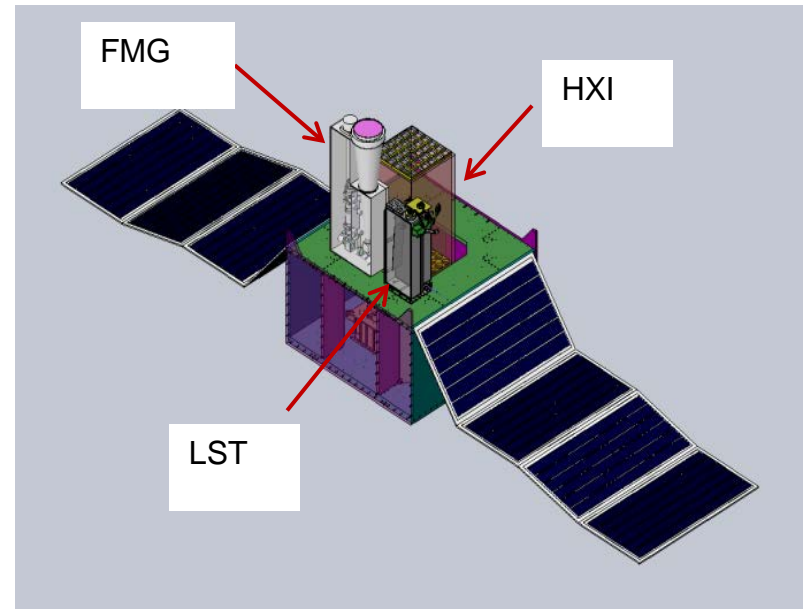
Scientific Objectives

- Simultaneously observe the full disc vector magnetic field, non-thermal images of hard X-rays, and initiation of CME
- Understand the causality between magnetic field and flares, magnetic field and CMEs, flares and CMEs



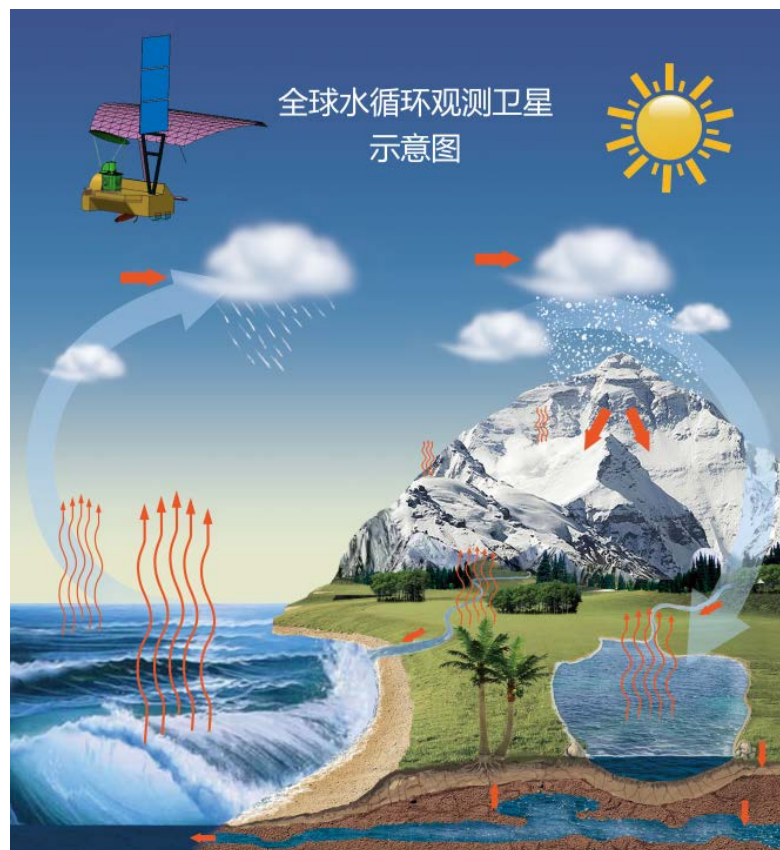
Payloads

Payloads	Objectives
Full-disc vector MagnetoGraph (FMG)	Magnetic Field
Lyman-alpha Solar Telescope (LST)	CMEs
Hard X-ray Imager (HXI)	Solar Flares



Scientific Objectives

- Understand better status and process of the Earth's water cycle system under the global change environment, by simultaneous and fast measurement of a set of water cycle key parameters (soil moisture, ocean salinity, ocean surface evaporation, snow water equivalent, frozen/thaw, atmospheric vapor...)

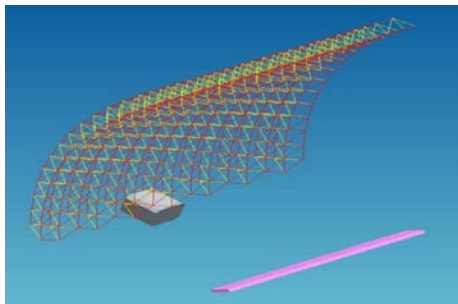
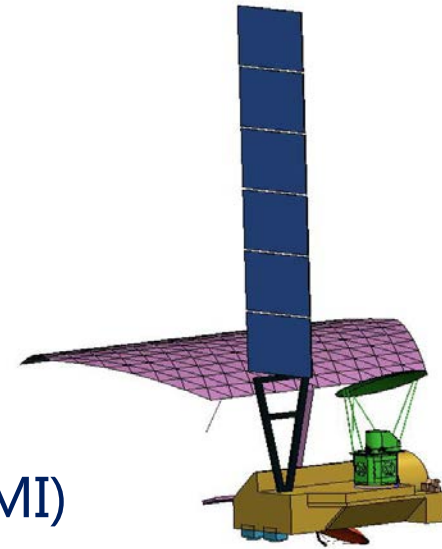


Satellite Specifications

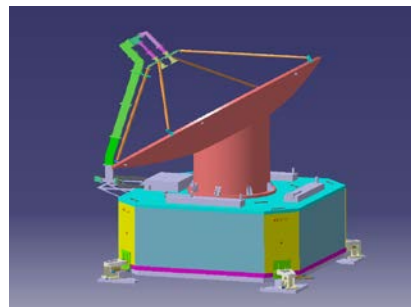
- Orbit : 600km , 97.79°
- Mass : 1050kg , 450kg (P/L)
- Lifetime : 3-5 years

Payloads

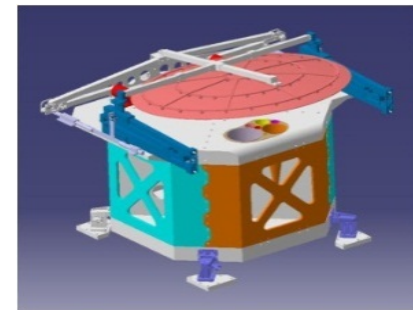
- Interferometric Microwave Imager (IMI)
- Dual-frequency Polarized microwave Scatterometer (DPS)
- Polarimetric Microwave Imager (PMI)



IMI



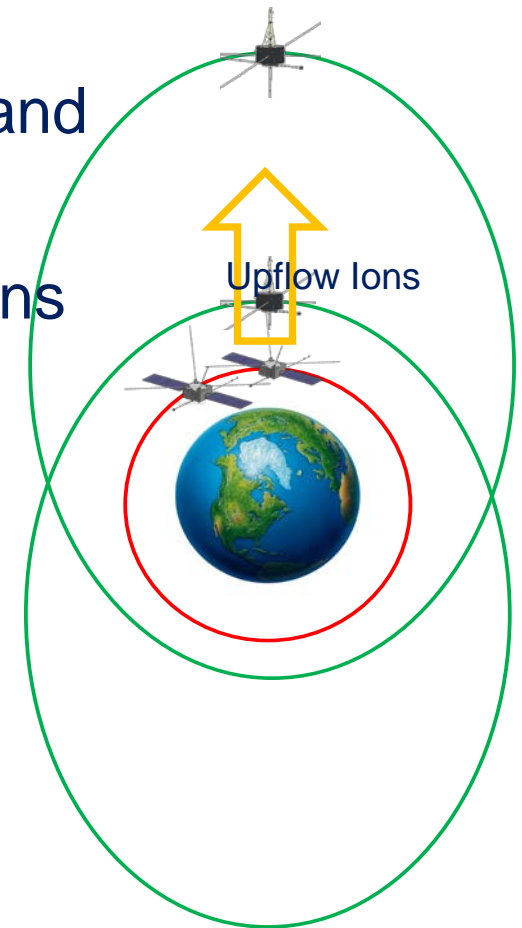
DPS



PMI

Scientific Objectives

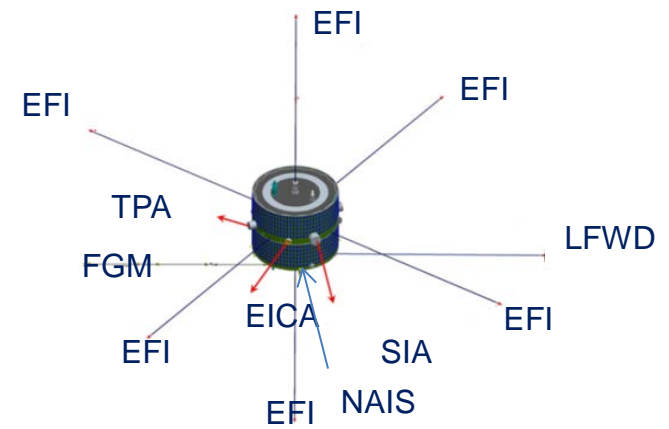
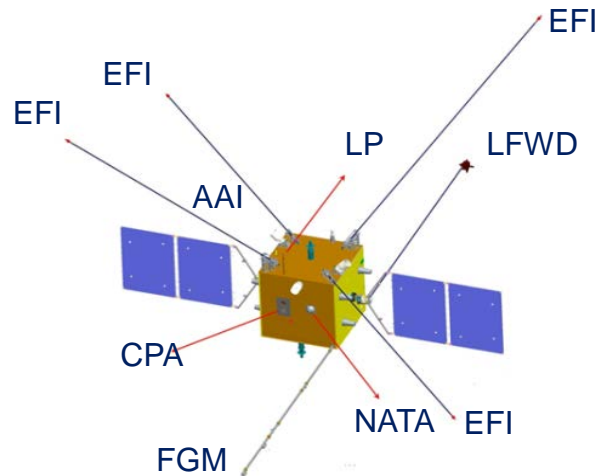
- Investigate the origin of the upflow ions and their acceleration mechanism
- Understand the impact of the outflows ions on magnetic storm development
- Characterize the ionosphere and thermosphere storm driven by magnetic storm
- Discover the key mechanism for the magnetosphere, ionosphere and thermosphere coupling



Satellite Specifications

Spacecraft	ITA	ITB	MA	MB
Inclination	90°	90°	90°	90°
Perigee	500km	500km	1Re	1Re
Apogee	1500km	1500km	7Re	7Re

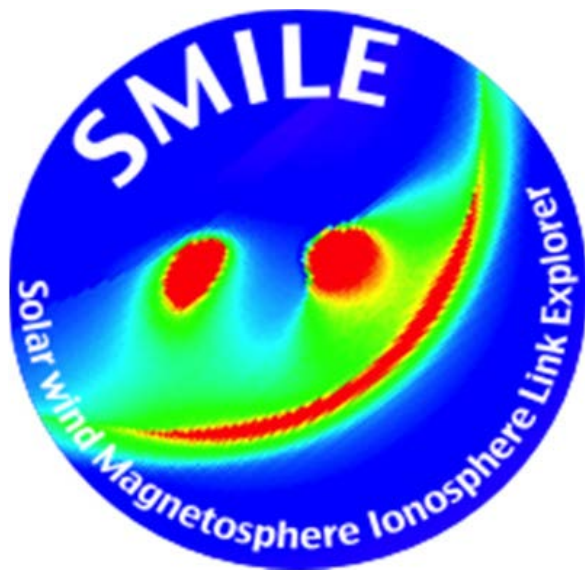
Payloads





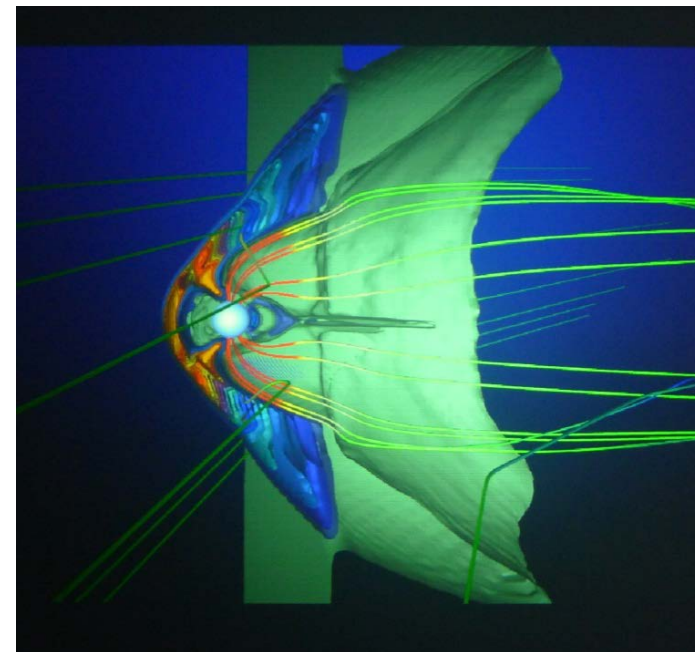
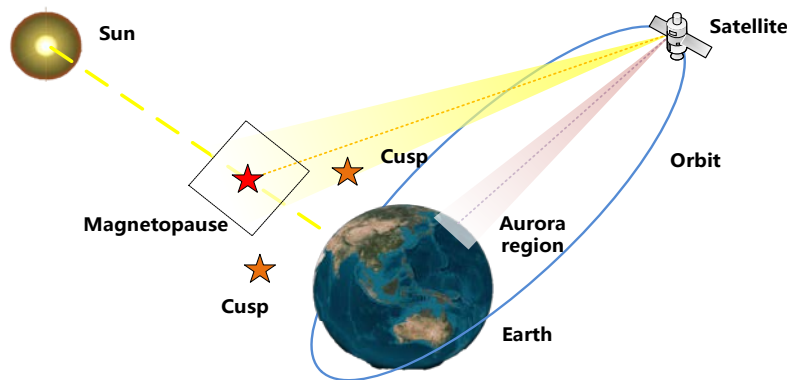
ESA-CAS joint mission esa

Solar wind Magnetosphere Ionosphere Link Explorer (SMILE)



A New Mission to Image the Magnetosphere

- Orbit : 5000km@perigee
19 RE@apogee
- Mass (PLM+SVM+PM): <2000kg
- Lifetime : 3 years

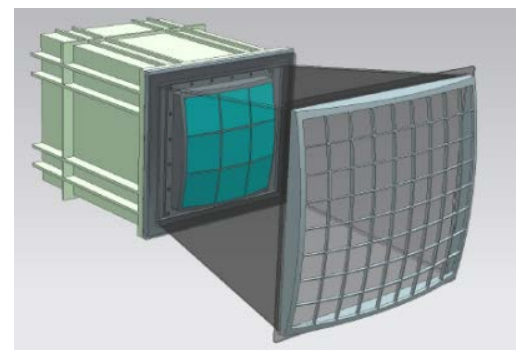


SMILE scientific objectives

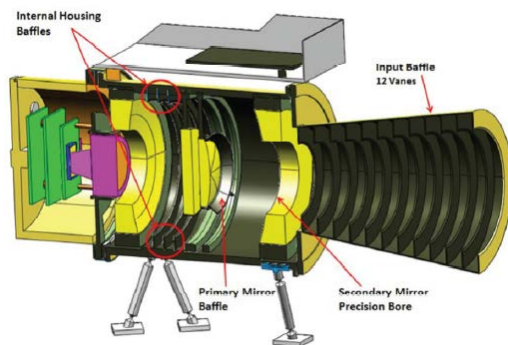


- Investigate the dynamic response of the Earth's magnetosphere to the solar wind impact in a **unique** and **global manner**
- Combine **X-ray imaging** of the dayside magnetosheath and the cusps with simultaneous **UV imaging** of the northern aurora, while monitoring the **solar wind** conditions in situ
- **Full chain of events that drive Sun-Earth relationships:** dayside reconnection / magnetospheric substorm cycle / CME-driven storms

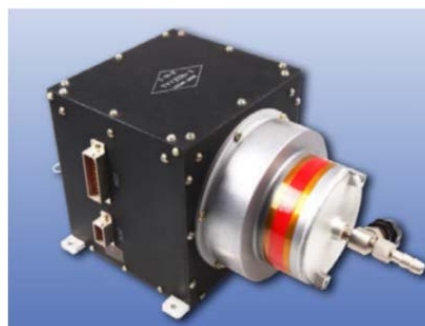
- Soft X-ray Imager (SXI)
- Ultra-Violet Imager (UVI)
- Light Ion Analyzer (LIA)
- MAGnetometer (MAG)



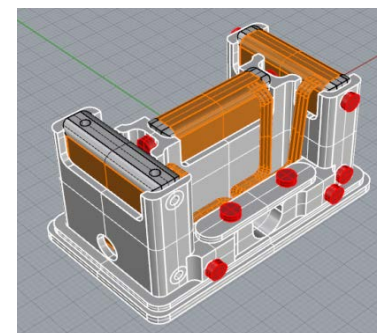
SXI



UVI



LIA



MAG

- Space activities in China toward science is under way.
- Space science program in China is open to the world. You are welcome to participant in.

A deep blue night sky filled with numerous stars of varying sizes and brightness. A large, glowing blue nebula is centered in the upper half of the frame. A bright, multi-pointed star is located at the center of the nebula. The overall scene is a beautiful representation of a starry night.

Thank You!