



# Future Directions of Space Science in China

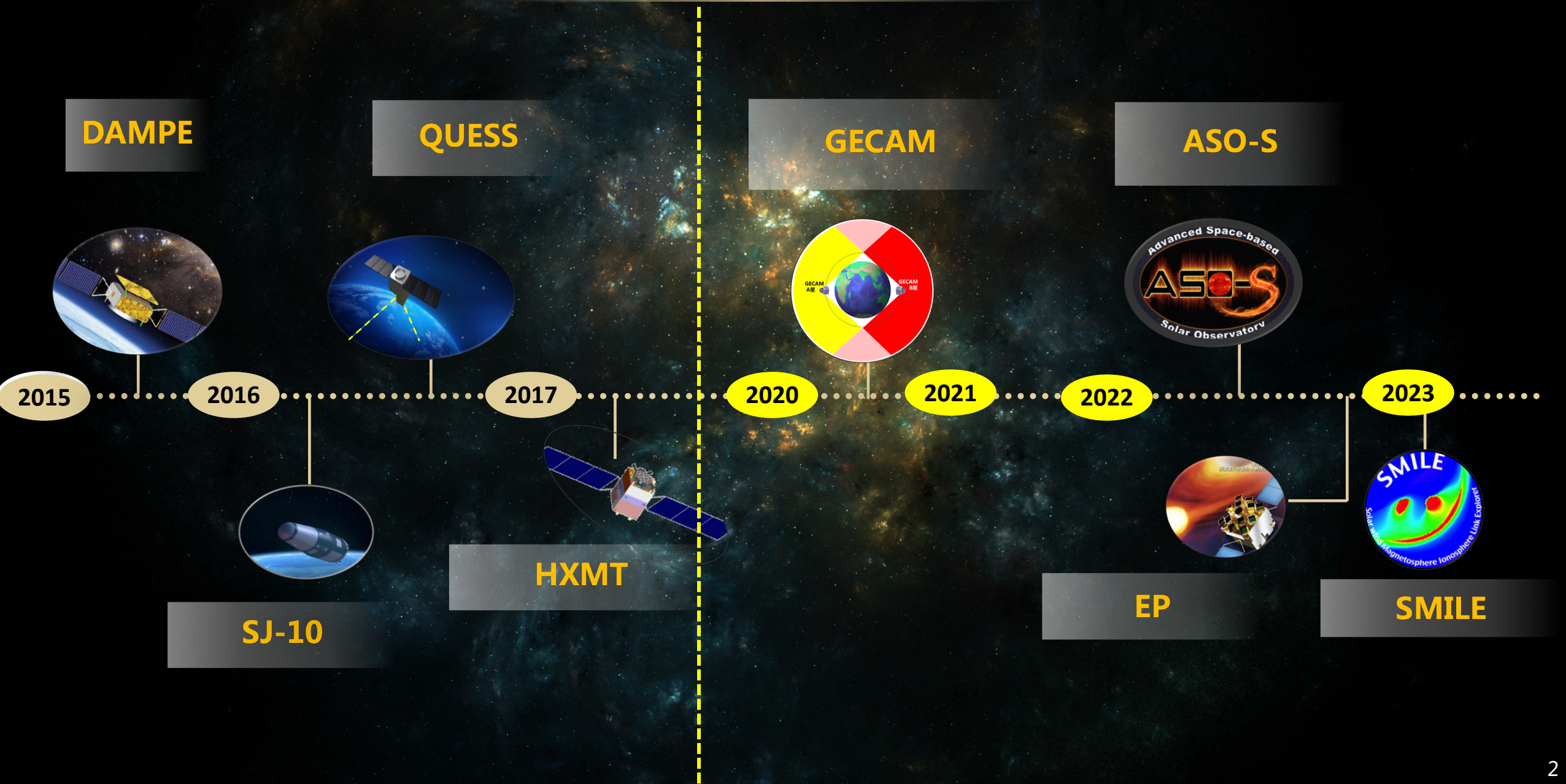
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Oct. 26, 2019



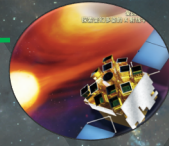
# Roadmap of Space Science Missions in China





# Ongoing Missions

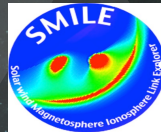
## Implementation



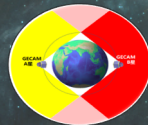
1. Einstein Probe (EP)



2. Advanced Space-borne Solar Observatory (ASO-S)



3. Solar wind Magnetosphere Ionosphere Link Explorer ( SMILE )



4. Gravitational wave high-energy Electromagnetic Counterpart All-sky Monitor (GECAM)



# Einstein Probe (EP)

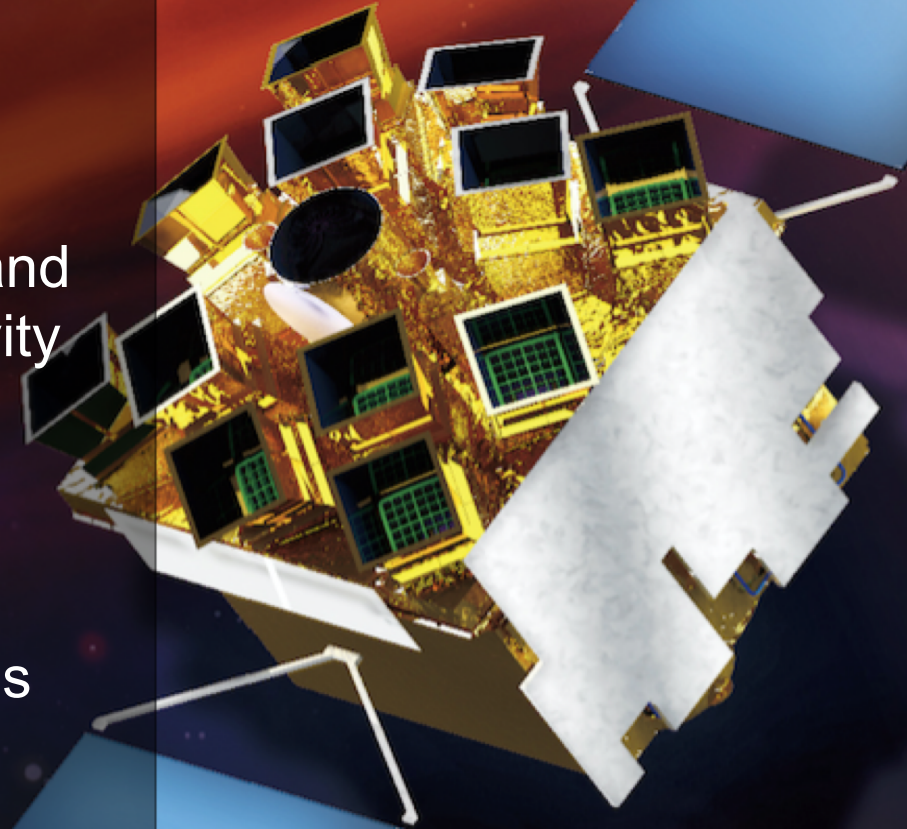
爱因斯坦探针：  
探索变幻多姿的 X 射线宇宙专题

## An explorer-class mission

- Dedicated to time-domain astronomy
- For all-sky monitoring & exploring cosmic high-energy transients

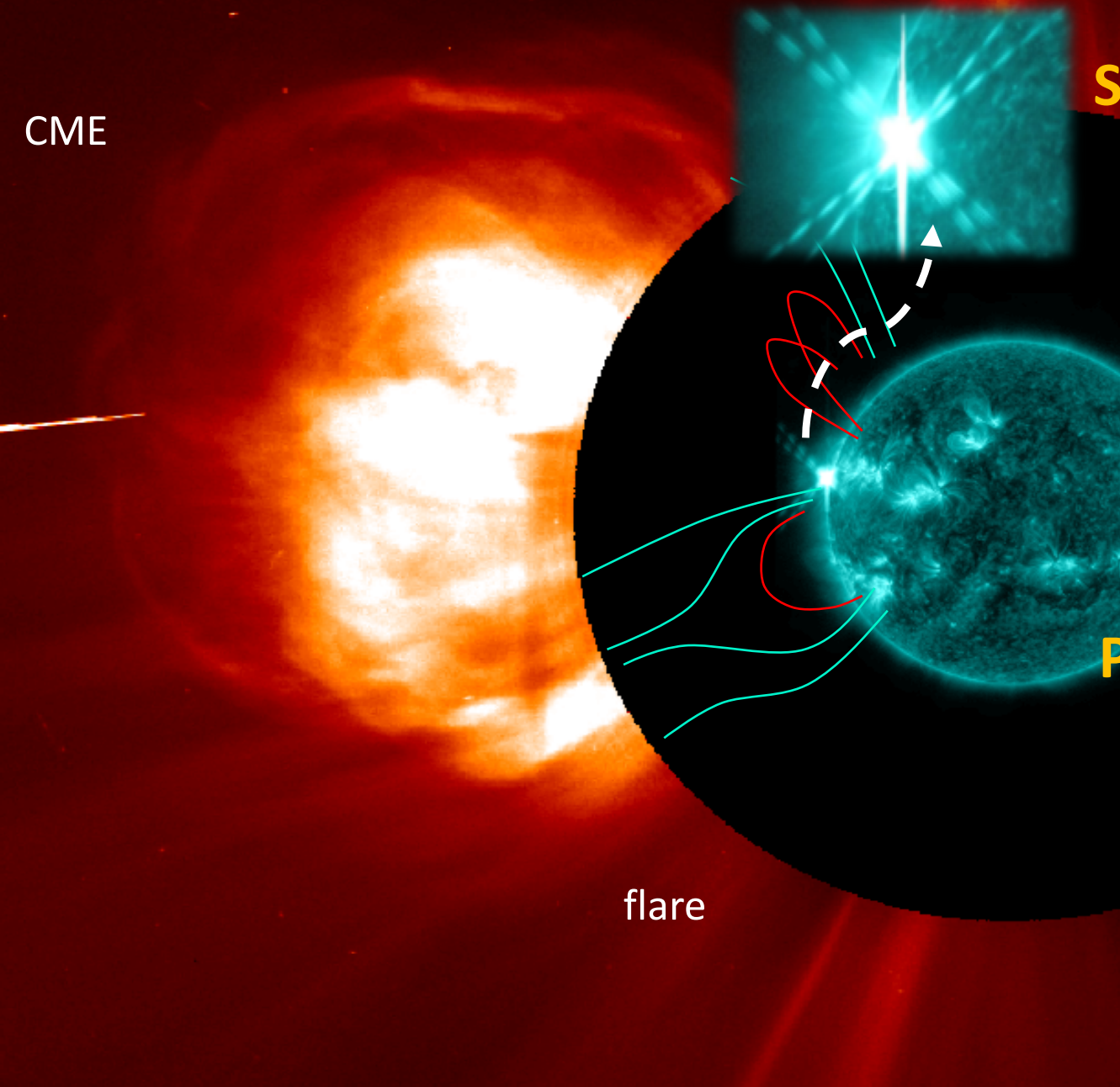
## Science Goals

- Carry out systematic survey of soft X-ray transients and variability of X-ray sources at unprecedented sensitivity and high cadence
- Demography, origin and evolution of **black hole** population
- Detect and localize the electromagnetic-wave sources of **gravitational-wave** events





# Advanced Space-borne Solar Observatory (ASO-S)



## Science Objectives

- Relationship between solar magnetic field and solar flares
- Relationship between solar magnetic field and CMEs
- Relationship between solar flares and CMEs

## Payloads

- Full-Disc Vector Magnetograph (FMG) : solar magnetic field
- Hard X-ray Imager (HXI) : solar flare
- Lyman-alpha Solar Telescope(LST): CME



# Solar wind Magnetosphere Ionosphere Link Explorer (SMILE)



Provide a **global view** of magnetosphere

## Key Scientific Questions

- What are the fundamental modes of the dayside solar wind/magnetosphere interaction?
- What defines the substorm cycle ?
- How do CME-driven storms arise, and what is their relationship to substorms?

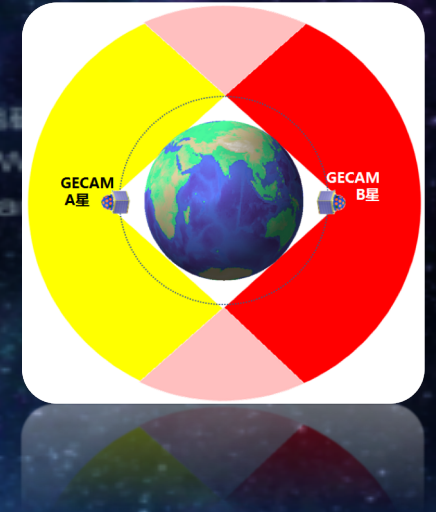


# Gravitational wave high-energy Electromagnetic Counterpart All-sky Monitor(GECAM)

Sciences: **GW GRB + others**

All-time all-sky detect GW GRB, FRB, ...

- Independent confirmation of GW event
- Accurate localization, host galaxy, redshift
- Astrophysical content of the GW source
- GW+EM, Cosmology, fundamental physics





# New Missions in Study





# Enhanced X-ray Timing and Polarimetry mission(eXTP)

To observe black holes, neutron stars, and magnetars to understand the physics in extreme gravity, magnetism and density

- 1 Singularity
- 2 Stars
- 3 Extremes

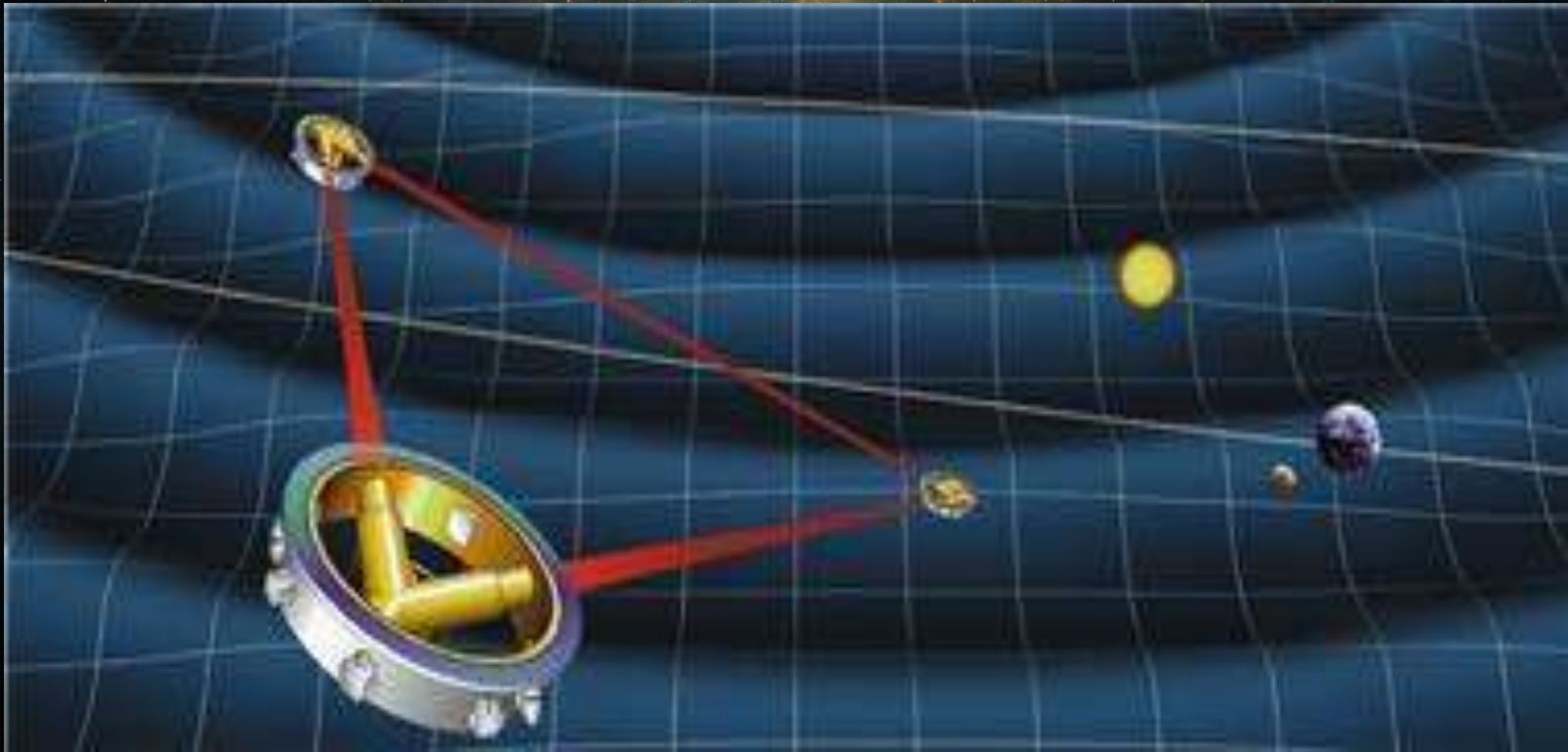
Phase B





# Taiji Program

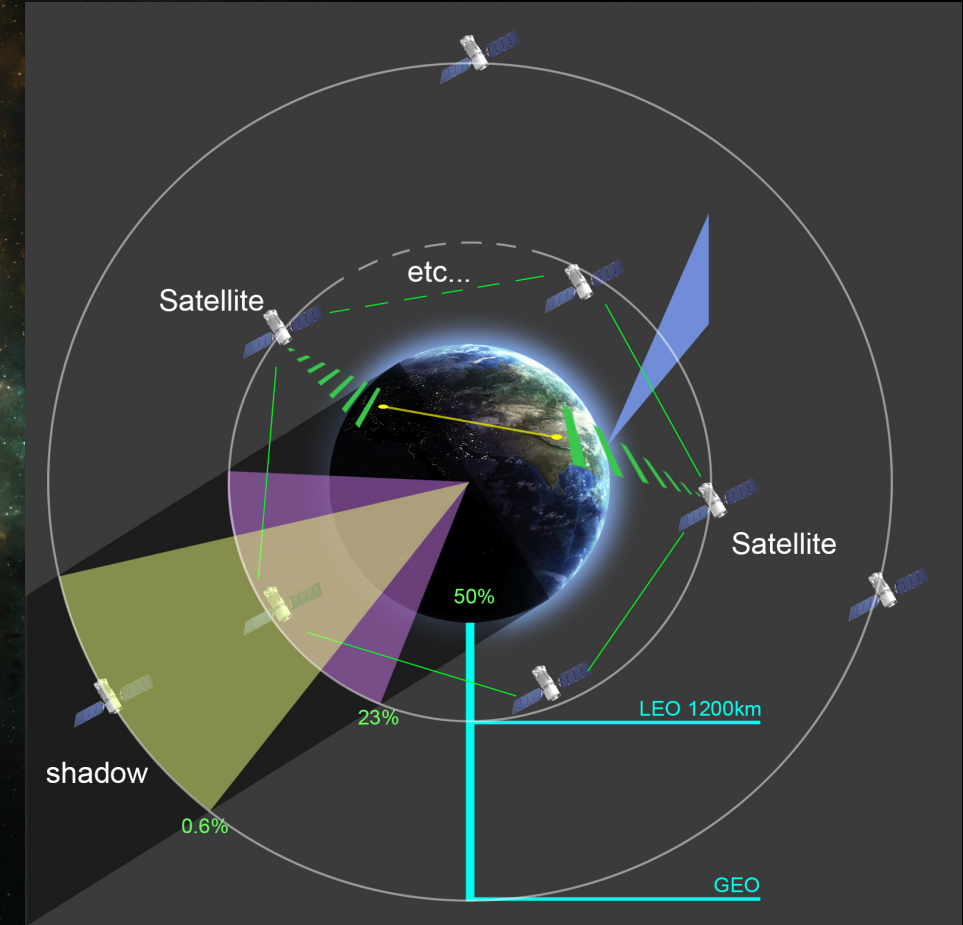
To observe gravitational wave from mergence of binary black holes or great massive celestial bodies and so on





# MEO-to-GEO quantum satellite

1. Develop key technologies, produce MEO-to-GEO quantum satellite, realize ~10000km all-day quantum communication, and build global quantum network
2. Explore ultimate Bell test of Quantum Mechanics with free-will
3. Explore new methods of testing the unification of Quantum Mechanics and General Relativity

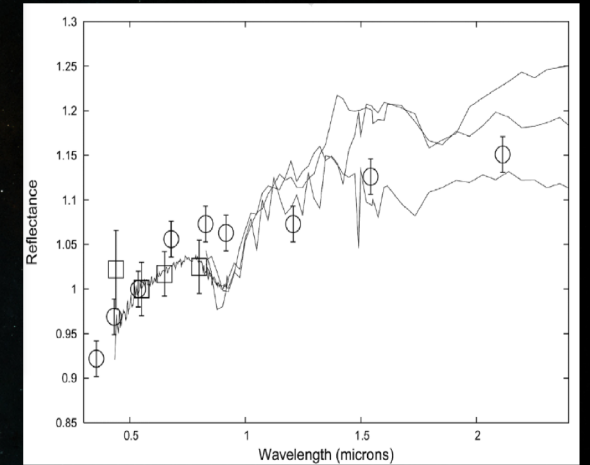




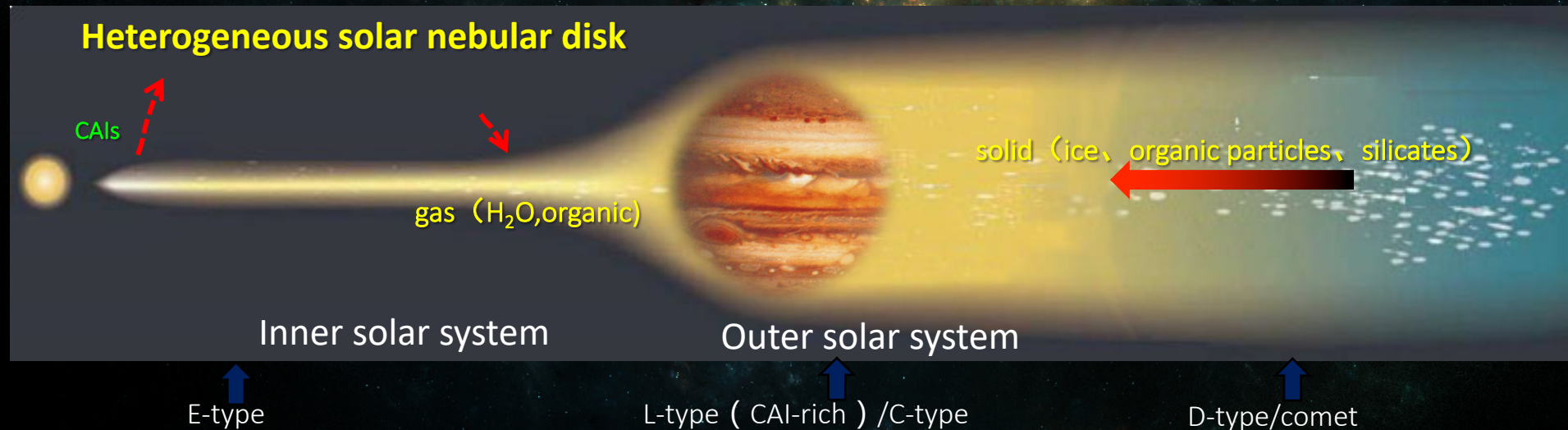
# Small Bodies Sample Return Mission

To study 1st 10 Ma history of the solar system

- Formation of the solar system
- Formation of planets in the inner solar system
- Accumulation of planetesimal



E-type asteroids

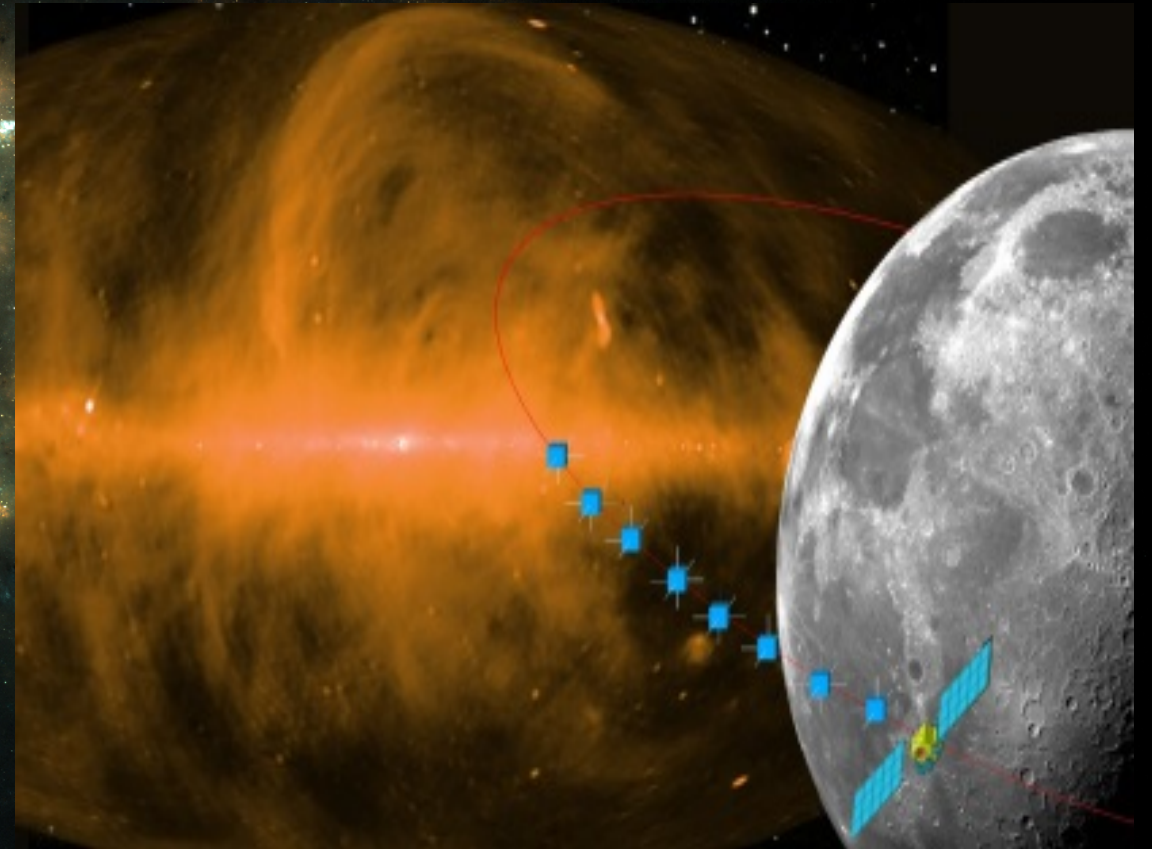




# Ultra-long Wavelength Astronomical Observation Array

To open up a new window of in the electromagnetic spectrum

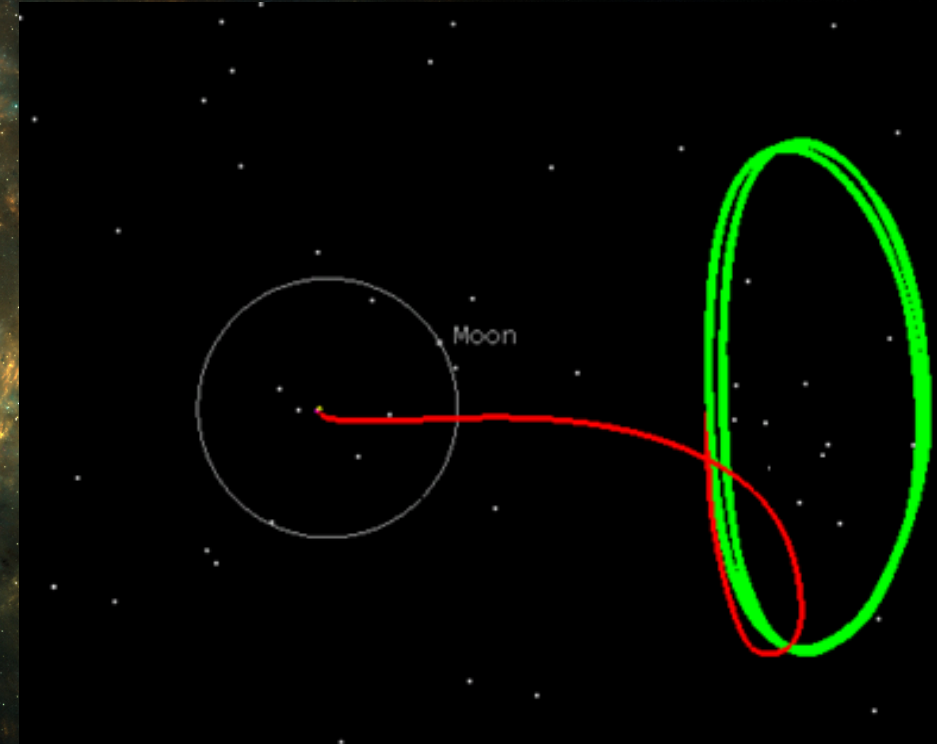
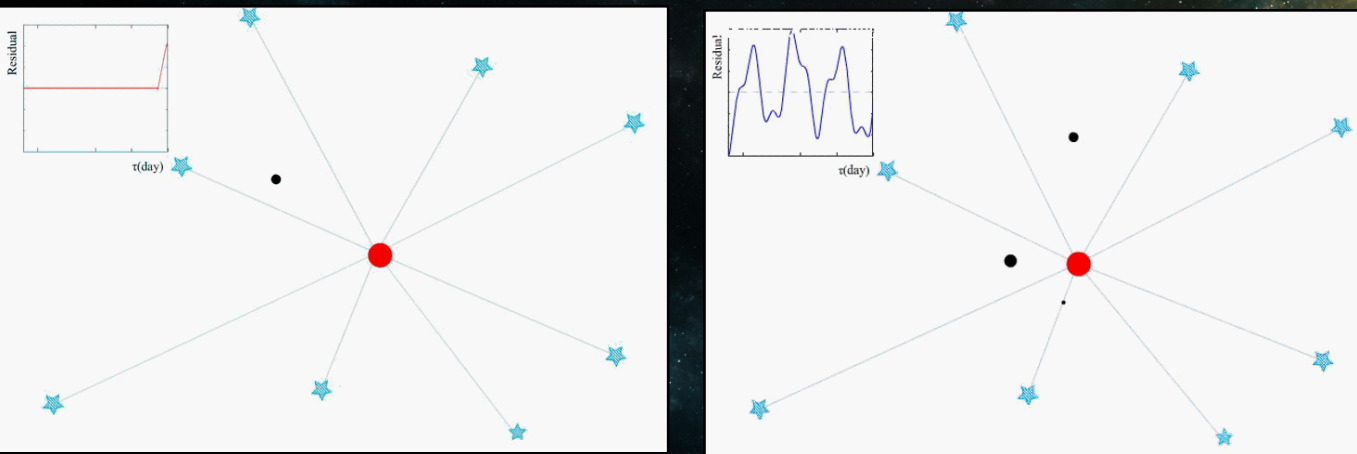
- Probe the dark age and cosmic dawn
- Observe radio activity of the Sun and planets
- Study the origin and propagation of cosmic ray





# Close-by Habitable Exoplanet Survey ( CHES )

To detect habitable Earth-like exoplanets near the solar system (within 10 pc)



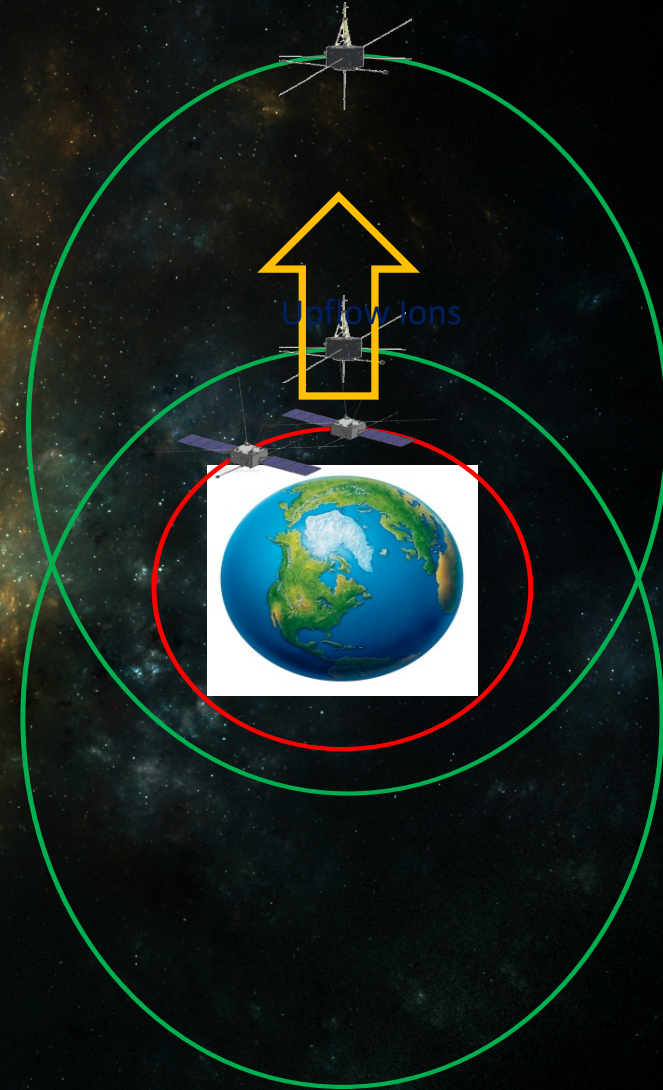
CHES principle diagram of astrometry



# Magnetosphere-Ionosphere-Thermosphere Coupling

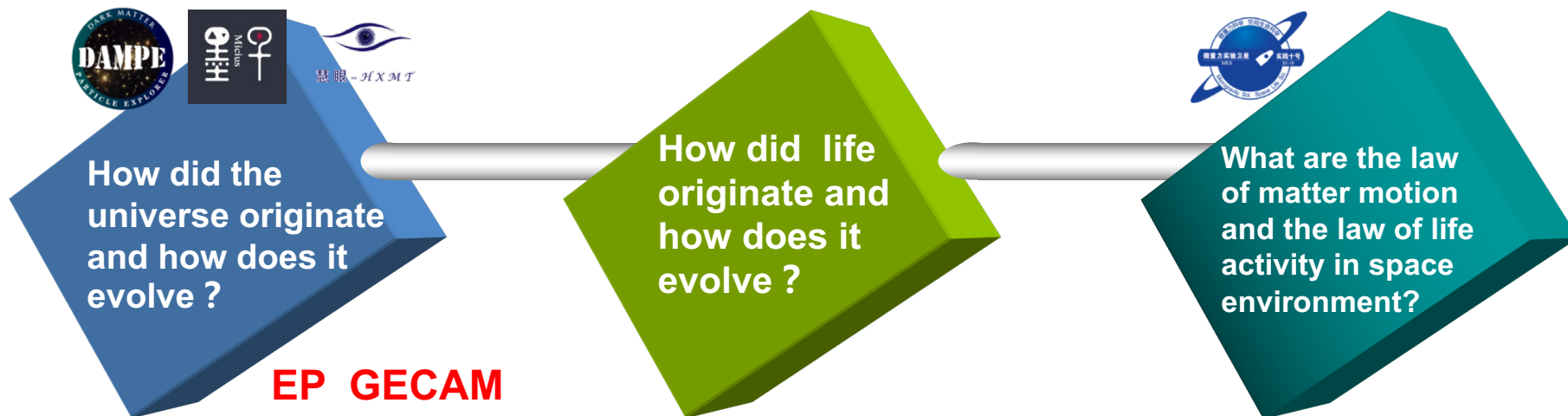
(MIT)

- Understanding the mechanism of ion acceleration and transport in ionosphere / thermosphere
- Unveil the role of the coupling of the Earth's spheres in triggering the space storm
- Discover the escape process of the earth particles and deepening the understanding of the evolution of the planetary atmosphere

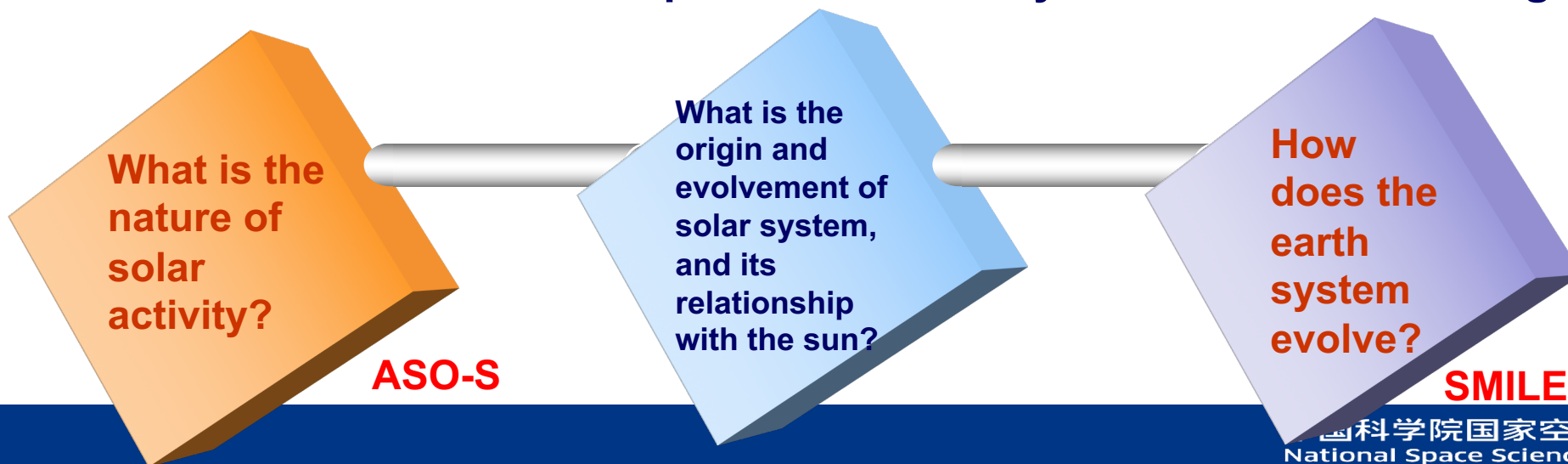




## Theme 1: How did matter originate, how does it evolve?



## Theme 2: What is the relationship between solar system and human beings?





# Final Remarks

- The breakthroughs in fundamental science is of great significance. China will make contribution to human civilization through space science.
- A new chapter of Chinese space endeavor has been opened, with the implementation of Strategic Priority Program on Space Science. Chinese government puts a high value on space science and will continuously develop its science satellite series.
- We are open to International cooperation and welcome to join us.

