



Chinese Space Science Programs and International Cooperation

- A Brief History
- Current Missions
- Future Missions
- International Cooperation
- Remarks

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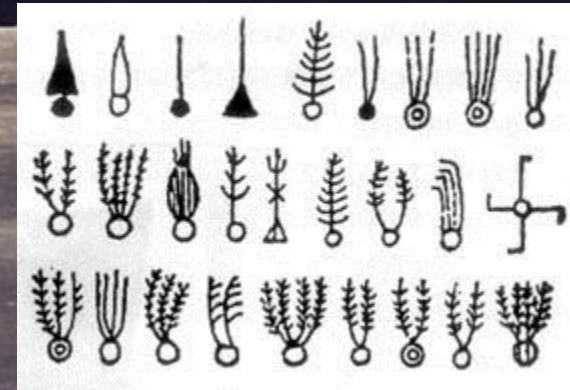
Center for Space Science and Applied Research



A Brief History

In the ancient time:

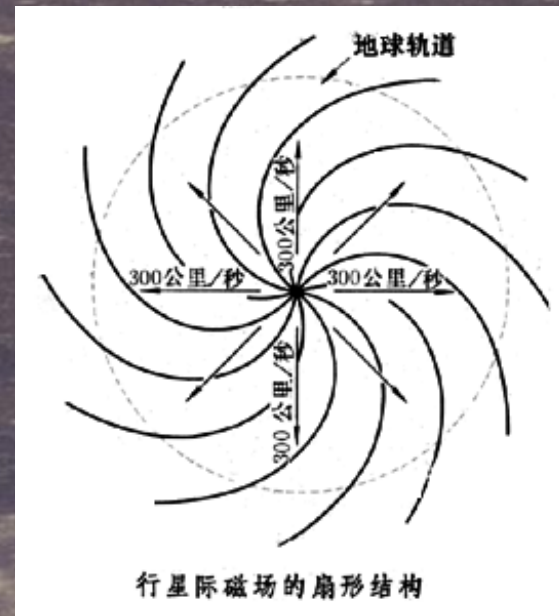
- The earliest record on Haley comet in 613 B.C. and more than 500 times comet records afterward
- The earliest record on Sun spots, 28 B.C.
- The earliest application of the earth magnetism --- the compass, ~500 B.C.





A Brief History

About 1000 B.C. solar beam was already expressed as a spiral shape:
(Jinsha historical site, 2001, Chengdu, China)





A Brief History

Space environment exploration and
space physics studies:

SJ-1 1971

SJ-2 1981

SJ-4 1994

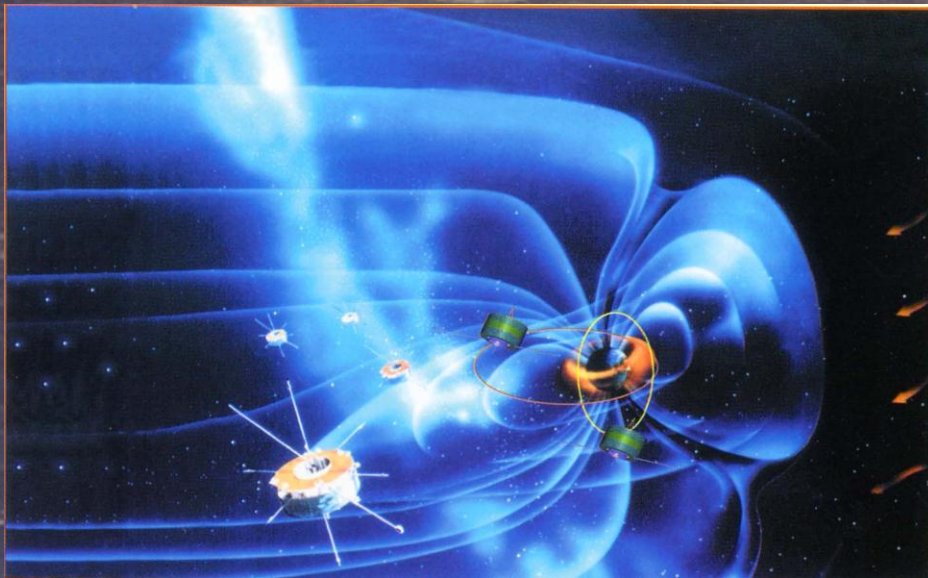
SJ-5 1999





A Brief History

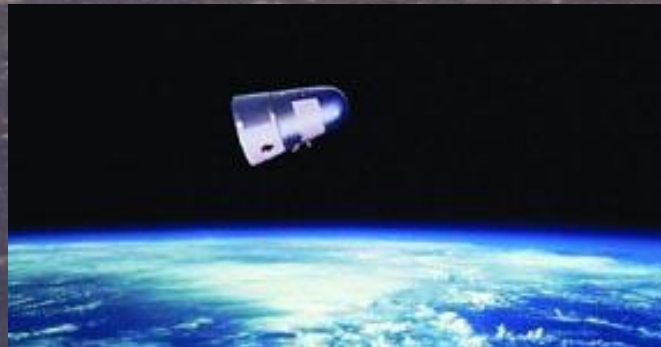
Double star program was a recent space physics mission with close cooperation with ESA, TC-1 30.12.2003 TC-2 25.07.2004





A Brief History

Micro-gravity and space life science got a few opportunities to be onboard of retrievable satellite, SJ-5 1999, SJ-8 2008.





A Brief History

Most intensive space experiments were carried on Chinese manned space program through Shenzhou 1-5





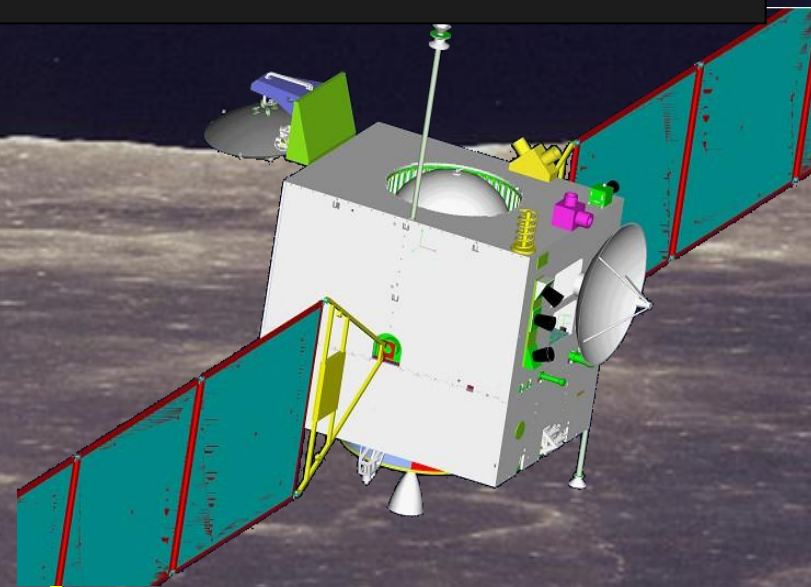
Current Missions

Chang'E-1 (嫦娥一号)

200km orbiter

8 scientific instruments

- Stereo Optical Camera
- Optical Interferometric Imager
- Laser Altimeter
- x and gamma ray spectrometer
- Microwave sounder
- Solar wind detector





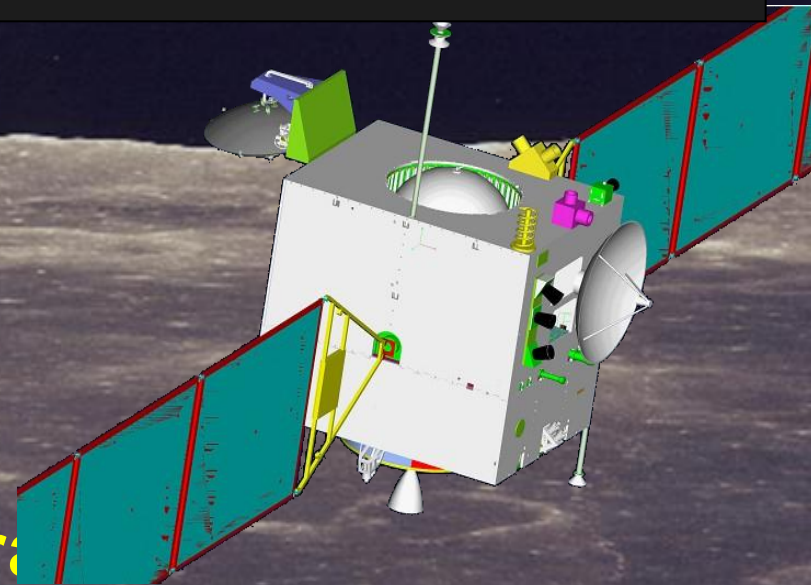
Current Missions

Chang'E-2 (嫦娥二号)

100km orbiter

7 scientific instruments

- High Resolution Camera
- Laser Altimeter
- x and γ ray spectrometer
- Microwave sounder
- Solar wind detector





Current Missions

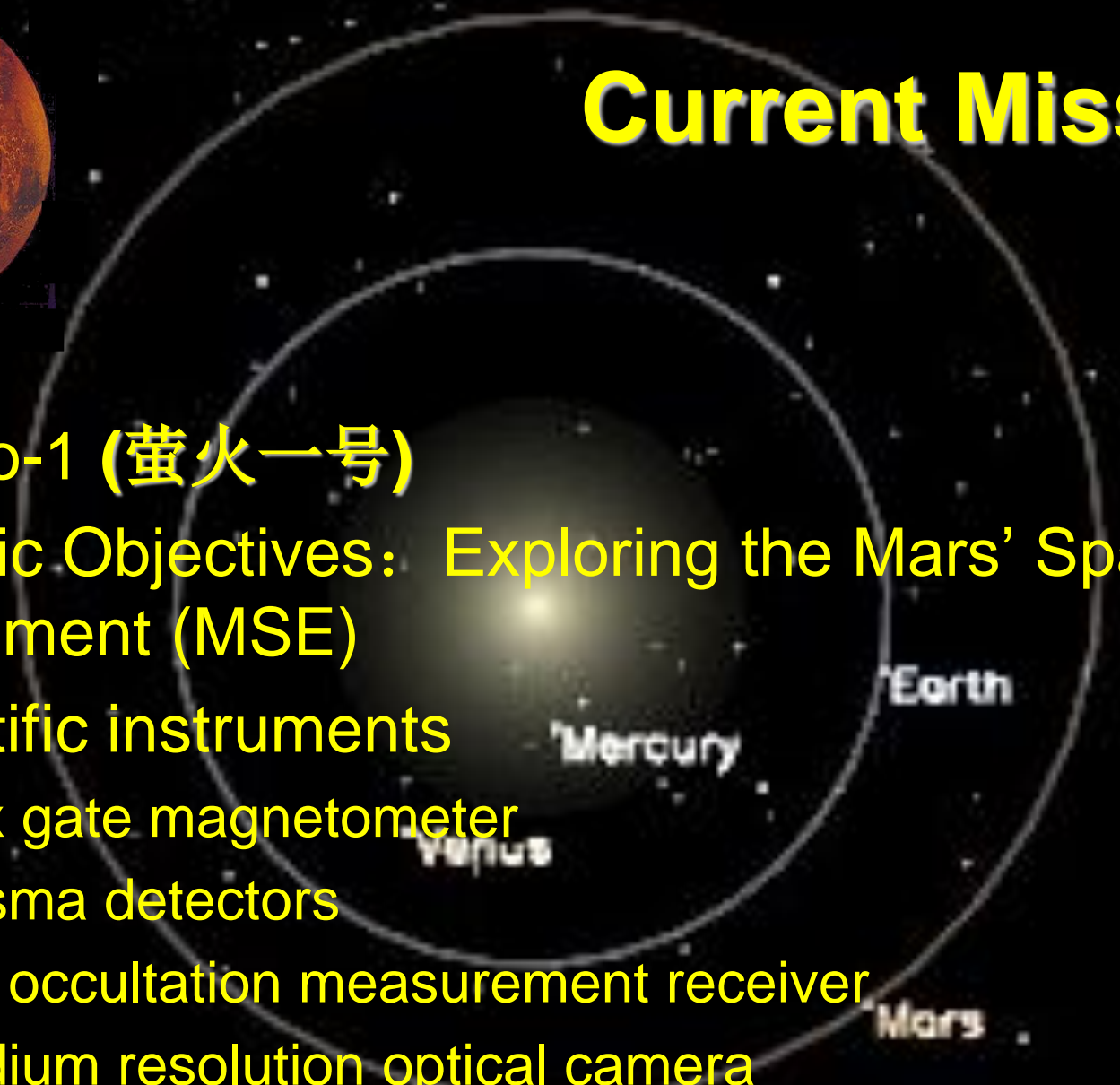
Yinghuo-1 (萤火一号)

Scientific Objectives: Exploring the Mars' Space Environment (MSE)

4 scientific instruments

- Flux gate magnetometer
- Plasma detectors
- S-S occultation measurement receiver
- Medium resolution optical camera

800X80,000km orbit, launch with Phobos-Grunt





Future Missions

Chinese Lunar Exploration Program

Phase 1: Learn knowledge of the Moon

Phase 2:

Chang'E-3: Lander and rover 2013

Phase 3:

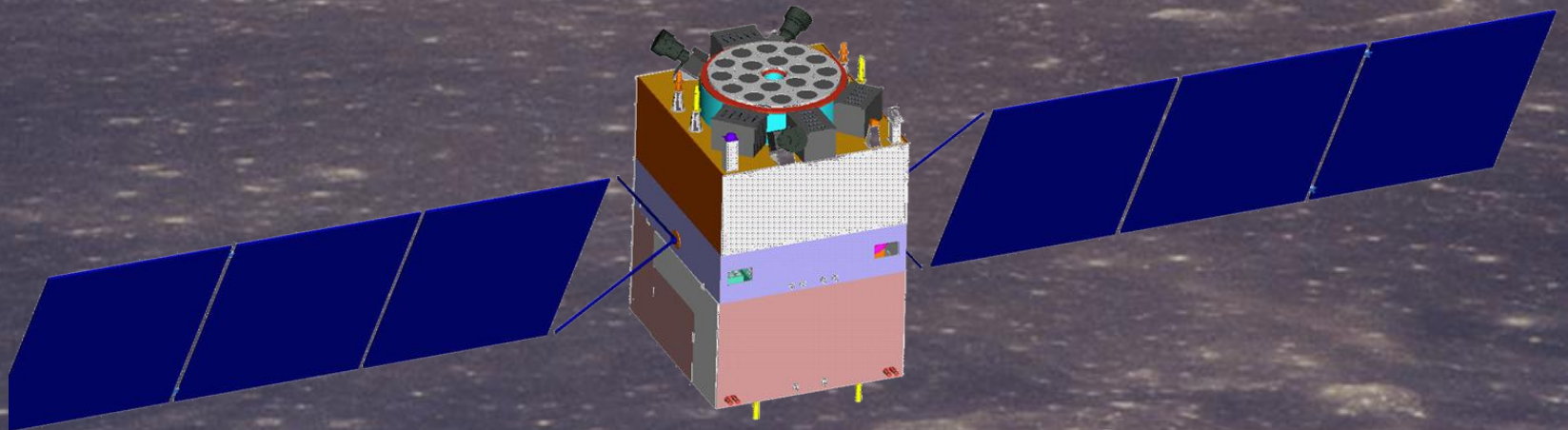
Sample Return: after 2017



Future Missions

Space Astronomy Mission

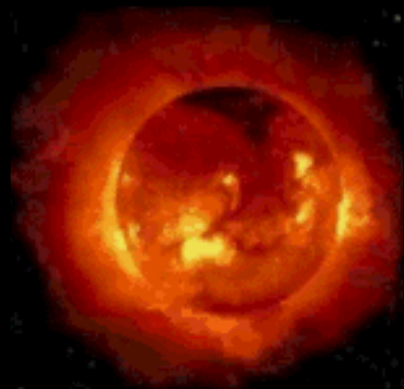
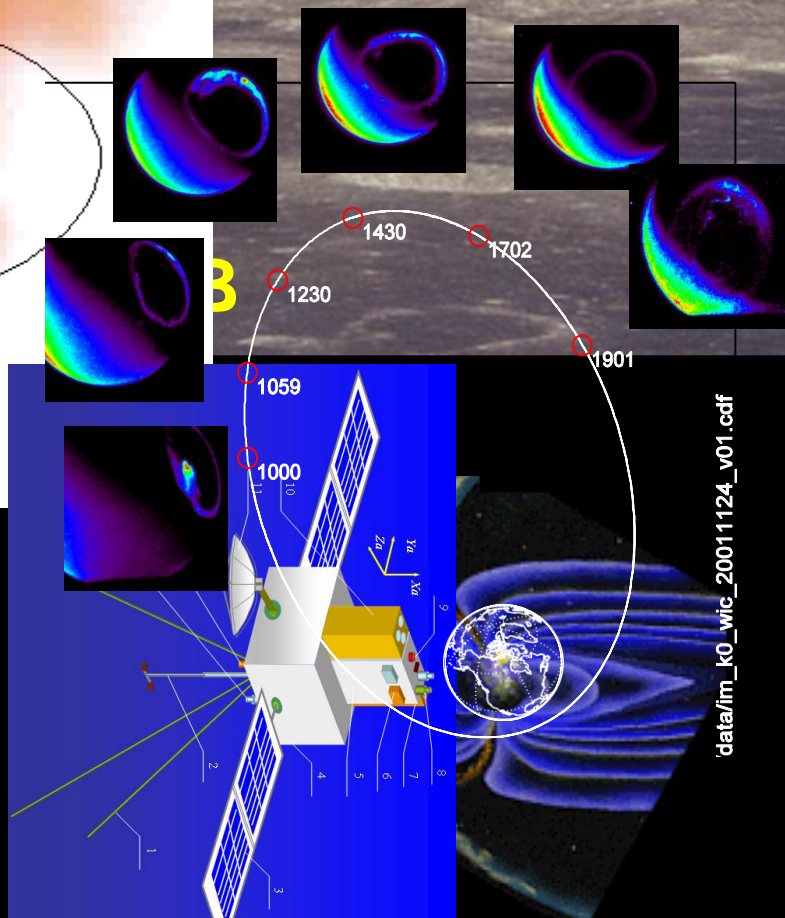
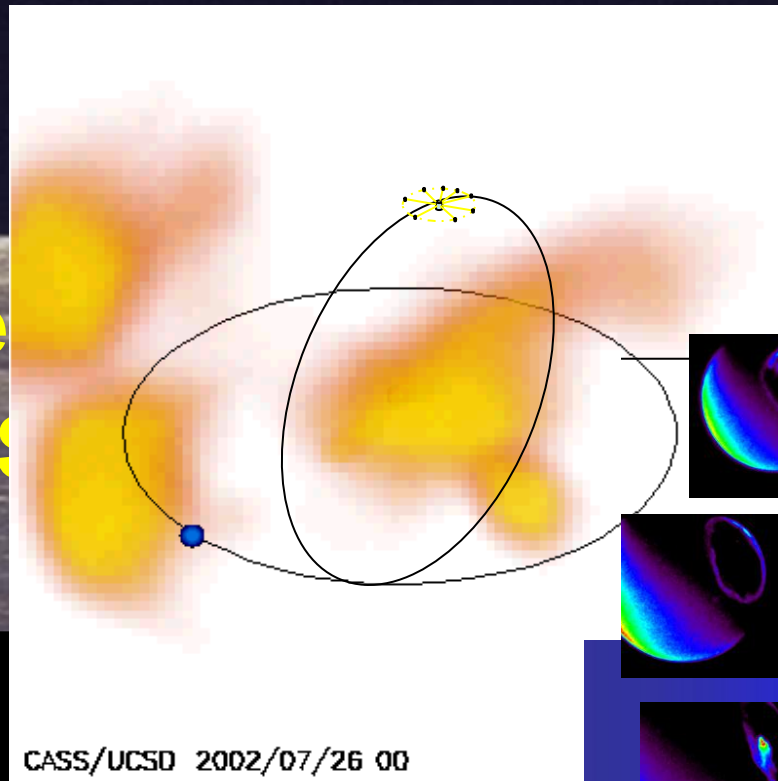
**Hard X-ray Modulation Telescope,
SVOM**





Future Missions

Space We
From the S
KUAFU/A -





Future Missions

**Microgravity Mission:
SJ-10 and follow on
Future Manned Space flights**





International Cooperation

- For Space Science Program, international cooperation is highly encouraged
- China currently have good cooperation with ESA, Roscosmos, CNES
- Chinese space science community have broader connections with scientists from Europe, US, Japan, India, etc.
- More open policy is called to the US government to open governmental level cooperation with China.



International Cooperation

- **Bilateral meetings on space science held every year between ESA and China since 2004**
 - DSP, HXMT, KUAUFU
- **Cooperation with Canada Space Agency on KUAUFU**
- **Cooperation with Russian on Mars Exploration – Phobos-Grunt/Yinghuo-1**



International Cooperation

Difficulties on international cooperation

- ITAR issue has blocked many opportunities not only between US and China but also other countries
- ISS is not open to China, therefore China has to carry out manned space program independently
- US policy is not consistent from the president and the parliament



International Cooperation

Suggestions to the US government:

- Detach space science cooperation from other cooperation limited by ITAR
- Open ISS to Chinese Astronauts and start negotiation on a cross station visit between ISS and Chinese space station
- Reopen cooperation between NASA and China on space science programs
- Establish joint space security mechanism on debris and space weather forecast and warnings



Remarks

- Although China had great contributions on astronomy observations in the history, our contributions are not significant at all in the modern space age
- Past and new space science missions have all involved some international cooperation
- More open policies from US to cooperation with China on space science is expected

Thank You!

