Space Solar Physics in 2012–2014

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ABSTRACT

The main activities of Chinese space solar physics in 2012–2014 include: to continue studying the mid and long-term (2016–2030) plan of Chinese space solar physics; to arrange a group of pre-study projects of space solar physics; to initiate and continue a few solar mission-level projects. This paper summarizes all these activities briefly.

KEY WORDS

Space astronomy, Solar physics

1 Strategic Study for 2016 to 2030

Based on "The Strategic Report of Long-term Plan of Chinese Space Sciences (2011–2025)", space solar physics community, together with other branches of space sciences, is studying its development strategy in 2016–2030. It is in fact an updated and optimized version from the previous strategic report. The goals are described in a more practical way. The final report will be published later this year.

2 Financing Some Pre-study Projects

During this period, two batches of pre-study projects got support from the channel of "Space Science" sponsored by CAS. The first batch was started at the beginning of 2012, while the second batch was at the beginning of 2014. We list all of those projects belonging to solar physics as follows:

(a) Conception study on advanced space-based solar observatory (January 2012–March 2013).

(b) Key technique studies on solar hard X-ray imager (January 2012–December 2013).

(c) Key technique studies on space-borne solar full-disc vector magnetograph (January 2012–December 2013).

(d) Key technique studies on Lyman-Alpha telescope (January 2012–December 2013).

(e) Key technique studies on a new type Bi-refraction filter (January 2014–December 2015).

(f) Deepen technique studies on space-borne solar full-disc vector magnetograph (January 2014–December 2015).

(g) Key technique studies on detection of solar energetic particles with a high accuracy (January 2014–December

2015).

(h) Key technique studies on high resolution spectrometer of solar soft X-rays (January 2014−December 2015).

(i) Key technique studies on inner coronagraph at L_5 (January 2014−December 2015).

Up to now, the first batch of 4 projects was finished successfully. However, the second batch of 5 projects has not got the fund yet, although it has completed all the procedures for approval.

3 Some Mission-level Projects

As mentioned in previous report [1−5], we have not launched any Chinese own solar missions so far. There are still no solar missions which have been undertaken into the engineering stage. We do not know how long this situation will maintain. But we indeed have seen something changing within the framework of the strategic plan. There are some mission-level projects, which are undertaken in phase-A and part of phase-B (so-called background) stage or in promoting stage. According to the definition in "The Strategic Report of Long-term Plan of Chinese Space Sciences (2011−2025)", there are 16 programs of space sciences totally. Two belong to solar physics: Solar Microscope Program and Solar Panorama Program. Another program related to solar physics is Solar-Terrestrial Connection Program, which belongs to Space Physics. The list below provides the mission-level projects which are related to solar observations, despite it belongs to solar physics or space physics.

(1) ASO-S: Advanced Space-based Solar Observatory

Aiming at the 25th solar maximum years, the community plans to manufacture and launch a small-sized solar mission named Advanced Space-based Solar Observatory (ASO-S), to realize the zero-breakthrough of Chinese solar satellite. The scientific objectives of ASO-S are focused on solar magnetic field, solar flares, and coronal mass ejections. ASO-S will observe simultaneously solar vector magnetic field, solar flares with high energy imager and coronal mass ejections with coronagraph within a single platform for the first time. The relationship among solar magnetic field, solar flares and coronal mass ejections will be studied extensively. The obtained knowledge from this mission can be also applied to space weather forecast. There are three payloads: Full disk vector Magneto Graph (FMG), Hard X-ray and gamma-ray Imager (HXI) and Lyman-alpha Solar Telescope (LST). It is expected that ASO-S will be launched in 2021 and work in orbit for 4 years. In 2013, ASO-S has finished all the procedure for approval as a background project.

(2) SPORT: Solar Polar Orbit Telescope

The Solar Polar Orbit Telescope (SPORT) is intended to be the first mission from a polar orbit around the Sun to measure solar high-latitude magnetism leading to eruptions and the fast solar wind and to image interplanetary propagation of Coronal Mass Ejections (CMEs) in the ecliptic. It was proposed as a radio array in 2004 by the National Space Science Center, Chinese Academy of Sciences, and is under a scientific and engineering background study in China (2012−2016). SPORT is expected to have an orbit similar to that of Ulysses, with its perihelion at 0.7 AU from the Sun, aphelion at 5 AU, and inclination angle of about 75 degrees with respect to the ecliptic. Tentative payload aboard SPORT will include an EUV imager (121.6 nm), a magnetograph, a coronagraph, a heliospheric imager, a synthetic aperture radio imager, a solar wind plasma analyzer, a magnetometer, a radio and plasma wave instrument and an energetic particle detector.

(3) DSO: Deep Space Solar Observatory

In 2011 the community got a chance to put solar observations into the national deep space program. Then, based on the heritage of SST (Space Solar Observatory), a new mission named Deep Space Solar Observatory (DSO) was proposed. Different from SST, DSO will work at L_1 with a set of optimized payloads. Although preparation works have been done during past two years, DSO is still waiting for the green light for the whole plan of national deep space exploration.

(4) Kuafu

The Kuafu mission underwent significant progress in 2012. The Chinese Academy of Sciences and European Space Agency collaborated closely to realize the original three-satellite configuration. However, due to financial pressure, the collaboration ended without a clear European commitment to Kuafu B. The Chinese Academy of Sciences pursued an alternate mission scenario with the original Kuafu A redeployed from L_1 to L_5 point. The work has been completed. Kuafu is now awaiting decision from the Chinese Academy of Sciences on follow-on steps.

References

[1] Gan W Q, Xue S J. Space astronomy in China: 2002−2004 [J]. *Chin. J. Space Sci.*, 2004, **22**(Sppl.): 99-101

[2] Gan W Q. Space astronomy in China During 2004−2006 [J]. *Chin. J. Space Sci.*, 2006, **26**(Sppl.): 76-78

[3] Gan W Q. Space astronomy in China: 2006−2008 [J]. *Chin. J. Space Sci.*, 2008, **28**(5):424-425

[4] Gan W Q, Zhang S N, Yan Y H, Chang J. Space astronomy in China: 2008−2010 [J]. *Chin. J. Space Sci.*, 2010, **30**(5): 424-426

[5] Zhang S N, Yan Y H, Gan W Q. China's space astronomy and solar physics in 2011−2012 [J]. *Chin. J. Space Sci.*, 2012, **32**(5): 605-617