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Solar satellite breaks ground with new data

Imaging research on sun gives China influence in related academic fields

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China's solar observation satellite has achieved major scientific and technological feats during its in-orbit operation, according to the China National Space Administration.

The satellite Xihe, named after the sun goddess in ancient Chinese mythology, has carried out spectral scanning and imaging of the sun's H-Alpha waveband and has recorded the dynamics of the solar activities in the star's photosphere and chromosphere.

The spacecraft has also obtained spectral lines of the sun's H-Alpha waveband, neutral silicon atoms and neutral iron atoms, the space administration said on Tuesday.

All of these accomplishments have never been achieved by scientists before and they are expected to extensively advance the research of the sun and solar system and will give a bigger say to China in the academic field of solar physics, the administration noted.

The administration held a ceremony on Tuesday in Beijing to make public the scientific and engineering achievements of the Xihe mission.

Also known as the Chinese H-Alpha Solar Explorer, Xihe was launched in October 2021 from the Taiyuan Satellite Launch Center in Shanxi province.

The satellite is China's first space-based solar telescope and is designed to work for at least three years. It is tasked with helping scientists deepen their knowledge of our nearest star.

Its scientific payload is an H-Alpha imaging spectrograph that can, for the first time, acquire full-disk spectroscopic solar observations in the H-Alpha waveband.

The 508-kilogram satellite is traveling in a sun-synchronous orbit about 517 kilometers above the Earth.

Its primary task is to investigate the dynamics of solar activity in its lower atmosphere, namely the photosphere and chromosphere, and to understand the physical mechanisms of solar eruptions. The mission is very meaningful to the nation's space exploration and satellite technology, mission planners said.

Zhao Jian, head of the space administration's Key and Special Project Center, said on Tuesday that Xihe has carried out more than 300 technological tests and over 1,000 spectral imaging operations.

According to him, scientists around the world have been studying the H-Alpha spectral lines for a long time, but they had to rely on ground-based observatories that are susceptible to interference from factors such as earthly atmospheric disturbances.

Through Xihe, scientists now can get consistent, more accurate high-definition data, he said.

In addition to the scientific value, the spacecraft has also enabled researchers to verify a new satellite platform with exceptionally high directional accuracy and flying stability, the official said.

Ding Mingde, a professor at Nanjing University's School of Astronomy and Space Science and a scientist involved in the Xihe project, said that solar eruptions have many effects on human activities so it is essential to obtain more knowledge about solar physical phenomena.

"We need to study when a solar eruption would take place, how long it takes for the rays created by such eruptions to reach the Earth and its probable impacts on sensitive instruments and spacecraft," he explained.

"Now with the Xihe, we have got the world's finest two-dimensional spectral data about the sun, and we can use the data to detect new patterns of solar eruptions. Thanks to the satellite, we will definitely produce world-class feats in solar studies," the professor said.

Astronomers obtain sky's large-field X-ray maps

Chinese astronomers have released the world's first collection of large-field X-ray maps of the sky, captured by a small satellite put into orbit last month.

The Wide-field X-ray Telescope, launched into orbit on July 27 by a solid-propellant-fuelled rocket, is the first large-field X-ray imaging telescope, according to the National Astronomical Observatory of China.

After a four-day in-orbit observation, the telescope obtained X-ray images and the energy spectra of many celestial bodies in the Milky Way and beyond.

The telescope is equipped with 36 micro-pore lobster-eye lenses and four large-array CMOS sensors, all developed by China, and its field of view stretches to 340 degrees, considerably wider than other similar telescopes.

It is an experimental module for the Einstein-Probe satellite that is in the pipeline.

A total of 12 WXT modules will be mounted on the new satellite.

Einstein-Probe is a mission tasked with discovering celestial bodies that emit X-rays during fierce changes, as well as quiescent black holes with transient high-energy radiation.

The WXT has observed the central celestial region of the Milky Way.

The results show that a single glance can detect X-rays from multiple directions, including those from stellar black holes and neutron stars.

The findings are highly consistent with the simulations, scientists said.

An X-ray imaging of the famous Cygnus supernova remnant demonstrated that the WXT's lobster-eye lenses can capture diffuse targets, and that the WXT's CMOS sensors are able to process high spectral resolutions.

The probe further spotted the relatively faint X-ray signals from a quasar 814 million light years away.

A quasar is a star-like object that produces bright light and radio waves.

The Large Magellanic Cloud near the Milky Way galaxy was also spotted within the WXT's field of view, according to the NAOC.

A pilot run in August indicated that the WXT is operating normally, laying a solid foundation for the Einstein-Probe mission, the NAOC said.

Yuan Weimin, chief scientist of the EP mission, who works with the NAOC, said the results are very exciting and attest to the instrument's capability in obtaining quality scientific data.

The WXT was co-developed by the NAOC and the Shanghai Institute of Technical Physics of the Chinese Academy of Sciences.

The NAOC released the data during the China Space Science Assembly held in Taiyuan, capital city of Shanxi province, which concluded on Sunday.

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