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Sino-French satellite launched

Collaboration to seek out secrets of most extreme explosive events in cosmos

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A cutting-edge astronomical spacecraft jointly developed by China and France was launched into its preset orbit on Saturday afternoon to capture and observe gamma-ray bursts — the most distant explosions of stars — the China National Space Administration said.

The Space Variable Objects Monitor spacecraft is a combination of small telescopes. It was placed in a low-Earth orbit by a Chinese Long March 2C carrier rocket launched at 3 pm from the Xichang Satellite Launch Center in Sichuan province, the administration said in a news release.

The 930-kilogram spacecraft was built by the Chinese Academy of Sciences' Innovation Academy for Microsatellites in Shanghai. It carries four scientific payloads: the ECLAIRs coded mask camera and the Microchannel X-ray Telescope made by French scientists, and the Gamma-ray Burst Monitor and the Visible Telescope built by the Chinese team.

The best spacecraft ever built for multi-band comprehensive observation of gamma-ray bursts, it is expected to play an important role in space-based astronomical explorations, the CNSA said.

Gamma-ray bursts, immensely energetic explosions in distant galaxies, are the brightest and most extreme explosive events in the universe and the most energetic and luminous electromagnetic events since the Big Bang.

Humanity's first knowledge about gamma-ray bursts came from the serendipitous detection of one such explosion on July 2, 1967, by the United States' Vela-series satellites, which were tasked with detecting gamma radiation pulses emitted by nuclear weapons tests.

In 1973, US scientists published the first research paper about the astronomical phenomenon.

Several spacecraft, including NASA's Compton Gamma Ray Observatory and High Energy Transient Explorer 2, and the Italian-Dutch astronomical satellite BeppoSAX, have been placed into space to detect gamma-ray bursts.

Initiated in 2005, the SVOM project is the result of a long-term collaboration between the CNSA and France's National Center for Space Studies. It has involved scientists and engineers from multiple institutes, including the Research Institute in Astrophysics and Planetology in Toulouse and the Institute of High Energy Physics in Beijing.

Following its orbital deployment, scientists from both China and France will work together to control the satellite, receive scientific data and arrange follow-up observations.

The main scientific objectives of the SVOM mission include searching for and rapidly locating various gamma-ray bursts; comprehensively measuring and studying their electromagnetic radiation properties; using the bursts to study dark energy and the evolution of the universe; and observing electromagnetic signals associated with gravitational waves.

Wei Jianyan, a scientist at the Chinese Academy of Sciences' National Astronomical Observatories and the SVOM mission's Chinese principal investigator, said that the state-of-the-art satellite features world-class technologies, a large field of view and is capable of highly precise observations.

"As soon as the satellite spots traces of gamma-ray bursts, it can transmit the information to ground control within about one minute," he said. "After receiving that notification, ground control will notify ground-based observation stations across the world to use their assets to carry out integrated detection with the spacecraft.

"We hope that we can 'see' the earliest gamma-ray bursts that took place in the farthest parts of the universe, and that will help scientists learn more about the universe's 'childhood' and its evolution."

In addition, Wei said, the SVOM satellite is specifically suitable for searching for kilonovas, which are bright blasts of electromagnetic radiation that happen when two neutron stars or a neutron star and a stellar-mass black hole collide and merge.

"Such a detection would be of great significance to the study of stellar evolution, and to answering very interesting scientific questions such as where heavy elements like gold and silver come from in the universe," he said.

The SVOM is the second satellite jointly developed by China and France, following the China-France Oceanography Satellite that was launched from the Jiuquan Satellite Launch Center in northwestern China in October 2018.

That satellite has obtained a great deal of data that has been used to study ocean surface winds and waves, predict cyclones and improve scientists' understanding of climate change.

In China's ongoing Chang'e 6 robotic lunar mission, a radon-measuring instrument made by French scientists has been placed on the far side of the moon. The data collected is expected to help study the movement of lunar dust and some volatile chemicals between the lunar regolith, a layer of unconsolidated rocky material, and the lunar exosphere.

Liu Yunfeng, deputy director of the CNSA's international cooperation department, said that both China and France are global space powers and they are determined to advance their collaboration in space science and technology to uncover mysteries in the universe, enrich humanity's knowledge and use their space programs to benefit the world.