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Phase II of space project completed

Network spans area between sun and Earth to warn of interstellar weather

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China achieved a significant milestone in space science on Friday with the completion and national approval of the Chinese Meridian Project Phase II.

The project is the world's first comprehensive ground-based monitoring network spanning the entire sun-Earth space environment, extending from the solar atmosphere to near-Earth space, said Li Hui, deputy director of the National Space Science Center of the Chinese Academy of Sciences.

The breakthrough delivers 72-hour early warnings in space weather forecasting as solar activity approaches its 11-year peak this year, which poses interference risks to space missions and navigation systems, said Luo Bingxian, deputy director of the State Key Laboratory of Solar Activity and Space Weather at the NSSC.

With construction starting in 2019, the CMP Phase II established a "two vertical, two horizontal" double-cross monitoring network along the 100 degrees and 120 degrees east longitudes, and the 30 degrees and 40 degrees north latitudes.

By integrating 16 new observation stations with the original 15 CMP Phase I stations, the project enables unprecedented three-dimensional monitoring of space weather phenomena, from solar eruptions to the Earth's atmospheric responses.

The CMP Phase II features several key technological advancements, Li said, with the Daocheng Solar Radio Telescope ranking first. The ring-shaped array captures 3D coronal tomography with a 10-solar-radius field of view, enabling exceptional tracking of solar activity.

The project includes the world's first tristatic incoherent scatter radar system, which employs phased array technology to perform ionospheric computed tomography scanning and 3D imaging over distances of thousands of kilometers.

The Super Dual Auroral Radar Network, a mid-latitude high-frequency radar array, achieves large-

scale continuous detection of ionospheric dynamics in the middle and high latitudes of the Asian sector, covering over 4,000 km meridionally and 10,000 km zonally.

During its trial phase, the CMP Phase II demonstrated high reliability, Li said. It captured the May 2024 super geomagnetic storm, providing real-time, high-precision data crucial to understanding the sun-Earth space environment's responses to the solar activities.

Wang Chi, general commander of the CMP Phase II, said that the project exemplifies China's institutional strengths in "mega-science".

"By unifying global-scale monitoring, we are building a critical shield against space weather threats and offering innovative solutions to global scientific challenges," he said.

Building on this achievement, China is launching the International Meridian Circle Program, enabling all-latitude, all-weather and round-the-clock observation of space weather. This initiative will address transnational challenges such as solar storms and geomagnetic disruptions, reflecting a commitment to a collaborative future in space exploration.

"The Daocheng Solar Radio Telescope is the world's largest synthetic aperture radio telescope. The preliminary design and validation phases alone consumed half the project timeline, uncovering numerous technical bottlenecks. With perseverance and patience, we addressed these challenges step by step," said Yan Jingye, chief designer of the telescope.

All monitoring data from the CMP will be made accessible to domestic and international universities and research institutions for collaborative research, Li said.

"Space environment and weather are integral to the community with a shared future for mankind. However, disturbances in space weather pose a significant challenge worldwide, requiring coordinated efforts from the international community," he said.

Fang Biling contributed to this story.



Researchers monitor the operational status at the control center of the Chinese Meridian Project in Beijing on Thursday. JIN LIUWANG / XINHUA