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Work starts on telescope to assist lunar missions

CHANGCHUN — China on Wednesday started the construction of a 40-meter-aperture radio telescope in the Changbai Mountain area in the northeastern province of Jilin, to support future lunar and deep-space probe missions.

Developed by the Shanghai Astronomical Observatory of the Chinese Academy of Sciences, the optical instrument is designed to be a large, fully movable, high-precision multipurpose radio telescope.

Scientists believe the Changbai Mountain area is an ideal site for telescope observation due to its clear skies and dry climate.

Upon completion, the telescope will form a network with five others nationwide and one data processing center in Shanghai, increasing the country's observation capacity and better serving its deep-space exploration.

The facility will also enhance China's radio astronomy research and promote more innovative achievements in researching various cutting-edge fields, including supermassive black holes and galactic dynamics.

China announced earlier this year that it will continue its lunar research with several planned missions, including one task to bring 2 kilograms of samples from the far side of the moon back to Earth.

According to the observatory, the construction of the telescope and its station will be completed by the end of next year.

XINHUA

Neutrino network could unlock space mysteries

By ZHOU WENTING in Shanghai
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Shanghai Jiao Tong University's Tsung-Dao Lee Institute announced the conceptual design of a project to establish China's first deep-sea, multi-cubic-kilometer neutrino telescope in the western Pacific to explore the mysteries of the universe.

By detecting high-energy astrophysical neutrinos, the project called Trident will bridge the gaps in China's research in this area, and contribute to the global multi-messenger astronomical network.

The endeavor may also advance cutting-edge interdisciplinary research across particle physics, astrophysics, geophysics and marine sciences, researchers said on Tuesday.

For centuries, astronomical observations primarily depended on capturing photons from cosmic sources, using space telescopes.

However, the universe communicates through various "messengers", including neutrinos and gravitational waves. Neutrinos, known for their ability to penetrate matter, can escape from intense cosmic events, such as supernova explosions and black hole eruptions. This makes them ideal messengers for studying the most extreme phenomena in the universe.

The IceCube experiment, located in Antarctica, is currently the world's leading neutrino telescope. Completed in 2010, it had detected high-energy neutrinos from space by 2013 and identified a corresponding celestial source in 2017.

Other projects, such as one in the Mediterranean and in Lake Baikal in Russia, enhance these endeavors. As neutrino astronomy approaches significant breakthroughs, there is a global push to develop next-generation telescopes for deeper exploration of the cosmos and a better understanding of fundamental physics.

"This represents an opportune moment for China to venture into the emerging field of neutrino astronomy and provide a platform for international collaboration in this nascent area," said Xu Donglian, the project spokesperson.

Researchers said the site offers an excellent deep-sea environment for construction of a neutrino telescope. It is situated on a deep-sea plain in the northern part of the western Pacific, approximately 3.5 kilometers deep.

"The neutrino telescope utilizes the Earth as a shield, capturing neutrinos that penetrate from the planet's opposite side. Located near the equator, our project can detect neutrinos from 360 degrees of the entire sky due to the Earth's rotation, complementing IceCube in Antarctica and other Northern Hemisphere neutrino telescopes," said Xu.

According to the conceptual design, the Trident array, anchored to the seabed like seaweed, consists of 1,200 vertical strings, each 700 meters long and spaced 70 to 100 meters apart. Each string carries 20 high-resolution digital optical modules.

Spanning 4 km in diameter, the array covers 12 square km and monitors around 8 cubic km of seawater for high-energy neutrino interactions. The designed life span is 20 years.