International team establishes unique observatory in Antarctica

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A team of scientists representing six international institutions, including Texas A&M University, has succeeded in reaching the summit of Antarctica – also a monumental achievement for ground-based astronomy -- to establish a new astronomical observatory at Dome Argus on the highest point of the Antarctic Plateau.

Two weeks after arriving Jan. 11 at “Dome A” for only the second time in history, an expedition team led by the Polar Research Institute of China (PRIC) has completed installation work on a revolutionary fully robotic observatory, dubbed PLATeau Observatory or PLATO, that Texas A&M astrophysicist Dr. Lifan Wang predicts will result in new insights into the universe once possible only from space.

“Dome A is believed to be the best site for ground-based astronomy,” explains Wang, one of the leaders of the scientific planning phase of the expedition, who holds the Mitchell-Heep-Munnerlyn Endowed Career Enhancement Professorship in Physics at Texas A&M and is head of the Chinese Center for Antarctic Astronomy. “Unlike the stormy Antarctic coast, the plateau is a very quiet place with very low wind speed. It is the coldest and driest place on Earth. These are critical conditions of a good site at which to build an observatory.”

On Saturday the PRIC team featuring scientists from the National Astronomical Observatories of China carefully buttoned up their instruments and PLATO within the snug confines of the newly installed ground station. They then boarded their snow tractors for the 18-day,

nearly non-stop return trip to the coast of Antarctica, leaving both PLATO and their telescopes behind for an 11-month period poised to make astronomical history.

“This permanent facility marks the culmination of centuries of effort to find the best location on the planet from which to observe the universe,” Wang notes. “With a telescope at Dome A, it is possible to achieve near-space quality images at a much lower cost than launching a telescope into space.”

Built by the University of New South Wales (UNSW) in Sydney, Australia, PLATO is designed to operate autonomously for up to 12 months at a time while sending back data via the Iridium satellite network.

Powered by an array of solar panels during summer and small, high-efficiency diesel engines through the darkest winter months, it will be efficient as well as environmentally friendly, according to its developers.

“By minimizing the need for human support, robotic facilities such as PLATO will play an important role in the future of Antarctic research,” says the UNSW’s Dr. Jon Lawrence, who led PLATO’s development.

A global team of scientists will be contributing PLATO’s instruments as part of the 2007-2008 International Polar Year that will see thousands of scientists — including Wang and fellow Texas A&M astronomer Dr. Nicholas Suntzeff, both of the George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy — from more than 60 nations conducting 200 projects examining a range of physical, biological and social research topics. PLATO’s site-testing instruments include cameras that will measure the darkness of the sky, an acoustic radar to measure atmospheric turbulence and a monitor for very short

microwave astronomy.

Seven telescopes — four from China, two from Caltech and one from the University of Arizona and the University of Exeter that is partially funded by the National Science Foundation — will take unique images of the heavens toward the South Pole.

One of the most important experiments is a set of four telescopes built at Purple Mountain Observatory, Nanjing, and the Nanjing Institute of Astronomical Optics Technology. Each of the 14.5-centimeter diameter telescopes is equipped with a different filter so that each can observe the sky in a different color or wavelength. The telescopes can view a large field of the sky toward the South Pole area. The system will generate continuous movies of the sky lasting for four months.

“This is a scientific study that can only be done in Antarctica,” Wang explains. “We will be able to study the variability of the stars and search for planets around those far-away stars.”

The 17-person PRIC team began its trek to Dome A in November, leaving Shanghai aboard the Xue Long icebreaker and sailing to Fremantle, where they were met by the 7-ton PLATO observatory, which had made the 4,000-kilometer journey across the Nullabor Plain from Sydney by road. After a further 18 days crossing the Southern Ocean, the Xue Long arrived at Zhongshan station, adjacent to Australia’s Davis Station on the Antarctic coast, where PLATO was loaded onto a sled and filled with the 4,000 liters of jet fuel that will power it throughout the winter. The six-tractor caravan then covered the 1,300-kilometer overland traverse from Zhongshan to Dome A in just three weeks, arriving at the historic site on Jan. 11 for the first time since a PRIC team made the initial journey three years earlier to install an automatic weather station and evaluate the site’s suitability for a permanent station.

Built to withstand some of the most extreme conditions on Earth, PLATO must endure temperatures that drop to -90 C in winter as well as air pressure barely half of that at sea level. The facility must operate completely unattended until the Chinese expeditioners return in January 2009, as there will be no human being within 600 kilometers of Dome A now that the traverse team has departed.

During the next few years, China will spend more than $25 million constructing a permanent station at Dome A. Already there are plans to build an array of large, wide-field telescopes there to generate additional movies of the sky.

Astronomers now are working on the construction of AST3 — the Antarctic Schmidt Telescopes — a system of three, half-meter telescopes expected to find planets around other stars about the size of Earth, hundreds of supernovas useful for cosmological studies and many other variable objects.

Source: Texas A&M University