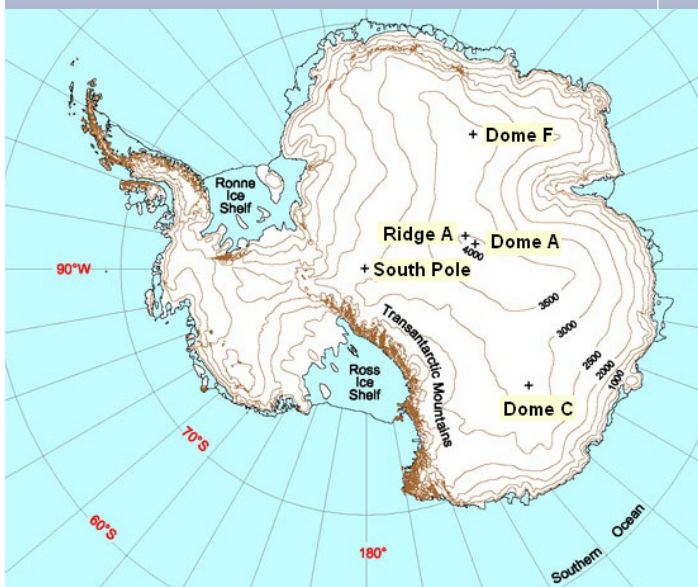




Astronomy
Australia
Ltd.

PLATO: Antarctic plateau robotic observatories

PLATO (PLATEau Observatory) is an Australian designed and manufactured robotic astronomical observatory for Antarctica. The first PLATO was deployed in 2008 and supports scientific instruments for astronomy and atmospheric site testing on the highest point on the Antarctic Plateau. PLATO was pioneered by the University of New South Wales (UNSW).



Antarctic atmosphere

Antarctica promises to be a superb place to observe the Universe. The atmosphere above the highest altitude sites on the Antarctic plateau is extremely dry and stable and the cold temperatures result in low thermal background radiation. The result is a sharper view of stars and galaxies at optical, infra-red and sub-millimetre wavelengths relative to other locations on Earth.

Dome A is the highest point on the Antarctic plateau at an altitude of 4093 metres. In 2005 the Chinese became the first to visit the site. Other potential plateau observatory sites include the French/Italian station at Dome C, the Japanese station at Dome F, and Ridge A, a remote site yet to be traversed.

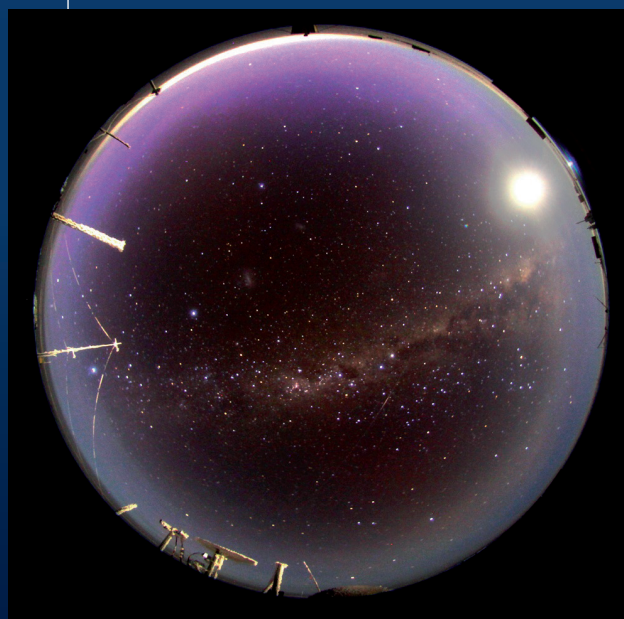
PLATO

PLATO supplies heat, power and computer control for its scientific instruments, and also provides a satellite communications link. The resulting observations inform astronomers on the suitability of Antarctic sites for observing the Universe.

The first PLATO was deployed by the Polar Research Institute of China (PRIC) and the Chinese Academy of Sciences to Dome A.

New PLATOs for Dome F and Ridge A, and an upgraded PLATO for Dome A, are scheduled for deployment in 2011-13. UNSW will collaborate with Tohoku University and the Japanese National Institute of Polar Research at Dome F and the University of Arizona, USA at Ridge A.

All-sky image taken with HRCAM (High Resolution CAMera) on PLATO at Dome A.
Credit: Daniel Luong-Van, Michael Ashley and the PLATO collaboration.



Instrument and Engine Modules

PLATO comprises two modules separately containing scientific instruments and power generators. It is designed to run unattended for periods of up to one year in temperatures which can range from -25°C down to below -75°C .

The instrument module contains the core control, communication, computing and power conversion electronics for PLATO. Each instrument is provided with its own customisable power, communication, and thermal control.

The engine module provides up to 1kW of power to supplement solar arrays during summer and is the primary power source between April and August when the sun is below the horizon. The module contains six diesel engines, four thousand liters of Jet-A1 fuel, and power management and control electronics. The module is heavily insulated with 200mm thick polyurethane foam panels, enabling it to maintain its own internal temperature using only waste heat from the engines.

Science observations

Instruments supported by PLATO have shown that Dome A will be an exceptional site for certain types of astronomical observations.

- The Chinese “CSTAR” instrument on PLATO has produced the first detailed catalogue of the time variation of stars, including stellar transients, in a 4.5 degree field around the South Celestial Pole.
- The US “PreHEAT” instrument found that the atmosphere above Dome A is the driest and clearest on Earth, when viewed at sub-millimetre wavelengths. A dry atmosphere results in better atmospheric transmission at these wavelengths, allowing unprecedented observations of cold gas clouds in the Milky Way from which stars and planets are formed.

- An Australian-New Zealand instrument, “Snodar”, has measured the height of the atmosphere’s turbulent boundary layer above the ground at Dome A. In temperate parts of the world this layer could be as thick as 500 metres or more, but at Dome A it extends just a few metres above the ground. This means optical and infrared telescopes, mounted on a small tower above the boundary layer, could expect better image quality than at other sites in the world.

See Yang et al (2009) Publications of the Astronomical Society of the Pacific 121: p174-184

Funding

The first PLATO and its deployment were funded jointly by the National Astronomical Observatories of the Chinese Academy of Sciences (NAOC), the Polar Research Institute of China (PRIC), and UNSW. A large international team contributed to PLATO and its instruments, with Iridium satellite communication being provided by the U.S. Antarctic Program.

Australian investment in the new PLATOs for Dome A, Dome F and Ridge A totals \$2,000,000. This is primarily funded by Australian Government NCRIS and EIF grants administered by Astronomy Australia Limited, and an ARC LIEF grant.

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PLATO at Dome A. Image courtesy Zhenxi Zhu