

and activities of other Antarctic Treaty countries. These were the first by Australian observers for many years. Antarctic Treaty inspections ensure all Parties are upholding their obligations to conduct peaceful scientific research and minimise their environmental impacts in Antarctica.

The introduction of the new CASA 212–400 aircraft, ‘Ginger’ and ‘Gadget’, to Antarctica, was not without its teething troubles, but we were able to test and measure the capability of the aircraft and the systems that they operate with. We are looking forward to consolidating our new knowledge in the season that lies ahead and to see the aircraft play a central role in supporting Antarctic science.

This issue also brings you some surprising and exciting results from the Southern Ocean, an Antarctic ice core, the Davis lidar and the seabed near Casey. The discoveries reported in these articles illustrate the important roles technology and cooperation have in improving the amount, diversity and quality of information scientists can gather from their experiments. Robotic ‘Argo’ floats, for example, repeatedly gather information about the ocean’s physical and chemical properties, from its surface to 2000 m below, and beam this information to satellites connected to computers around the world. Five years ago we could not have dreamed of collecting information from such remote and hostile regions of the Southern Ocean. Today, it is saving us time and money and fast-tracking our ability to monitor changes and predict their effect.

As this magazine goes to press I am pleased to report that the Prime Minister’s Science and Engineering Innovation Council (PMSEIC) enthusiastically received a presentation and report on future opportunities in Antarctic and Southern Ocean science. Over the coming months my colleagues and I will follow up on initiatives flowing from PMSEIC’s engagement with our work, to best position us for the future.

I am also delighted to hear that the May 2005 Federal Budget has announced the Government’s commitment of \$46.3 million over four years to introduce an air link between Hobart and Antarctica. The air link will revolutionise the way we go about supporting science in Antarctica. I look forward to telling you more about this exciting development in our next issue.



—TONY PRESS
Director, AAD

Setting up the drilling tent.



650 years in an

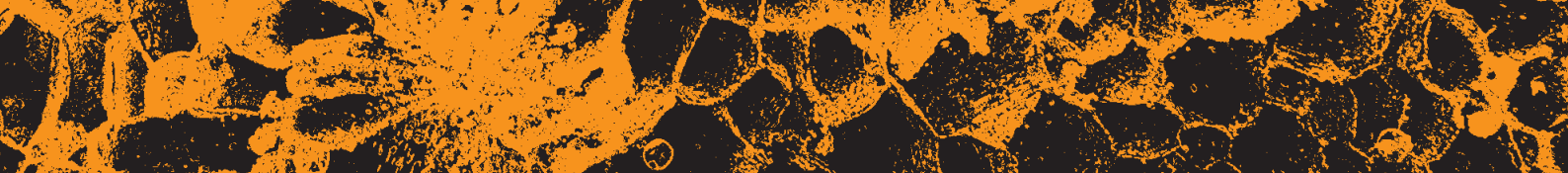
A 120 m ice core retrieved from Law Dome inland of Casey Station last October will provide AAD scientists with a 650 year record of the Earth’s climate. This record covers both natural and human induced changes in the Earth’s climate, in particular the natural climate phenomenon known as the ‘Little Ice Age’.

Historical records show that Northern Europe experienced the Little Ice Age between around 1400–1850 AD, but the extent to which it may have affected the global climate is not well understood. The sea ice that forms each year on the Southern Ocean around Antarctica may provide a clue, as the extent of the Antarctic sea ice cover varies in response to climate change. However, observations of sea ice extent are limited. Most research to date has used satellite data, ice edge records from whaling ships and even the observations of Captain Cook.

In November 2003 we published an article in *Science* magazine (*Science* 302:1203–1206) detailing the use of a ‘proxy’ record of sea ice extent, obtained through the analysis of methanesulphonic acid (MSA) in an ice core from Law Dome. This chemical is produced by certain species of algae associated with sea ice. The more sea ice there is, the more algae, and the more MSA in the ice core. MSA measurements on the ice core produced a 150 year record of sea ice extent. In order to extend the sea ice proxy into the Little Ice Age, however, we needed to obtain a core at least 500 years old.

Before going into the field to drill this ice core, there were a few considerations. Firstly, we needed to choose a drilling location on Law Dome that gave us low enough snow accumulation to get a 500 year record at around 100 m depth. If we chose the wrong site, we could have been drilling up to 500 m to obtain the 500 year record!

Secondly, we had a small 12-day window of opportunity to visit Law Dome and drill the ice core. This tight schedule required good planning, with a range of options, priorities and backups in case of poor weather and the ‘A’ (Antarctic) factor. With the help of the Operations Branch, Casey Station personnel and a lucky string of good weather, we were able to travel to the drill site, set up camp, assemble the drill, drill 120 m over eight days, disassemble the drill, and depart on schedule.



VIN MORGAN



ice core

Camp ice core

Vin Morgan monitors the ice core drilling process inside the drill tent.



BARBARA SMITH



TAS VAN OMMEN

Ice core chemist, Mark Curran, measures the ECM of the ice core to determine its age.

To work out when we had reached our target date in the ice core (more than 500 years) we used a technique known as ‘electrical conductivity measurement’ (ECM). Over the past 600 years there have been two gigantic volcanic events, namely Tambora in 1815 AD and Kuwae in approximately 1458 AD. Volcanic activity deposits acid sulphates in the ice core, which can be measured by ECM.

For the drilling season, we modified a laboratory-based ECM instrument that would be easy to use and quick to provide results in the field. The new system worked extremely well in its first field trial, producing an ECM trace within minutes of logging the ice core. It showed the trace corresponding to the Tambora eruption around the depth we expected to see it (32 m) and on day 12 we saw the trace containing the Kuwae eruption (95–120 m). We decided to keep drilling for the rest of day 12 and reached a depth of 120 m, which is dated at around 1350 AD – over 650 years old.

With the retrieval of the ice core completed, the fun part starts – ice core analysis. This analysis will help our team of climate scientists understand the natural changes in the Antarctic climate system through the Little Ice Age period, and to compare the natural warming at the termination of the Little Ice Age with recent warming. Stay tuned...

For more information on this project visit <<http://www.aad.gov.au/default.asp?casid=292>>

—MARK CURRAN and TAS VAN OMMEN
Ice, Oceans, Atmosphere and Climate Programme, AAD

This ECM trace obtained from the ice core extracted between 95 and 120 m detects acid sulphates produced by the Kuwae eruption in approximately 1458 AD.

