

The last Ice Age in Australia

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The technique of 'exposure dating' is a new tool which has revolutionised the way we study the history of glaciers and ice sheets. ANU scientists are using this technique to take a fresh look at the history of glaciation and climate change in Australia. By directly dating glacial debris and eroded bedrock, the timing of the advance and retreat of the ice (a sensitive indicator of climate) can be determined with unprecedented reliability.



Blue Lake in the Snowy Mountains, formed by glaciers



A boulder deposited by the Blue Lake glacier 20,600 years ago

Exposure dating is based on the principle that long-lived cosmogenic isotopes accumulate naturally at the Earth's surface as a result of interactions between cosmic rays from space and atomic nuclei in surface rocks. After a geological process freshly exposes a rock surface, these cosmogenic isotopes build up at a constant rate. Measurements of their present-day abundances, in conjunction with knowledge of the rate at which they are produced, allow an 'exposure age' of the surface to be determined.

Concentrations of cosmogenic isotopes in typical earth materials are incredibly low, being less than one in a million million (10^{-12}) relative to their stable counterparts. Hence, the ultra-sensitive technique of accelerator mass spectrometry (AMS) is required. The powerful and versatile 14UD tandem accelerator at the ANU has proved to be one of the best tools in the world for such measurements.

Studies of relics of the last Ice Age, particularly in the Snowy Mountains and Tasmania have led to a complete revision of the glacial history of these regions, which were the only areas in Australia where glaciers existed. Hypothetical ideas about glacier extent and its timing that stood for nearly a century have been replaced with a robust chronology placing Australia into a global context.

It transpires that there was not just one but at least four major advances of glacier ice during the last 70,000 years. The coldest part of the last ice age was 20,000-22,000 years ago and only lasted a few thousand years. The ensuing global warming is the greatest in recent geological history. Using the altitude of the ice age landforms we have calculated that mean temperatures around Canberra are about 9°C warmer today. This research provides an important baseline from which to assess climate variability and raises intriguing questions about the adaptation of Aboriginal people to the conditions at the time.

