



Antarctica's hidden lakes

Lakes that lie beneath Antarctica's vast ice sheets may hold clues to the Earth's past climate and evolution of life

Lakes hidden beneath the ice – how do we know?

Since the 1970s scientists have used radar, seismic and satellite technologies to discover over 150 lakes locked beneath Antarctica's vast ice sheets. The water beneath the ice remains liquid because of small amounts of heat from the Earth's core coming up through bedrock and from the insulating effect of several kilometers of ice above. The largest and most well-known is Lake Vostok in East Antarctica. Recognised by British and Russian scientists in the mid-1990s as being over 500m deep, it is the size of Lake Ontario.

How long have they been under the ice?

Some lakes may be as old as the ice sheet itself, possibly 15 million years in East Antarctica. The age of the water within the lakes will be as old as the ice that melts into them, which in East Antarctic is around 1 million years. Lake Ellsworth, in West Antarctica, lies under 3.2km of ice and has been isolated from the surface for hundreds of thousands of years. Aircraft surveys using radar revealed that it is around 18km² (similar in size to Lake Windermere) and could be tens of metres deep. Lake Ellsworth is likely to be connected to a network of lakes that drain water from beneath the West Antarctic Ice Sheet.

Why are Antarctica's lakes important?

For a number of reasons: they are thought to be extreme yet viable habitats for unusual lifeforms that may have evolved to suit the harsh conditions; they are analogues to the extraterrestrial environment of Europa (one of Jupiter's moons); they may contain ancient records of past climate

change on their floors; and they may influence how the ice sheet flows as water acts as a lubricant to the ice above.

Are there plans to drill through the ice in to the water?

This is a huge technical challenge. The lakes are located in the most remote and hostile continent on Earth. Russian scientists drilled through the ice above Lake Vostok in 2006 but stopped short of penetrating the water while they developed technologies that would not contaminate the lake's unique environment. They plan to get into the lake in the next few years, but only to sample the top of the lake by allowing the water here to freeze and be captured in the hole that has been drilled.

So what next?

January 2008 sees the first steps for ground-based exploration of Lake Ellsworth. Scientists from over ten UK universities and research institutions have been planning the work for several years. The project's

Principal Investigator is Professor Martin Siegert from the University of Edinburgh.

The first phase, led in the field by British Antarctic Survey glaciologist Andy Smith, is to undertake geophysical surveying of the lake. Andy's field team includes Neil Ross from the University of Edinburgh, Dr John Woodward from Northumbria University and Dan Fitzgerald, field assistant and polar guide.

If the survey work goes well, the next phase will be to build a probe, drill down into the lake and explore and sample the lake water. The UK could do this as soon as 2012/13.



▲ Subglacial lakes occur all over Antarctica

FACTFILE

- There are over 150 subglacial lakes known in Antarctica.
- They exist in most parts of the continent, because low levels of heat from the Earth's interior is enough to melt the base of the ice sheet.
- Melted water runs into hollows beneath the ice just as it does on the land surface to form lakes.
- Some lakes are known to discharge their water from time to time, which can flow several hundred kilometers into other lakes.
- Lake Ellsworth is a good place for exploration because it is far smaller than many

other lakes, and so is easier to understand in detail. It is also well covered by logistic support, which makes the task of transporting lots of heavy equipment to the site possible in future.

- Lake Ellsworth, although likely to be younger than Lake Vostok, is essentially the same environment, which means life living here will be able to survive in any other lake. The sediments on the floor of Lake Ellsworth may tell us about the unknown history of this part of Antarctica.