Information sheet – collecting climatic data from ice and sediment cores

Drilling into seabed sediments from sea ice presents a huge technological challenge. In 1996 drilling in the Antarctic was cancelled due to storms. In 1997 the drilling had to finish early, once again because of bad weather.

A drill rig is set up and positioned on sea ice which is about 1.7 m thick. The drill has to be lowered more than 200 m through water before reaching the seabed. It is a special design incorporating inflatable floats under the sea ice, and a submarine video camera with lights to monitor operations.

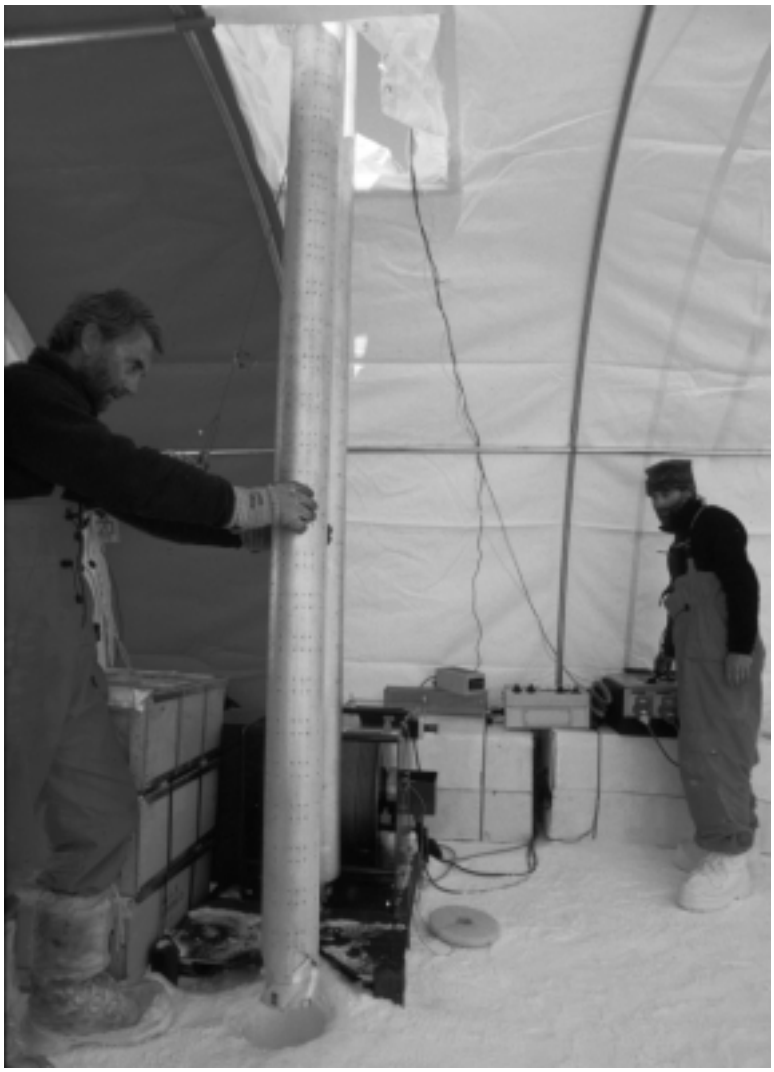
Lake sediment core from the Larsemann Hills
(Reproduced with permission from the British Antarctic Survey.)

The layers of sediments indicate the age of the sediment. Each year a fresh layer of sediments form. The composition of shells and other remains of sea life are used as a temperature indicator.

Sea bed sediments are unable to retell the whole story. They were laid down very slowly over hundreds of years, so the dating is limited.

Ice Cores

During 1997–98 scientists from British Antarctic Survey (BAS) set out to drill holes in the 4000 m high ice plateau, where the average temperatures are –50 °C. The ice cores can be used to reveal climatic data.



Rob Mulvaney and colleagues collect ice cores
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Each year the snow that falls on the polar cap becomes buried under new layers of snow. It becomes compressed and turns to ice. During the process bubbles of air get trapped in between the ice crystals. At a depth of 50–100 m the air is sealed and trapped from the outside world. These air bubbles contain a sample of carbon dioxide from ancient atmospheres and are easy to analyse.

It is more difficult to determine the temperature at the time the air was trapped. This is done by measuring the ratio of different isotopes ^{18}O:^{16}O and ^{2}H:^{1}H in the ice, relative to seawater. When the two ratios are low, this indicates a lower temperature. At higher temperatures more of the lighter molecules escape into the atmosphere because they are moving faster. This process also occurs when water condenses to form snow.