Guest editorial

The hunt for Antarctic climate history

ANTOSTRAT (the Antarctic Offshore Stratigraphy initiative) began 10 years ago as a collaborative study of Antarctic margin seismic data by offshore seismic profilers who set up an Antarctic Seismic Data Library System. It was soon realised that the ice-transported margin sediments retain a record of ice sheet history that could be recovered by direct sampling, and that ANTOSTRAT formed the springboard for a description of ice sheet history. ANTOSTRAT today aims to describe Antarctic climatic history over the past 100 million years or so. Of this history, by far the most important element is the Antarctic ice sheet, which probably formed 35 to 40 million years ago. Although geologically young, the ice sheet is still about ten times as old as Northern Hemisphere ice sheets. ANTOSTRAT's key aims are to establish when, how and why the Antarctic ice sheet formed.

To do this ANTOSTRAT needs ground truth, to which offshore sampling is the key. The offshore sedimentary record is generally more continuous than onshore and sub-ice records (which have often led to conflicting interpretations), and of longer duration than lacustrine or ice records (though essential insights have come from all sources). Offshore data are available mainly through drilling - either shallow coring or drilling by individual Antarctic countries, or deeper drilling by the Cape Roberts Project. Beyond the Antarctic community lies the Ocean Drilling Program (ODP), a 22-nation consortium that funds the drilling ship *JOIDES Resolution*. The ship is unique - an extremely capable and "free" resource, used to drill high-quality geoscience problems worldwide. Competition for ship time is fierce, and high-latitude proposals cost extra because of the need for a chartered ice support ship. Successful bids for two ODP drilling legs (one, to the Antarctic Peninsula, is completed and a second, to Prydz Bay, is scheduled) suggest that Antarctic science can compete globally, and that the ice sheet problem is one that the rest of the world is anxious to see solved.

Numerical models of palaeoclimate and of ice sheet development are powerful aids to interpretation. Models are increasingly sophisticated (thanks to decades of intellectual effort) and more detailed because of the continuing geometric expansion of computing power, and are now paying dividends as a means of synthesising data. There remain many competing models with differing outputs, but it is no longer justifiable to rely solely on intuition: our data must constrain the models.

Current ice sheet modelling suggests that a further two ODP drilling legs around the Antarctic margin are needed for a first-order approximation of ice sheet evolution. For these legs, ANTOSTRAT has three targets: in priority order these are Wilkes Land, the eastern Ross Sea, and the eastern Weddell Sea. However, given the uncertain nature of the Antarctic environment and ODP drill ship scheduling, these targets are flexible. A matter of some urgency is the fact that the present phase of drilling finishes at the end of 2003, and may not be continued. If remote targets gain high priority before end-2003, there may be no more Antarctic margin legs.

The Antarctic ice sheet is crucially important in modern and in ancient global climatic and oceanic systems. If the Antarctic community is not to lose this opportunity of reaching an understanding of ice sheet evolution it must help the geoscientist understand the modern and palaeo-environments, look for ways of providing ice support, lobby for the continuation of ODP and collect essential pre-drilling site surveys as a matter of urgency. The hunt for Antarctic climate history is a hunt for Earth climate history, and this needs both the Antarctic science community and ODP.

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