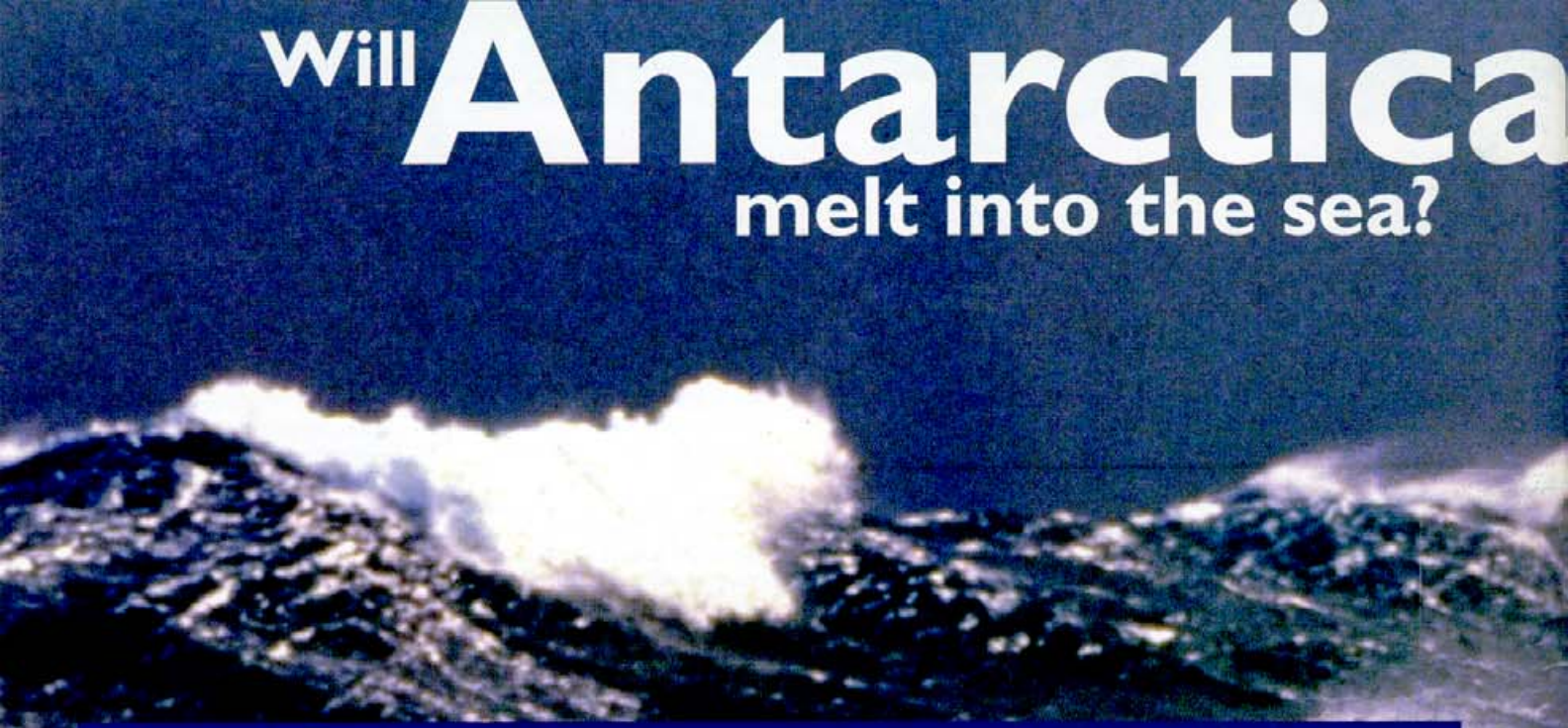
Will Antarctica melt into the sea?



Popular speculation about the effects of global warming on the Antarctic ice sheet has been fuelled by the break up over the past few decades of the northern part of the Larsen Ice Shelf.

Will the complete melting of the ice sheet lead to a 60-metre rise in sea level? Will the sea rise by several metres per century, such as occurred 10 000-18 000 years ago, during the melting of the Northern Hemisphere ice sheets?

Rates of this order would certainly be significant (and in many cases disastrous) to societies living close to current sea level. But according to the Antarctic CRC, sea-rise scenarios of this kind are highly unlikely. In fact, they are about 10 times faster than scientists predict.

The CRC says losses from the Antarctic ice sheet are unlikely to generate the 'metres per century' rates of sea-level rise that occurred in association with the melting of the Northern Hemisphere ice sheets. This is because Antarctica is so cold that its loss of ice is basically controlled only by the temperature and level of its surrounding ocean.

During the next 100 years, and perhaps the next 200 years, it is probable that greater snowfall on Antarctica will outweigh the increased loss of grounded ice caused by increasing ocean temperatures, the statement says.

Whatever is the rise in sea level associated with thermal expansion of the ocean (models suggest something of the order of 20 to 30 centimetres over the next century), calculations suggest that the net gain of Antarctic ice will reduce that rise by a few centimetres.

On the time scale of 500 to 1000 years, and assuming that global warming maintains temperatures a few degrees Celsius above those of the present, a net loss of Antarctic ice is probable. This will add on average several centimetres per century to the rate of sea-level rise, with peak rates of 10 to 30 centimetres per century.

The process will probably stop after a few thousand years, when the overall loss of ice from Antarctica has contributed perhaps three or four metres to sea level, and when most of the ice in direct contact with the ocean has disappeared.

The CRC says the break-up of the Larsen Ice Shelf is significant because it has occurred in an area of Antarctica where there has been a definite rise of temperature (perhaps 2°C) over the past 50 years. If there is a rise in temperature more generally over Antarctica, there may indeed be a loss of the major floating ice shelves around the coast. They cover an area equal to about 10% of the continent. Since the ice shelves are already floating, their loss would not in itself contribute to sea-level rise. However, it would eventually allow a faster flow of grounded glacial ice into the ocean behind them.

Numerical modelling to date suggests that the Larsen Ice Shelf, which is the most northerly of the significant Antarctic ice shelves, would be among the first affected by global warming. Its break-up therefore fits an expected pattern of response to such warming.

The position statement from the Antarctic CRC can be found on CSIRO's Climate Change and El Niño Internet site (http://www/csiro.au/news/issues/climate.htm). The site includes information on climate change processes and impacts, greenhouse science, policy responses to climate change and cost-effective methods for reducing greenhouse gas emissions, plus links to a range of relevant databases. In December these included the Kyoto Conference website, the United States Global Change Research Information Office, and the UN Intergovernmental Panel on Climate Change.

Another excellent source of information on the science of climate change is *Climate Change Newsletter*, produced for the Bureau of Resource Sciences. *Climate Change Newsletter* is published on the Internet at http://www.brs.gov.au/ccs/ccn/ccn.html. The latest issue includes articles by CSIRO scientists Ian Enting and Miko Kirschbaum on modelling techniques for projecting future carbon dioxide concentrations, and uncertainties in the contribution of Australia's managed forests to the national greenhouse gas inventory.