



Antarctic News

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Evidence of widespread changes in the Southern Ocean

The deep waters of the Southern Ocean are cooler and less salty than they were 10 years ago, according to scientists returning today from an eight-week marine science and oceanography expedition aboard the Australian Antarctic Division's research ship *Aurora Australis*.

Expedition leader Dr Steve Rintoul, of the Antarctic Climate and Ecosystems Cooperative Research Centre and CSIRO Wealth from Oceans Flagship, said he was surprised at the size and speed of the changes observed.

"At every station we sampled in the deep basin between Antarctica and Australia, the deep waters were cooler and less salty than they were 10 years ago.

"Our measurements suggest that the movement of water between the warm surface layers of the ocean and the cool deep layers is changing.

"Ocean circulation has a big influence on global climate, so it is critical that we understand why this is happening and why it is happening so quickly.

"We used to think of the deepest layers of the ocean as being very stable in their properties and current patterns. These new observations show that the dense water produced around the periphery of Antarctica is capable of rapid and widespread change."

Dr Rintoul said the cooler and fresher water near the sea floor indicates a change in the sources of dense water supplying the basin. There are two main sources of the bottom water in the region - a salty variety from the Ross Sea and a fresher variety formed near the Mertz glacier in Antarctica.

"The influence of the Mertz bottom water seems to be more widespread now than it was in the past. The challenge now is to use these new observations to explain why the cool, fresh water is more dominant than in the past," he said.

The expedition also successfully recovered a \$1 million array of current-meter moorings, measuring the flow of a deep current adjacent to the Kerguelen Plateau. The moorings had been anchored to the sea floor for two years, measuring current speeds, temperature and salinity.

"The deep boundary current east of the Kerguelen Plateau carries the dense water produced around Antarctica, northward, to world's oceans, as part of a global network of ocean currents that influence the Earth's climate," Dr Rintoul said.

“The current measurements we collected will allow us to calculate the transport of heat and fresh water for the first time.”

Nineteen free-floating ocean robots known as Argo floats were also deployed, as part of an international ocean monitoring effort. The floats measure temperature and salinity throughout the water column, between the sea surface and 2000m depth below, every 10 days. The information is relayed by satellite to scientists in Australia and around the world, providing a continuous measure of ocean change; while the drift of the floats provides information on current speeds.

“These automated systems will make a huge contribution to our understanding of remote and hostile regions like the Southern Ocean,” Dr Rintoul said.

“On voyages like the one just undertaken, we work hard to obtain about 100 ocean profiles over eight weeks - all from one period of the year. The Argo floats we deployed are adding an additional 190 profiles every 10 days, year-round, and will keep doing so for up to four years.”

The eight-week voyage was funded through the Australian Antarctic Division, the Antarctic Climate and Ecosystems Cooperative Research Centre and the Australian Greenhouse Office.

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