

Ocean 'supergyre' link to climate regulator



Ocean currents in the Australian region including the Tasman Outflow (blue) passing south of Tasmania towards the Indian Ocean.

Australian scientists have identified the missing deep ocean pathway – or ‘supergyre’ – linking the three Southern Hemisphere ocean basins in research that will help them explain more accurately how the ocean governs global climate.

The new research confirms the current sweeping out of the Tasman Sea past Tasmania and towards the South Atlantic is a previously undetected component of the world climate system’s engine-room – the thermohaline circulation or ‘global conveyor belt’.

Wealth from Oceans Flagship scientist Ken Ridgway says the current, called the Tasman Outflow, occurs at an average depth of 800-1,000 metres and may play an important role in the response of the conveyor belt to climate change.

Published this month in *Geophysical Research Letters* the findings confirm that the waters south of Tasmania form a ‘choke-point’ linking the major circulation cells in the Southern Hemisphere oceans.

“In each ocean, water flows around anticlockwise pathways or ‘gyres’ the size of ocean basins,” Mr Ridgway says. “These gyres are the mechanism that distribute nutrients from the deep ocean to generate life on the continental shelves and slopes. They also drive the circulation of the world’s oceans, creating currents and eddies and help balance the climate system by transferring ocean heat away from the tropics toward the polar region.”

He says the conventional picture of the Southern Hemisphere mid-latitude circulation comprises basin-wide but quite distinct gyres contained within the Indian, Pacific and Atlantic Oceans. However model simulations had suggested that these gyres are connected.

The CSIRO team analysed thousands of temperature and salinity data samples collected between 1950 and 2002 by research ships, robotic ocean monitors and satellites in the region between 60°S and the Equator. They identified linkages between these gyres to form a global-scale ‘supergyre’ that transfers water to all three ocean basins.

Mr Ridgway and co-author Mr Jeff Dunn say identification of the supergyre improves the ability of researchers to more accurately explain how the ocean governs global climate.

Completed as part of the BLUElink ocean forecasting project, this research provides the missing deep-flow connection between the Pacific and Indian Oceans. It has long been known that north of Australia a system of currents in the ocean’s upper 300m, called the Indonesian Throughflow, drains water from the Pacific into the Indian Ocean through the Indonesian archipelago – a process which influences Australian rainfall.

Mr Ridgway says Tasmania figures as a critical converging point providing a northern boundary to the mid-water funnel that is bordered at latitudes near 50°S.

“The interconnected gyre system and the East Australian Current provide the mechanism by which SubAntarctic Mode Water and Antarctic Intermediate Water are distributed between the ocean basins,” he says. “The flows of these water masses have strong influences on the global climate and so monitoring changes in the transport of the Tasmanian connection may be an important measurement of the state of the global climate system.

“Recognising the scales and patterns of these subsurface water masses means they can be incorporated into the powerful models used by scientists to project how climate may change,” he says.

Source: CSIRO

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