Salty oceans provide early warning for climate change

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Monitoring the saltiness of the ocean water could provide an early indicator of climate change. Significant increases or decreases in salt in key areas could forewarn of climate change in 10 to 20 years time. Presenting their findings at a recent European Science Foundation (ESF) conference, scientists predicted that the waters of the southern hemisphere oceans around South Africa and New Zealand are the places to watch.

Palaeoclimate data shows that the ocean's currents (like the Gulf Stream and its North Atlantic deep water partner) are capable of shifting gears very suddenly, but until now it wasn't clear how this occurred. Using a combination of modern observations, numerical models and palaeoclimate data scientists are increasingly realising that salt is the key.

Their results reveal that a build up of salty water can stimulate deep water circulation, while a diluting of the waters is linked to sluggish flow. "Salt plays a far more important role that we first thought," says Professor Rainer Zahn, a palaeoclimatologist at the Autonomous University of Barcelona in Spain.

Salt increases the density of water. Once a pocket of water becomes salty enough it sinks, drawing in additional water from surrounding areas, and initiates an ocean circulation loop called thermohaline overturning.

The scientists discovered that a build up of salt in the waters off the coast of South Africa could help to speed up ocean circulation in the

North Atlantic, despite the two areas being thousands of kilometres apart. “A salt surge is enough to kick start circulation,” says Zahn. Meanwhile, a decrease in saltiness in South African waters could be linked to a slowing down of the North Atlantic circulation.

Models and data both indicate that these changes in ocean circulation occur over very short time-scales, usually in less than a decade or two. Ocean water can’t possibly travel this fast (it takes nearly a century for a parcel of water to move from the South Atlantic to the North Atlantic). Instead the scientists think that energy is transferred through the ocean along a deep pressure wave. “The surge of salt generates a pressure gradient in the ocean that sends energy to the north without water actually being transported,” explains Zahn.

Regardless of whether ocean circulation speeds up or slows down it causes significant climate change, altering the hydrological cycle and affecting atmospheric circulation patterns too.

Currently there is no large-scale salt monitoring system in place in the southern hemisphere oceans. Zahn thinks that regular measurements taken in the waters around South Africa and New Zealand could be useful. “It could act as an early warning system for climate changes 10-20 years down the road,” he says.

Source: European Science Foundation