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Seals Gather New Ocean Data

With sensors glued to their heads, seals have helped scientists understand the effects of climate change.

By Michael Gibson

An international team of scientists have devised a system that could help obtain better real-time coverage of the Antarctic Ocean's temperature changes and current flows: they've stuck sensors on the heads of migrating elephant seals. The information could provide new insights into the effects of climate change in the ocean, stemming from inflows of freshwater from melting ice and warmer water from the north.

In the past, obtaining information about the region's waters, especially about winter temperatures, has proved extremely difficult. It's costly and sometimes impossible to send ships through the ice-filled waters, and each ship covers only a thin stretch of ocean. Now a small navy of seals has collected data inexpensively where no ship has gone before.

"It's a win-win situation," says [Daniel Costa \(http://bio.research.ucsc.edu/people/costa/people/\)](http://bio.research.ucsc.edu/people/costa/people/), an ecologist from the University of California, Santa Cruz, who was part of the research, called the [SEaOS \(http://biology.st-andrews.ac.uk/seaos/\)](http://biology.st-andrews.ac.uk/seaos/) project (Southern Elephant Seals as Oceanographic Samplers). "We're getting an amazing data set about the ocean's properties and how the animals' feeding habits react to changes in their environment."

The research, conducted by a diverse team of scientists from the University of St. Andrews, the University of Tasmania, the University of California, France's Centre National de la Recherche Scientifique, and other institutions, will be published online this week in the [Proceedings of the National Academy of Sciences \(http://www.pnas.org/\)](http://www.pnas.org/).

In their two-year study, the scientists recruited 85 elephant seals from four points around the Antarctic region: South Georgia, the Kerguelen Islands, Macquarie Island, and Livingston Island. As the seals migrated and foraged for food during their winter journey, they circumnavigated the Antarctic continent and its continental shelf, diving down to 2,000 feet more than 60 times a day.

With every dive, the seal's sensors collected information about the animal's location and depth, and about the ocean's temperature and salinity levels. Each time the seals resurfaced to breathe, that data was relayed via satellite to the National Oceanographic Data Center ([NODC \(http://www.nodc.noaa.gov/\)](http://www.nodc.noaa.gov/)) in the United States and the [Coriolis \(http://www.coriolis.eu.org/\)](http://www.coriolis.eu.org/) center in France, where oceanographers can disseminate and use it to test climate models and track developments in the region.

Once the seals returned home from their journey, they molted, shedding the equipment from their heads.

The Antarctic Ocean is important to global climate change: it's home to the world's largest current, and it's also where some water masses of key importance in the climate system are formed. One fear is that increasing average temperatures could lure too much freshwater into the Antarctic, bringing cooling and sinking processes in ocean currents to a halt and ultimately causing a dramatic effect on the global climate.

"The elephant seals are an interesting attempt to use nature to help obtain a valuable data set," says [Carl Wunsch \(http://puddle.mit.edu/~cwunsch/\)](http://puddle.mit.edu/~cwunsch/), a professor of physical oceanography at MIT who is unaffiliated with the SEaOS team. "We use the data here, knowing that our control over the seals is not perfect. But we need to understand what the ocean is doing."

The SEaOS project is a continuation of earlier, smaller programs involving placing similar sensors on penguins and seals. Costa is also part of a group that uses crab-eater seals to measure how quickly the temperature changes

in the Antarctic waters from summer to winter.

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