

Boaty McBoatface mission gives new insight into warming ocean abyss

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Boaty McBoatface. Credit: Povl Abrahamsen, British Antarctic Survey

The first mission involving the autonomous submarine vehicle Autosub Long Range (better known as "Boaty McBoatface") has for the first time shed light on a key process linking increasing Antarctic winds to rising

sea temperatures. Data collected from the expedition, published today in the scientific journal *PNAS*, will help climate scientists build more accurate predictions of the effects of climate change on rising sea levels.

The research, which took place in April 2017, studied the changing temperatures at the bottom of the Southern Ocean.

During the three day mission, Boaty travelled 180 kilometres through mountainous underwater valleys measuring the temperature, saltiness and turbulence of the water at the bottom of the ocean. Using an echo sounder to navigate, Boaty successfully completed the perilous route, reaching depths of up to 4000 metres, to re-unite with the rest of the project team at the programmed rendezvous location where the sub was recovered and measurements collected along its route were downloaded.

In recent decades, winds blowing over the Southern Ocean have been getting stronger due to the hole in the ozone layer above Antarctica and increasing greenhouse gases. The data collected by Boaty, along with other ocean measurements collected from research vessel RRS James Clark Ross, have revealed a mechanism that enables these winds to increase turbulence deep in the Southern Ocean, causing warm water at mid depths to mix with cold, dense water in the abyss.

The resulting warming of the water on the sea bed is a significant contributor to rising sea levels. However, the mechanism uncovered by Boaty is not built into current models for predicting the impact of increasing global temperatures on our oceans.

Boaty's mission was part of a joint project involving the University of Southampton, the National Oceanography Centre, the British Antarctic Survey, Woods Hole Oceanographic Institution and Princeton University.

Professor Alberto Naveira Garabato from the University of Southampton who led the project said: 'Our study is an important step in understanding how the climate change happening in the remote and inhospitable Antarctic waters will impact the warming of the oceans as a whole and future sea level rise'



Boaty McBoatface. Credit: Povl Abrahamsen, British Antarctic Survey

Dr. Eleanor Frajka-Williams of the National Oceanography Centre said: "The data from Boaty McBoatface gave us a completely new way of looking at the deep ocean—the path taken by Boaty created a spatial view of the turbulence near the seafloor."

Dr. Povl Abrahamsen of the British Antarctic Survey said: 'This study is a great example of how exciting new technology such as the unmanned submarine "Boaty McBoatface" can be used along with ship-based measurements and cutting-edge ocean models to discover and explain previously unknown processes affecting heat transport within the [ocean](#).'

More information: Alberto C. Naveira Garabato el al., "Rapid mixing and exchange of deep-ocean waters in an abyssal boundary current," *PNAS* (2019). www.pnas.org/cgi/doi/10.1073/pnas.1904087116

Provided by University of Southampton

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