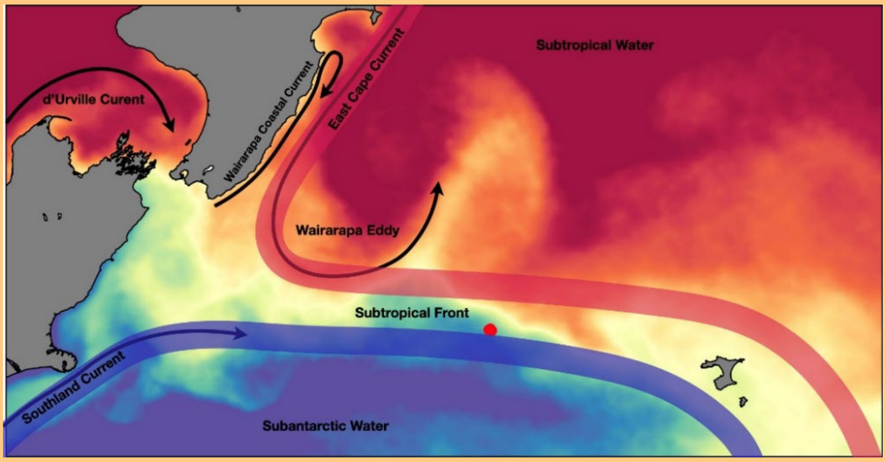

Image shows the location of the glider deployment on the Chatham Rise (red dot) on a background of satellite derived sea surface temperature. We see warm, salty Subtropical water in the north and cold, fresh Subantarctic water in the south. The black solid lines show some of the main currents and circulation features in the area. The shaded contours indicate the southern limit of Subtropical water (red) and the northern limit of Subantarctic water (blue) separated by the Subtropical Front.

NIWA
Taihoro Nukurangi

The resilience of deep-sea benthic communities to the effects of sedimentation

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VICTORIA UNIVERSITY OF WELLINGTON TE HERENGA WAKA

WAIKATO Te Whare Wānanga o Waikato

BY LEE RAUHINA-AUGUST, MALCOLM CLARK, DI TRACEY

16 JUNE 2022

Ngā mihi mahana ki a koutou

In this Information sheet **Ocean Modelling scientist Charine Collins** presents some of the data collected by NIWA's underwater glider that was deployed during the 2018 and 2019 *Tangaroa* voyages to the central Chatham Rise.

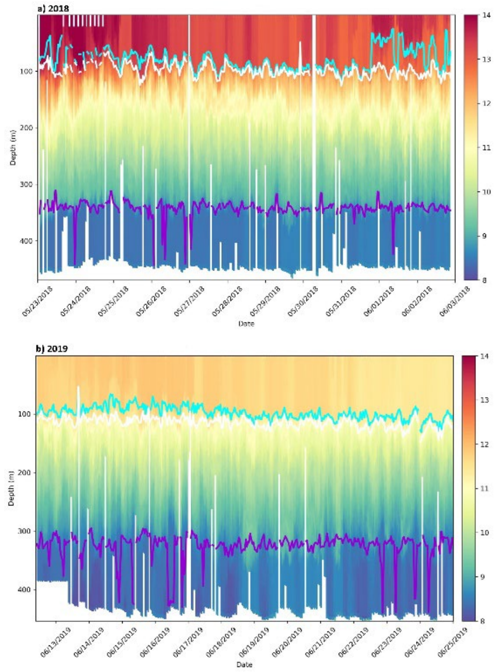
The glider collected vertical profiles of various physical (temperature, salinity) and biological variables (oxygen and chlorophyll-a concentrations) from the surface to just above the seafloor. More than 350 profiles were collected over a two-week period in both 2018 and 2019.

Three-layer Ocean

The data collected showed that the water column over the Chatham Rise has a well-defined three-layer structure: warm surface (0-100m), cool intermediate (100-300m), and cold bottom layers (>300m). Both the surface and bottom layers are well-mixed with nearly uniform temperature and salinity values.

The bottom and intermediate layers were fairly similar between the two years. However, the surface layer was distinctly different.

Temperature data collected by the glider showed that warm water of subtropical origin dominated the upper 100 m of the water column in 2018 while cold water of sub-Antarctic origin dominated in 2019. This is due to the relative strength of the prevailing winds. Weak southwesterly winds prevailed in 2018 which allowed warmer subtropical water to be transported southward onto the rise. In 2019, stronger southwesterlies dominated which pushed cold sub-Antarctic water northward onto the rise.



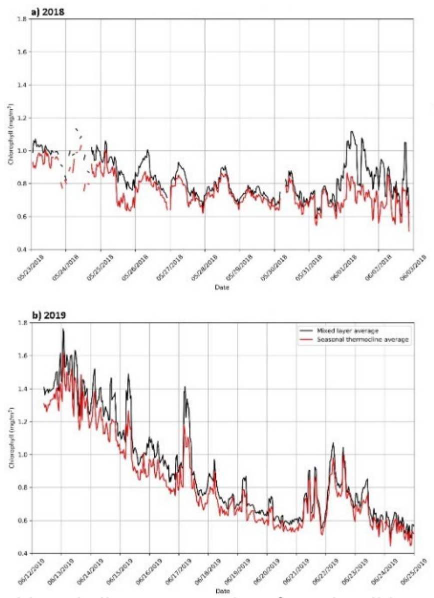
Temperature plotted as a function of depth and time for the 2018 (top graph) and 2019 (bottom graph) glider deployments.

Phytoplankton response

The well-mixed surface layer plays an important role in the growth of microscopic algae (phytoplankton) that form the base of the marine food-web.

Phytoplankton require nutrients and light to grow and are confined to the well-mixed surface layer where light can penetrate to 100-200m depth. In addition, mixing at the bottom of this layer injects nutrients required for growth into the surface layers.

The stronger southwesterly winds in 2019 caused more intense vertical mixing resulting in a broader (~100 m thick) well-mixed surface layer. Decreased vertical mixing in 2018 due to lighter southwesterly winds meant there was a thinner (~80 m) well-mixed surface layer. The deeper mixed layer in 2019, along with nutrient-rich, cold sub-Antarctic water, initially resulted in elevated phytoplankton growth followed by a steady decline due to a depletion of nutrients. The nutrient-poor, sub-tropical water that dominated the well-mixed surface layer in 2018 supported lower phytoplankton growth compared to 2019. However, a relaxation of the winds in early June 2018 led to a thinning of the well-mixed surface layer which, in turn, resulted in an increase in phytoplankton growth due to better access to light.



Chlorophyll-a concentrations from the glider averaged over the depth of the mixed layer in 2018 (top graph) and 2019 (bottom graph).

All this information contributes to our understanding of productivity in this part of our ocean. *Kia whiria te mātauranga o te moana*

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