# Upper ocean variability on the South Orkney Plateau

Using krill trawling data for hydrographic investigations

BJERKNES CENTRE for Climate Research



#### Anna M. B. Hollænder<sup>1,2</sup>, Angelika H. H. Renner<sup>3</sup>



<sup>1</sup> DTU Aqua, Technical University of Denmark,
<sup>2</sup> Geophysical Institute, University of Bergen
<sup>3</sup> Ocean and Climate, Institute of Marine Research

### Introduction

The South Orkney plateau is located in the Atlantic sector of the Southern Ocean on the boundary between the Weddell and the Scotia Sea. This area is especially interesting due to it's high abundance of Antarctic krill (*Euphasia Superba*). Hydrographically the area is influenced by the Antarctic Circumpolar Current, as well as more locally the Weddell-Scotia Confluence. In this project Conductivity-Temperature-Depth data that were collecting alongside krill trawling were examined. These were collected in austral summer 2011-2019.

# Inter-annual and horizontal variability

The surface waters exhibit both horizontal and inter-annual variations. The surface layer has an increasing northward temperature gradient. The exemplified years shows that 2011 was warm and saline compared to the cold and fresh surface in 2015.





Figure 1: Instrument setup with the CTD mounted on the krill trawl. Modified figure, originally from Krafft et al. 2014



## Vertical patterns

The data shows clear salinity driven stratification. The surface waters are relatively warm and fresh. Below this layer the near-surface temperature minimum is found indicating the Winter Water (WW), which was created at the surface during winter, and is now trapped below the warmer surface water. Addionally some of the years show a warm water mass beneath this layer in the northern part, which indicates the southern boundary of the Antarctic Circumpolar Current.



Figure 3: Sea surface temperature (upper panels) and salinity (lower panels) of the upper 10 dbar depicted for 2011 (left) and 2015 (right). The grey lines are isobaths and the black lines indicate the South Orkney Islands. Map from *GEBCO Compilation Group* (2020).

### Sea ice

The inter-annual variability is closely linked to the amount of sea ice free days prior to sampling. Longer ice free periods coincide with warm and saline surface properties. This is due to the cold freshwater supply from the melting ice.



Figure 4: Annnual average (a) sea surface temperature and (b) sea surace salinity against the amóunt of sea ice free days prior to sampling.

Figure 2: Latitudinal transect plots from (a), (c), (e) 2011 at approx. -44°E and (b), (d), (f) 2018 at approx. -46.5°E. The panels showing (a), (b) temperature, (c), (d) salinity and (e), (f) density.

### Acknowledgement

A big thanks to Bjørn Krafft, Georg Skaret and the rest of their team for collecting the data that is the foundation for this project, sharing it with us and contributing to the process.

#### References

Krafft, B. A., L. A. Krag, T. A. Klevjer, G. Skaret, and R. Pedersen (2014), Distribution of Antarctic krill and apex predators at South Orkney Islands in 2014, and assessing escape mortality of krill in trawls, *Tech. rep.*, Institute of Marine Research.

GEBCO Compilation Group (2020), Gebco 2020 grid, doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9.

# Further outlook

This far it was not possible to show any correlation between the abundance and distribution of Antarctic Krill (*Euphasia Superba*) and the measured hydrographic properties. This is likely due to complex interactions and is subject to further work.



Download the poster & leave a comment here



Allégaten 55, NO-5007 Bergen | Tel: +47 55 58 98 03 | Fax: +47 55 58 43 30 | post@bjerknes.uib.no | bjerknessenteret.no

