Physical Oceanography
Göteborgs universitet
Institutionen för marina vetenskaper

Romain Caneill
PhD Student

Find a title.

Abstract: *TODO*

Keywords: *CTD, Field work, TODO*

Contents

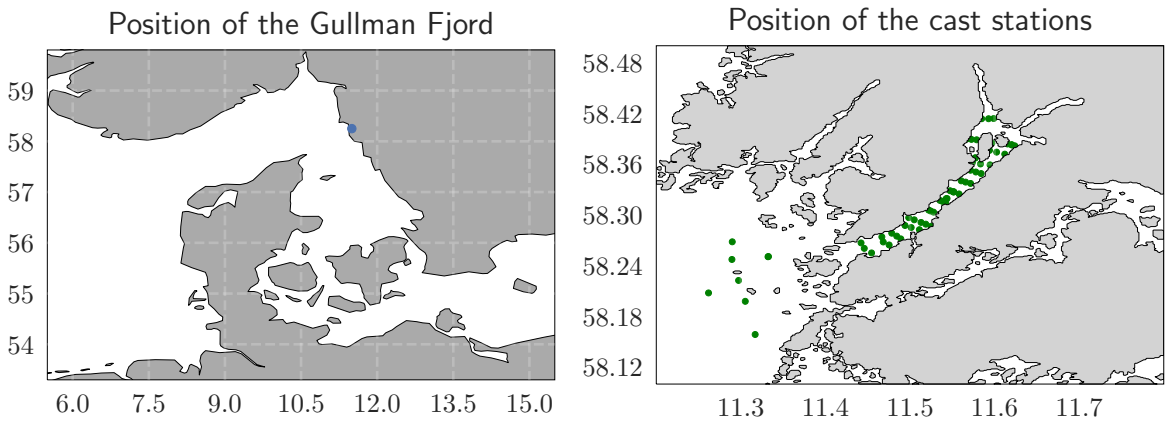

Figure 1: Stations of CTD casts.

1 Introduction

TODO find references about fjords, skagerrak

2 Materials and methods

2.1 Presentation of the field work and data acquisition

field work 10-11 of December 2018

on board of 2 ships: Skagerrak and Trygve

CTD casts with T, S, lat, lon, Oxygen, Niskin bottles for oxygen calib.

Figure 1

very good spatial coverage

also moorings, with CTD at a acertain depth, recording T and S variations (did not gave a lot of informations)

2.2 Data processing

We will refer to potential temperature as temperature, saying explicitly to in situ temperature if necessary. Idem for absolute salinity, we say salinity.

2.2.1 Cleaning and calibration

Reprocessing data, potential temp, absolute sal

Gridding every meter 1-120 m depth

2.2.2 Data assimilation / creating new metrics

Find some

Turner angle TODO conpute

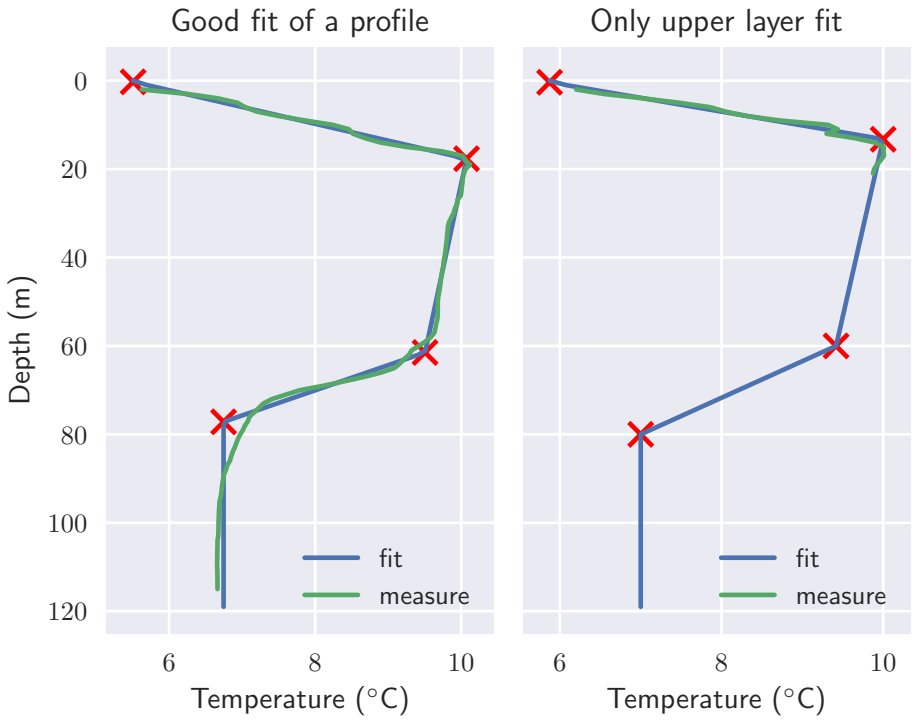

Figure 2: Profile fitting with a multi-linear function. The measured profiles are plotted in green, the fitted functions in blue, and the red crosses represent depth and temperature at the interfaces between the different layers. On the right plot, the fit corresponds to the *a priori* model for the two lowest interfaces.

Geostrophy TODO compute

Profil fitting and layers Temperature profiles in the fjord all look very similar, with 1. an upper thermocline; 2. a warm water mass; 3. a lower thermocline; 4. the lowest layer where temperature is approximatively constant. It is not easy to compute the depth of these layer by using a threshold (on the value or on the gradient) due to the irregularities of the temperature. Inspired by the work of *Pauthenet et al.* (2017), we decided to approximate the profiles with a function and then extraxt the layers informations from the functions properties. As the studied profiles have all the same shapes, we used a mutli-linear fit, fitting the 4 layers. The parameters of the fitted function are the depths and the temperatures of the interface between each layers. We considered that for the lowest layer, the fitted temperature will be a constant. An *a priori* model was set for these 8 parameters, with values set by eye to be a good candidate. Table 1 in Appendix presents the parameters. The least squares approximation has been used to find the best parameters. For the profiles that are not deep enough, only the part where data are present has been used for the least squares method. The *a priori* model has been set for the lower part, with a confidance flag set to 0. Figure 2 presents two examples of profiles: one where the 4 layers are present and one where the fjord was not deep enough, so only the upper layer is fitted.

No sub-mesoscale heat fluxes because no mixed layer

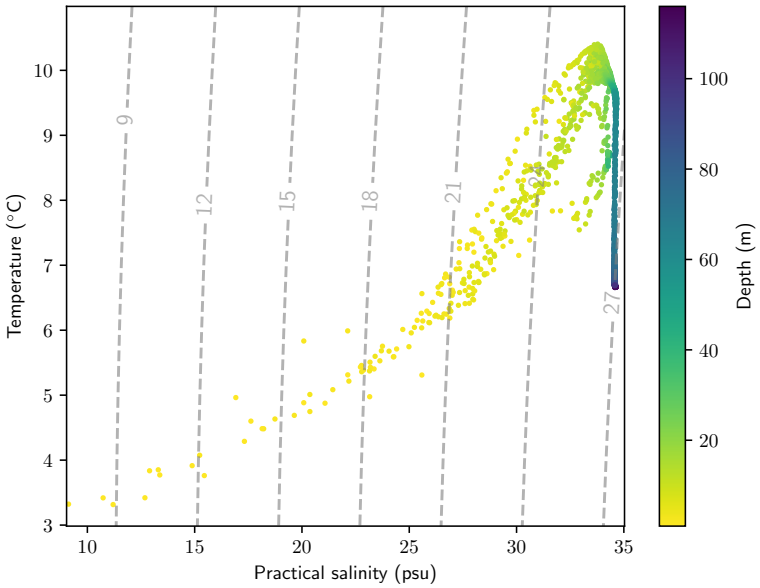

Figure 3: T-S diagram

3 Results

T-S diagram see figure 3

we recognize Skagerrak and Kattegat water (*Björk and Nordberg*, 2003; *Gustafsson and Stigebrandt*, 1996)

Kattegat salinity 15/20(depending on the source)-25

Skagerrak salinity between 33 (surface) to 35 (100m depth)

warm water layer warm water in the fjord, see mean depth, std depth, mean T and S, see spatial distribution

strong halocline

Turner angle What is happening here?

Geostrophy What is happening here?

Upwelling event? Mixing? (*Arneborg*, 2004)

4 Discussion

TODO

fitting of the profile, using spline could be better. but here maybe not necessary.

5 Conclusion

See what is the context
What we did
What we showed/saw
What is the conclusion

References

Arneborg, L. (2004), Turnover times for the water above sill level in gullmar fjord, *Continental Shelf Research*, *24*(4), 443 – 460, doi:https://doi.org/10.1016/j.csr.2003.12.005.

Björk, G., and K. Nordberg (2003), Upwelling along the swedish west coast during the 20th century, *Continental Shelf Research*, *23*(11), 1143 – 1159, doi:https://doi.org/10.1016/S0278-4343(03)00081-5.

Gustafsson, B., and A. Stigebrandt (1996), Dynamics of the freshwater-influenced surface layers in the skagerrak, *Journal of Sea Research*, *35*(1), 39 – 53, doi:https://doi.org/10.1016/S1385-1101(96)90733-9.

Pauthenet, E., F. Roquet, G. Madec, and D. Nerini (2017), A linear decomposition of the southern ocean thermohaline structure, *Journal of Physical Oceanography*, *47*(1), 29–47, doi:10.1175/JPO-D-16-0083.1.

A Complementary data and figures

Depth (m)	Temperature (°C)	Comment
0	5	Surface
20	10	Bottom of the upper thermocline / top of the warm water
60	9	Bottom of the warm water / top of the lower thermocline
80	7	Bottom of the lower thermocline / top of the lowest layer

Table 1: Values of the *a priori* model for the multi-linear fit.

TODO
ALL THE FIGURES I WANT TO PUT ON THE REPORT
For all profiles, put 2 different color for offshore and fjord