

The Atlantic Water boundary current north of Svalbard

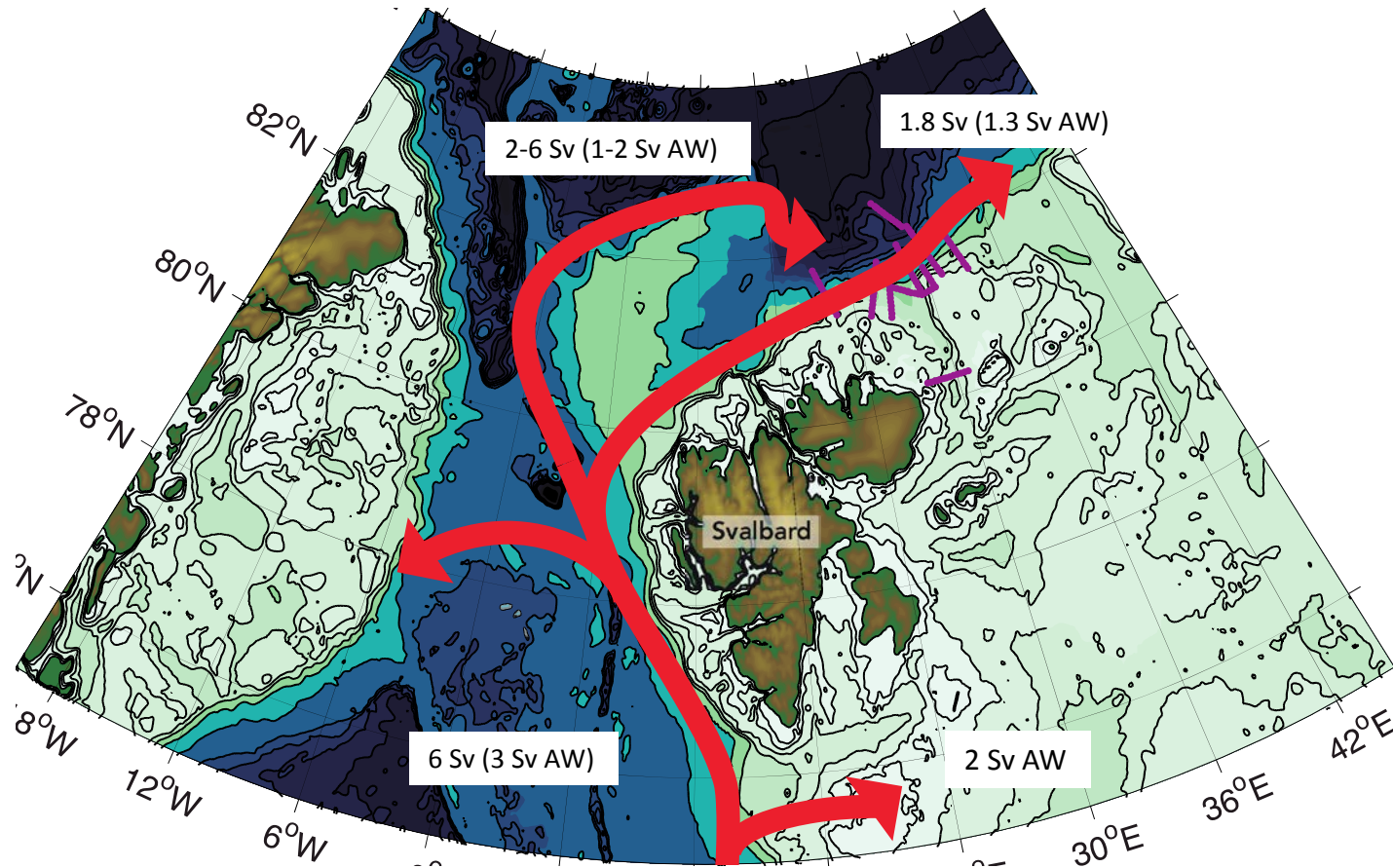
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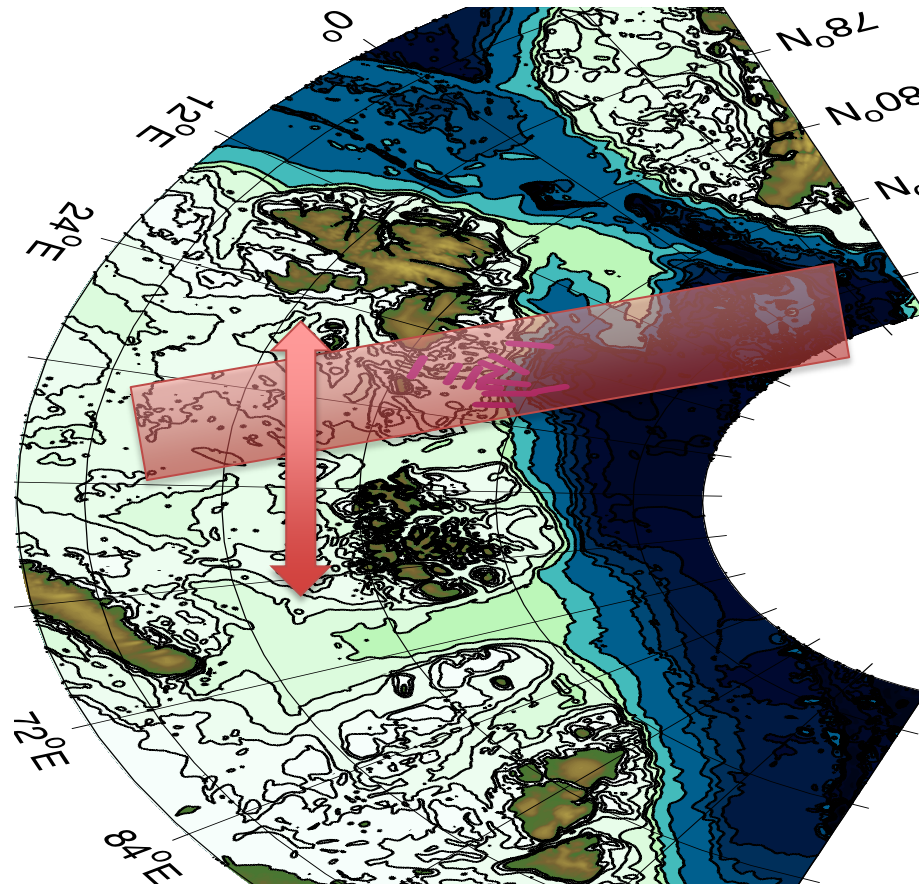
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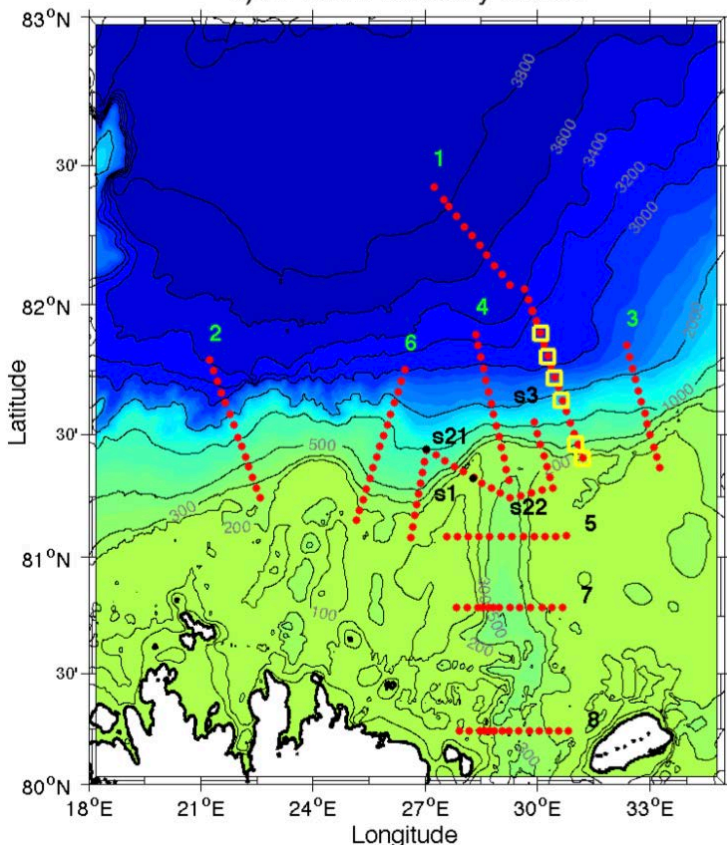


- Aw inflow supplies heat and salinity to the Arctic
- AW influences the climate and ice conditions of Svalbard (Walczowski and Piechura 2011).
- Most studies have focused in temperature and salinity variability (Aagaard et al. 1987; Saloranta and Haugan 2001; Cokelet et al. 2008).
 - It is an area with large ocean-atmosphere heat flux
 - Its where the main direct interactions between AW and sea ice take place (Polyakov et al. 2011; Onarheim et al. 2014; Rudels et al. 2014).

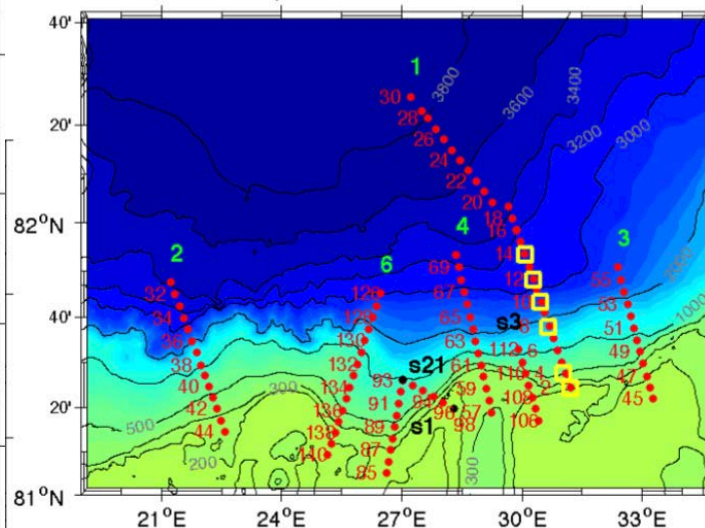


Long-term variability and trends in the Atlantic Water inflow region (ATWAIN)

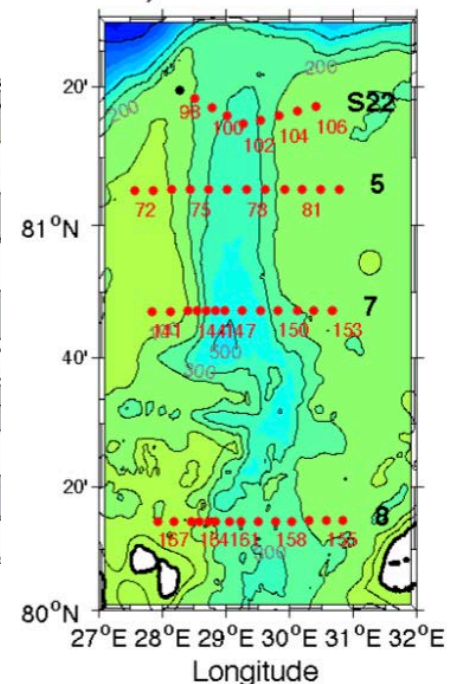
a) ATWAIN-recovery Cruise



b) Meridional sections



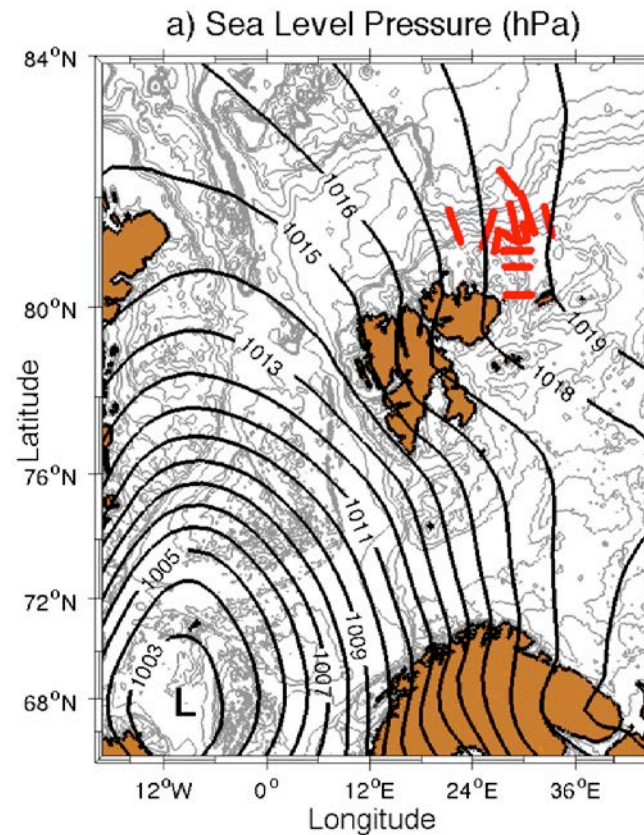
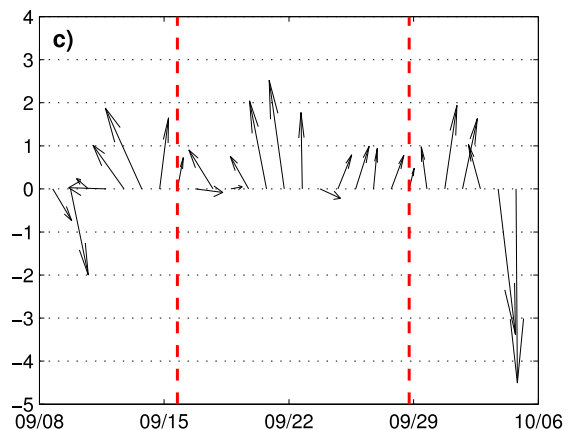
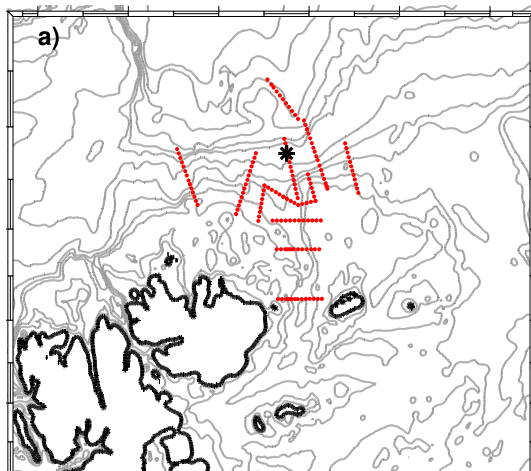
c) Zonal sections



- 167 Sea bird 911+ CTD and VMADCP down to 200 m
- 15th -28th September 2013, on board the R/V Lance
- Atmospheric conditions during the cruise from:
 - ERA-Interim daily global atmospheric reanalysis (winds and SLP).
 - MASAM2 (ice coverage).

Atmospheric Conditions

Wind and Sea Level Pressure

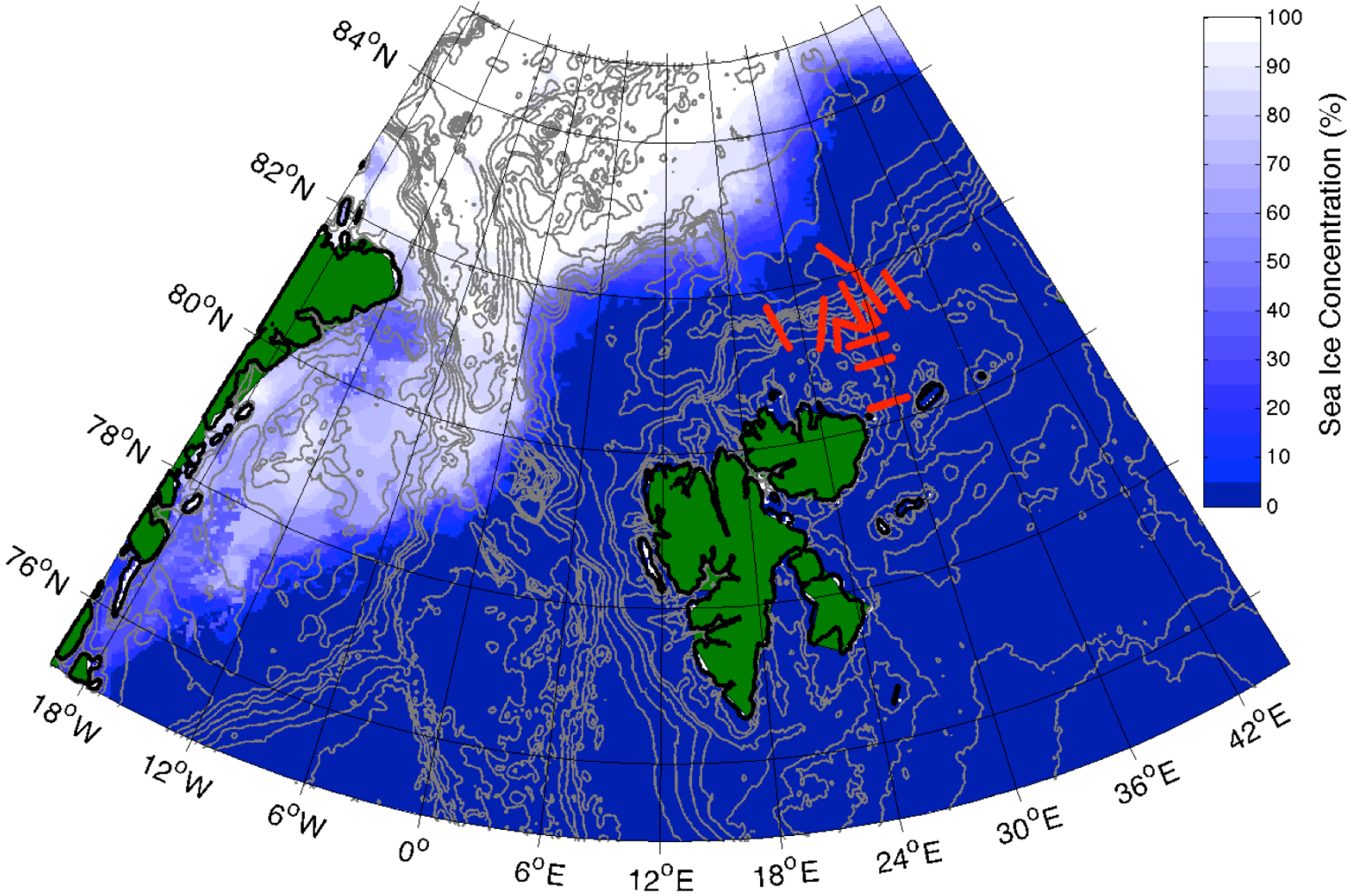


Mean Ekman Transport (Sv)

Meridional sections	Kvitøya Trough
0.09±0.12	-0.00±0.02

Ice Coverage

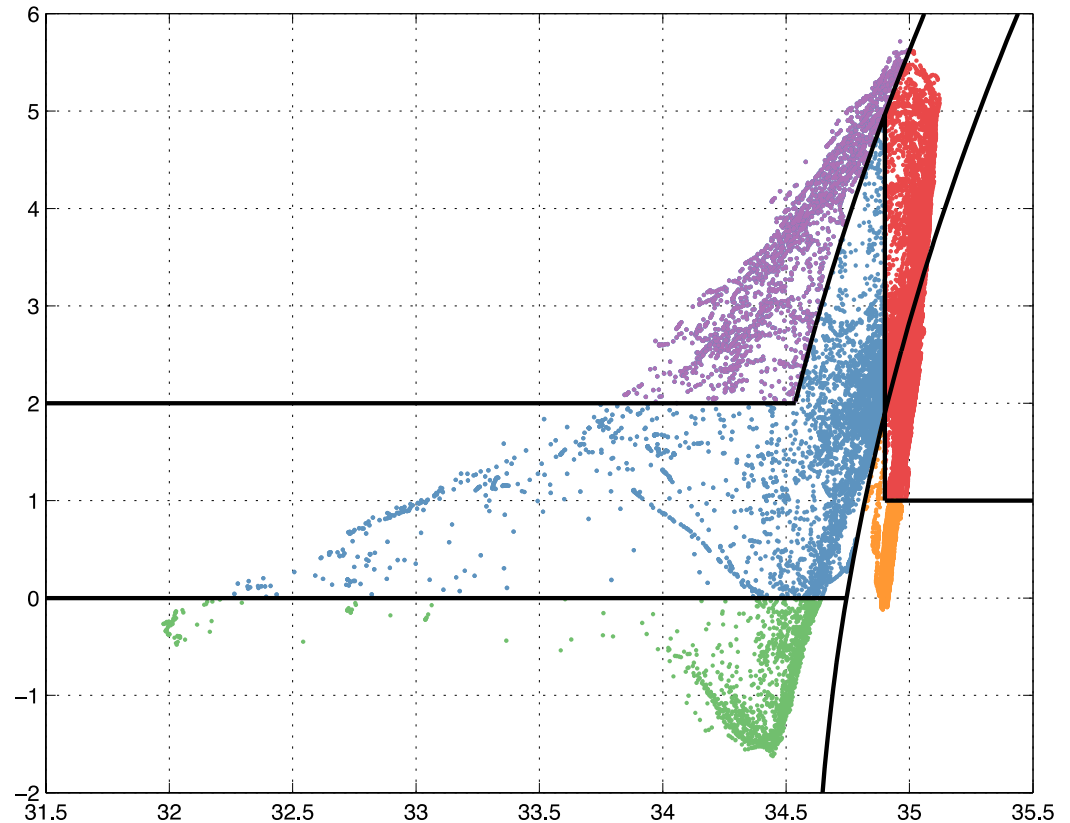
c) Mean, from the 10 to 28 Sept.



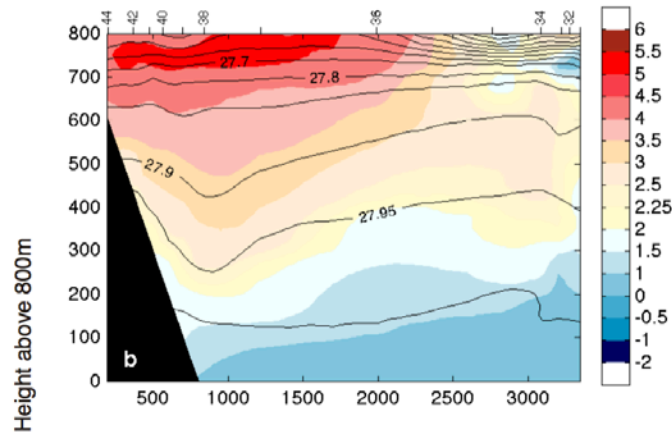
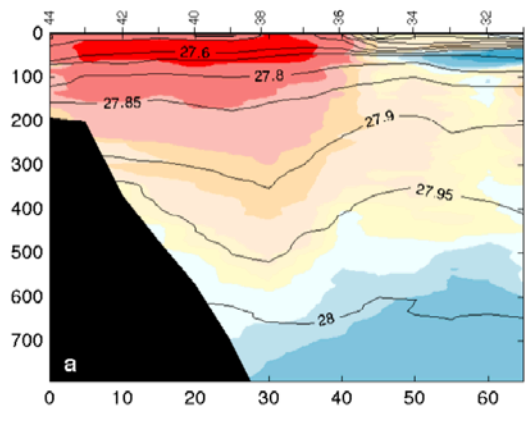
The boundary current north of Svalbard

Water Masses

- Polar Surface Water (PSW)
- Polar Surface warm Water (PSWw)
- Surface warm Water (SwW)
- Atlantic Water (AW)
 - $\sigma_{\theta} \geq 27.6 \text{ kg m}^{-3}$,
 - $S > 34.9$
 - $T > 1^{\circ}\text{C}$
- Arctic Intermediate Water (AIW)



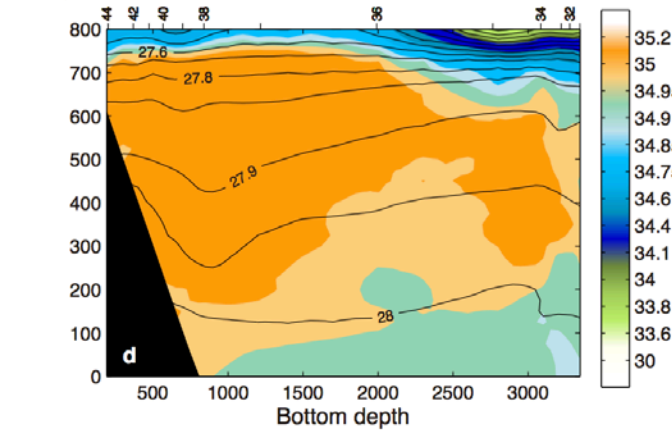
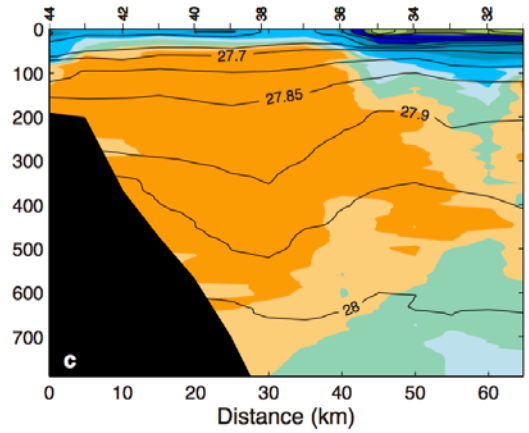
Temperature ATWAIN-recovery cruise T-2



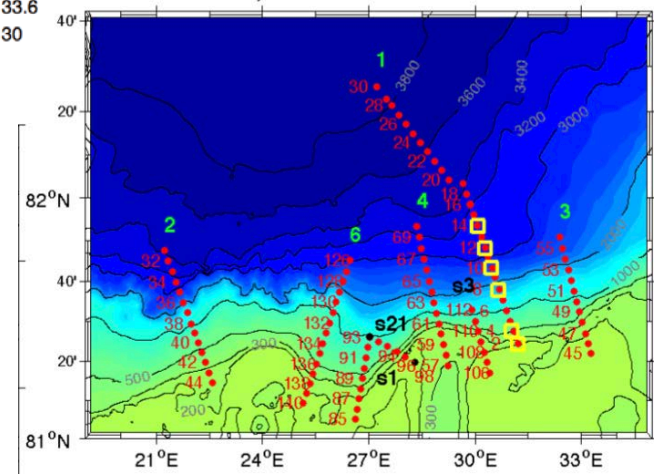
Methods

The bottom topography varies significantly among transects, therefore, to generate an average meridional vertical section, each transect is transformed into a bottom depth vs. height above 800 m coordinate frame following Pickart (1992).

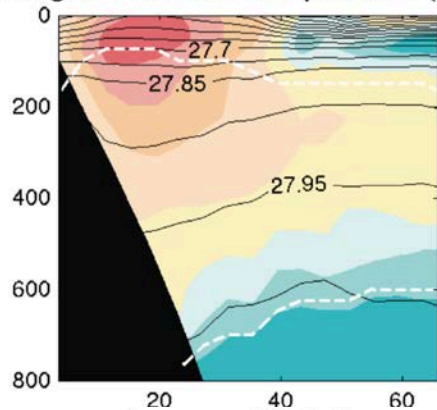
Salinity ATWAIN-recovery cruise T-2



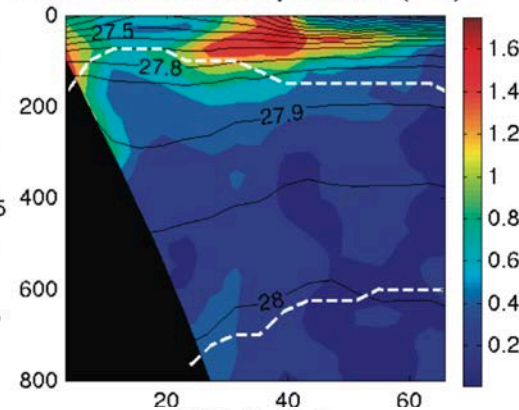
b) Meridional sections



Averaged Potential Temperature ($^{\circ}$ C)



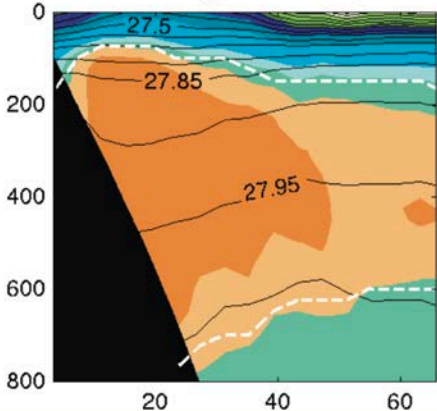
STD Potential Temperature ($^{\circ}$ C)



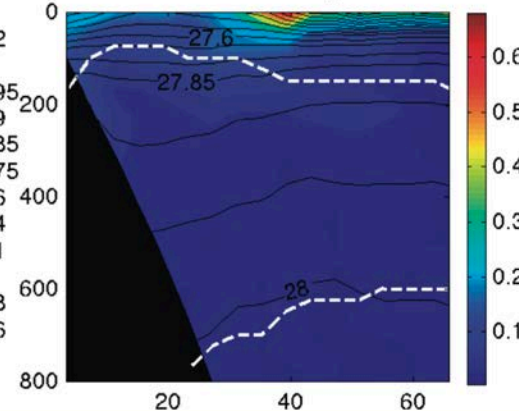
From an Average point of view

- Atlantic boundary current: 75 -800 m depth, a maximum offshore distance of ca.55 km. Eastward with velocities between 4 - 20.7 cm/s.
- Surface intensification of the eastward flow (SwW).
- On the shifting boundary existing in between the PSWw and the SwW, the standard deviations shows a surface maximum.

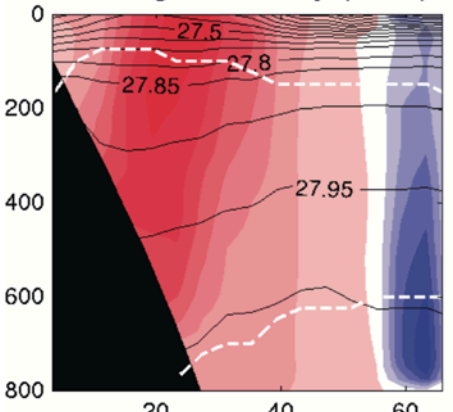
Averaged Salinity



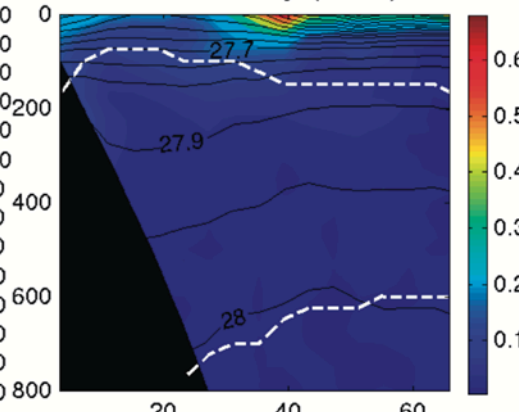
STD Salinity



Averaged Velocity (cm/s)

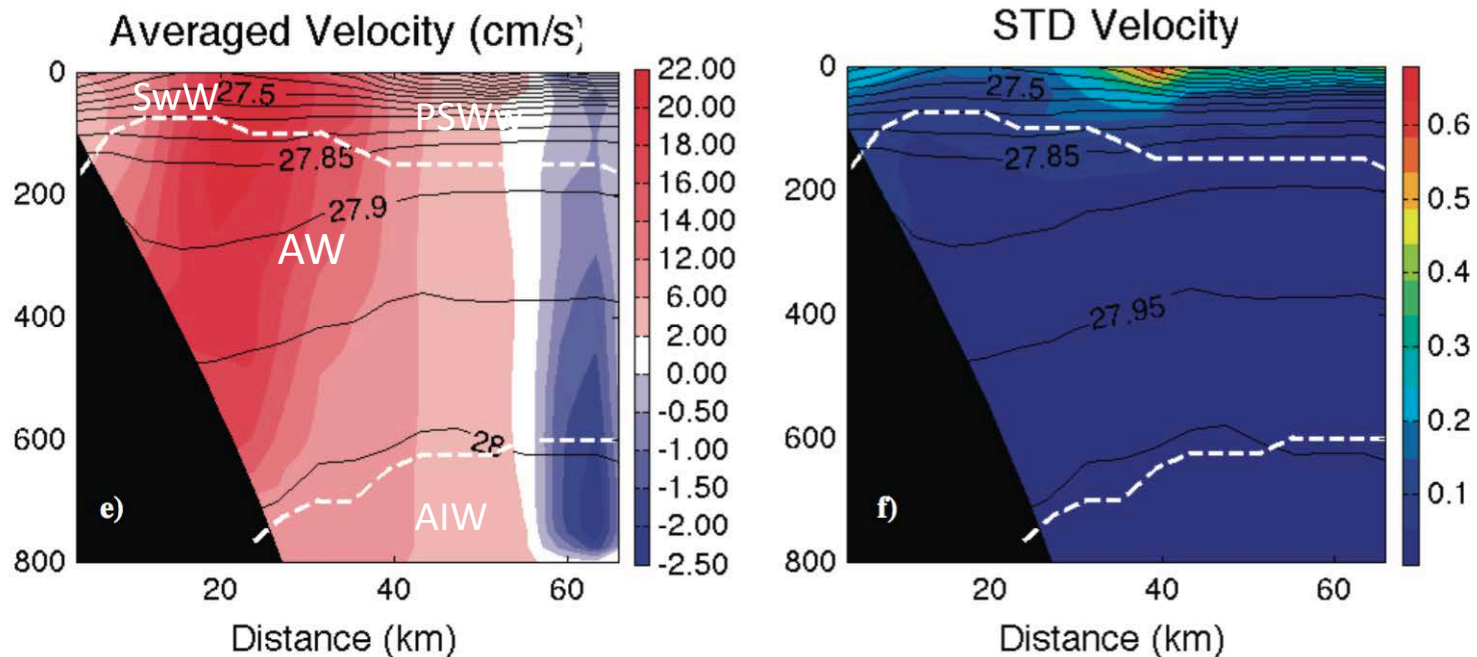


STD Velocity (cm/s)

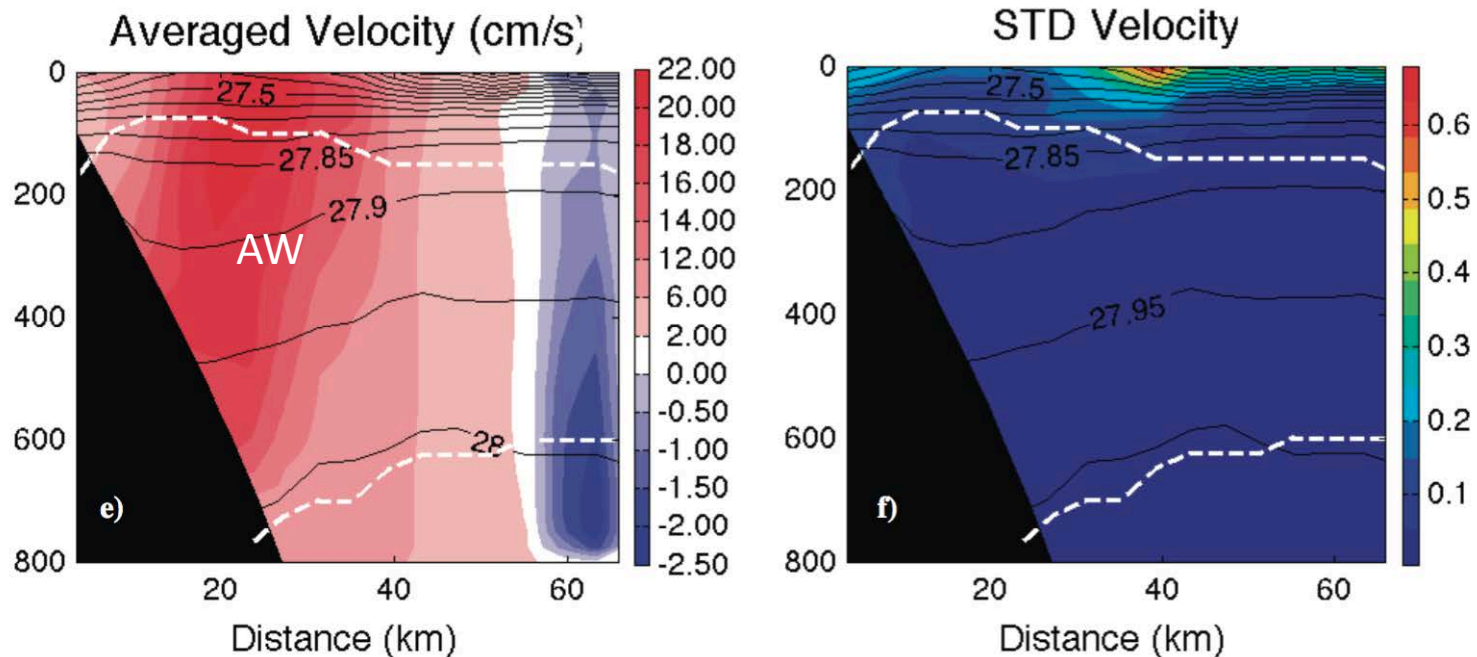


Distance (km)

Distance (km)



- The Atlantic boundary current carries a 73% of the eastward net transport across the sections.
- Average Net transport $3.10 \pm 0.56 \rightarrow 2.28 \pm 0.10$ Sv of AW
- PSWw contributes 13% of the eastward net transport across the sections.
- Average Net transport $3.10 \pm 0.56 \rightarrow 0.41 \pm 0.06$ Sv of PSWw
- Surface intensification
- SwW and AIW separately, contribute a 0.1% of the eastward net transport across the sections.

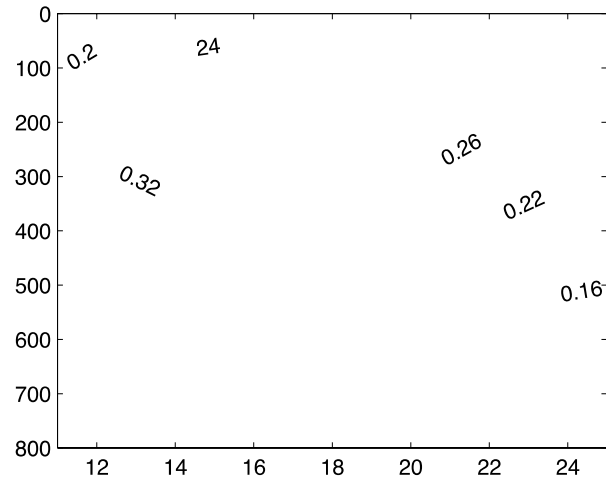
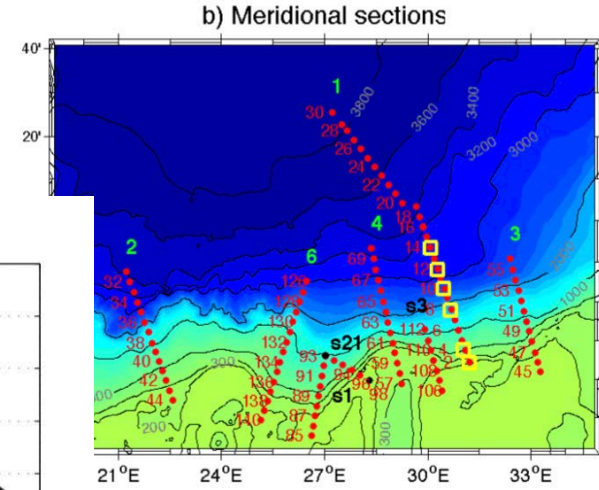
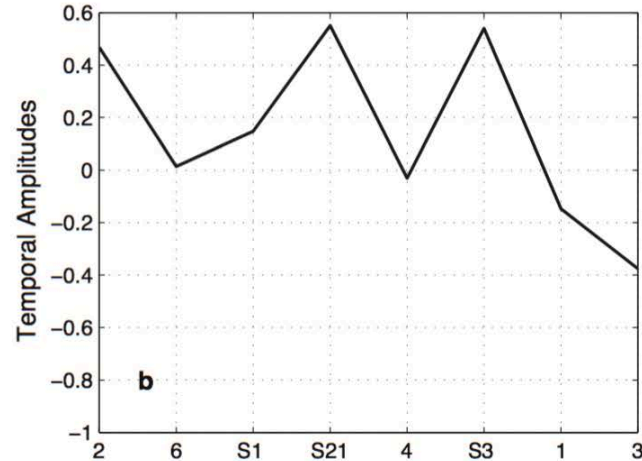
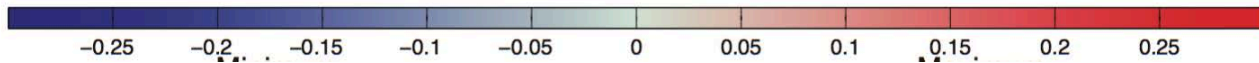
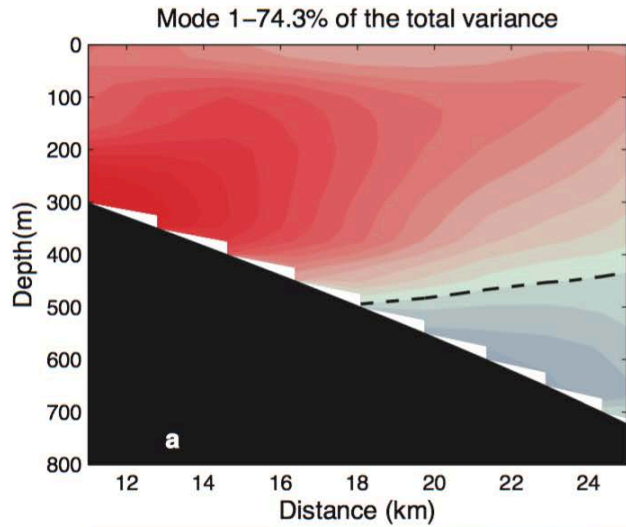


- The Atlantic boundary current carries a 73% of the eastward net transport across the sections.
- Average Net transport $3.10 \pm 0.56 \rightarrow 2.28 \pm 0.10$ Sv of AW
- Fram Strait definition of Beszczynska-Möller et al. (2012) , 1.91 ± 0.10 Sv
- Not west to east trends were found
- Average net heat transport 29.45 ± 3.36 TW $\rightarrow 23.63 \pm 0.75$ TW of AW
- Average Fresh water flux non- significantly different from 0 but westward in all sections



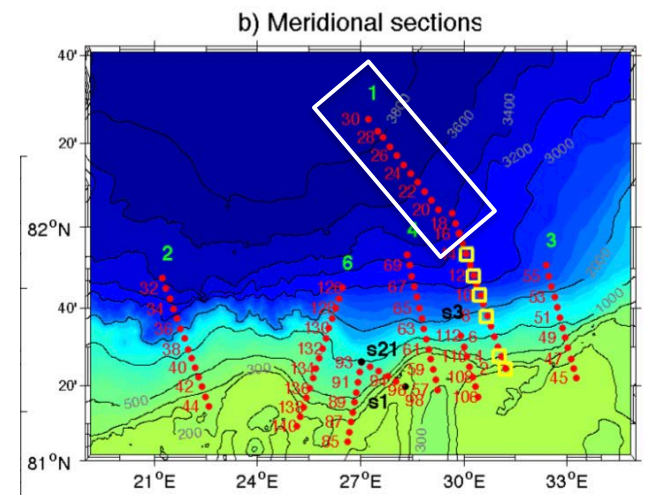
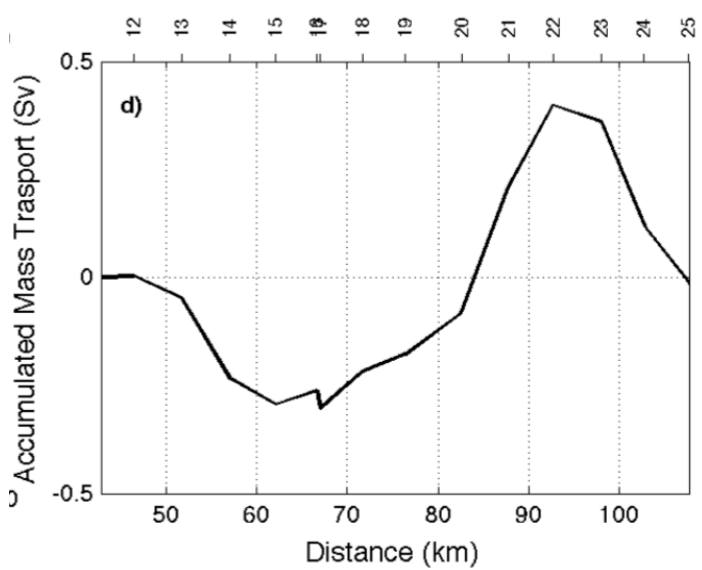
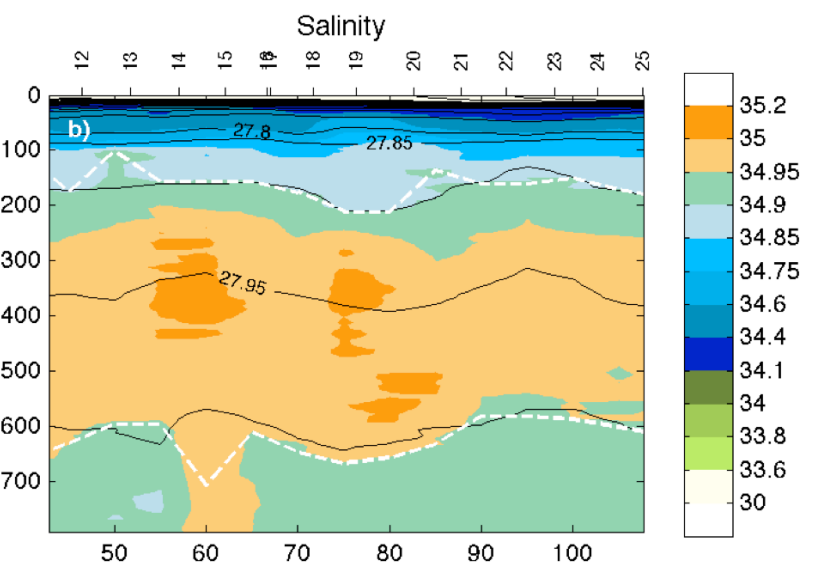
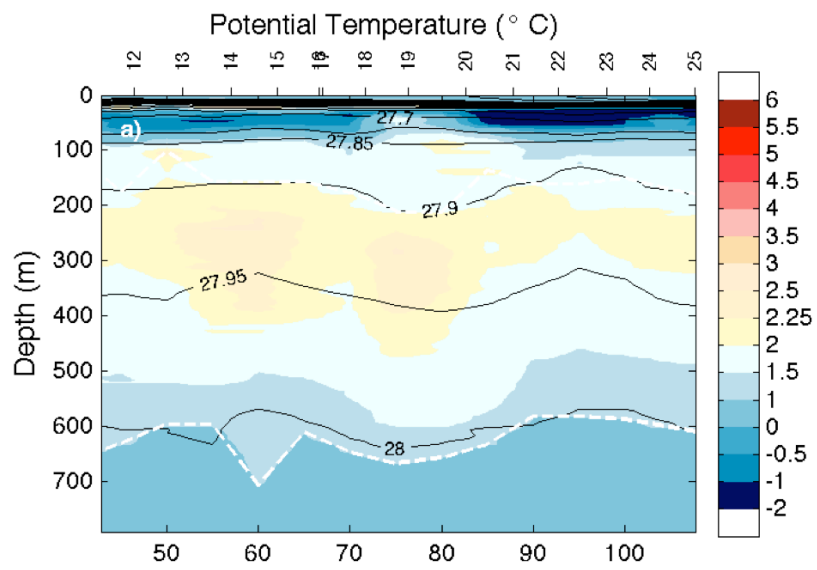
Variability

The results from the EOF of the velocities

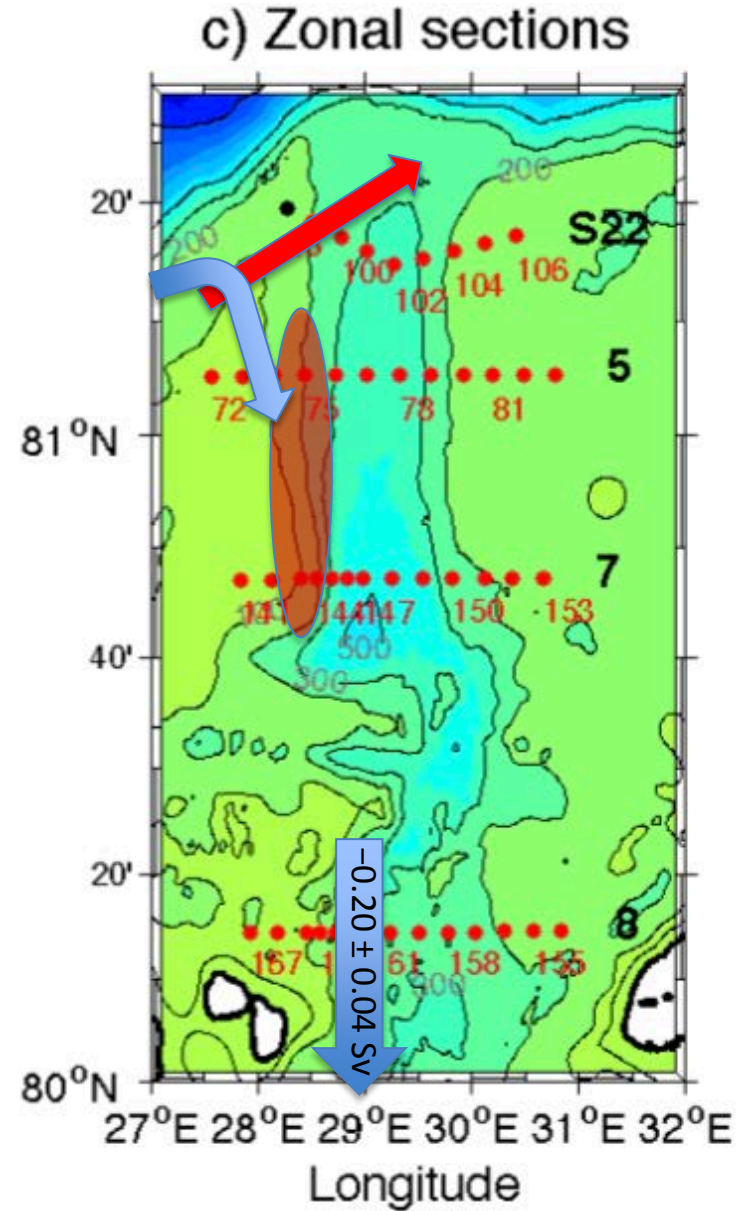
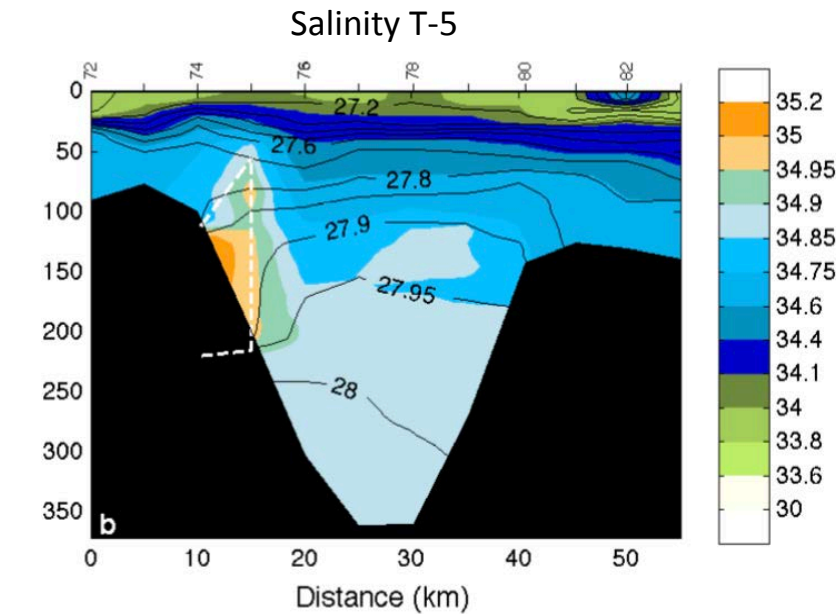
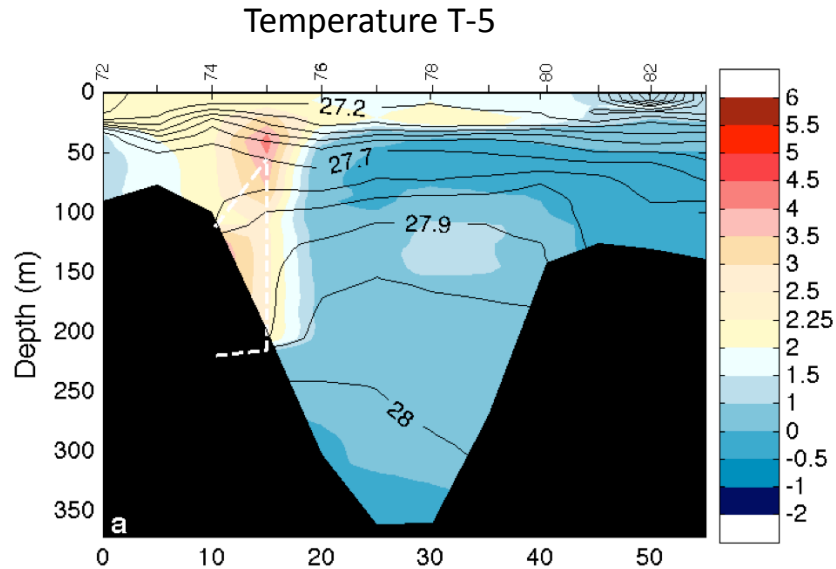


Eddie

- An anticyclonic eddy of ca. 36 km wide, stations 12 and 20
- A cyclonic eddy of ca. 25 km wide, stations 20 to 25



Kvitøya Trough



Conclusions

- The Atlantic boundary current carries a 73% of the eastward net transport across the sections, which is an average of **2.30 ± 0.12 Sv**.
- The average heat transport of the Atlantic boundary current is **23.63 ± 0.75 TW**.
- The boundary currents presents meanders and eddies are shed from it.
- AW gets into the Kvitøya Trough but it does not cross it.

Thank you!!

