

# Modelling Heat and Salt Fluxes Across Davis Strait, 2004-2016, using the ANHA12 Configuration

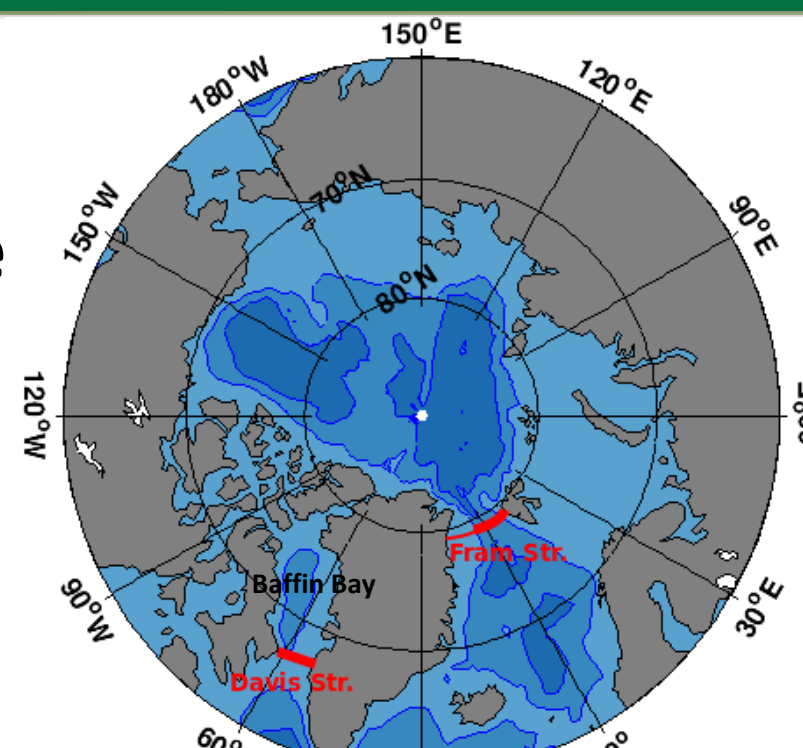
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## I . Introduction

■ Davis Strait and Fram Strait are two major oceanic gateways for exchange between the Arctic and North Atlantic Oceans.



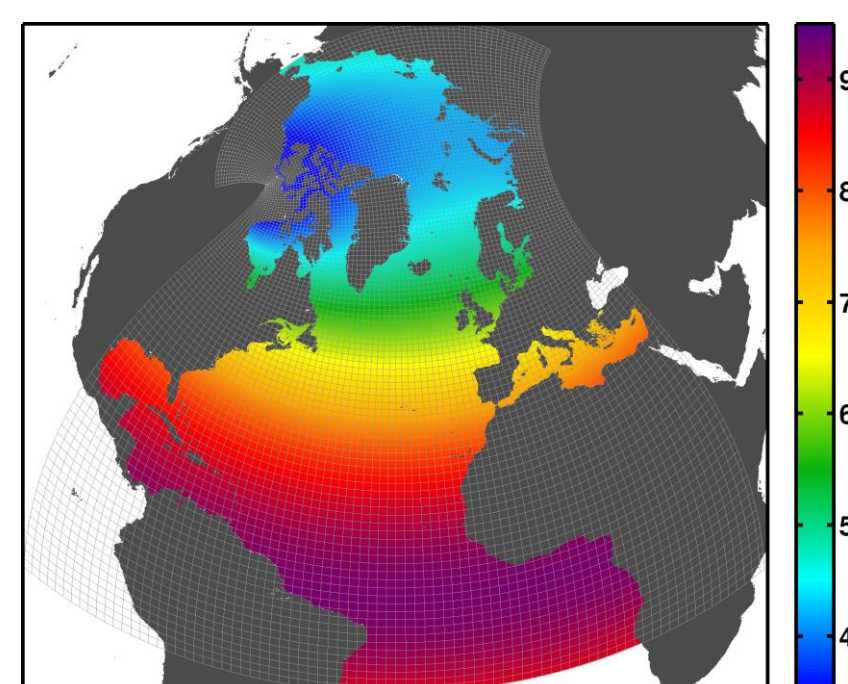
■ Davis Strait lies between Canada's Baffin Island and southwestern Greenland, while Fram Strait connects Svalbard and the northeast side of Greenland.

■ Understanding how heat and salt are delivered from the Arctic to the North Atlantic in response to oceanic and atmospheric variability is necessary for studying changes in North Atlantic thermohaline circulation.

## II . Methods

The **ANHA** (*Arctic and Northern Hemispheric Atlantic*), a regional configuration based on the coupled ocean-sea ice modelling framework **NEMO** (*Nucleus for European Modelling of the Ocean*).

The model NEMO v3.4

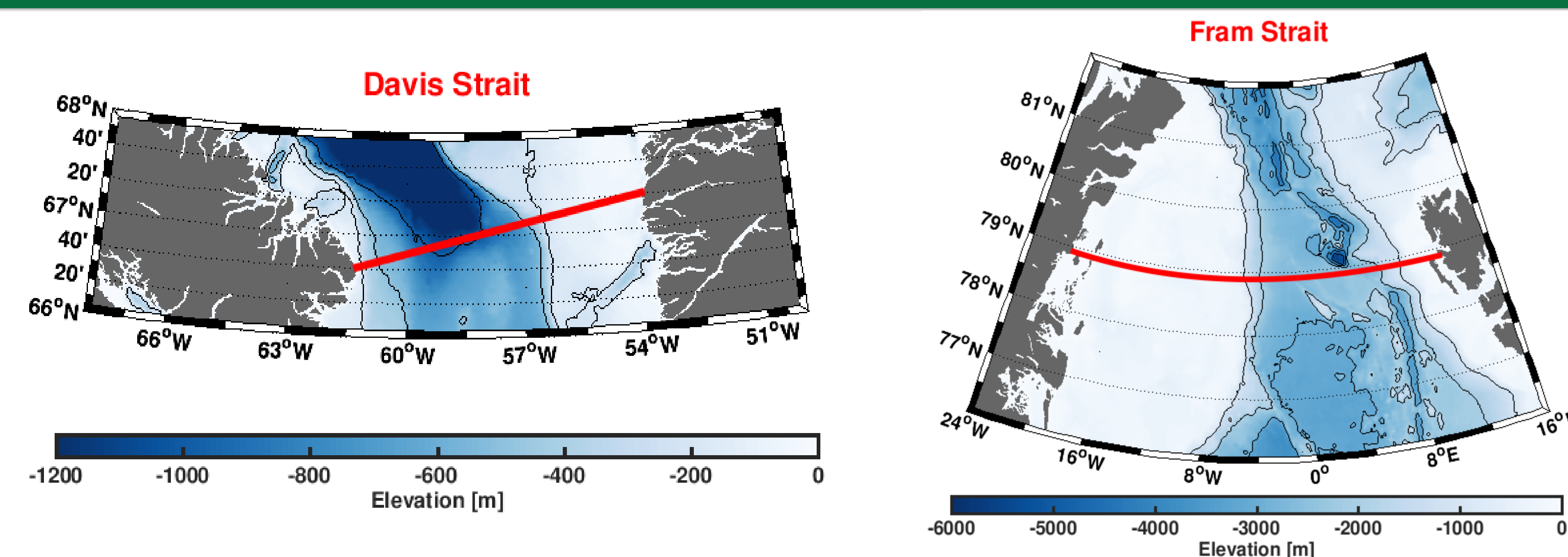


ANHA12 horizontal mesh (every 20 grids, color shows the resolution in kilometers)

- Mesh grid: ANHA12 1/12° resolution  
196M grid points (1632×2400×50)
- Horizontal resolution in { Davis Strait: ≈ 4.5km  
Fram Strait: ≈ 4.2km
- Time period: 2002-2018 Time Step: 180s
- Output: 5-day NORMAL
- Sea ice model: LIM2
- Atmospheric forcing: CGRF
- Initial condition: GLORYS 2v3

No temperature/  
salinity restoring

## III. Topography



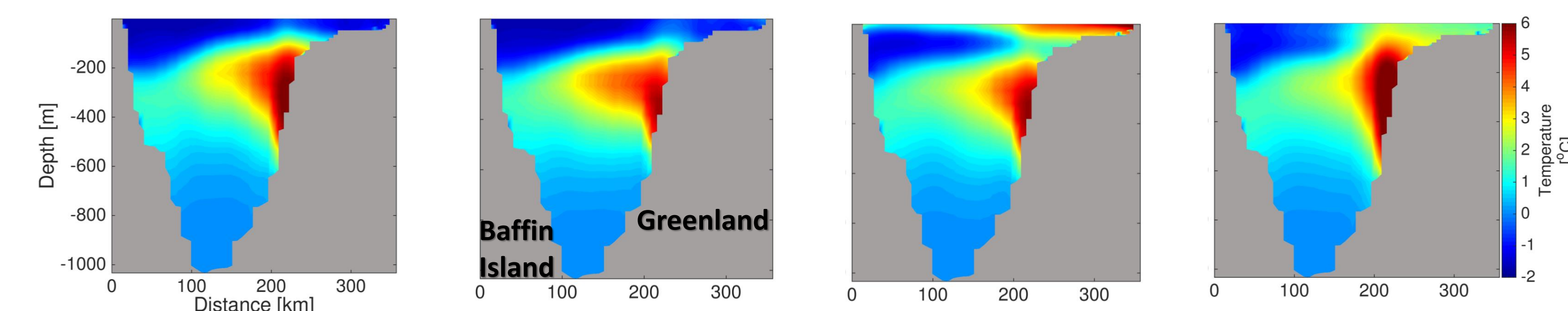
Compared to Fram Strait, Davis Strait is shallower with the largest depth of around 1000m and also narrower at 330km wide.

## IV. Results (Only taking the results of Davis Strait for analysis here)

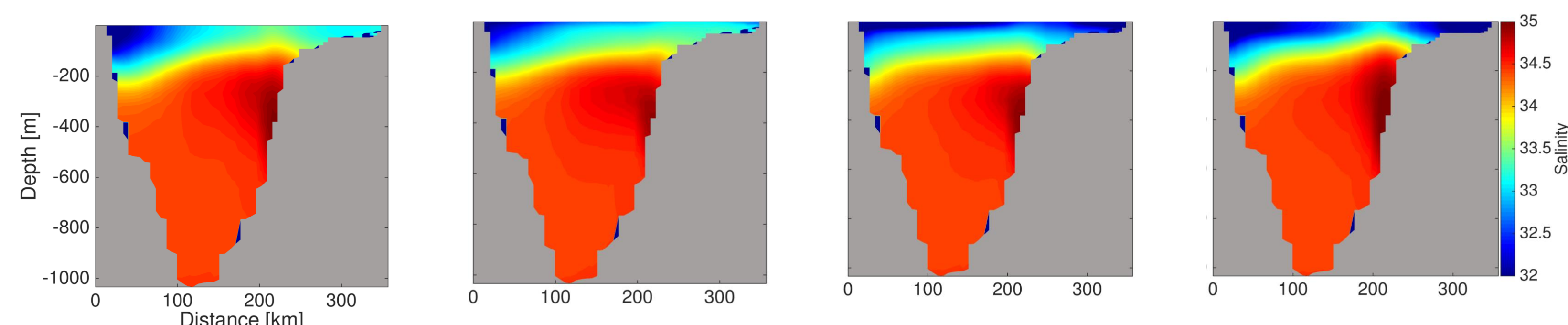
### ANHA12

#### Seasonal climatology over the years from 2004 to 2016

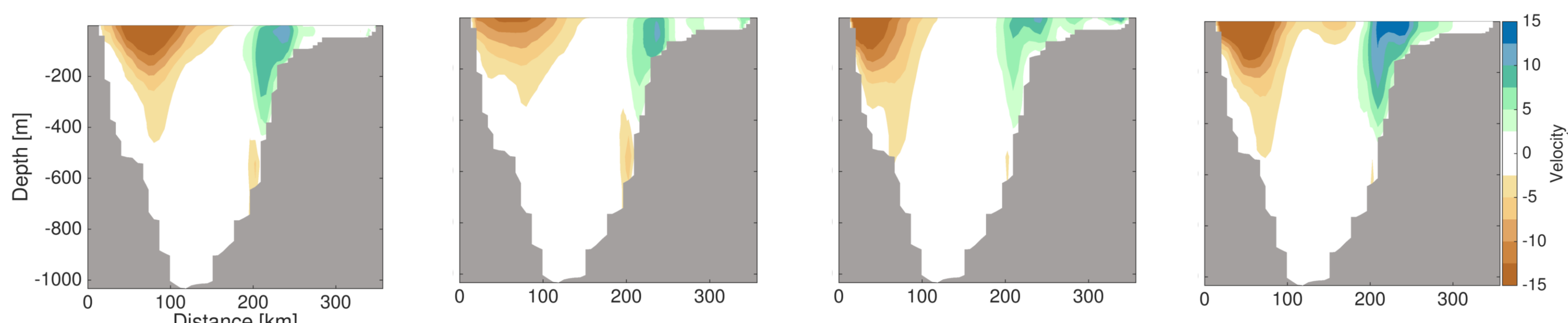
##### Temperature:



##### Salinity:



##### Cross-strait velocity: (northward positive and southward negative)



Winter (Jan-Mar)

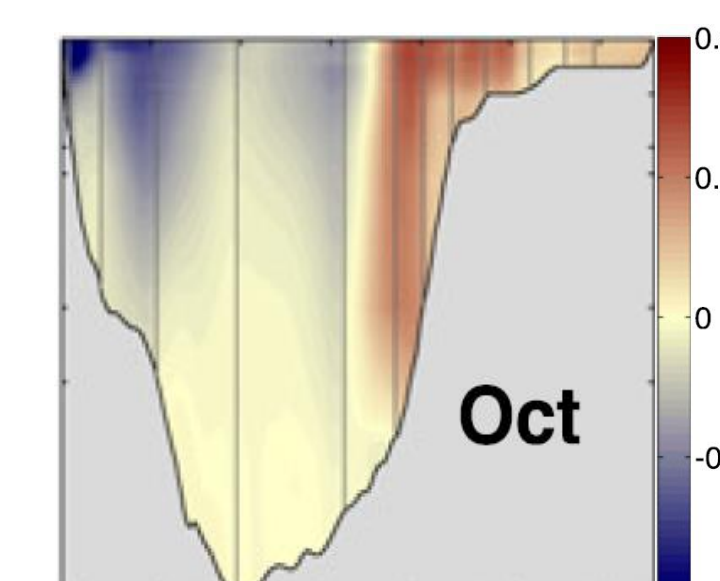
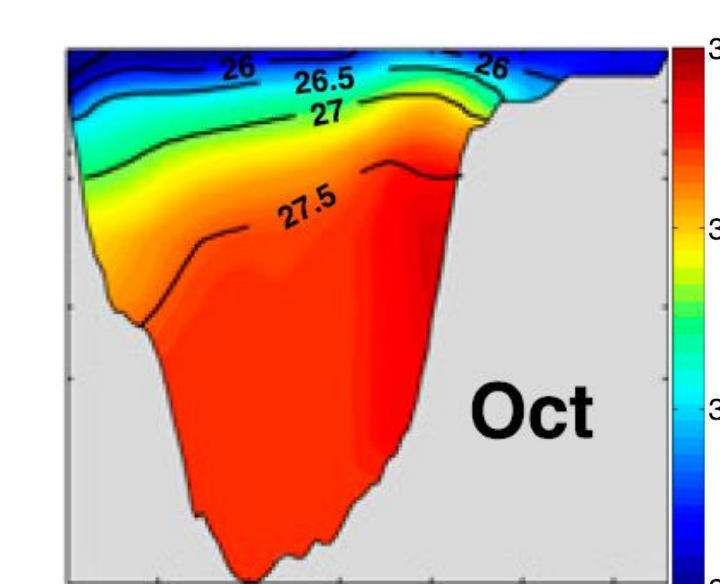
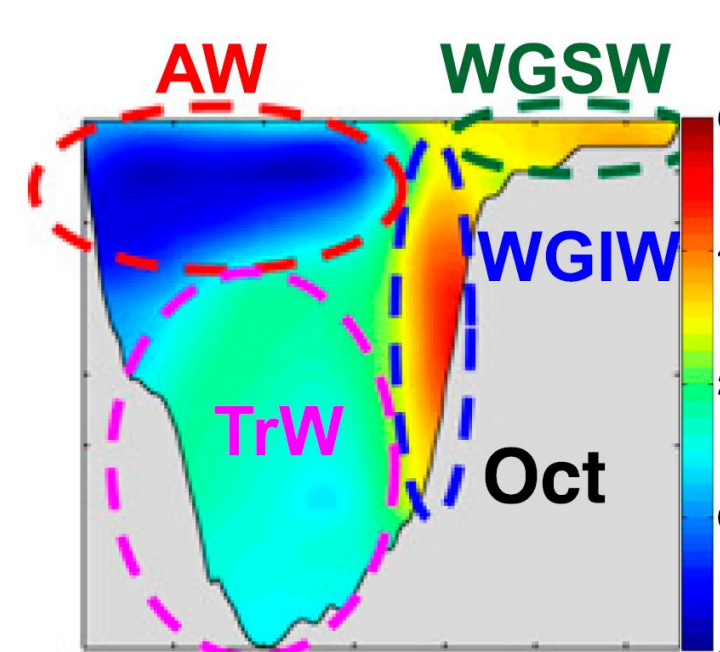
Spring

Summer(Jul-Sep)

Autumn

### Observation

#### 2004-2010



October

## V . Conclusions

- ① Maximum temperatures, salinities and northward velocities of the WGIW (Water mass above the east upper slope) occurred in autumn.
- ② Seasonal atmospheric temperature variations have a significant effect on the temperature cycle on the shelf, and it reaches a maximum temperature for summer months.
- ③ From the sea bottom to the surface, the seawater in the cross section gets fresher due to density decline whereas the salinity of WGIW is above average.
- ④ Exchanges through Davis Strait are predominately two-way and topographically steered.
- ⑤ Topographic steering in Baffin Bay creates stronger velocities along the edges and weaker velocities in the interior at depth.

All in all, the model does work very well in general and it shows that a large amount of heat and salt comes into the Arctic along the east coast, while the fresher and colder seawater keeps flowing out on the other side all year around.

In future work I will calculate seawater volume and freshwater export through Davis Strait, and then applying this model in Fram Strait. Davis and Fram Straits combined accounts for 98% of the total seawater volume and also 84% of the total freshwater Arctic outflows!

### Acknowledgements

I really appreciate it that my supervisor Prof. Myers provided me with the wonderful research internship and gave me some suggestions for this poster. Besides, thank you for the great support and guidance from Laura, Natasha, and other awesome members in the lab.

### References:

Davis Strait observation from Curry et al. (2011, 2014)