A synoptic view of the large-scale circulation at Denmark Strait during the FARDWO-DS1 cruise

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INTRODUCTION

- The Denmark Strait (DS) is a narrow path between Iceland and Greenland where the dense water from the Nordic Seas overflows the ridge, forming the Denmark Strait Overflow Water (DSOW). This deep flow forms the lower limb of the Atlantic Meridional Overturning Circulation (AMOC) and plays a determining role in the planet's climate.
- The FAR-DWO project is an interdisciplinary project that aims to understand the formation, propagation, and seafloor impact of dense water overflows in the DS. In summer 2023, a high-resolution hydrographic cruise took place between 64.5ºN and 67.5ºN (Fig. 1).
- This study describes the large-scale circulation from the DS to roughly 200km downstream and shows exchanges between the Greenland continental shelf and the deep Irminger Basin.

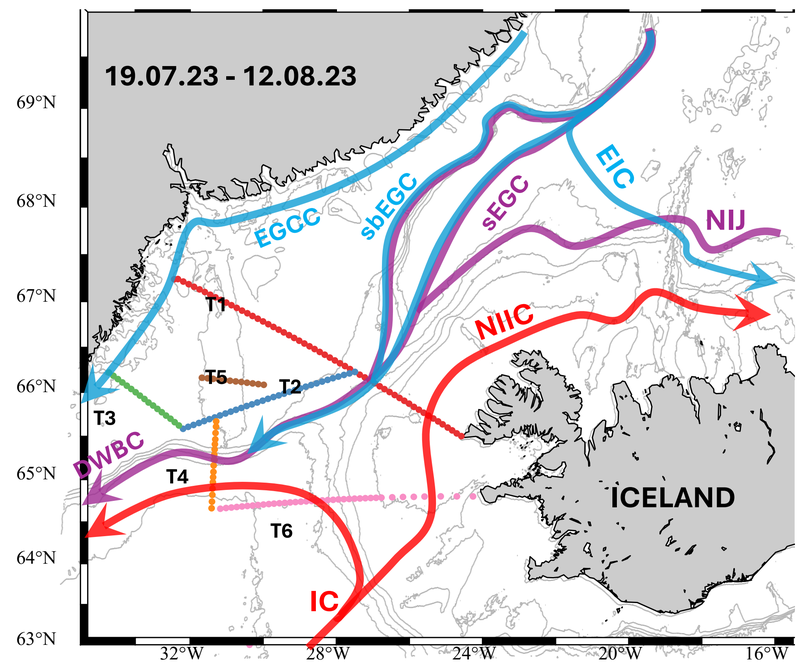


***Figure 1**. Map of the main currents in the vicinity of the Denmark Strait during FARDWO-DS1 cruise: warm upper currents (red lines), cold upper currents (blue lines), and cold bottom currents (purple lines)*

DATA & METHODS

- Hydrographic data from FARDWO-DS1 cruise in the Denmark Strait between 19 July and 12 August 2023.
- At each station pair, the relative geostrophic velocity is computed using the thermal wind equation and the reference layer γ^n=27.8 kg·m^{-3}.
- The SADCP and LADCP data are used to adjust the velocities at the reference level (Fig. 2).
- Volume transports are computed for 13 isoneutral layers as identified in Fig. 5d.

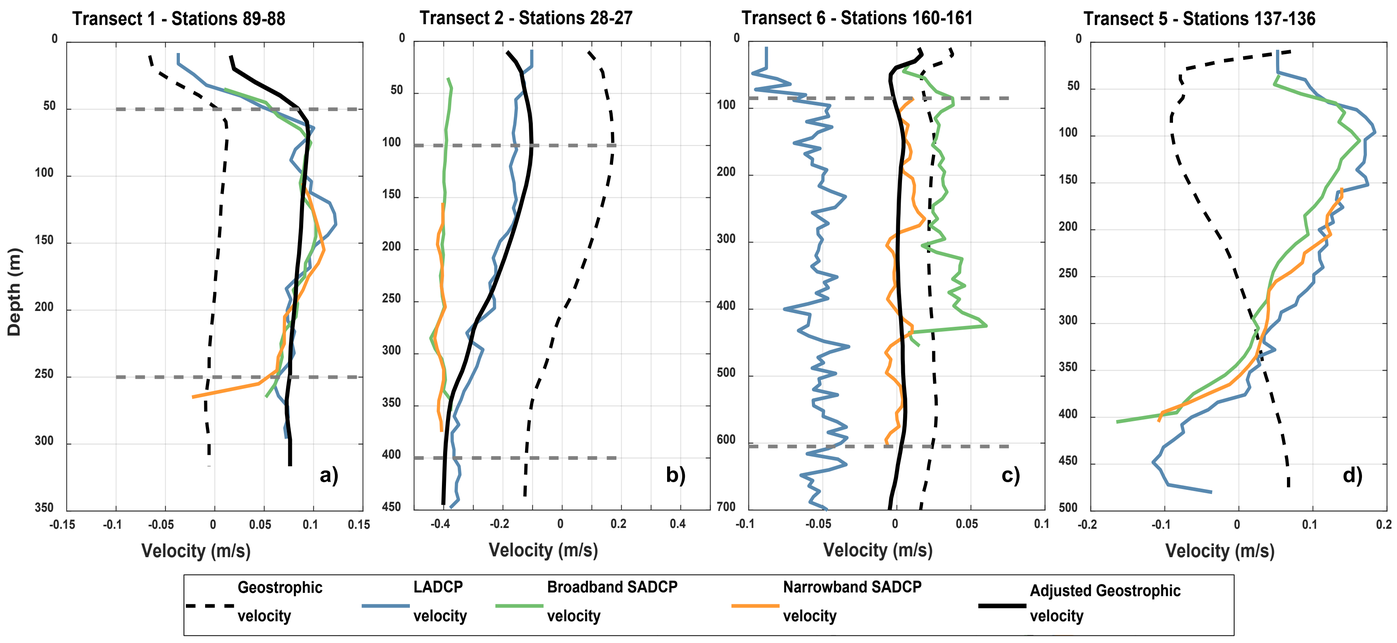


***Figure 2**. Comparison between the four different geostrophic velocity adjustments.*

WATER MASSES

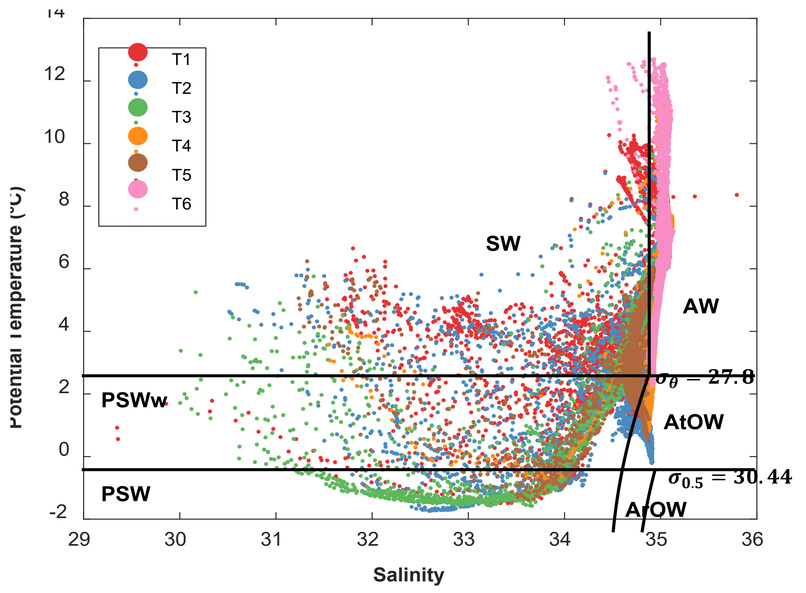


***Figure 3**. θ-S diagram of water masses present in the different transects during FARDWO-DS1 cruise: T1= Transect 1; T2=Transect 2; T3=Transect 3; T4=Transect 4; T5=Transect 5; T6= Transect 6*

ABSOLUTE TRANSPORT

	Waters	Transect	Localization	Vol. Transport (Sv)
Irminger Current (IC)	SW, AW	1	26.87-24.76 ºW (113 km)	1.382
		6	27.27-24.48ºW (72 km)	0.573
East Greenland Current (EGC)	SW, AW, wPSW	1	27.42-26.87ºW (30 km)	-5.966
	SW, AW, PSW, wPSW	2	29.79-27.56ºW (105 km)	-5.669
East Greenland Coastal Current (EGCC)	SW, PSW, wPSW	1	32.38-32.11ºW (14 km)	-0.365
		3	34.15-33-30ºW (50 km)	-0.315
Overflow	AtOW, ArOW	1	27.55-26.87ºW (35 km)	-2.915
	AtOW	4	65.31-65.70ºN (66 km)	-4.928

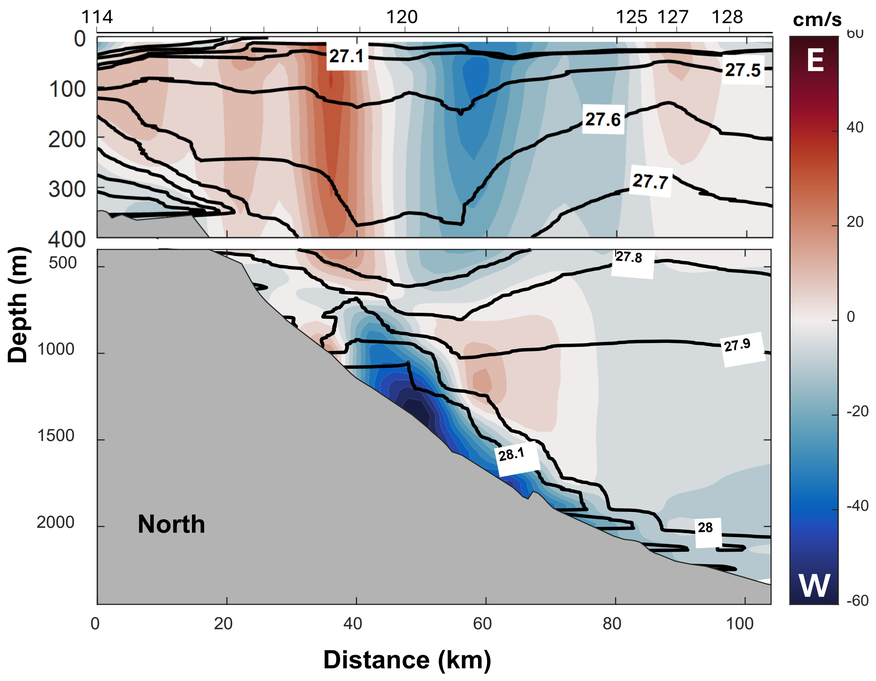
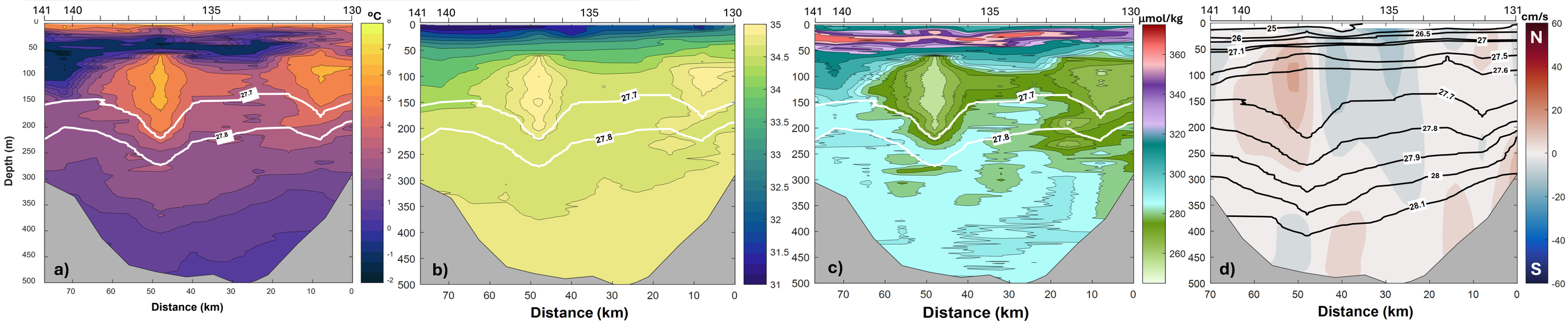


***Figure 4**. Vertical section of absolute geostrophic velocity (cm·s^{-1}) overlaid with neutral density layers (kg·m^{-3}) for Transect 4.*

KANGERLUSSUAQ TROUGH



	Flux	Waters	Localization	Vol. Transport (Sv)
Kangerlussuaq Glacier	Inflow	AW, PSW, wPSW, AtOW	31.44-31.13 ºW (14 km)	0.396
	Outflow		30.82-30.52ºW (15 km)	-0.224

***Figure 5**. Vertical sections of (a) potential temperature (ºC); (b) salinity; (c) oxygen (µmol·kg^{-1}); and (d) absolute geostrophic velocity (cm·s^{-1}) overlaid with neutral density layers (kg·m^{-3}) for Transect 5.*

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