Exploring the mechanisms driving Irminger Water bifurcation into the northern Labrador Sea and Davis Strait

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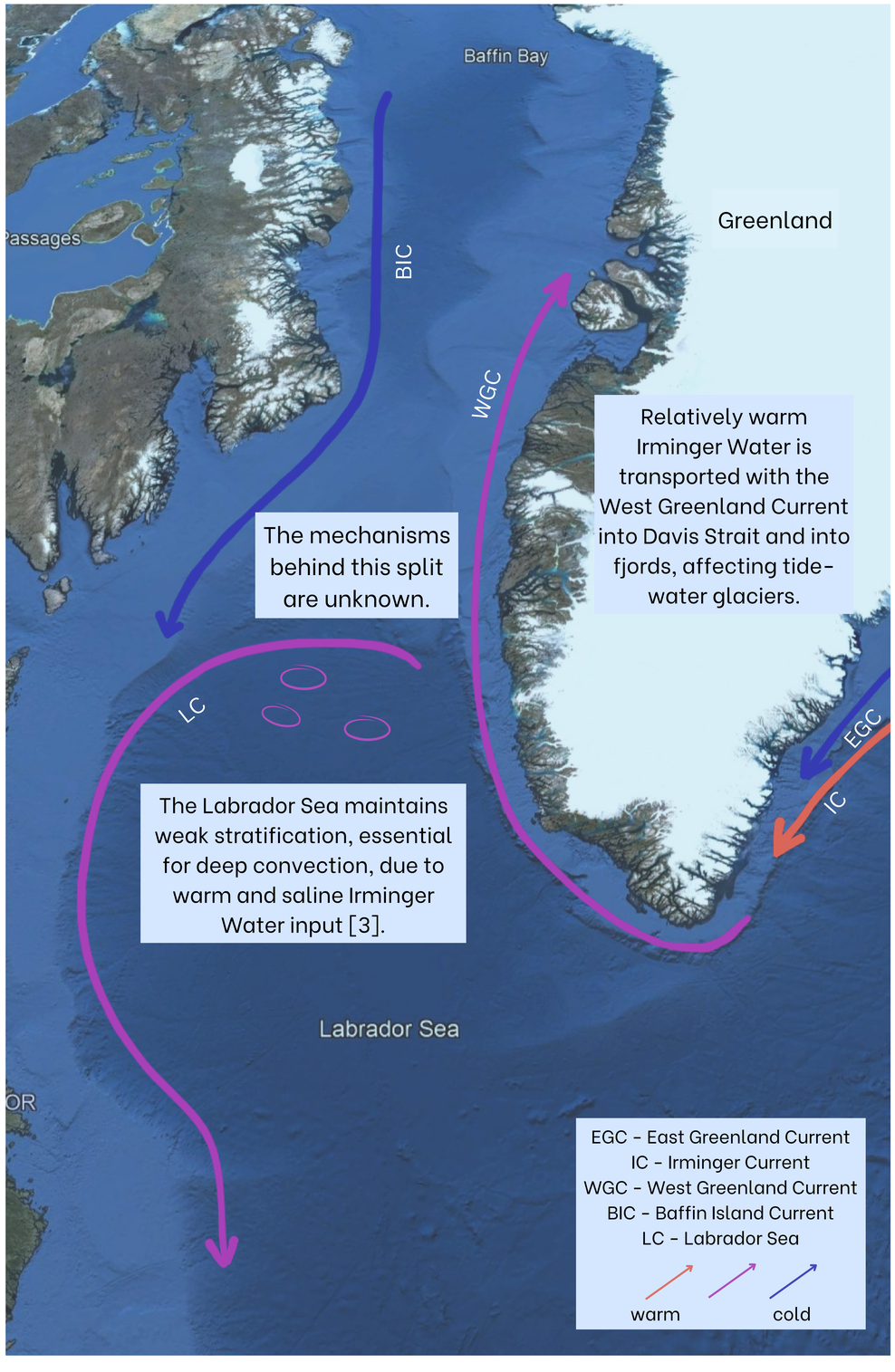


Abstract

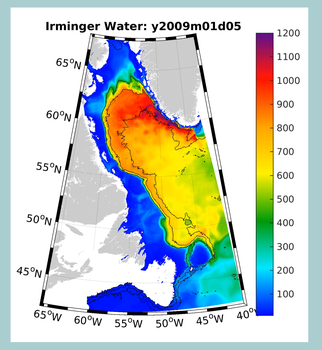
- The **warm and saline Irminger Water (IW)** originating from the North Atlantic Current and Irminger Current **bifurcates and flows into the northern Labrador Sea and into Davis Strait** with the West Greenland Current [1].
- IW acts as a source of heat and salinity in these regions however it has **highly variable properties** [2].
- We aim to study the **mechanisms driving this bifurcation** of IW with very high-resolution ocean models to understand the high-frequency variability in its heat and salinity.

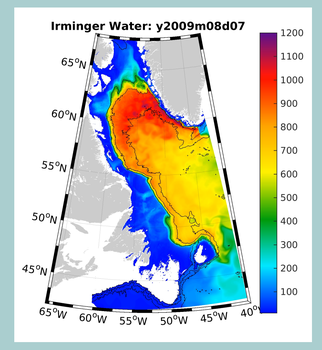
Impact

- Better understanding of **Irminger Water properties** and how it influences both Baffin Bay and the Labrador Sea.
- A better understanding of **Labrador Sea restratification** and the corresponding effect on deep convection.
- Improved representation of **fjord water properties** in ocean models.

Methods

- A **1/60° NEMO 3.6** numerical simulation of the Labrador Sea (LAB60) [4] with an Irminger Water passive tracer will be used for analysis.





Figures show depth of Irminger Water passive tracer's depth (meters) that passes a section south of Cape Farewell.
Source: https://doi.org/10.7939/r3-zwkr-0w35

Configuration:

	ANHA4-SPG12-LAB60		
Experiment	LAB60-CGRF	LAB60-DFS/ERA5	LAB60-NoGLM
NEMO ocean model version	3.6		
Horizontal Resolution	1/4 ° horizontal resolution with 1/12 ° nest covering Subpolar North Atlantic and 1/60 ° inner nest covering LS		
Vertical levels	75		
Atmospheric Forcing	CGRF	CGRF (to 2007), DFS (to 2017), and ERA5 (to 2019)	CGRF (to 2007), DFS (to 2017), and ERA5 (to 2019)
Initial and Boundary Conditions	GLORYS1v1		
Greenland Melt	Yes	Yes	No
Model bathymetry	ETOPO GEBCO		

References

1. Cuny, Jerome, Peter B. Rhines, Pearn P. Niiler, and Sheldon Bacon. "Labrador Sea Boundary Currents and the Fate of the Irminger Sea Water", Journal of Physical Oceanography 32, 2 (2002): 627-647, doi: https://doi.org/10.1175/1520-0485(2002)032<0627:LSBCAT>2.0.CO;2
2. Myers, Paul G., Nilgun Kulan, and Mads H. Ribergaard. "Irminger Water Variability in the West Greenland Current." Geophysical Research Letters 34, no. 17 (2007). Accessed February 11, 2024. https://doi.org/10.1029/2007GL030419.
3. Chanut, J., Barnier, B., Large, W., Debreu, L., Penduff, T., Molines, J. M., and Mathiot, P.: Mesoscale eddies in the Labrador Sea and their contribution to convection and restratification, J. Phys. Oceanogr., 28, 1617–1643, 2008.
4. C. Pennelly and P. G. Myers, "Introducing LAB60: A 1/60° NEMO 3.6 numerical simulation of the Labrador Sea," Geoscientific Model Development, vol. 13, no. 10, pp. 4959–4975, Oct. 2020, doi: 10.5194/gmd-13-4959-2020.