Variable Nordic Seas inflow linked to shifts in North Atlantic circulation

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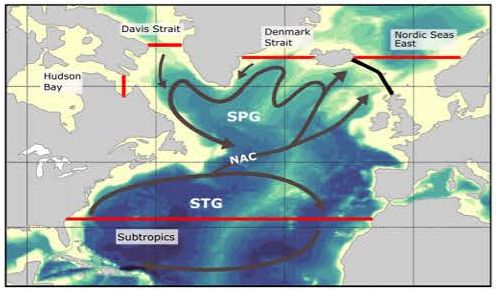
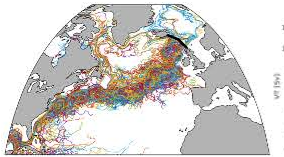
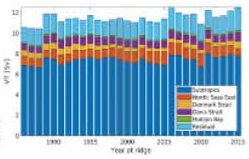
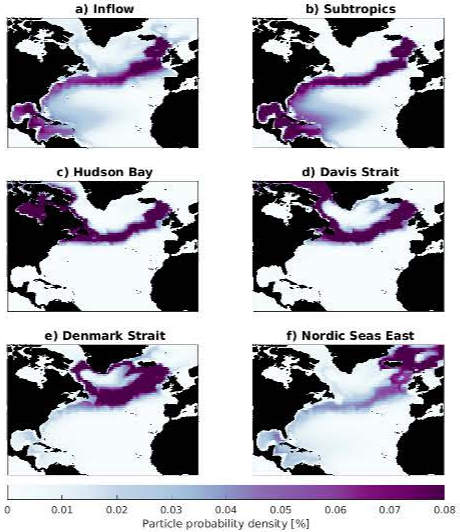
Abstract

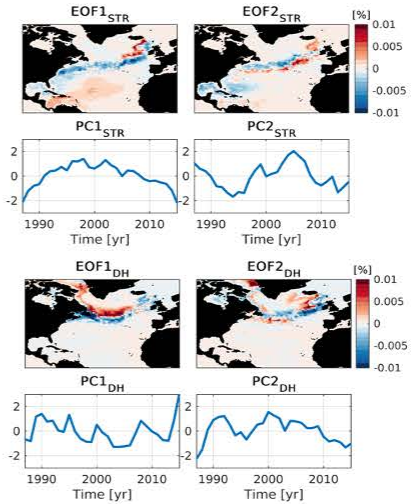
Heat transport variability at the **Iceland-Scotland Ridge** is a major driver of heat content variability in the Nordic Seas. Consequently, variable inflow **temperature, salinity and volume transport** at at the ridge influence marine ecosystems and sea ice extent further downstream, as well as continental climate in north-western Europe. The **predictability** of the system depends on how **inflow variability** relates to large-scale ocean **circulation changes** in the North Atlantic. Here, we explore the link between variability at the Iceland-Scotland Ridge and changes in the North Atlantic circulation in a **Lagrangian framework**.











	VT_{IN}	TWT_{IN}	TWS_{IN}
VT_{IN}	—	0.22	0.21
VT_{STR}	**0.85**	0.31	**0.46**
VT_{DH}	**0.60**	−0.17	−0.27
VT_{DEN}	0.09	**−0.68**	**−0.62**
VT_{NOR}	0.02	**0.42**	0.07
VT_{RES}	**0.72**	0.19	0.13
VT_{STR}/VT_{IN}	−0.09	0.19	**0.53**
VT_{DH}/VT_{IN}	0.24	−0.31	**−0.42**
VT_{DEN}/VT_{IN}	−0.11	**−0.72**	**−0.65**
VT_{NOR}/VT_{IN}	−0.25	0.34	0.00
VT_{RES}/VT_{IN}	**0.38**	0.13	0.05
$(VT_{DH}+VT_{DEN}+VT_{RES})/VT_{IN}$	0.28	**−0.45**	**−0.51**
$PC1_{STR}$	−0.02	**0.38**	**0.42**
$PC2_{STR}$	−0.10	**0.41**	0.27
$PC1_{DH}$	**0.42**	**−0.44**	−0.27
$PC2_{DH}$	0.18	0.12	0.07

Methods:

Tracking ~9.6 million Lagrangian particles released at the Iceland-Scotland Ridge during **1986-2015** backwards in time for **10 years**

Source regions and advective pathways:

64% of the inflow volume transport comes from the subtropics and 26% has a subpolar or Arctic origin.

Circulation shifts and inflow properties:

Notable **shifts in the advective pathways** detected through EOF analysis. After 2010 the **subpolar front** has been shifted southeastward. Such a shift is linked to a **colder and fresher** inflow.

For more, see: https://doi.org/10.1175/JCLI-D-20-0917.1