



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure and the
Environment*

The North Icelandic Jet and its contribution to the Denmark Strait overflow water in a high-resolution ocean model

**Carlo Corsaro, Univ. Catania (IT)
Andreas Sterl, KNMI (NL)**

Origin of DSOW

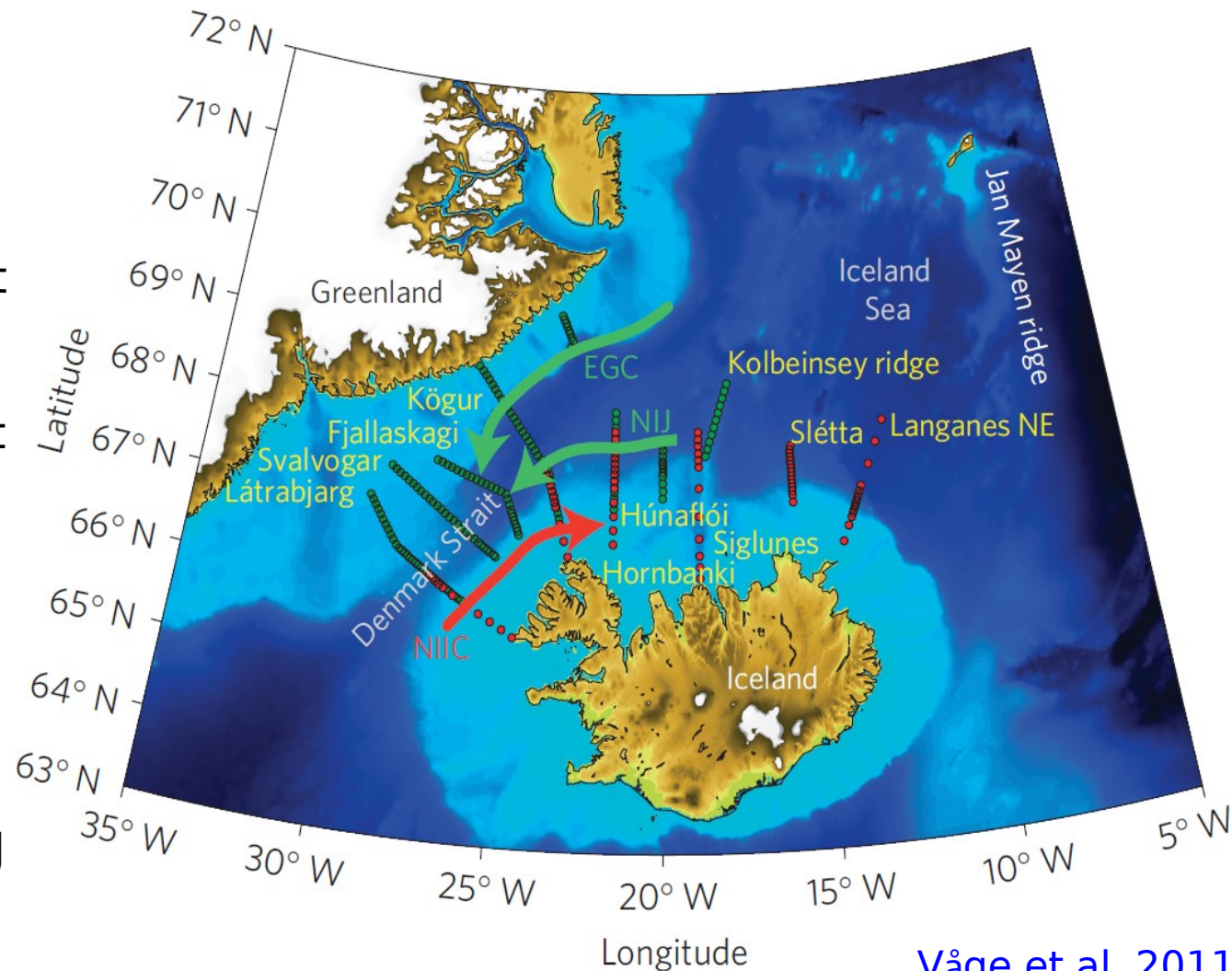


1. open-ocean convection in Nordic Seas => overflow
2. via EGC; derived from boundary current

Våge et.al, (2011):
large and **densest** part
from NIJ

Mixing (no mass
transport) in interior
Nordic Seas => NIJ

Sinking (mass
transport): NIIC => NIJ

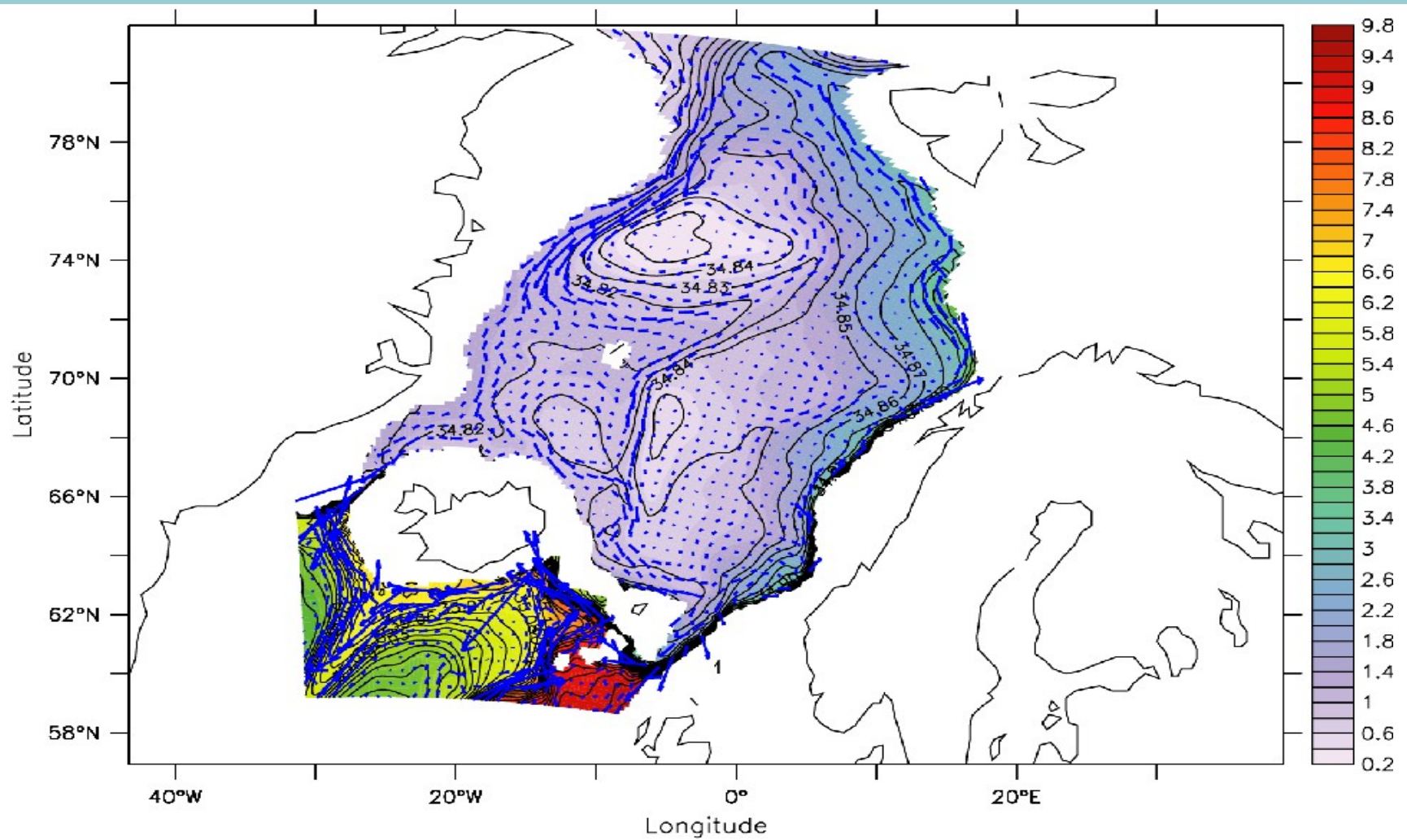


Våge et.al, 2011

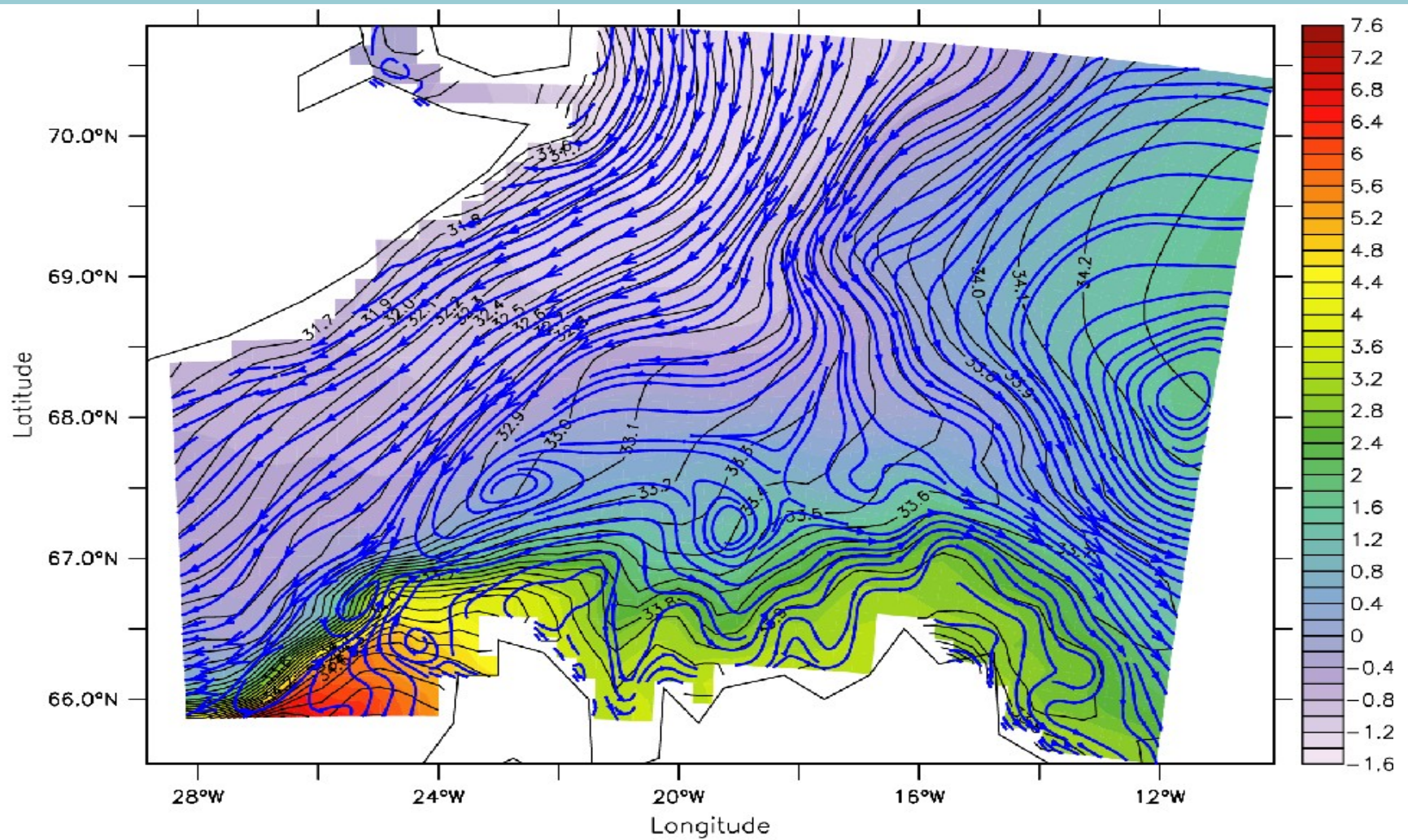


The model

- NEMO in ORCA025 config (0.25 deg, but higher in Nordic Seas)
- 46 layers
- Stand-alone
- Sub-surface restoring
- 45 years (ERA-40 period)
- Here: last 25 years
- DFS3 forcing (derived from ERA-40)
- Output: 5-day averages
- Here: monthly-means

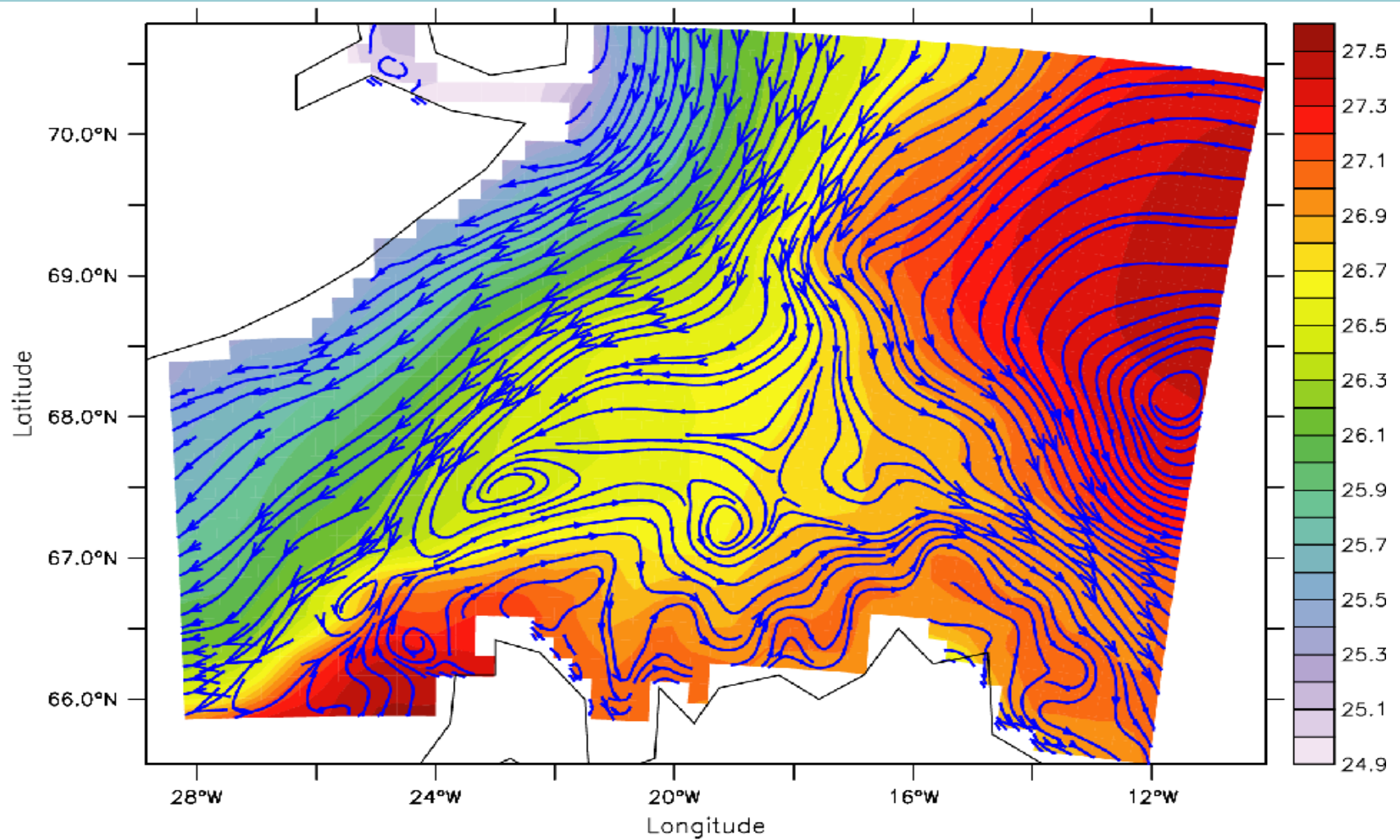


T + S + vel. at $z=534.0197$

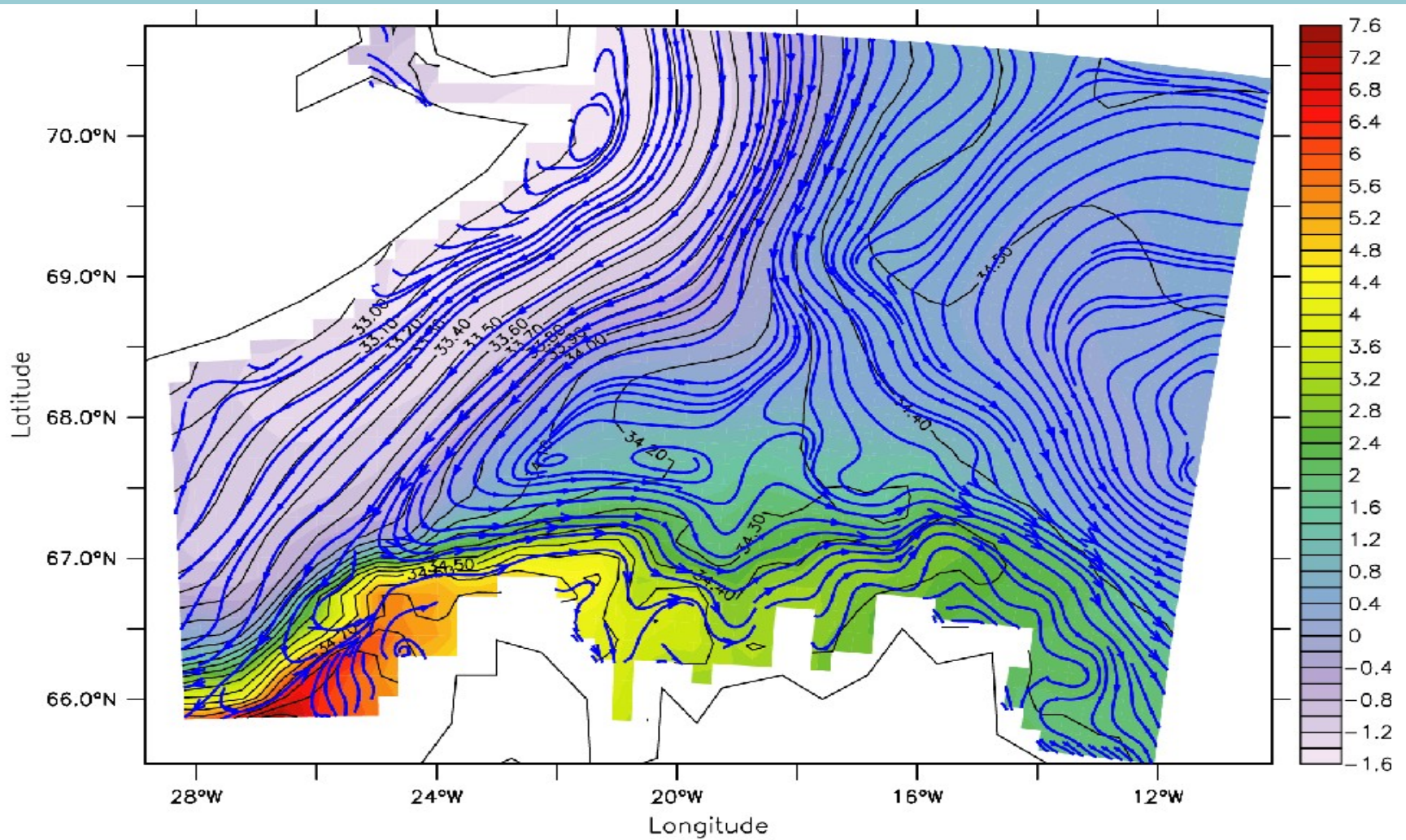


T + S + vel. at $z=9.454049$

A. Sterl; Argo Workshop, Southampton
20.06.2013

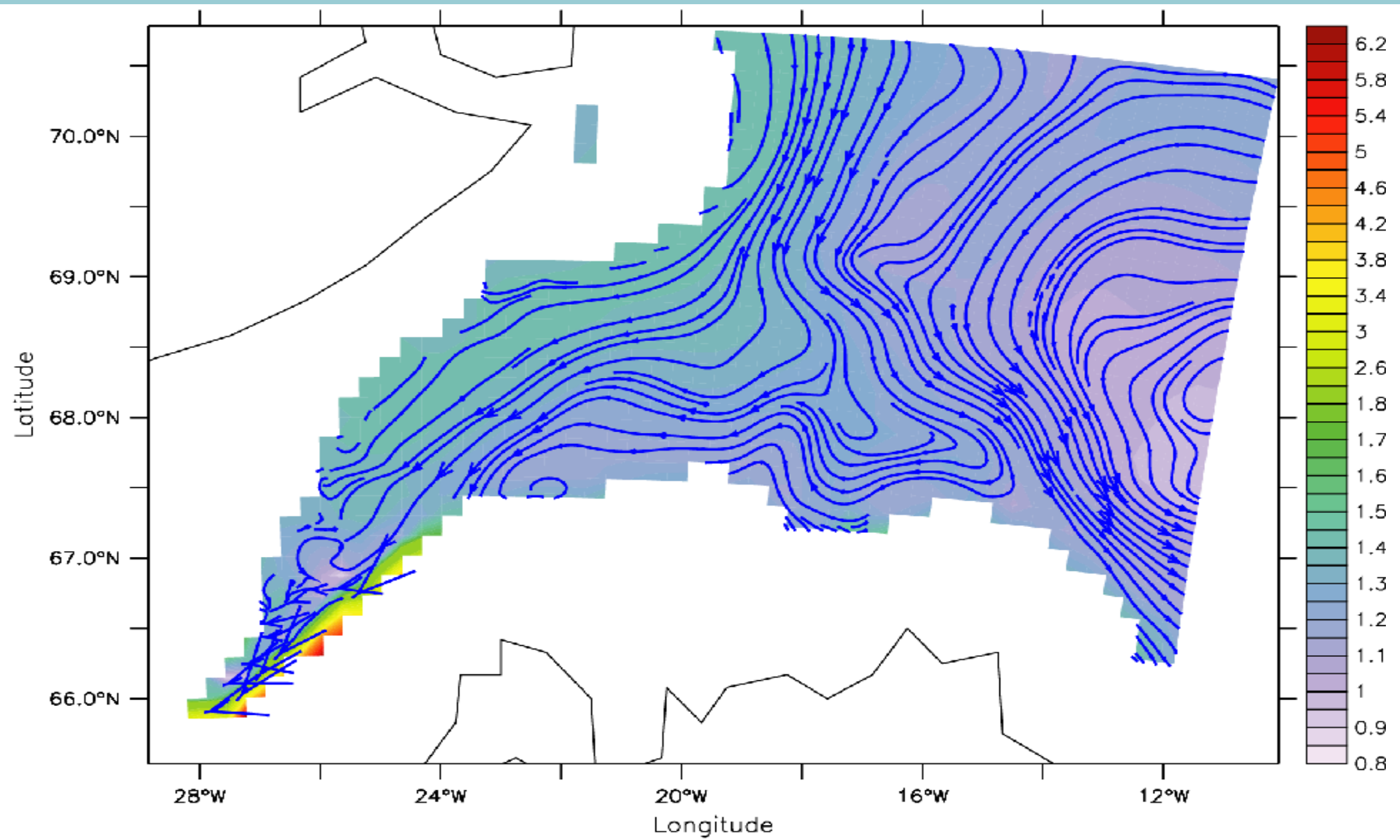


Density (σ_0) at $z=9.454049$

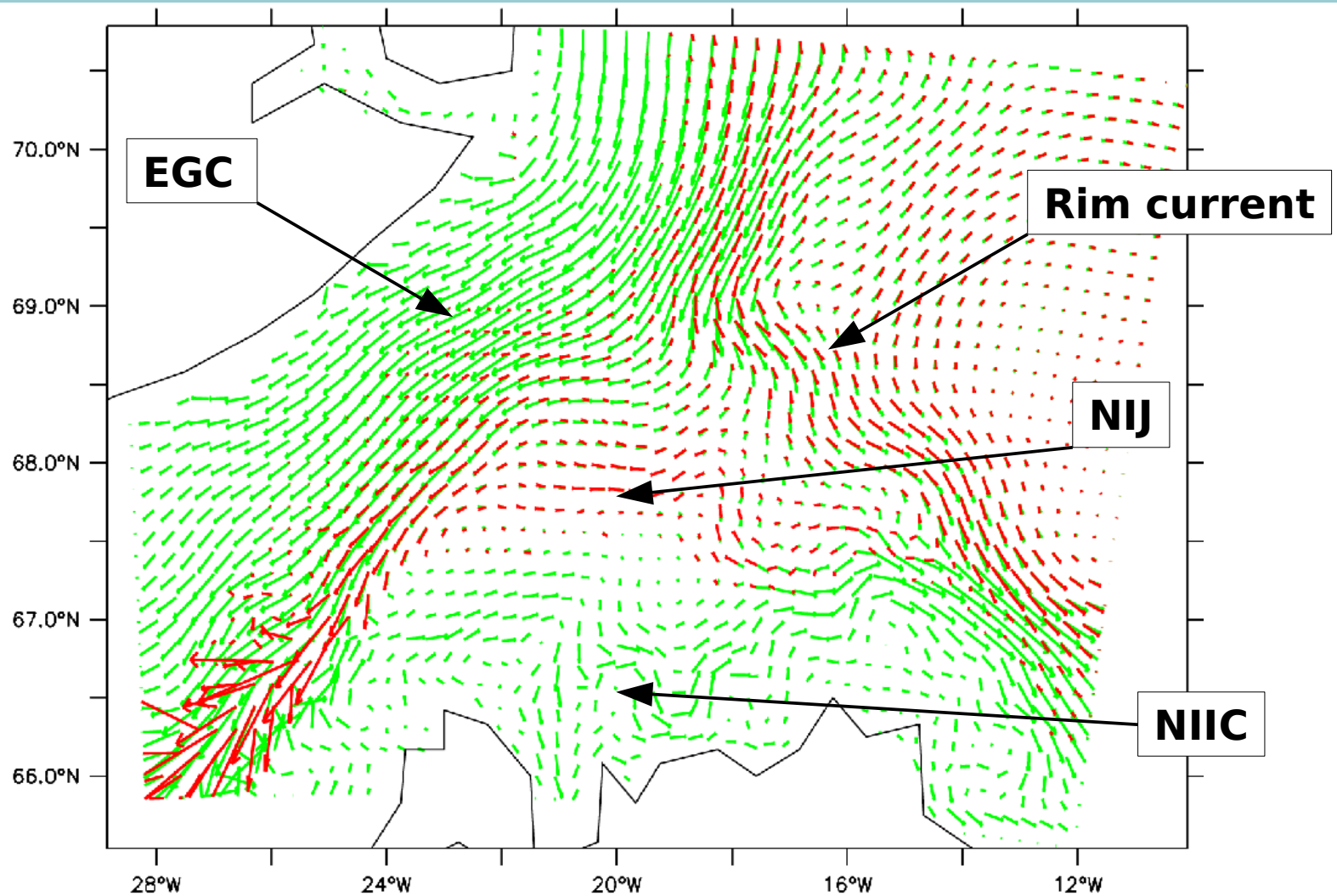


T + S + vel. at z=93.59412

A. Sterl; Argo Workshop, Southampton
20.06.2013



T + vel. at z=452 m
— flow arrow scale 6.25E-02

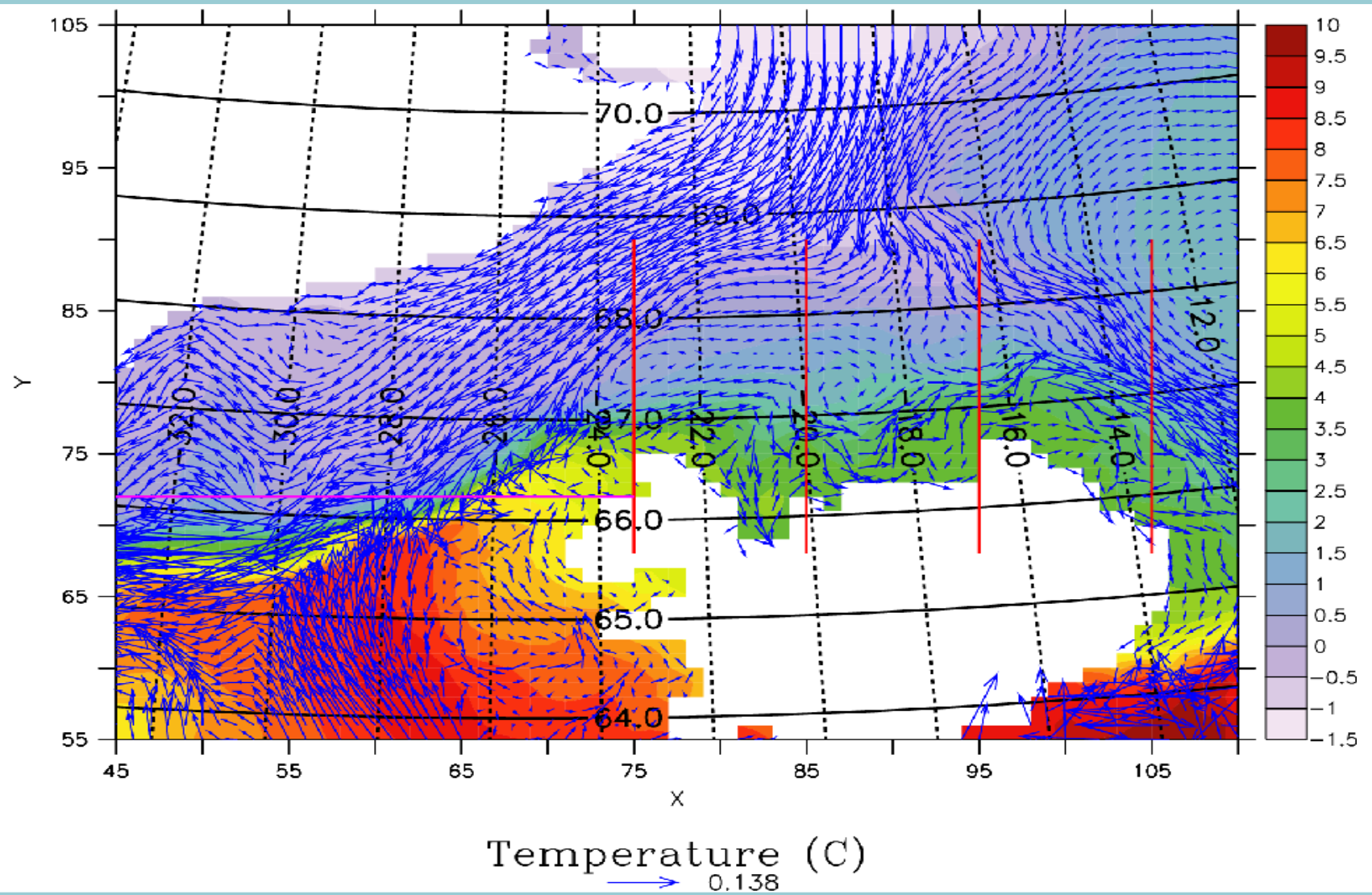


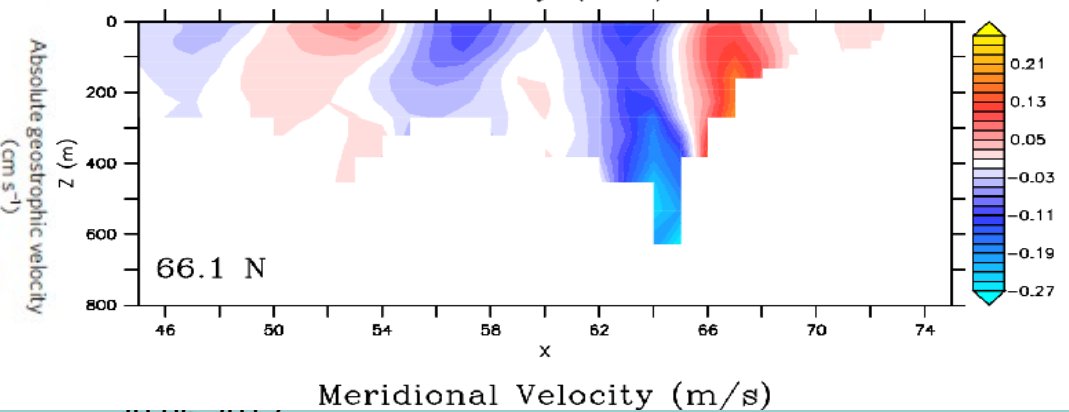
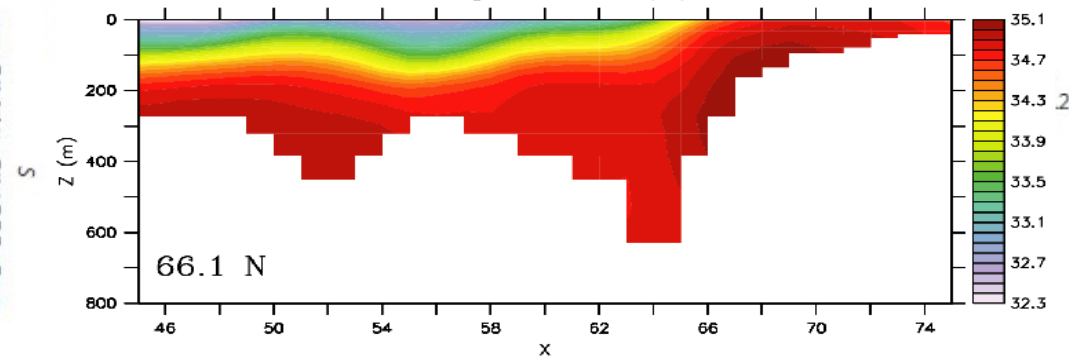
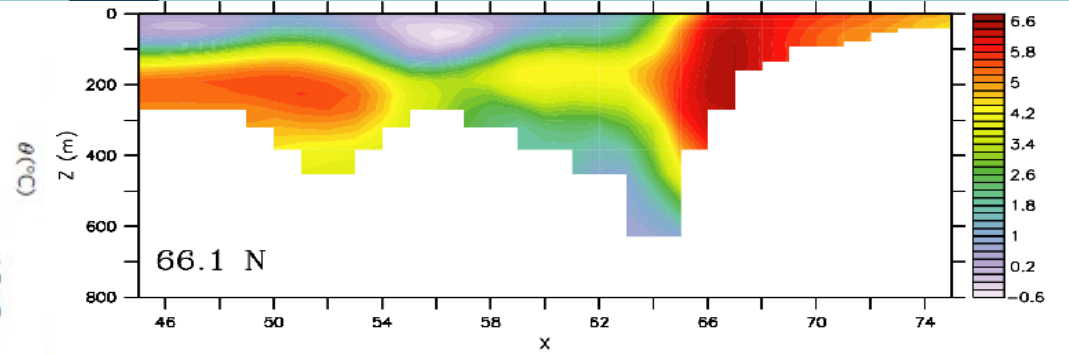
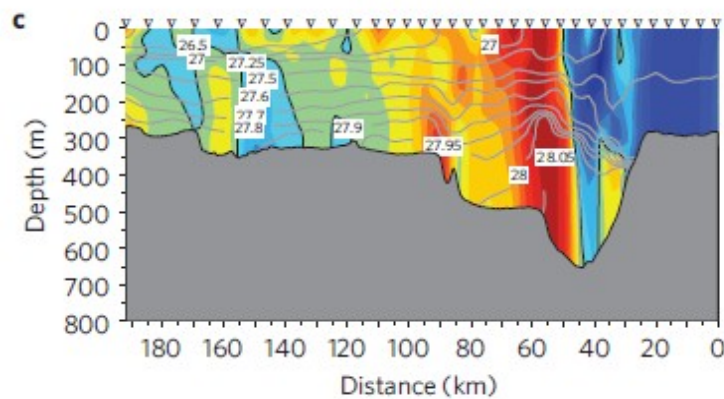
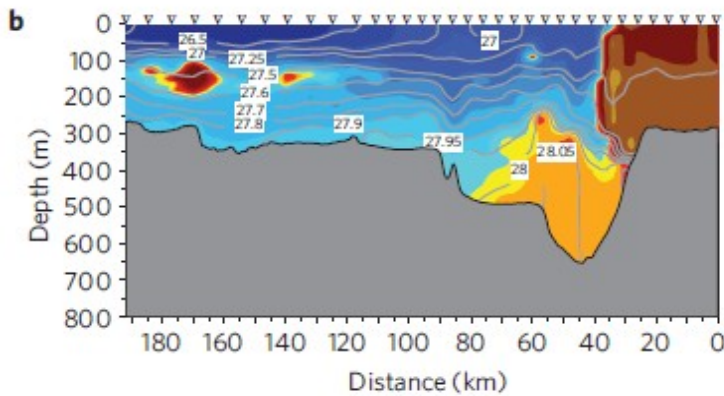
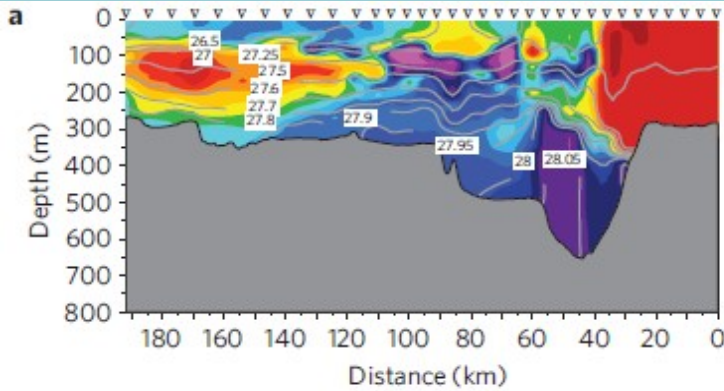


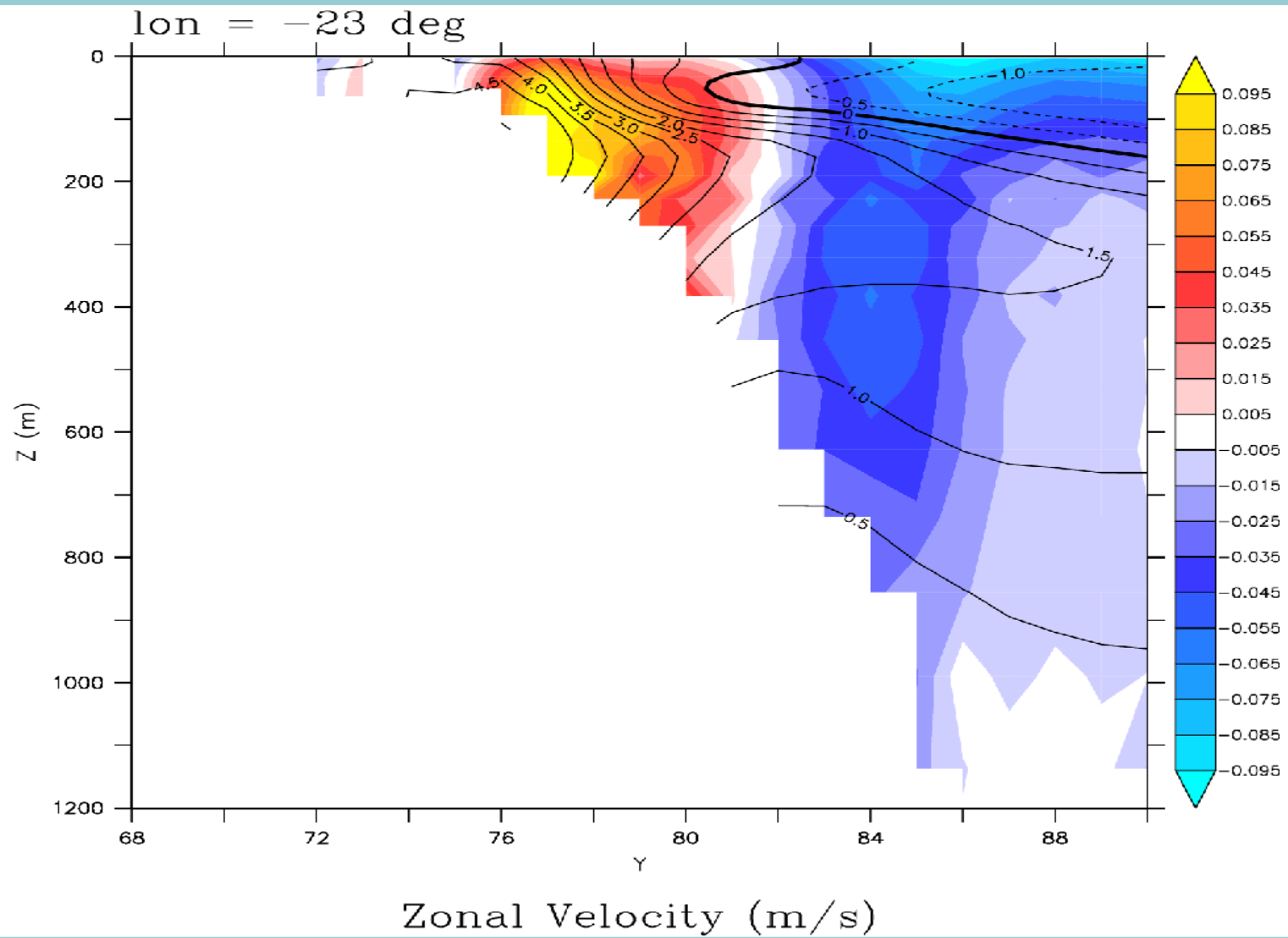
Transports

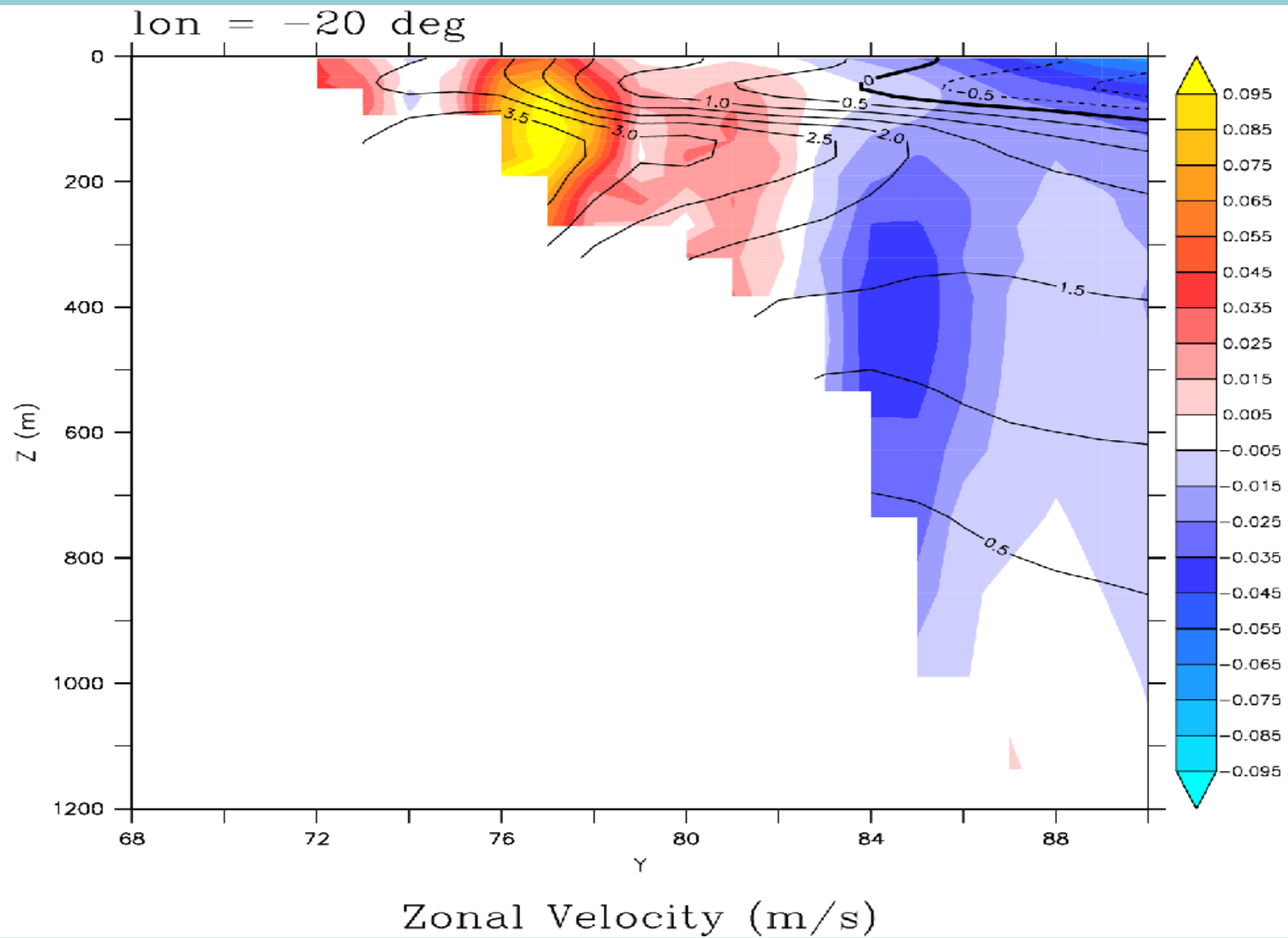
	observation	model
NIIC	0.75 / 1.5	1.2 – 1.35
NIJ (20°W)	1.5 ± 0.2	1.2 ± 0.3
DSOW	2.9 – 3.7	3.2 ± 0.7

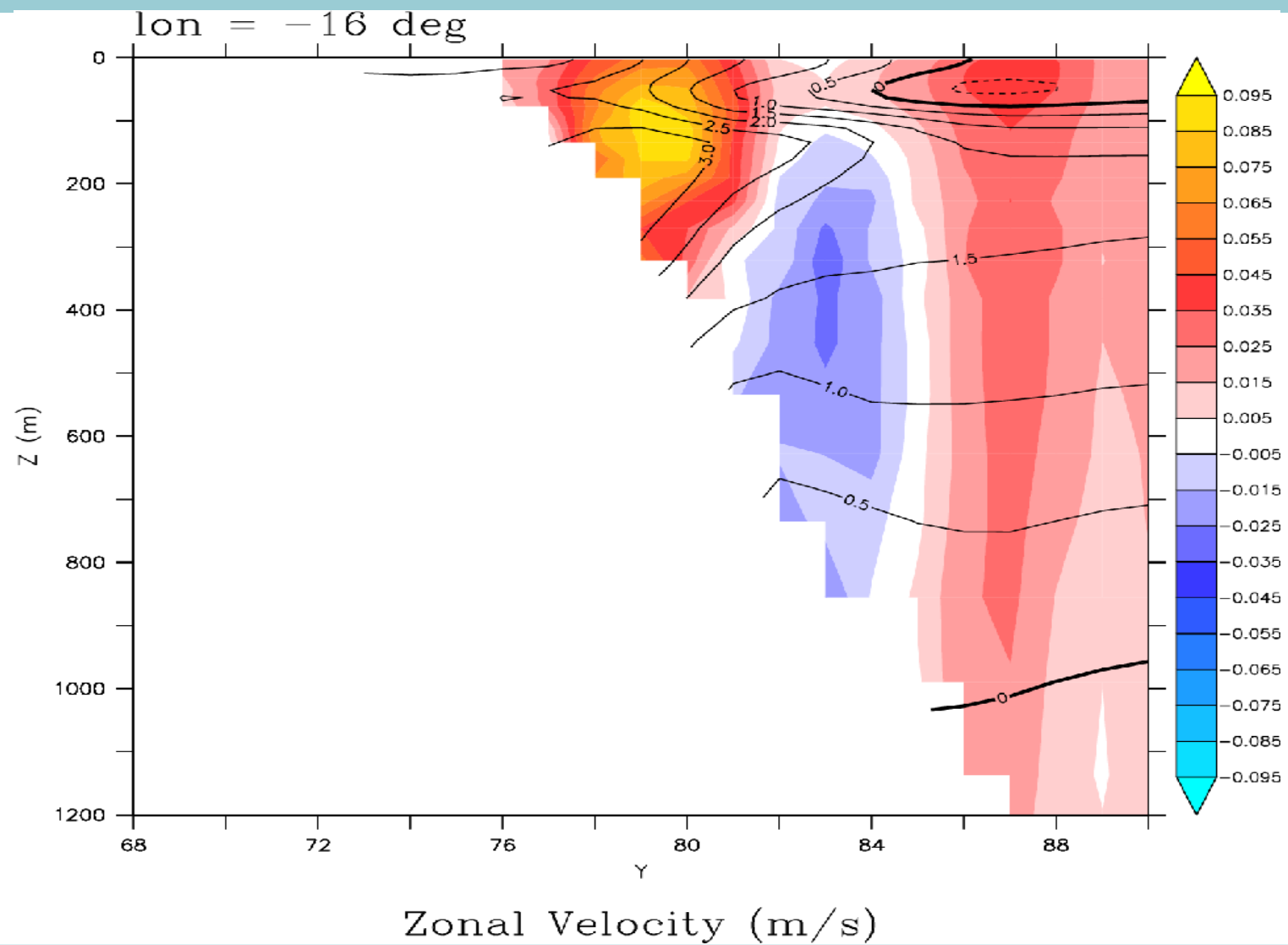
... are well reproduced by the model

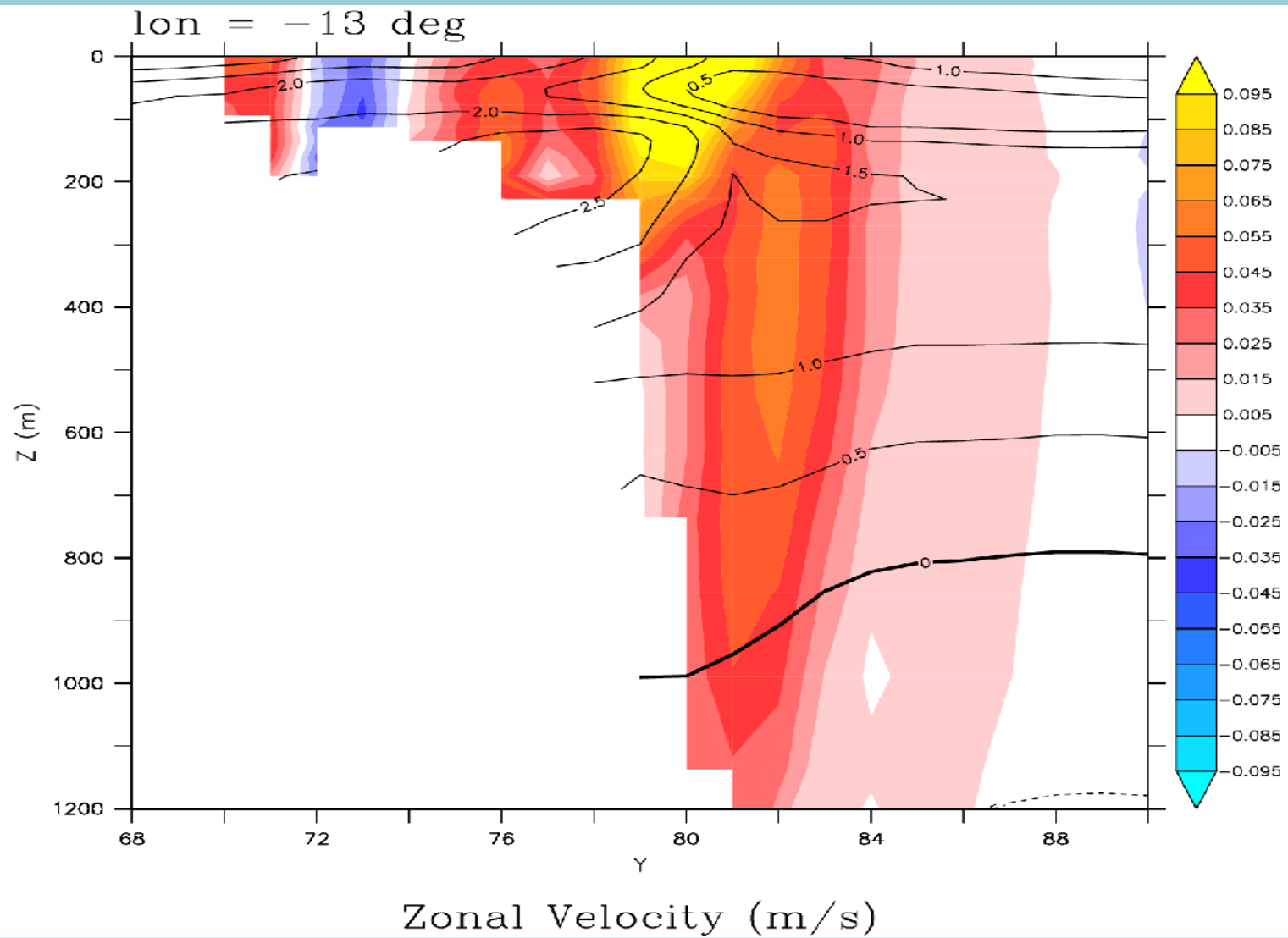






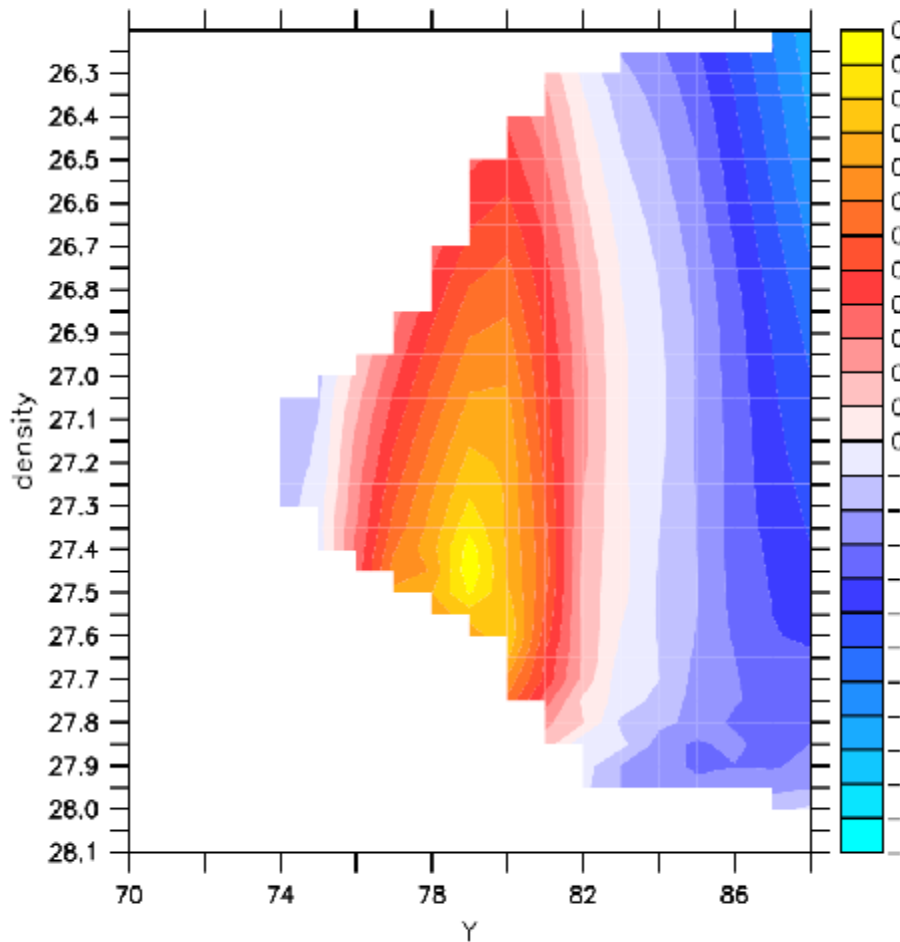






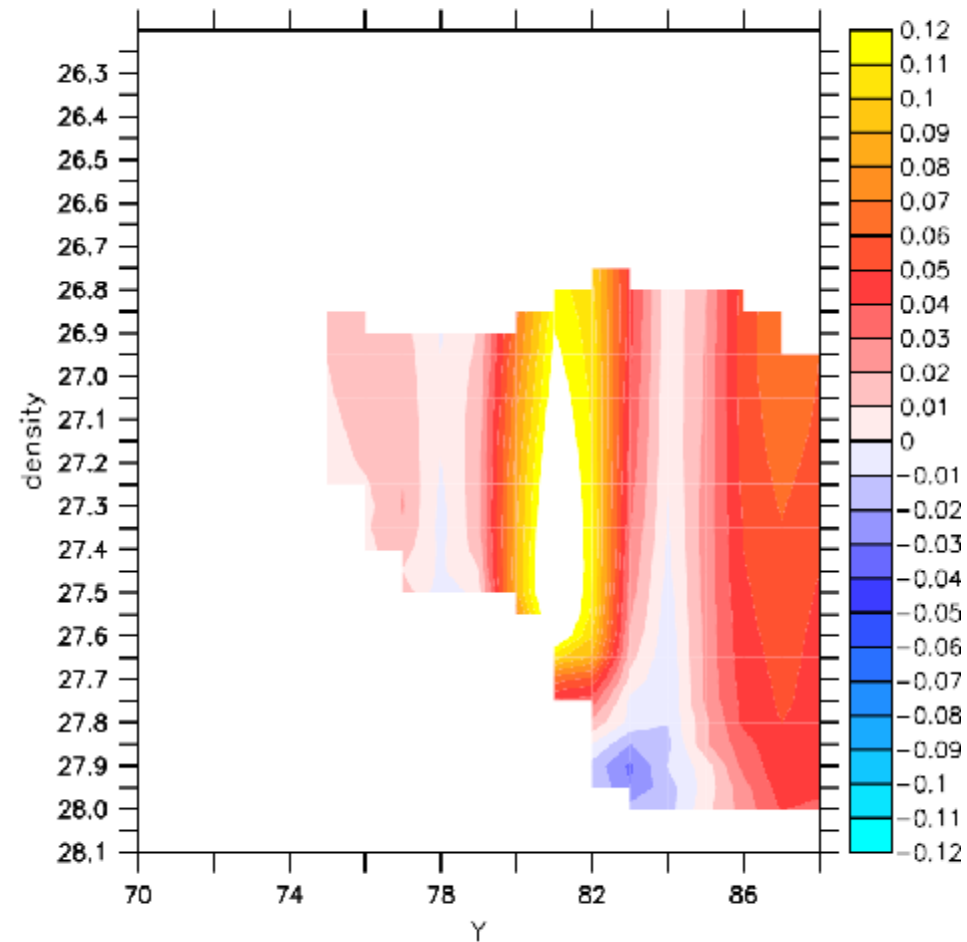


X : 78
TIME : 04-JAN-0006 18:00 to 22-DEC-0049 05:59



Mean zonal current vs density north of Icel

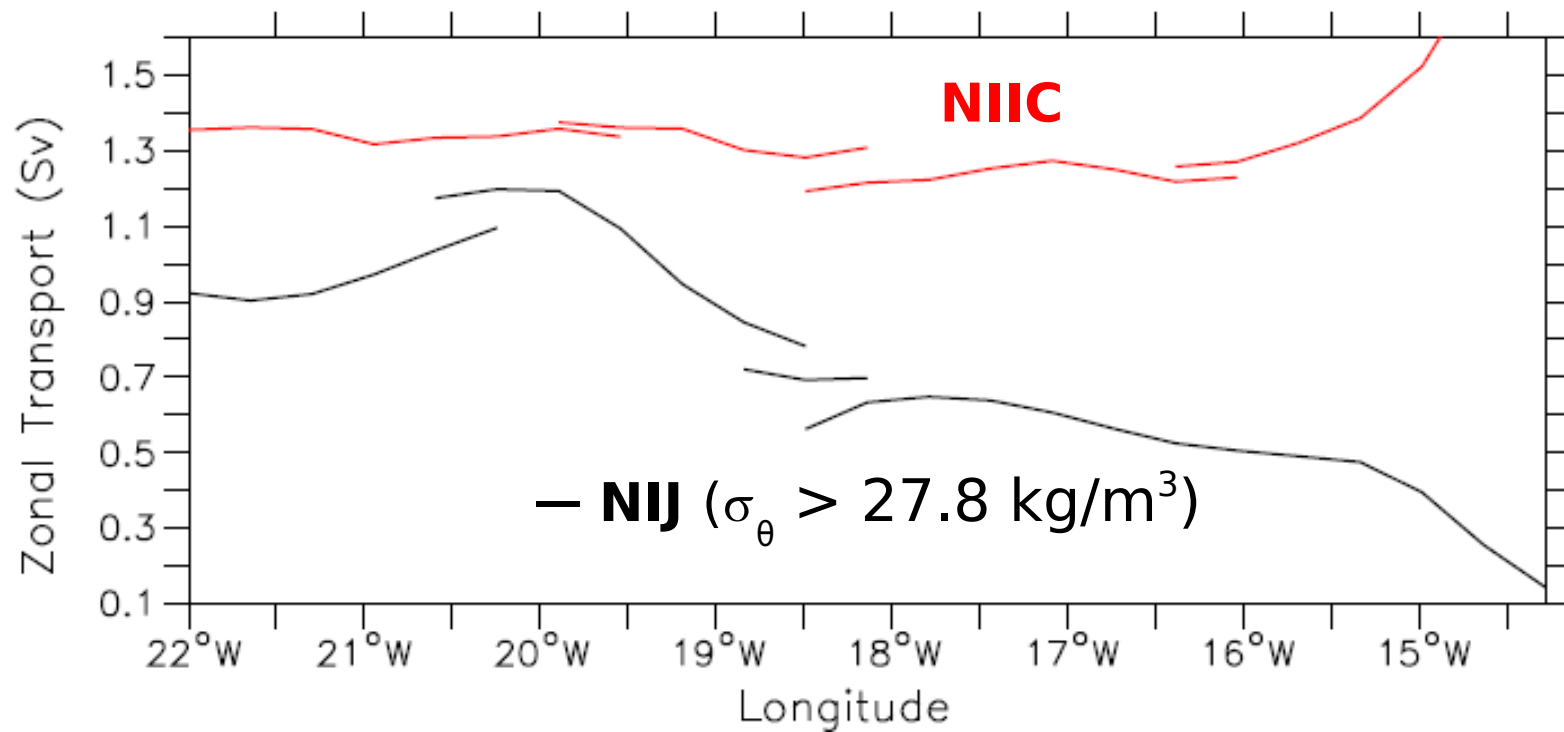
X : 98
TIME : 04-JAN-0006 18:00 to 22-DEC-0049 05:59

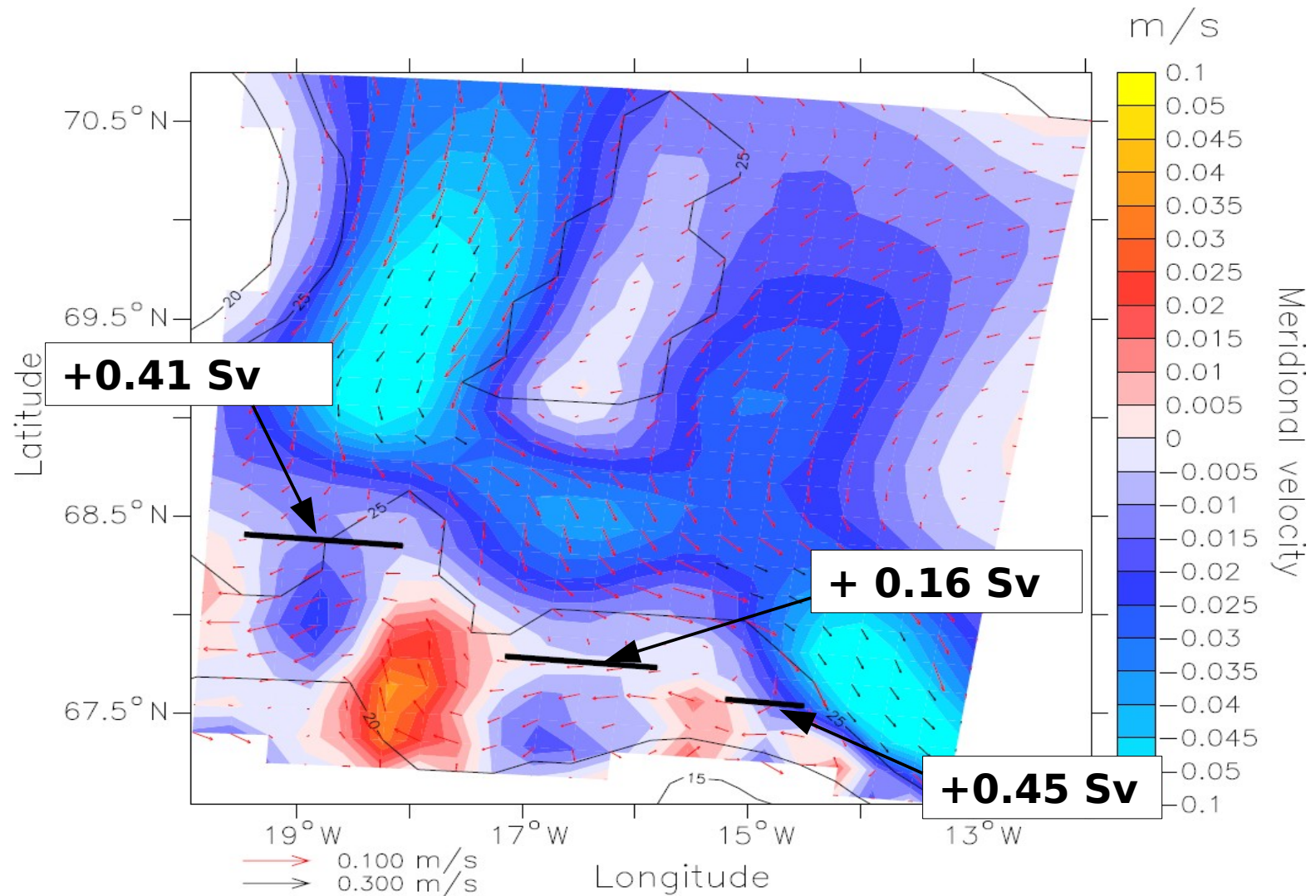


Mean zonal current vs density north of Icel



Transports along path of NIIC and NIJ







NIIC

- Flows eastward along north coast of Iceland
- Depth range 100 – 200 m
- Joins Nordic Seas rim current at the NE corner of Iceland
- Cools/densifies at surface, but not at depth
- Hardly loses mass (0.1 Sv sinking)
- No interaction with NIJ (no correlations)



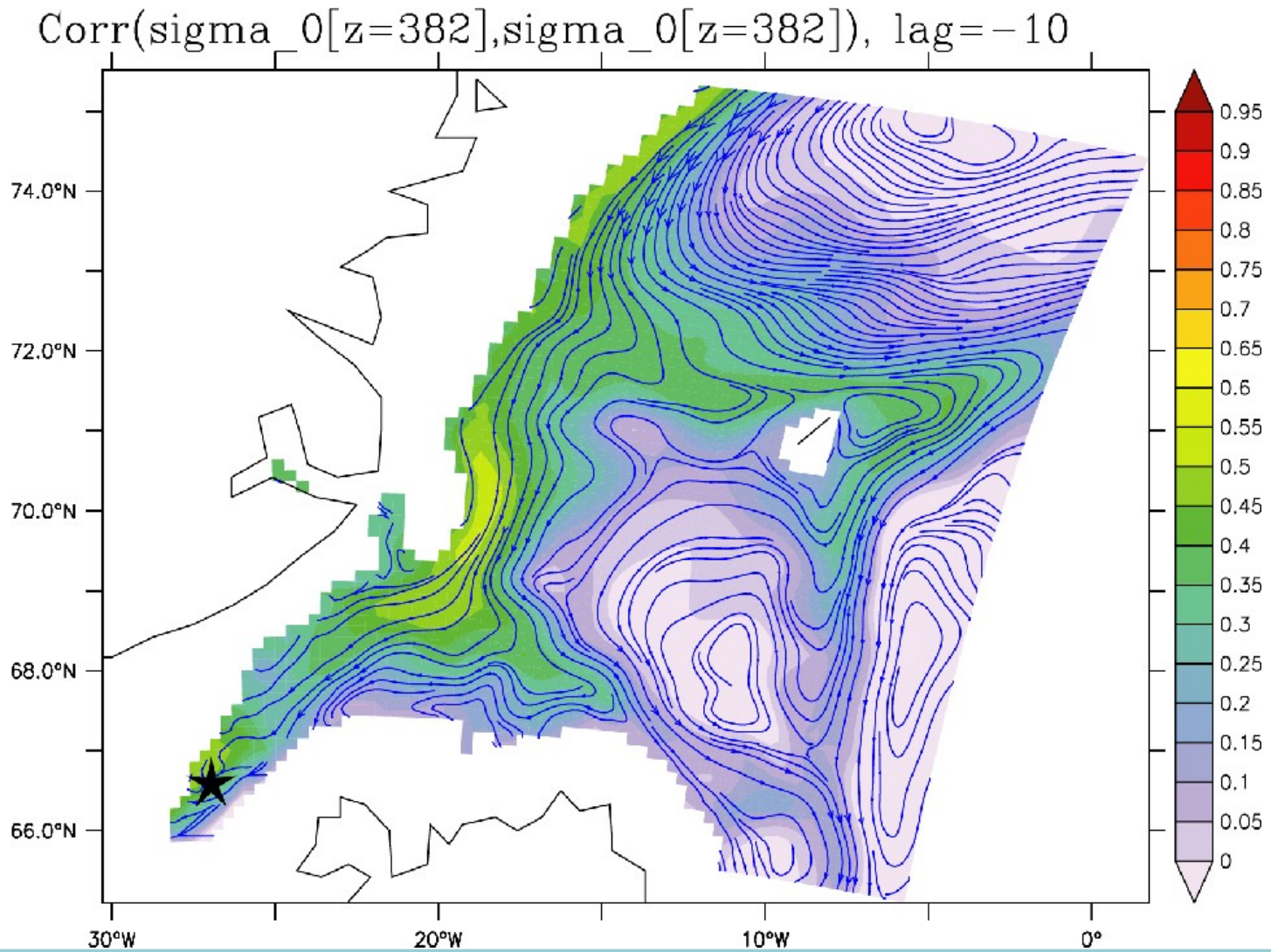
NIJ

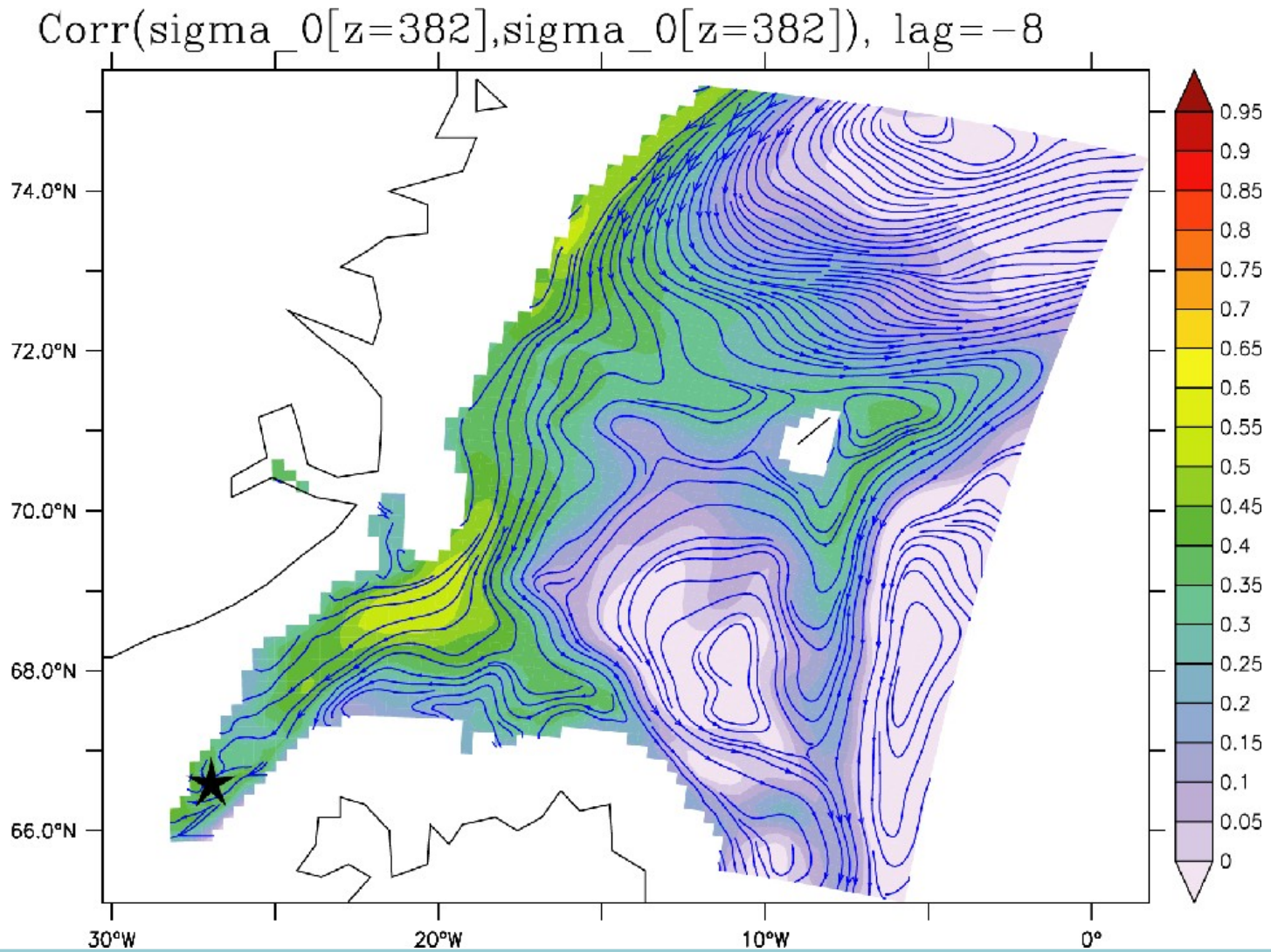
- Flows westward along north coast of Iceland
- Depth range surface to bottom, but maximum around 400 m
- Does not exist east of 14-15 °W
- Increases from 0.1 to 1 Sv
- Hardly any densification
- Is fed by Nordic Seas rim current
- Contributes about 1/3 of DSOW

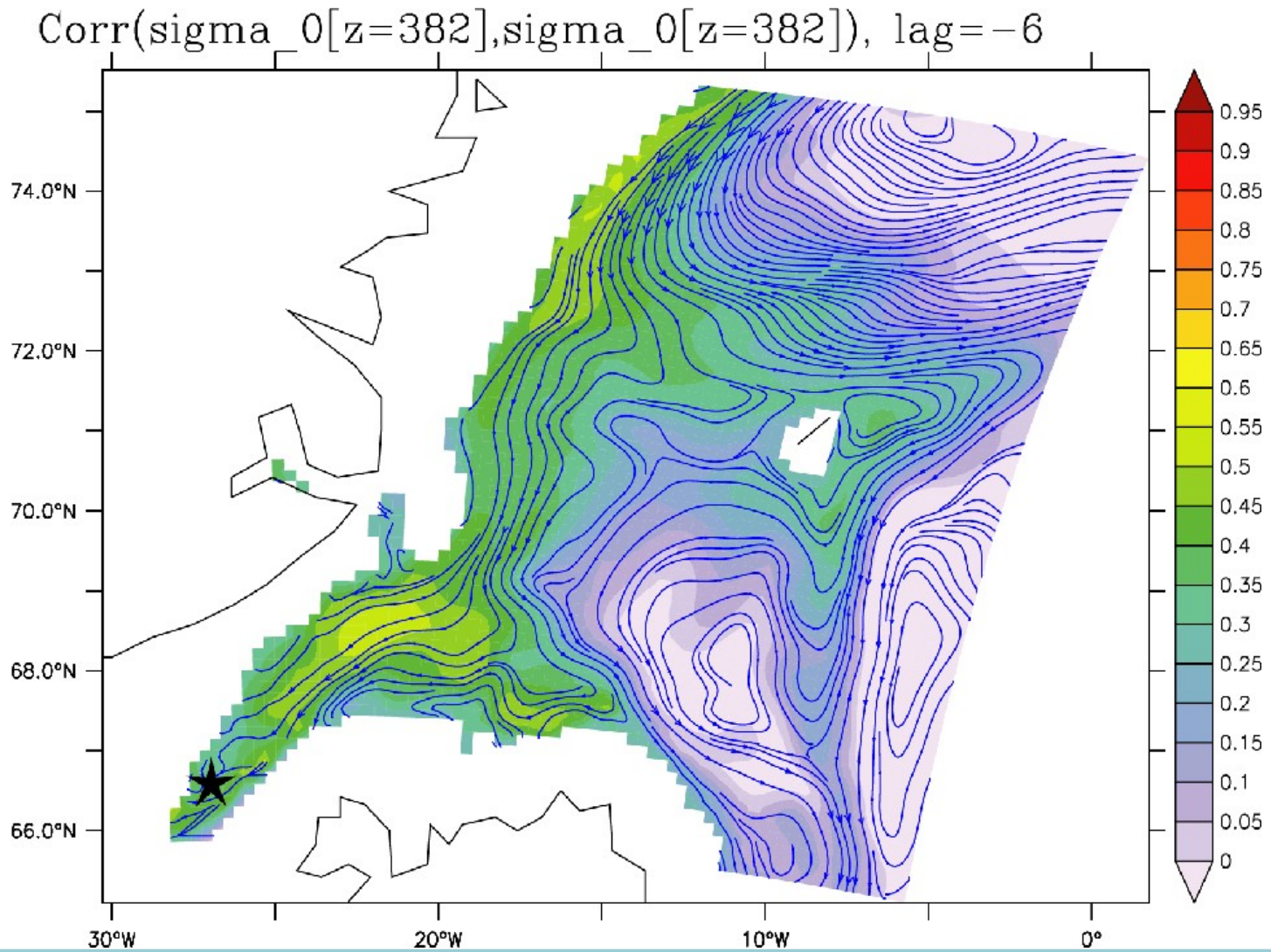


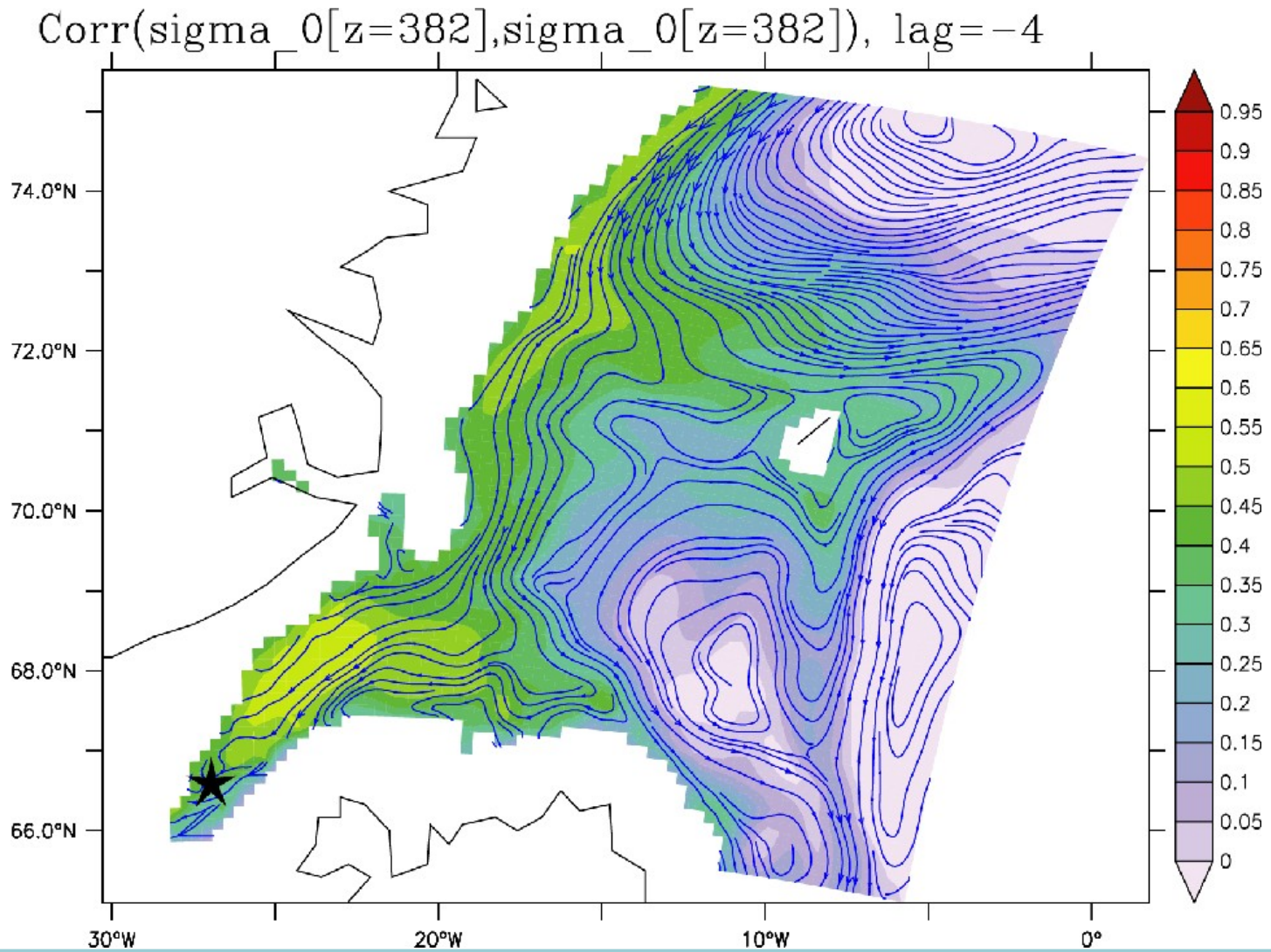
Where does DSOW come from?

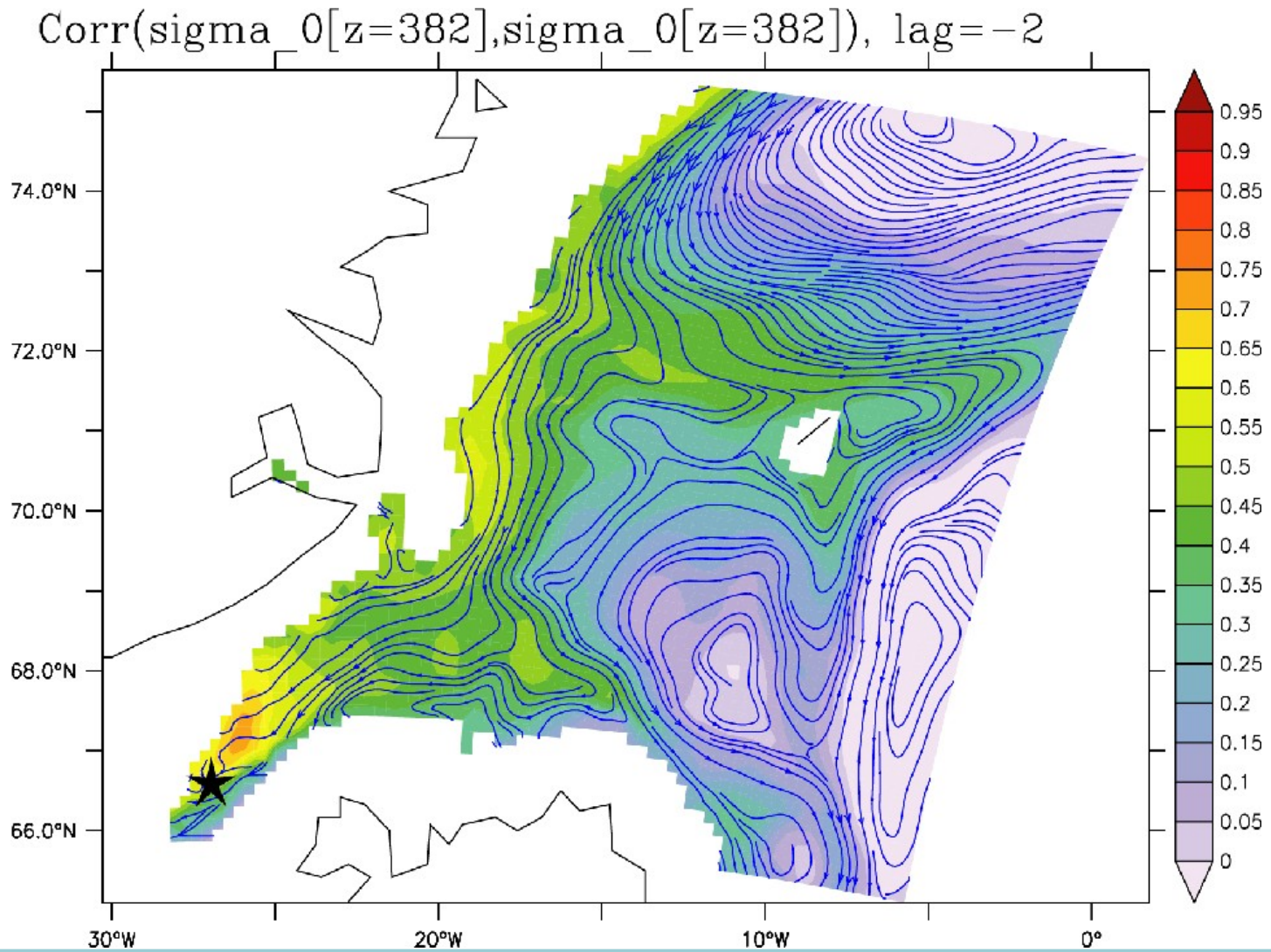
1. intermediate depth (400 m), western slope

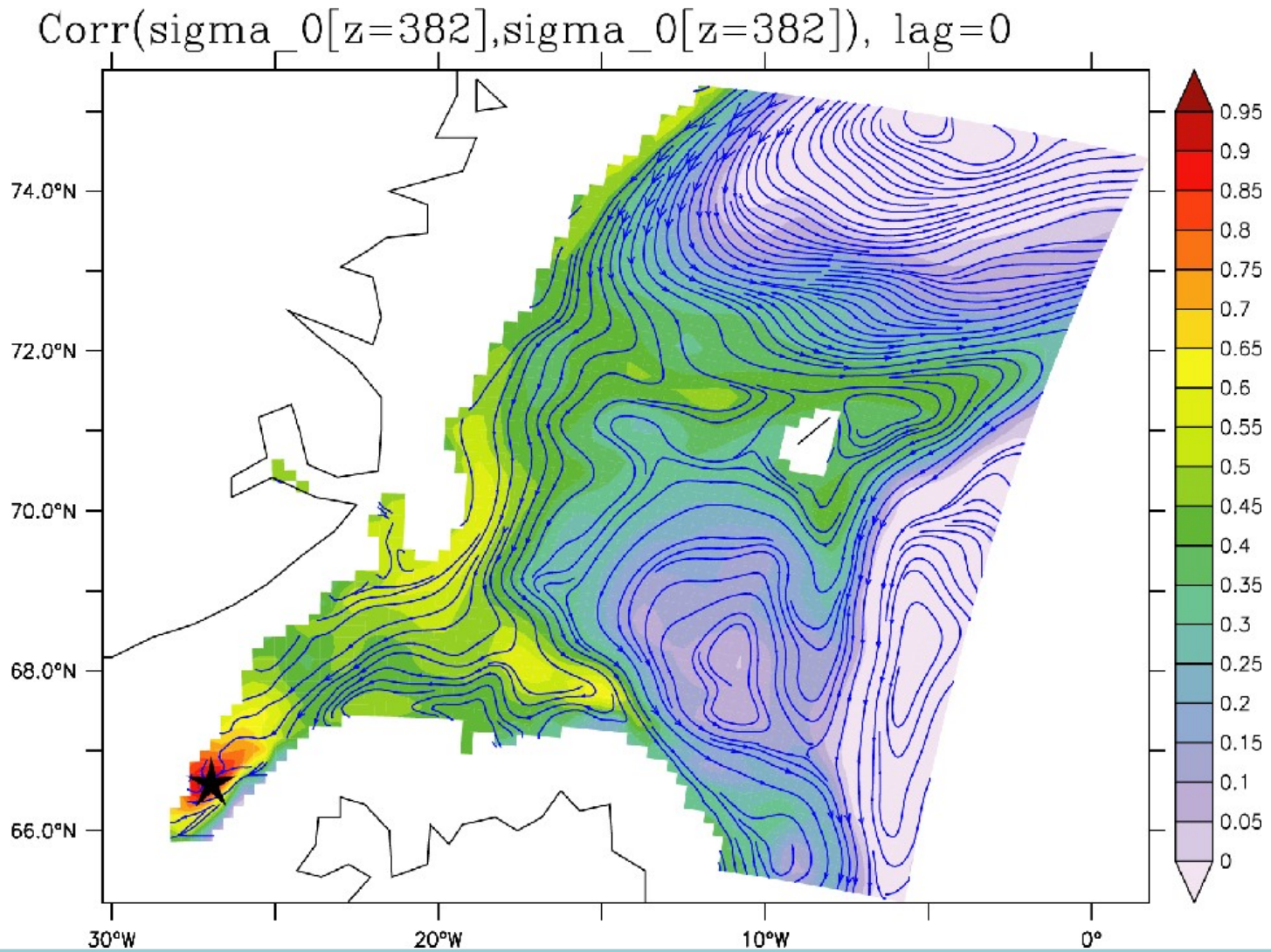


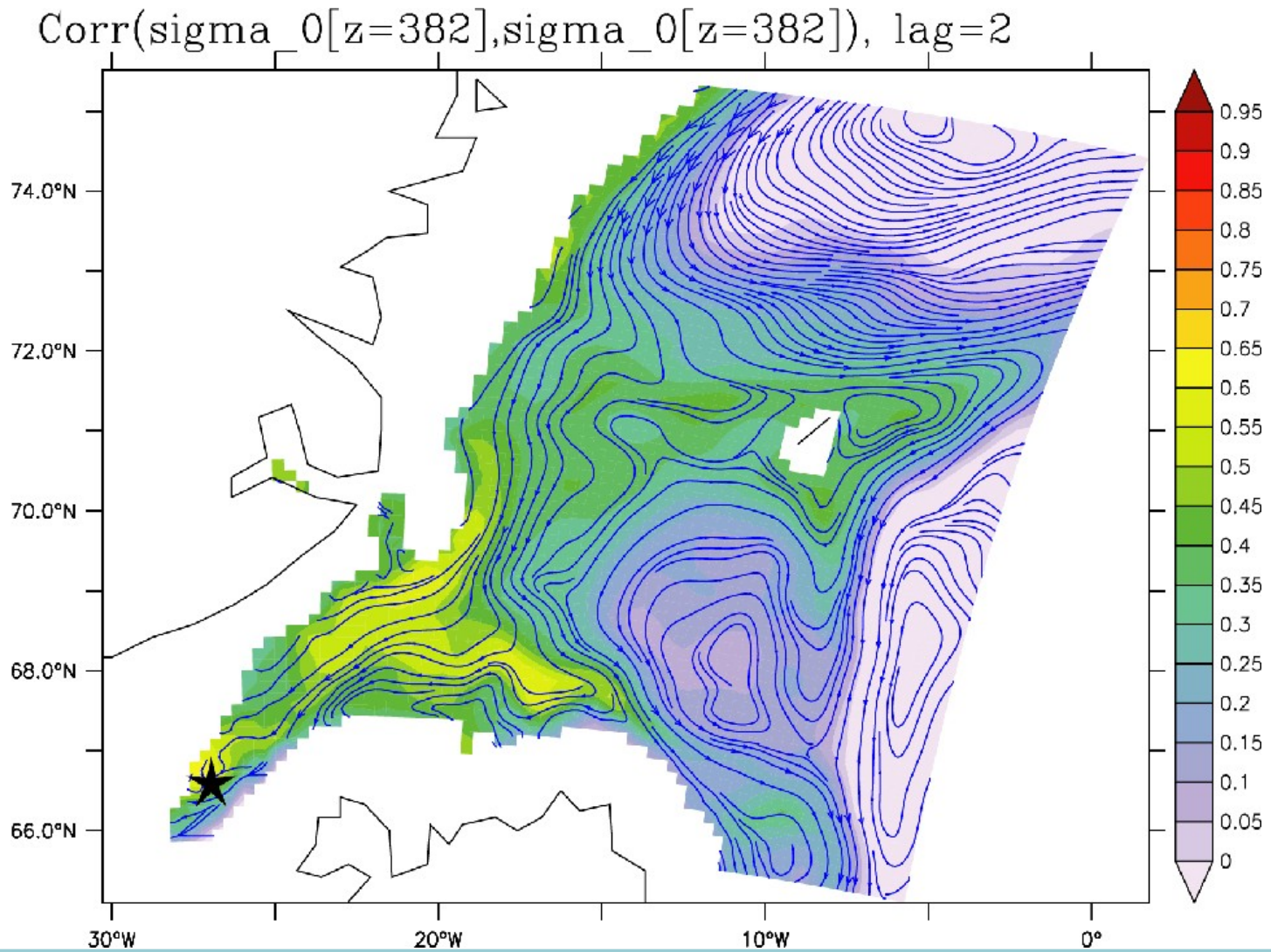


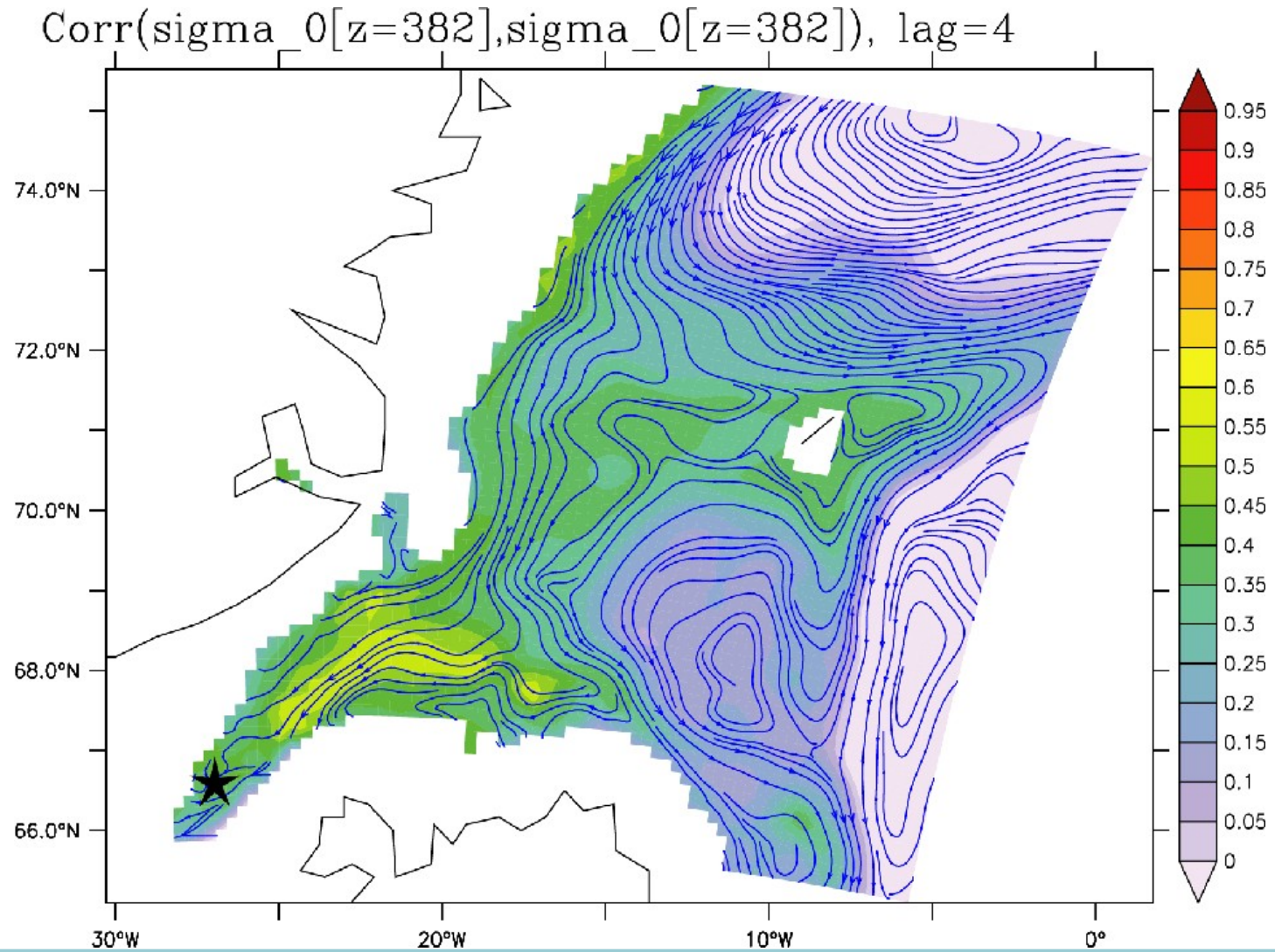












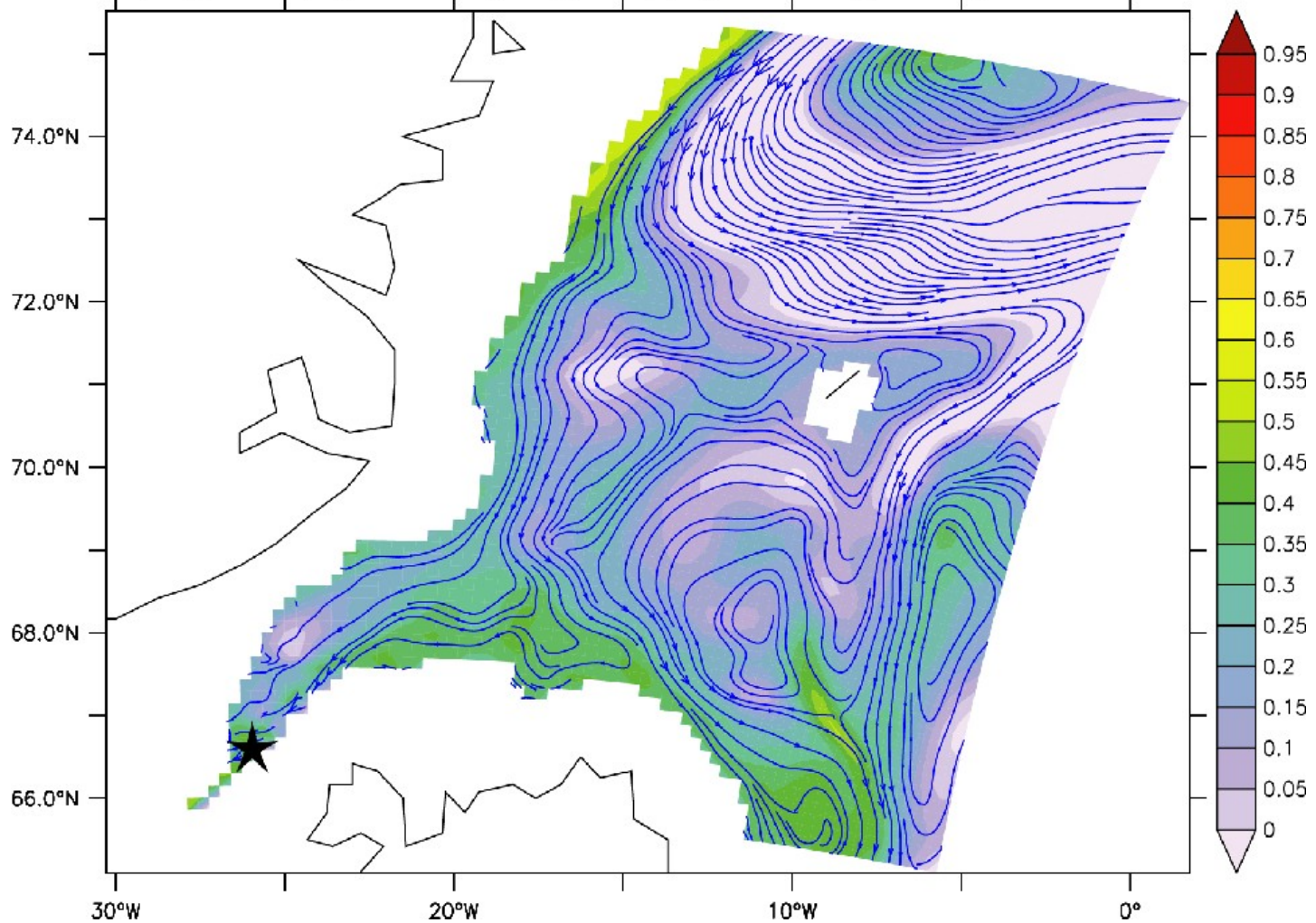


Where does DSOW come from?

2. deep (534 m), eastern slope

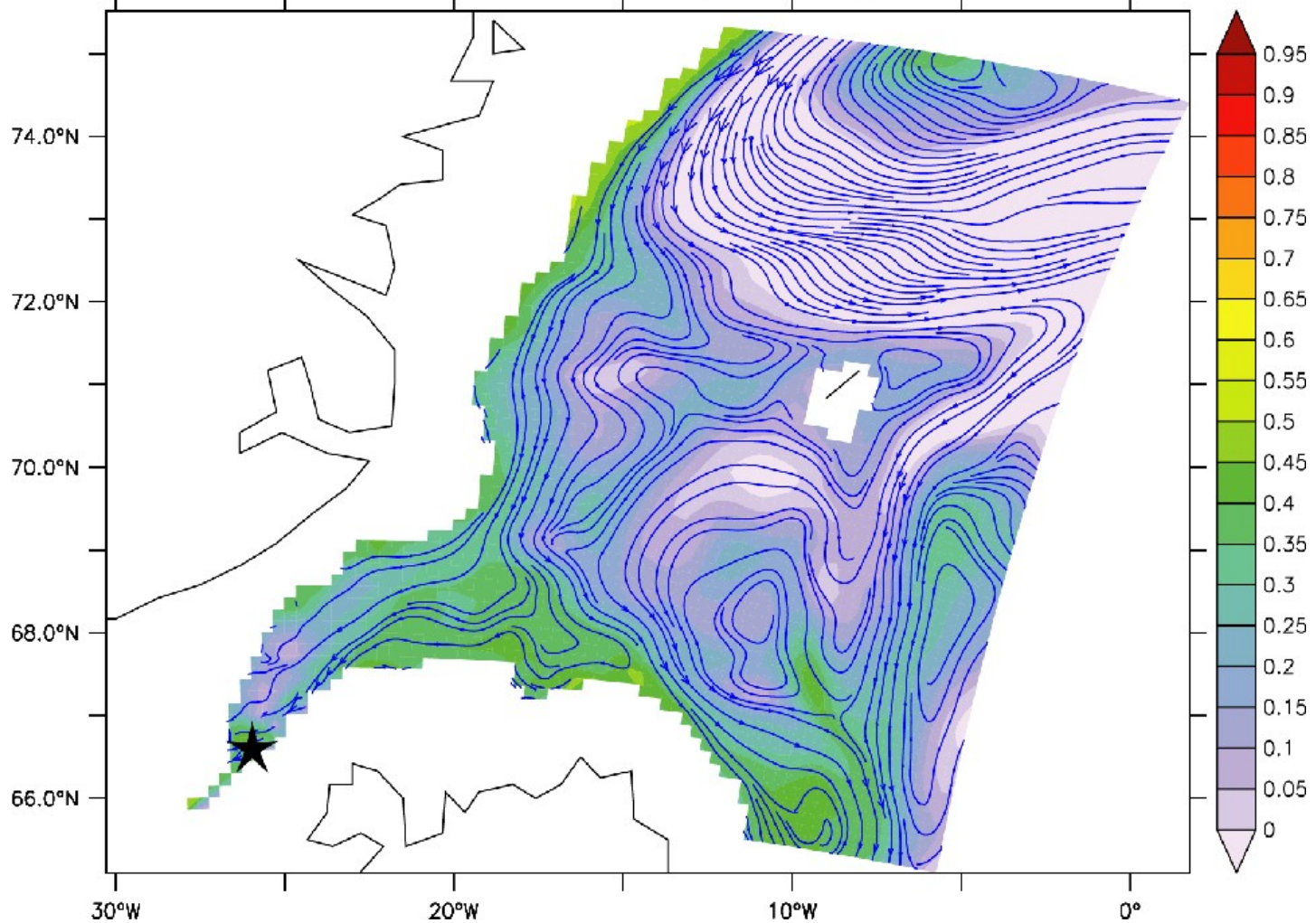


$\text{Corr}(\sigma_0[z=534], \sigma_0[z=534]), \text{lag}=-10$



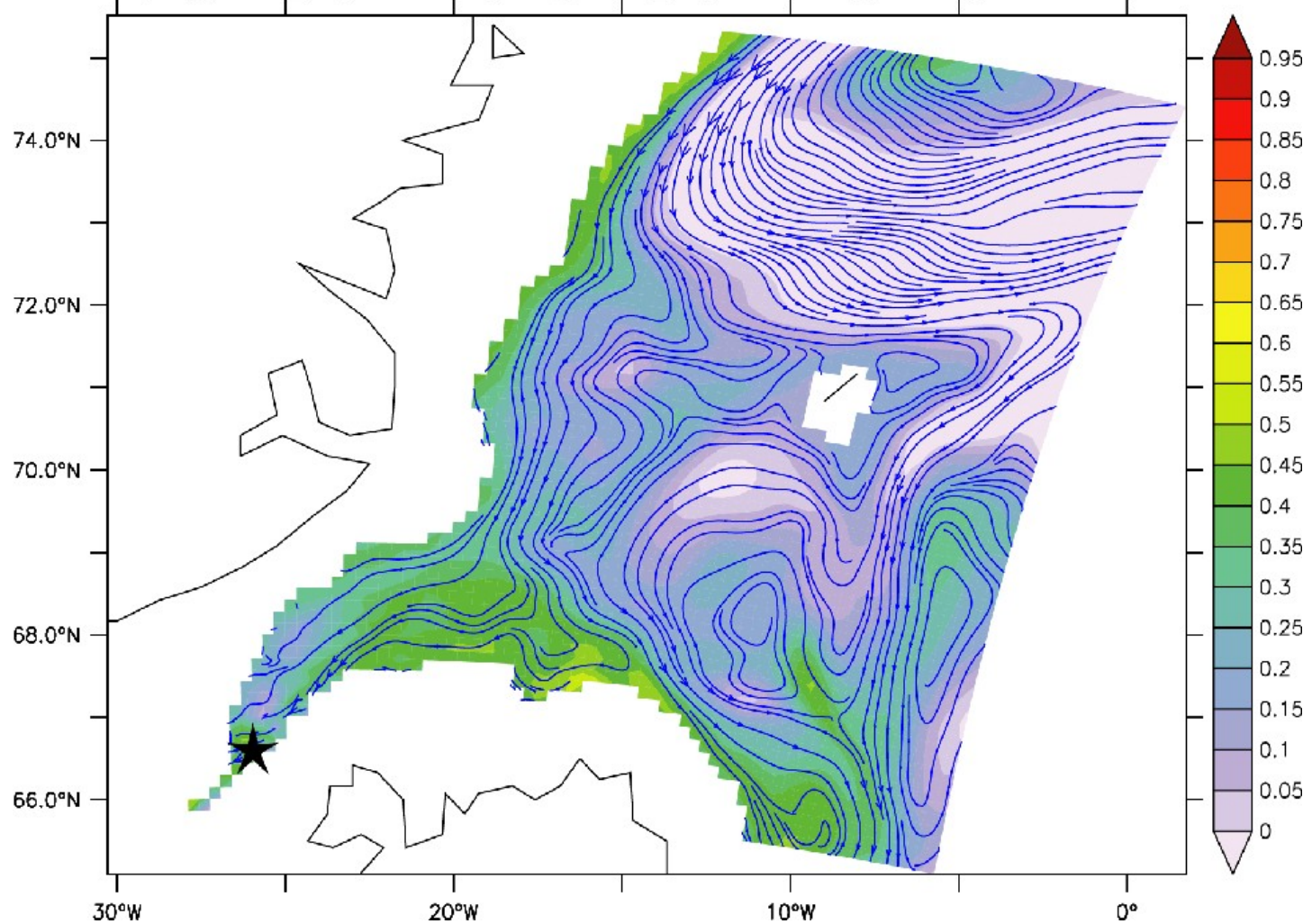


$\text{Corr}(\sigma_0[z=534], \sigma_0[z=534]), \text{lag}=-8$



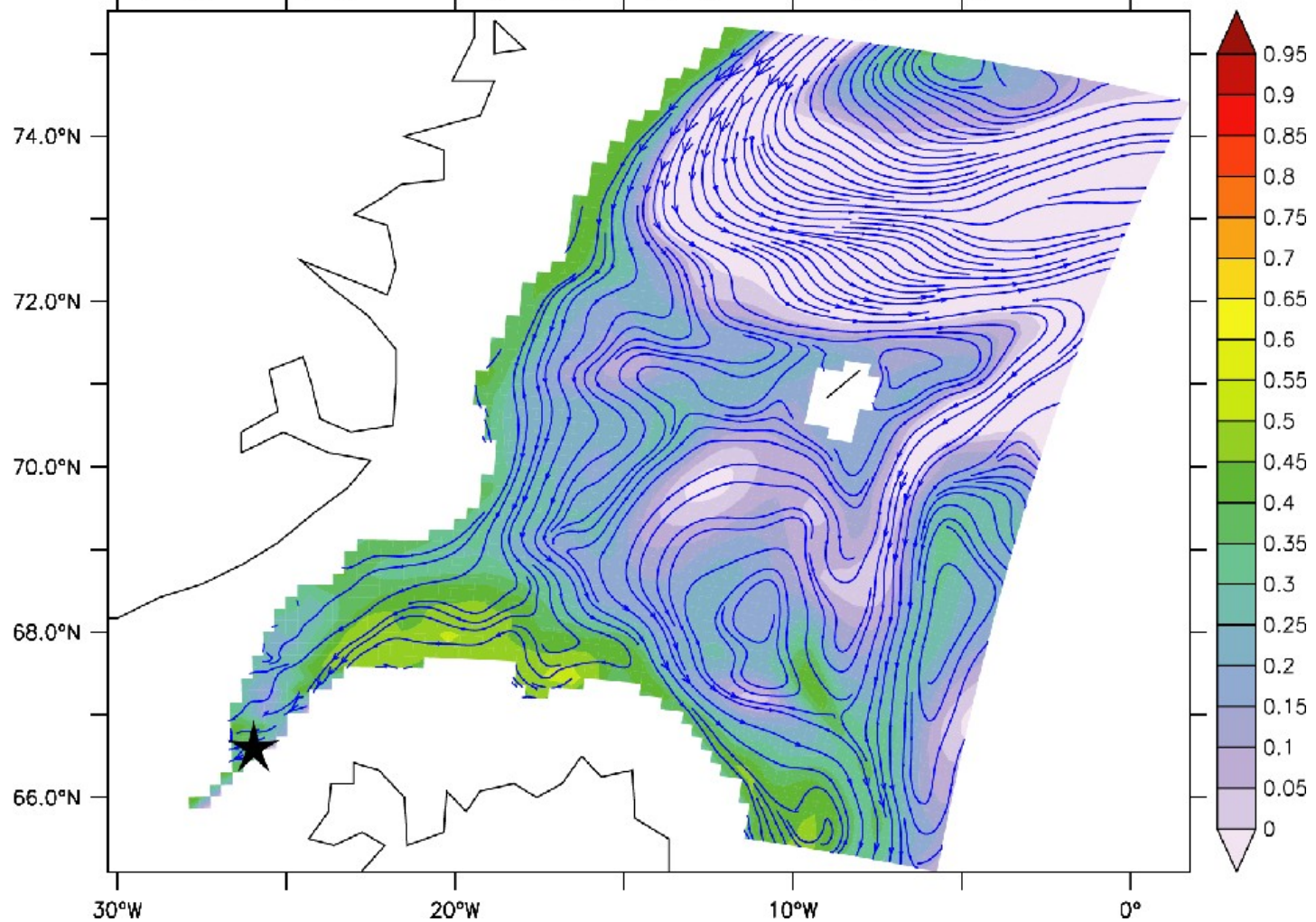


$\text{Corr}(\text{sigma_0}[z=534], \text{sigma_0}[z=534]), \text{lag}=-6$



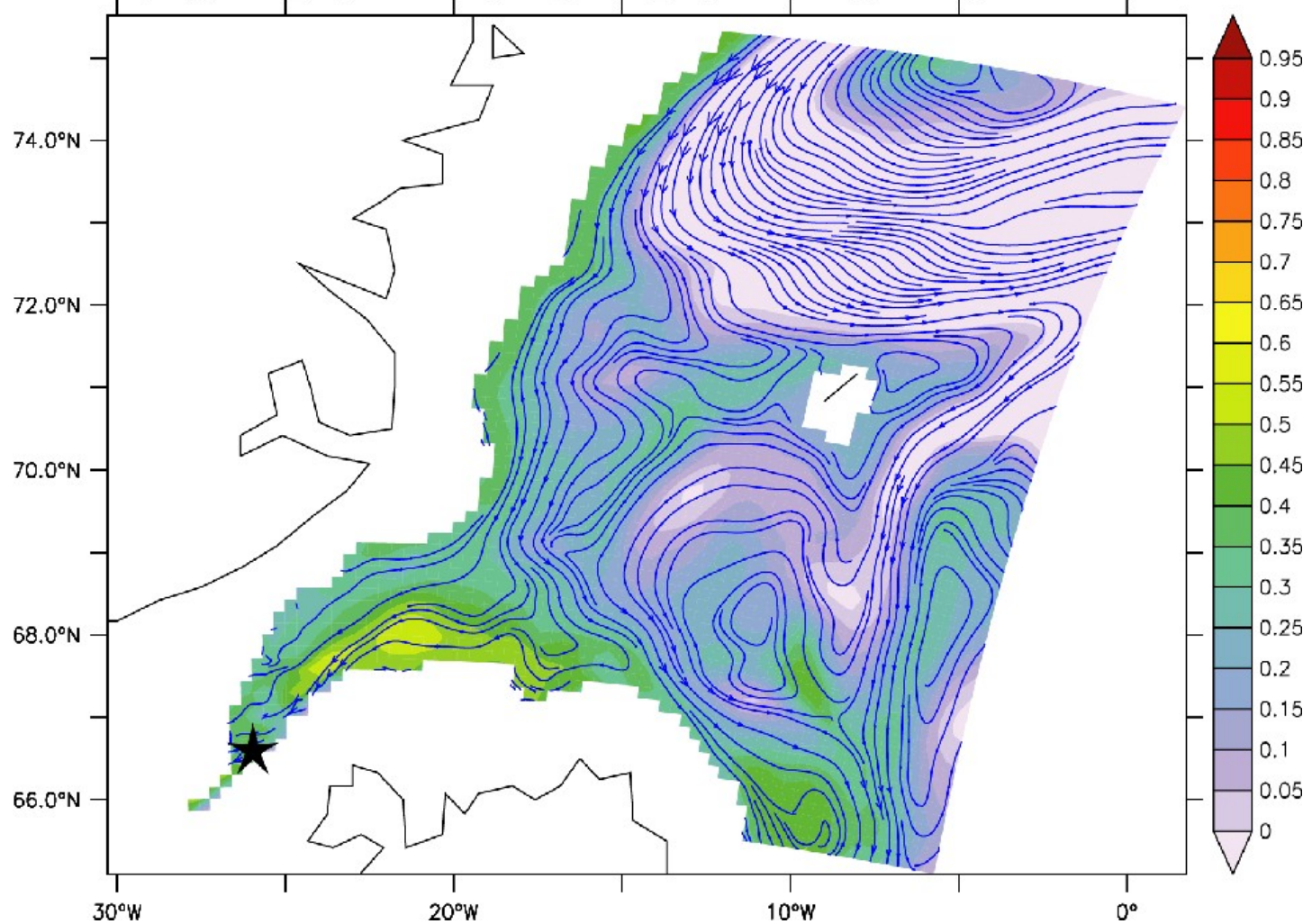


$\text{Corr}(\text{sigma_0}[z=534], \text{sigma_0}[z=534]), \text{lag}=-4$



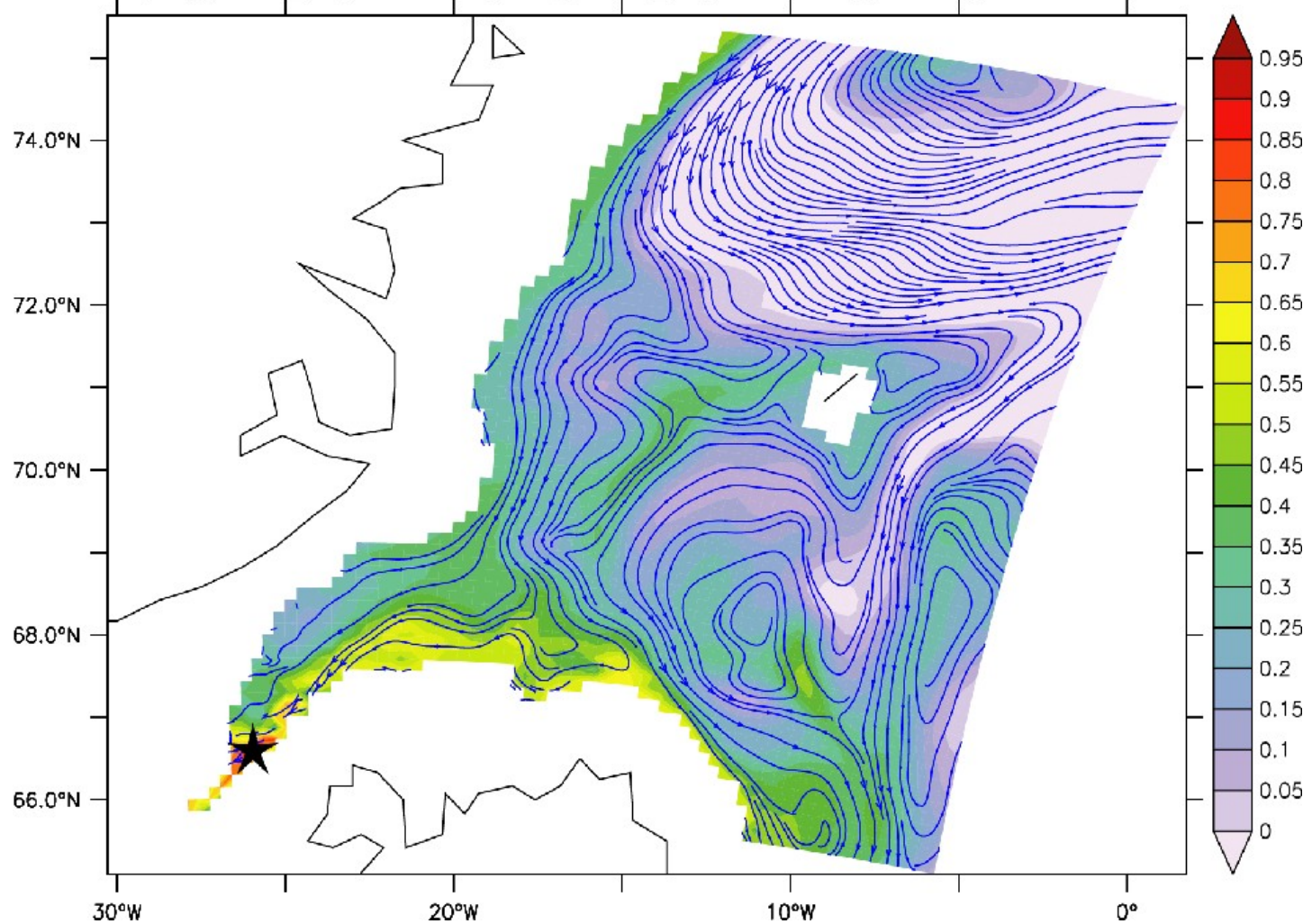


$\text{Corr}(\text{sigma_0}[z=534], \text{sigma_0}[z=534]), \text{lag}=-2$



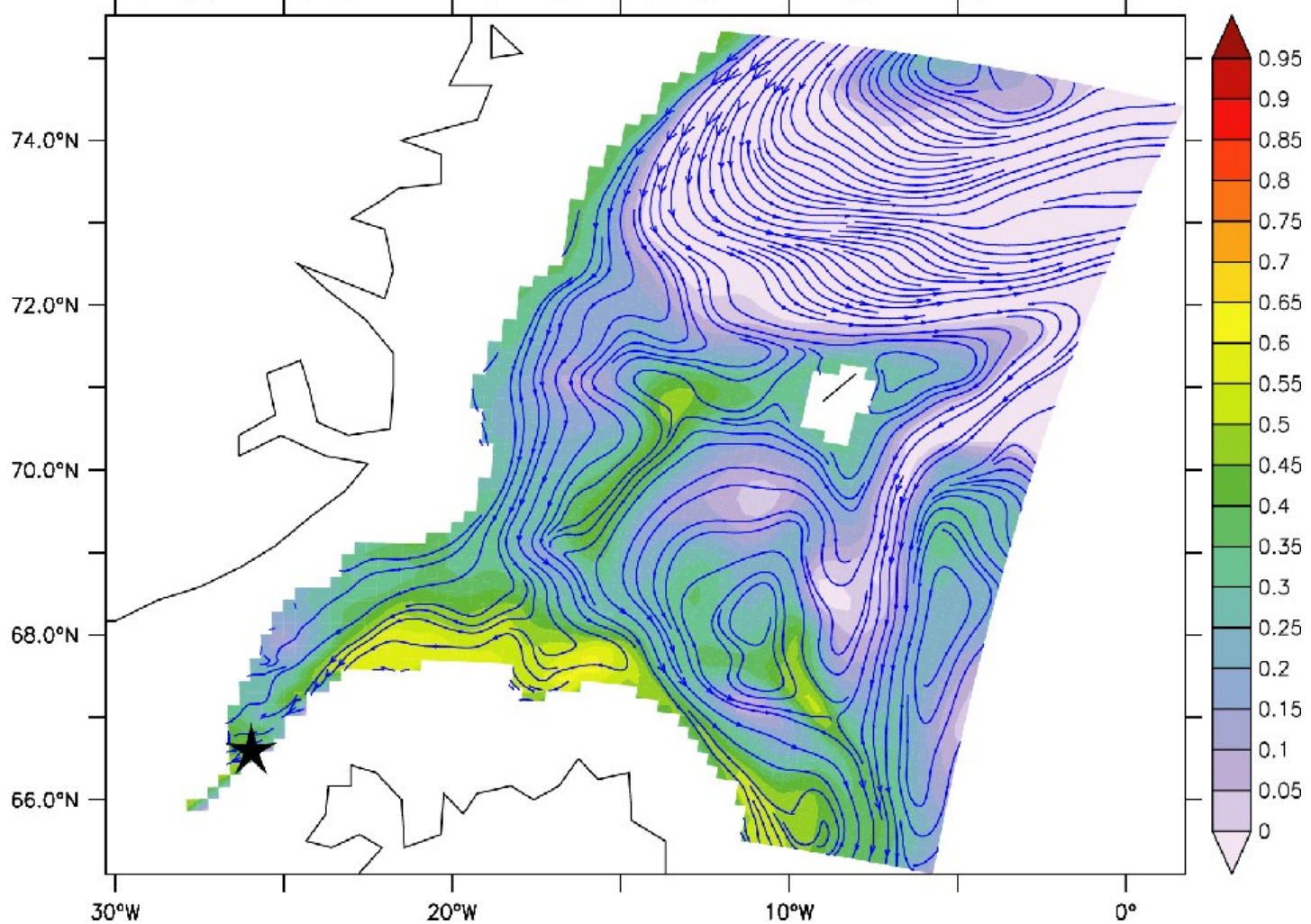


$\text{Corr}(\sigma_0[z=534], \sigma_0[z=534]), \text{lag}=0$



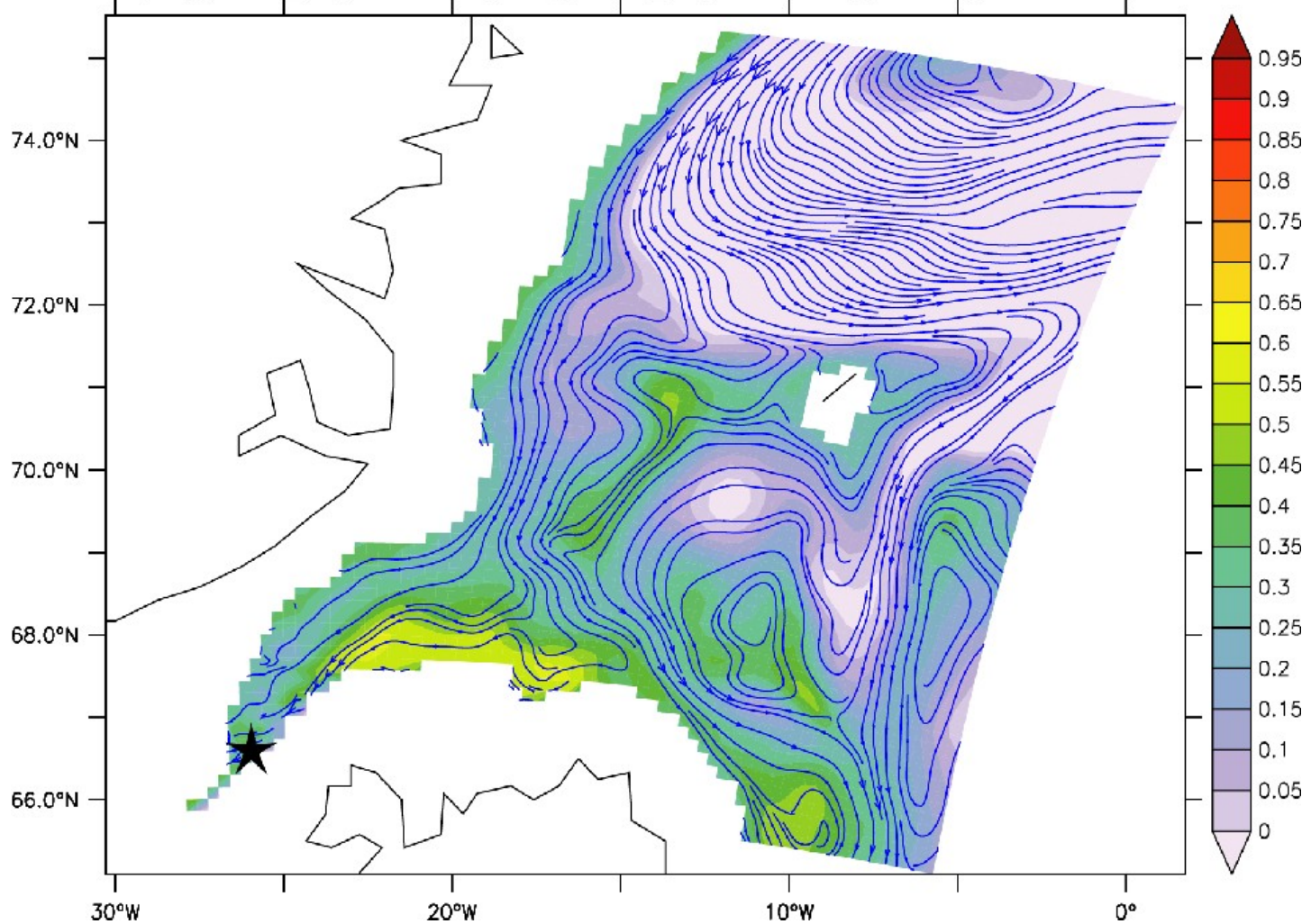


$\text{Corr}(\sigma_0[z=534], \sigma_0[z=534]), \text{lag}=2$



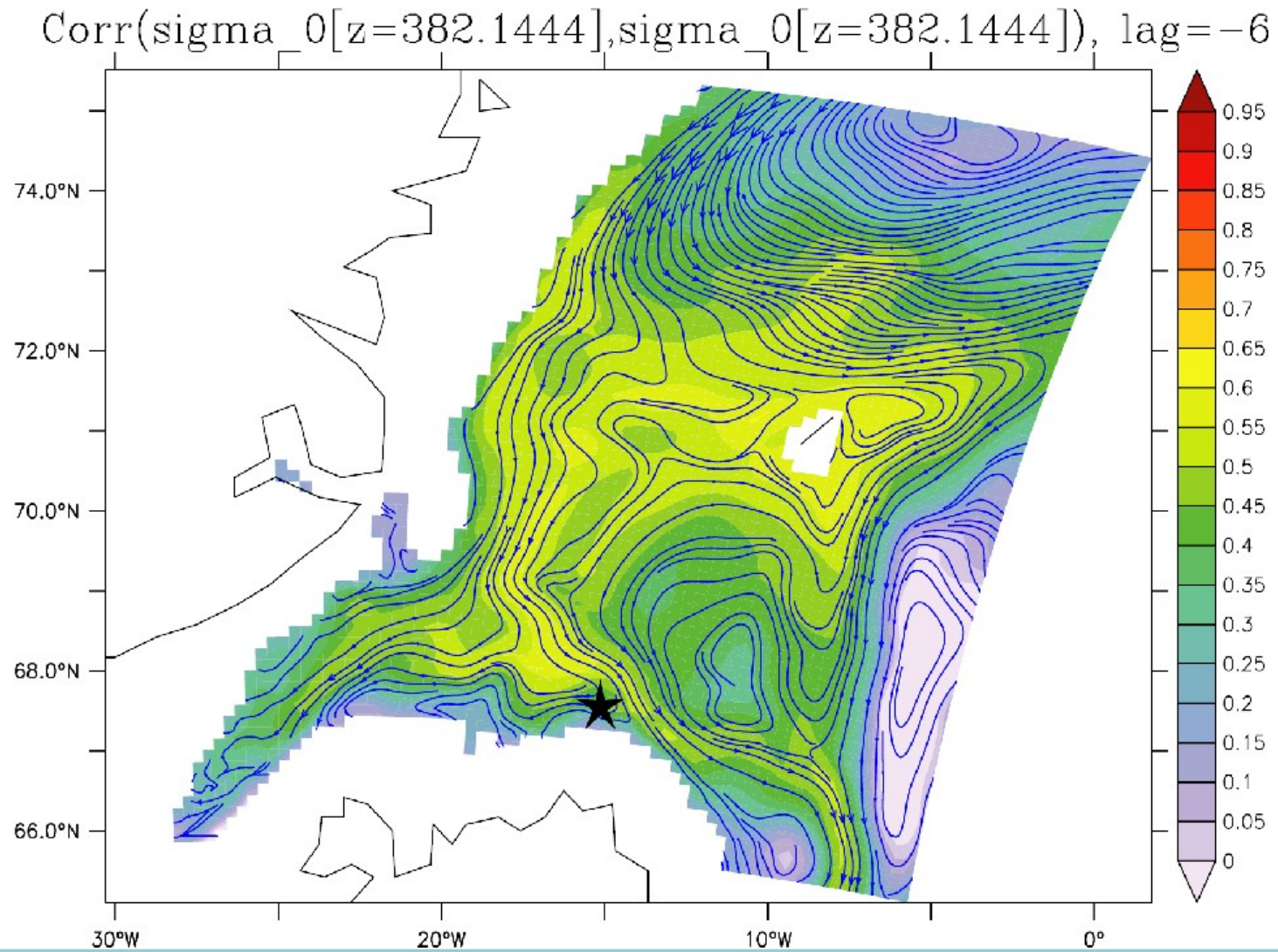


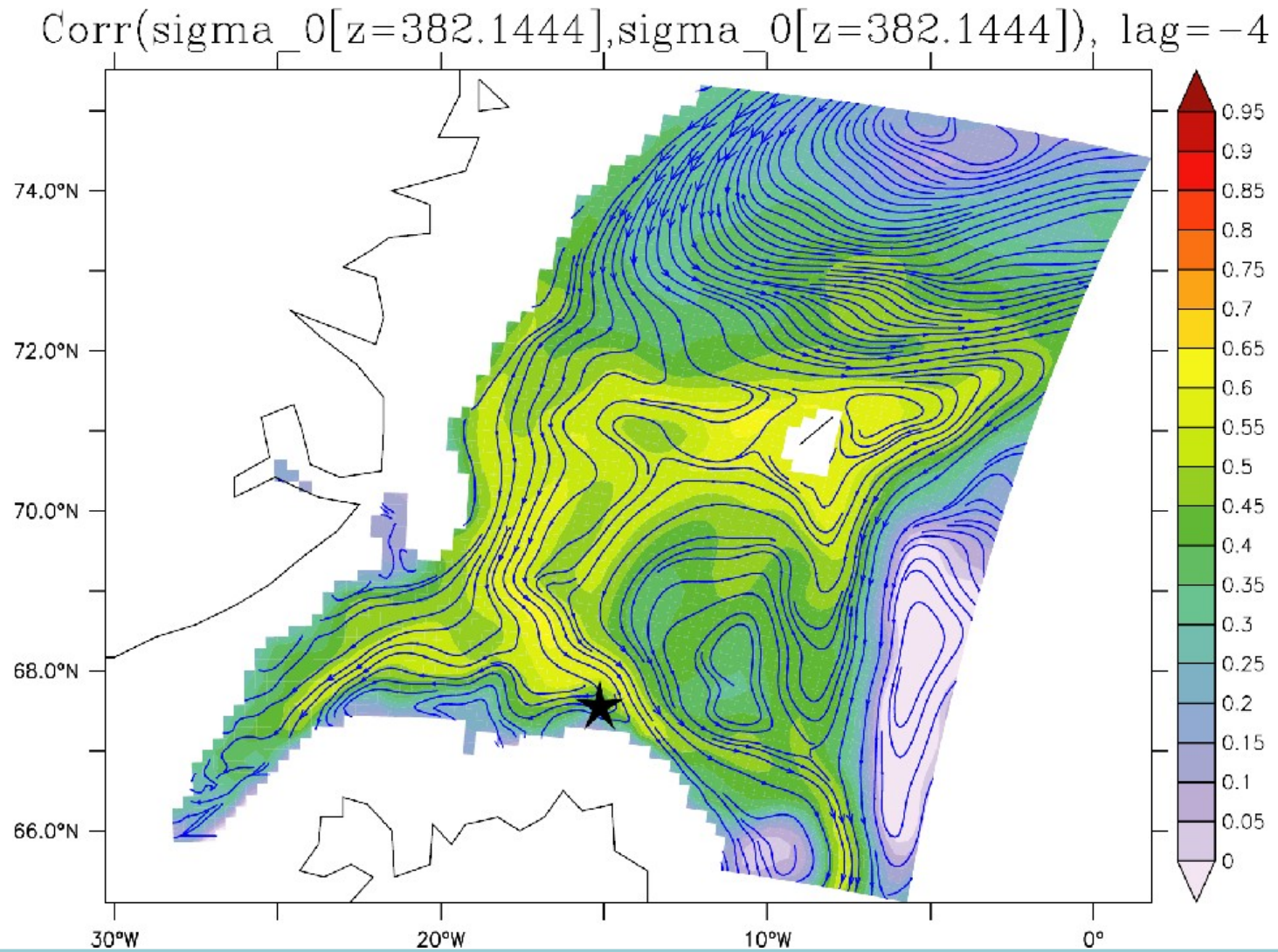
$\text{Corr}(\sigma_0[z=534], \sigma_0[z=534]), \text{lag}=4$

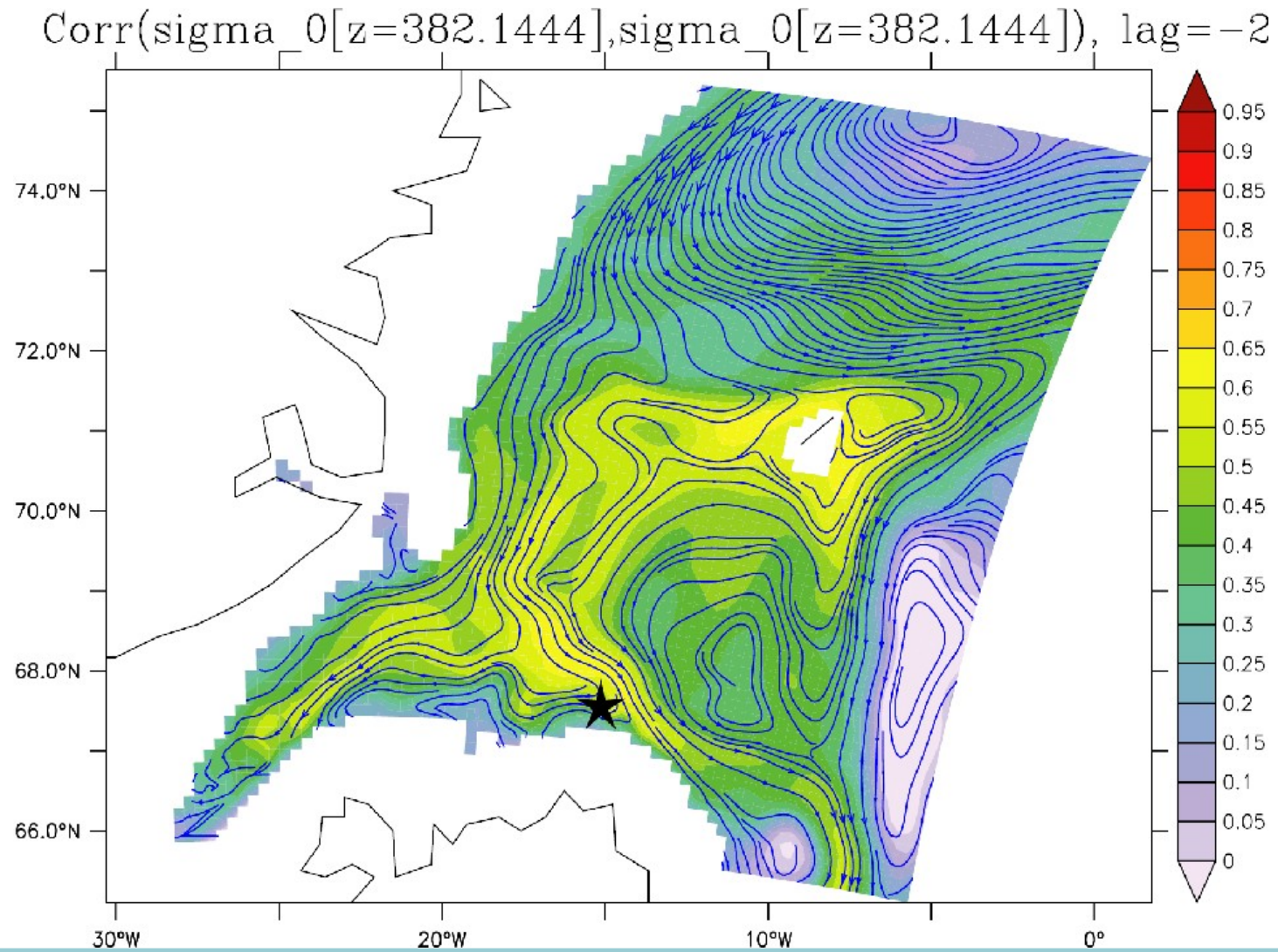


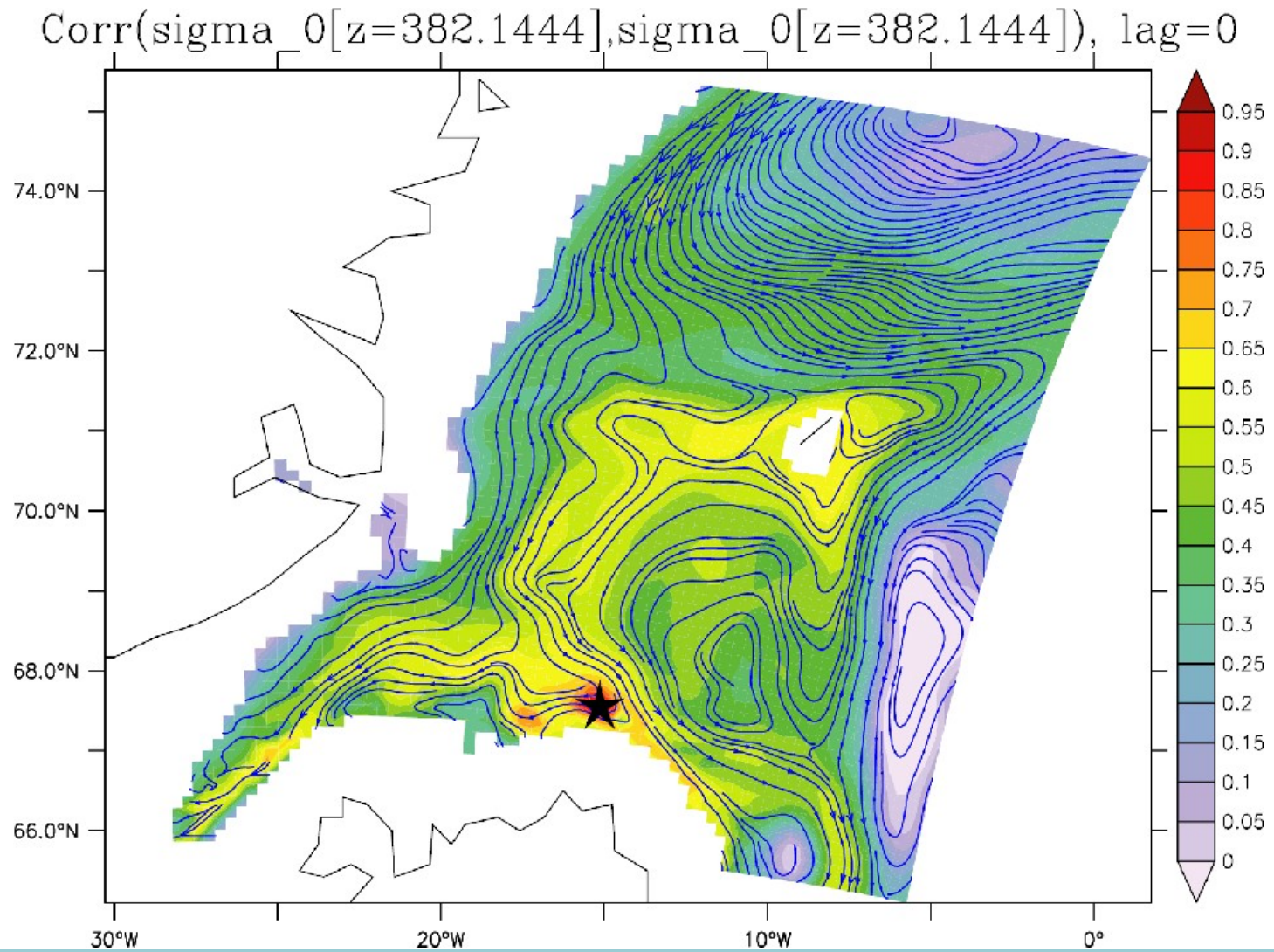


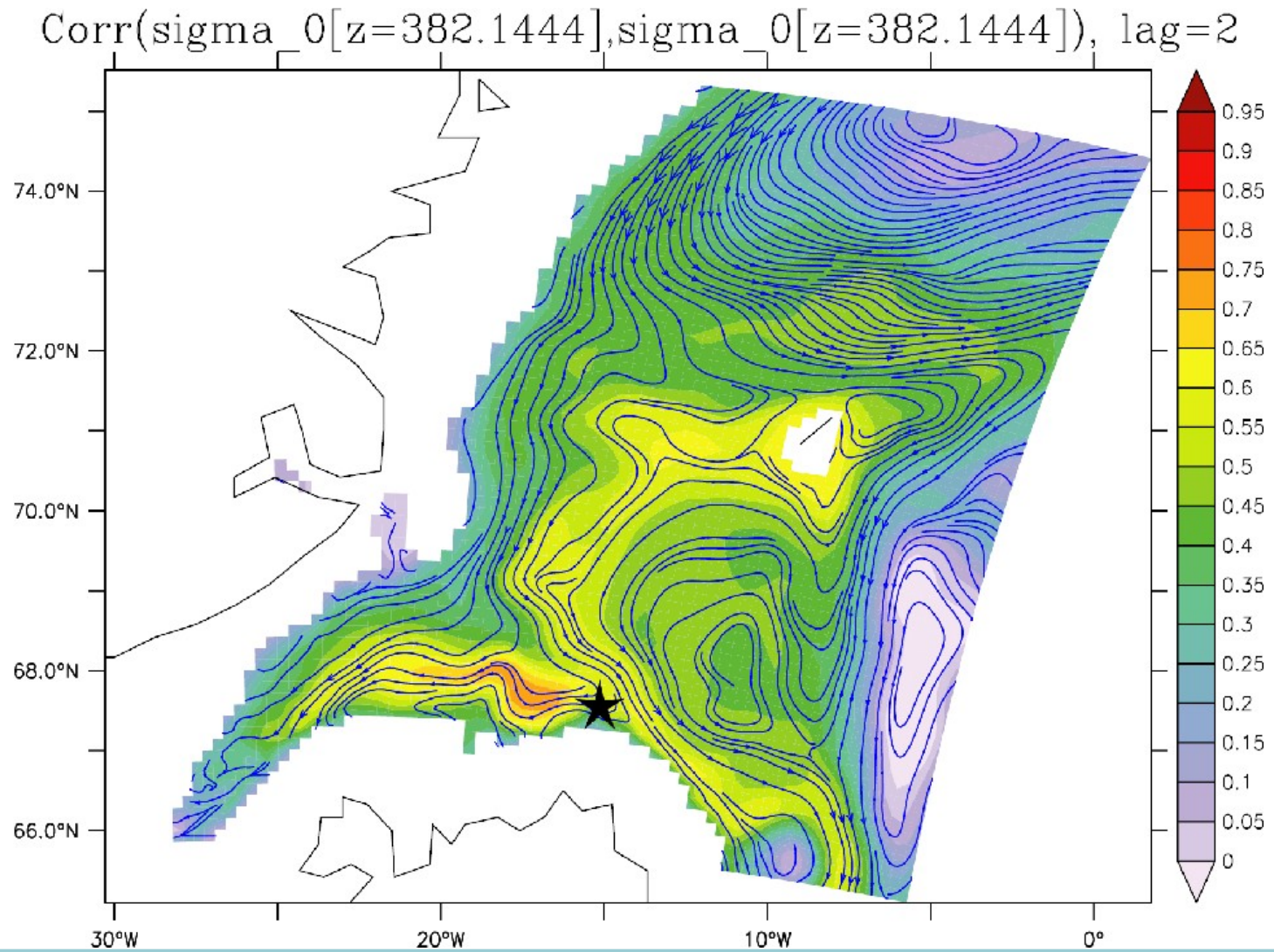
What feeds the NIJ and where does it go to?

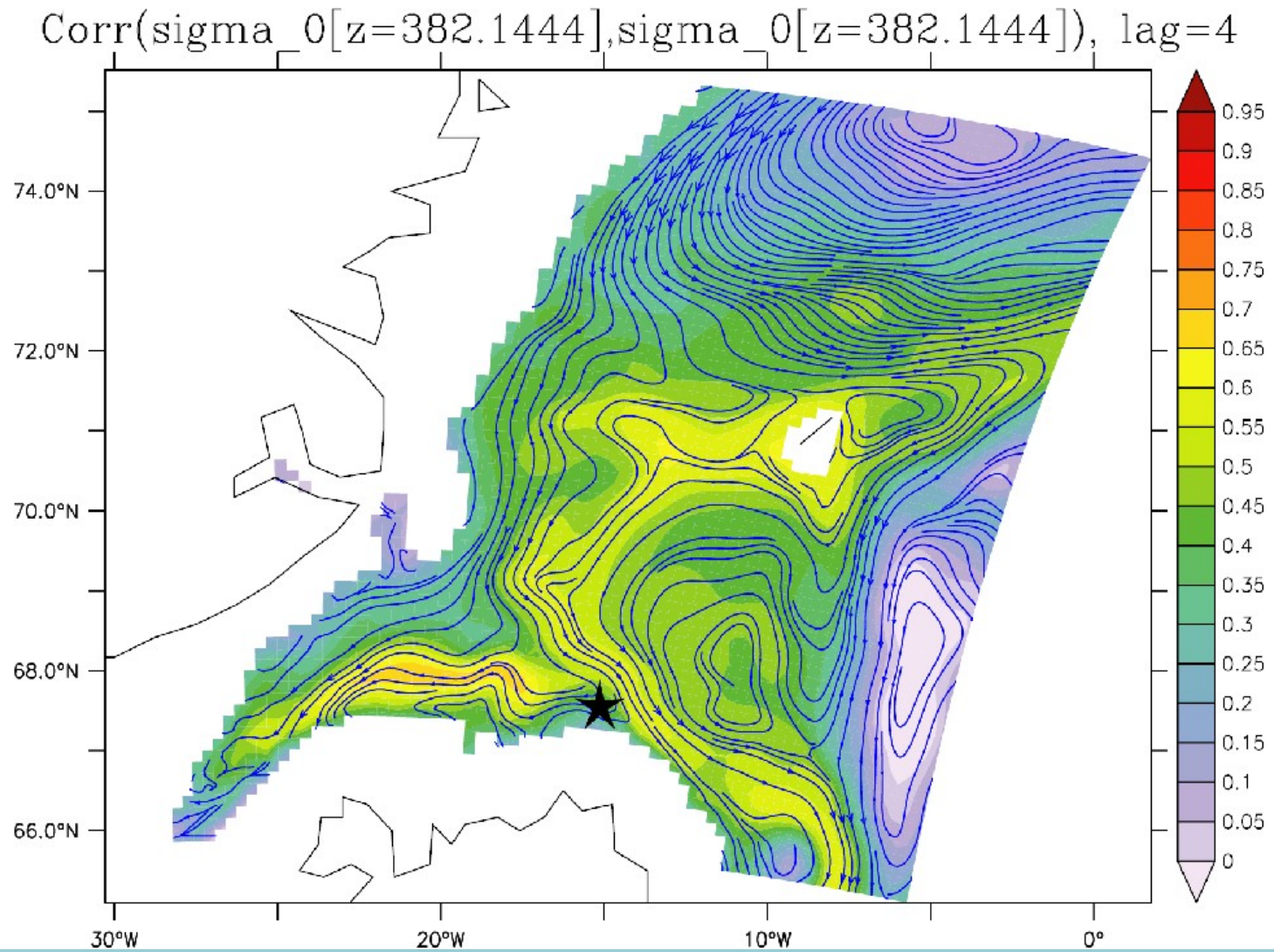


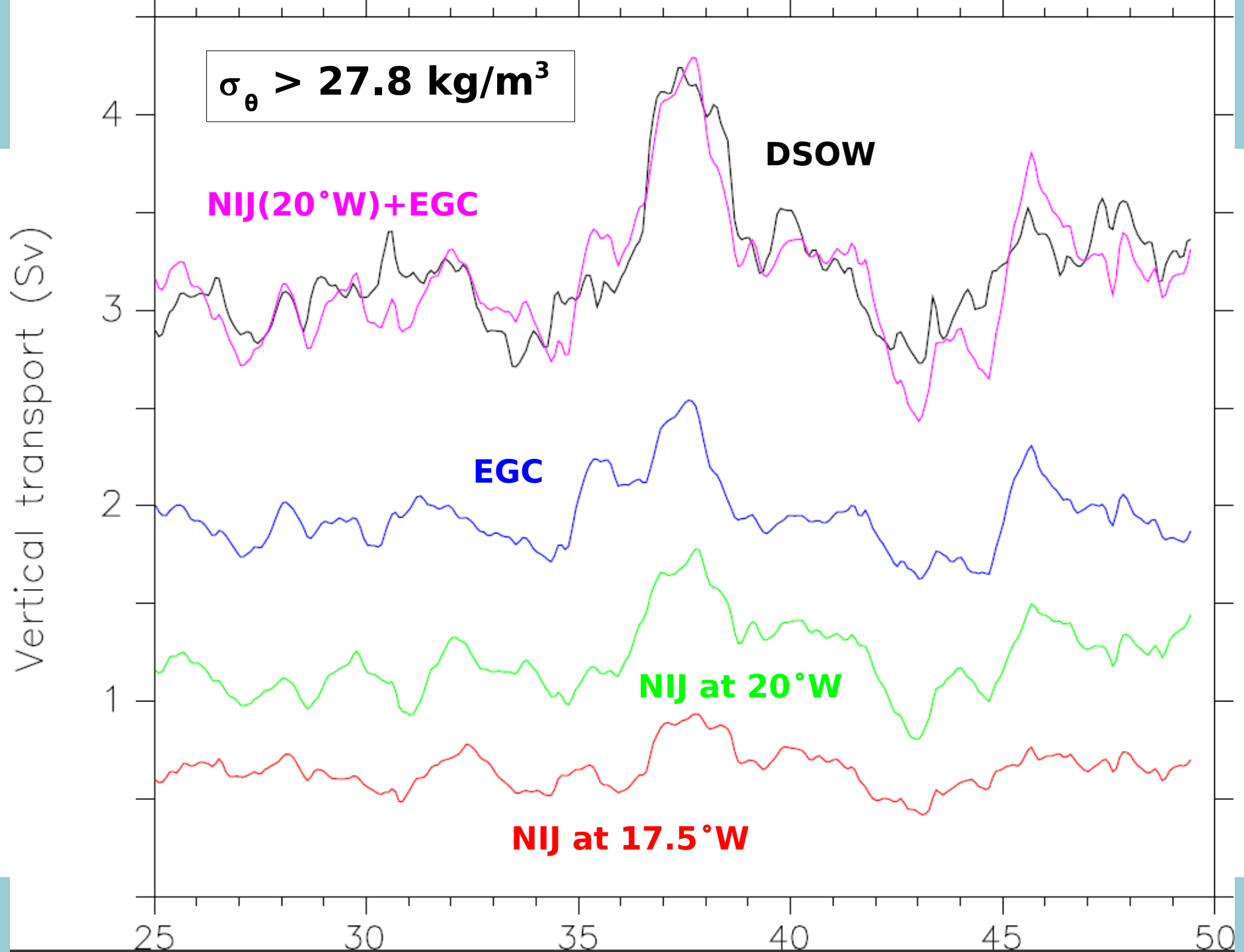














Summary

- No interaction between NIIC and NIJ (diff from Våge et al., 2011)
- NIJ is fed by Nordic Seas rim current
 - kind of loop
 - water from interior mixed in?
- 1/3 of DSOW from NIJ, other 2/3 from EGC