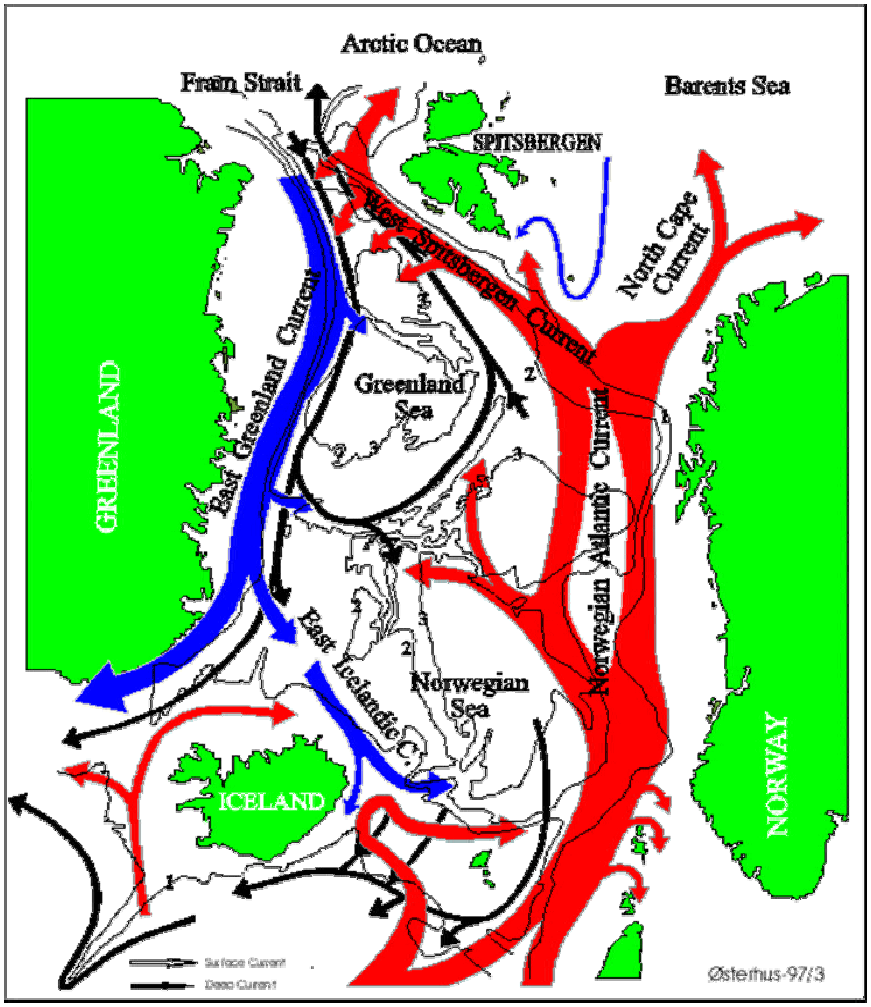
What do we learn about Atlantic Water inflow and circulation from the present set of AOMIP and AWI experiments?

Michael Karcher and Frank Kauker

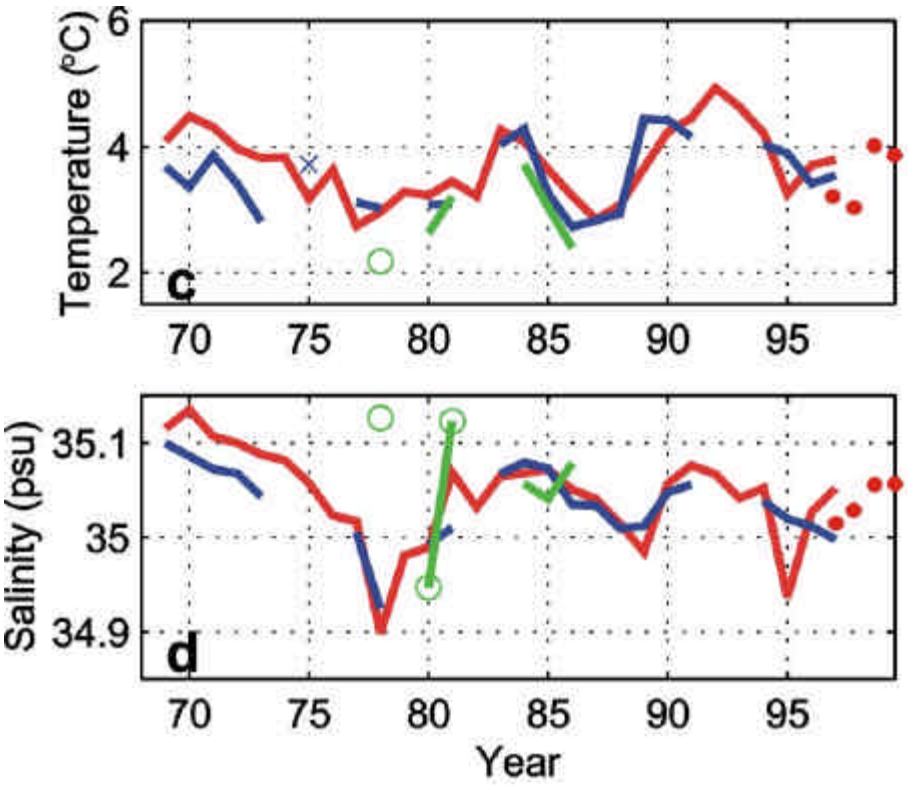
Alfred Wegener Institut for Polar and Marine Research
and
O.A.Sys – Ocean Atmosphere Systems

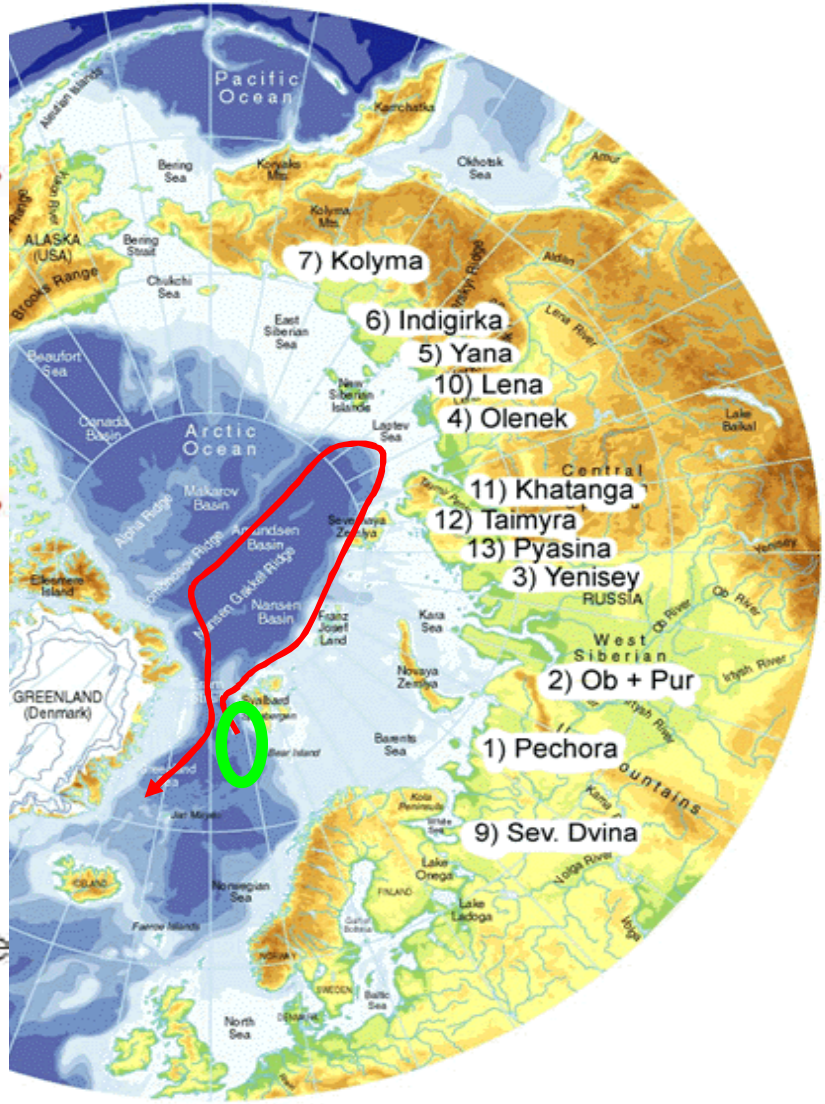
Flow Patterns in the Nordic Seas



Arctic Ocean Circulation

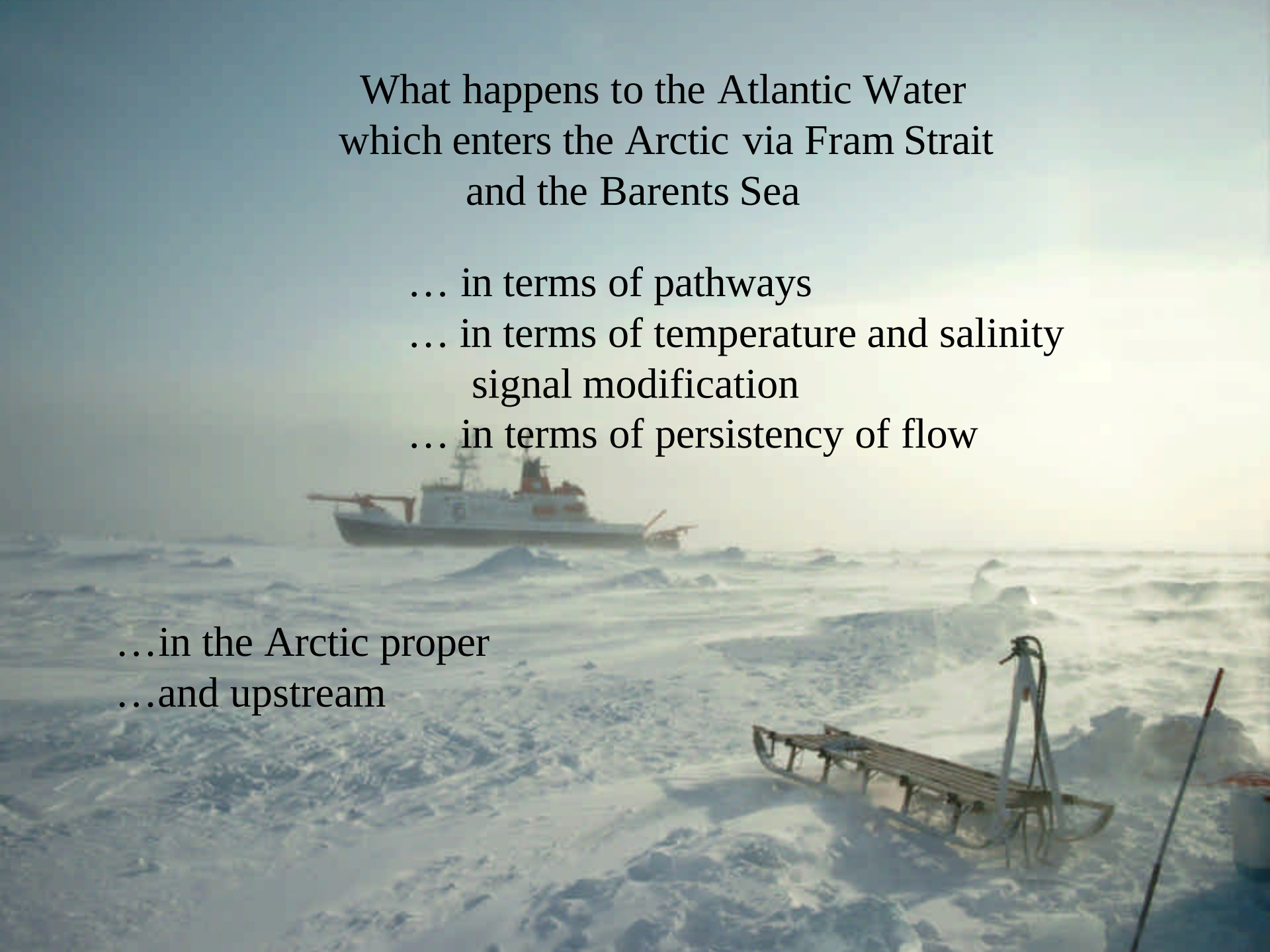
Temperature and Salinity Observations in the West Spitzbergen Current (Fram Strait Branch)





Saloranta and Haugan, 2001July, JGR:
Autumn temperature and salinity in the shelf edge branch of the WSC between 100 and 300 m

- at 79°N
- update from VEINS



What happens to the Atlantic Water
which enters the Arctic via Fram Strait
and the Barents Sea

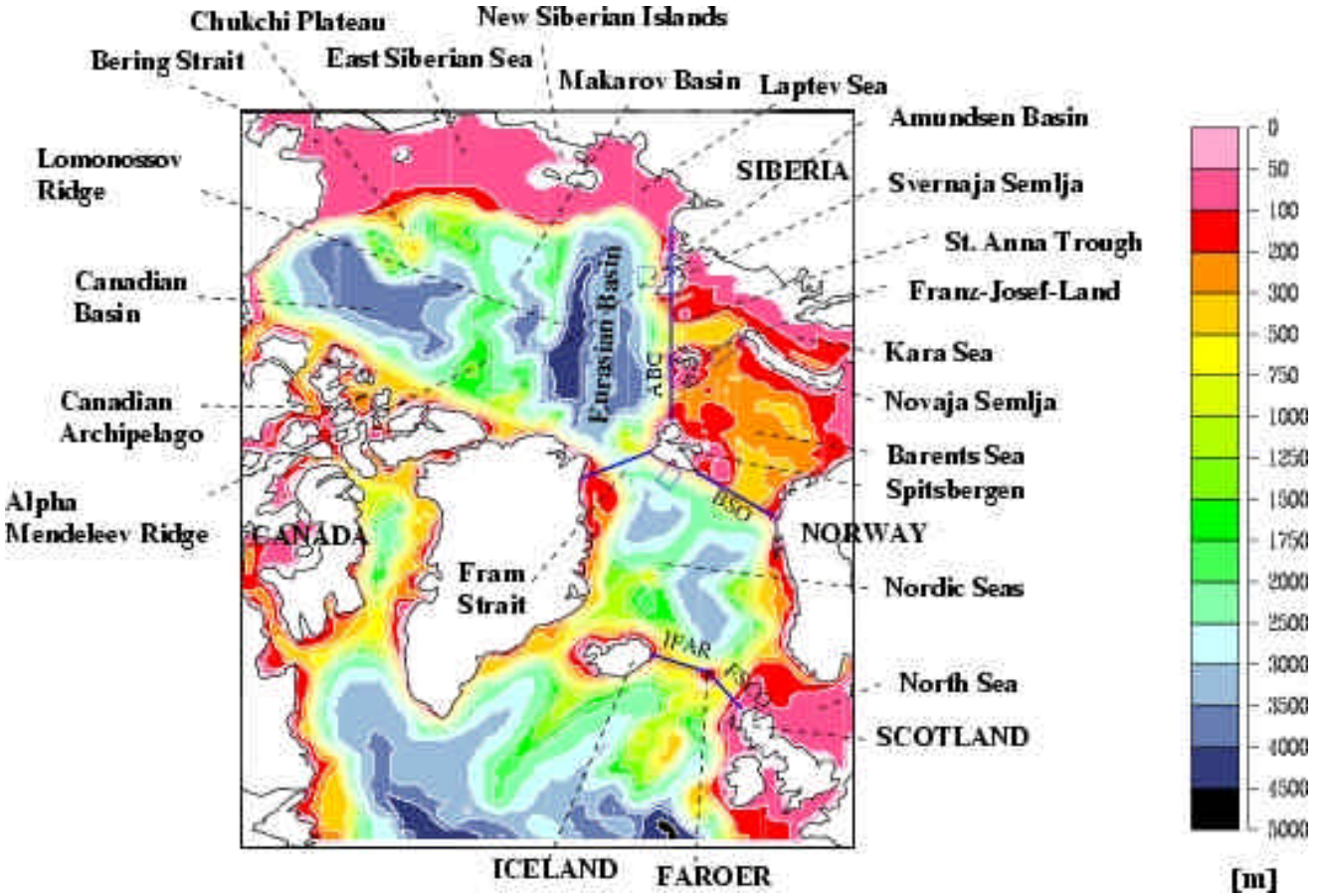
… in terms of pathways
… in terms of temperature and salinity
signal modification
… in terms of persistency of flow

…in the Arctic proper
…and upstream

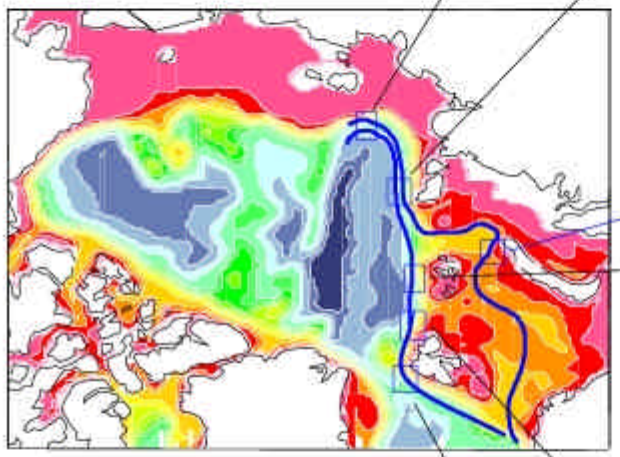
- AWI NCEP forced 54 year hindcast experiment
- AWI southern bound. cond. sensitivity experiment
- AWI AOMIP spin-up experiment

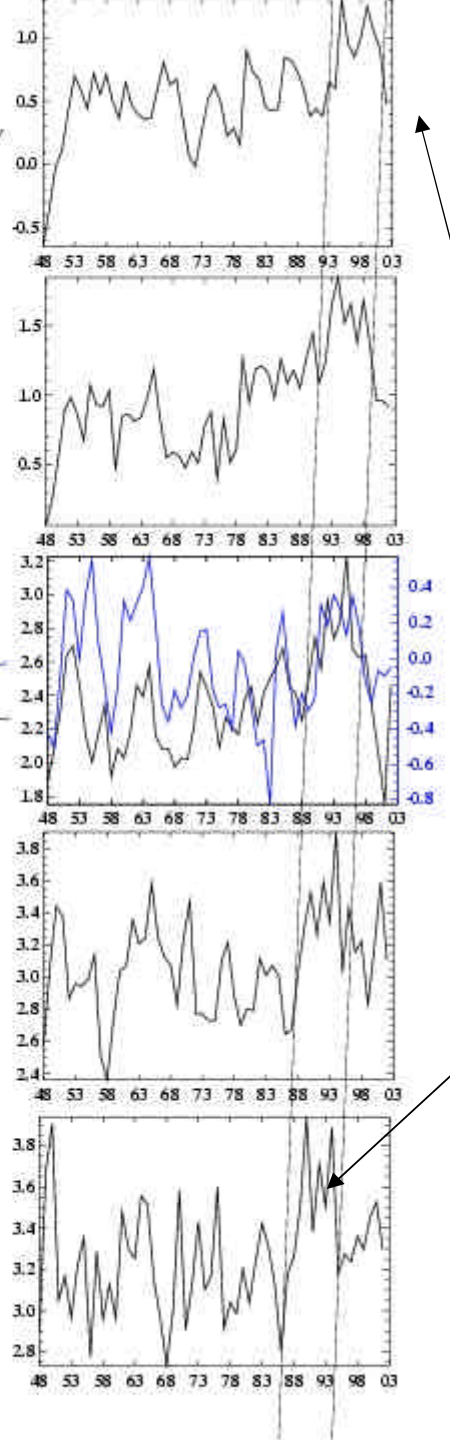
- AOMIP community spin-up experiments

The Model domain



AWI NCEP forced 54 year hindcast experiment





Barents Sea Branch (blue)

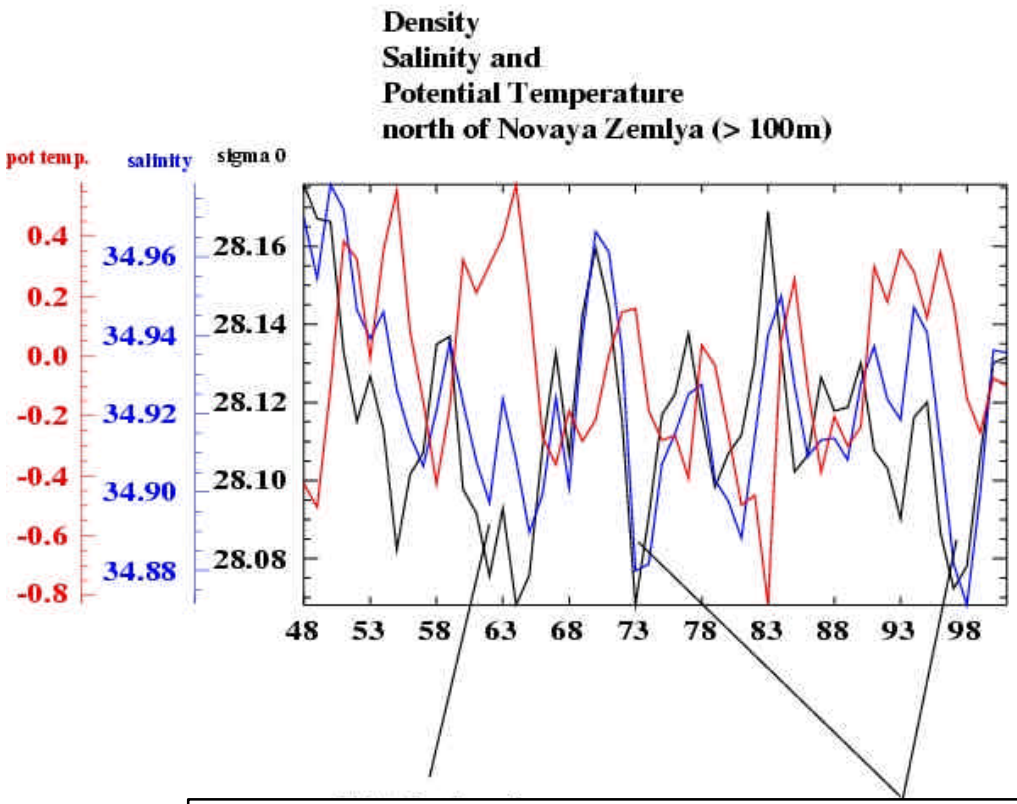
90s warm event

pot. temperature at 350 m along the cont. slope (black graphs)

(Gerdes, Karcher, Kauker and Schauer, in prep.)

NAOSIM model results

Karcher at al.

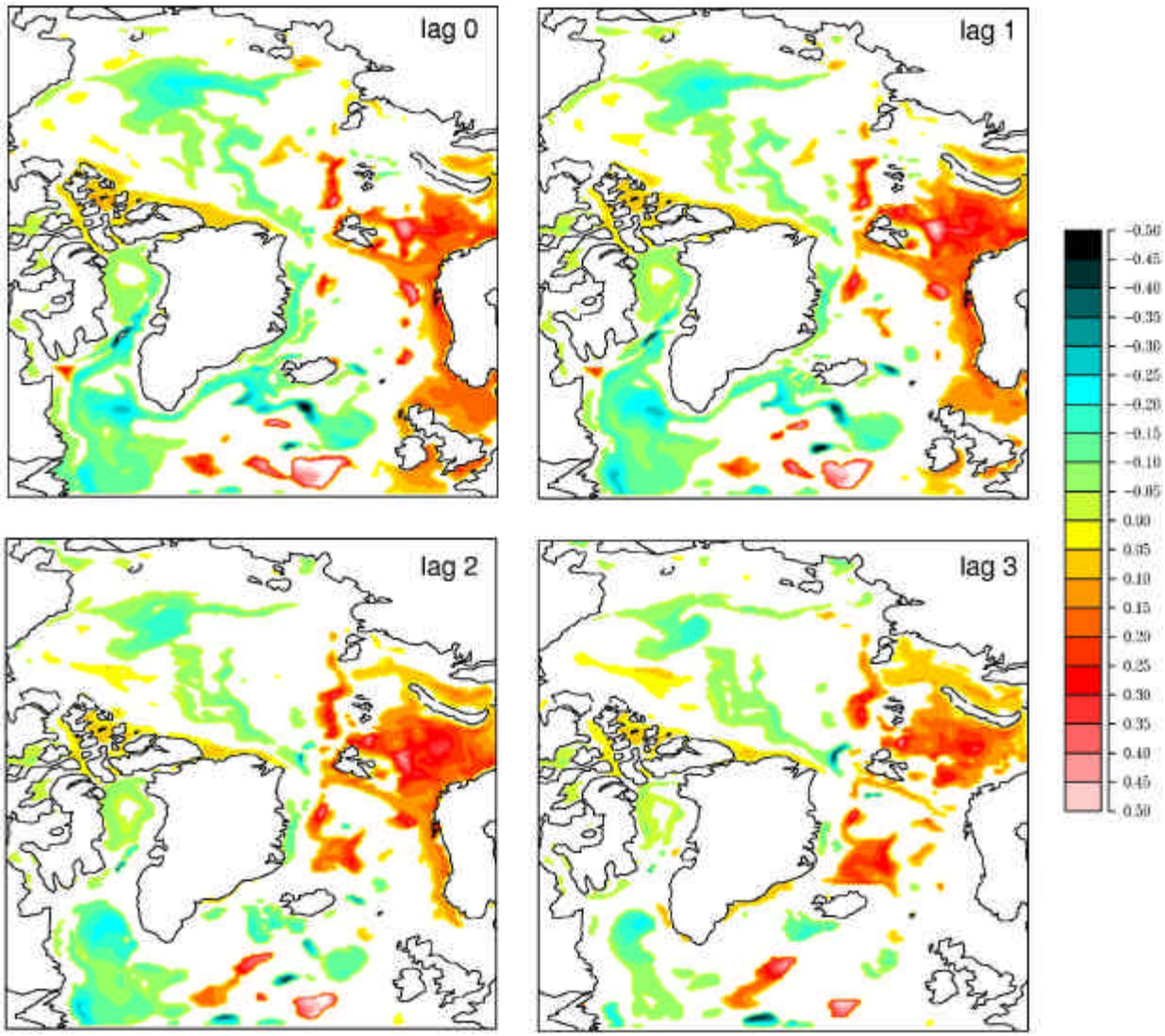


neg. density anomalies

Karcher, Gerdes, Kauker and Schauer, in prep.

AWI
Alfred-Wegener-Institut
für Polar- und Meeresforschung

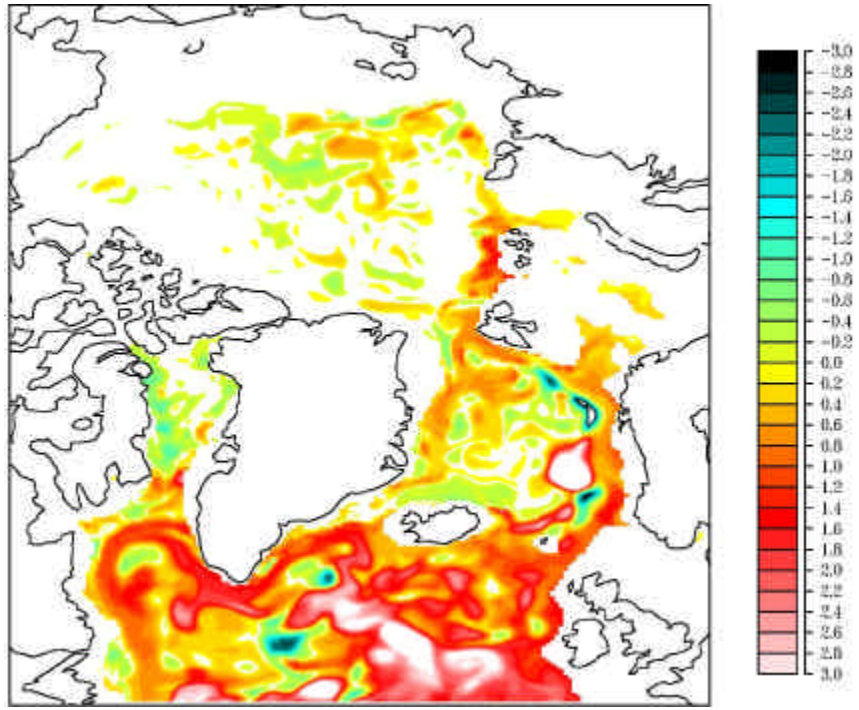
SST vs. NAO (1979-1999)
time lagged 0-3 y



Kauker, Gerdes, Karcher and Köberle, in prep.

AWI southerm boundary sensitivity experiment:
southern boundary + 2 K

temperature response in 300 m depth

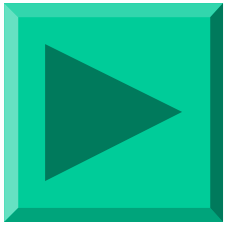


Year 5

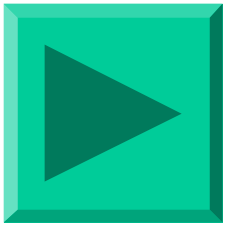
Kauker, Gerdes, Karcher and Köberle, in prep.

Animated velocity at 300-400 m

AOMIP coordinated spin-up (1948-78)

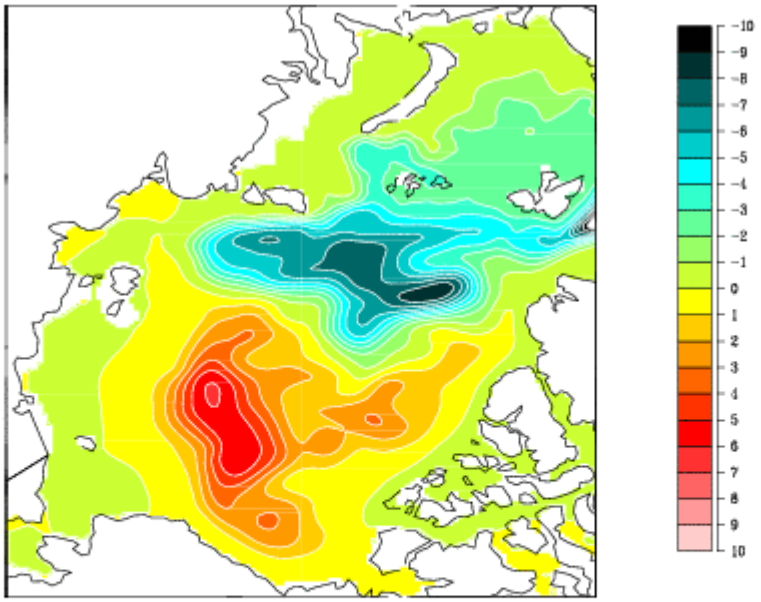


AWI-NCEP 78-02 hindcast (start from OMIP)



AWI NCEP hindcast experiment

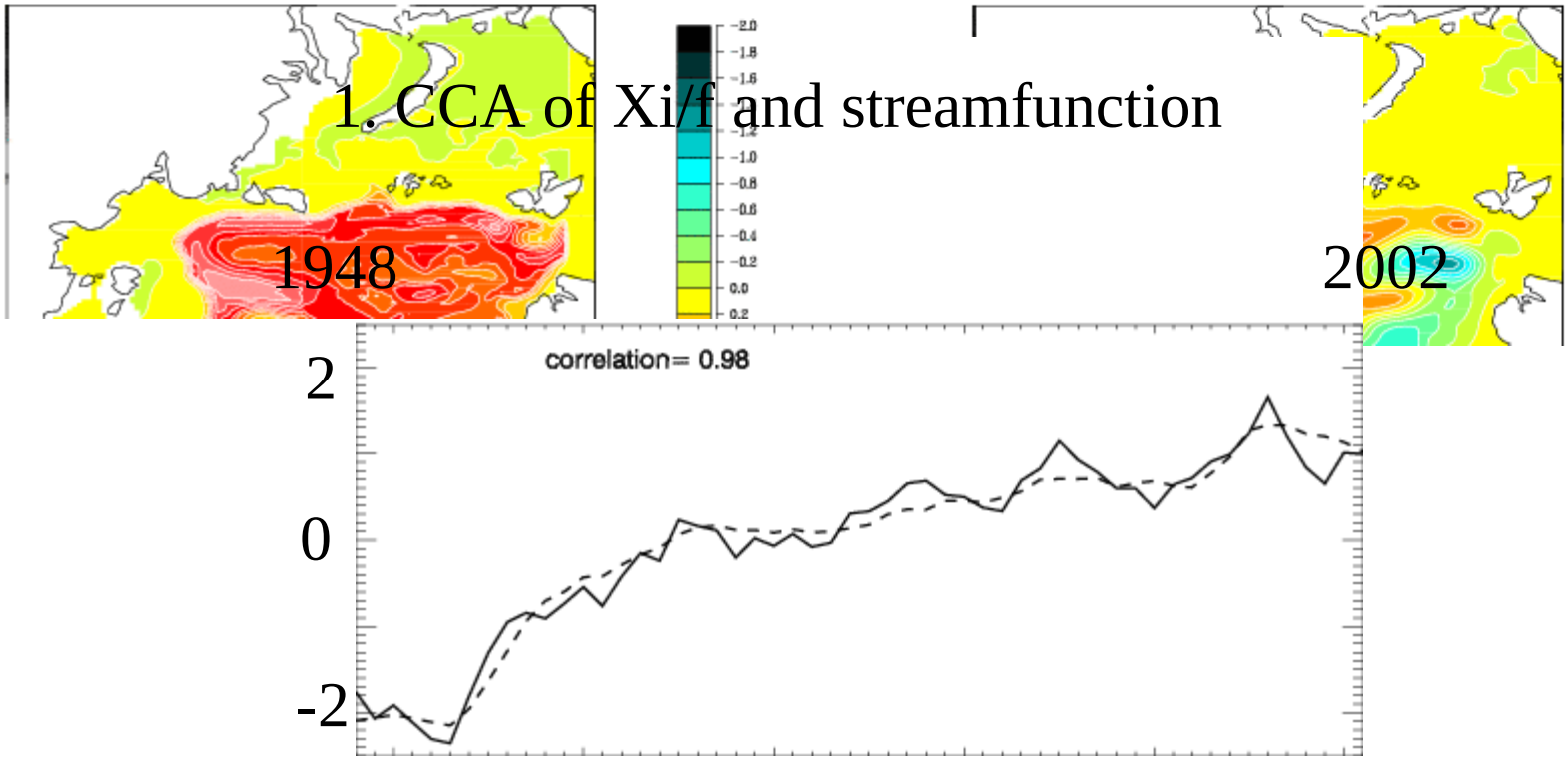
Barotropic Streamfunction 1948

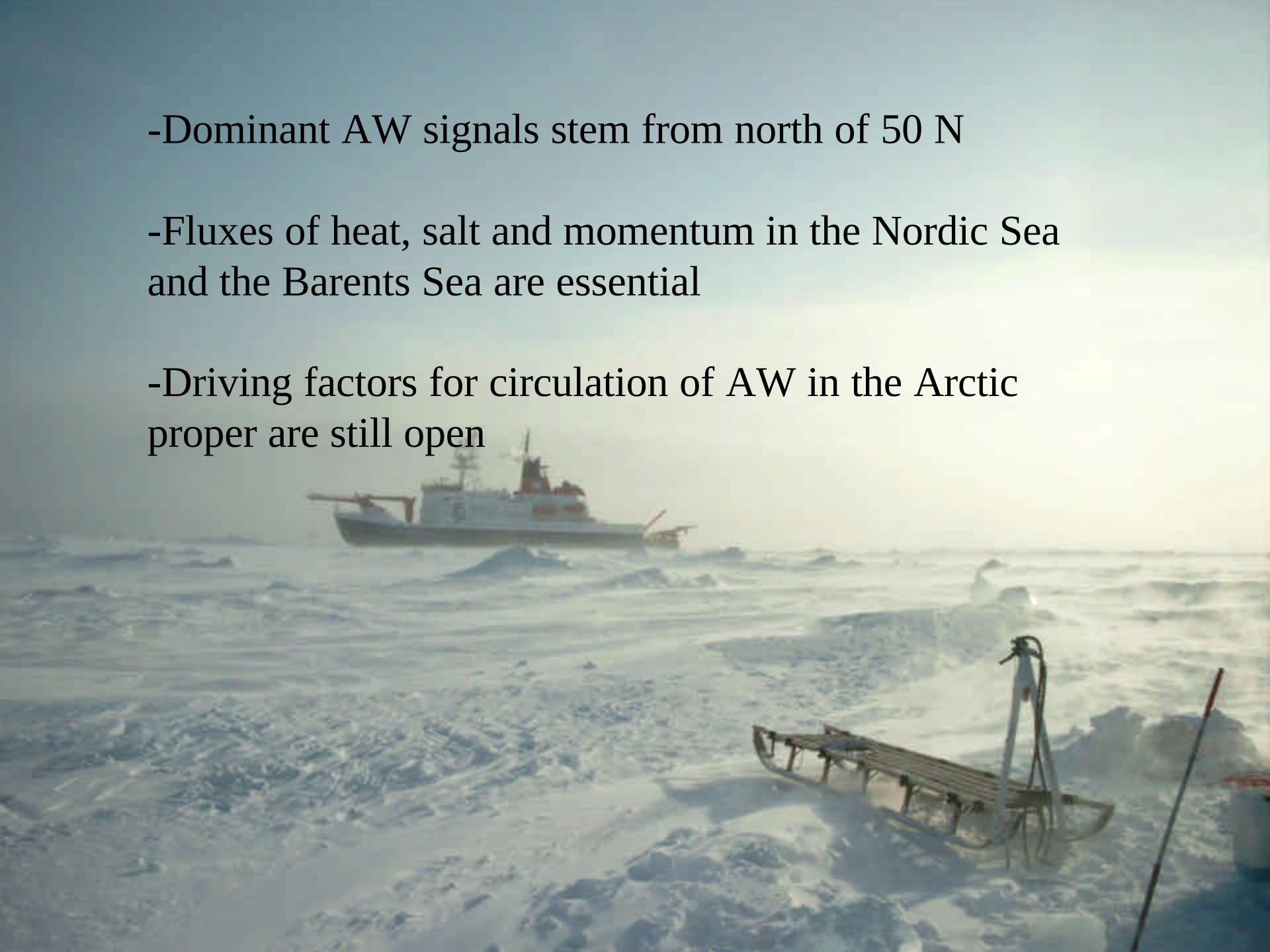


Xi/f

streamf

1. CCA of Xi/f and streamfunction





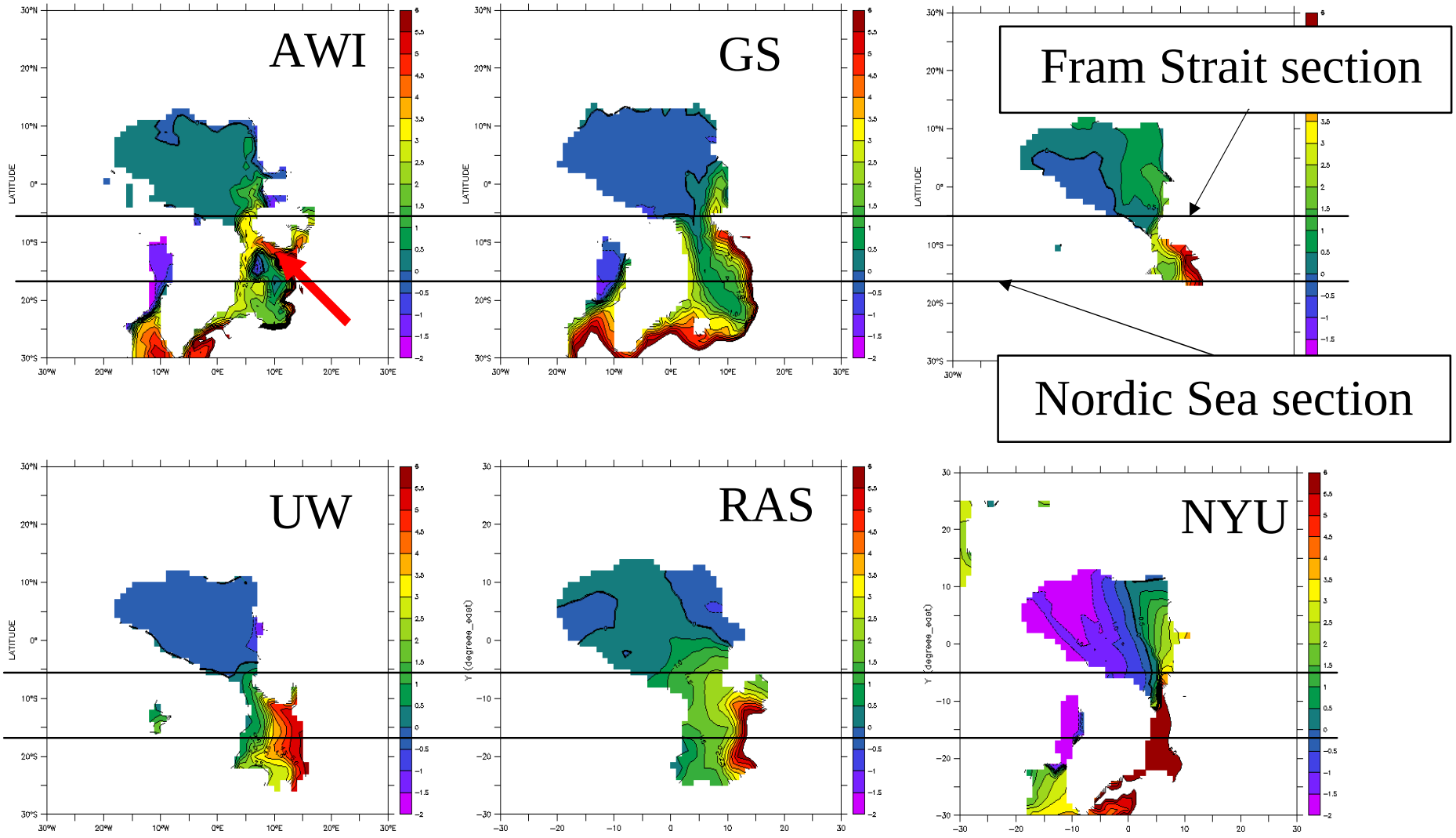
-Dominant AW signals stem from north of 50 N

-Fluxes of heat, salt and momentum in the Nordic Sea and the Barents Sea are essential

-Driving factors for circulation of AW in the Arctic proper are still open

AOMIP coordinated experiment

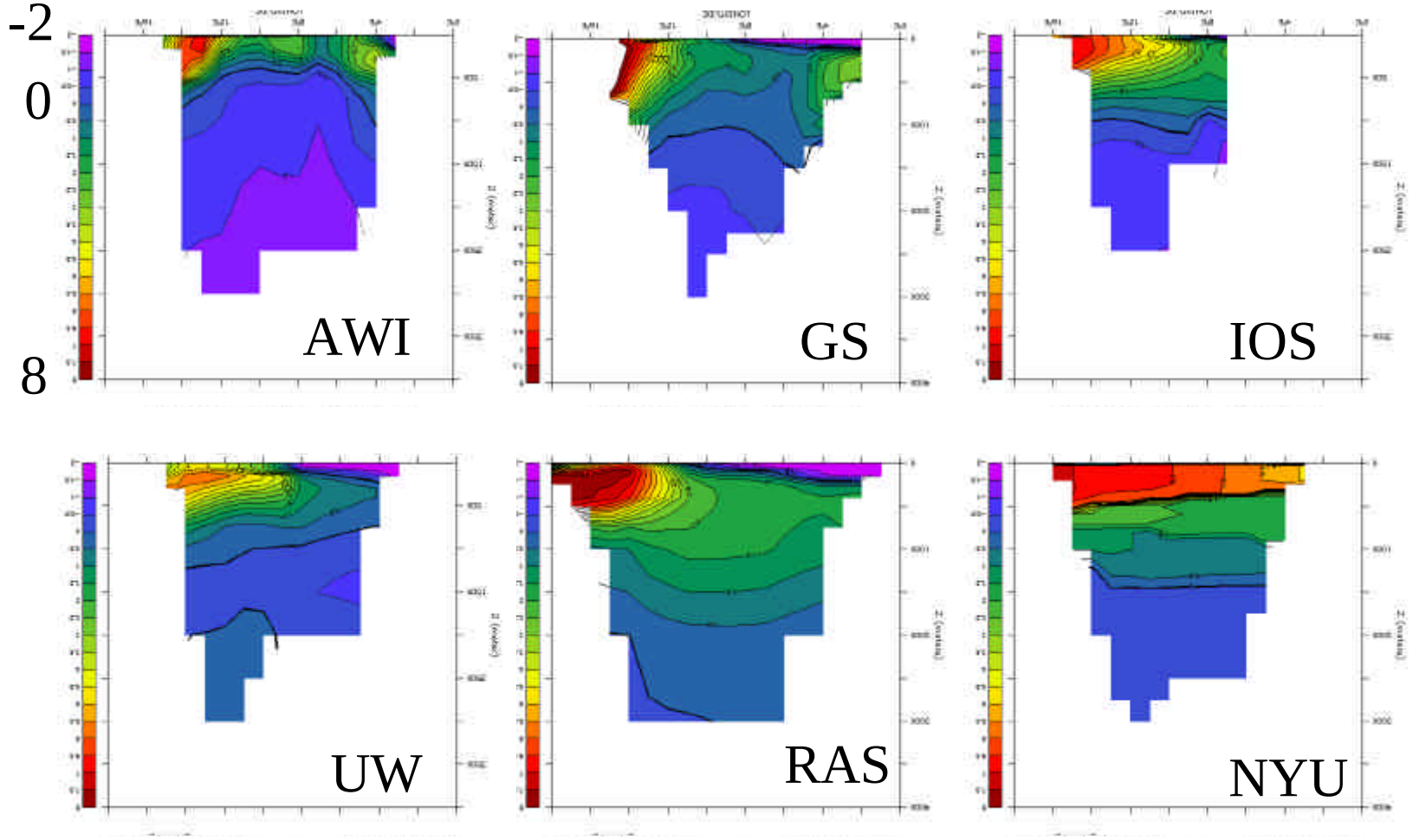
potential temperature 300 m



AOMIP coordinated experiment

Nordic Sea section

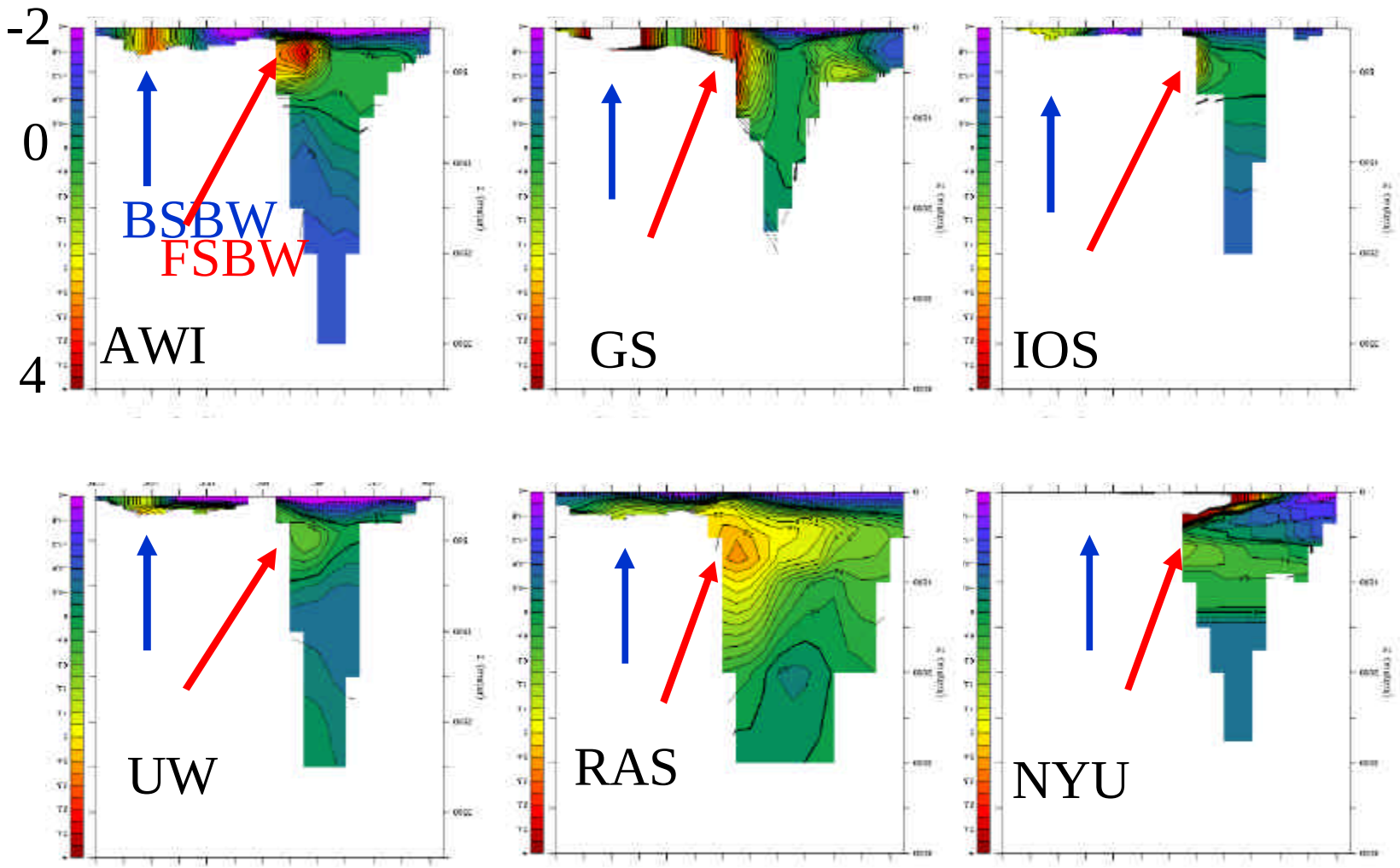
potential temperature (view from north)



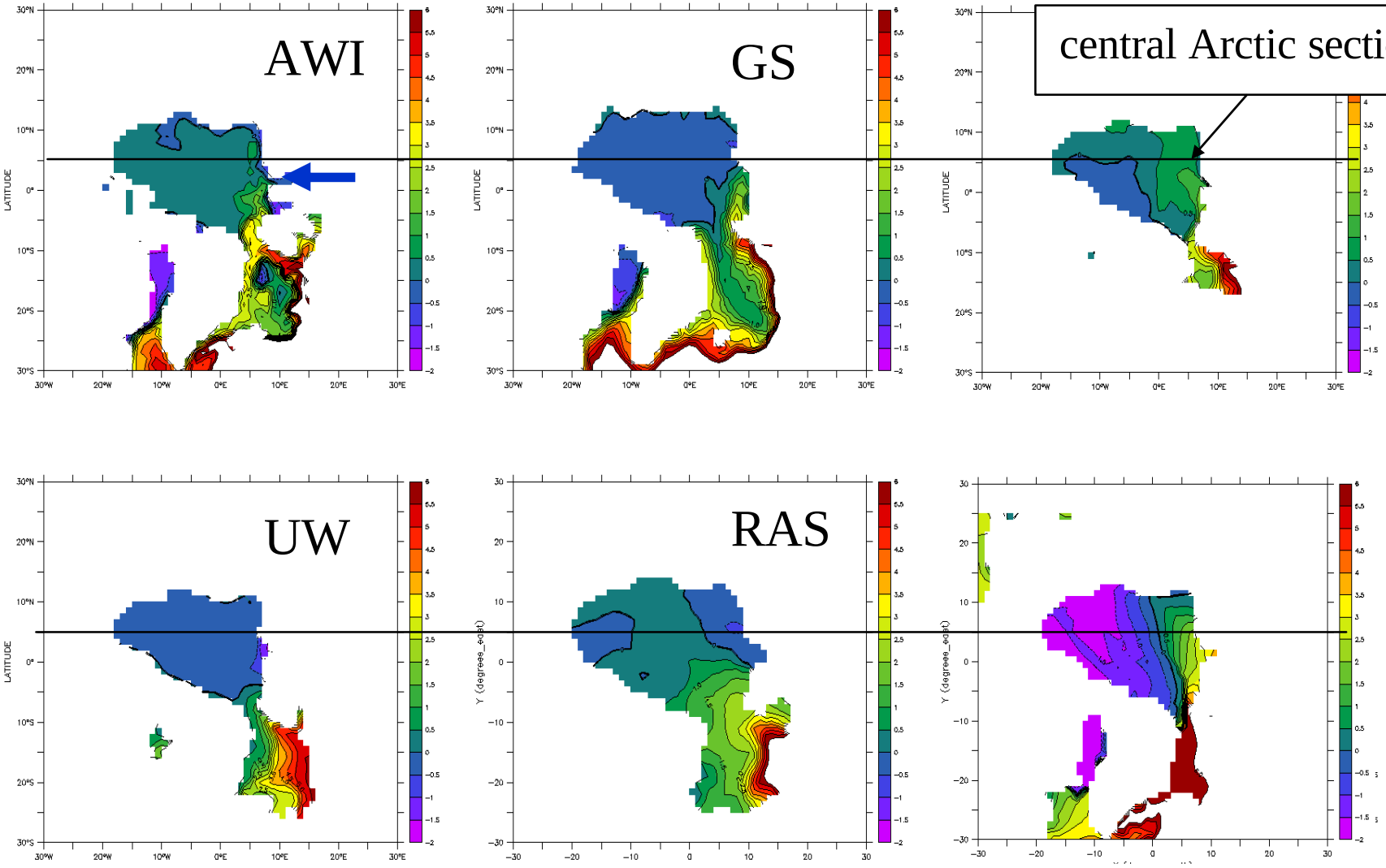
AOMIP coordinated experiment

Fram Strait section

potential temperature (view from north)



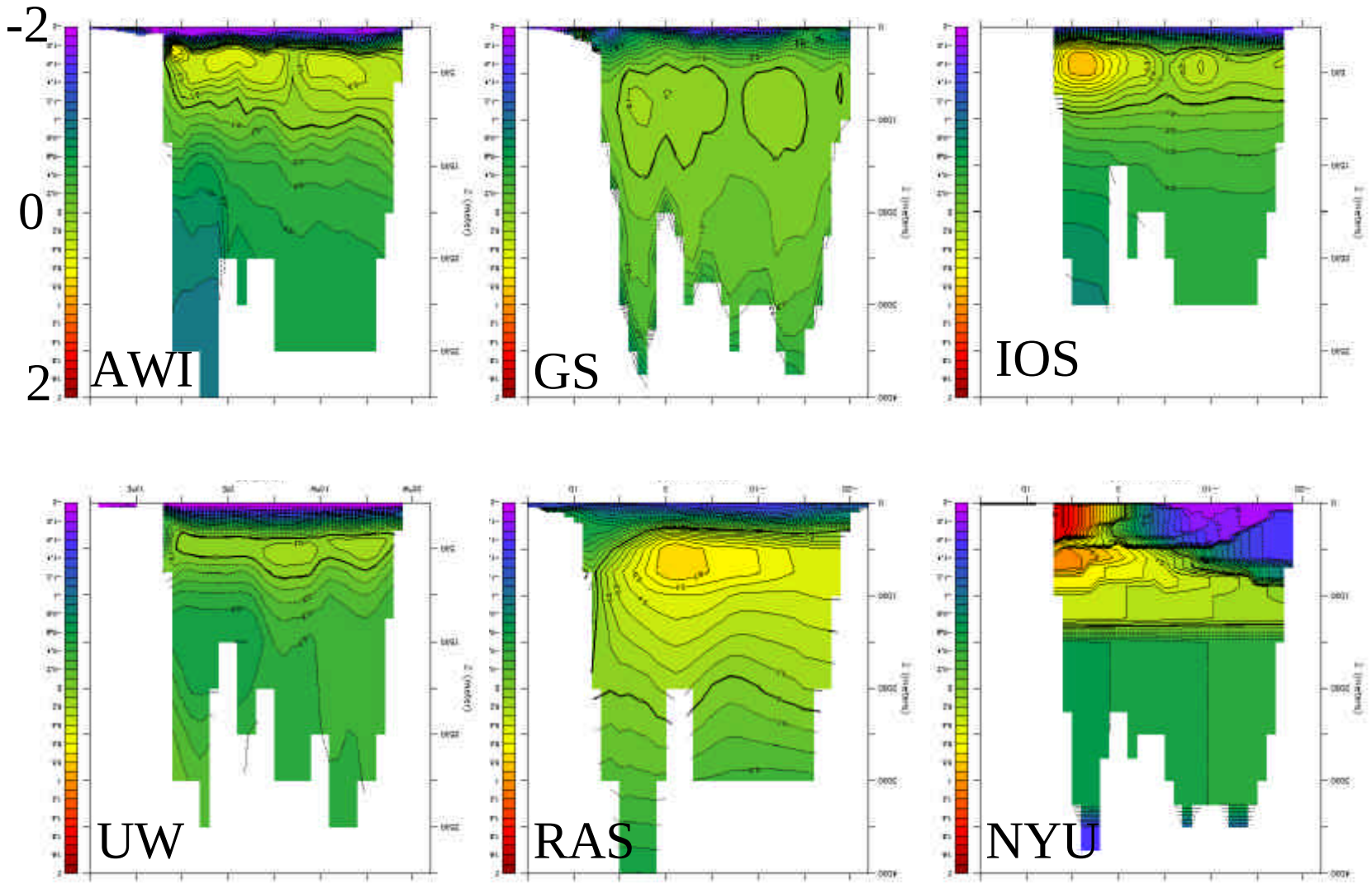
AOMIP coordinated experiment
potential temperature 300 m



AOMIP coordinated experiment

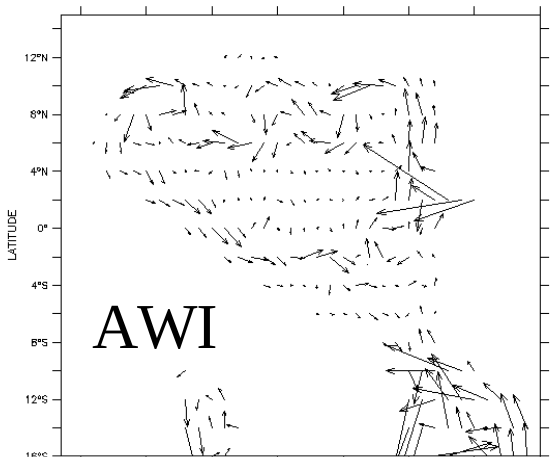
central Arctic section

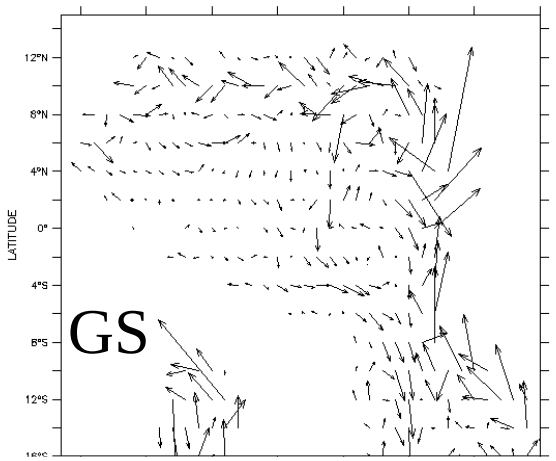
potential temperature

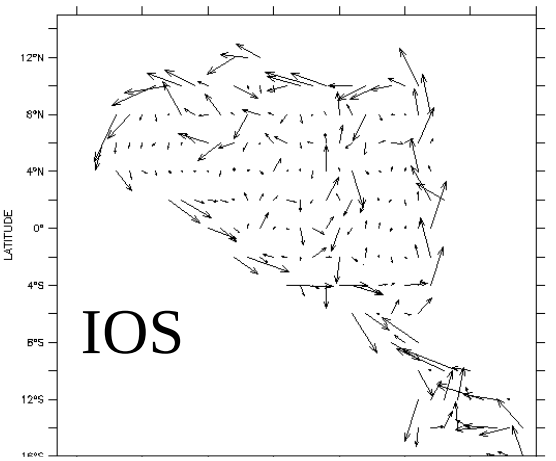


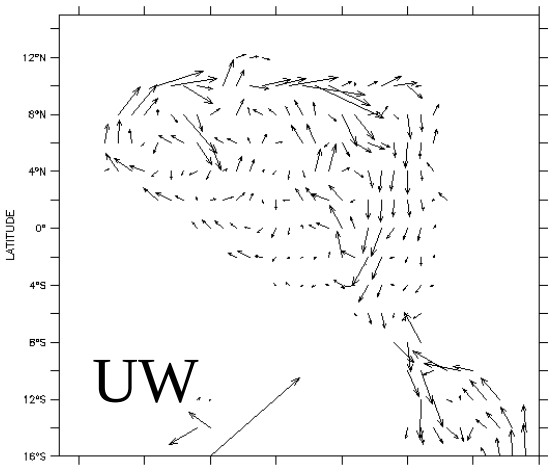
AOMIP coordinated experiment

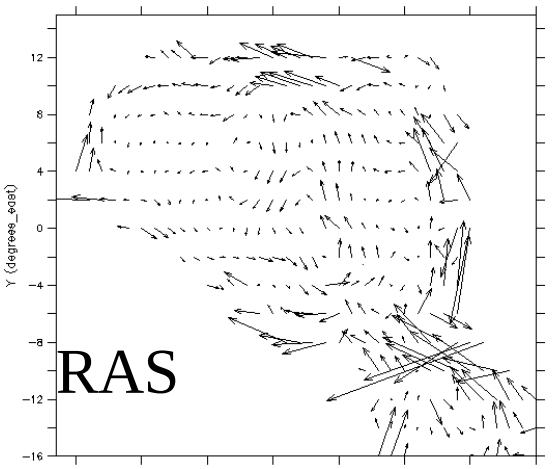
velocity 500 m

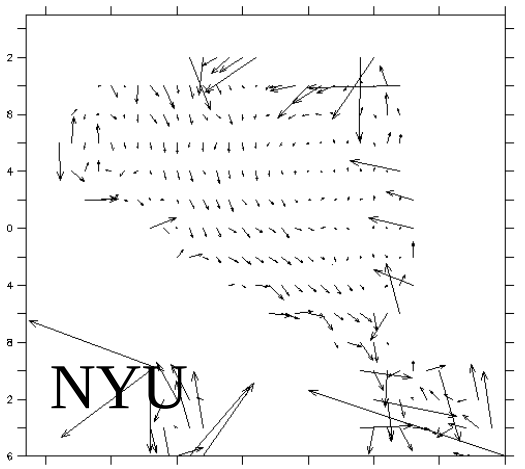




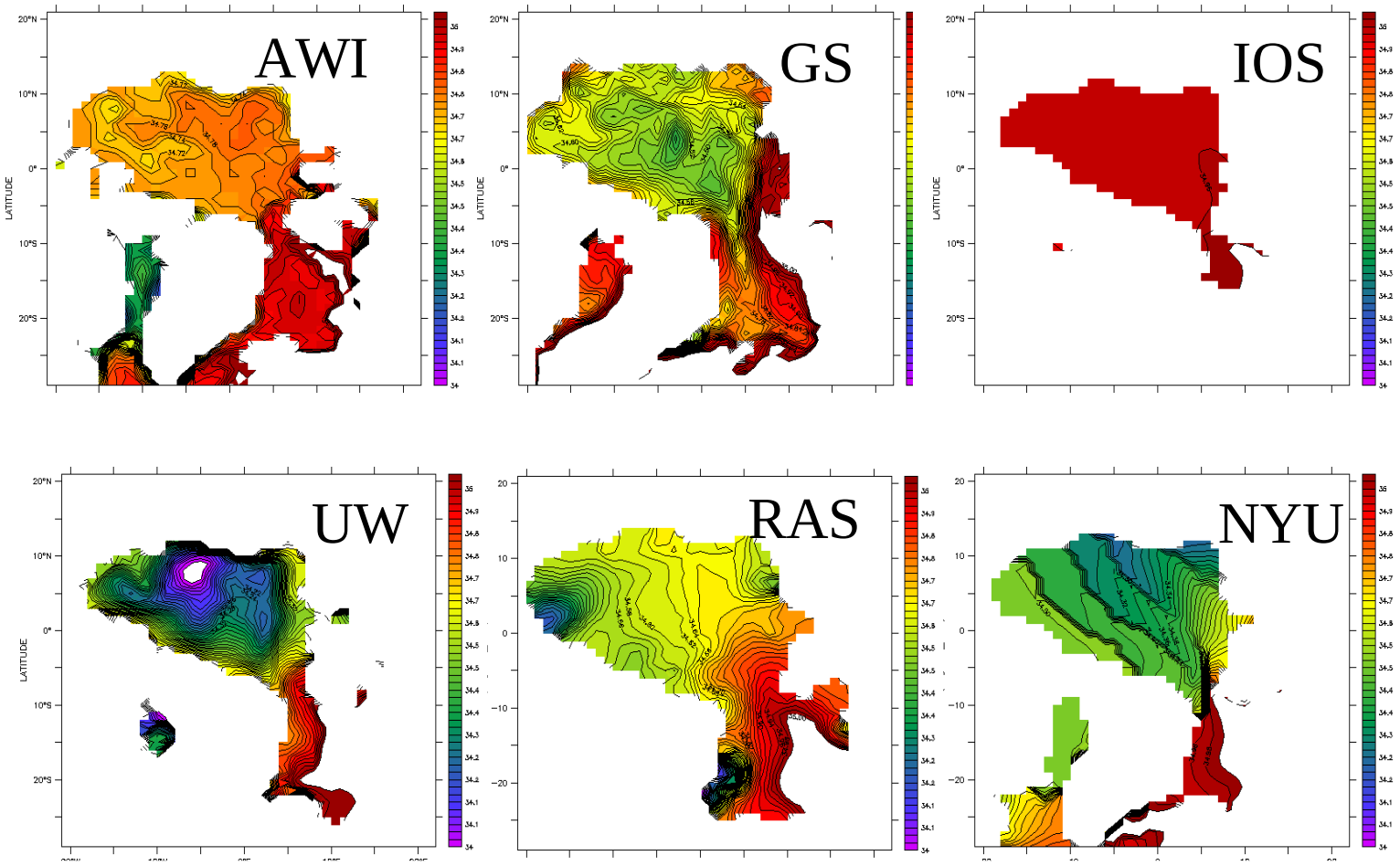








AOMIP coordinated experiment
salinity 300 m



Closer analysis might enclose

- Differences in effective topography
- Distribution of NAC properties on f/h contours
- Control of heat and salt fluxes in Nordic Sea
- Driving forces of the bc in the Arctic vs. driving forces for inflow
- Importance of initial conditions (esp. for diffusive models) and development in first years


Fin