AOMIP coordinated experiment with the NYU ice-isopycnal OGCM

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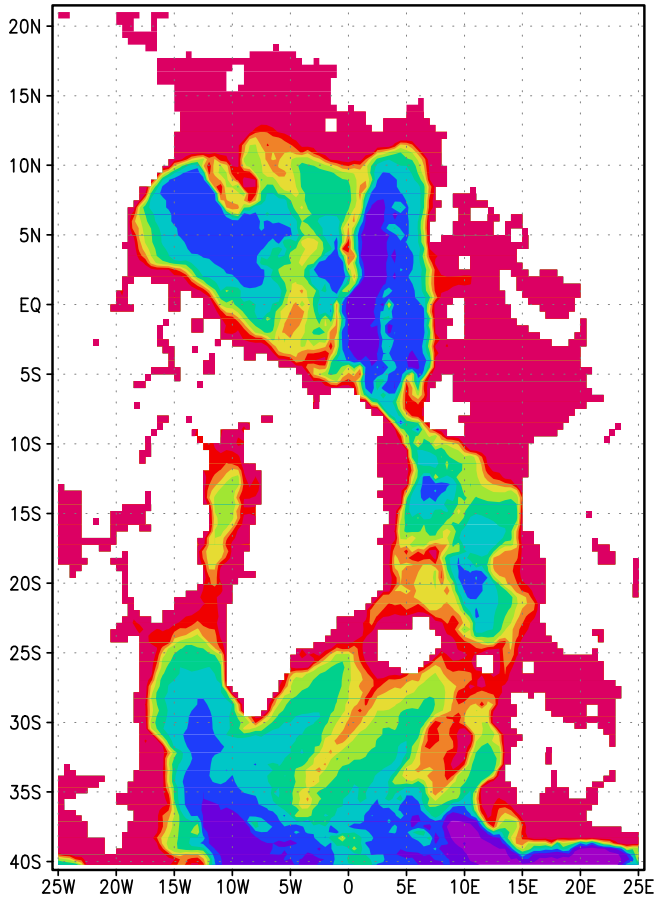
Configuration (MICOM)

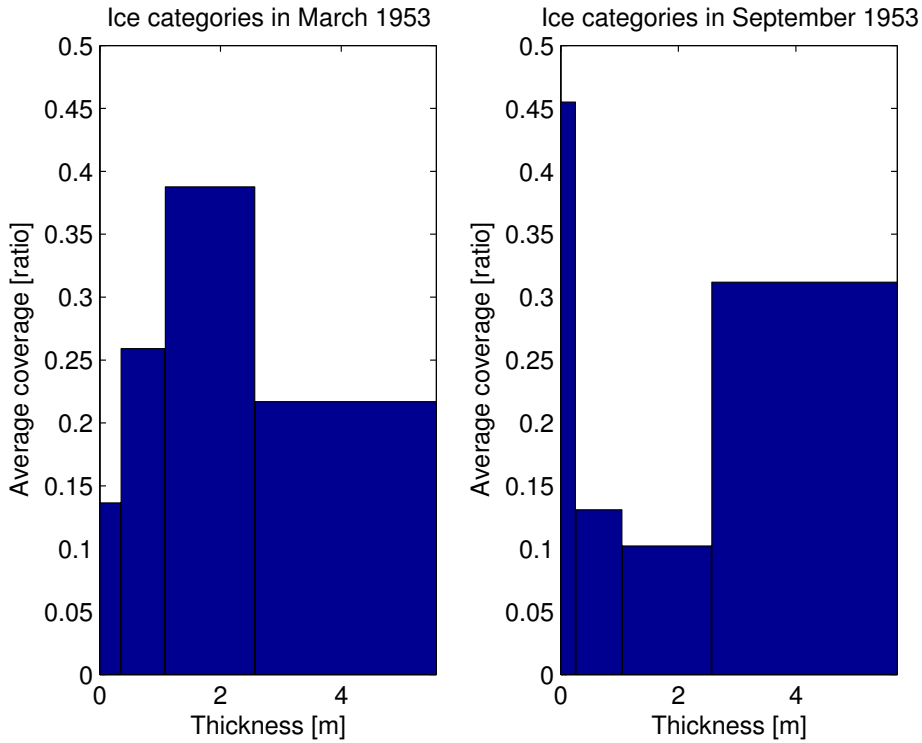


- Horizontal resolution 0.5°, isotropic grid, grid size 103×134
- 11 vertical layers
- no diapycnal mixing
- shallowest ocean points at -50m
- minimum mixed layer thickness is 25 m
- coupler time step = 4 h
- baroclinic time step = 24 min
- barotropic time step = 48 s

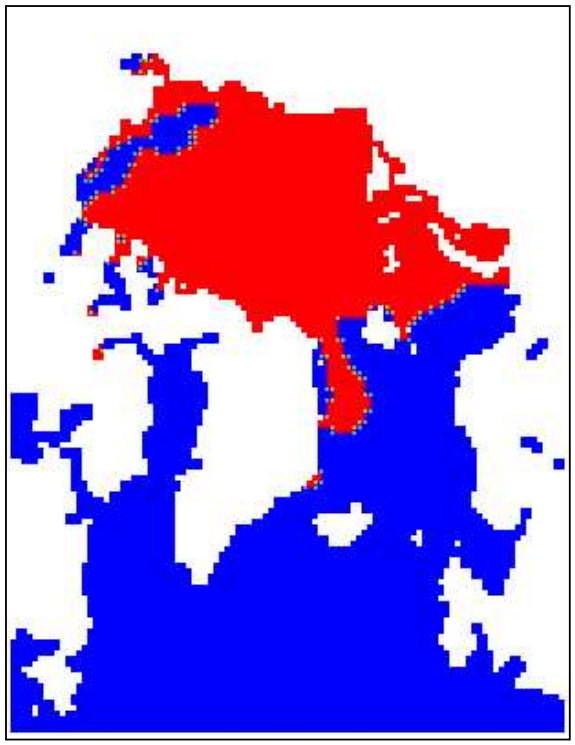
Figure 1: Model mask and bathymetry.

Configuration (CICE)

- four ice thickness categories
- three vertical layers
- time step = 4 h
- subcycling time step for elastic dynamics = 120 s

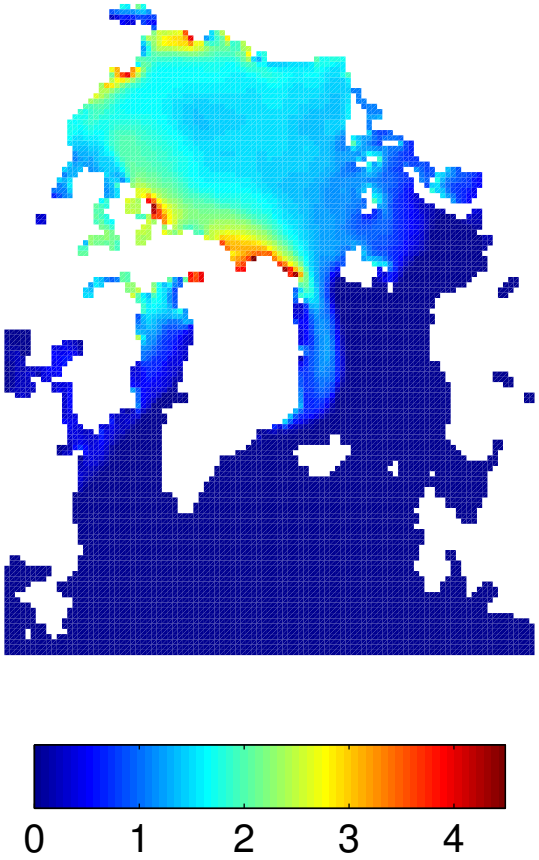


Initial Conditions



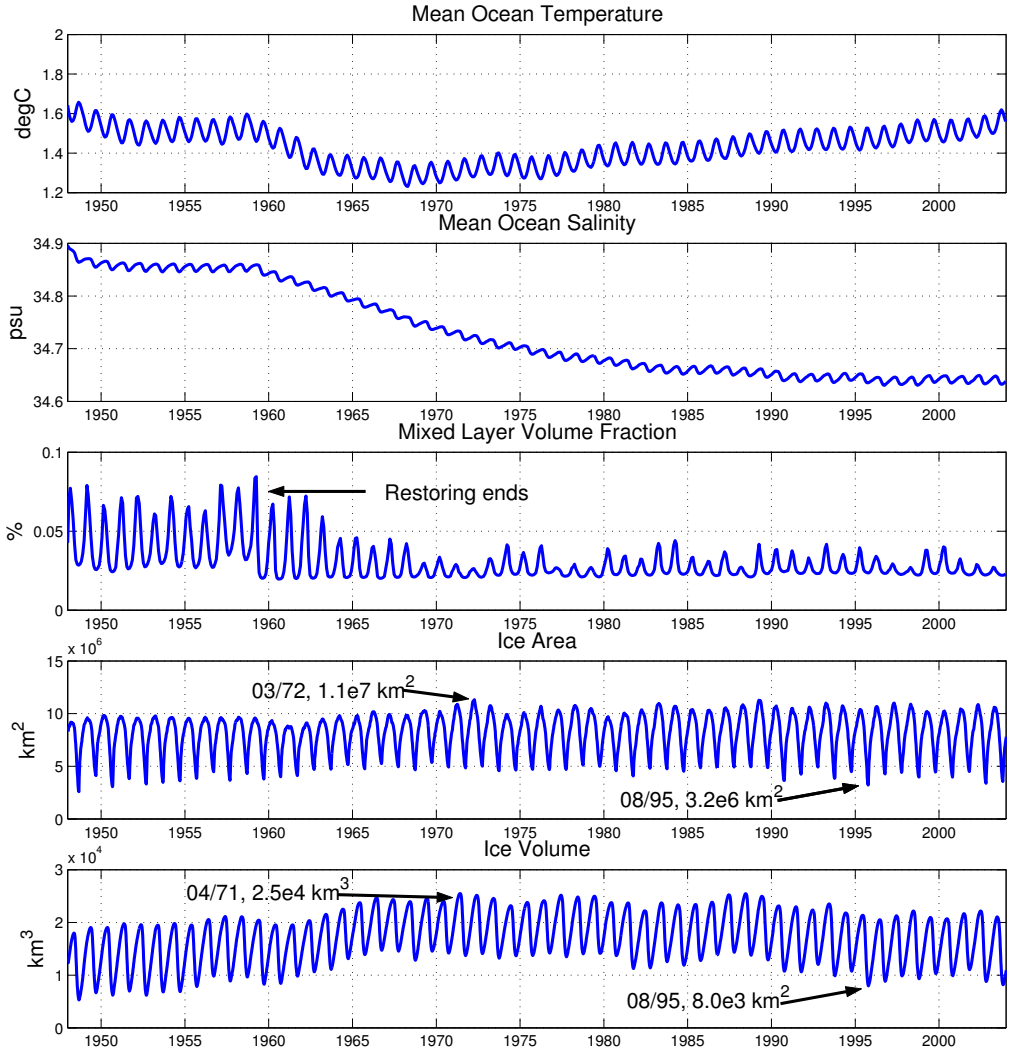
Based on $SST < T_f + 1^\circ C$

01/1948, Ice Thickness



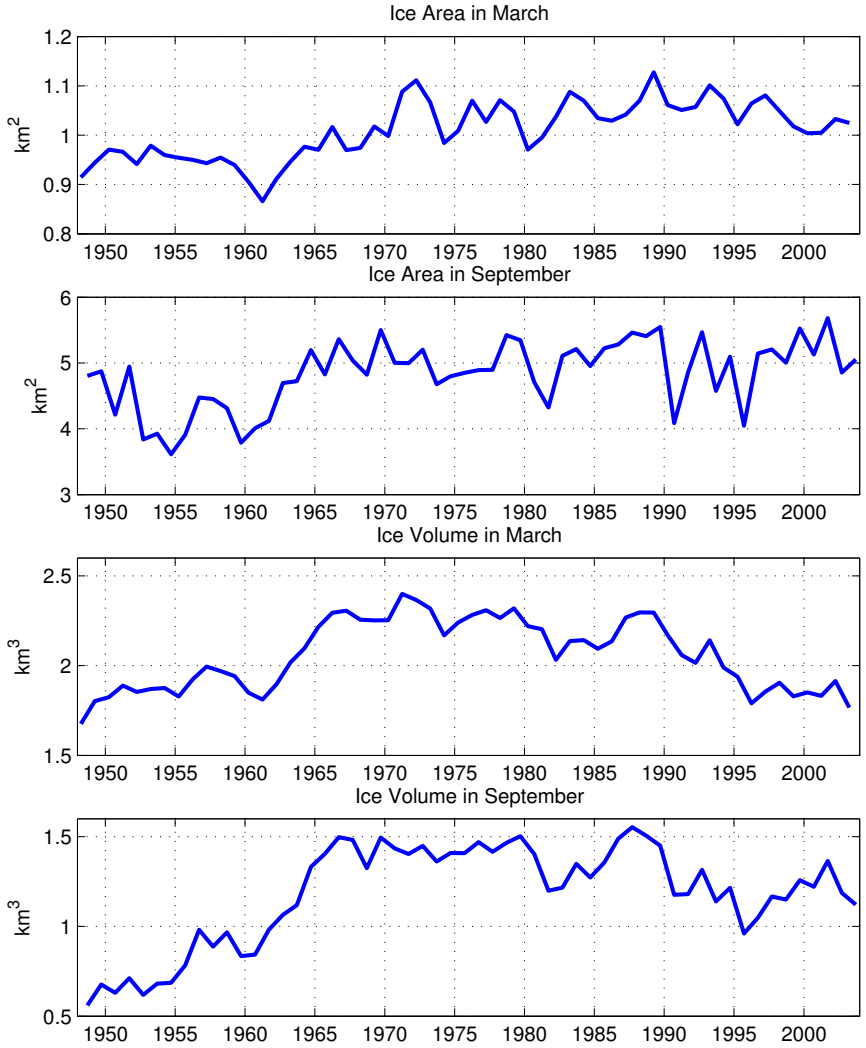
Ice is relatively thin in 01/1948

Results



- Evident trends appear after restoring
- Arctic becomes warmer and fresher
- mixed layer becomes thinner $\longrightarrow$ MICOM ?
- Too little initial and summer ice
- Too much ice in the winter
- Ice variability as expected, but higher than observed

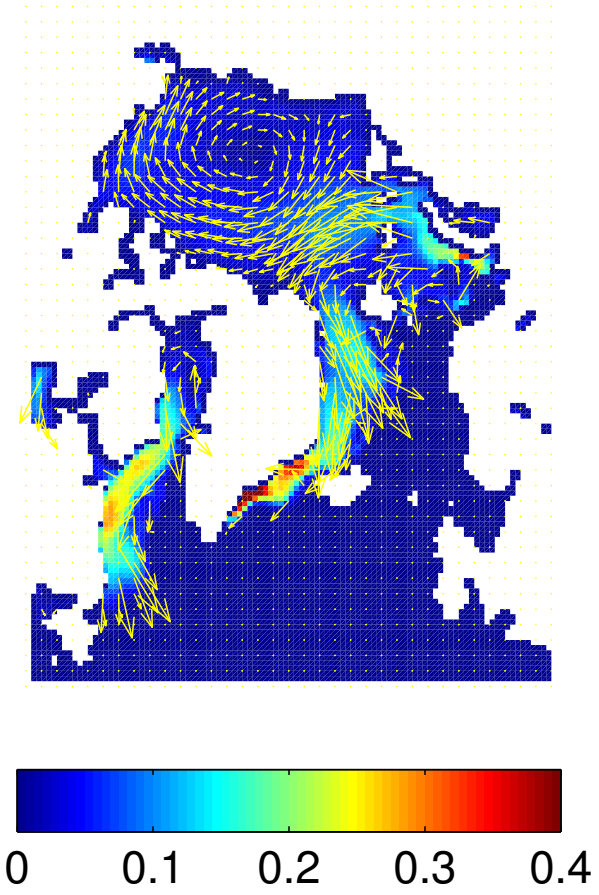
Inter-annual Ice variability



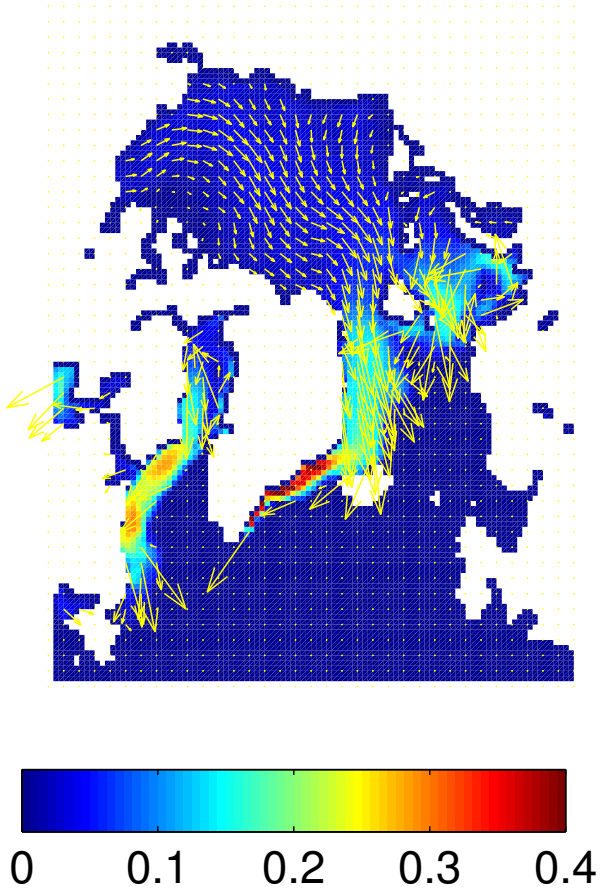
- Especially (winter) ice volume decreases

Ice Drift

01/2001, Ice velocity field

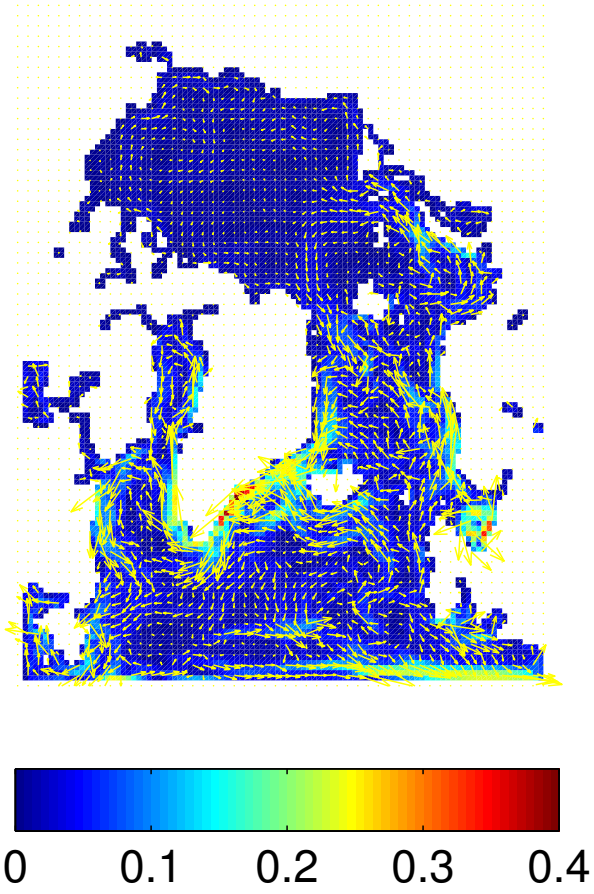


01/2003, Ice velocity field

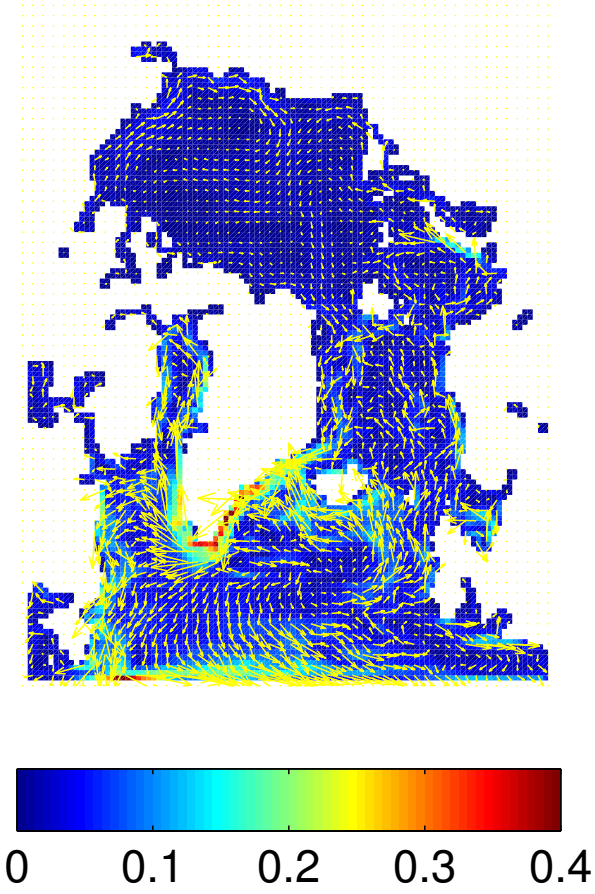


Results: Ocean, surface circulation

01/2001, Ocean surface velocity field

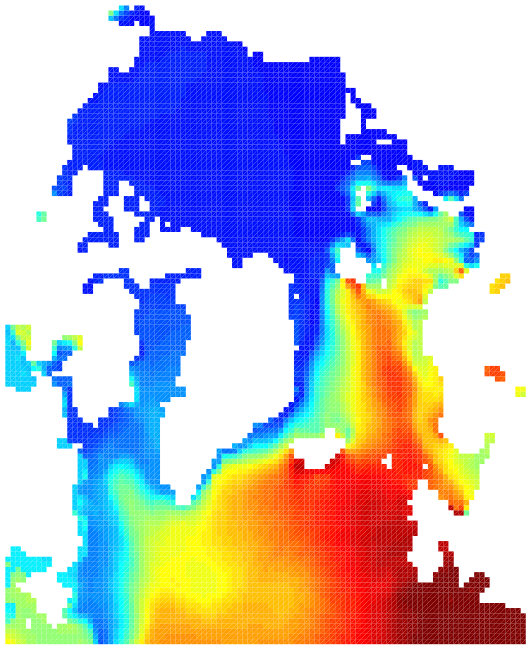


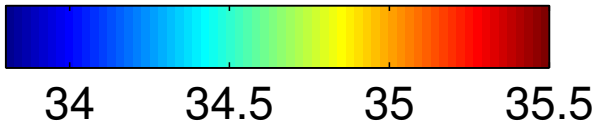
01/2003, Ocean surface velocity field



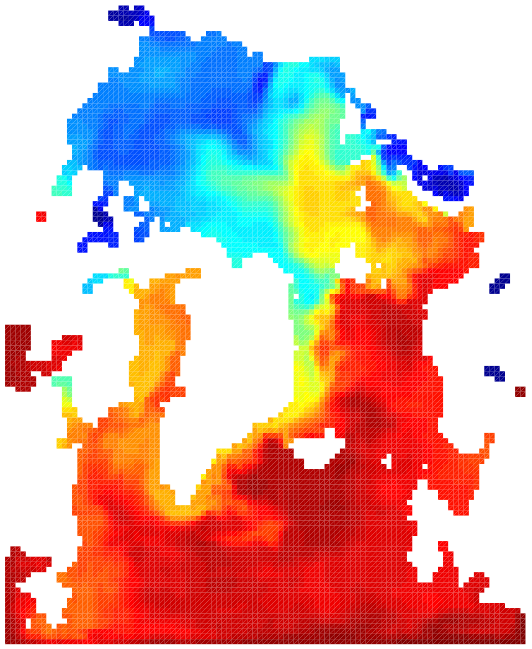
Results: SSS

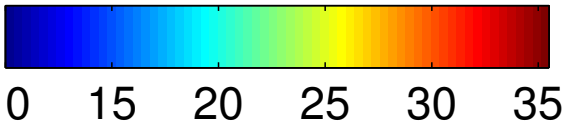
01/1948, Salinity at the surface





01/2003, Salinity at the surface

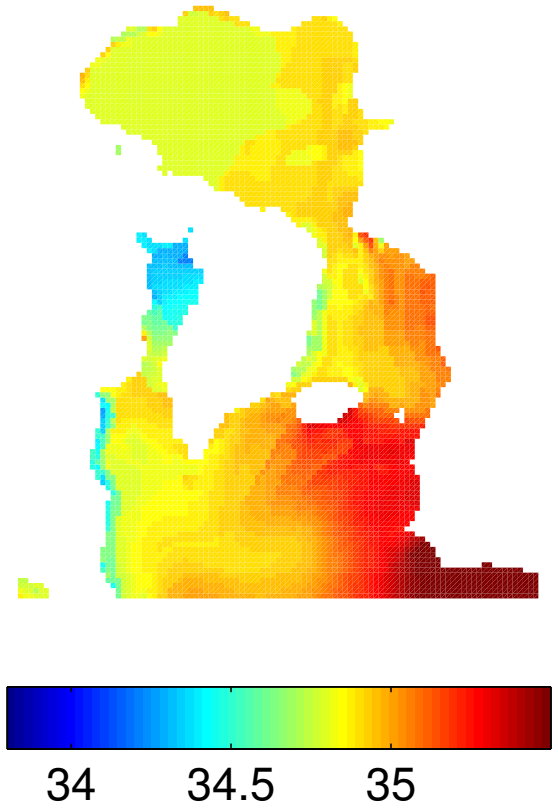




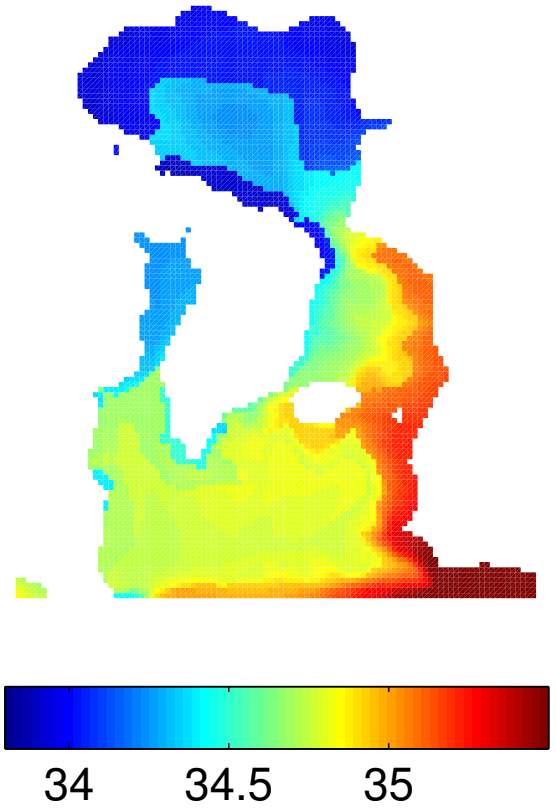
Note scale change !!

Results: Salinity at -400 m

01/1948, Salinity at –400 m

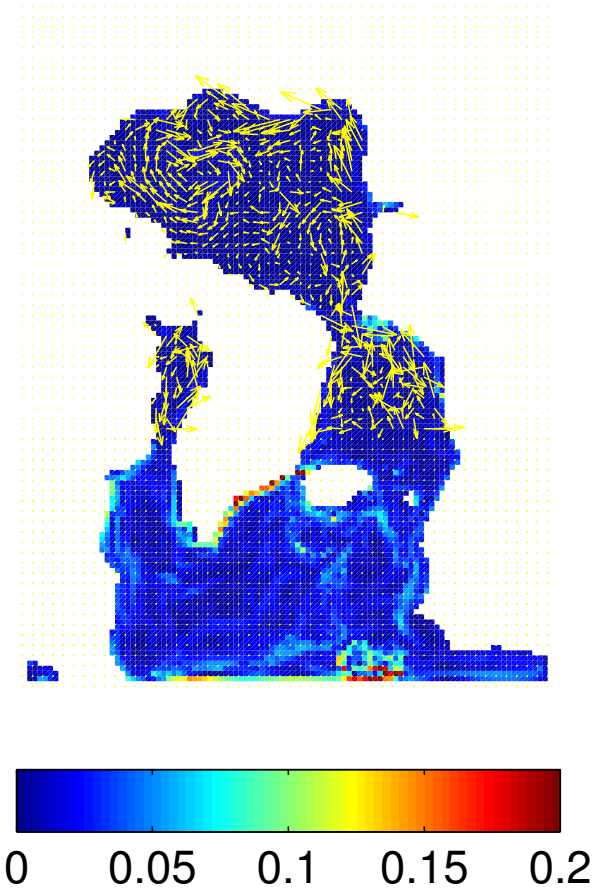


01/2003, Salinity at –400 m

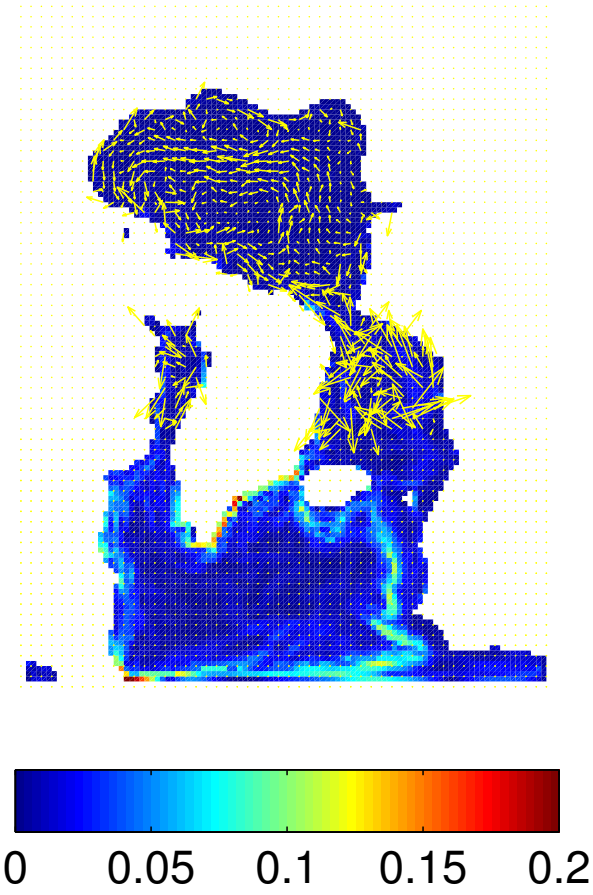


Results: Ocean circulation at -400 m

01/1953, Ocean velocity field at –400 m



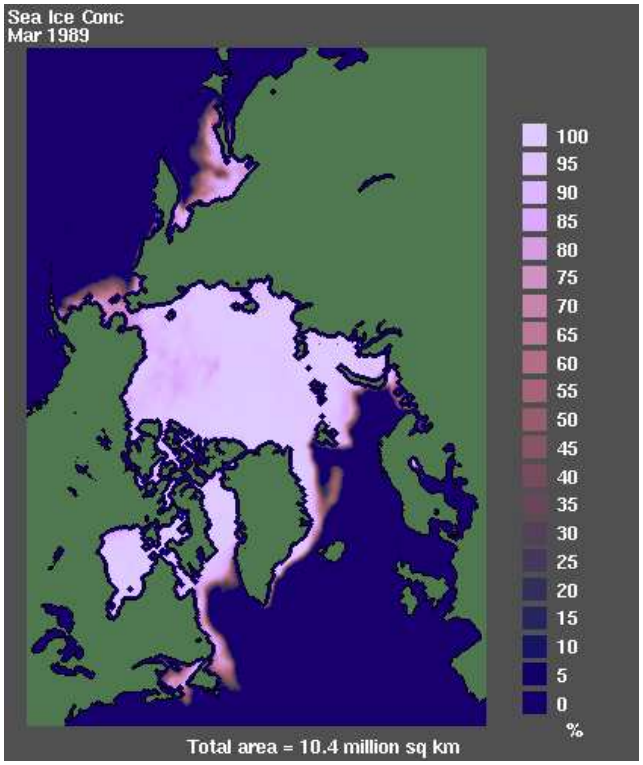
01/2003, Ocean velocity field at –400 m



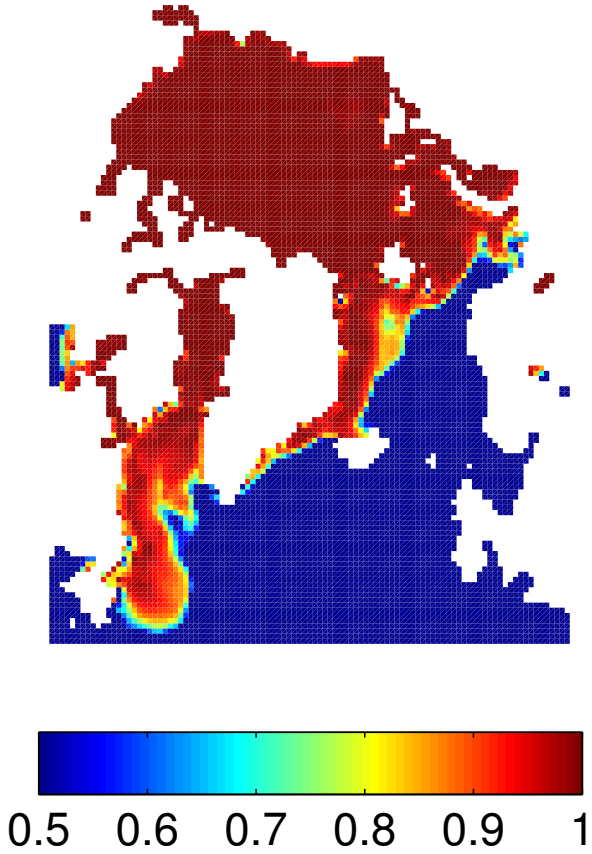
Concluding Remarks

- Data can be found from AOMIP-LAS
- Freshening due to the lacking salt input from the Pacific and due to the too weak advection of fresh water from the Arctic ?
- Freshening of the surface layer increases stratification and separates deeper layers from the surface layer.
- Atlantic layer circulation becomes non-dependent on the surface conditions.
- Deeper layers become more fresh as well
- Mixed layer thinning when there's no restoring $\longrightarrow$ Gaspar et al. -scheme, mixing, shear ?
- Thin mixed layer cools/warms fast and affects ice conditions and causes excessive seasonal ice variability

Maximum Ice extent in 03/1989



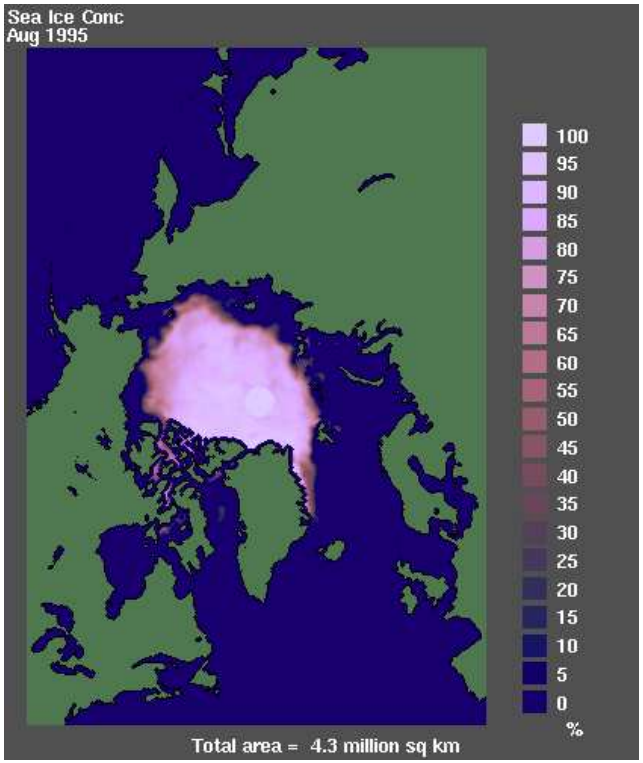
03/1989, Ice Concentration

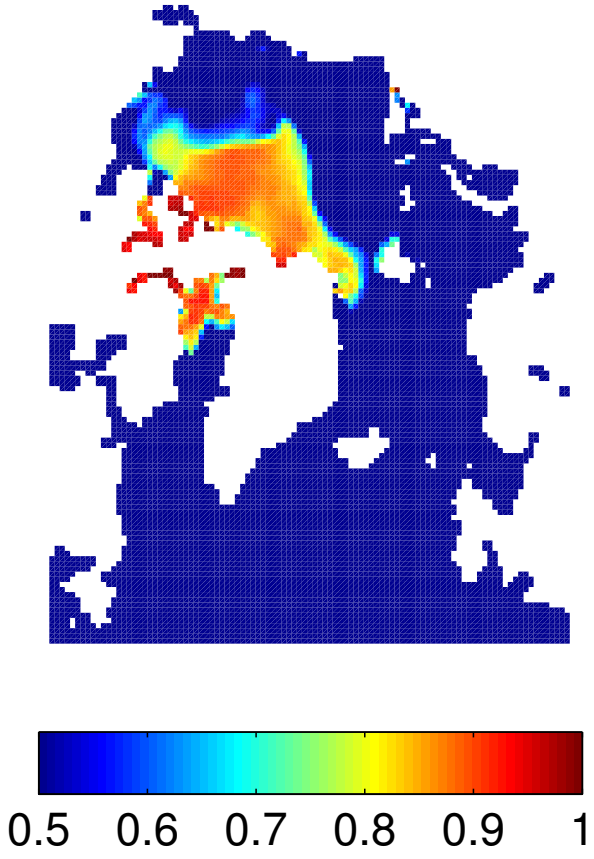


11 million sq km

Minimum Ice extent in 08/1995

08/1995, Ice Concentration





3.2 million sq km