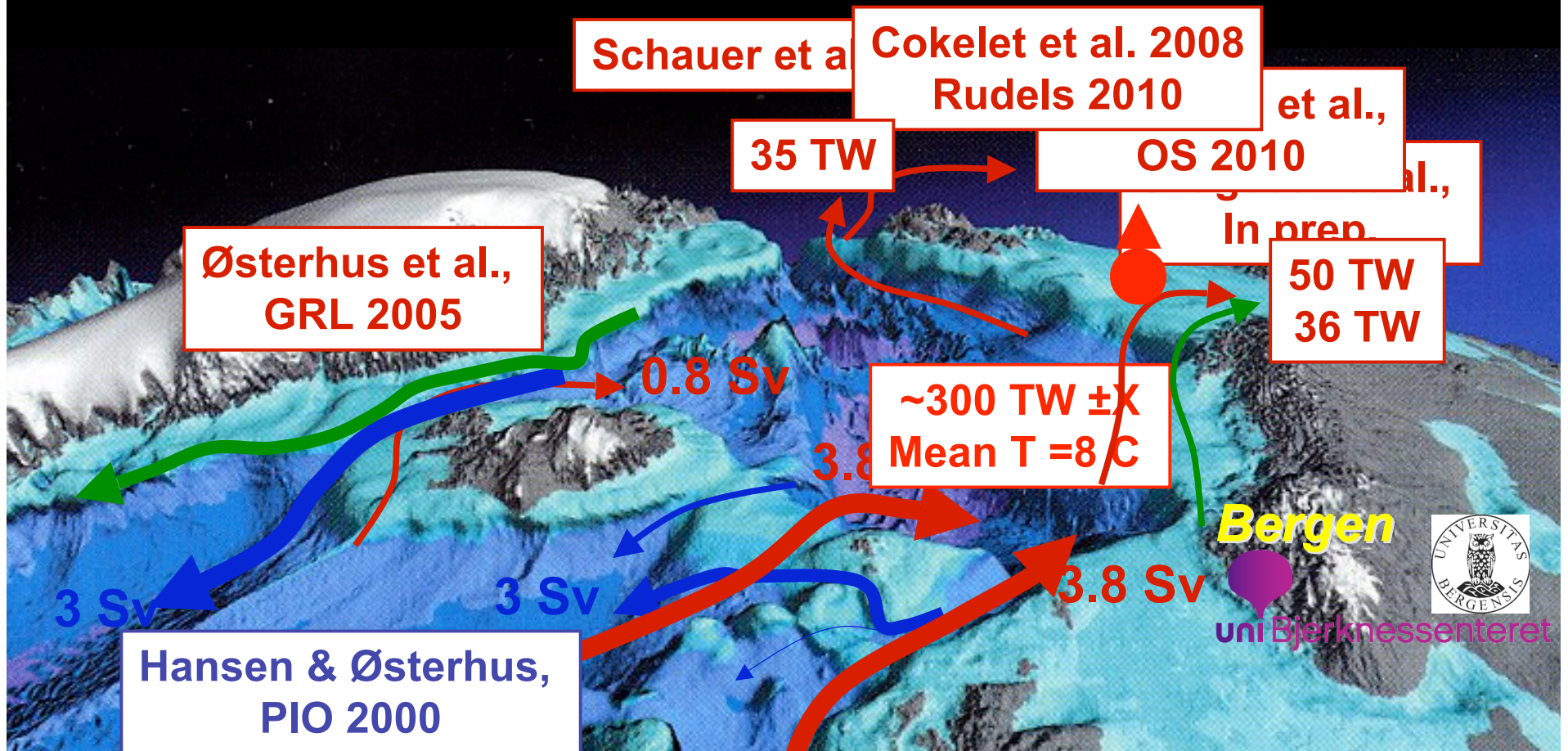


Poleward propagation of oceanic heat anomalies

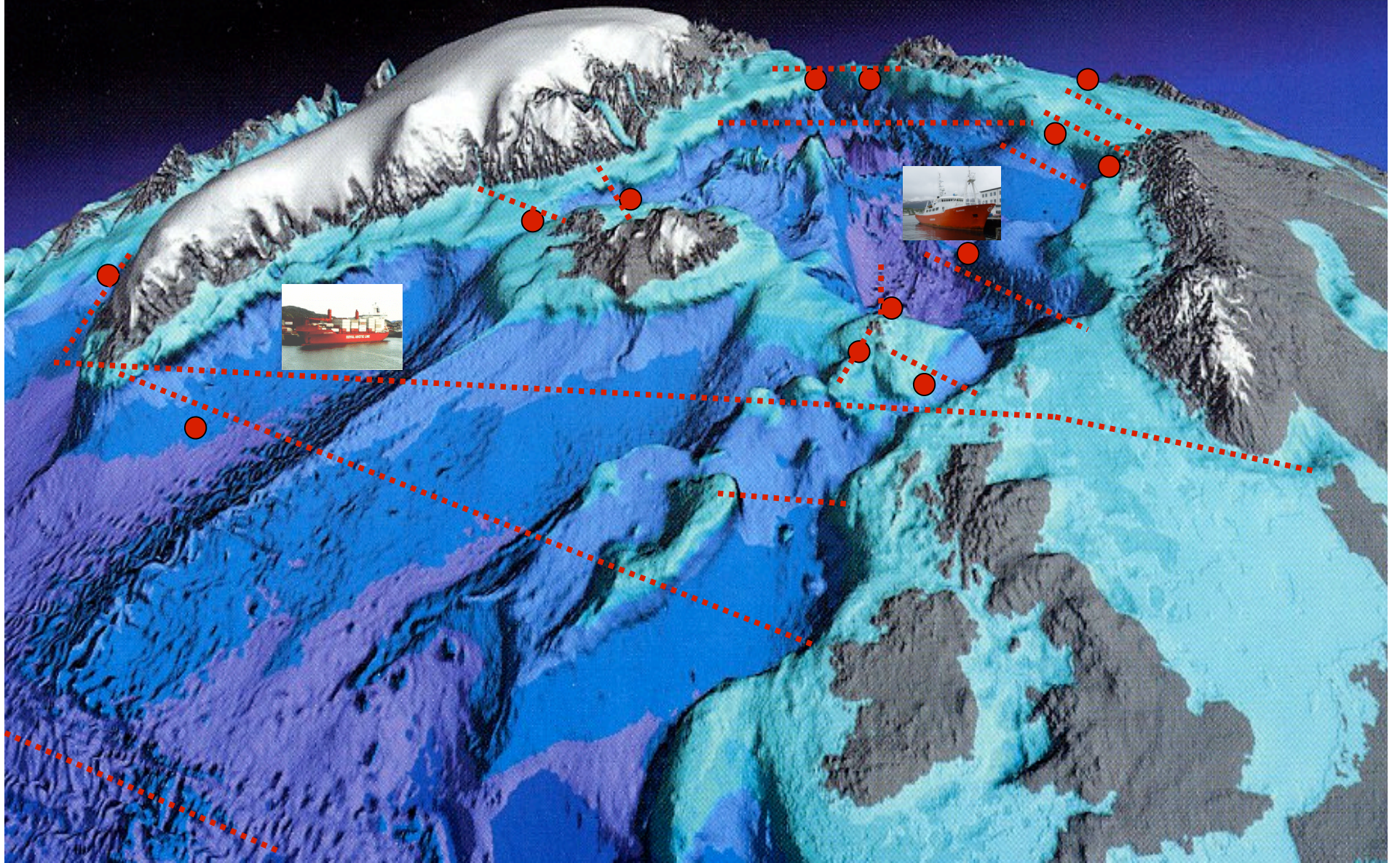


Svein Østerhus & Tore Furevik *With a little help from Bogi Hansen and others*

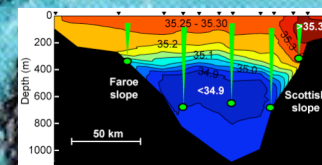
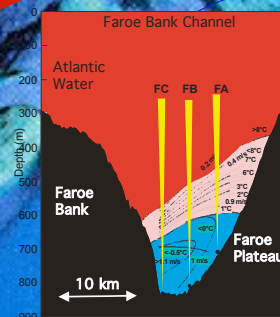
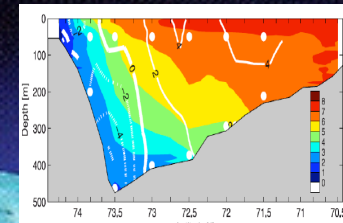
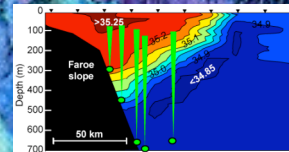
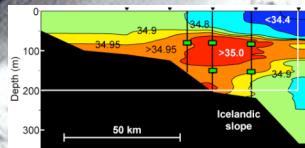
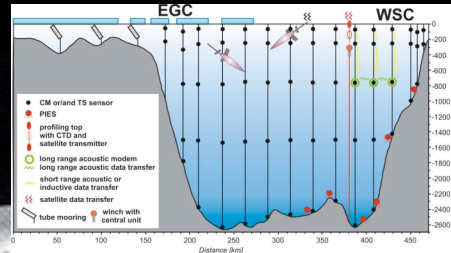
Seasonal to Multi-decadal Predictability of Polar Climate

A pan-WCRP workshop initiated by SPARC and CliC October 25-29, 2010 Bergen, Norway

North Atlantic long term monitoring Sites and Sections



Transport (mass and heat) observatories



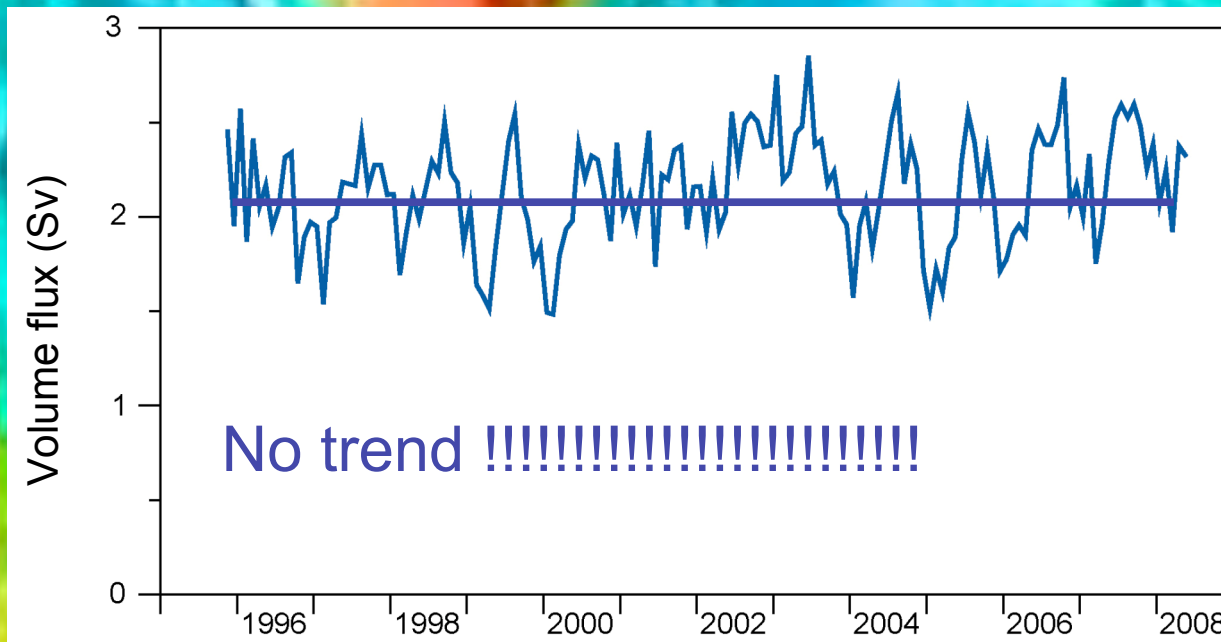
Faroe Bank Channel overflow

Hansen & Østerhus 2007 (updated)

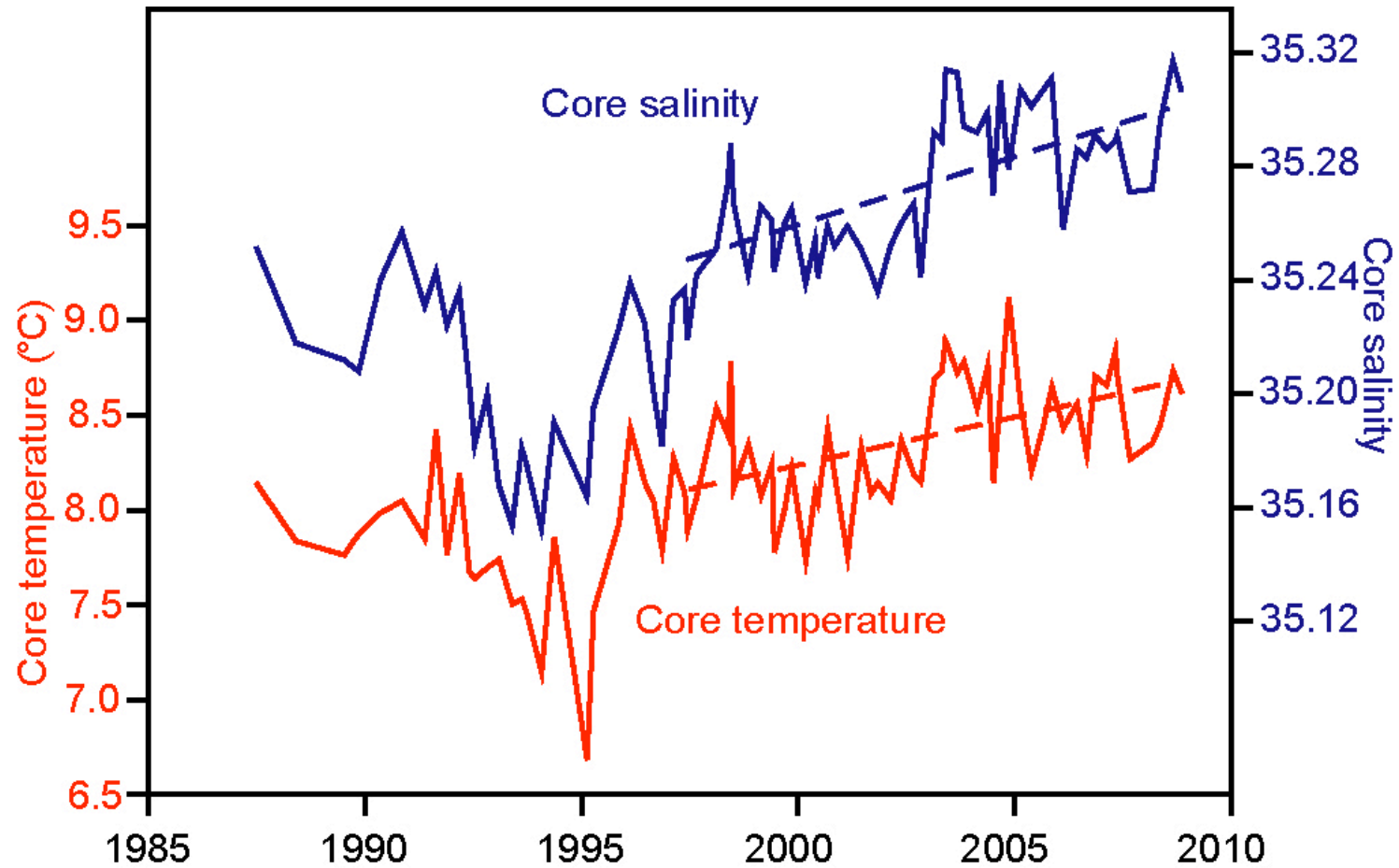
Greenland

Iceland

Scotland



T and S in the core of Atlantic water in the IF-inflow



Hansen, 2010

Conclusions 1995-2010

No indication of weakening of overflow or Atlantic inflow (the MOC) to Arctic during the last decade

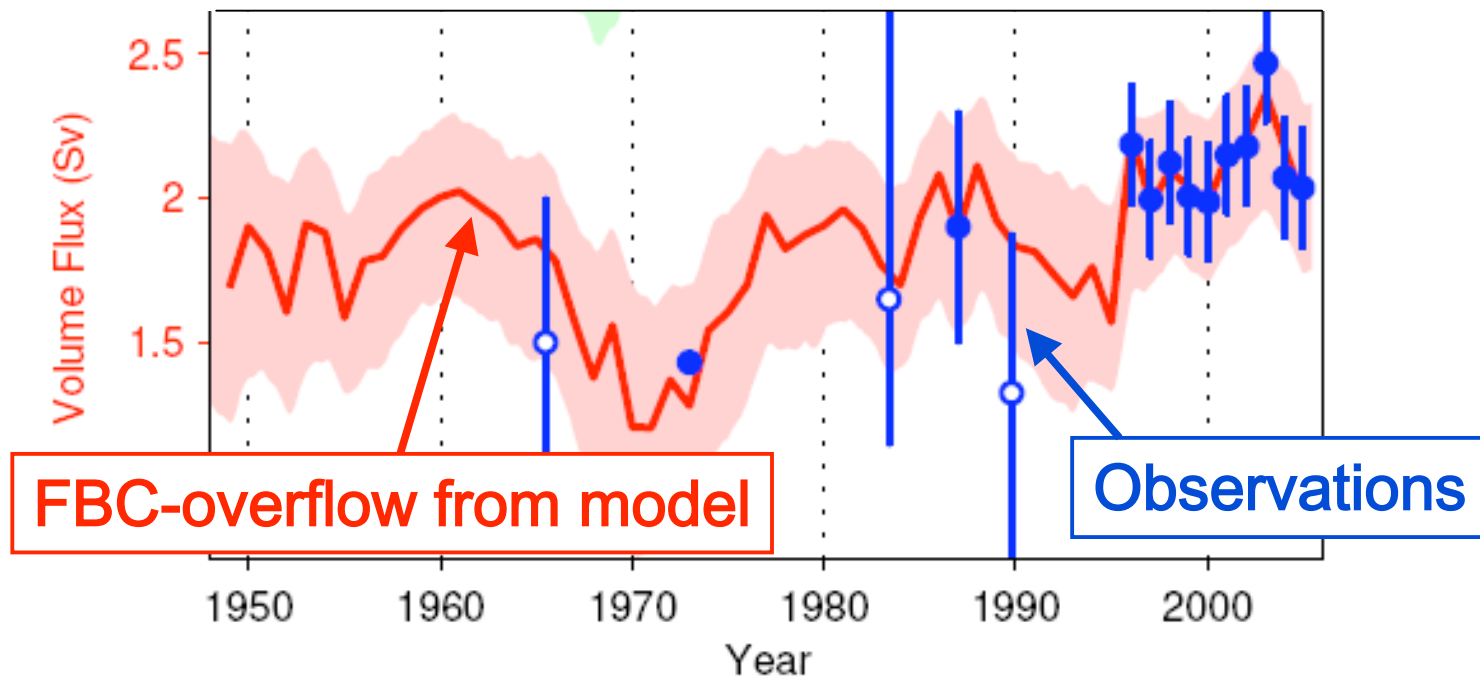
but

The temperature and salinity has increased (a trend?)

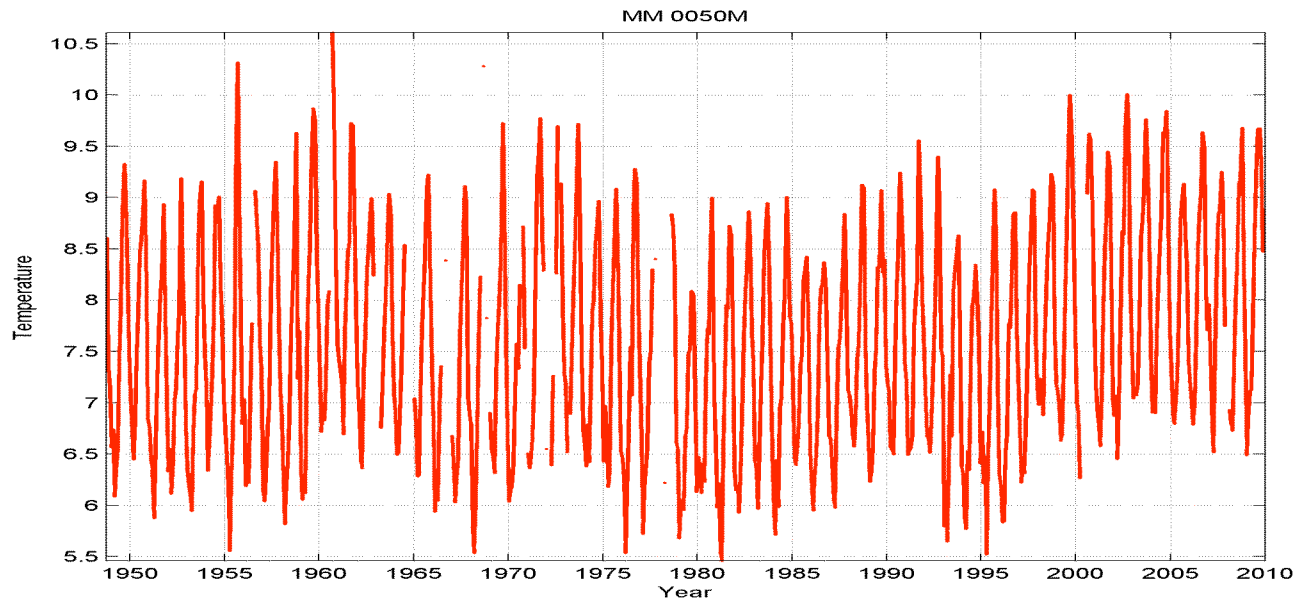
FBC- overflow from model

(Olsen & Schmith, 2007; Olsen et al., 2008)

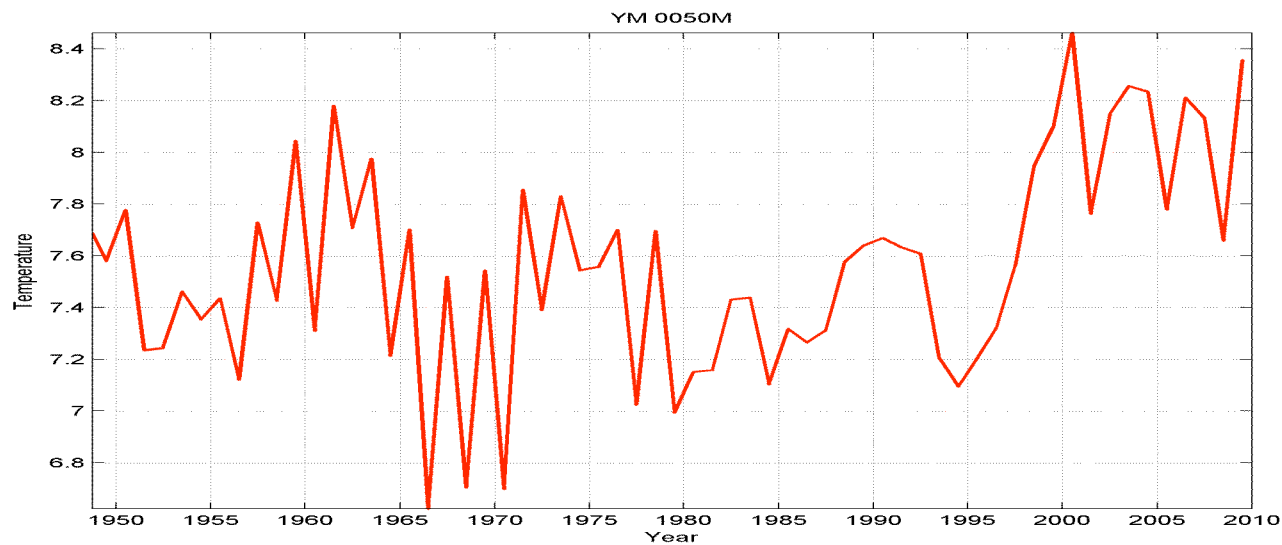
No trend !!!!!



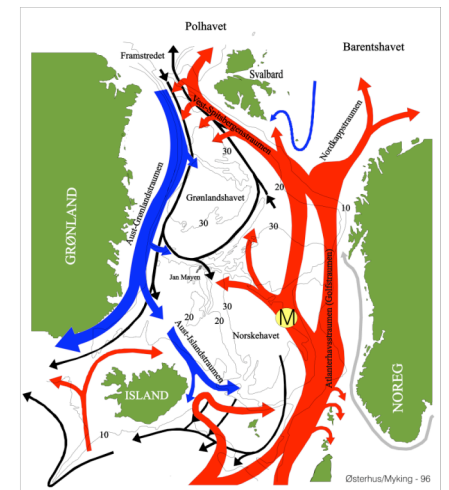
Temperature in Atlantic layer at station M



**Monthly
mean**



**Yearly
mean**



Conclusions 1948-2010

Greenland

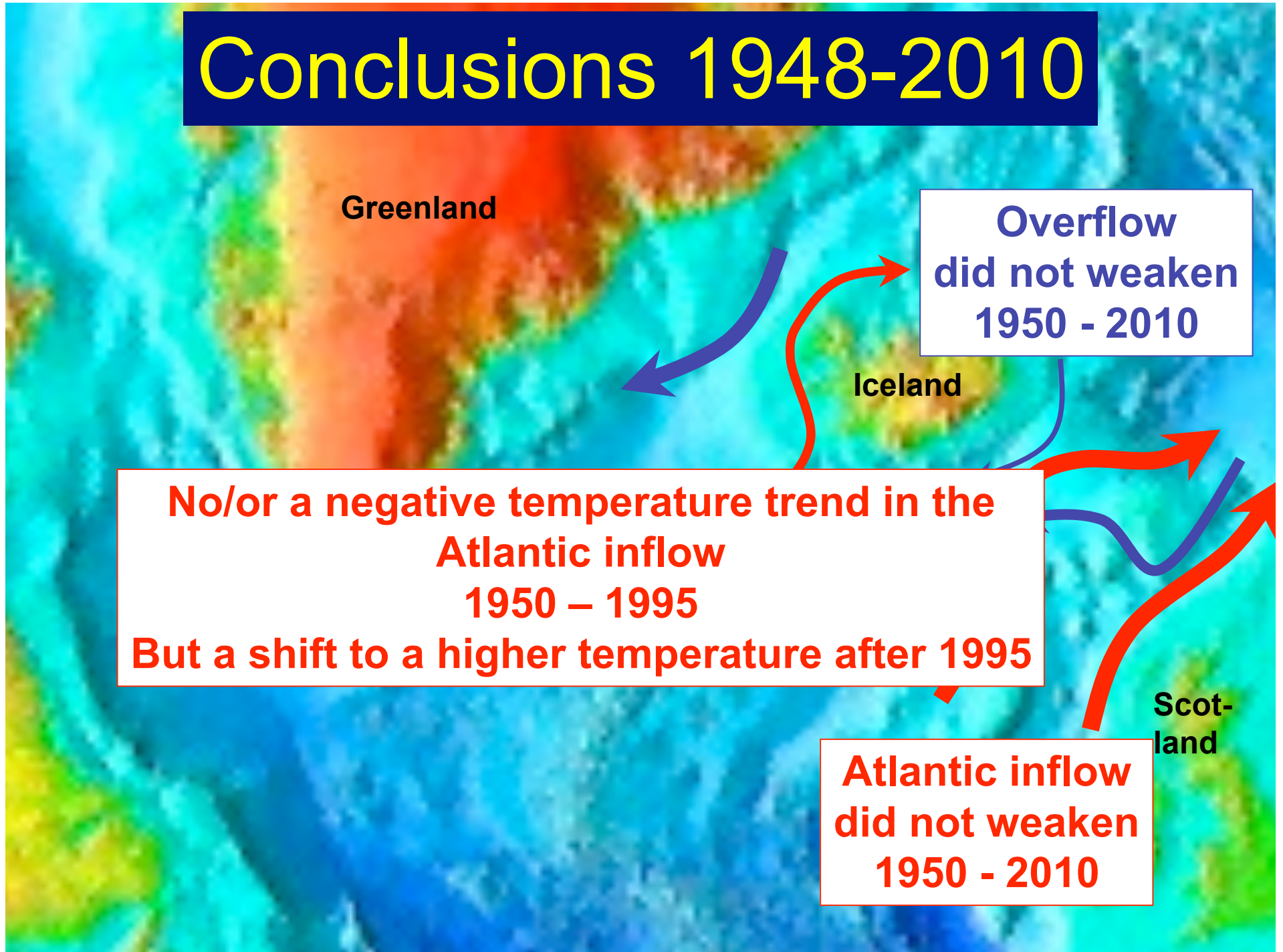
Overflow
did not weaken
1950 - 2010

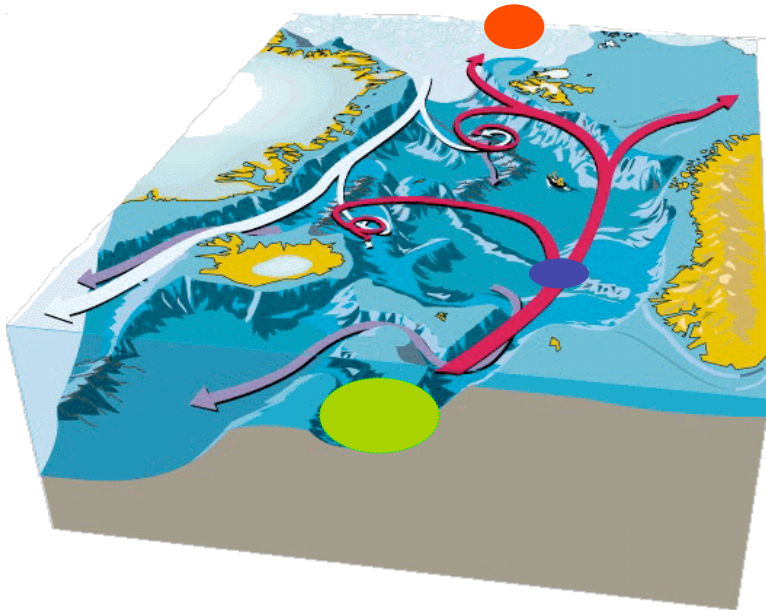
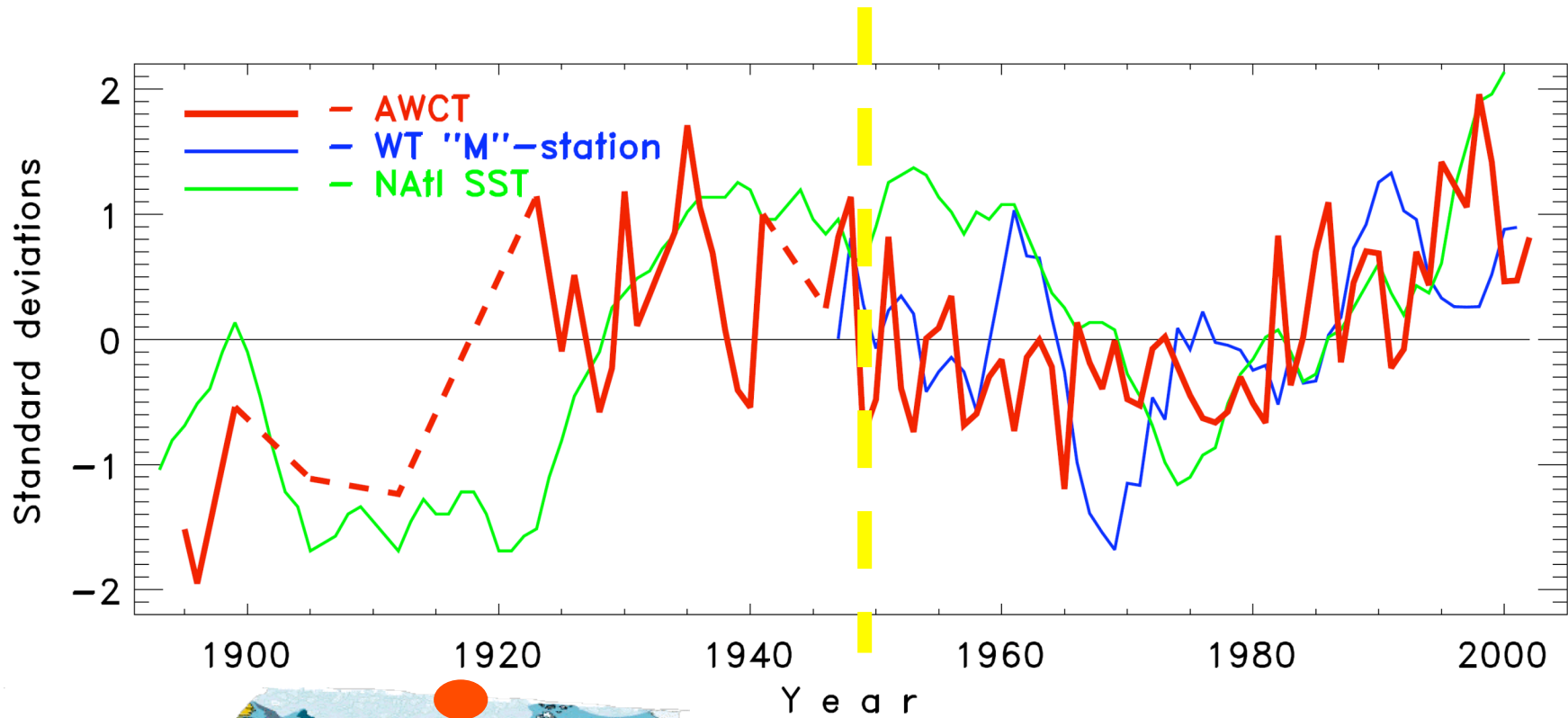
Iceland

No/or a negative temperature trend in the
Atlantic inflow
1950 - 1995
But a shift to a higher temperature after 1995

Scot-
land

Atlantic inflow
did not weaken
1950 - 2010





Temperature in the Atlantic water
1890-2001

Polyakov et al., 2004,
Dickson & Østerhus, 2007

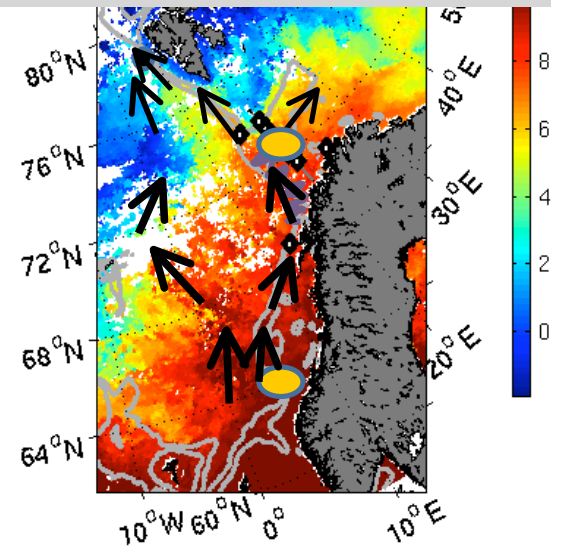
Volume fluxes: Svinøy vs Barents



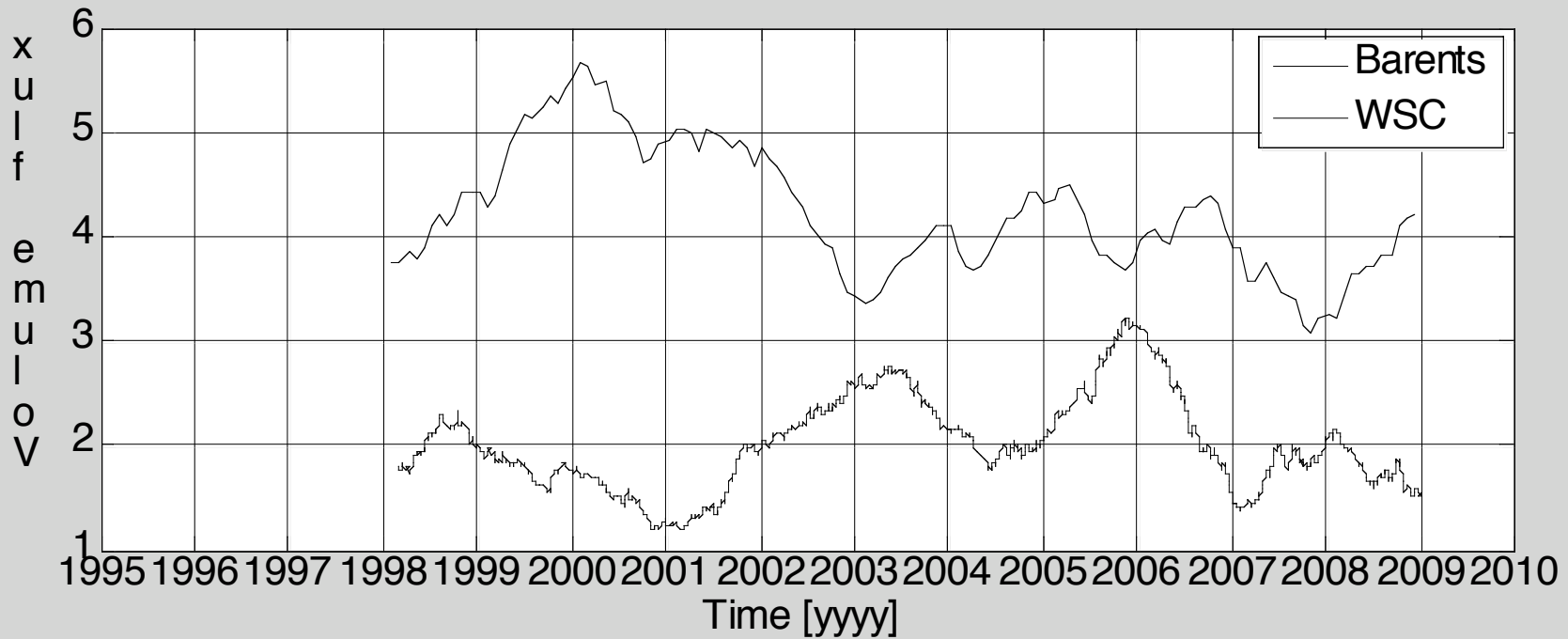
In phase

No trend !!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Skagseth et al., in prep.



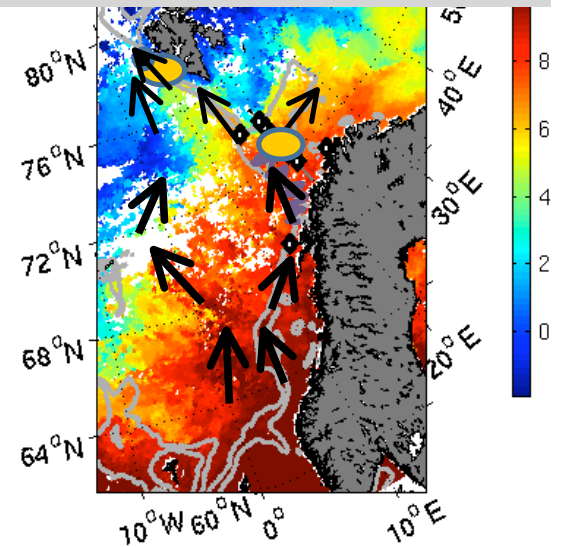
Volume fluxes: Barents vs WSC



-Out of phase

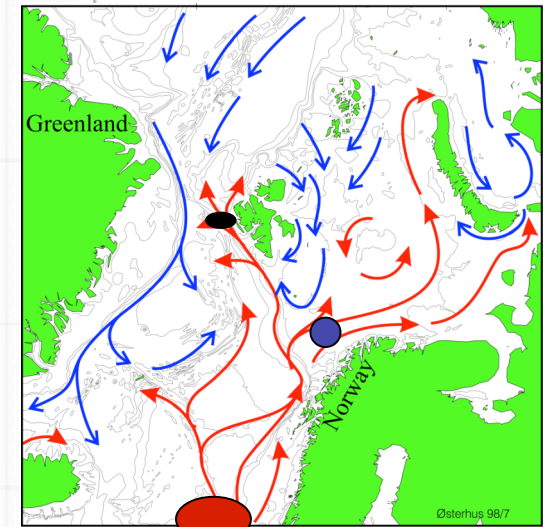
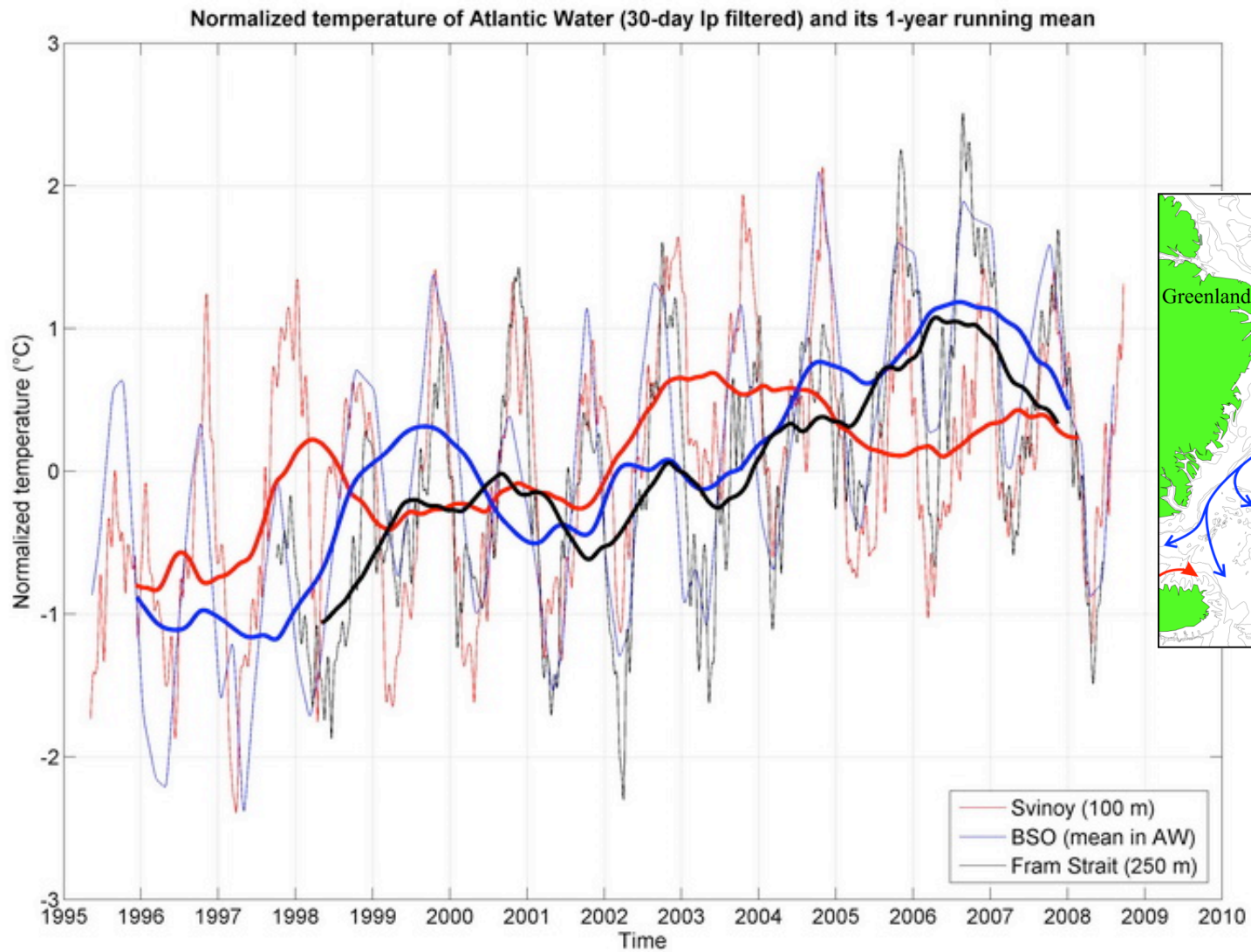
Hypothesis: Anomalous flow into Barents compensated by reduced WSC

Skagseth et al., in prep

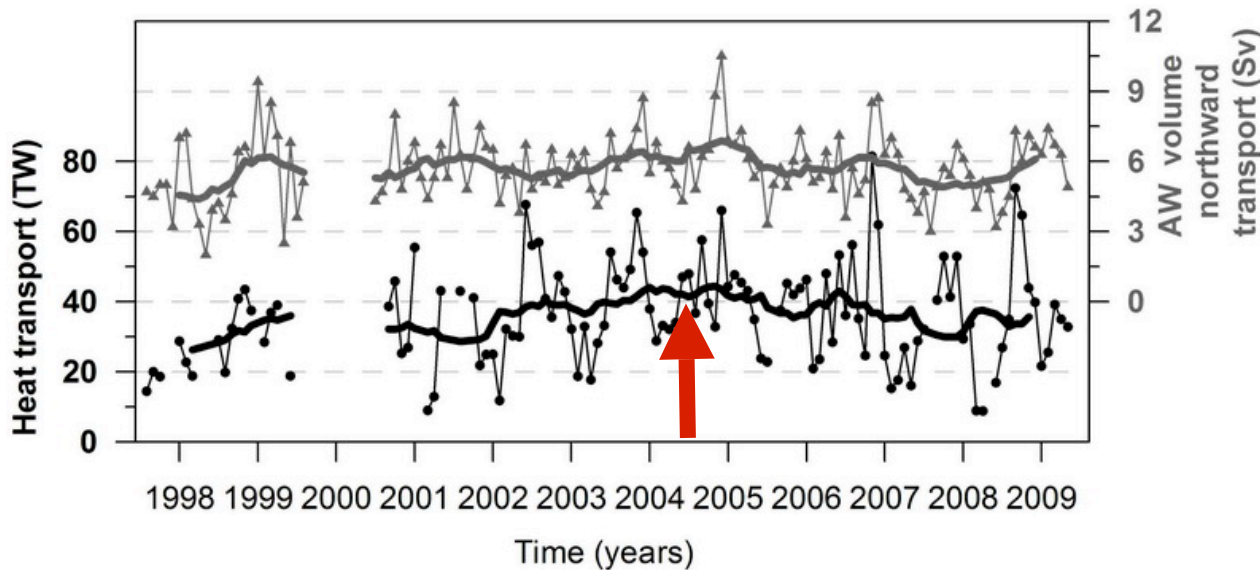


Temperature changes 1995-2009

Svinøy (red), Barents Sea Opening (blue), Fram Strait (black)



Heat transport through Fram Strait to the Arctic Ocean estimations for 1997-2009



max in 2004

Change in heat flux

- mean 1997-2002: 30 TW
- **mean 2002-2006: 41 TW**
- mean 2006-2009: 36 TW

Change in AW inflow

- mean 1997-2002: 5.5 Sv
- **mean 2002-2006: 6.0 Sv**
- mean 2006-2009: 5.6 Sv

max in 2006

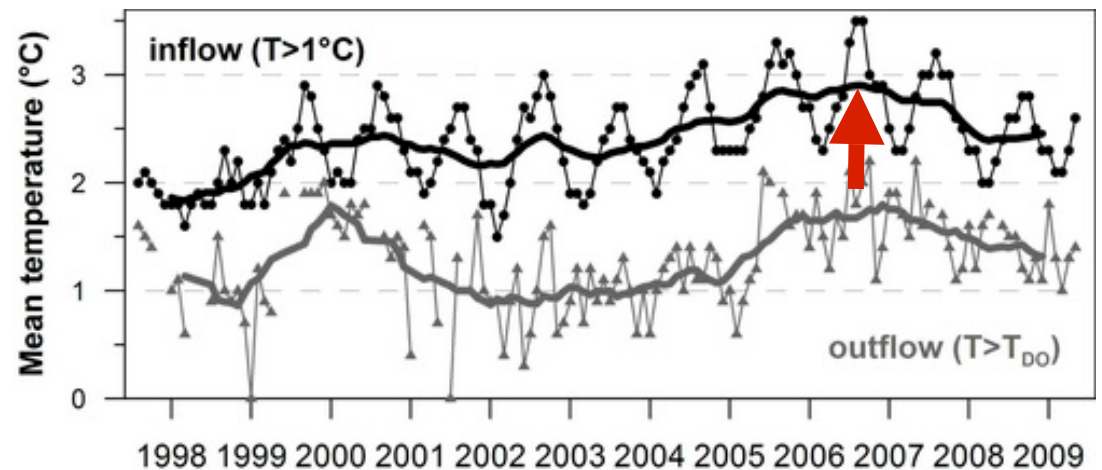
Mean heat flux 1997-2009:

36 TW (std 15 TW)

Mean AW inflow 1997-2009:

5.7 Sv (std 1.4 Sv)

Schauer and Beszczynska-Möller
Ocean Sciences, 2009



Heat loss north of Svalbard (Whalers' Bay)

Schauer and Beszczynska-Möller (AWI)

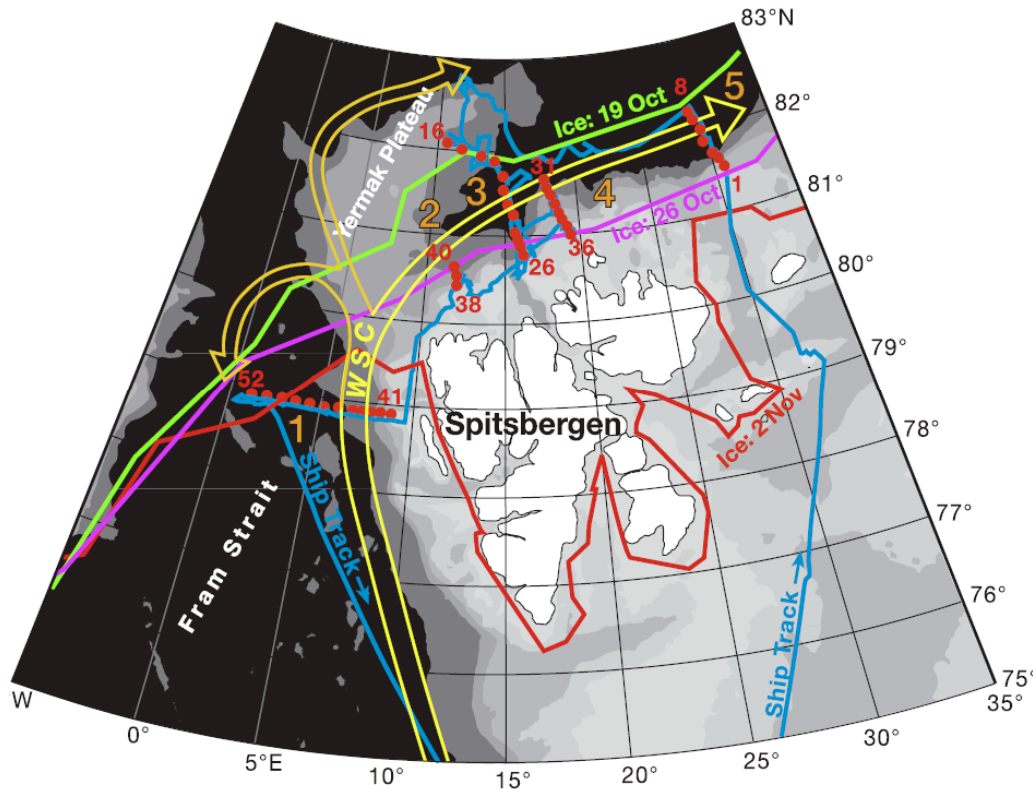
Cokelet et al., 2008:

October 2001

520 W/m² in upper 500 m
over ca. 500 km × 100 km

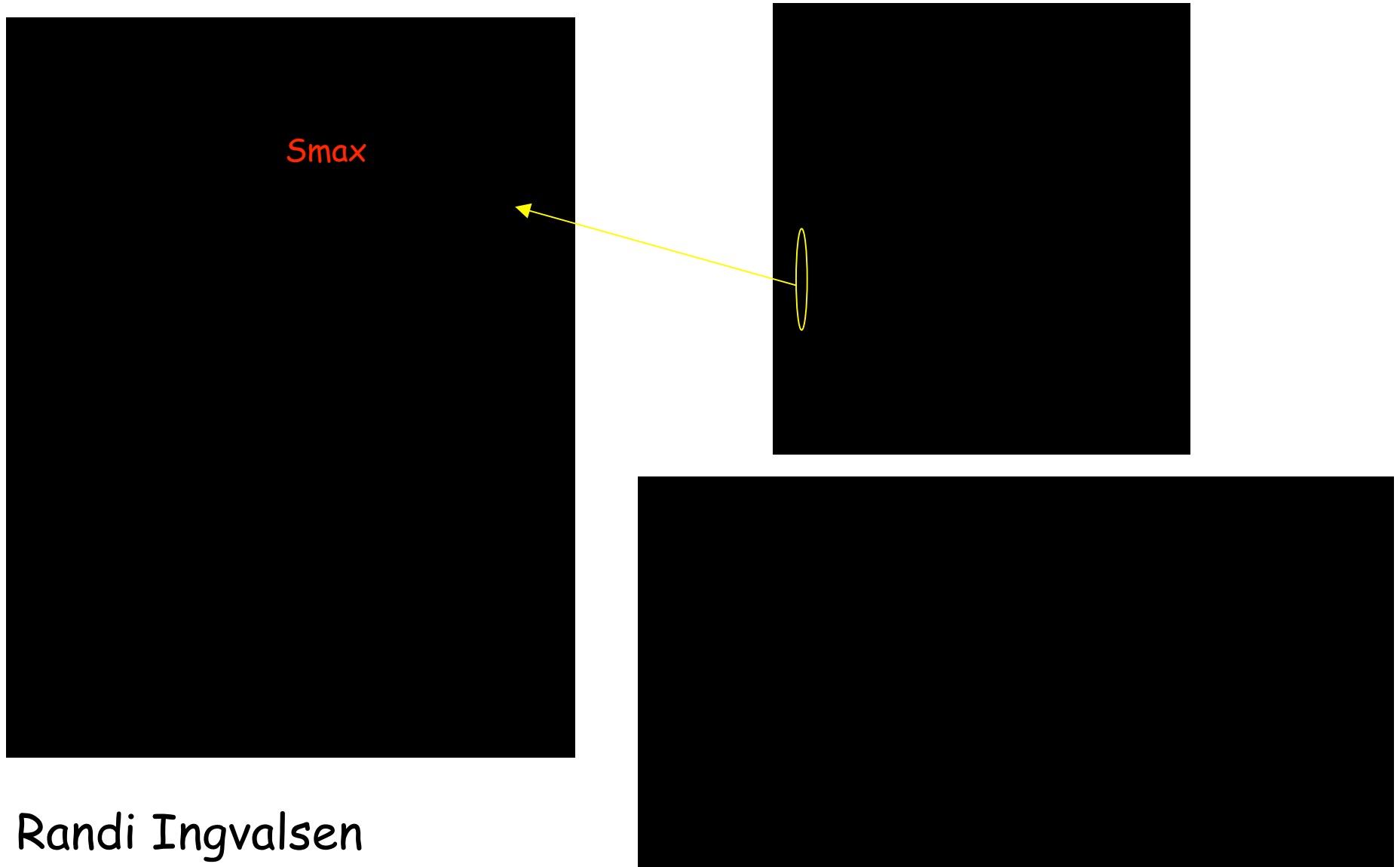
⇒ **26 TW**

Compares well
to heat flux
through Fram Strait
before 2002
⇒ **30 TW**



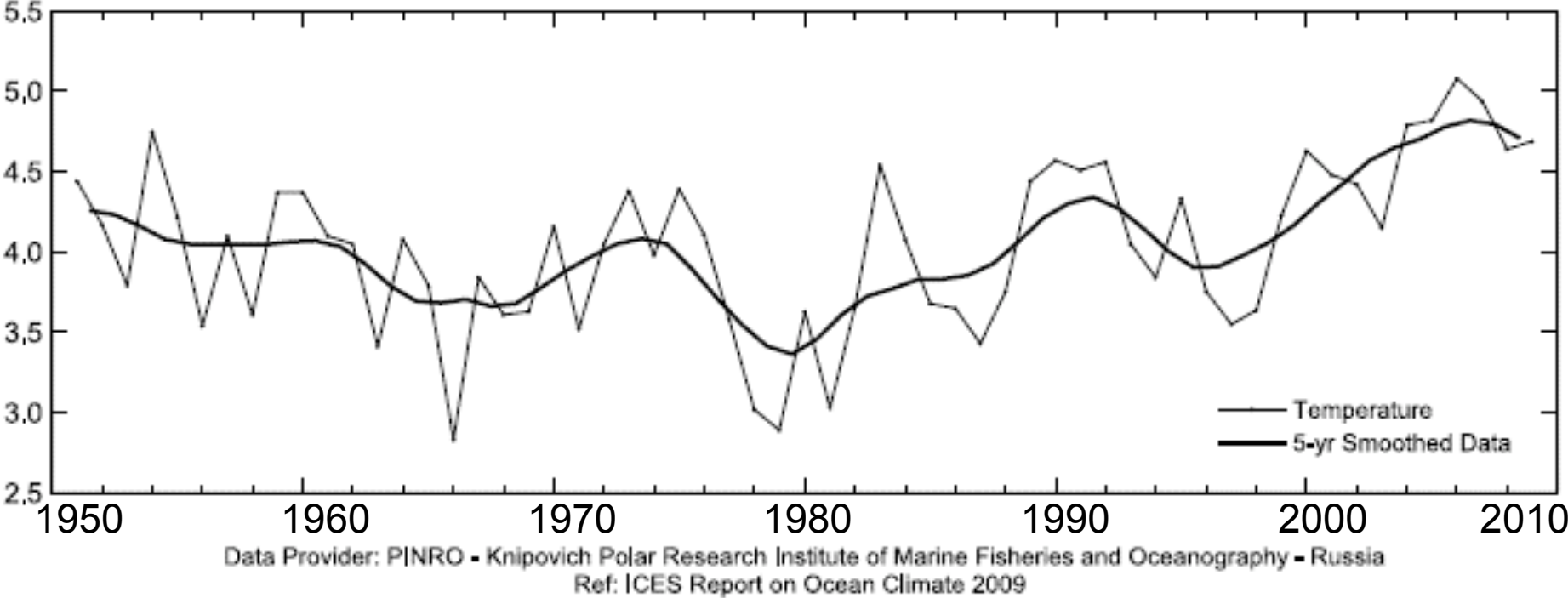
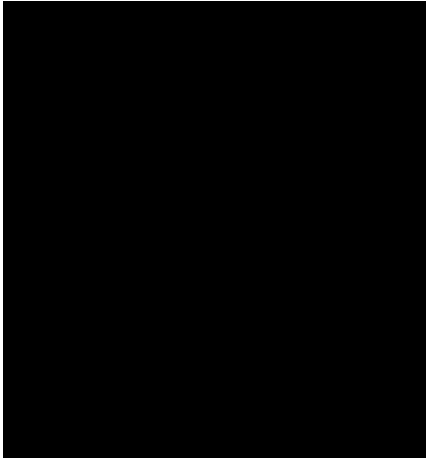
stronger anomalies = higher AW temperatures
⇒ a higher fraction of oceanic heat
going to ice melting (Rudels, 1999; Rudels et. al 2010)

Moorings covering the Atlantic inflow in the Barents Sea Opening 2007-2008



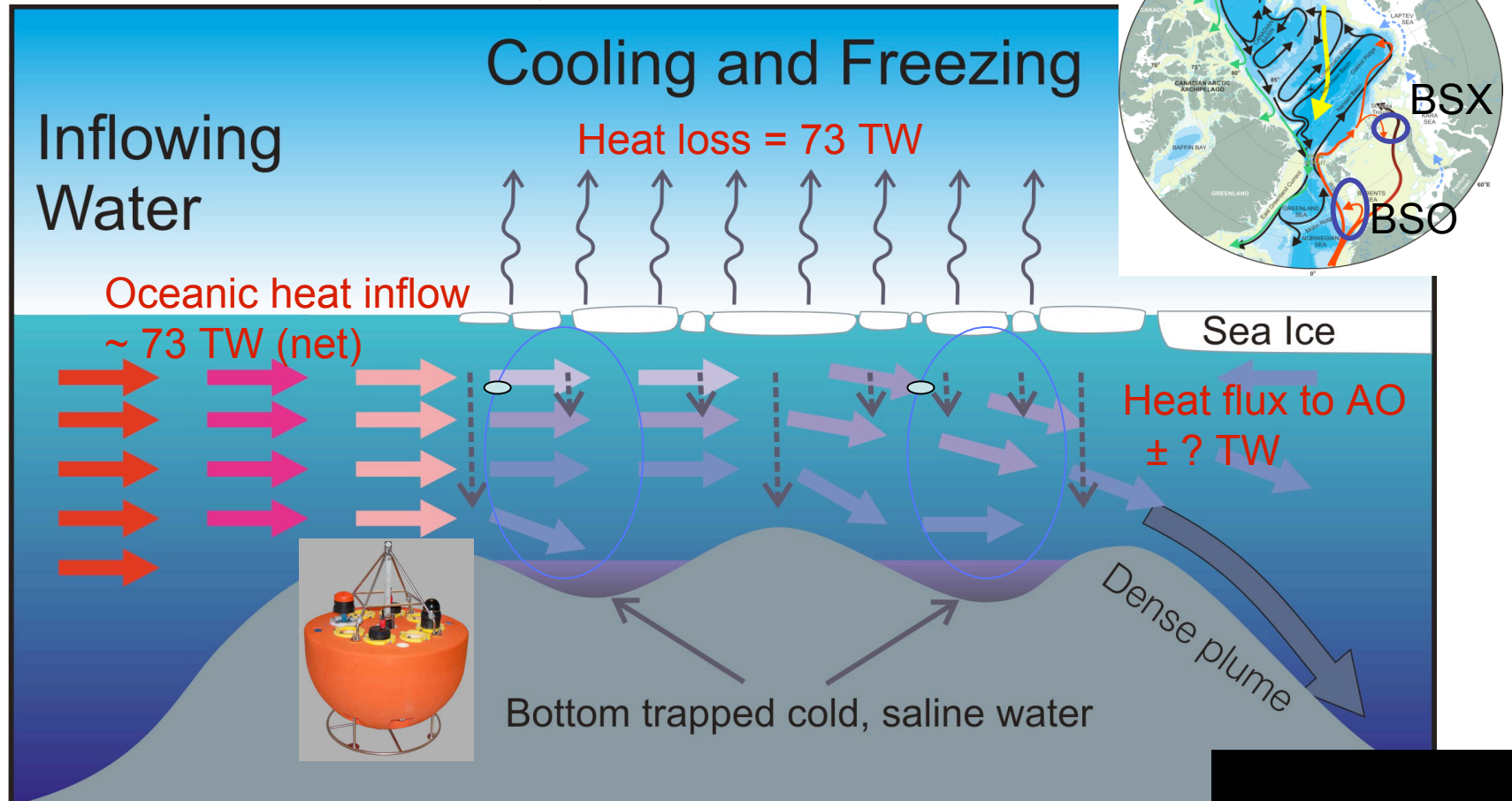
Randi Ingvalsen
Institute for Marine Research, Bergen

Temperature in the Kola section 0-200 m



Production of High Salinity Shelf Water and heat fluxes in the Barents Sea

Heat fluxes using 0°C reference temperature



Shallow (shelf) sea (300-500 m)

Smedsrud et al., 2010

Skagseth et al.

Vidar Lien (BSX moorings, www.bccr.no/biac)

Heat and volume transport through the Barents Sea Exit 2007-2008



CLASSIFIED

Vidar Lien

Conclusions

- *No trend in the volume transport of Atlantic water toward the Arctic Ocean*
- *But shift to higher temperature in the Atlantic Water after 1995*
- *Temperature changes of 0.5 K in the Atlantic inflow to the Nordic Seas (8.5 Sv) give ~20 TW*