GREENLAND CLIMATE RESEARCH CENTRE

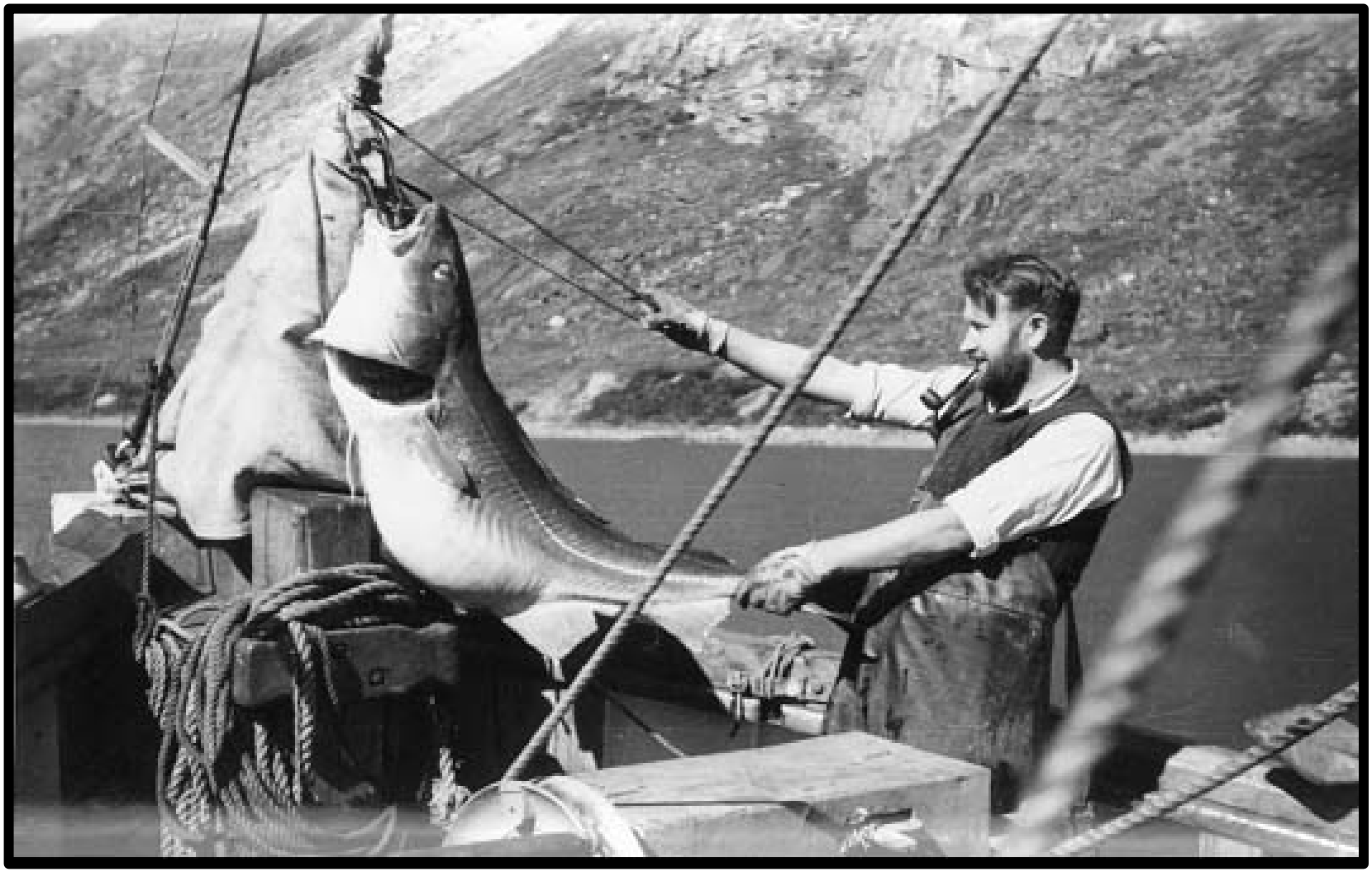
STUDYING CLIMATE CHANGE UP CLOSE

THOMAS JUUL-PEDERSEN, SØREN RYSGAARD AND MANY MORE…

BACKGROUND

THE PAST, PRESENT AND FUTURE

“THE COD-SHRIMP EXAMPLE”



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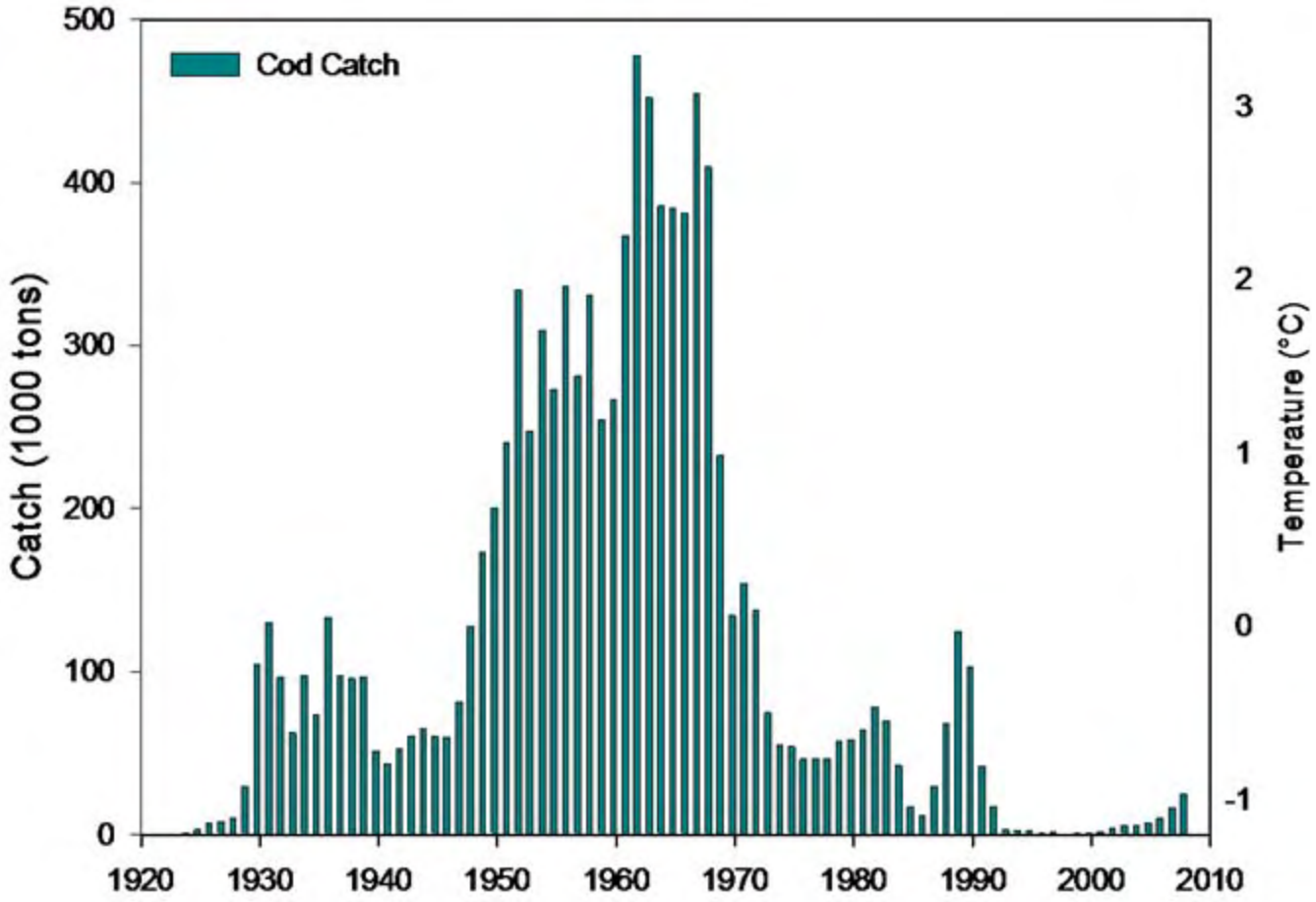

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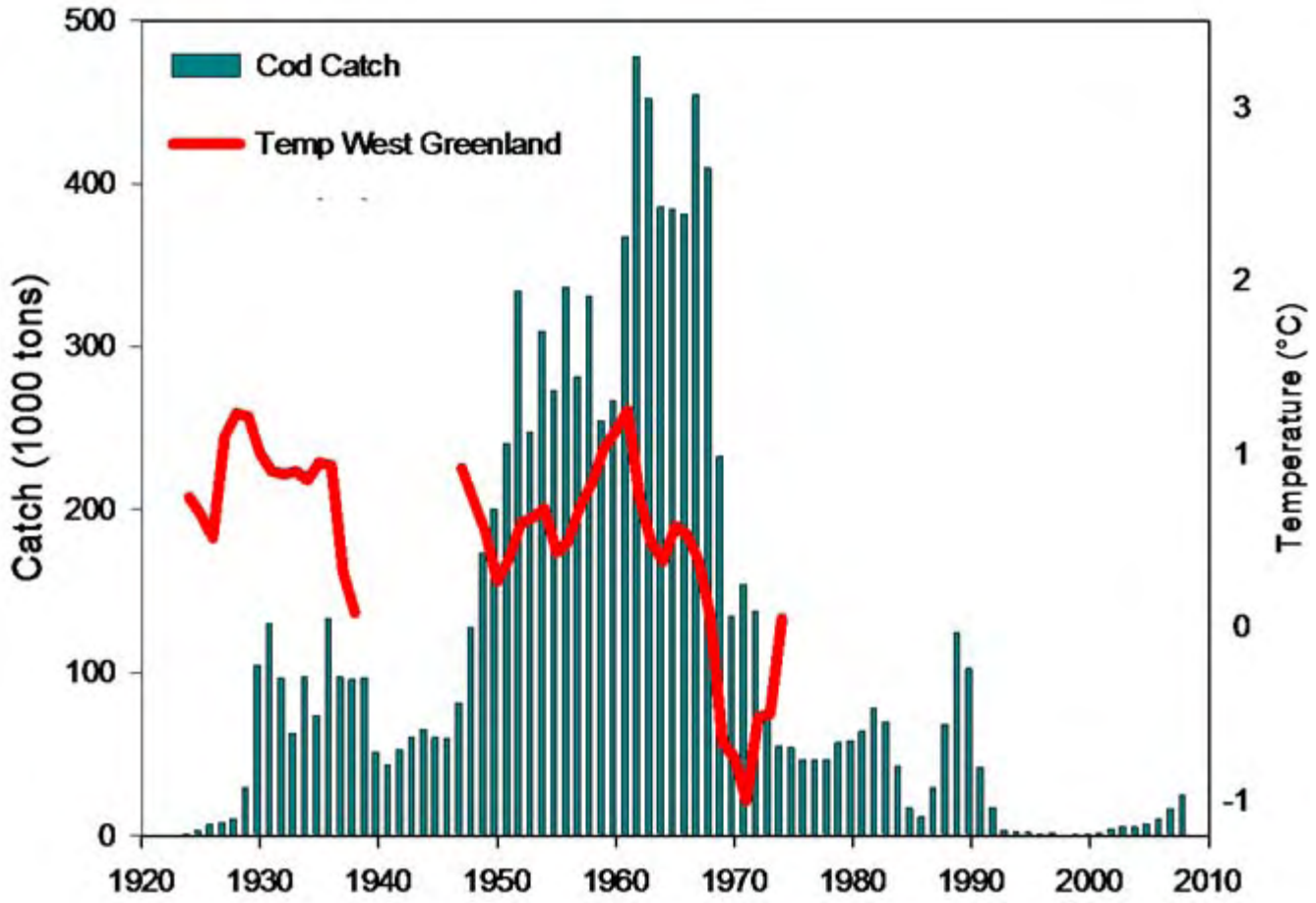

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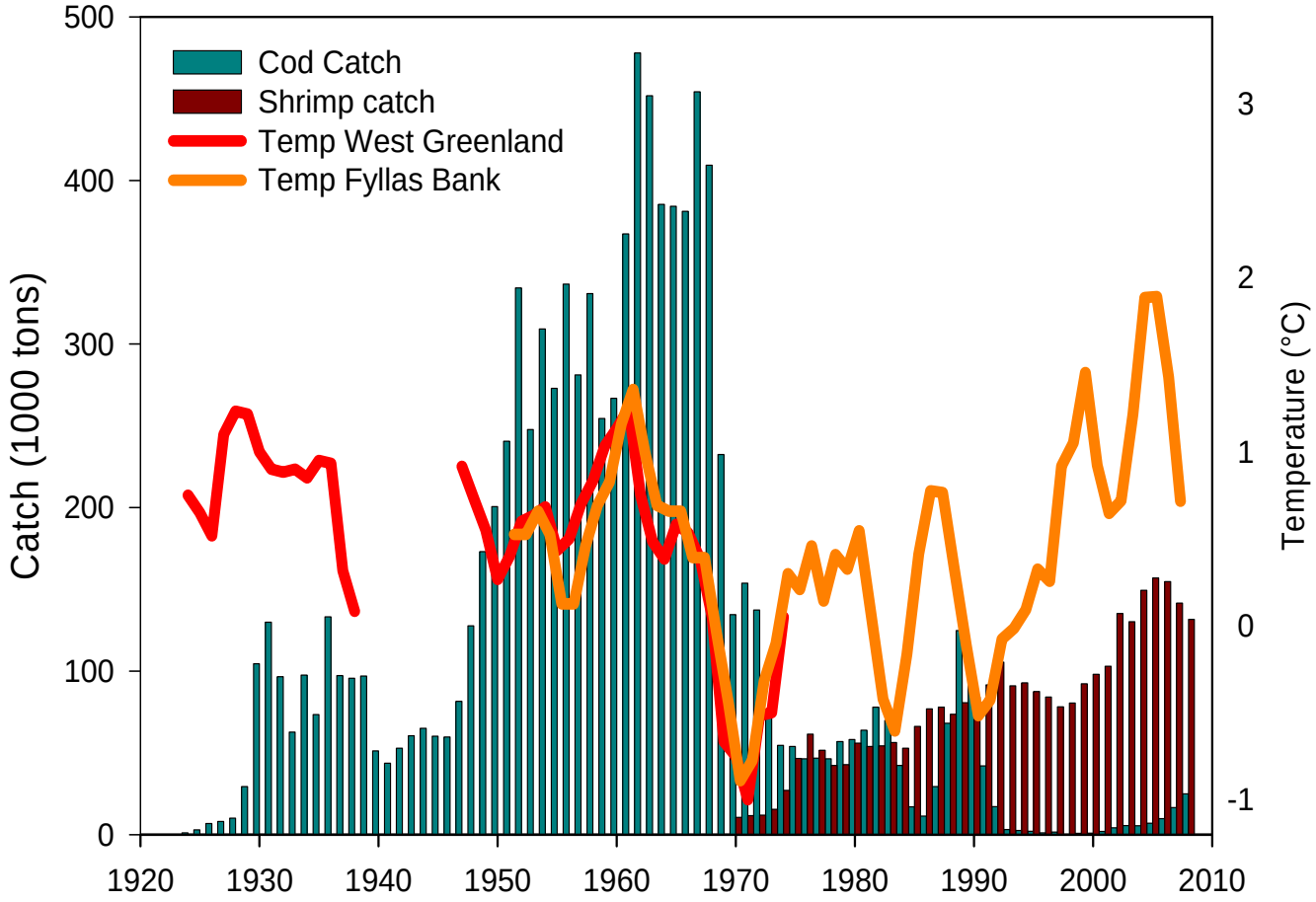
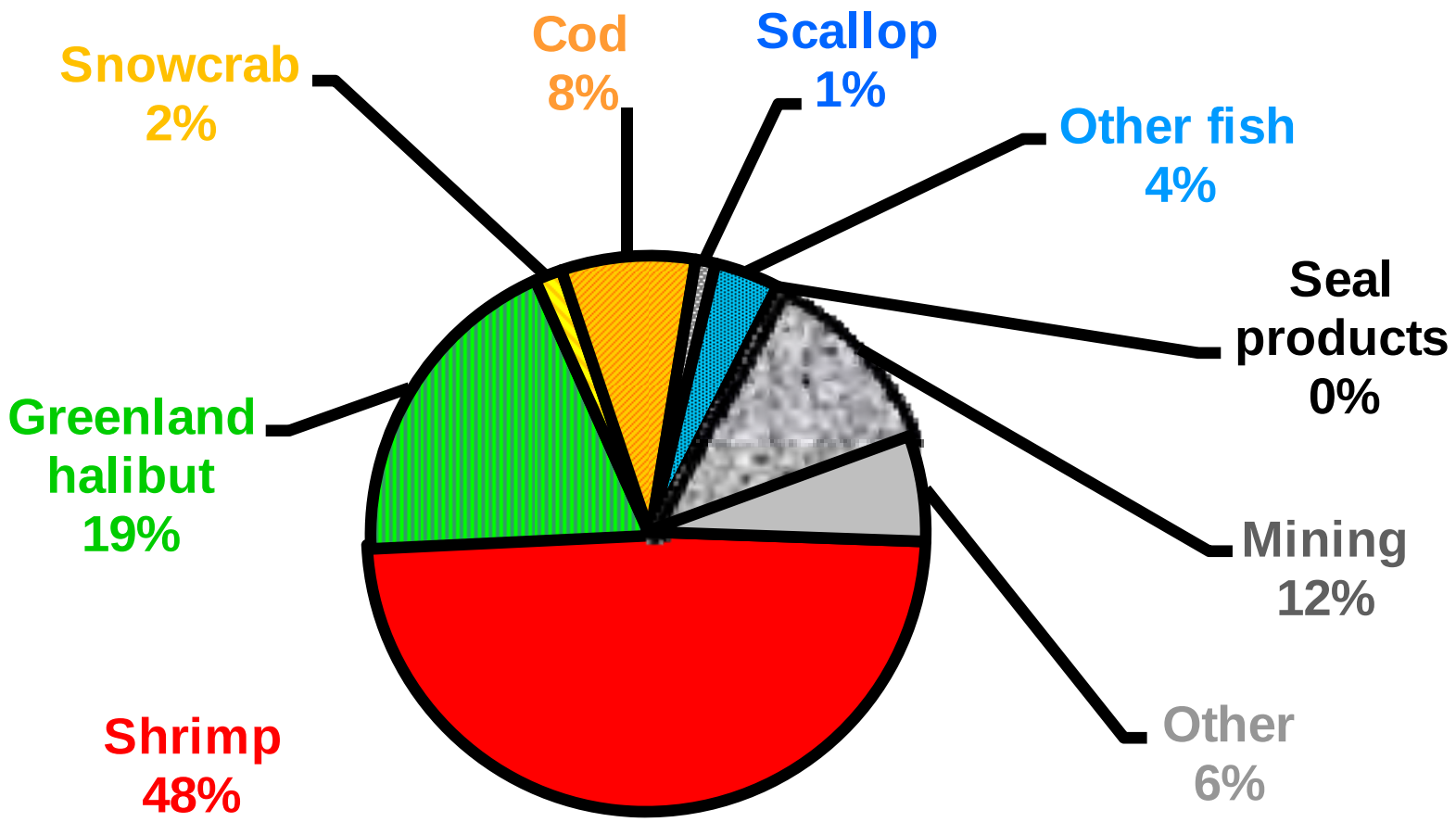


NATURAL RESOURCES

Social ***Cultural*** ***Economic***

NATURAL RESOURCES

Total export in 2007 (Greenland)



NATURAL RESOURCES

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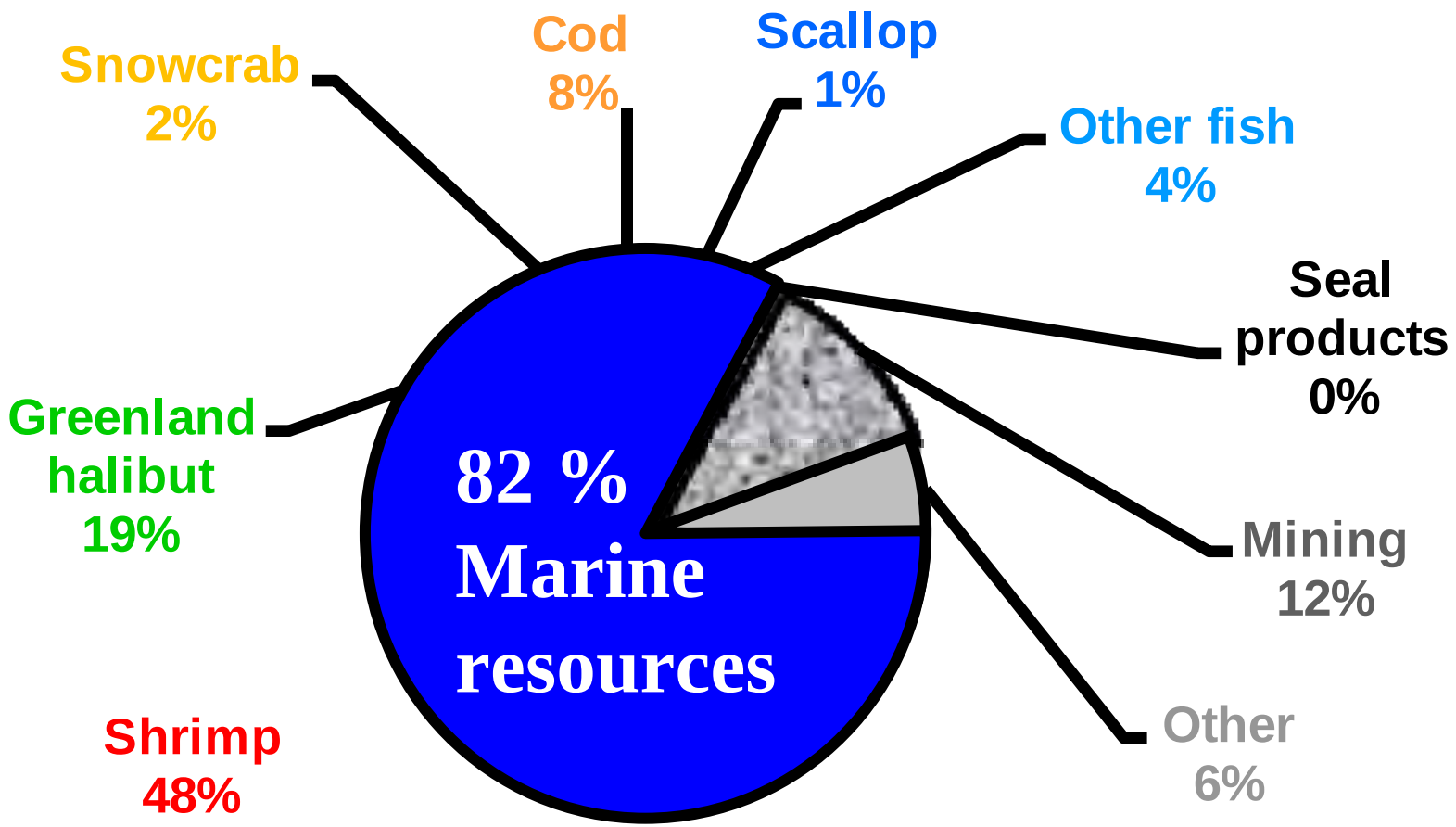
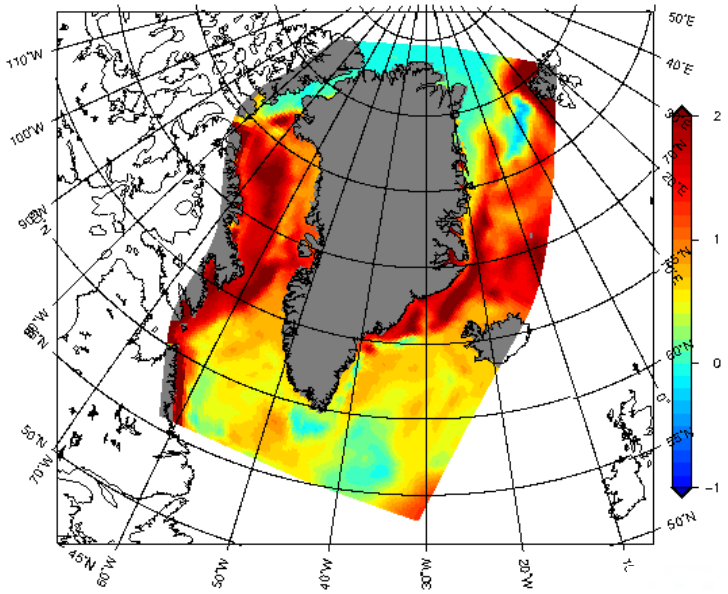
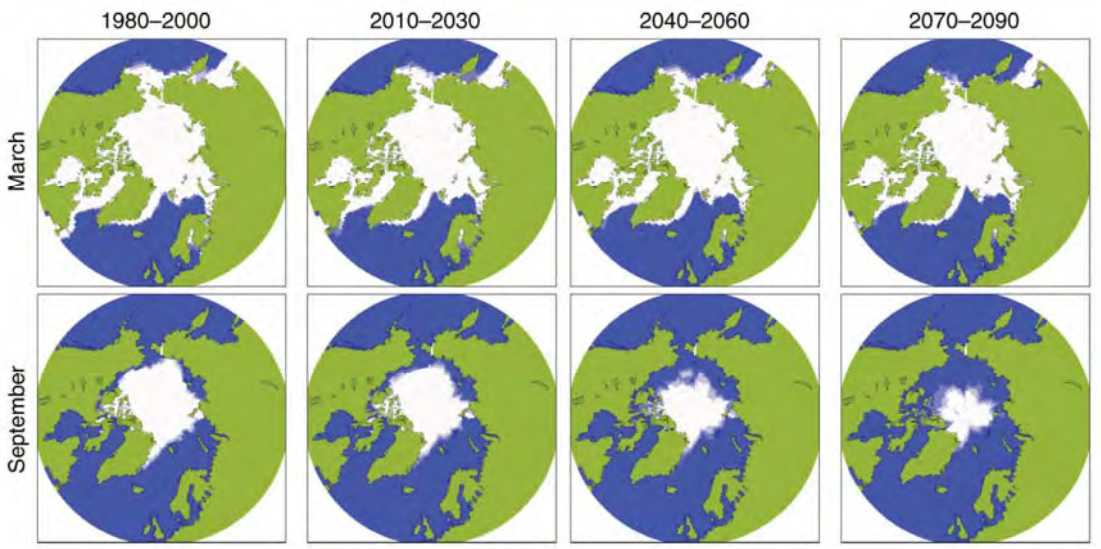


PREDICTED CHANGES



SST Sep-Nov
(2021-2050) - (1961-1990)

Sea ice extent



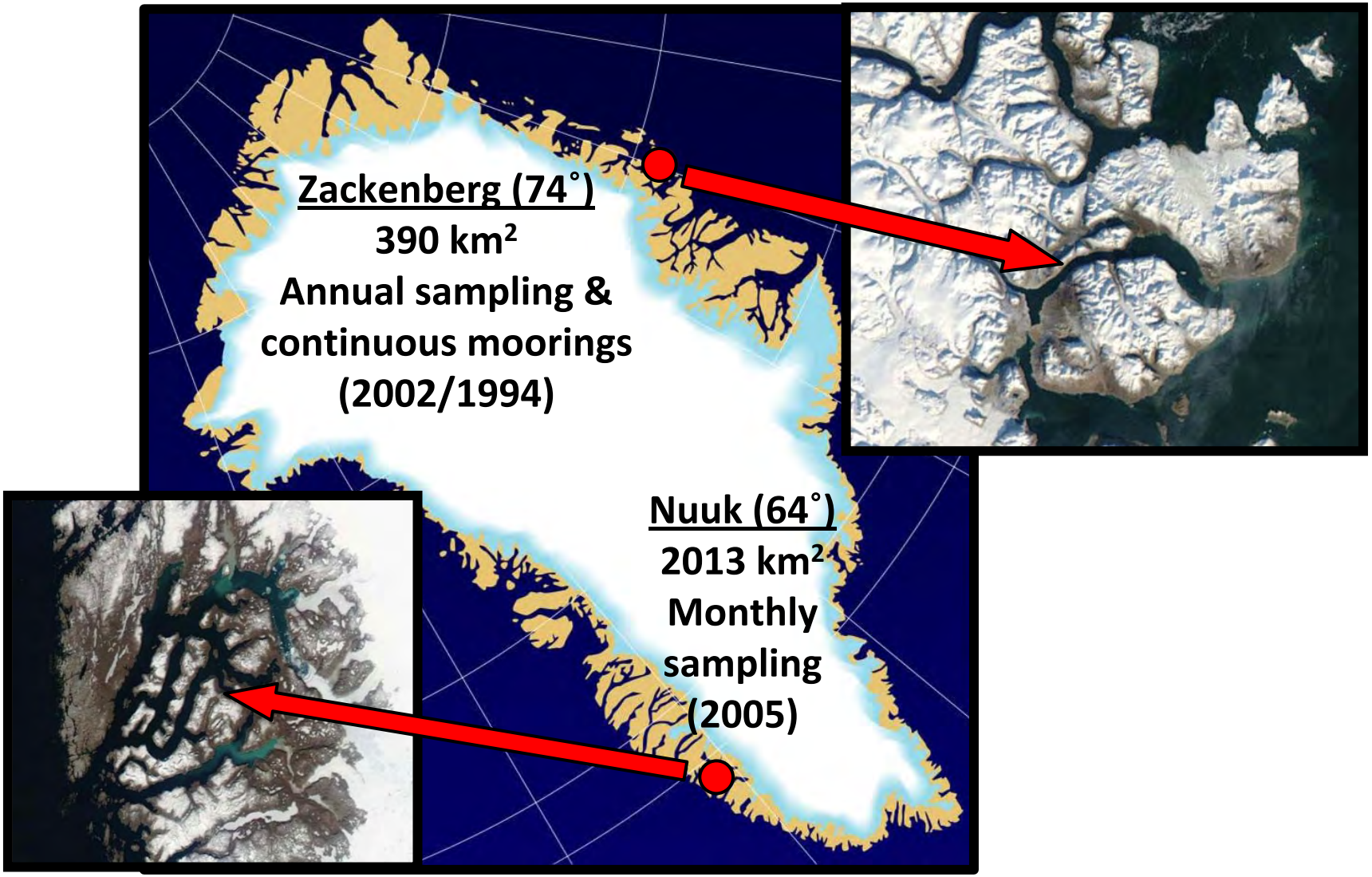
GREENLAND CLIMATE RESEARCH CENTRE

- GCRC opened May 2009
- Main focus is climate-cryosphere-ocean-society interactions
- Nine initial programs covering
  - Oceanography
  - Land-based ecosystems
  - Socio-economic adaption
  - Climate simulations
  - Plankton dynamics
  - The Atlantic cod
  - Marine carbon cycle
  - Satellite observations
  - Glaciers

Greenland Institute of Natural Resources

University of Greenland

FOCUS AREAS (HIGH & SUB-ARCTIC)



GREENLAND ECOSYSTEM MONITORING

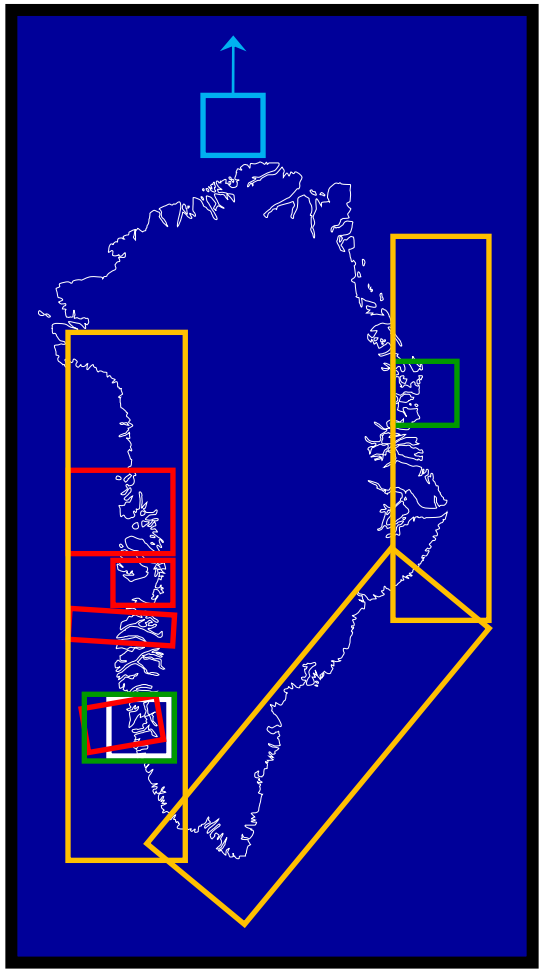
3500 parameters monitored annually

ClimateBasic	GeoBasic	BioBasic	**MarineBasic**	GlacioBasic
Climate	Climate		**Snow**	Climate
Snow	Snow		**Oceanography**	Snow
Hydrology	Hydrology		**Irradiance**	
UV radiation	UV radiation	UV radiation		
	Soil	Soil	**Algae**	
		Vegetation		
	Gas flux	Gas flux		
		Lakes		
		Arthropods	**Zooplankton**	
		Mammals/ birds	**Mammals/birds**	
			Sea ice	Glacial ice
			Sea water	
			Sea bottom	

RESEARCH AND MONITORING

- **GEM** – Atmosphere, terrestrial, marine and geological research/monitoring
- **NetIce** – sea ice and climate
- **GreenArc** – sea ice and climate
- **Merian** – historical climate changes
- **FreshLink/GCRC** – ice sheet and ocean
- **EcoGreen/BOFYGO** – sea and biology
- **Arctic Tipping Points** – sea and biology
- **FreshNor** – freshwater and sea
- **Kanumas/GCRC** – benthic biology

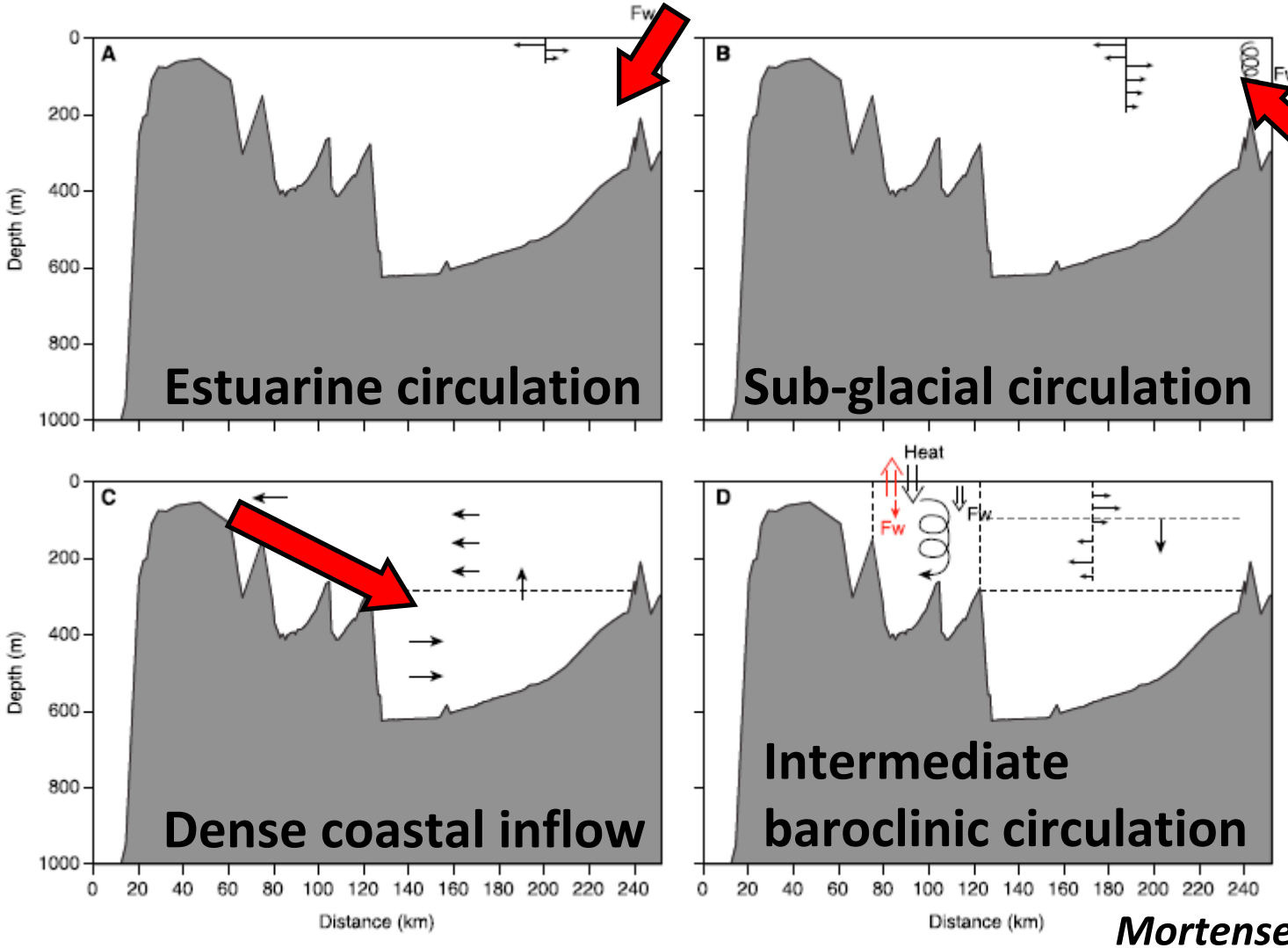
And more to come….



RESULTS

A FEW EXAMPLES

FJORD CIRCULATION & GLACIAL MELT

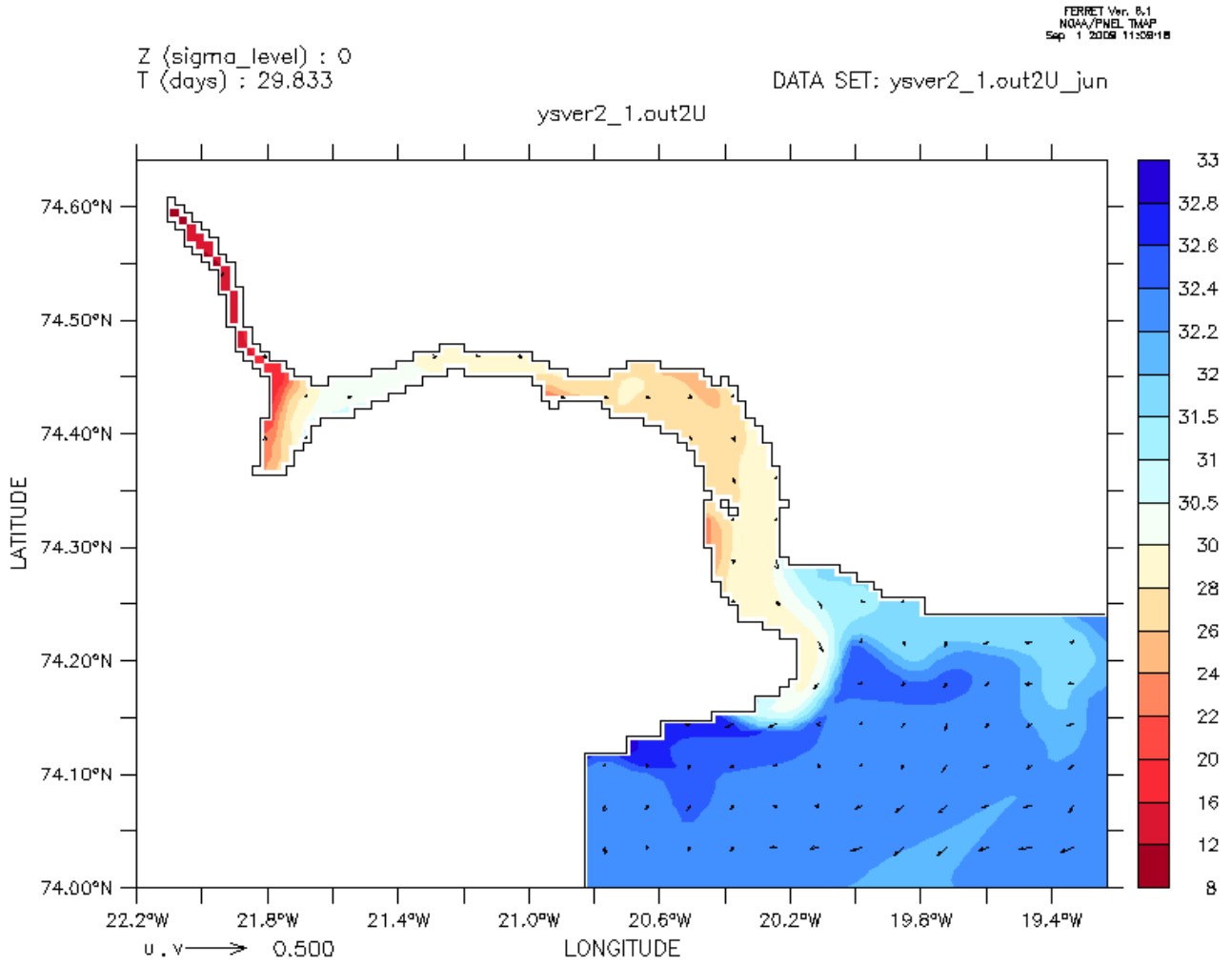


Entrainment of ambient water (ratio of 1:30)

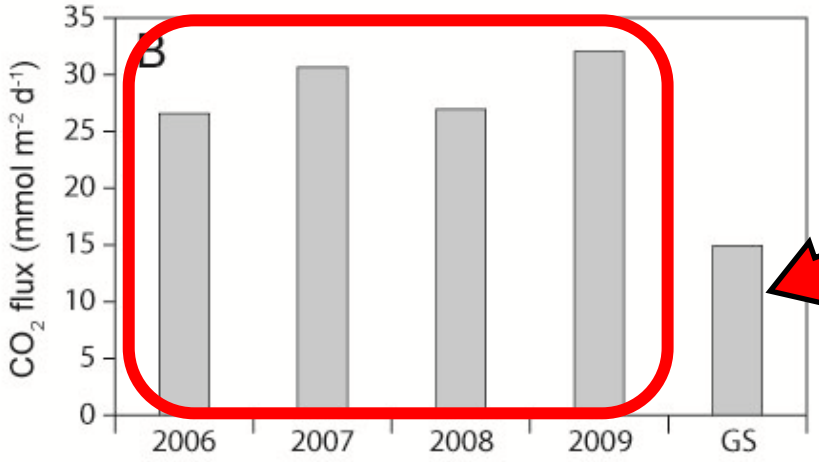
Vertical mixing of water column at sill

Mortensen et al. 2011

MODELING THE CIRCULATION



CO_2 UPTAKE IN GREENLANDIC FJORDS



High Arctic fjord

Greenland Sea

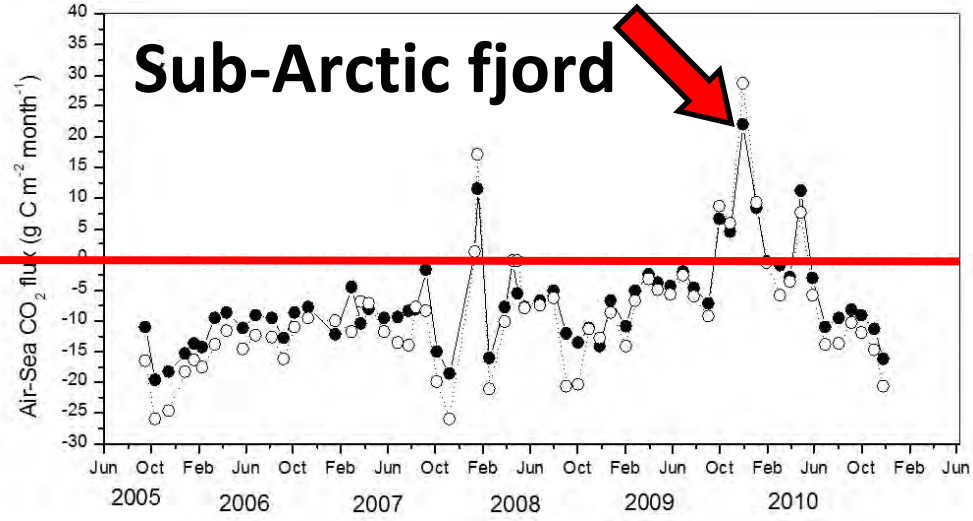
Sejr et al. accepted

Sub-glacial circulation (emptying of glacial lakes)

Sub-Arctic fjord

CO_2 release

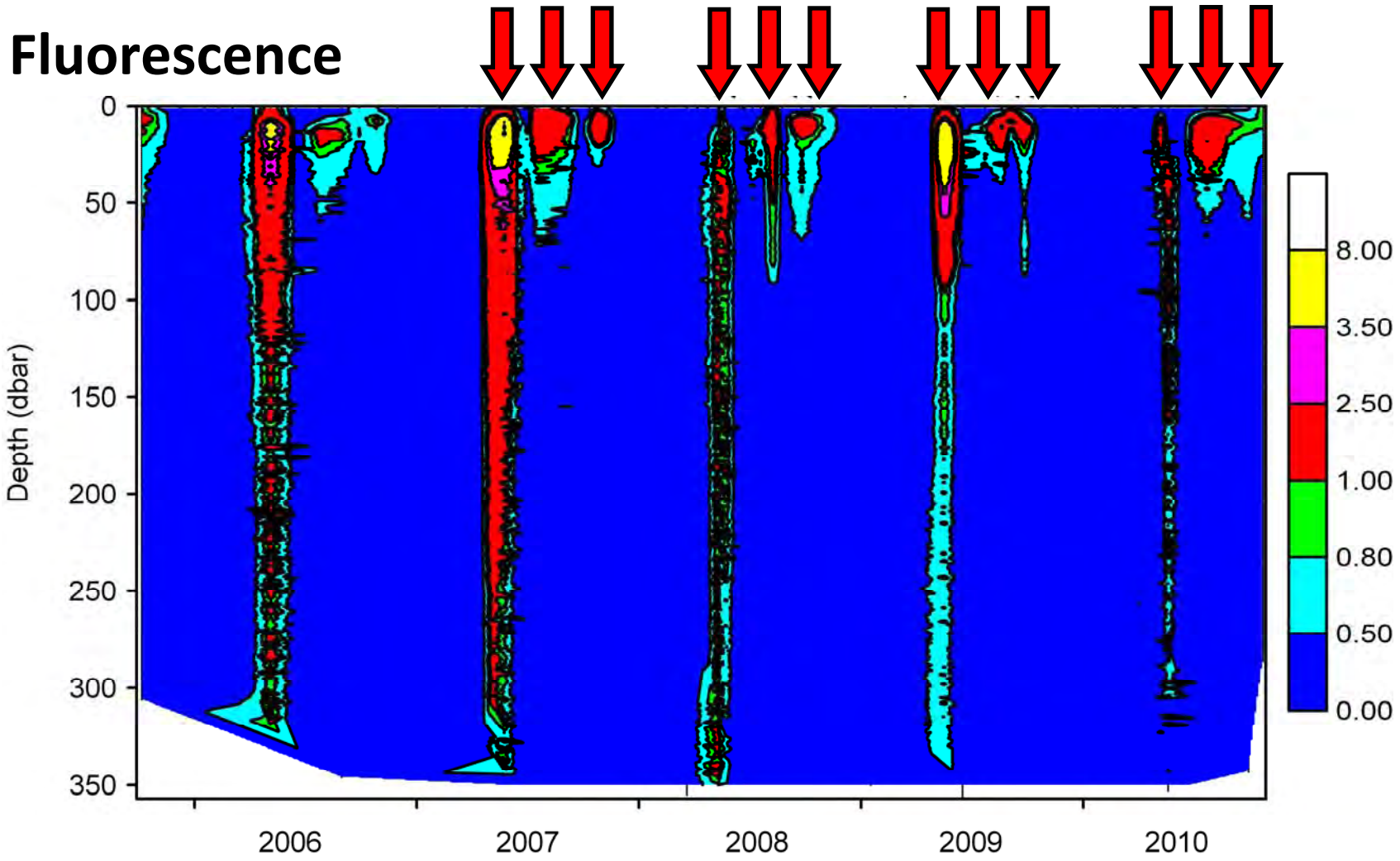
CO_2 uptake



Rysgaard et al. submitted

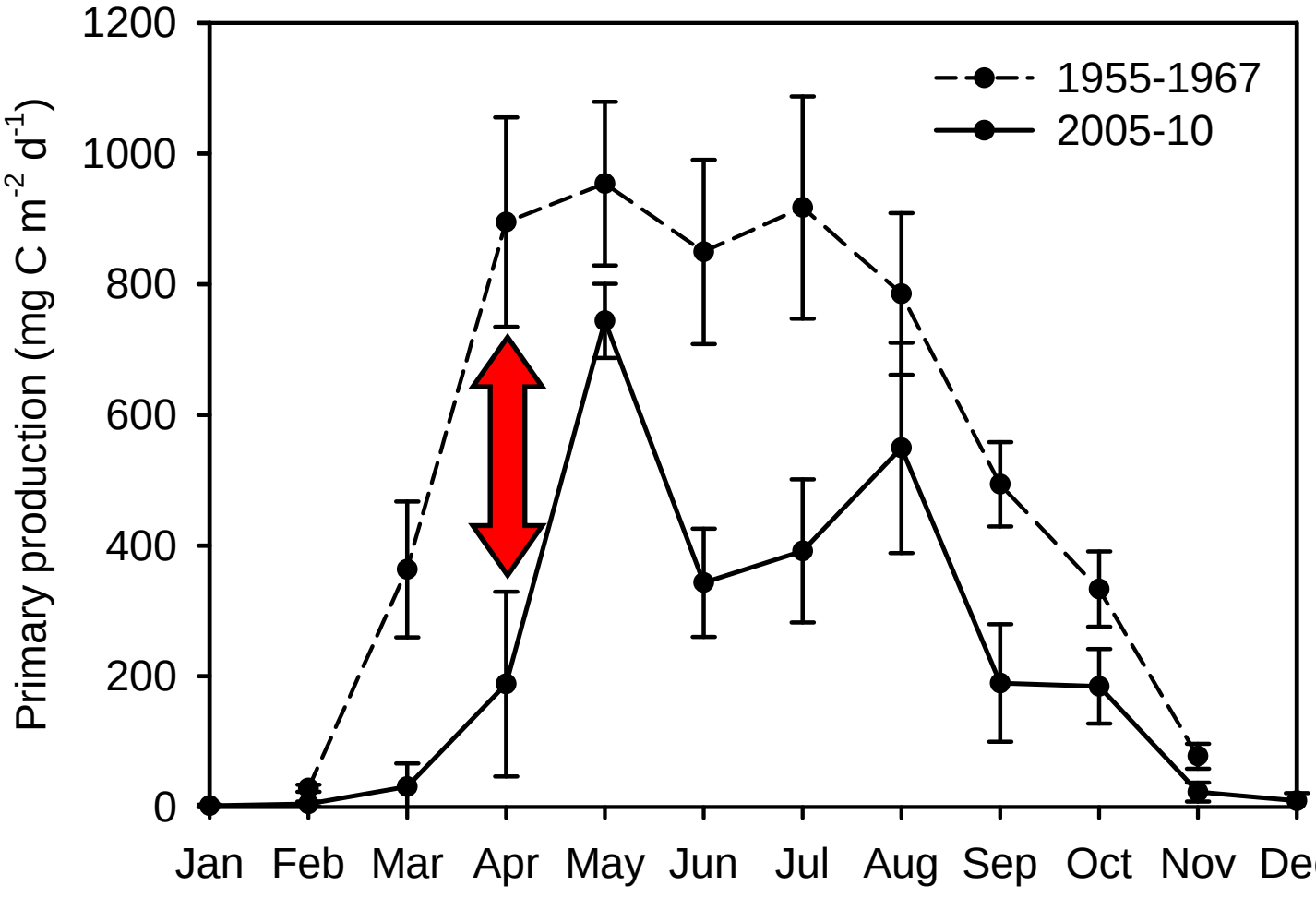
PHYTOPLANKTON BIOMASS

Fluorescence



Juul-Pedersen et al. in prep

PHYTOPLANKTON PRODUCTION

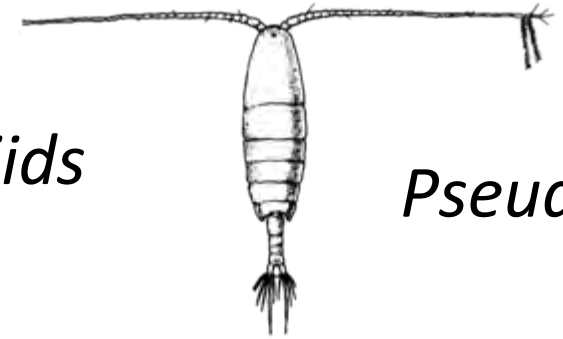


Juul-Pedersen et al. in prep

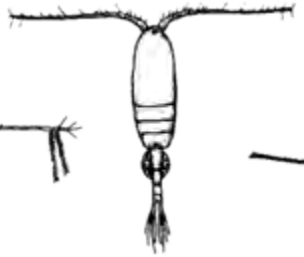
ZOOPLANKTON

Offshore **Fjord**

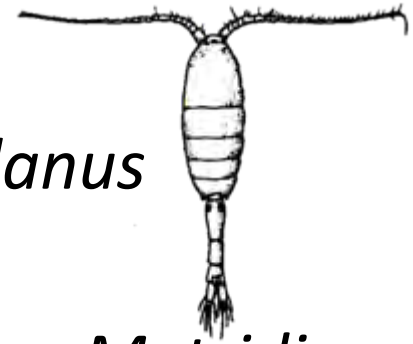
Euphausiids



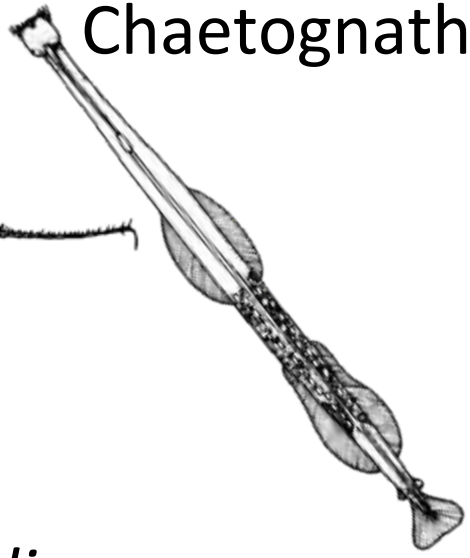
Calanus finmarchicus



Pseudocalanus



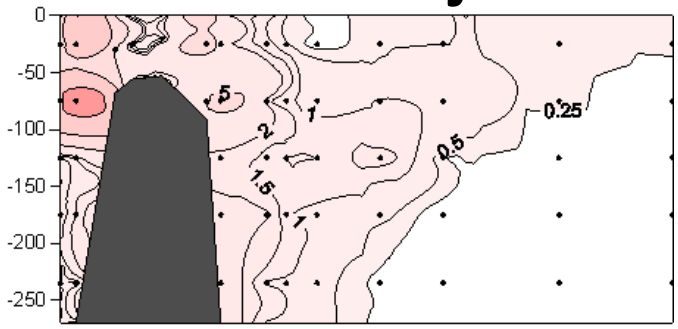
Metridia longa



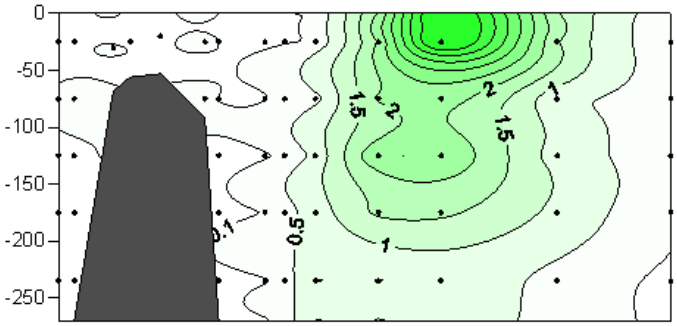
Chaetognath

COPEPOD DISTRIBUTION

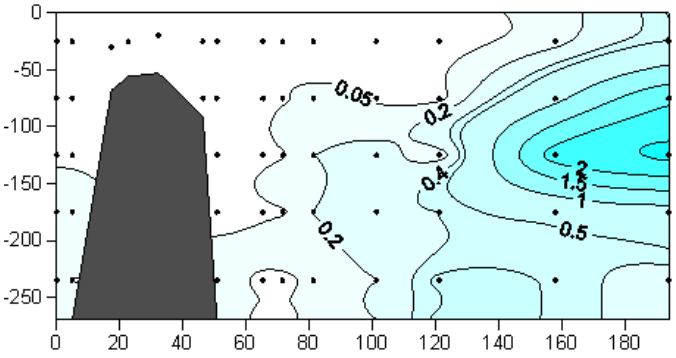
Offshore **Fjord**



Calanus finmarchicus



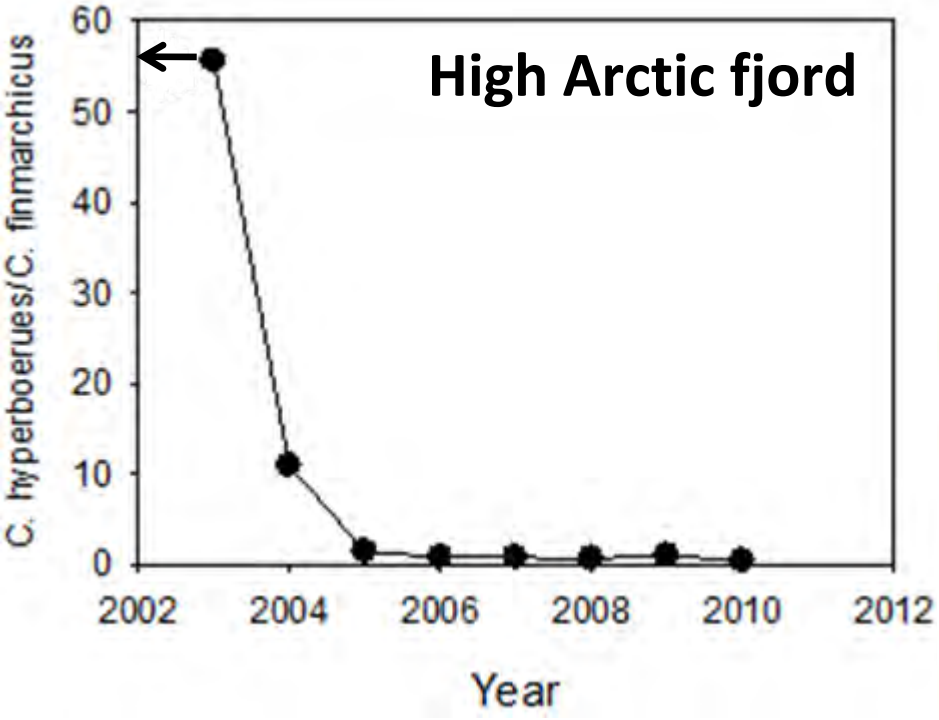
Pseudocalanus spp.



Metridia longa

Arendt et al. 2010

COPEPODS - A SPECIES SHIFT



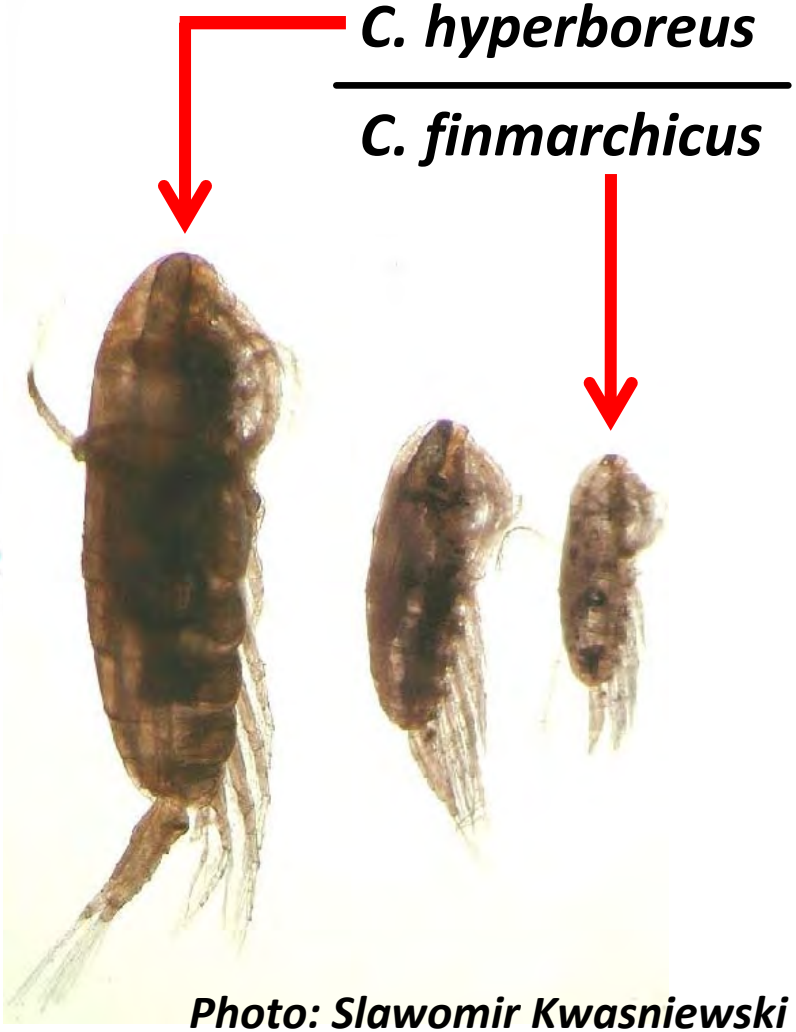
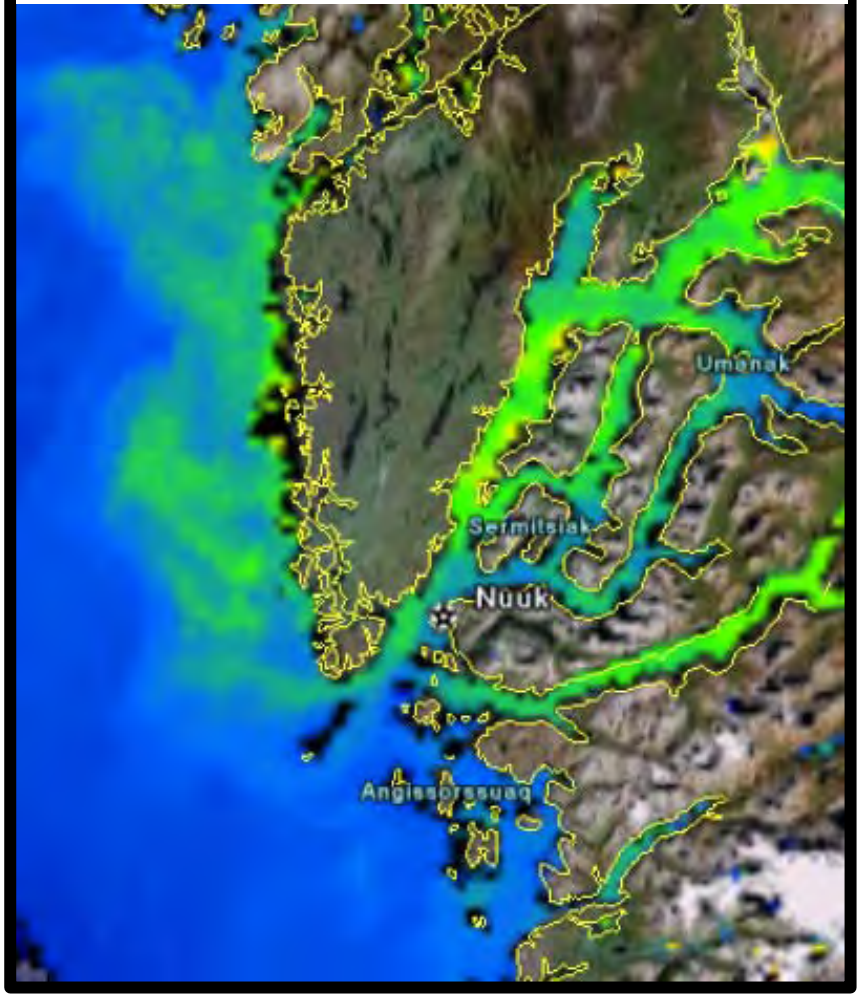


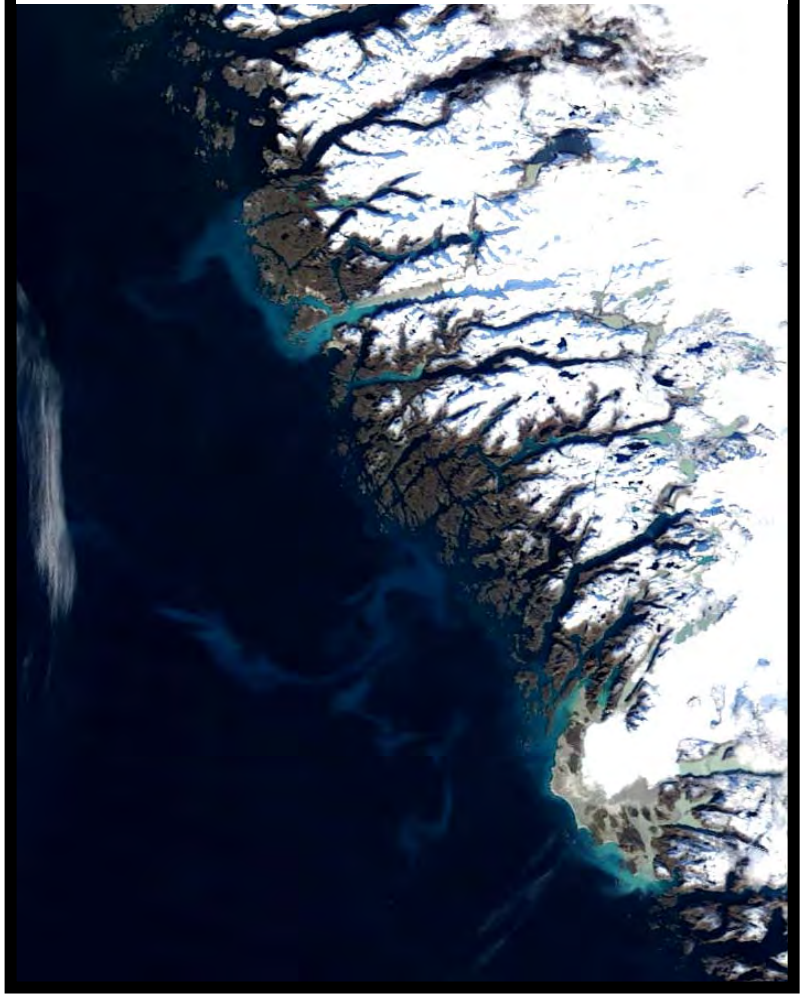
Photo: Slawomir Kwasniewski

EFFECTS ON COASTAL WATERS

Phytoplankton (chlorophyll)

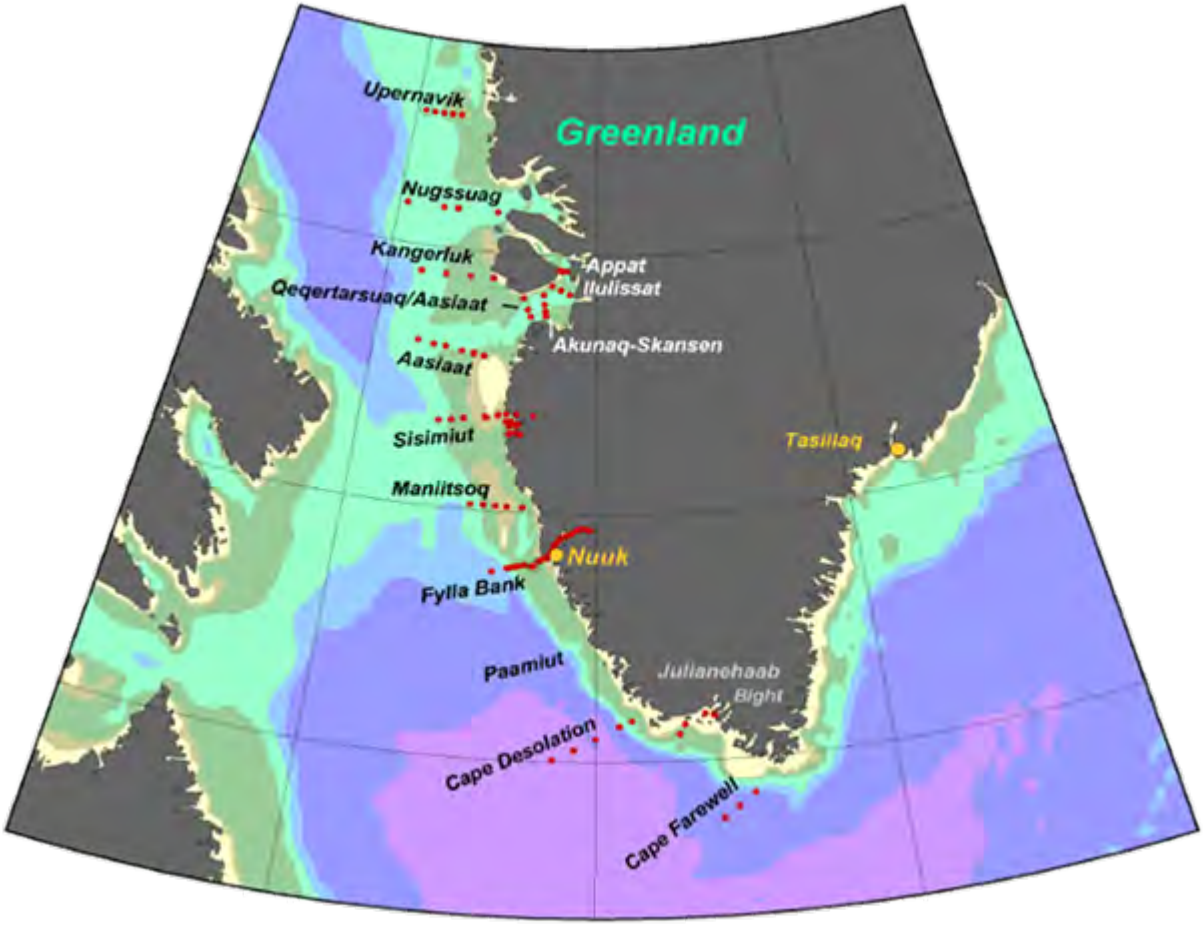


Freshwater and sediments



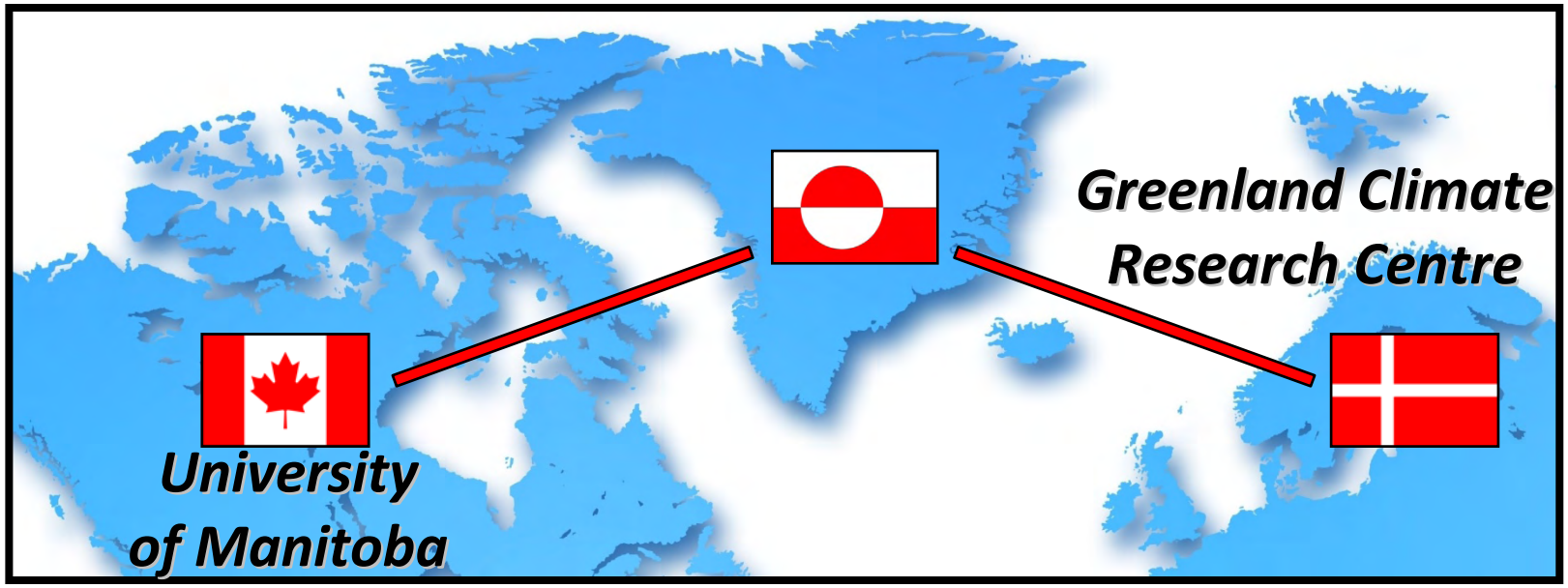
Greenland Climate Research Centre

COASTAL MONITORING PROGRAMS



Greenland Institute of Natural Resources standard hydrographic stations during annual fish/shrimp surveys

WHAT´S NEXT?



Canadian Excellence Research Chair

'Arctic Geomicrobiology and Climate Change'

Søren Rysgaard


"Mother of the Sea"
Aka Høegh
Thank you
Greenland Climate Research Centre
University of Manitoba
ArcticNet
DMI
DTU
International Polar Year 2007-2008
Aage V. Jensens Fonde
Danish Energy Agency
Ministeriet for Videnskab Teknologi og Udvikling
Miljøministeriet
Miljøstyrelsen