



# Ice matters

*Under-ice fauna surveys in the Arctic and Antarctic Oceans*

Hauke Flores, C. David, B. Lange, J. A. van Franeker, I. Peeken,  
V. Siegel, ...



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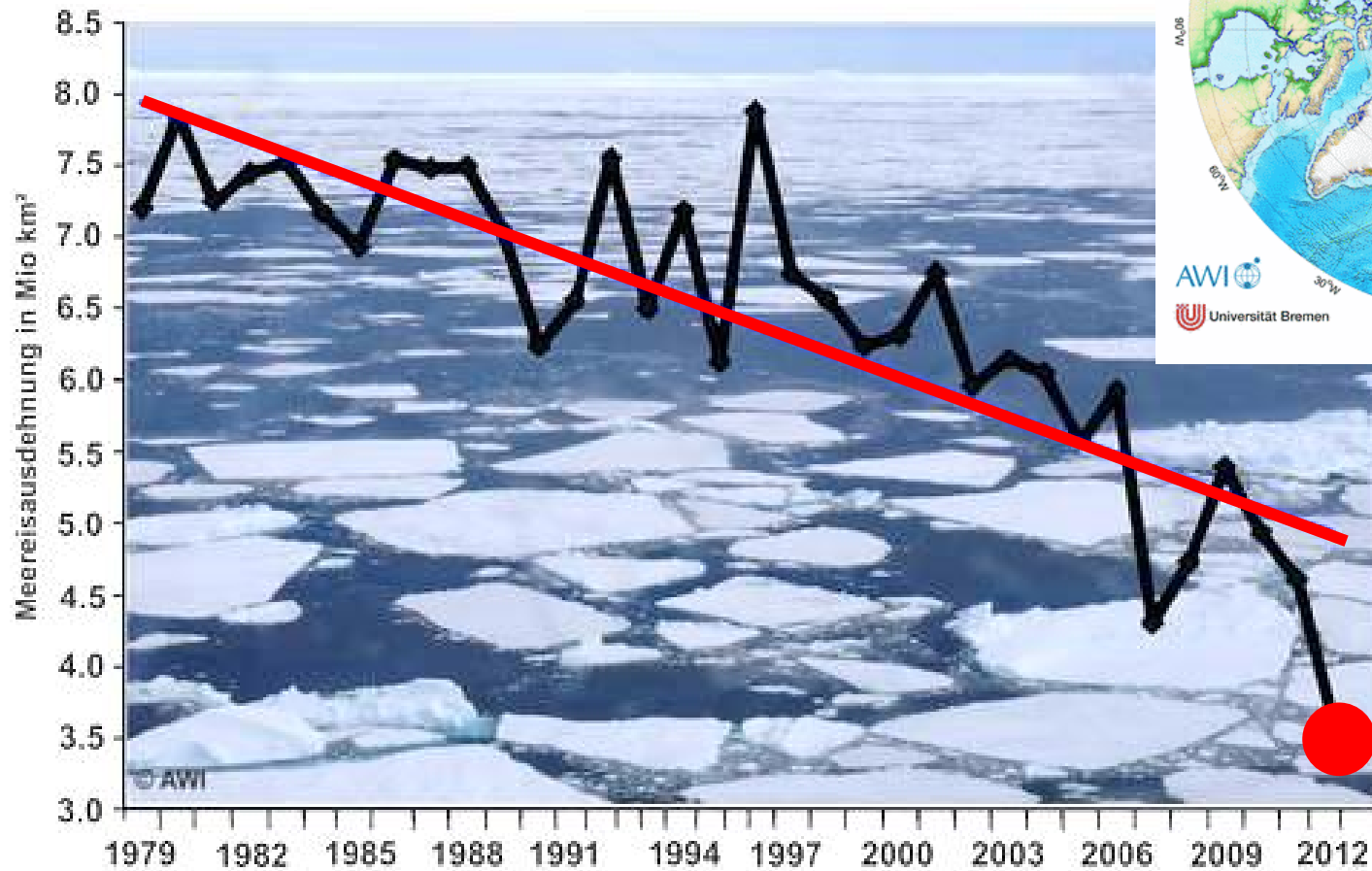


# Outline

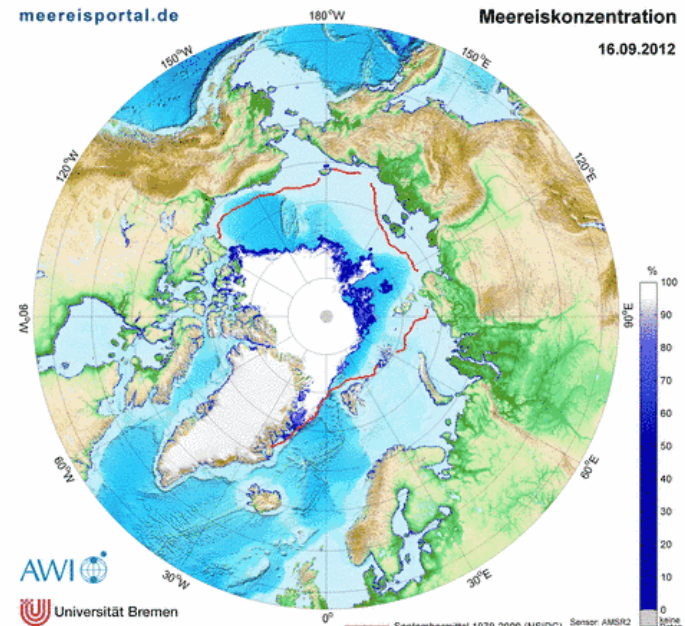


- 1. Background**
- 2. Past under-ice work  
(Antarctic)**
- 3. New under-ice work  
(Arctic)**
- 4. Conclusions**

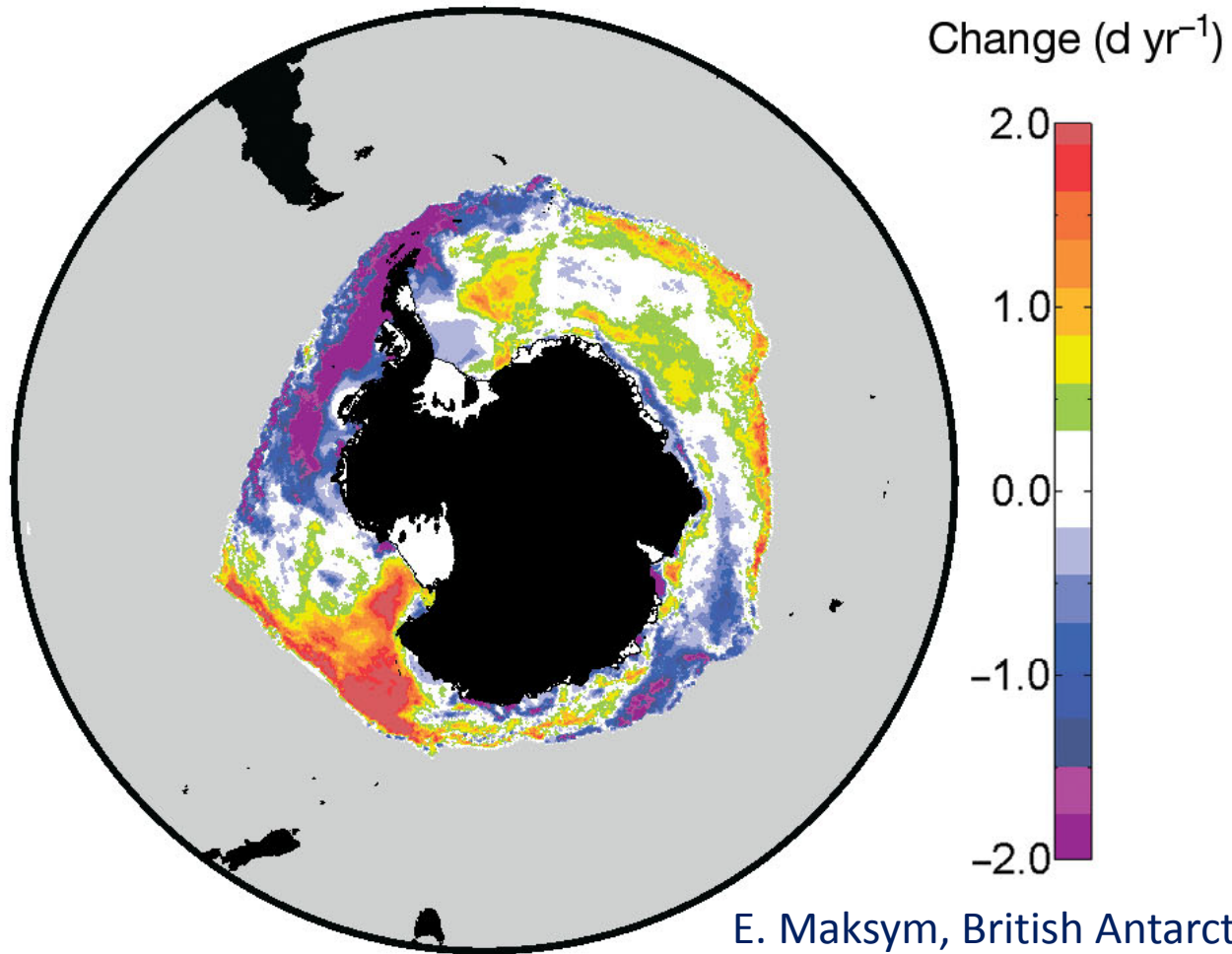




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# Change in duration of sea ice season



Flores et al. (2012) MEPS

# Ice algae





*Euphausia superba*



# Sea ice-associated fauna

**Antarctic**

*Boreogadus saida*

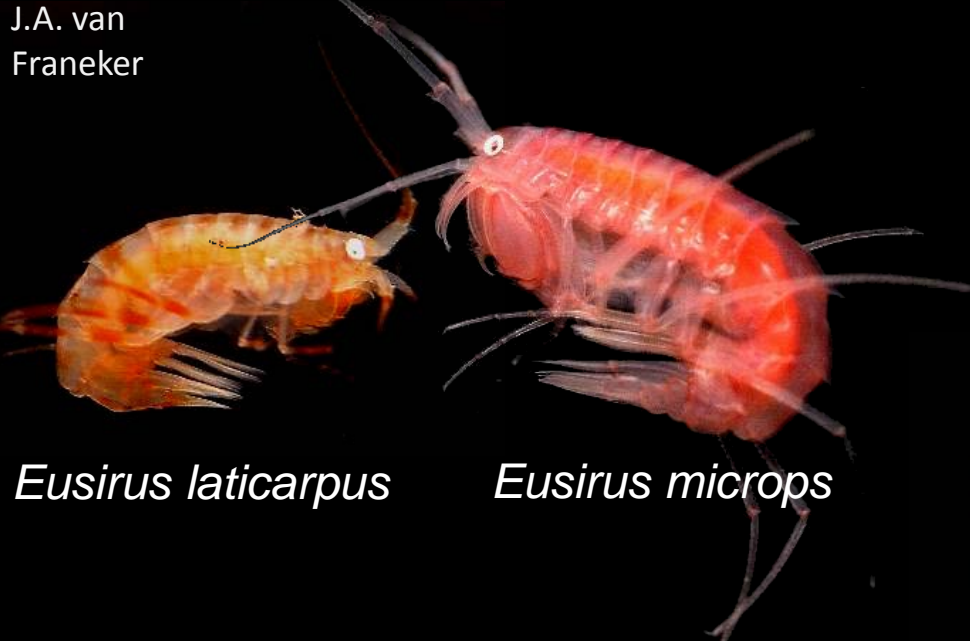


**Arctic**

*Gammarus wilkitzkii*



J.A. van Franeker



*Eusirus laticarpus*

*Eusirus microps*



*Apherusa glacialis*

Arcodiv.org

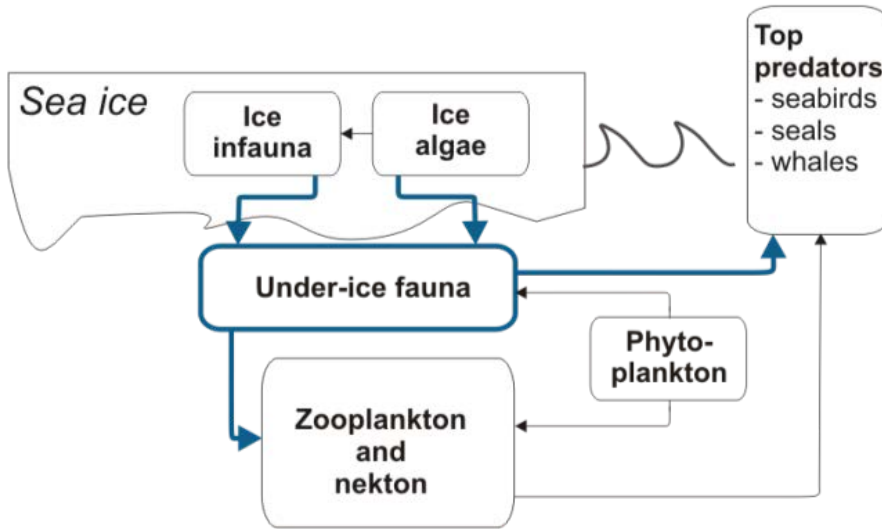
Bluhm&Gradinger UAF/CoML



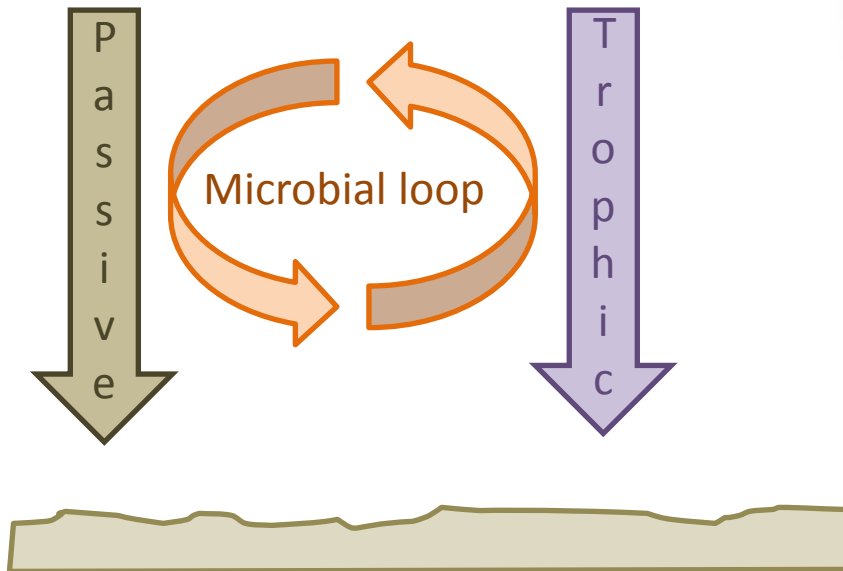
*Onissimus glacialis*

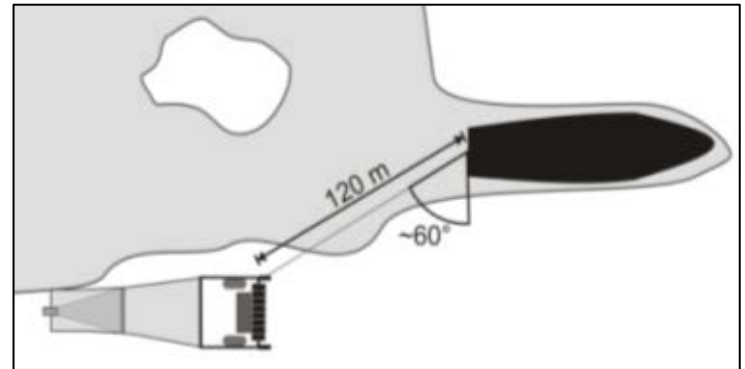
Arcodiv.org

Bluhm UAF/CoML

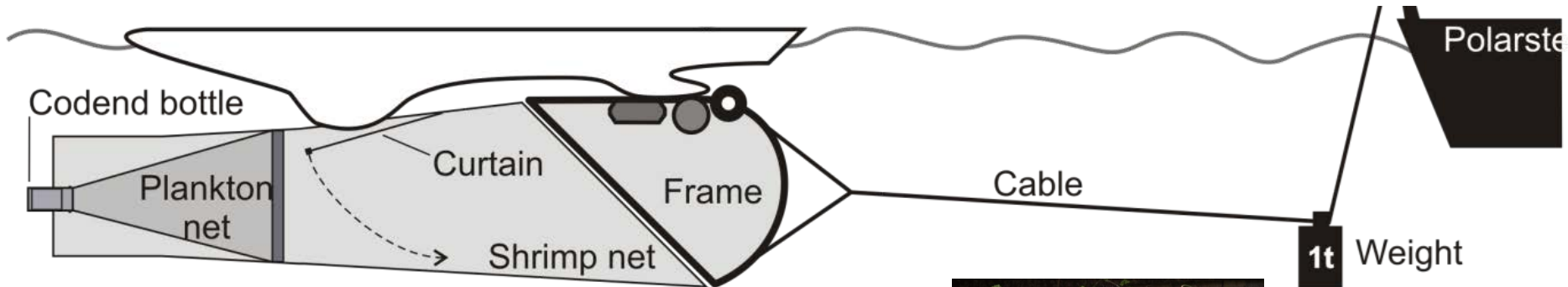


### Carbon flux through sea ice food web





# SUIT

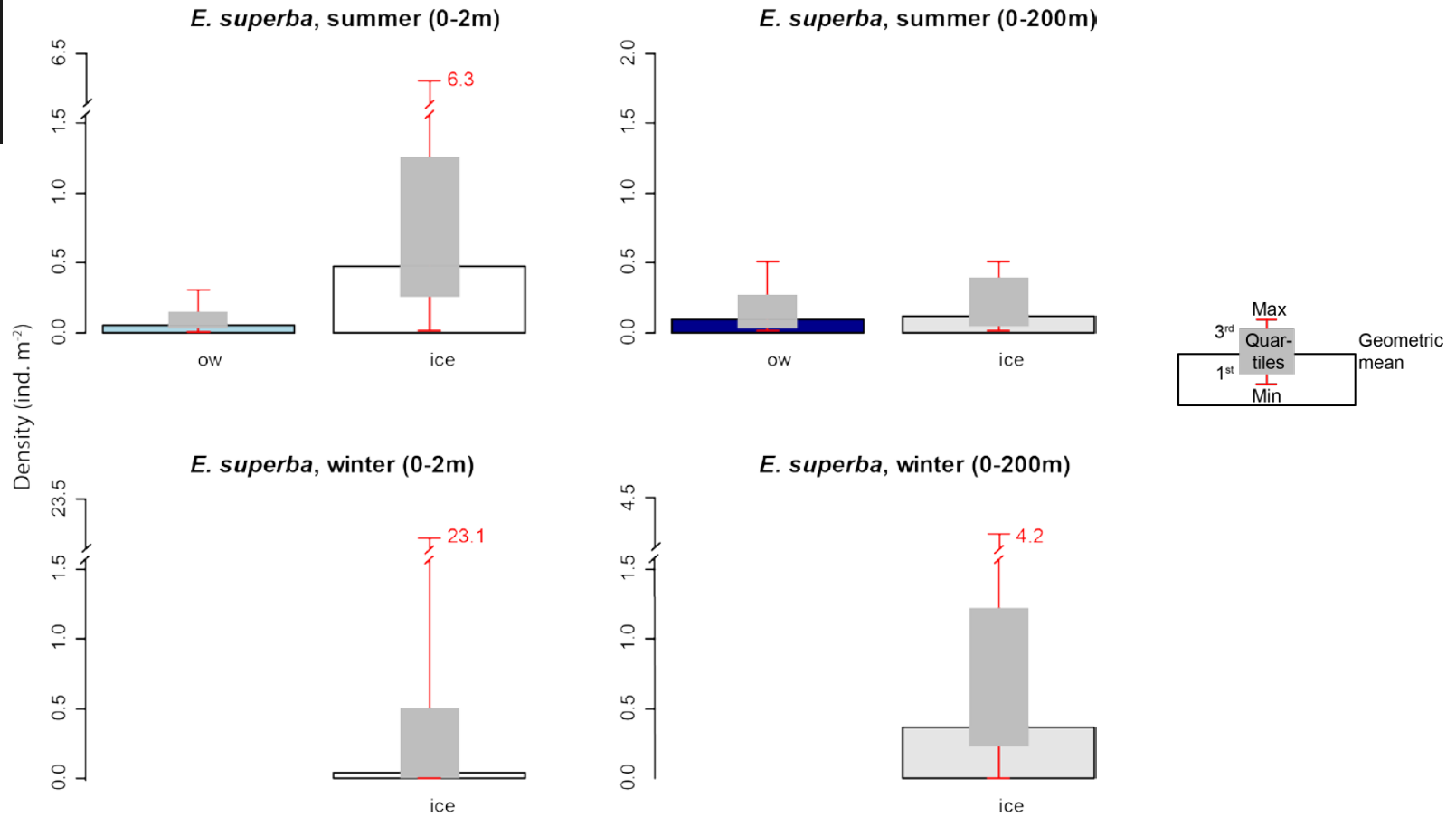


**Jan Andries  
van Franeker**

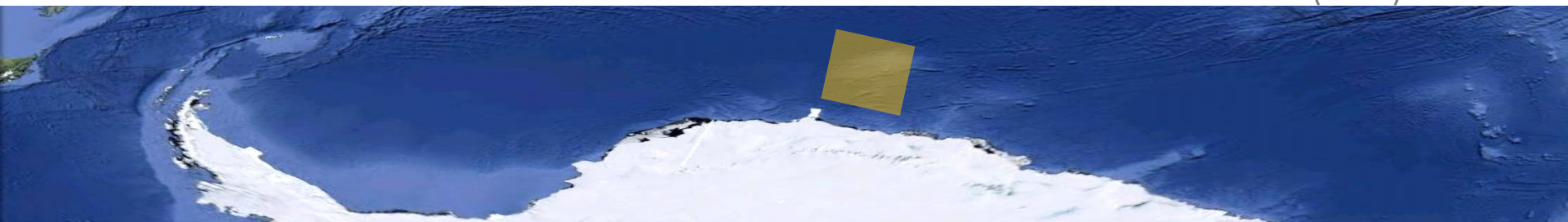




# Antarctic krill under sea ice

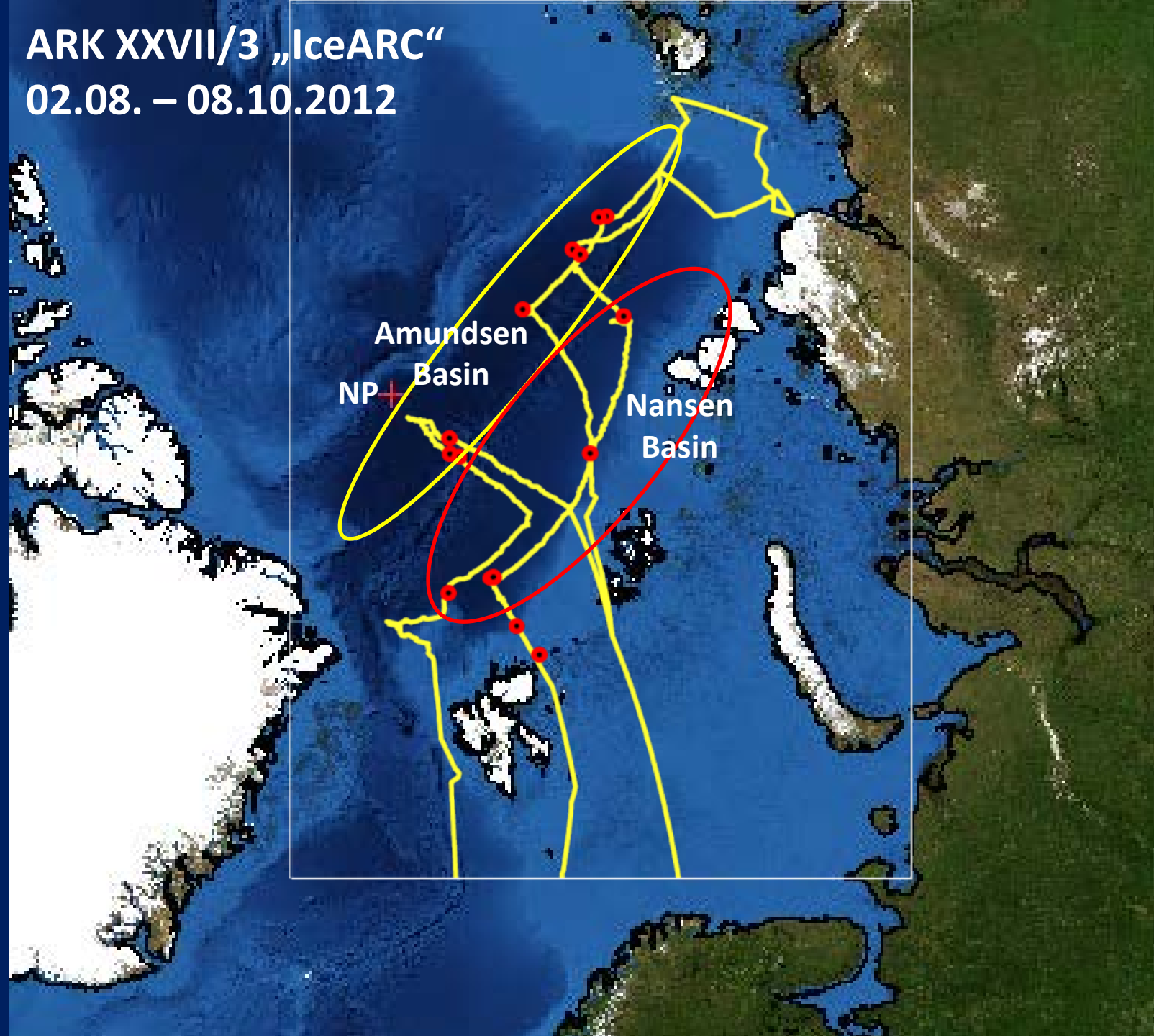


Flores et al. (2012) PLoS ONE

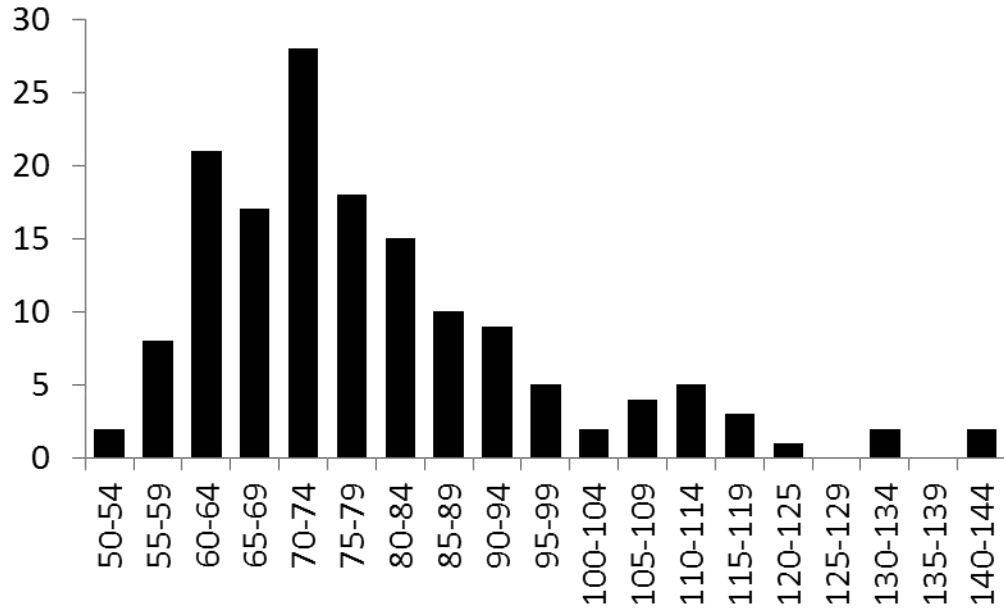


ARK XXVII/3 „IceARC“

02.08. – 08.10.2012

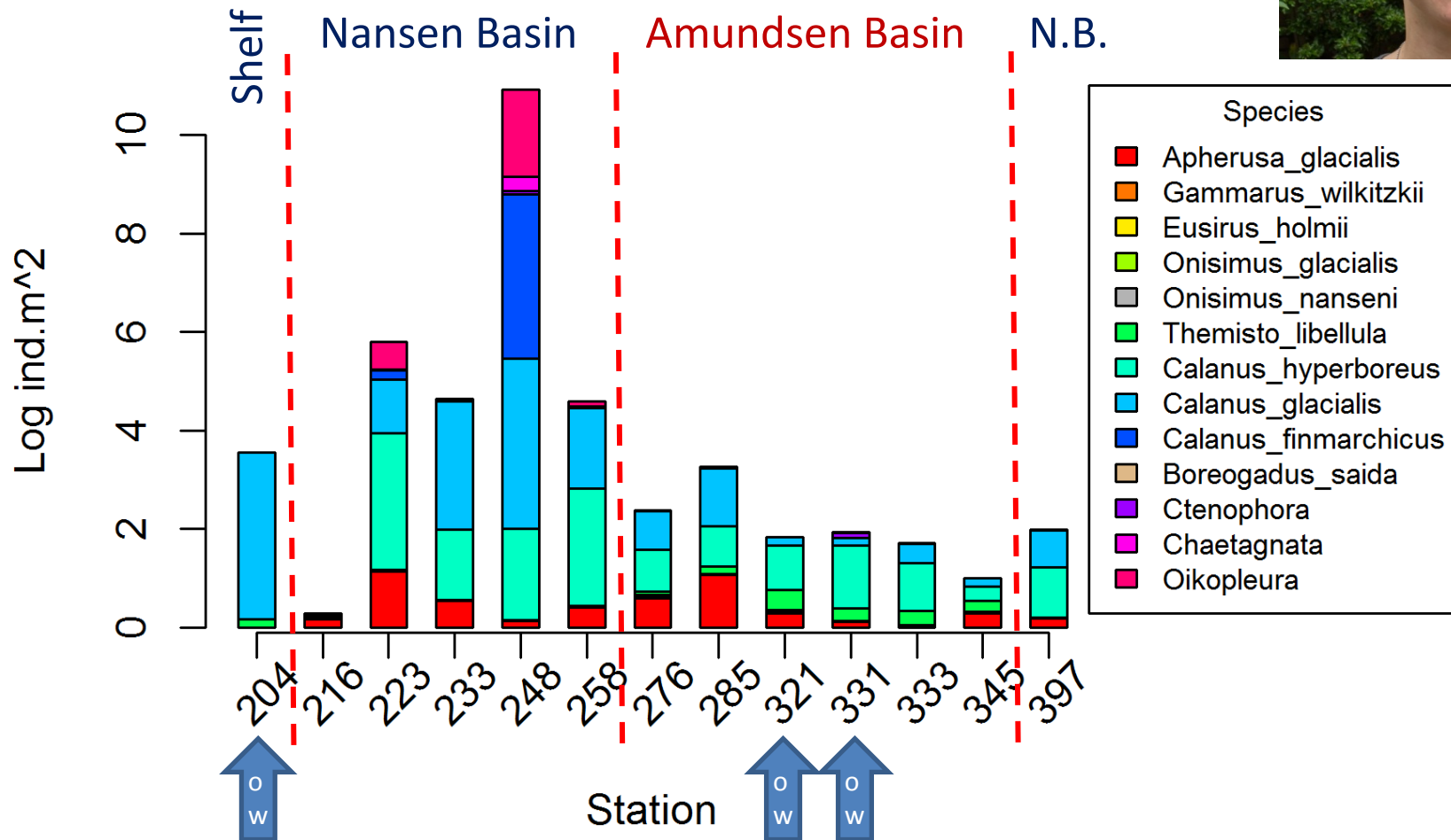


# Polar cod *Boreogadus saida*



# Community composition

Carmen David

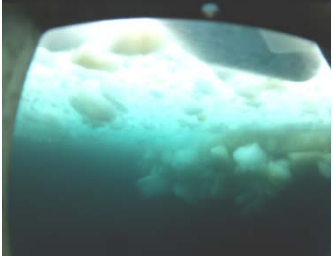
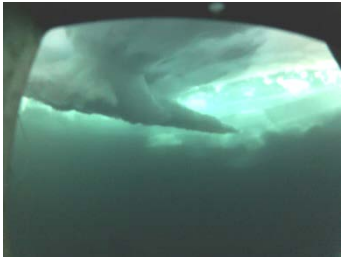
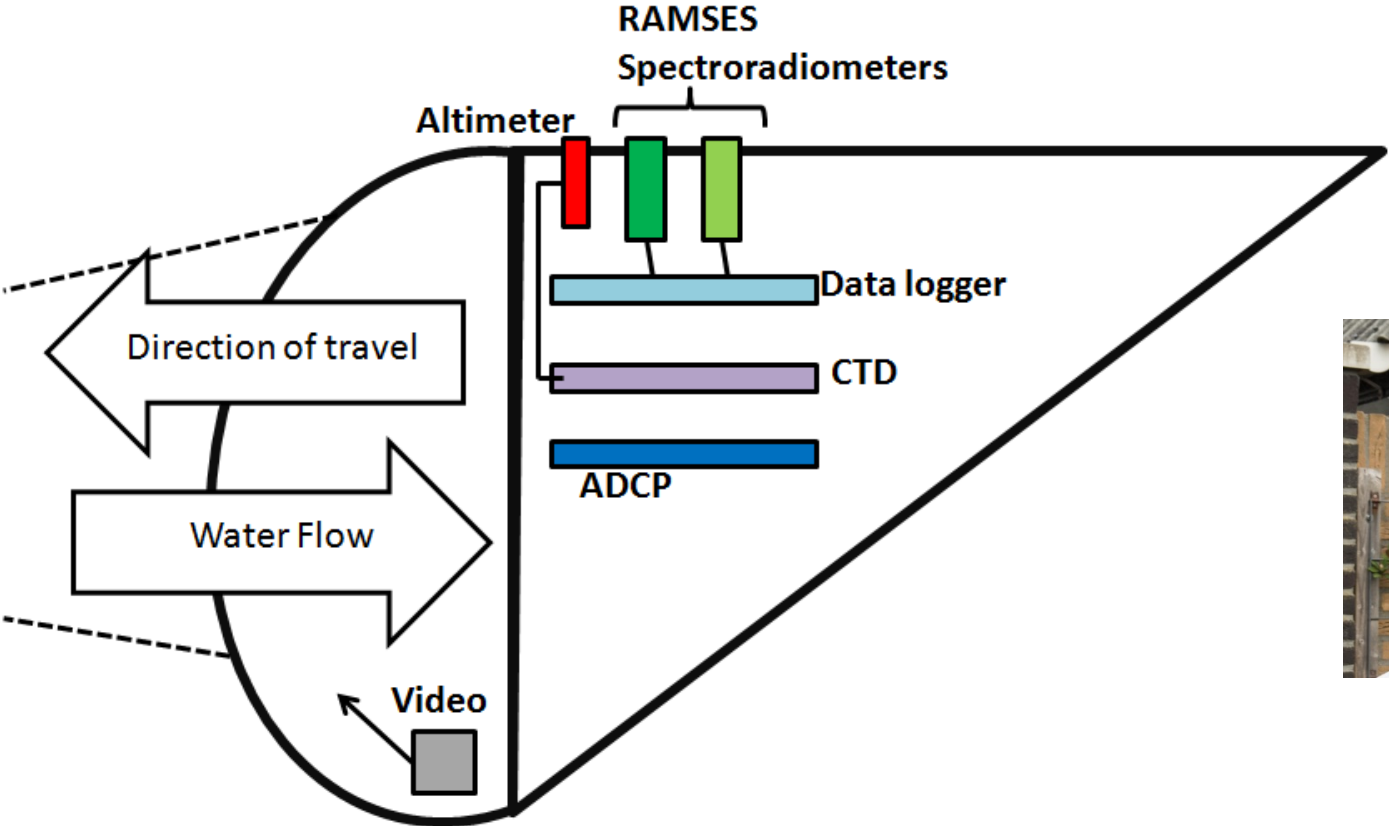




# Linking data

Benjamin Lange

## SUIT Sensor Array

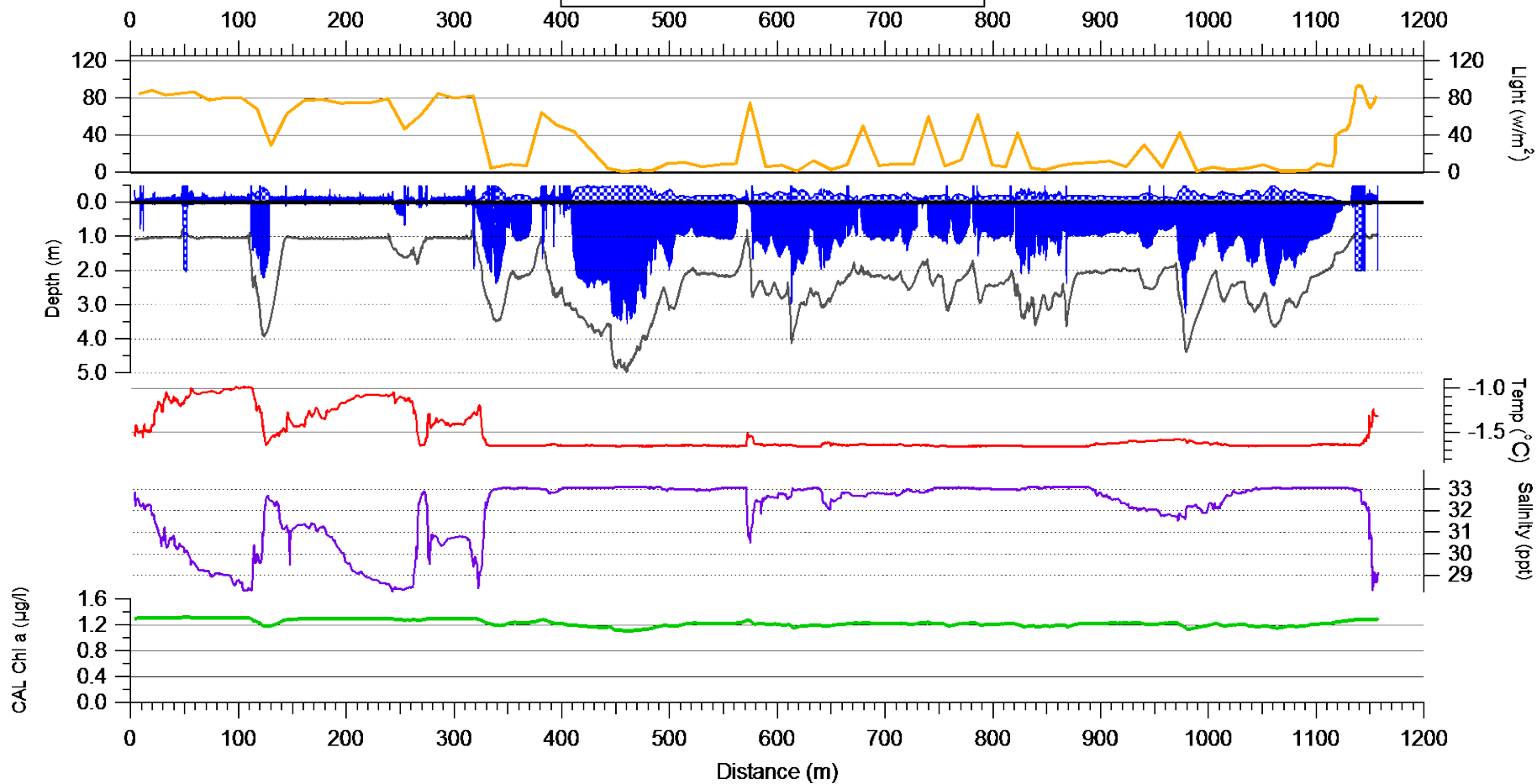


# Linking data

Benjamin Lange

- Irradiance
- Freeboard
- Draft
- SUIT Depth
- Temperature
- Salinity
- Chl a

PS80 SUIT Haul-03, Stn-223

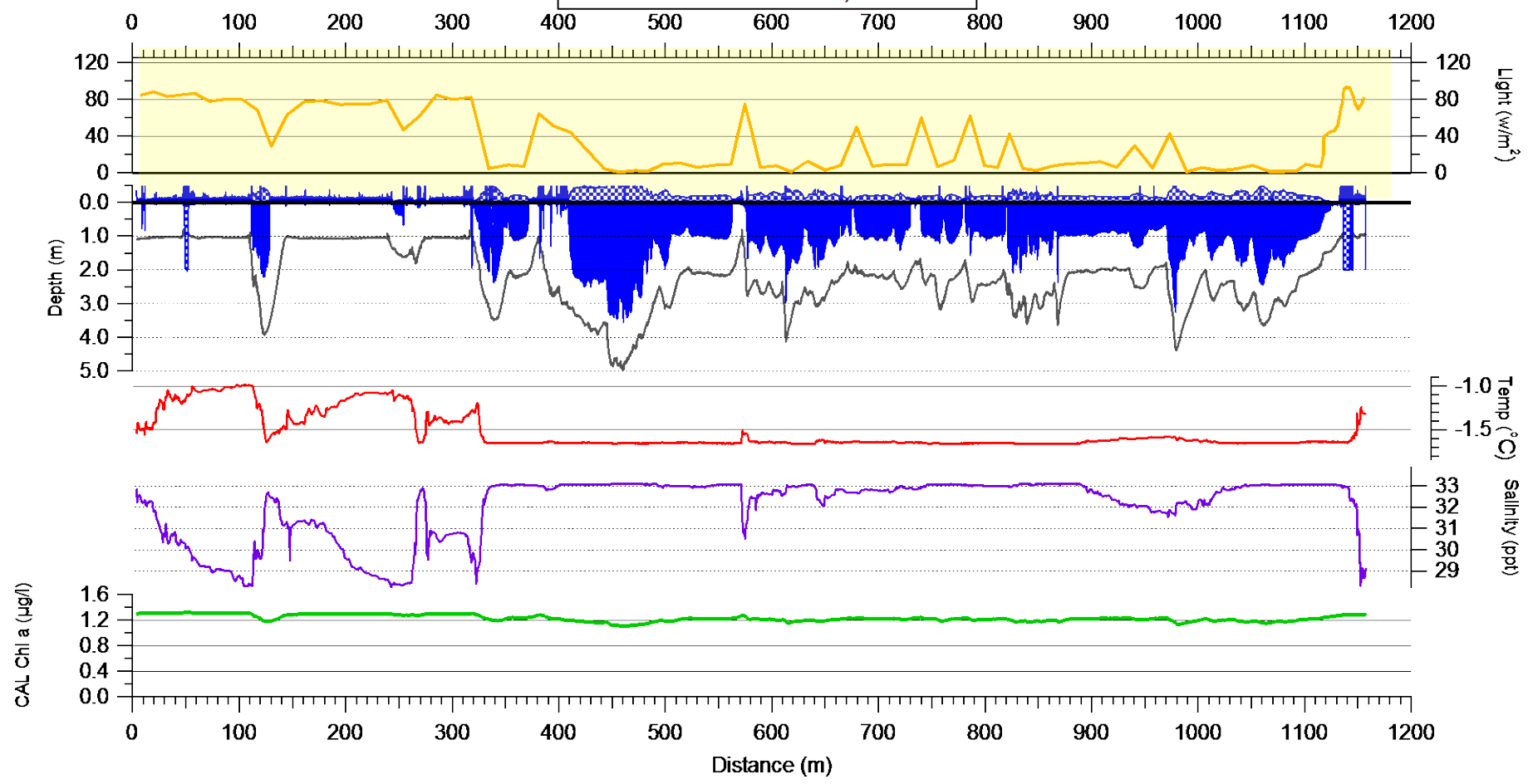


# Linking data

Benjamin Lange

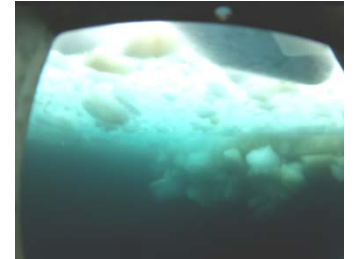
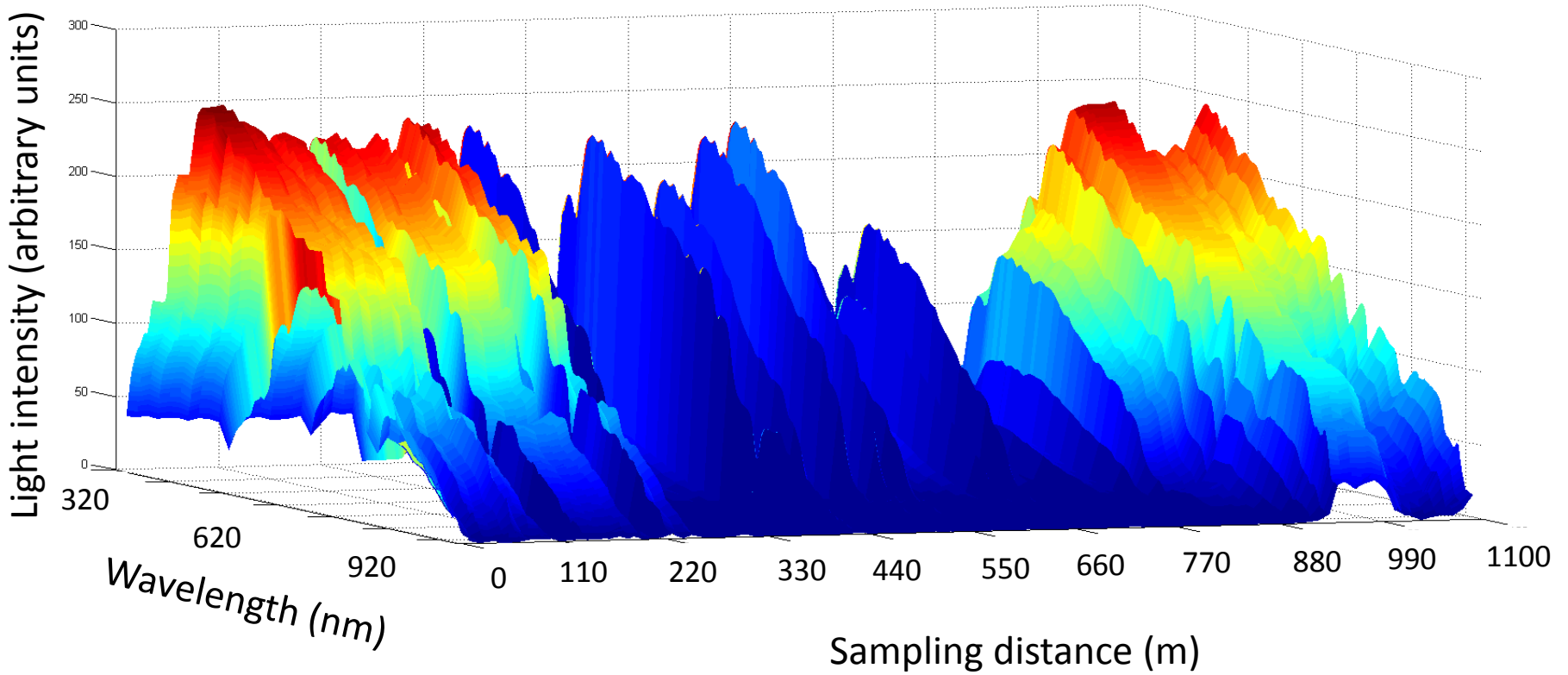
- Irradiance
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PS80 SUIT Haul-03, Stn-223



# Spectral profiles

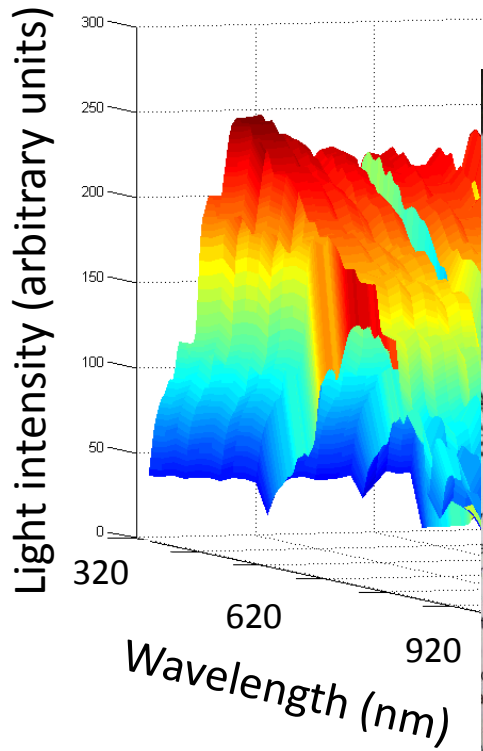
Benjamin Lange





# Spectral profiles

Benjamin Lange



## Light beneath the ice...

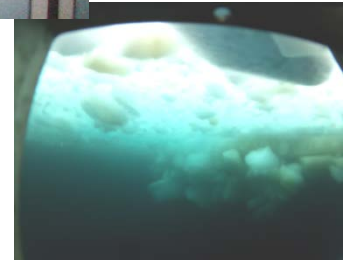
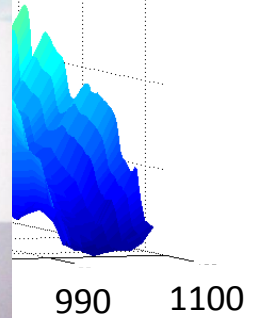
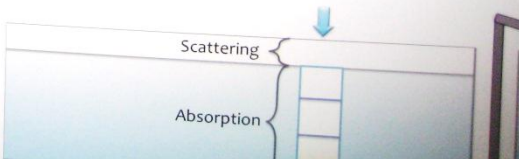
### Algorithms to estimate sea-ice algal biomass from under-ice irradiance spectra

**Jessica Melbourne-Thomas**  
Jessica Melbourne-Thomas<sup>1,2</sup>, Klaus Meiners<sup>1,2</sup>, Christina Schallenberg<sup>3</sup> and Katherine Tattersall<sup>4</sup>

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<sup>2</sup> Antarctic Climate and Ecosystems Cooperative Research Centre, University of Tasmania, Hobart, Tasmania, Australia  
<sup>3</sup> School of Earth and Ocean Sciences, University of Victoria, Victoria, Canada  
<sup>4</sup> Integrated Marine Observing System, University of Tasmania, Hobart, Tasmania, Australia

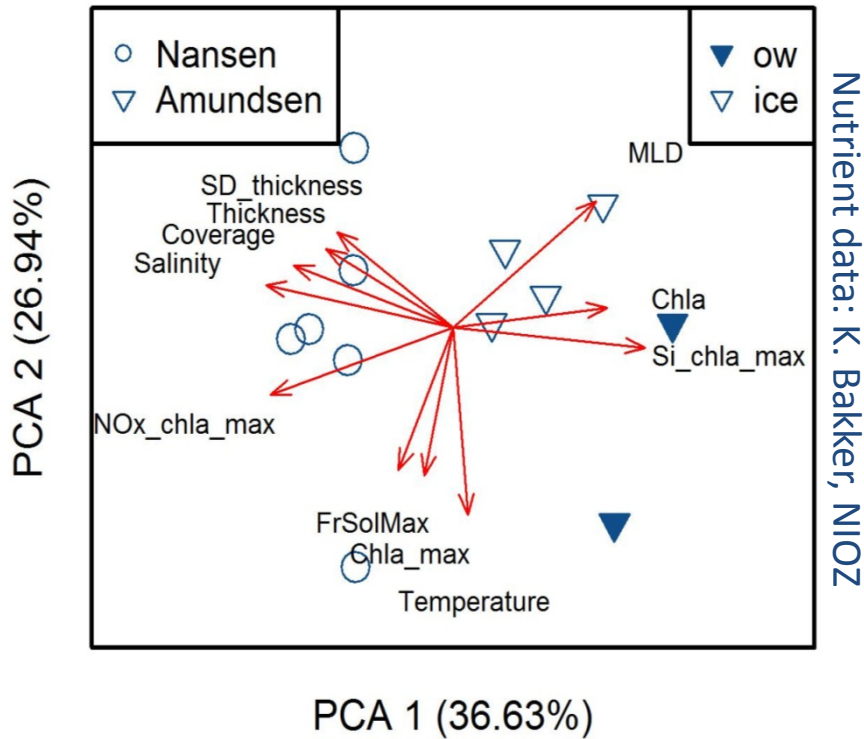
#### Introduction & Approach

Ice associated with Antarctic sea ice contribute significantly to primary productivity in the Southern Ocean. Algal distribution is extremely variable both temporally and spatially. The presence of ice algal pigments alters under-ice irradiance spectra and this relationship can be used to estimate ice-associated algal biomass. Ice cores and simultaneous under-ice irradiance measurements were collected during three voyages to (i) the Weddell Sea (WWOS) off East Antarctica (SIPEX1 and SIPEX2) in spring 2006, 2007 and 2012, respectively. We compared three methods for relating transmitted under-ice irradiance spectra to chlorophyll *a* concentration measurements: normalised difference...



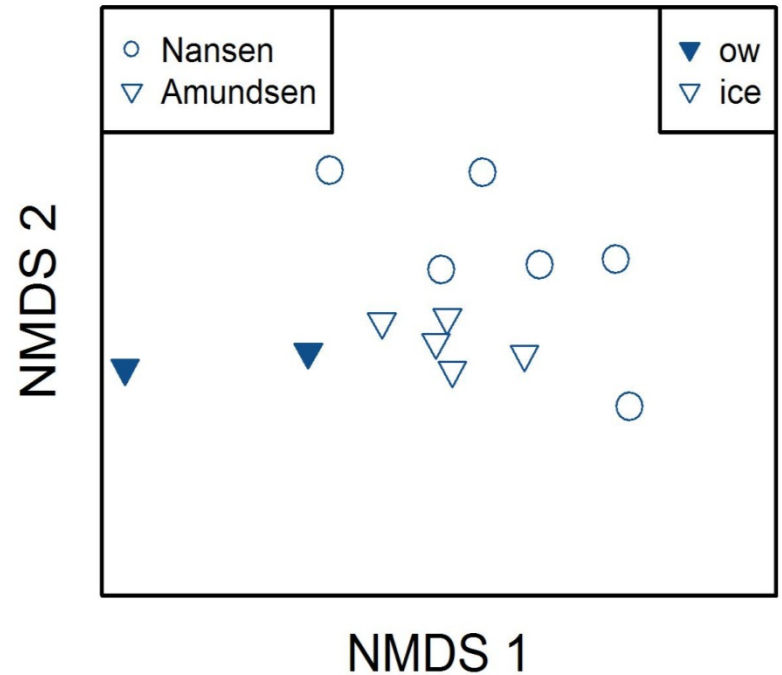
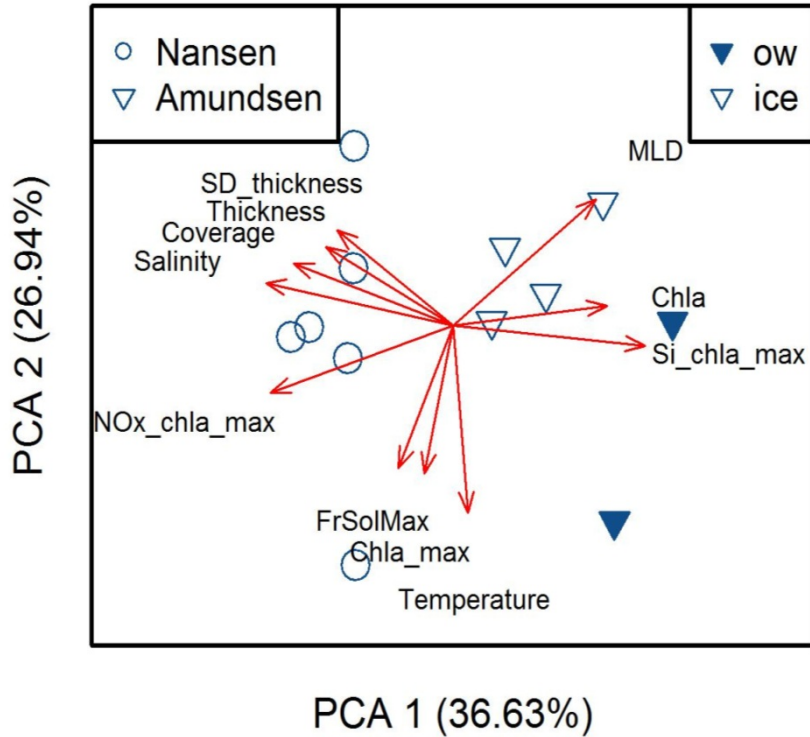
# Physical parameters

Carmen David



# Community composition

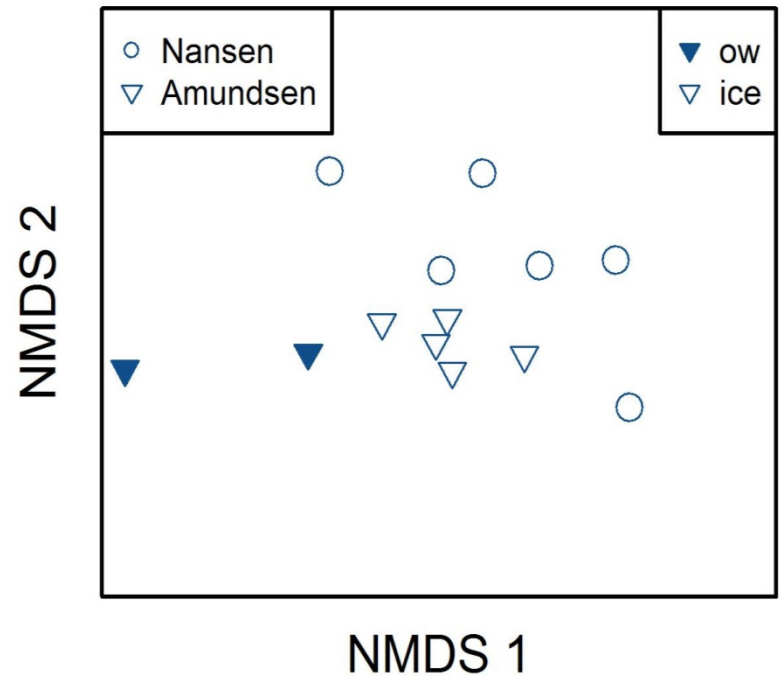
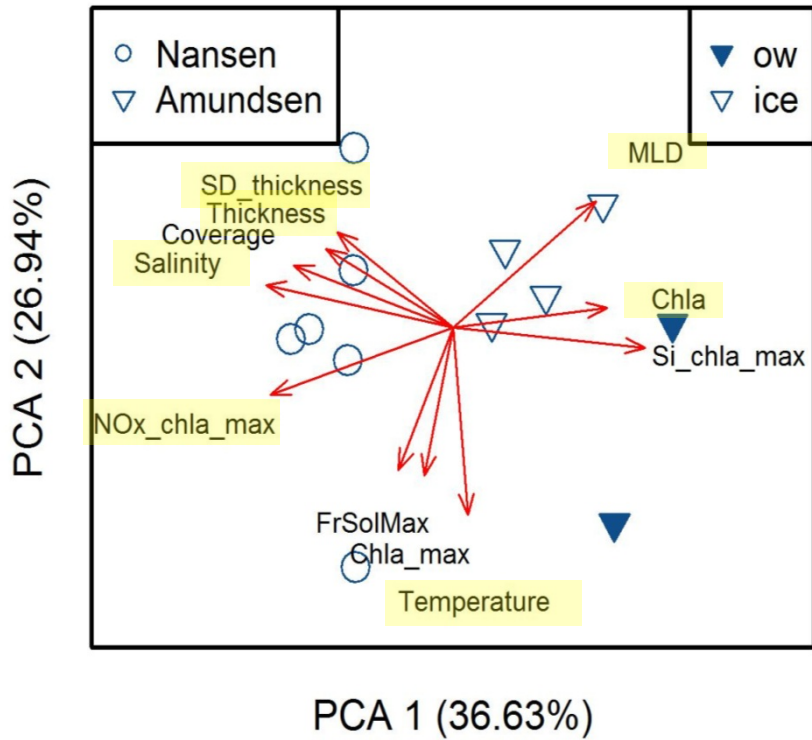
Carmen David





# Community composition

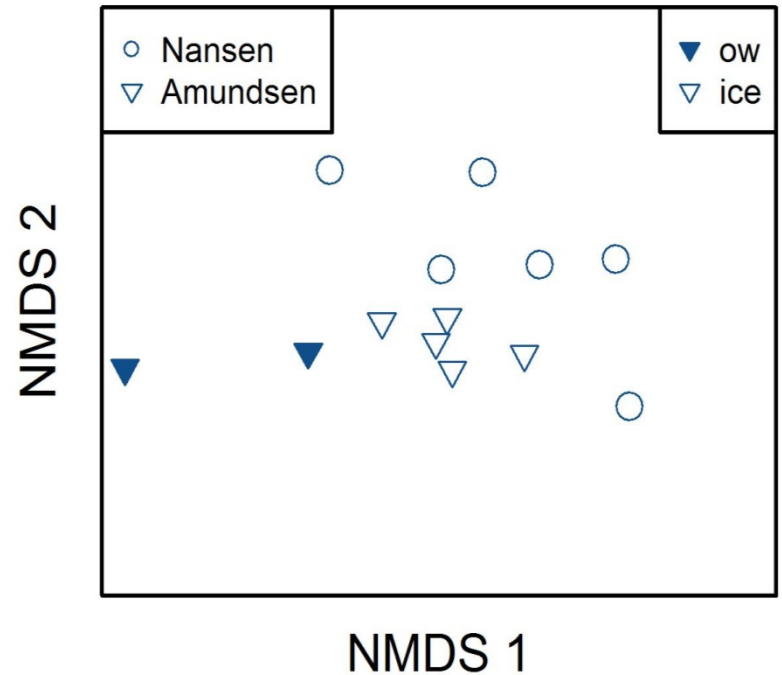
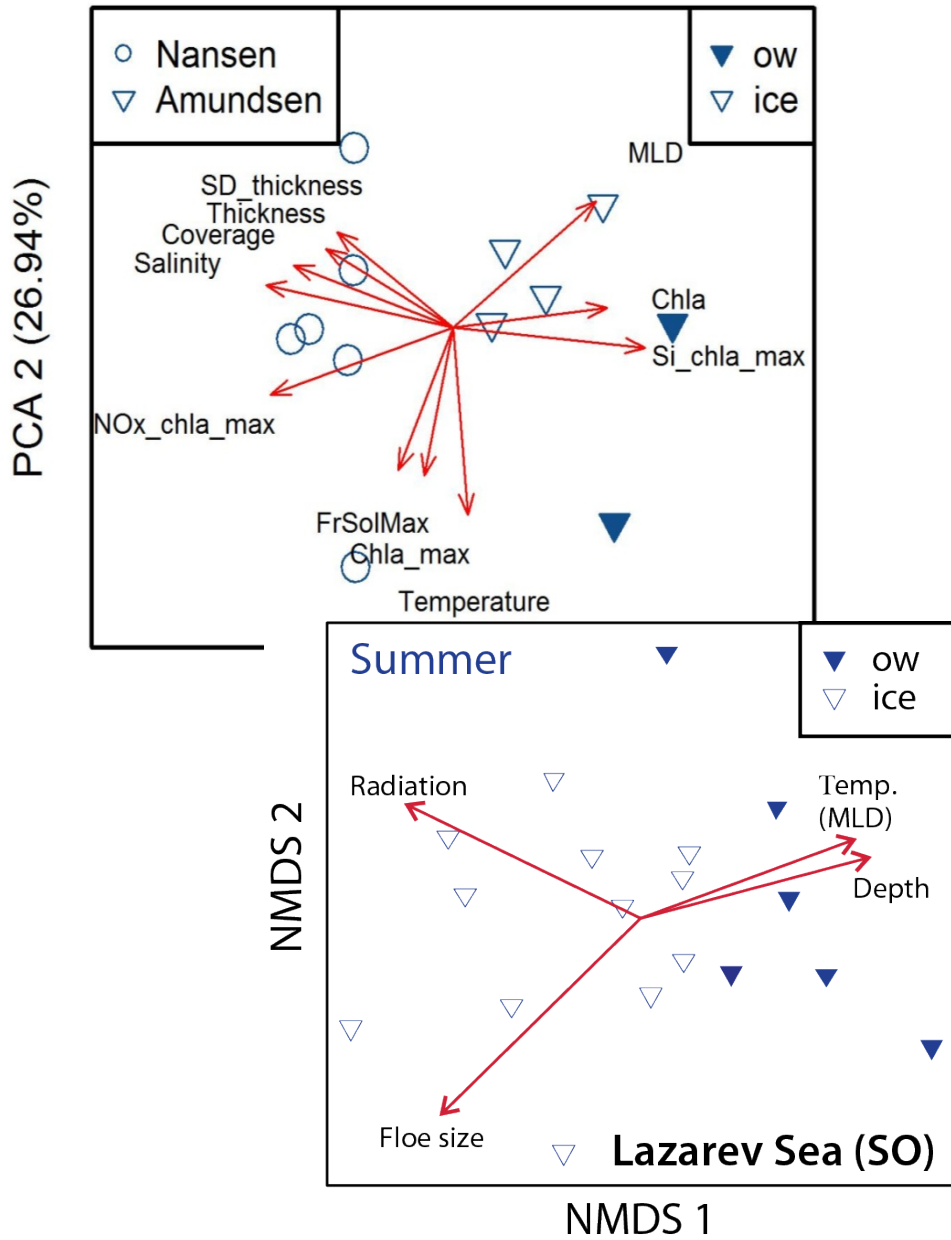
Carmen David





# Community composition

Carmen David





# Differences in sea ice

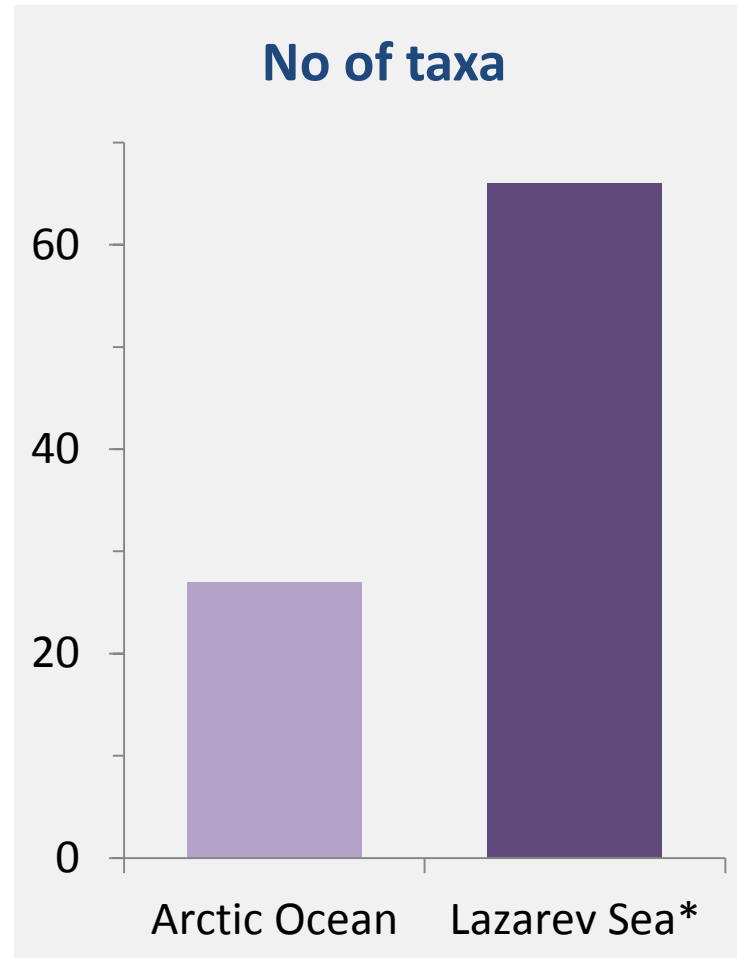
## Arctic Ocean

- MYI dominant (?)
- Little snow
- Melt ponds
- Aggregates / *Melosira*

## Antarctic Ocean

- FYI dominant
- Snow cover
- Diffuse ice algal assemblages

# Under-ice fauna

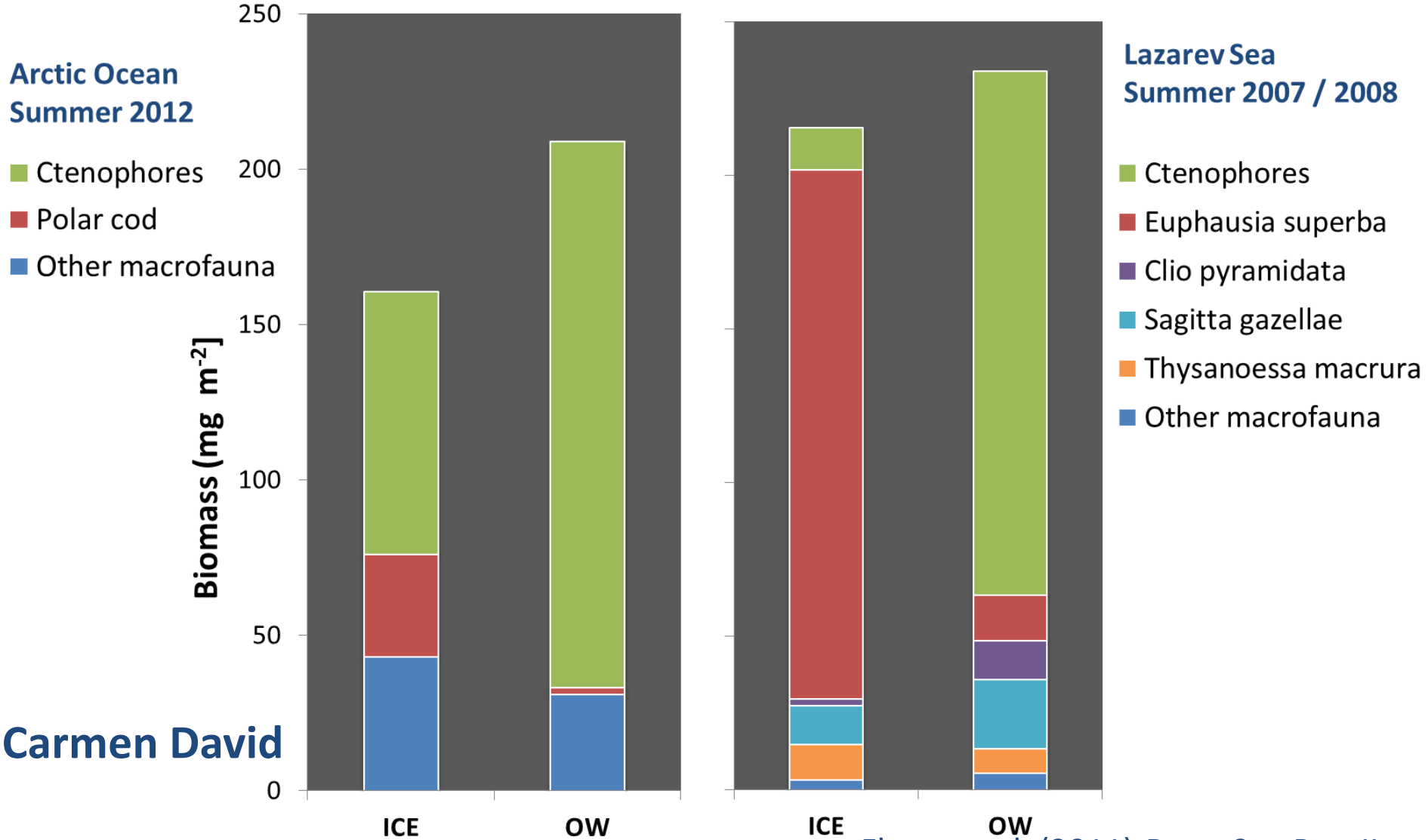


**Carmen David**  
**Henrieke Tonkes**



\*Flores et al. (2011) *Deep-Sea Res. II*

# Biomass comparison



Carmen David



# Conclusions

- Under-ice fauna significant in deep-sea systems:
  - Antarctic: Dominance of Antarctic krill
  - Arctic: Dominance of ice amphipods / polar cod
- Sea ice habitat properties are key in structuring community composition
- Differences in diversity, but not so much in biomass
- Arctic can learn from Antarctic sea ice research, and vice versa







*Thank you.*

**Polarstern crews and  
scientific staff:  
ANT XXI/4; ANT XXIII/6;  
ANT XXIV/7  
ARK XXVII/3**

**Michiel van Dorssen  
André Meijboom  
Karel Bakker  
Henriëke Tonkes  
Anton van de Putte  
a.m.o.**

*SUIT on-deck crew, Polarstern ARK XXVII/3*

**www.awi.de**

↳ Research

↳ Young Investigators

↳ Helmholtz University Young Investigators Groups

↳ *Iceflux*

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