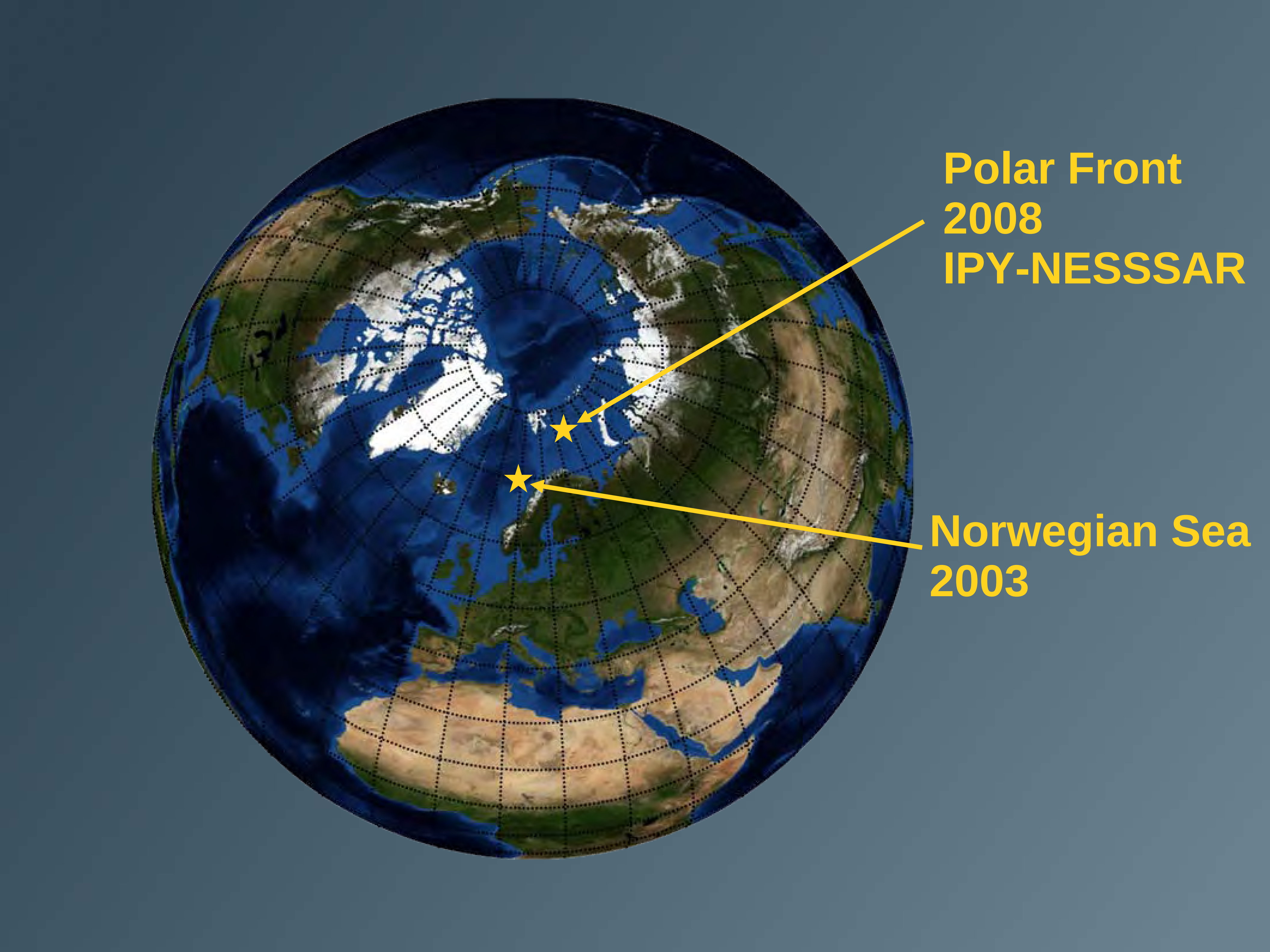
Comparison of spring bloom dynamics between the subpolar Norwegian Sea and the polar front in the Barents Sea

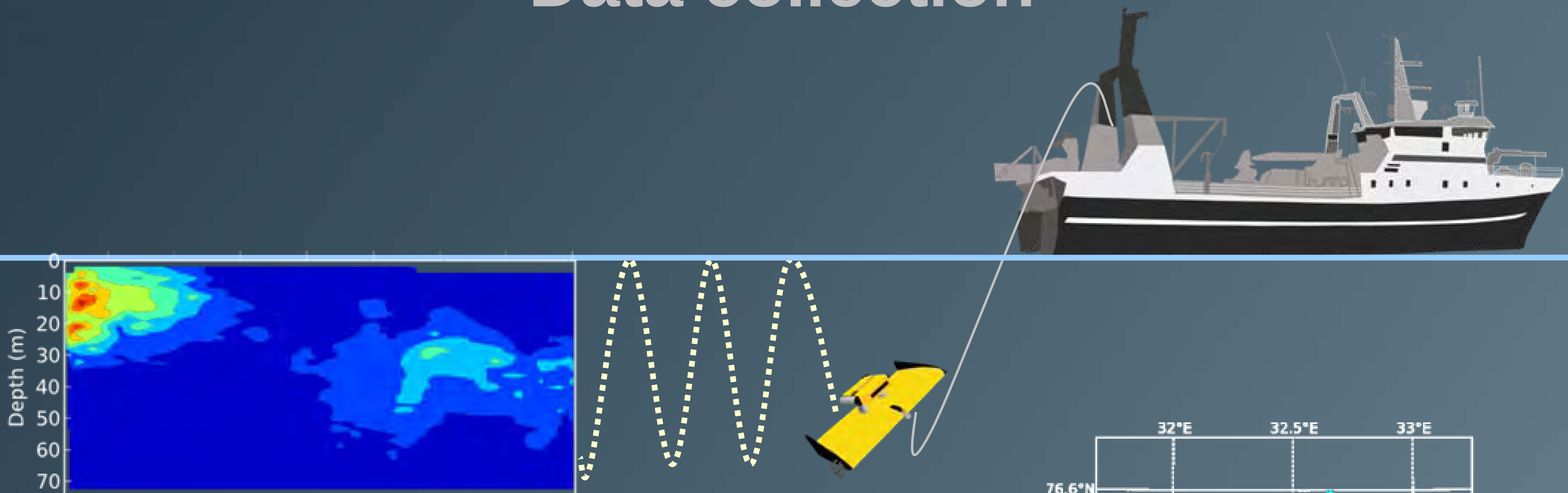
Sünnje L. Basedow[1], Meng Zhou[2] & Kurt S. Tande[1]
[1] University of Nordland, Bodø, Norway
[2]University of Massachusetts, Boston, USA


Polar Front
2008
IPY-NESSSAR
Norwegian Sea
2003

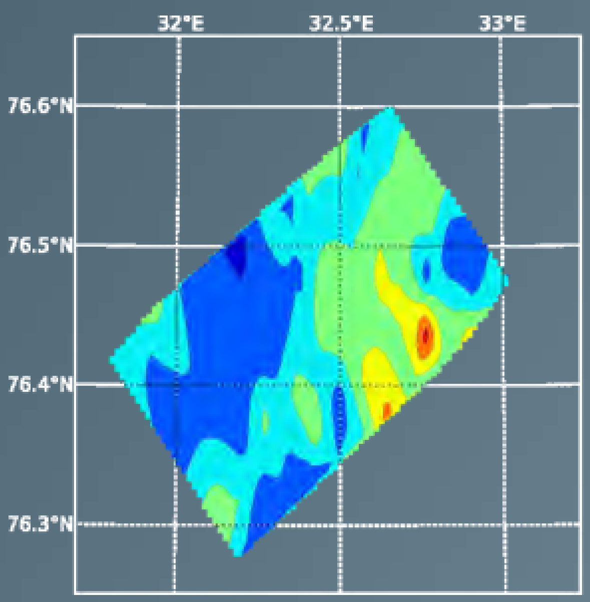
Objectives

- Analyse the response of the mesozooplankton community to spatial patterns of the phytoplankton community
- Analyse differences and similarities between the subpolar and the polar system

Data collection



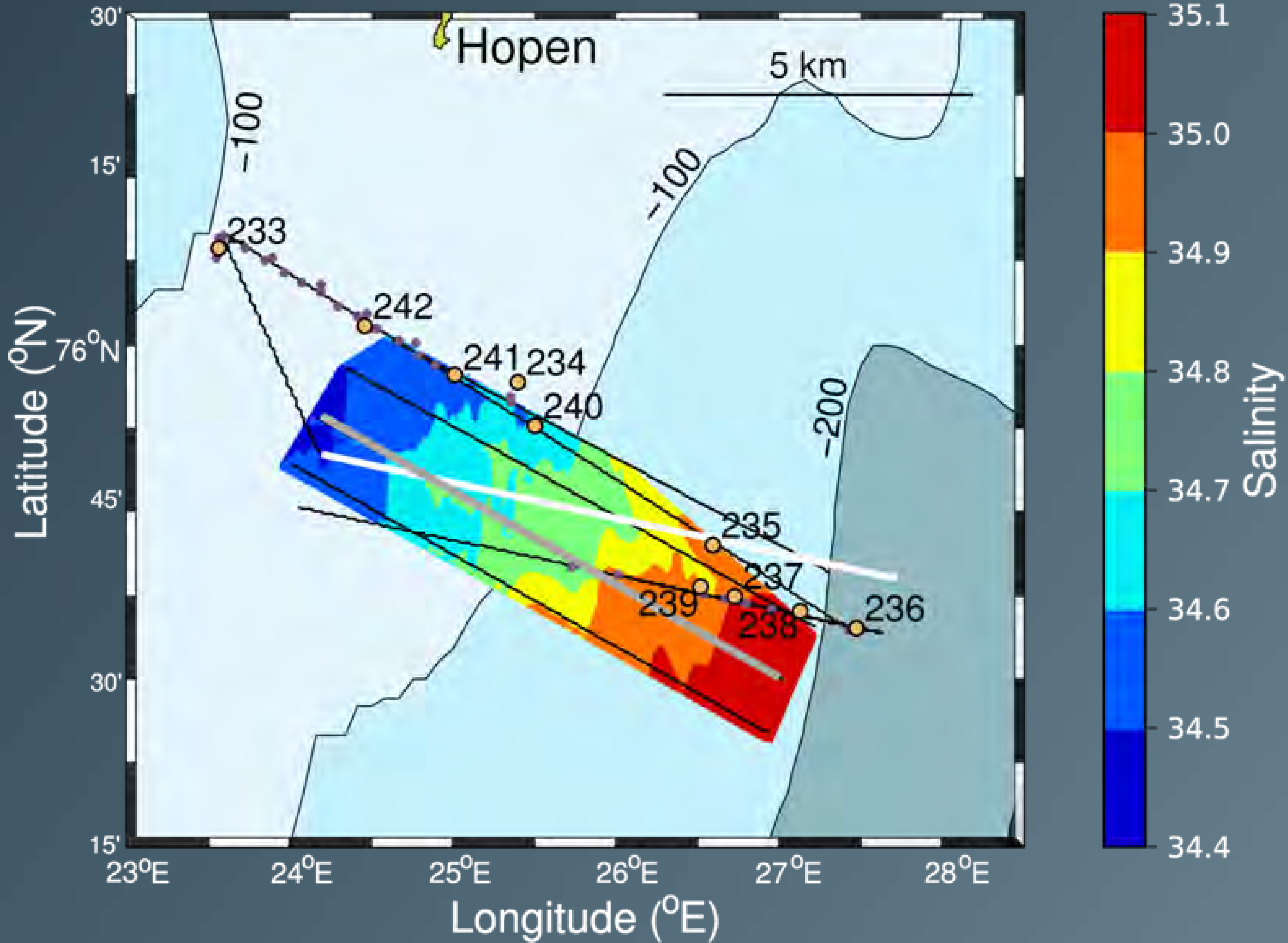
- Scanfish equipped with CTD-F and OPC or Laser-OPC
- Additional water and net samples
- At Polar Front also grazing experiments



- Data were binned for spatial maps

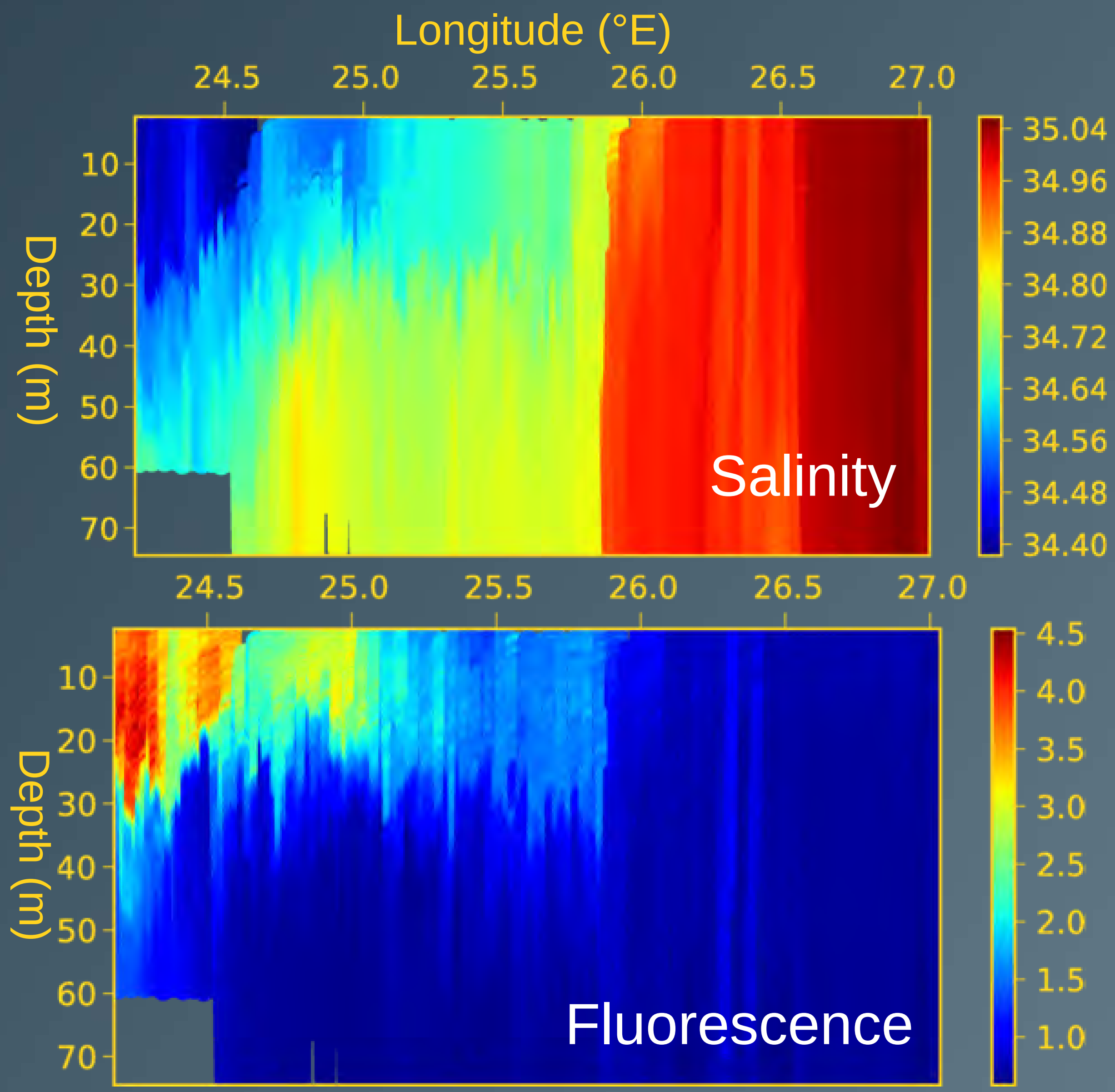

Polar Front, Barents Sea
Spring 2008

Study area Polar Front



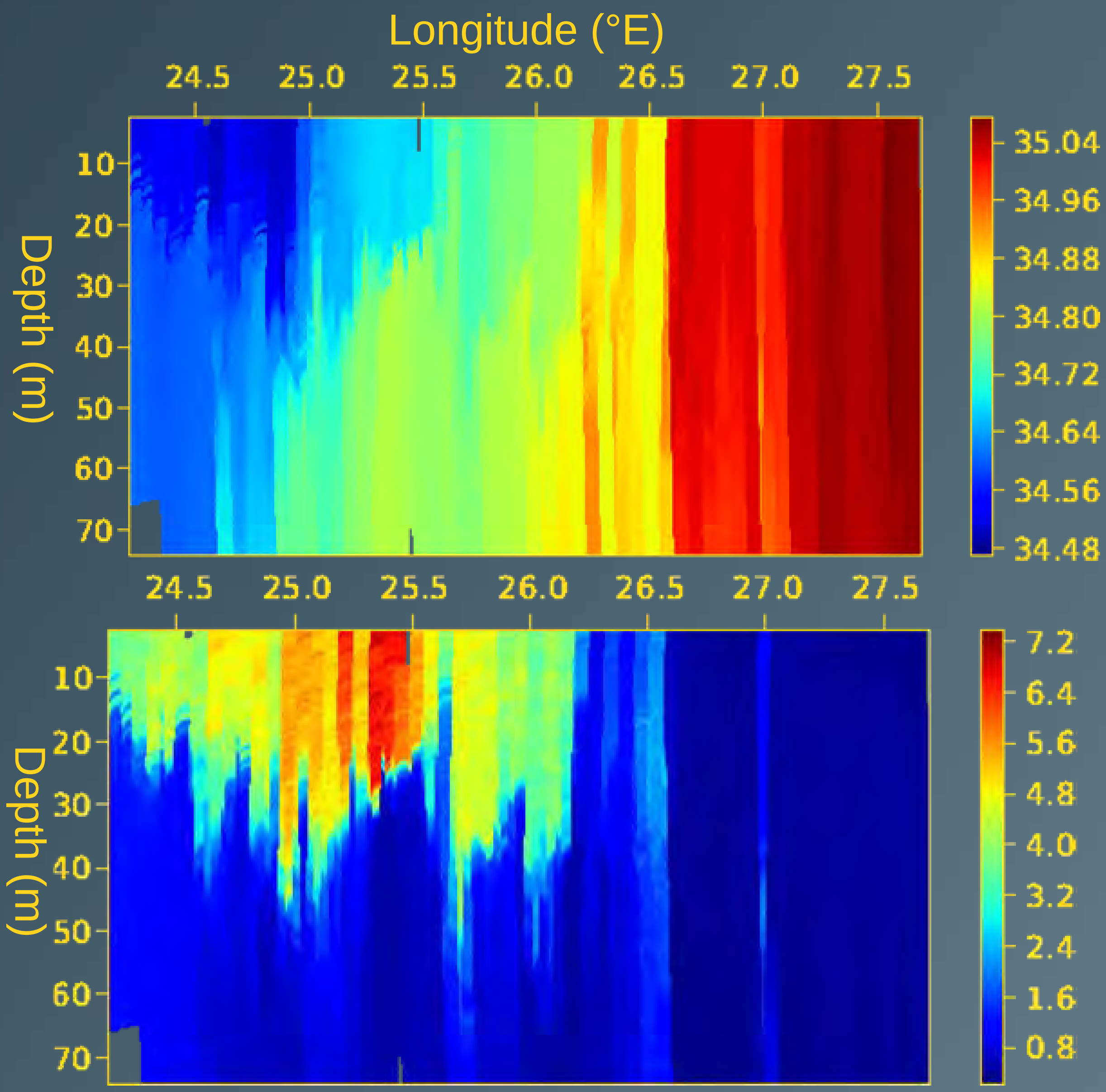
Ice edge phytoplankton bloom

May 1



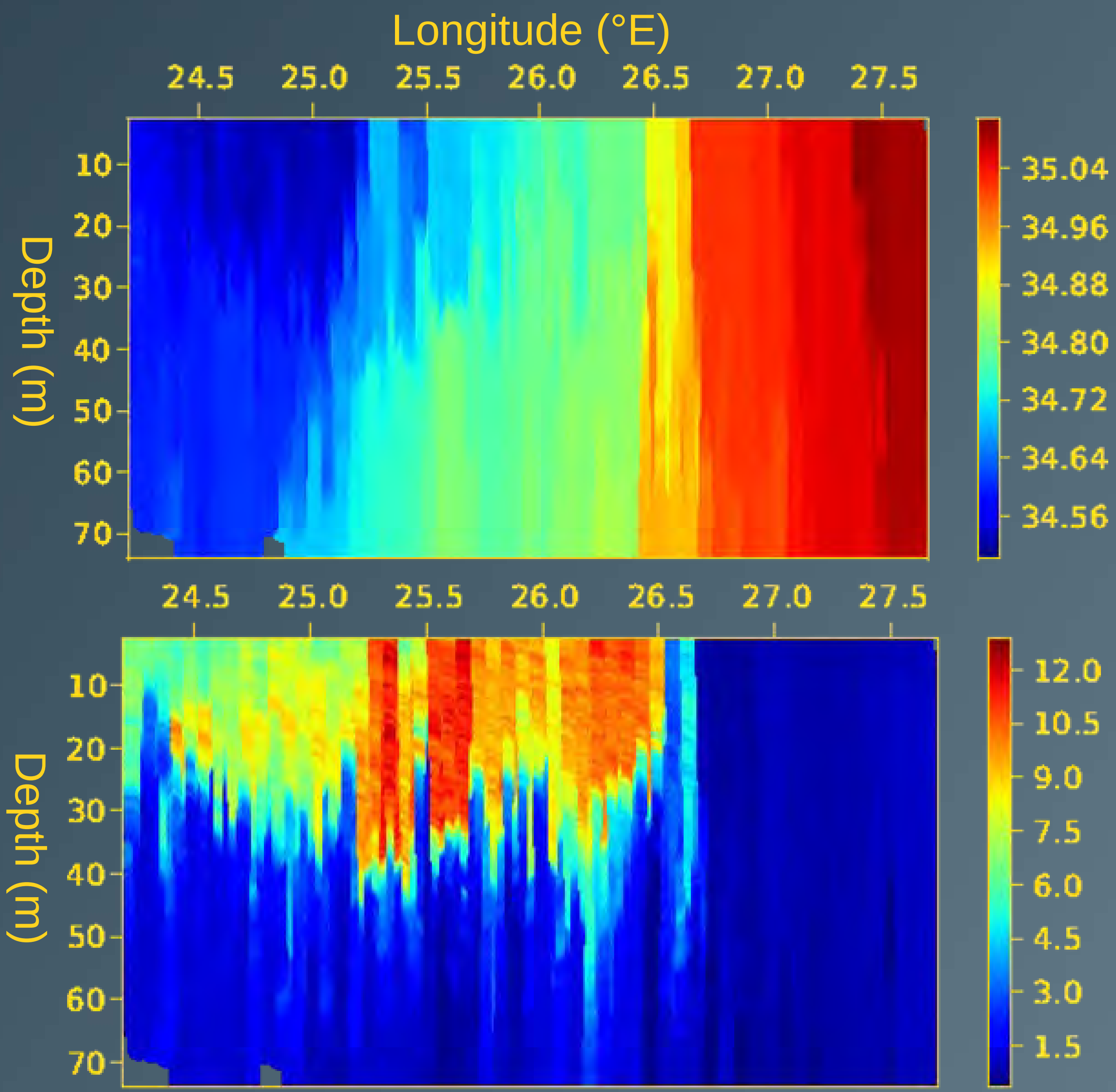
Ice edge phytoplankton bloom

May 10



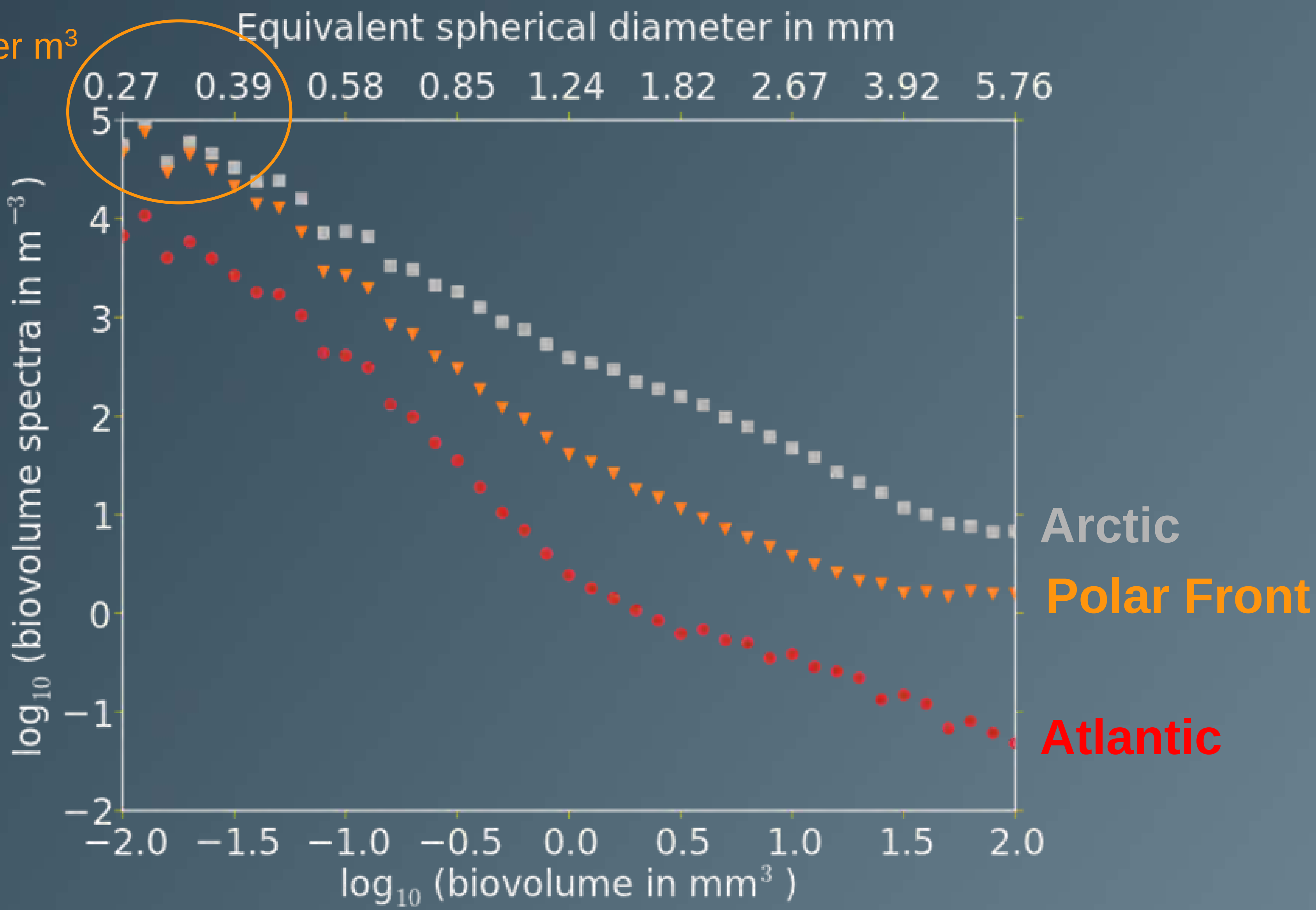
Ice edge phytoplankton bloom

May 14

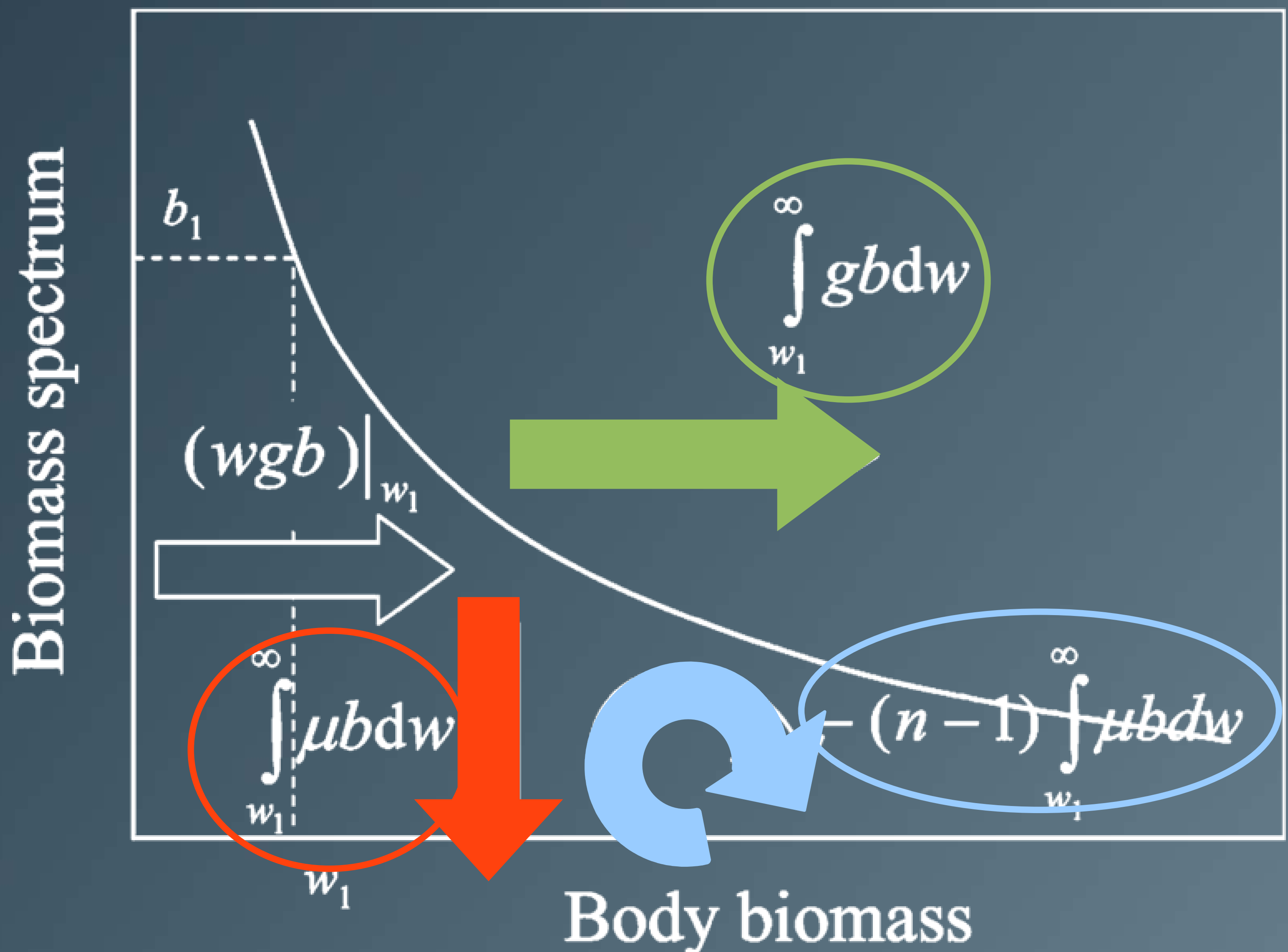


Biovolume spectra - Polar Front

Up to 35 000 barnacle nauplii per m^3 in net samples

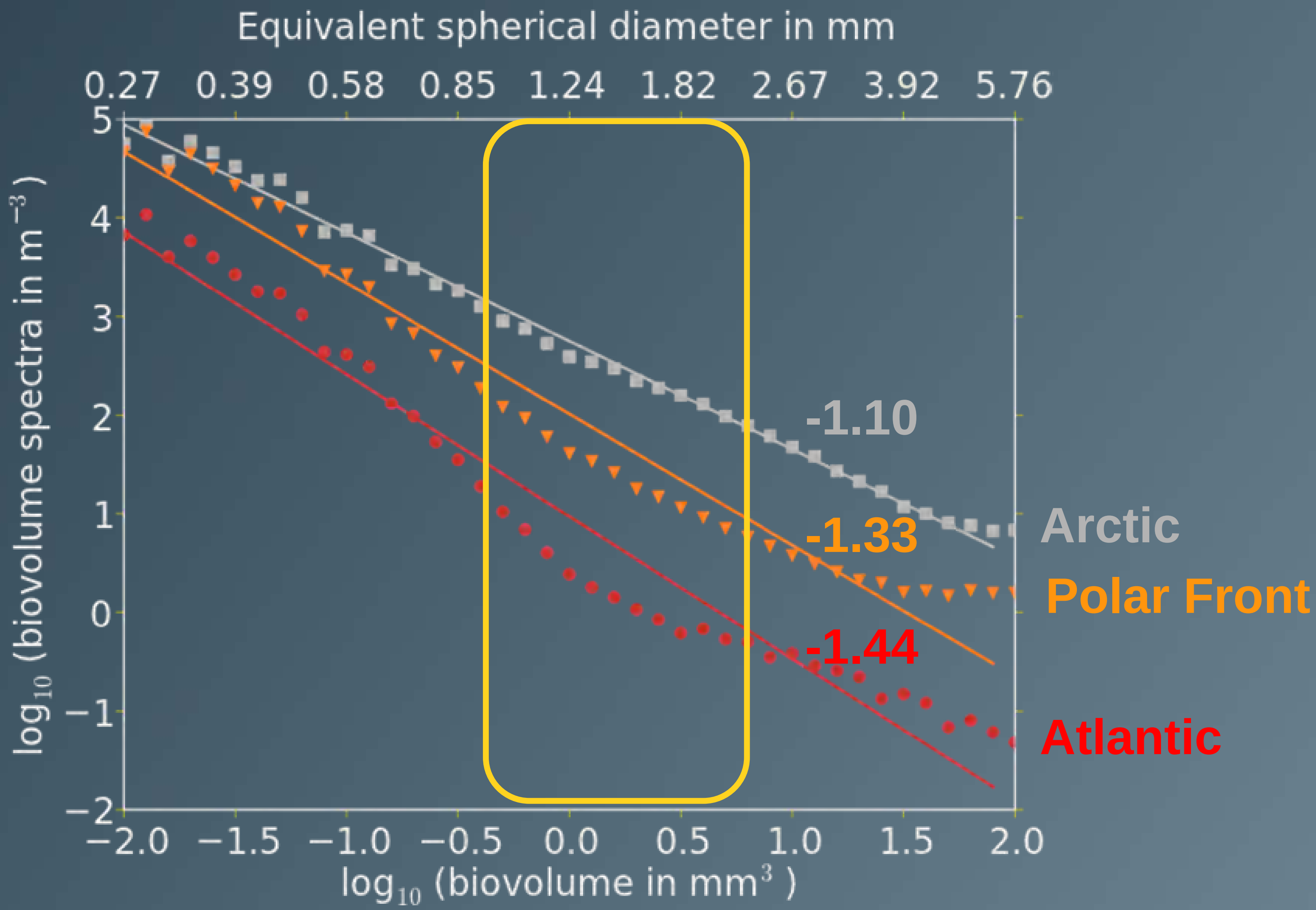


Biomass fluxes though a biomass spectrum



Zhou 2006 J Plankton Res 28

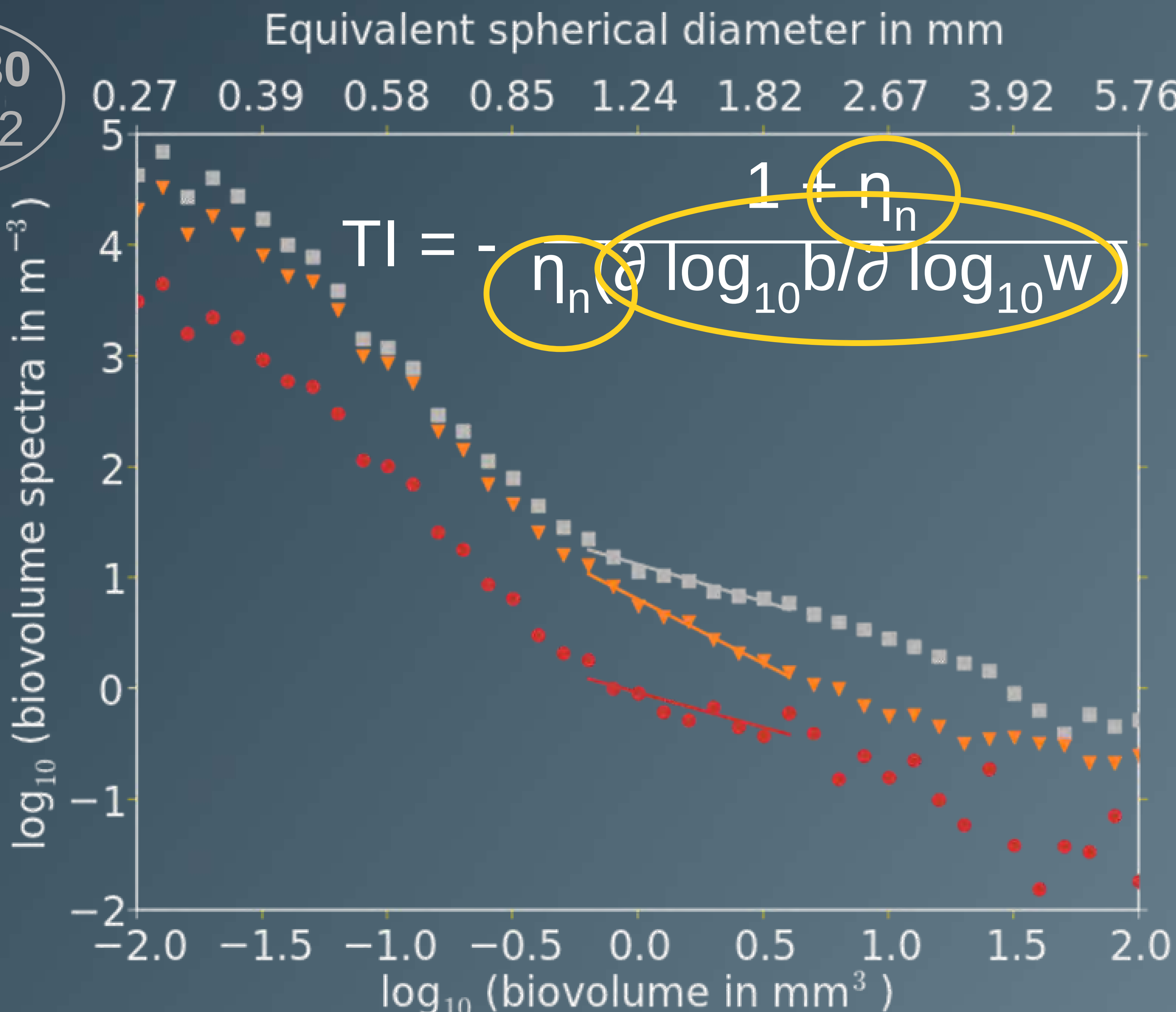
Biovolume spectra Polar Front



Computing trophic indices

April 30 - May 2

$$TI = -\frac{1+\eta_n}{\eta_n(\partial \log_{10} b/\partial \log_{10} w)}$$



Trophic indices estimated by biovolume spectrum theory

	Apr 30-May 2	10-12 May	14-15 May
Arctic Water	3.6	2.2	3.1
Polar Front Water	2.1	1.7	2.1
Atlantic Water	3.9	2.0	1.7

and by stable isotope analyses

Spring	1.6-2.4
Winter	2.6-3.1

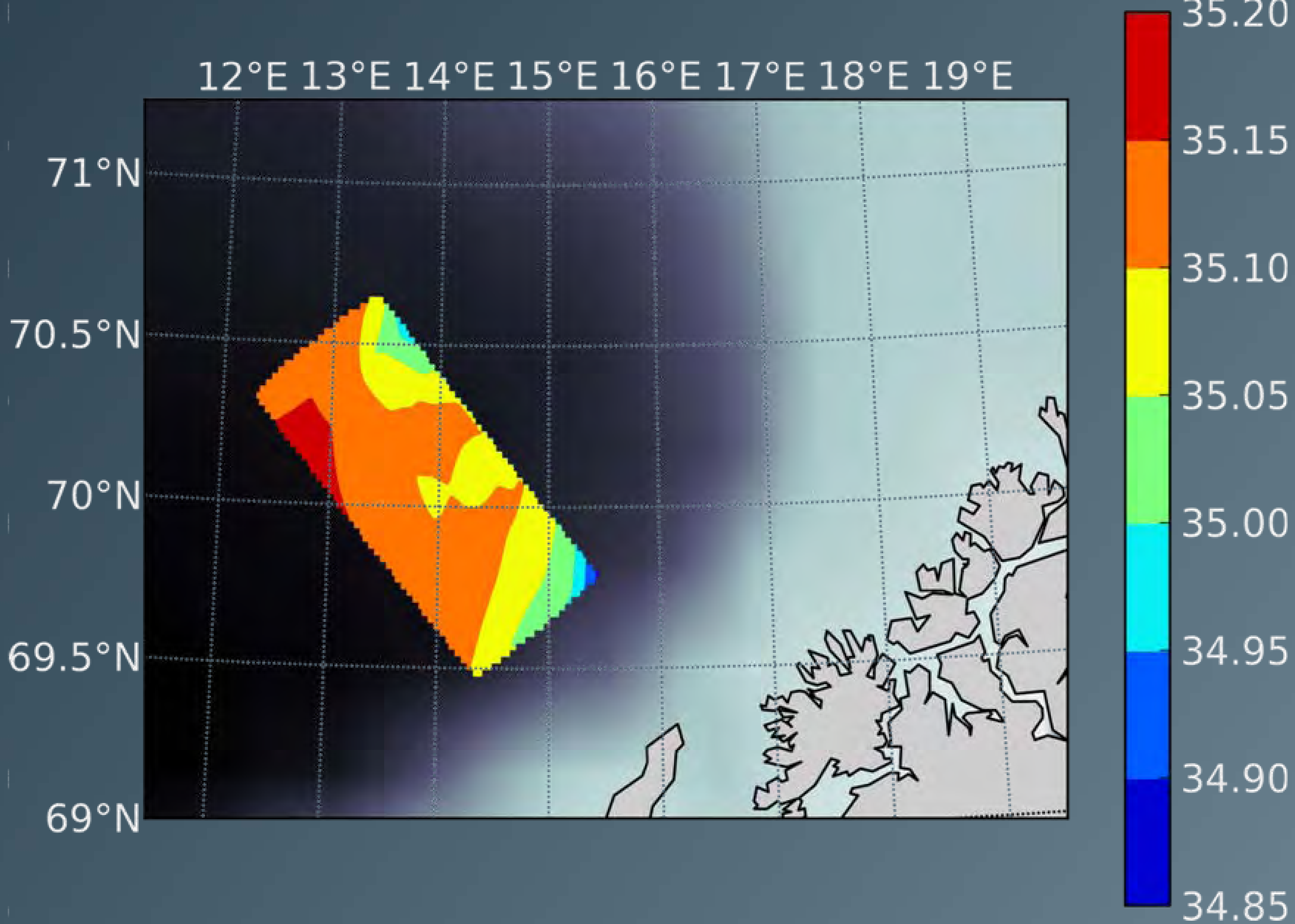
Søreide et al.2006 Prog Oceanogr 71

Grazing at the polar front

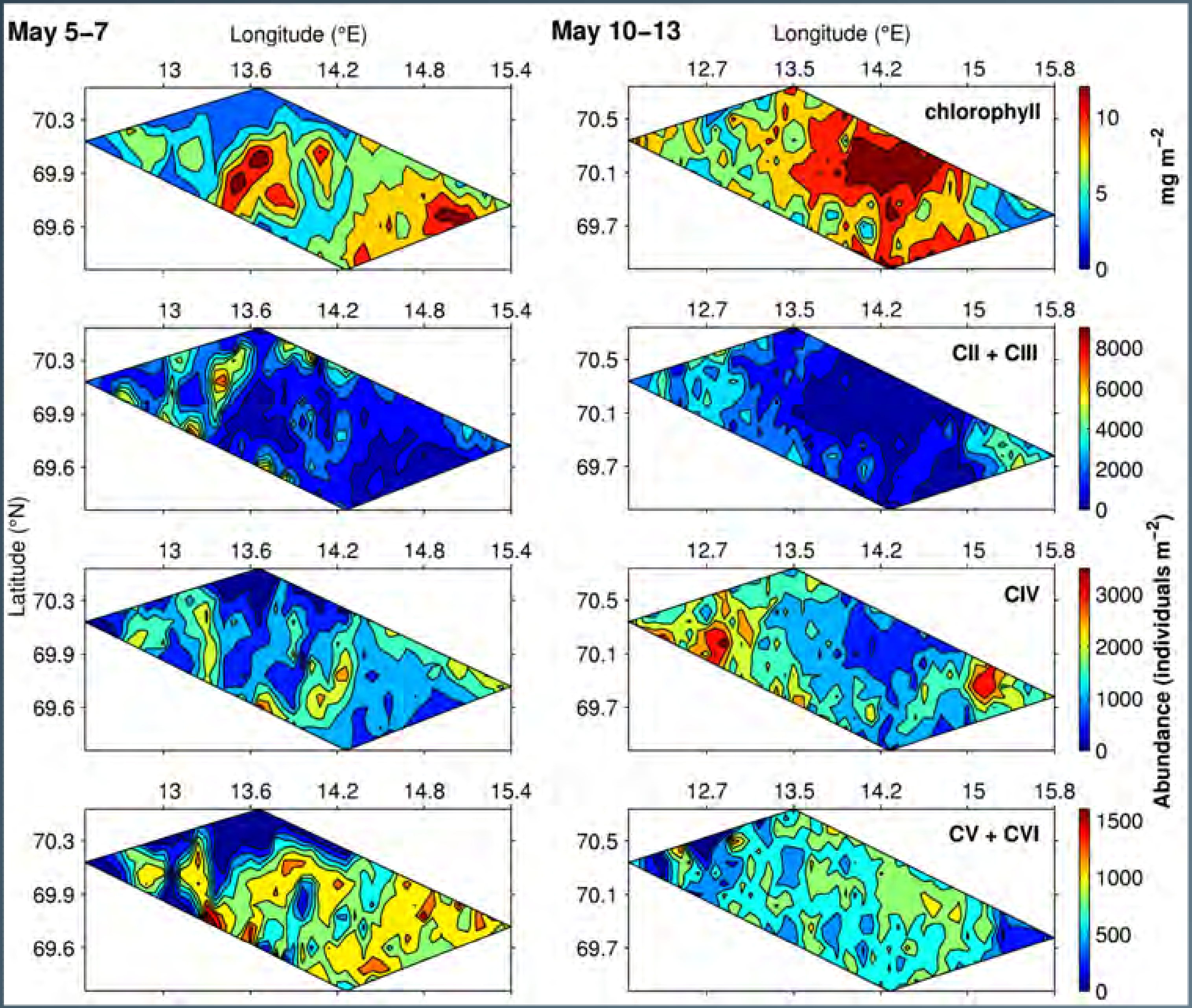
- No grazing experiments from Atlantic Water, but results from Arctic and Polar Front Water confirm estimates obtained by biomass spectrum theory:
- Highest filtration and ingestion rates on phytoplankton were observed in diatom bloom in Mixed Water (filtration rates up to 4.6 ml cop^{-1} L^{-1} and ingestion rates up to 17.2 ng chl a cop^{-1} L^{-1})
- Outside blooms, flagellates and cilitates were consumed.


Subpolar Norwegian Sea
Spring 2003

Study area Norwegian Sea



Chlorophyll and *Calanus* Norwegian Sea



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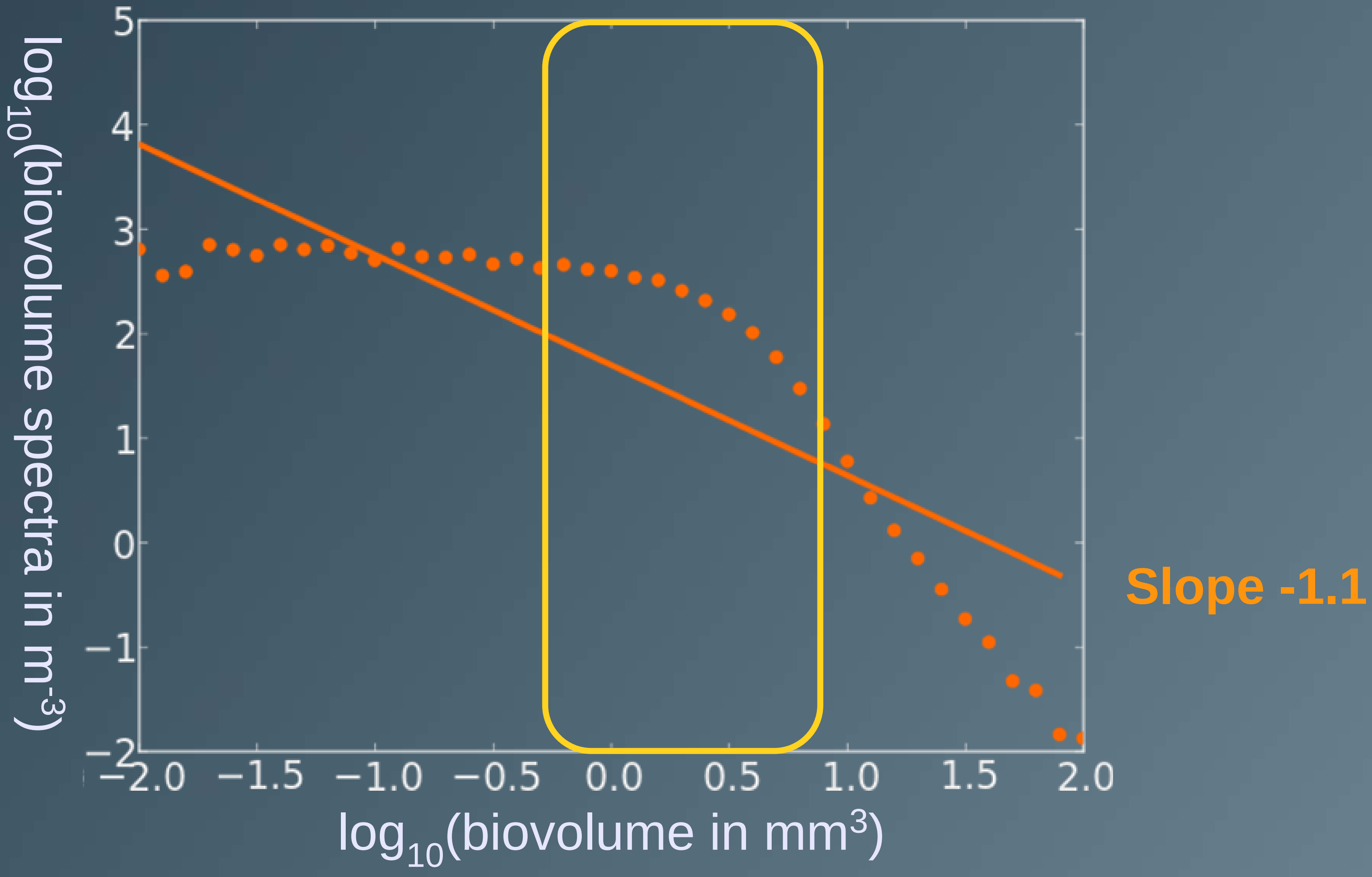
Biovolume spectra – Norwegian Sea



Grazing in the subpolar Norwegian Sea

- Where young copepodite stages of *Calanus* dominated, phaeophytin:chl a ratios were elevated and significantly higher than in areas where CIV-CVI dominated.
- No trophic index could be estimated for young copepodites
- The trophic index for CIV-CVI estimated by biomass spectrum theory was 3.2, indicating feeding on microzooplankton

Differences and similarities between the subpolar Norwegian Sea and the polar front in the Barents Sea

- Oceanic subpolar system vs. neritic polar system
- Large input of meroplanktic larvae into polar system, large input of *Calanus* into subpolar system.
- Patchy distribution of phytoplankton in both systems, related to ice edge in the polar system.
- The trophic index of *Calanus* was highly variabel over short spatial distances and closely related to the phytoplankton bloom, omnivory was observed at the polar front and indicated in the subpolar area.

Conclusions & Outlook

- Trophic indices estimated by biovolume spectrum theory agreed well with TLs estimated by stable isotopes, and with results from grazing experiments.
- Combining three-dimensional high-resolution sampling with biovolume spectrum theory proved to be a powerful tool to analyse the spatial patterns of the trophic structure in a dynamical area
- Next: Analyse spatial patterns of growth and mortality in relation to the front.