



Are benthic diatoms important?

YES!

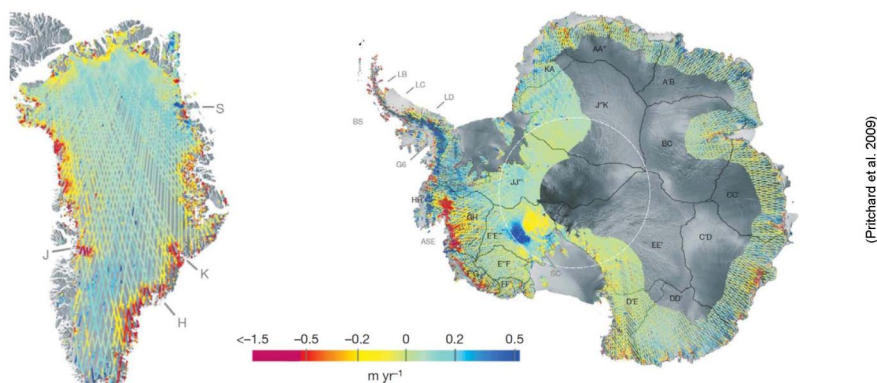
- In many polar areas the phytoplankton biomass is not sufficient to explain the benthic consumer abundance

- Sediment-associated benthic microalgae are present throughout the year, making up the basis for local food webs, and in the end the production of fish.

Benthic microalgae can account for 50% or even more of the total primary production in shallow estuaries and bays (Underwood and Kromkamp 1999)

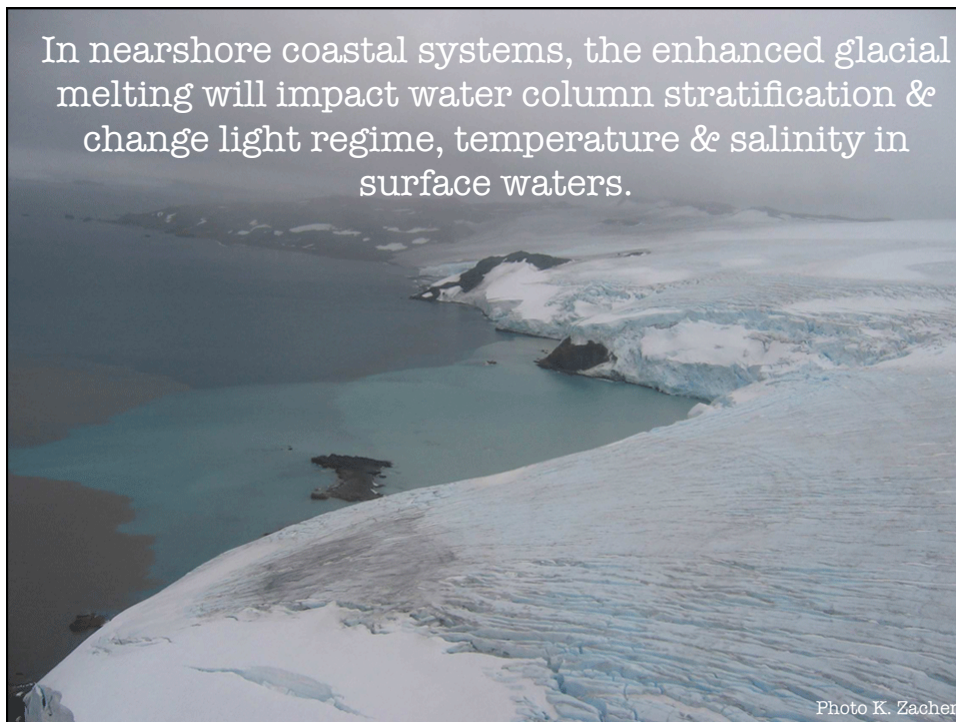
The Physical Science Basis: Latest Findings to be Assessed by WGI in AR5

## 2. Extensive thinning on the margins of Greenland and Antarctica



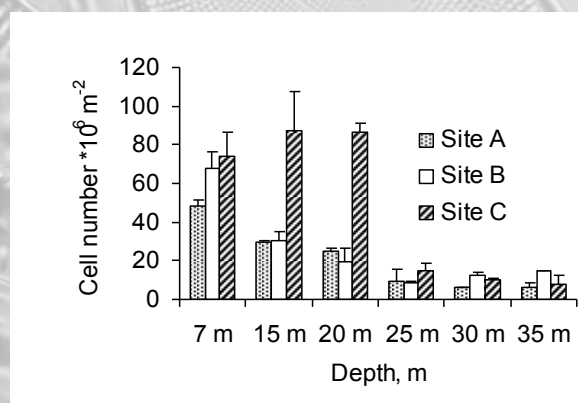
(Pritchard et al., 2009)

In nearshore coastal systems, the enhanced glacial melting will impact water column stratification & change light regime, temperature & salinity in surface waters.



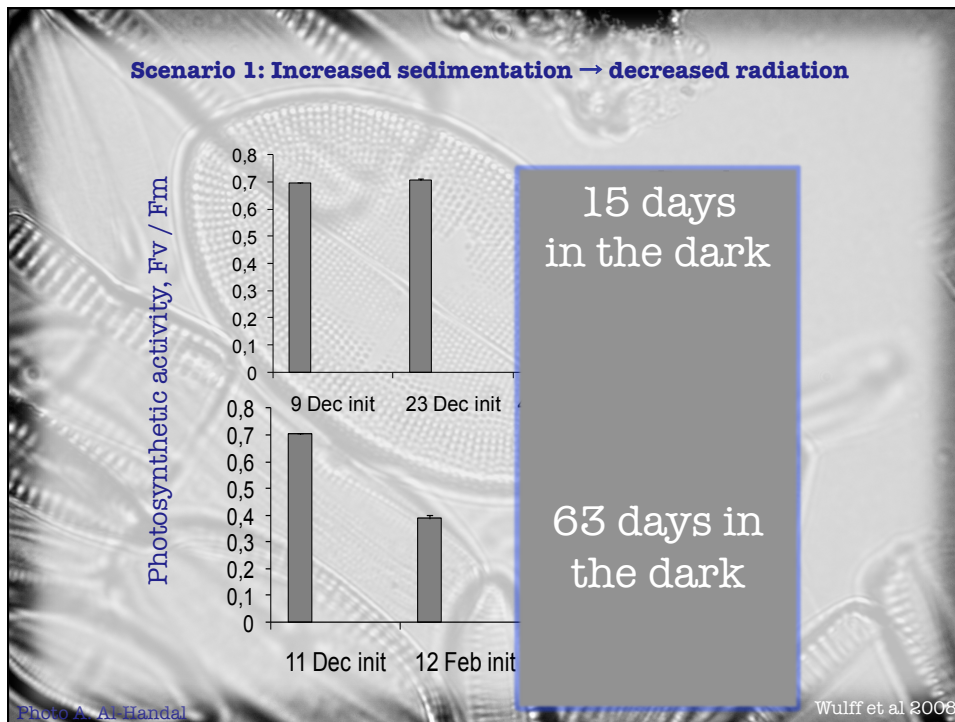
Scenario 1: Increased sedimentation - decreased radiation

Microalgae were sampled at 3 sites on the Swedish west coast



Benthic diatoms were active (epifluorescing) under very low light conditions (single  $\mu\text{mol photons m}^{-2} \text{s}^{-1}$ ) *in situ*

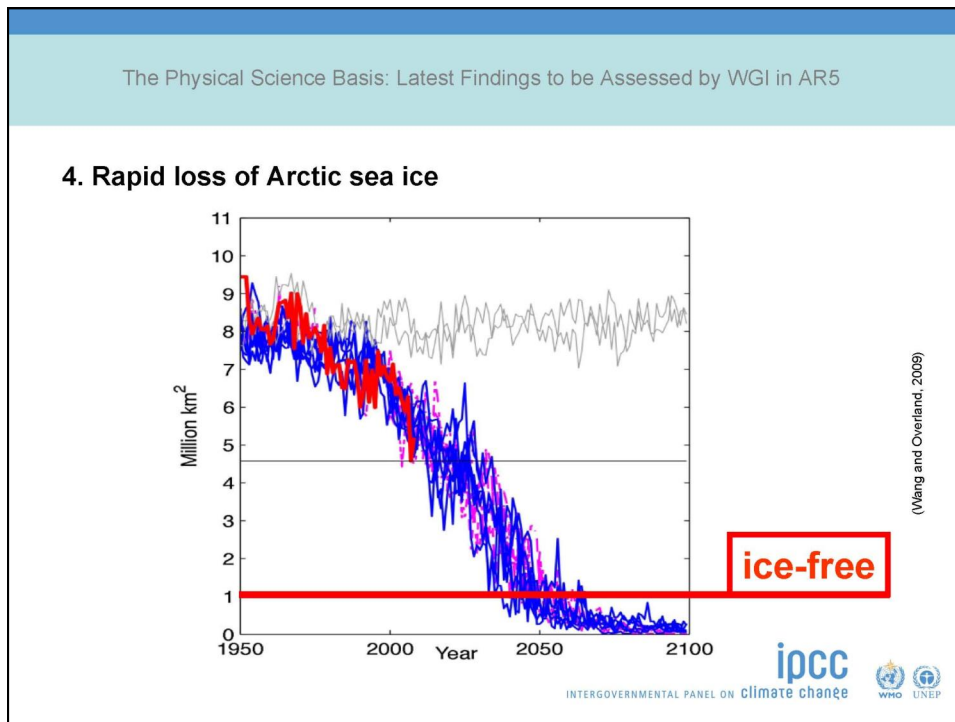
Wulff et al Hydrobiologia

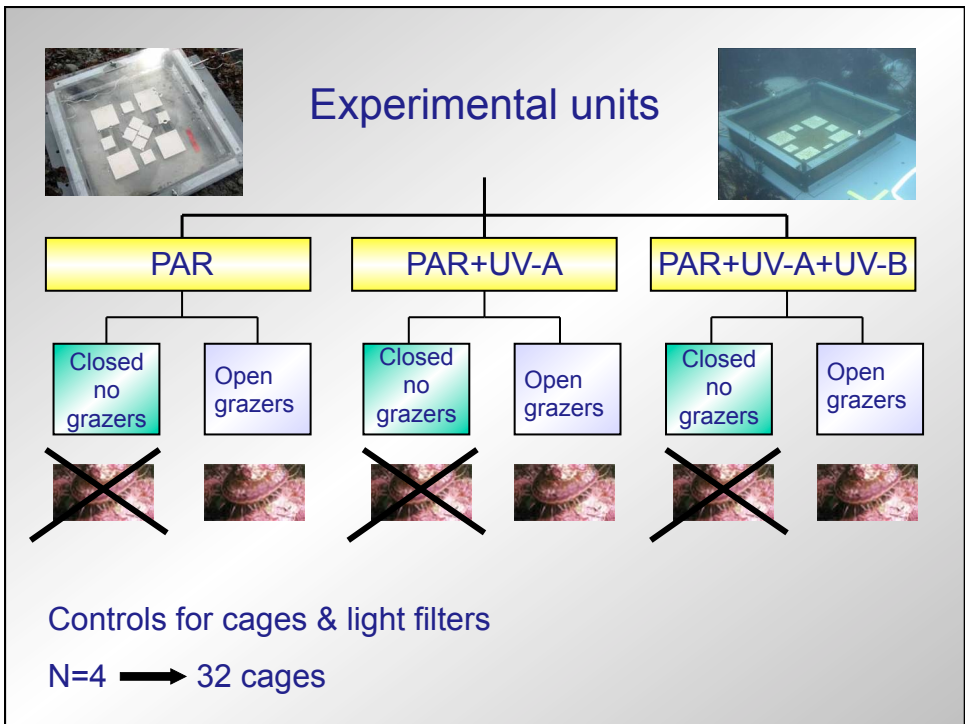
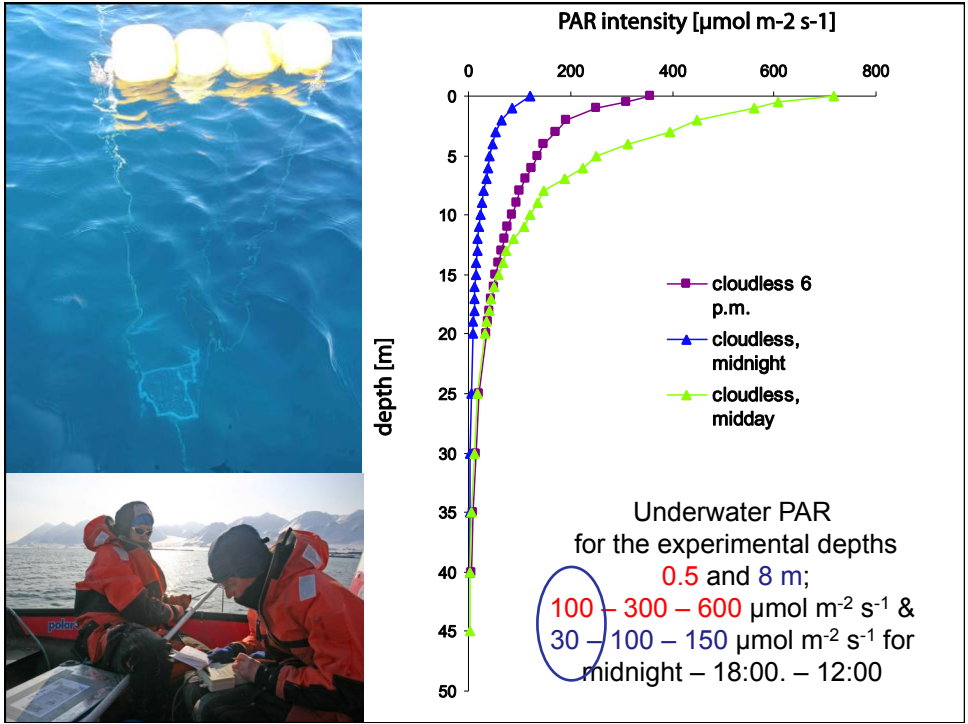


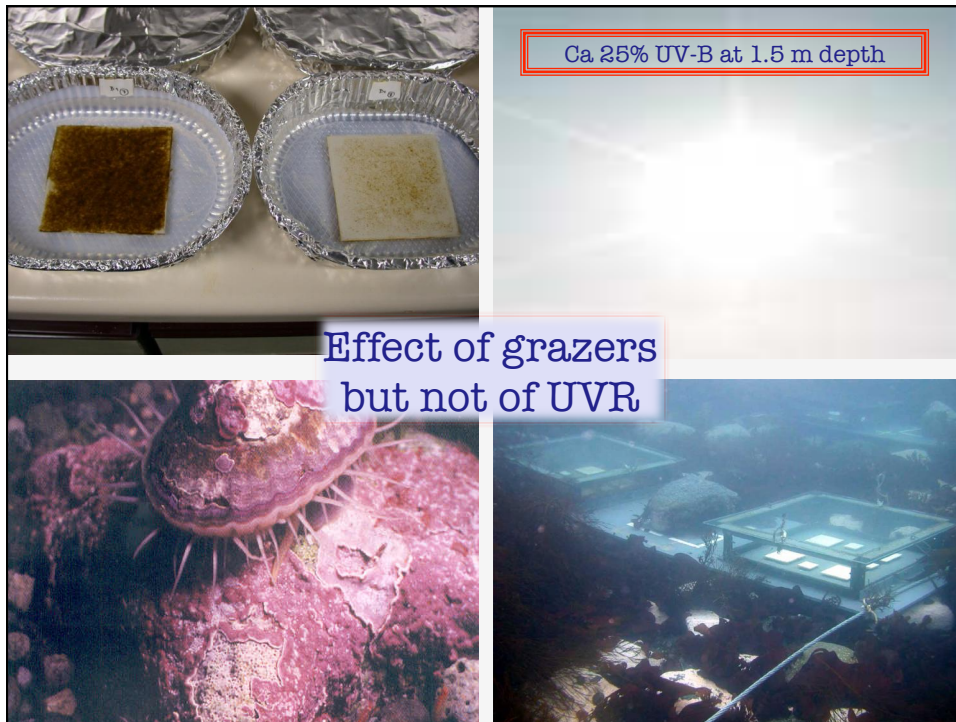
“...obligate benthic diatoms living as deep as 191 m substantially extends the known depth range of these primary producers...”

Mid-day PAR at the 191 m site averaged  $0.1 \mu\text{mol photons m}^{-2} \text{s}^{-1}$

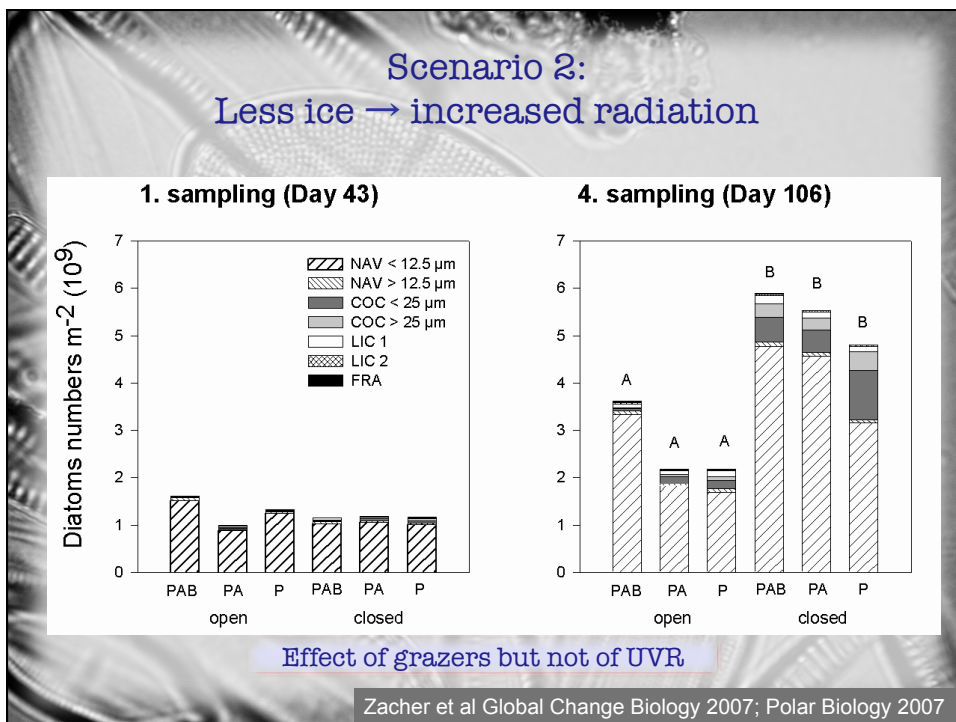
McGee et al MEPS 2008





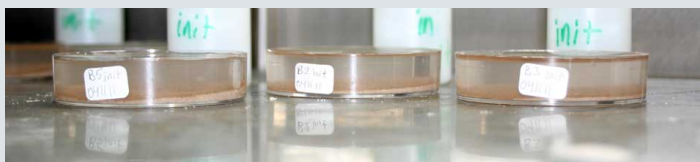


Effect of grazers  
but not of UVR





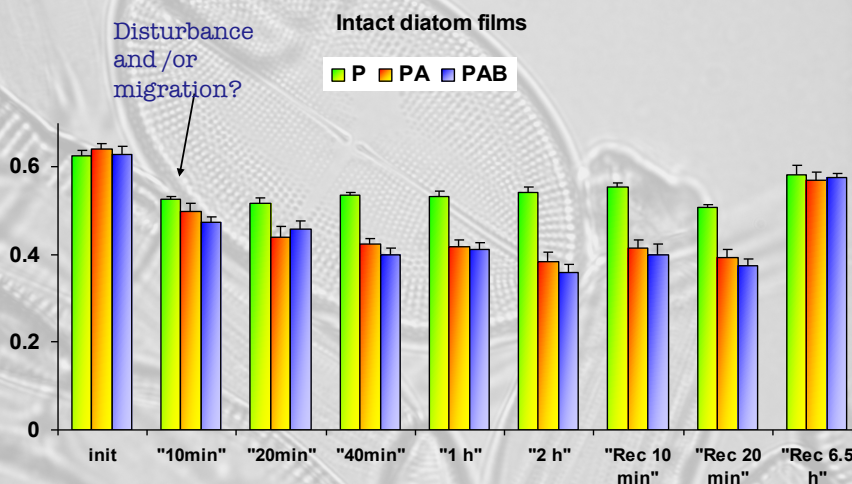
Methodological approach for some indoor experiments with diatom assemblages



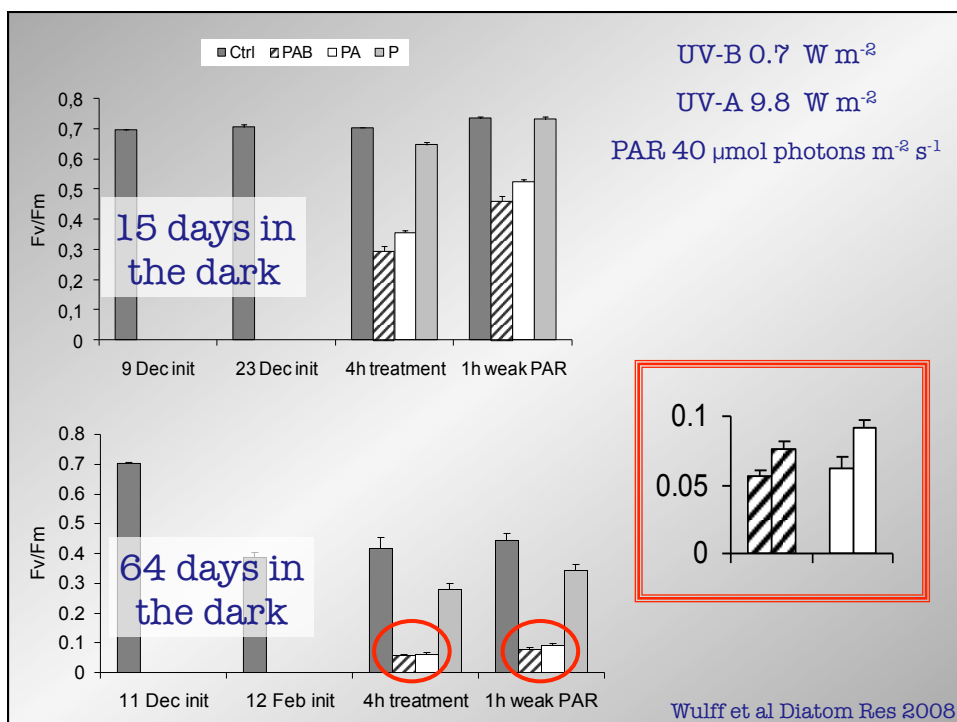
Sterile quartz sand plus diatoms, <1 mm layer (max. light penetration)

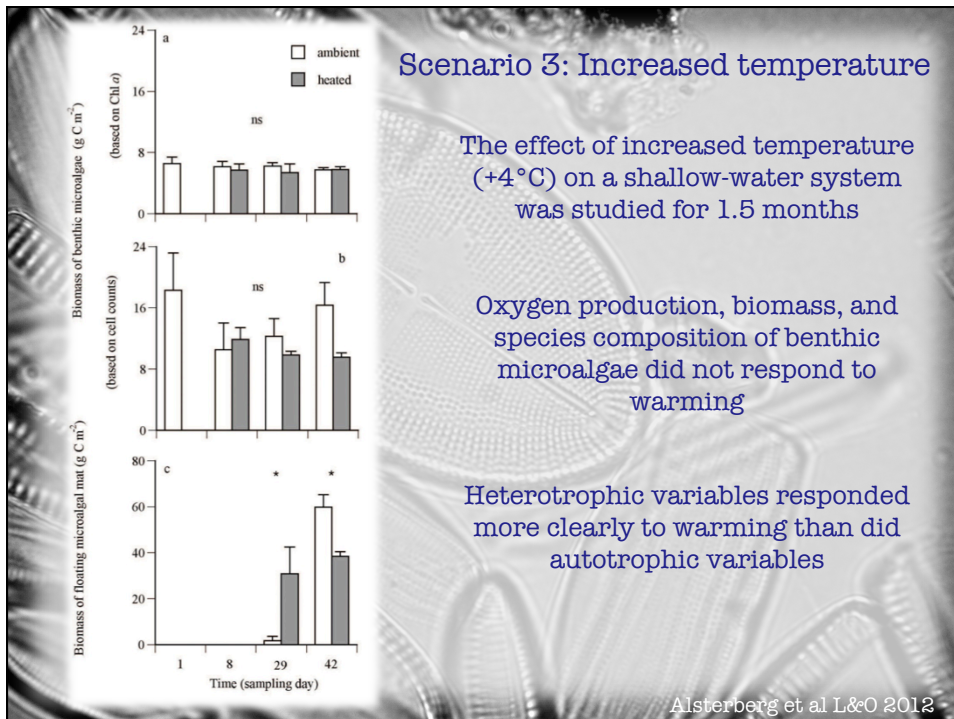
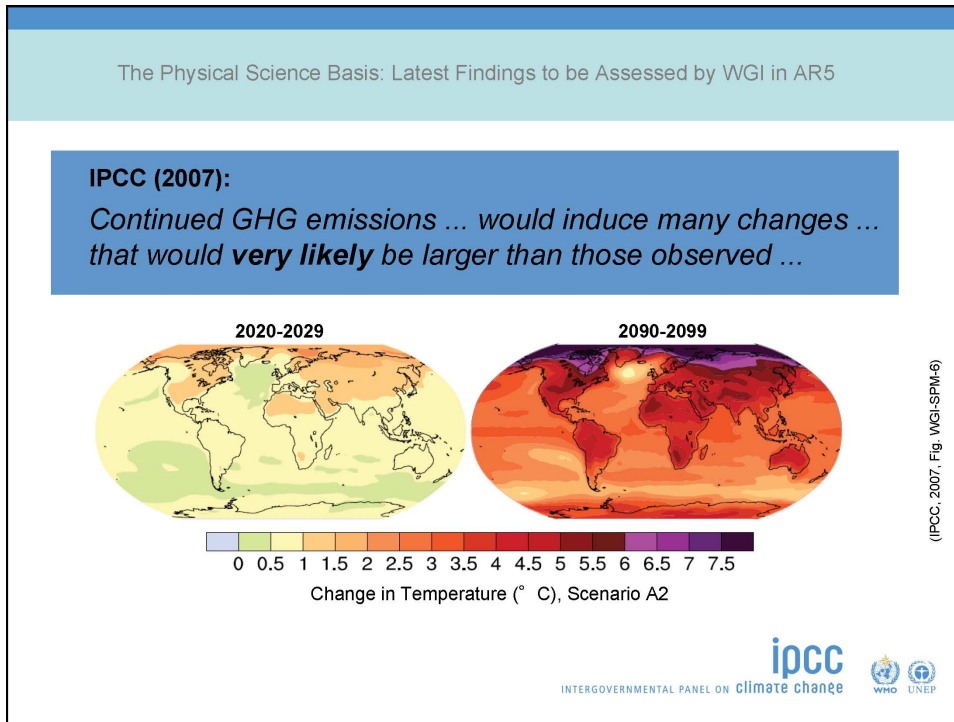
Scenario 2: Less ice → increased radiation

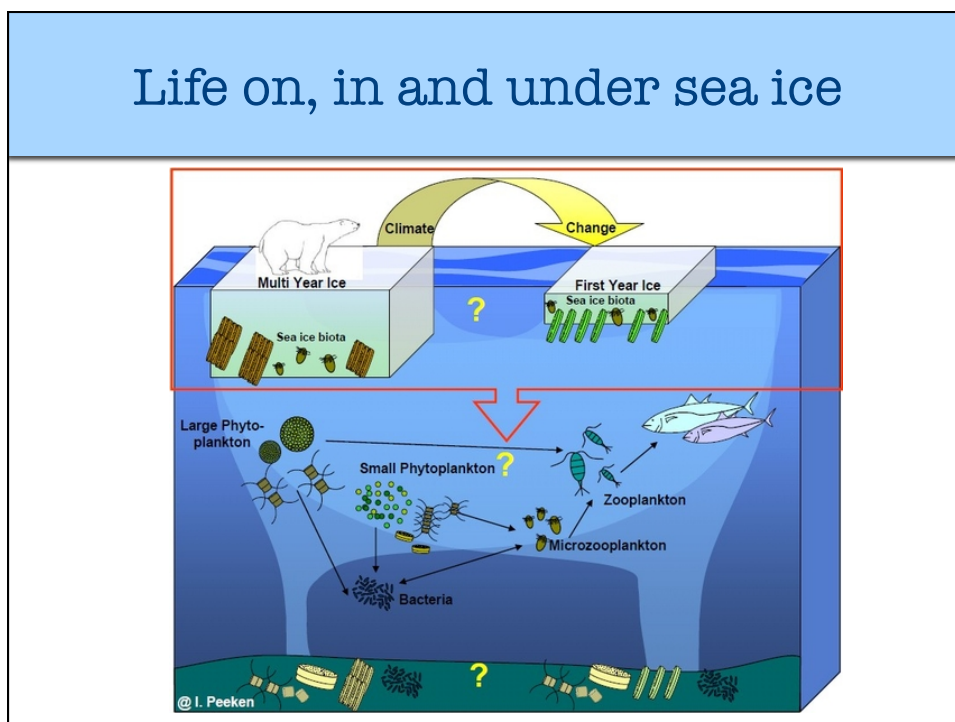
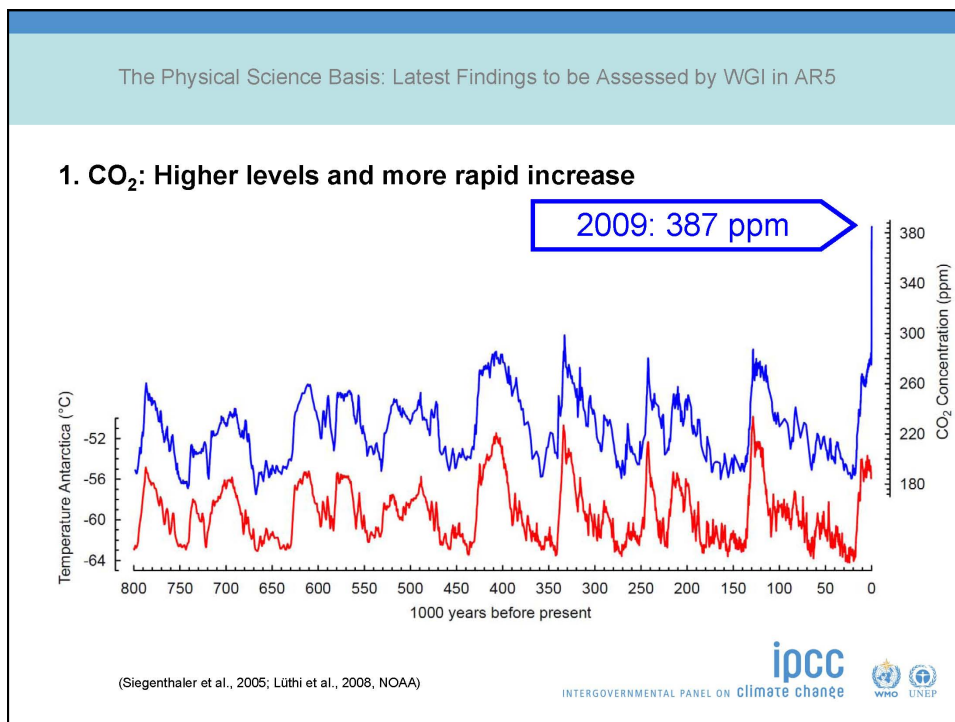
Some results on  $F_v / F_m$

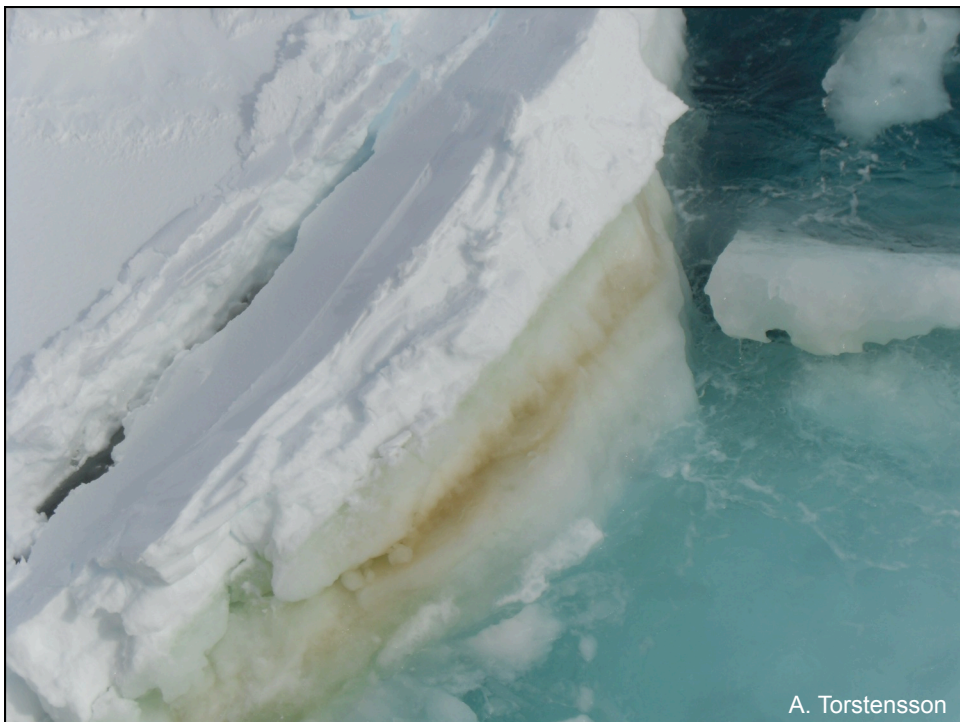
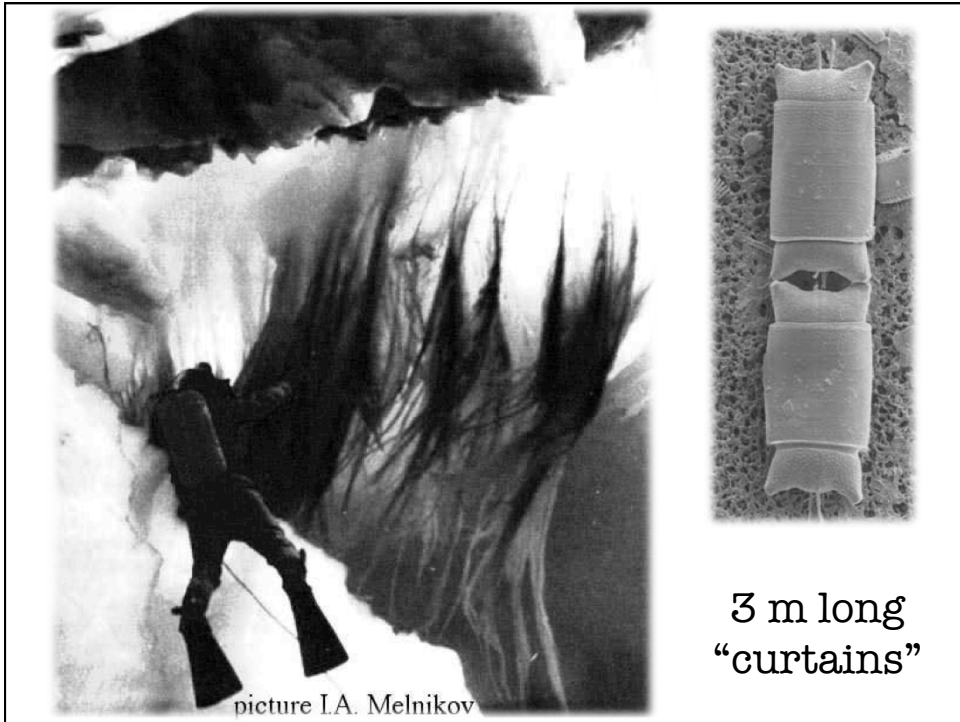


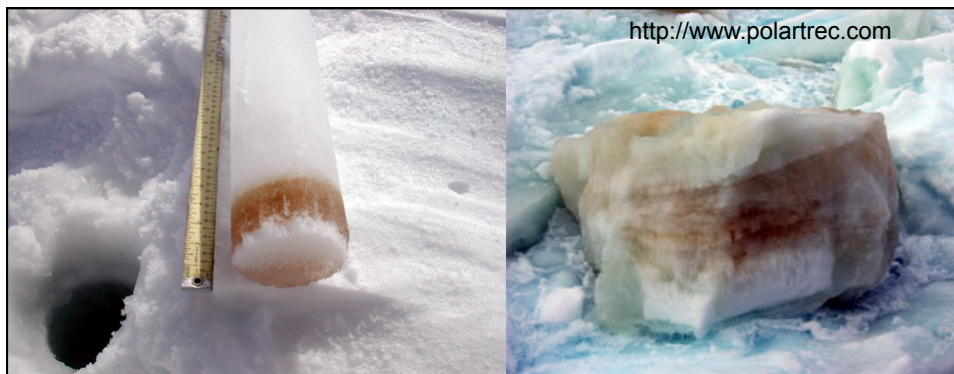
Repeatedly measured using a non-destructive probe (PAM 2100)



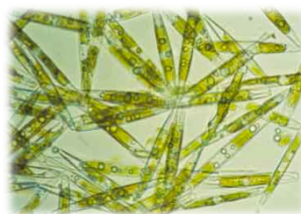
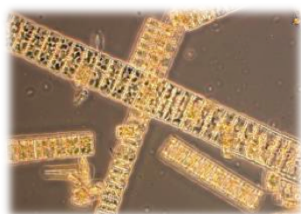


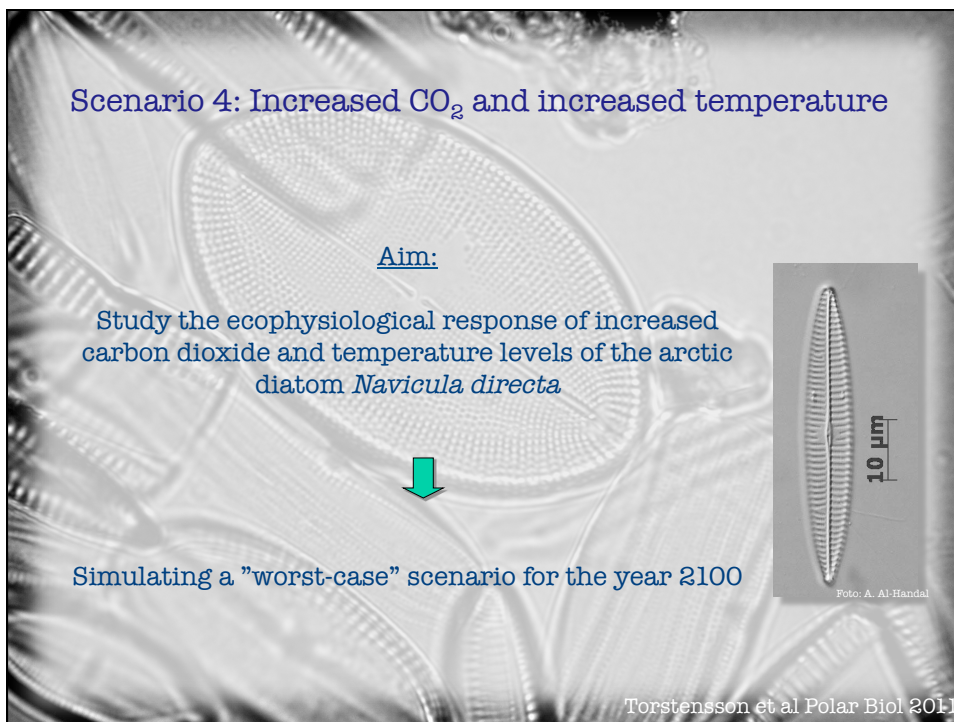
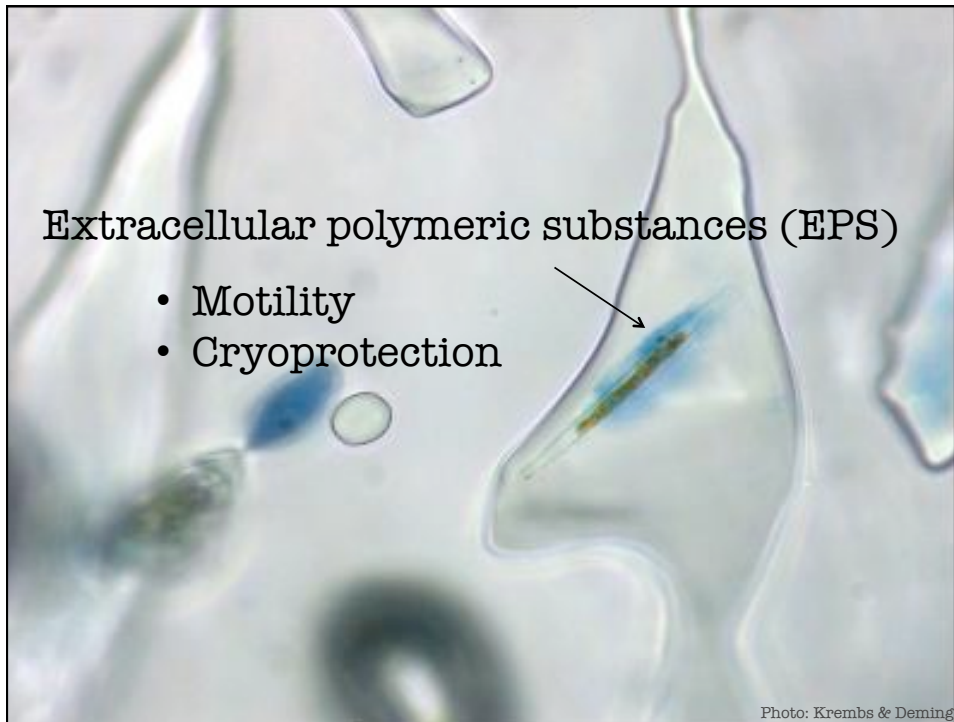


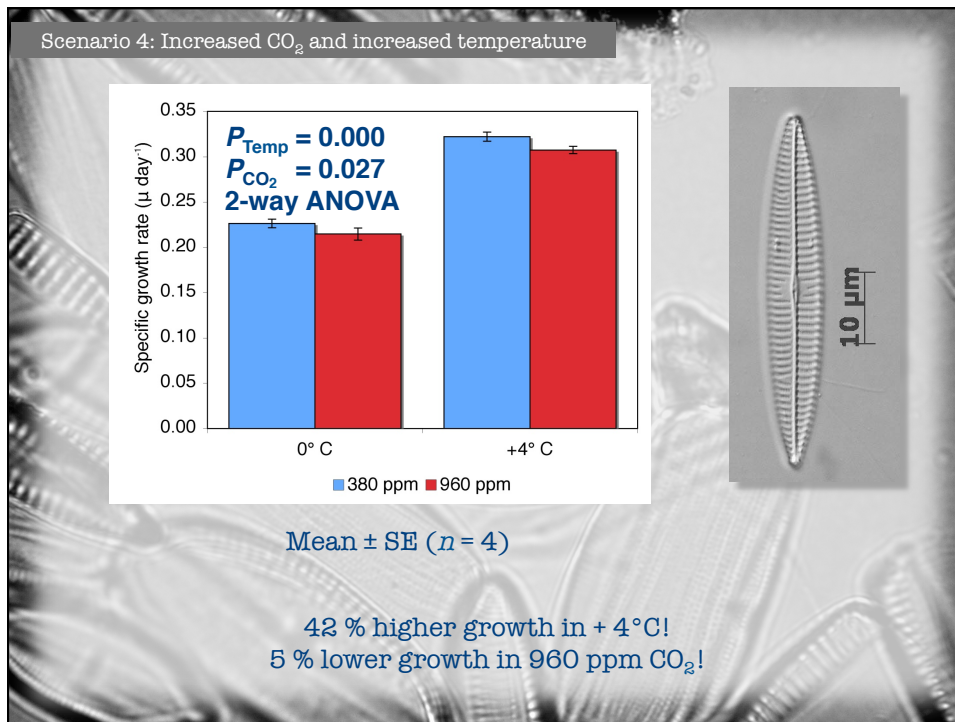




Mostly pennate diatoms







+Temp

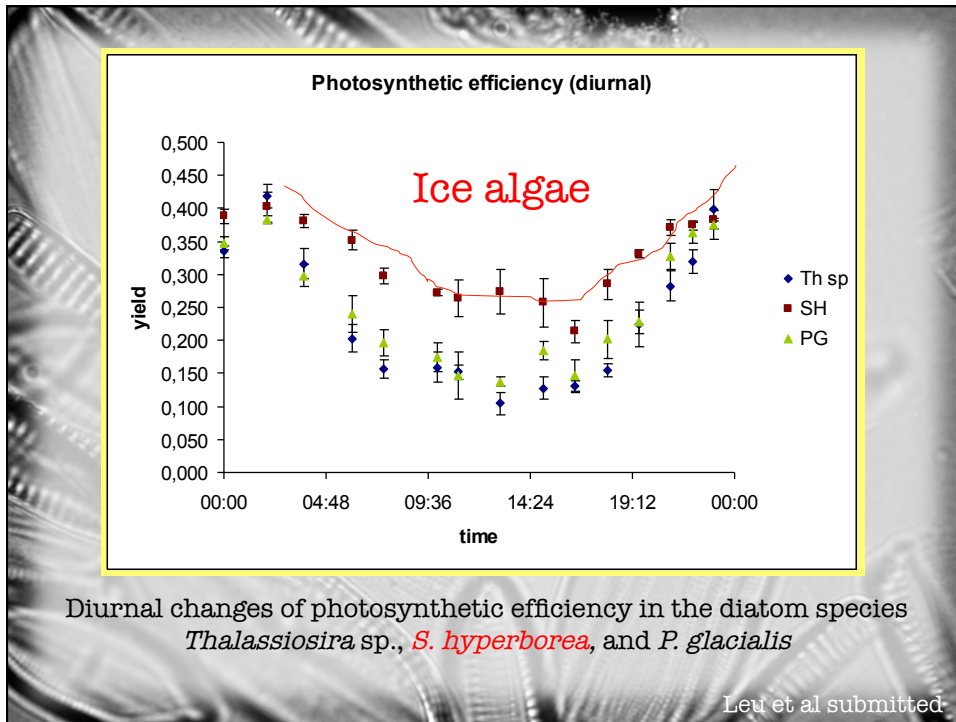
10  $\mu$ m

+CO<sub>2</sub>

But...

- Laboratory study
- 100 years of climate change in 7 days
- Cultured organisms
- Intraspecific variation





About experimental design / approach

Single species or communities / assemblages?

Cascade effects – several trophic levels?

Field experiments and/or laboratory expts?

Single factor or a multifactorial approach?

