Response of the diatom assemblage during two iron fertilization experiments in the Antarctic Polar Frontal Zone

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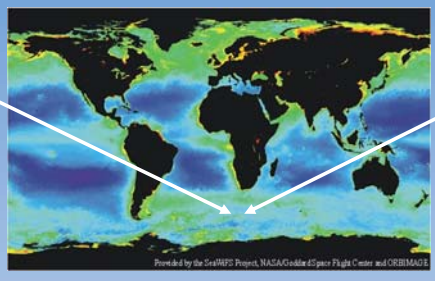
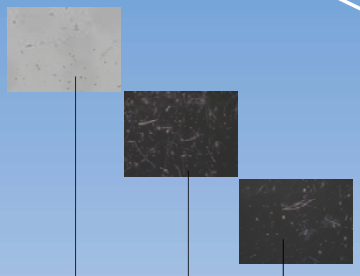
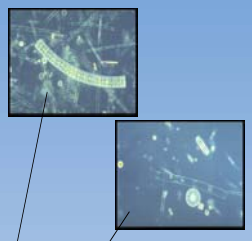
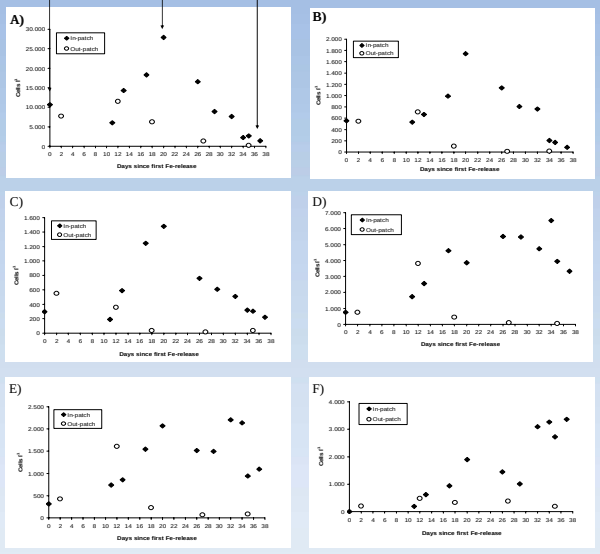
Introduction

Mesoscale *in situ* iron fertilization experiments have resulted in the build-up of phytoplankton biomass and established beyond doubt that iron availability is the key factor limiting growth rates of oceanic phytoplankton in "high-nutrient, low-chlorophyll" (HNLC) regimes. All iron-induced blooms were dominated by diatoms, however the ecological principles resulting in species dominance and succession have only been marginally addressed. The detailed analysis of the diatom assemblage during two Southern Ocean iron fertilization experiments conducted in austral spring (EisenEx) and austral summer (EIFEX) revealed major changes in the community structure in response to iron addition and shed light on plankton succession in pelagic ecosystems and its impact on the biogeochemistry.









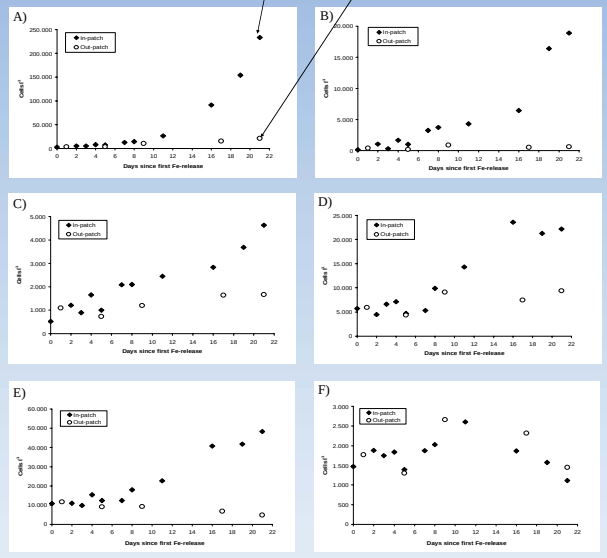


Fig. 1: Abundance of dominant diatom species during EIFEX in 20 m depth. Light micrographs depict the surface plankton community on days 0, 20 and 37 inside the fertilized patch.
A) Chaetoceros dichaeta, B) *Chaetoceros peruvianus*, C) *Trichotoxon* sp., D) *Pseudo-nitzschia lineola*, E) *Thalassiothrix antarctica* and F) *Corethron inerme*.

Fig. 2: Abundance of dominant diatom species during EisenEx in the upper 80 m of the water column. Light micrographs depict the surface plankton community at the end of the experiment inside and outside the fertilized patch.
A) *Pseudo-nitzschia lineola*, B) *Chaetoceros curvisetus*, C) *Corethron pennatum*, D) *Fragilariopsis kerguelensis*, E) *Thalassionema nitzschioides* and F) *Nitzschia* sp.

Conclusions

• Large and often heavily silicified diatoms dominate under iron deplete conditions typical of the ACC
→ Large seed population due to lower mortality; silica sinker

• FE-induced shift from a community initially dominated by heavily silicified diatoms to one dominated by weakly silicified species (EisenEx)
→ Implications for the interpretation of the opal record

• Decline phase of the bloom was characterised by a rapid sedimentation of dominant diatom species (EIFEX)
→ Implications for the biological carbon pump