PISCES Training School 2023

for Beginners

Bats sensitivity experiments

Session results

Olivier Aumont, Vincent Echevin, Christian Ethé, Coralie Perruche and Renaud Person

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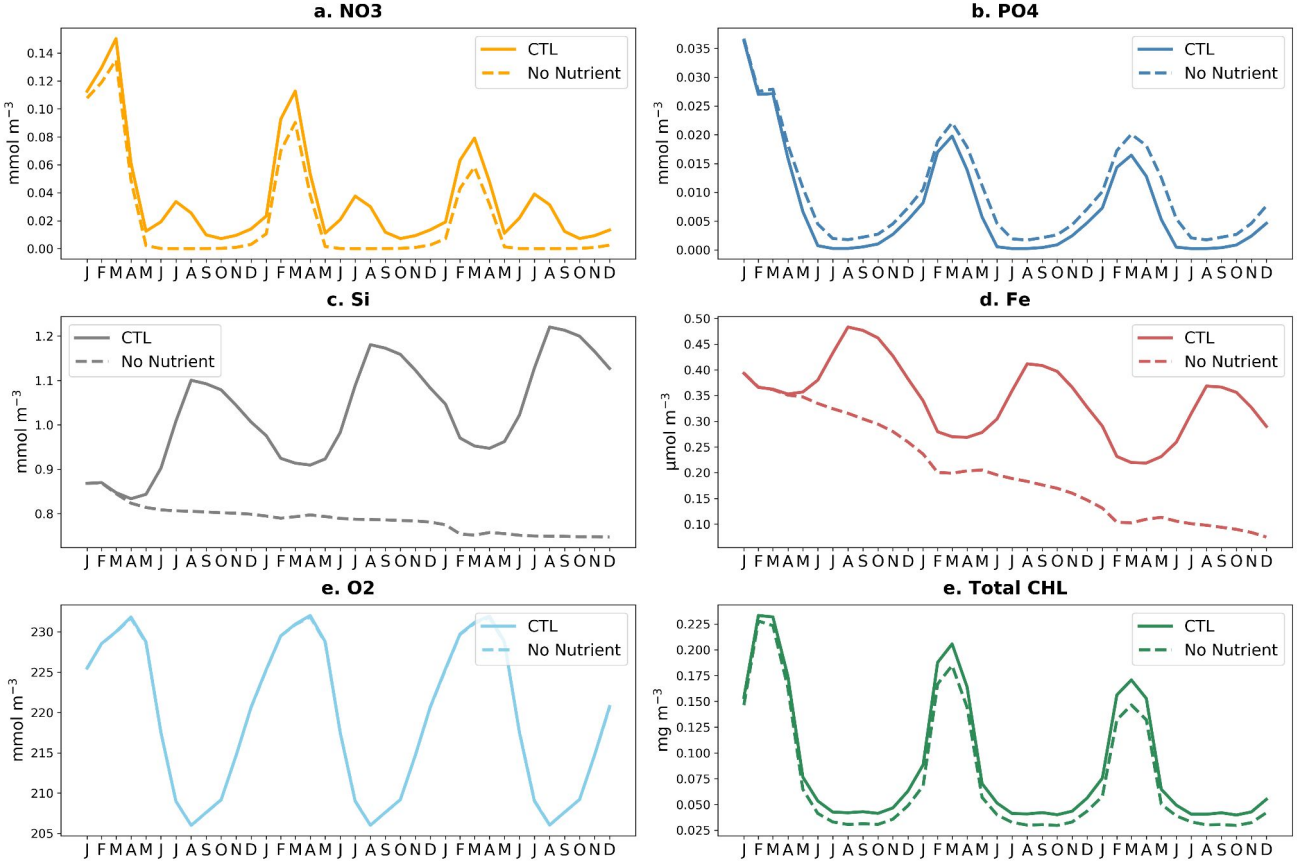
BATS

No nutrient supplies



No deposition of Fe, NO3 and Si which are important at this station

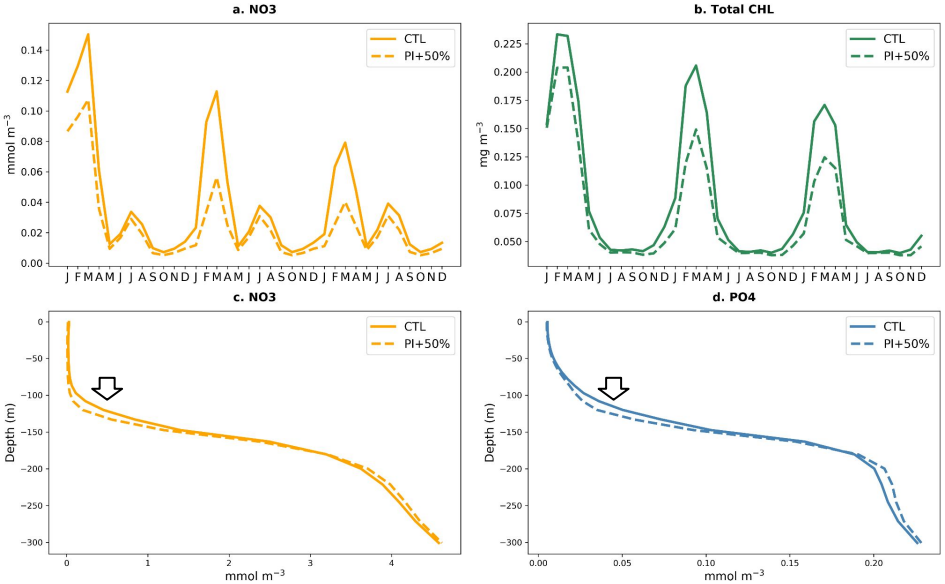
- **Decrease in surface nutrient (except PO4) and Chl concentrations**

➔ **Switch from PO4 to NO3 limitation**

BATS

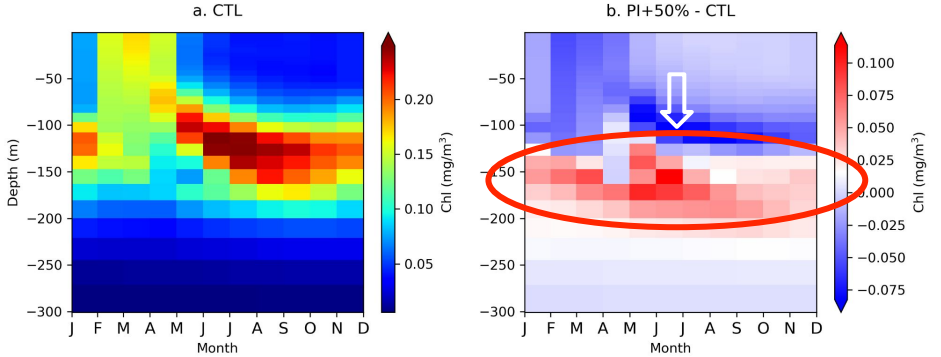
PI slope +50%

Decrease in surface NO3 and Chl concentrations



Slight deepening of the nutricline
→ Weaker entrainment of nutrients in the mixed layer

Deepening of the Deep Chl Maximum

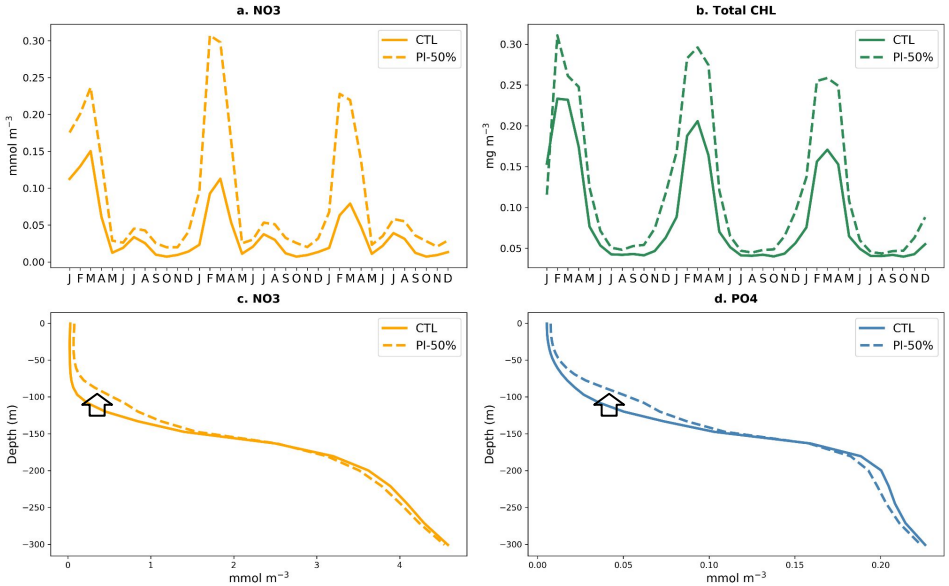


Adaptation of phytoplankton to lower light availability:
→ increased capacity of phytoplankton to assimilate nutrients at depth

BATS

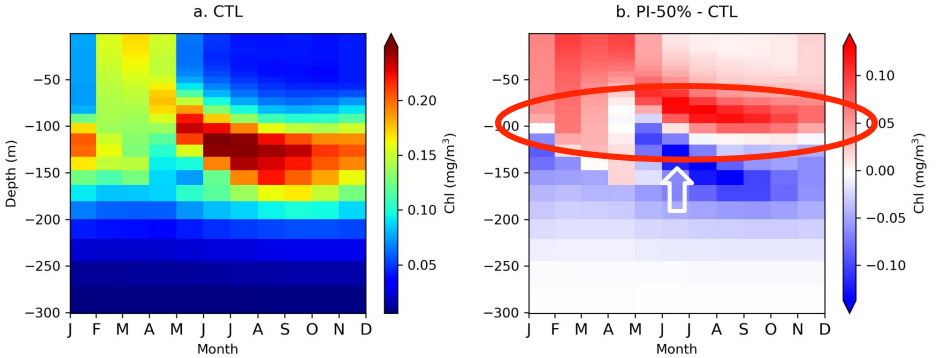
PI slope -50%

Increase in surface NO3 and Chl concentrations



Shallowing of the nutricline
→ Larger entrainment of nutrients into the mixed layer

Reverse effect of increasing the PI slope

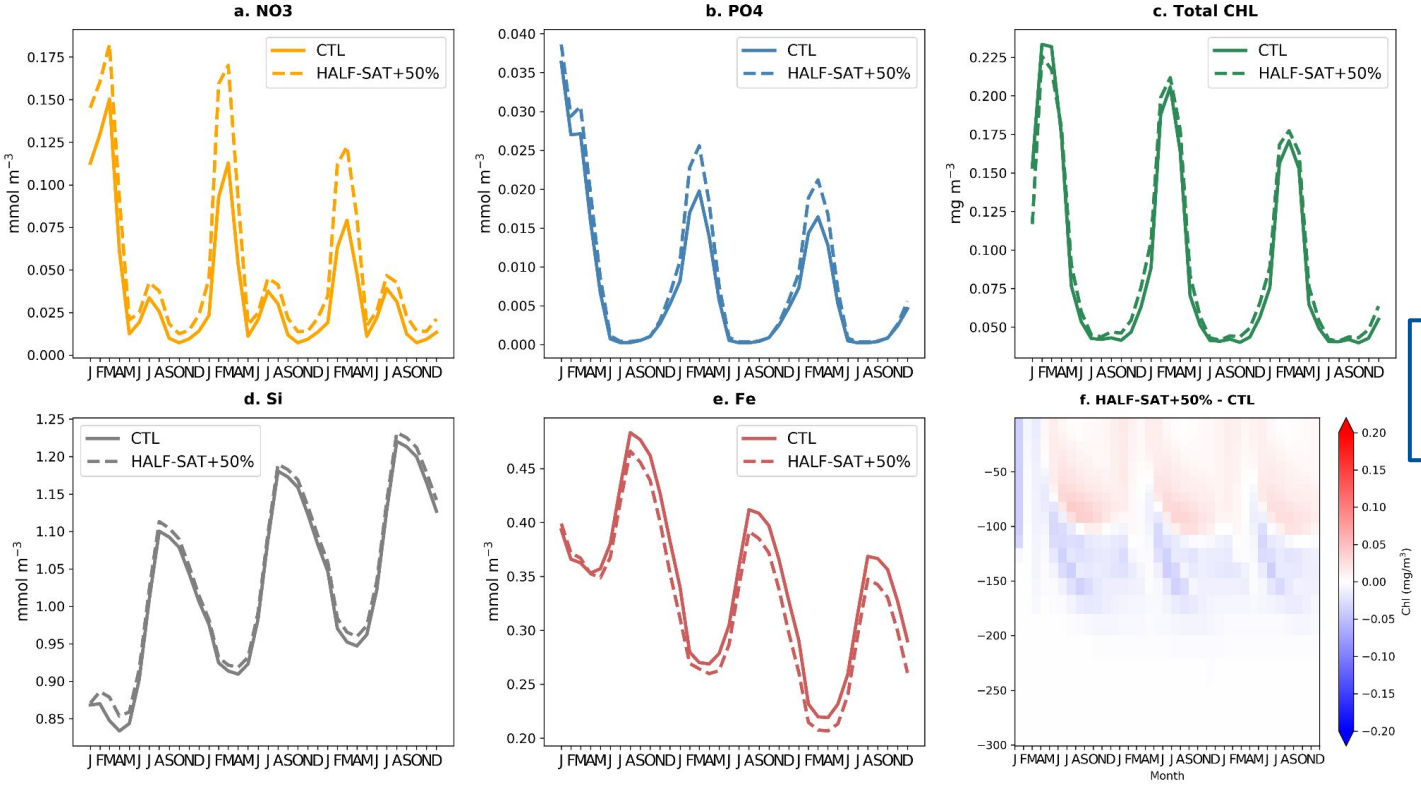


Phytoplankton less adapted to low light availability
→ Shallower DCM

BATS

Half-Sat NO3/NH4 +50%

Increased surface concentrations of NO3 and PO4 during late winter bloom, less NO3 consumption

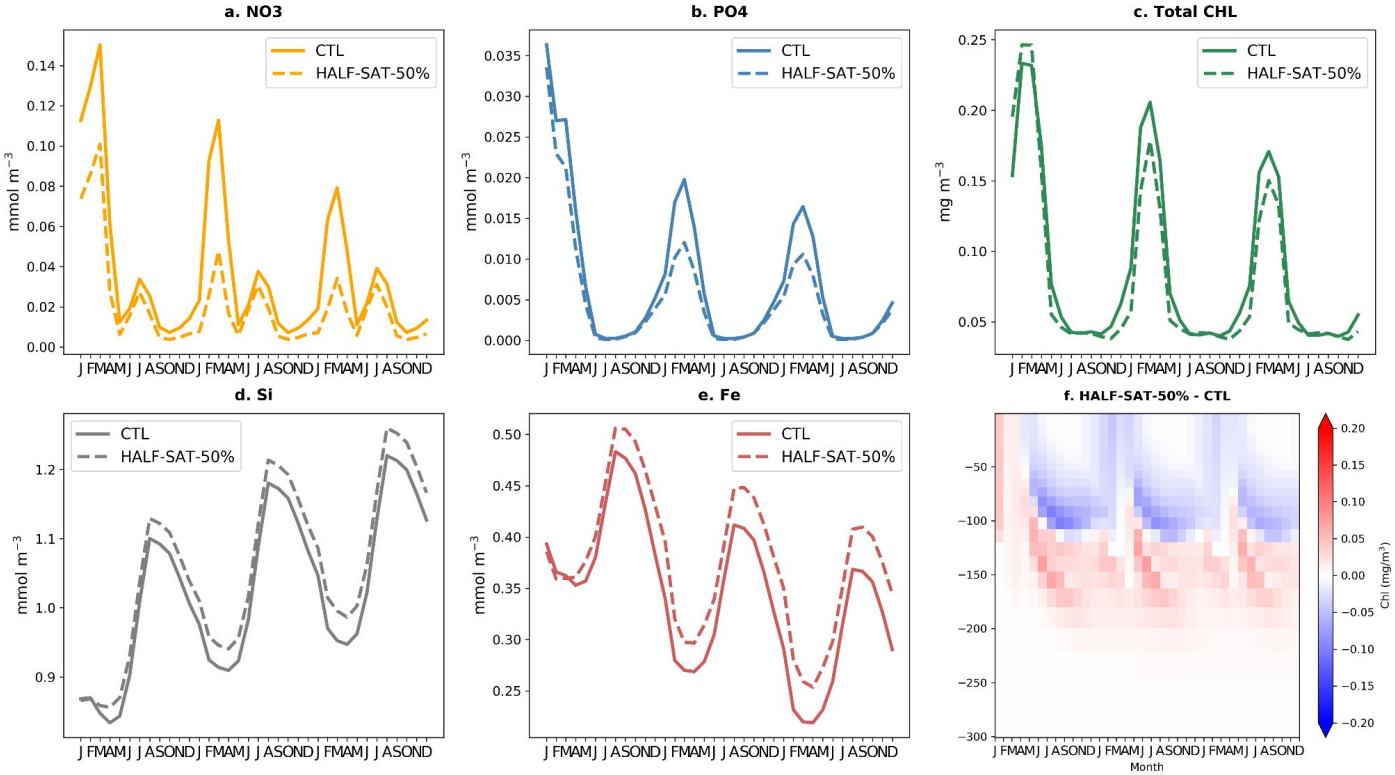


- ➔ **Very small increase in chlorophyll**
- ➔ **Shallowing of DCM**

BATS

Half-Sat NO3/NH4 -50%

Decrease in surface concentrations of NO3 and PO4, increase in Si and Fe, more NO3 consumption for same Chl levels

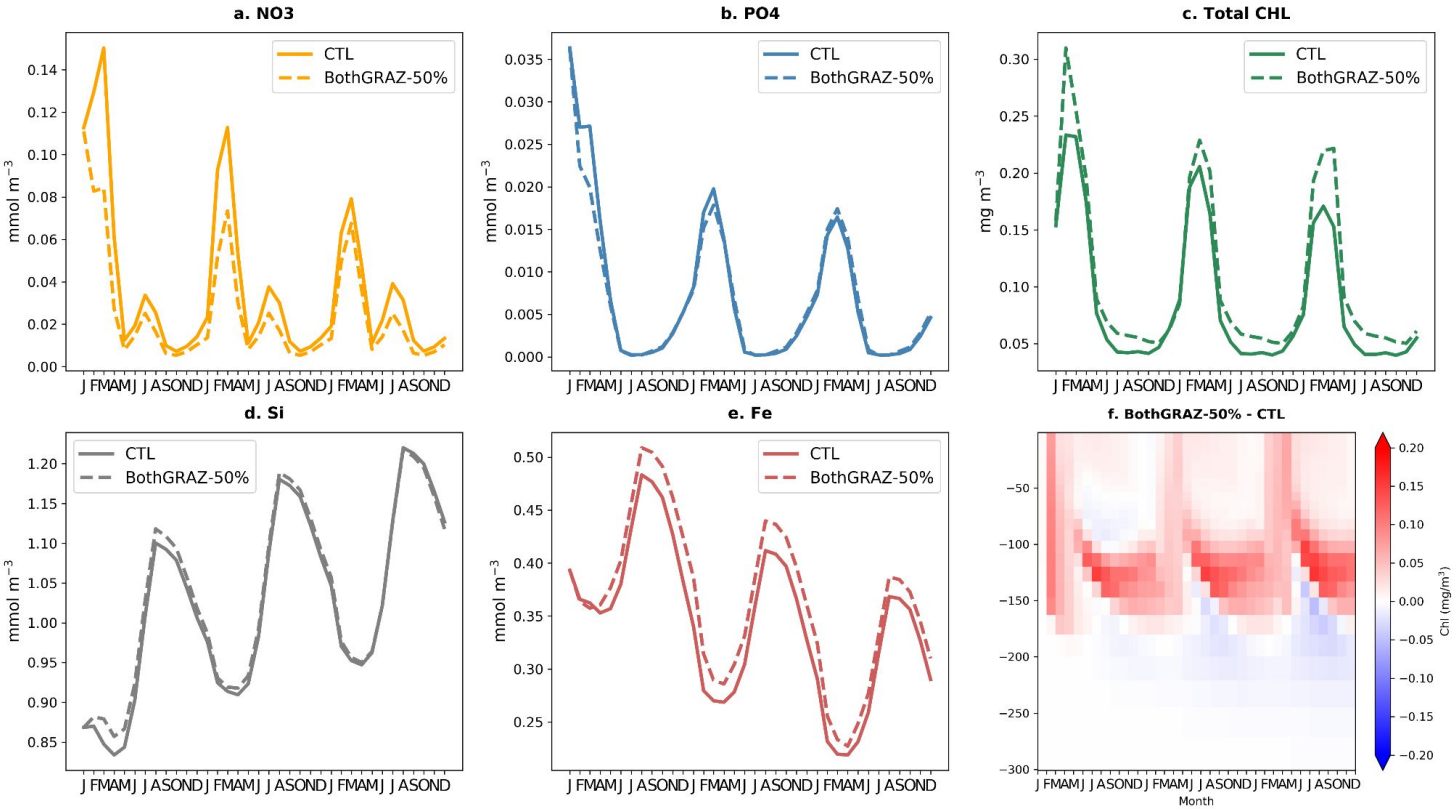


- ➔ **Slight decrease in surface chlorophyll**
- ➔ **Deepening of DCM**

BATS

Micro/mesozoo grazing reduced by 50%

Lower grazing rates on both phytoplankton: Increased phytoplankton bloom

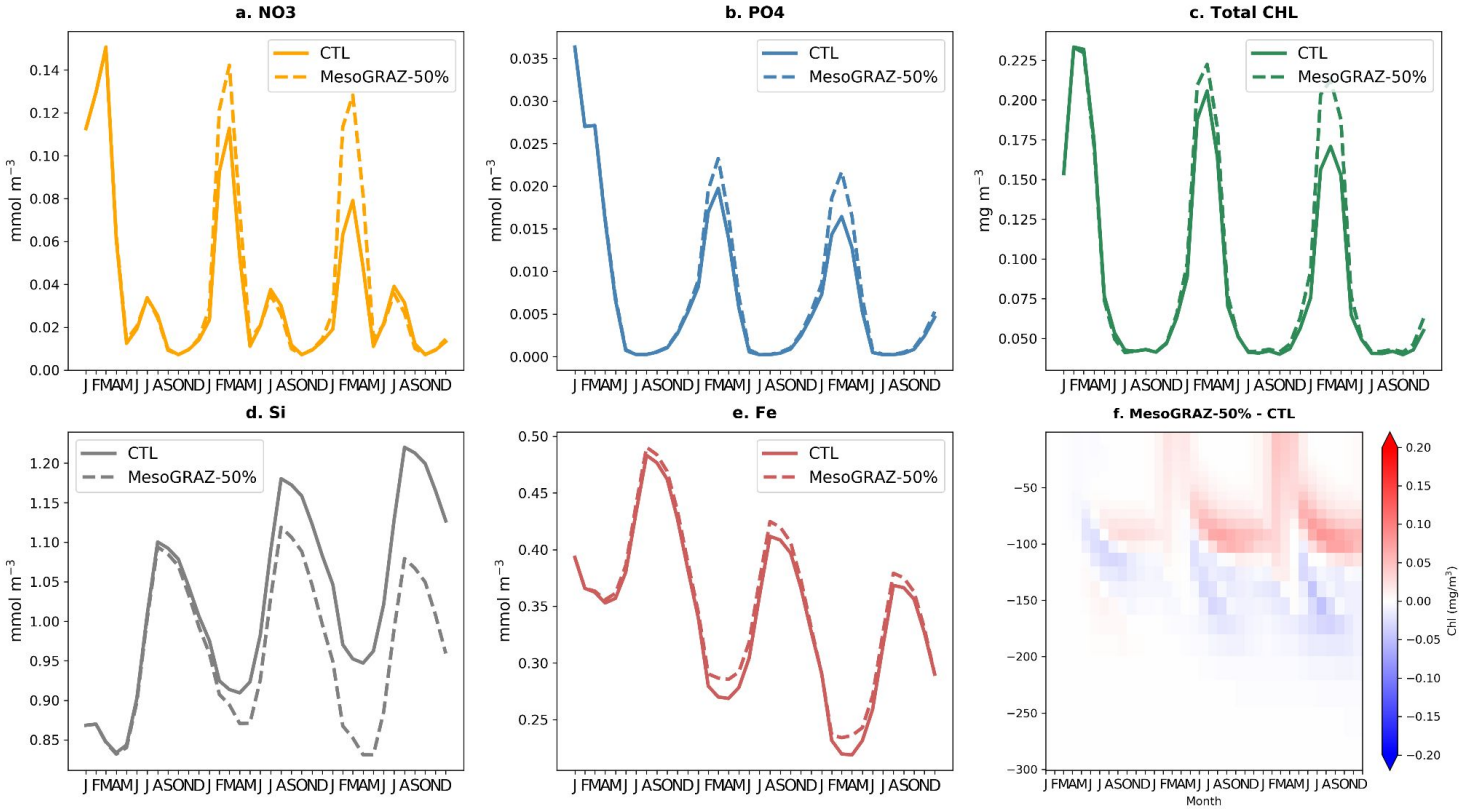


- ➔ Here, microzoo grazing pressure mainly controls the increase in Chl
- ➔ Less surface NO3
- ➔ DCM more intense
- ➔ Nanophyto drives the magnitude of the bloom

BATS

Mesozoo grazing reduced by 50%

Lower grazing rate of mesozoo → more microzoo

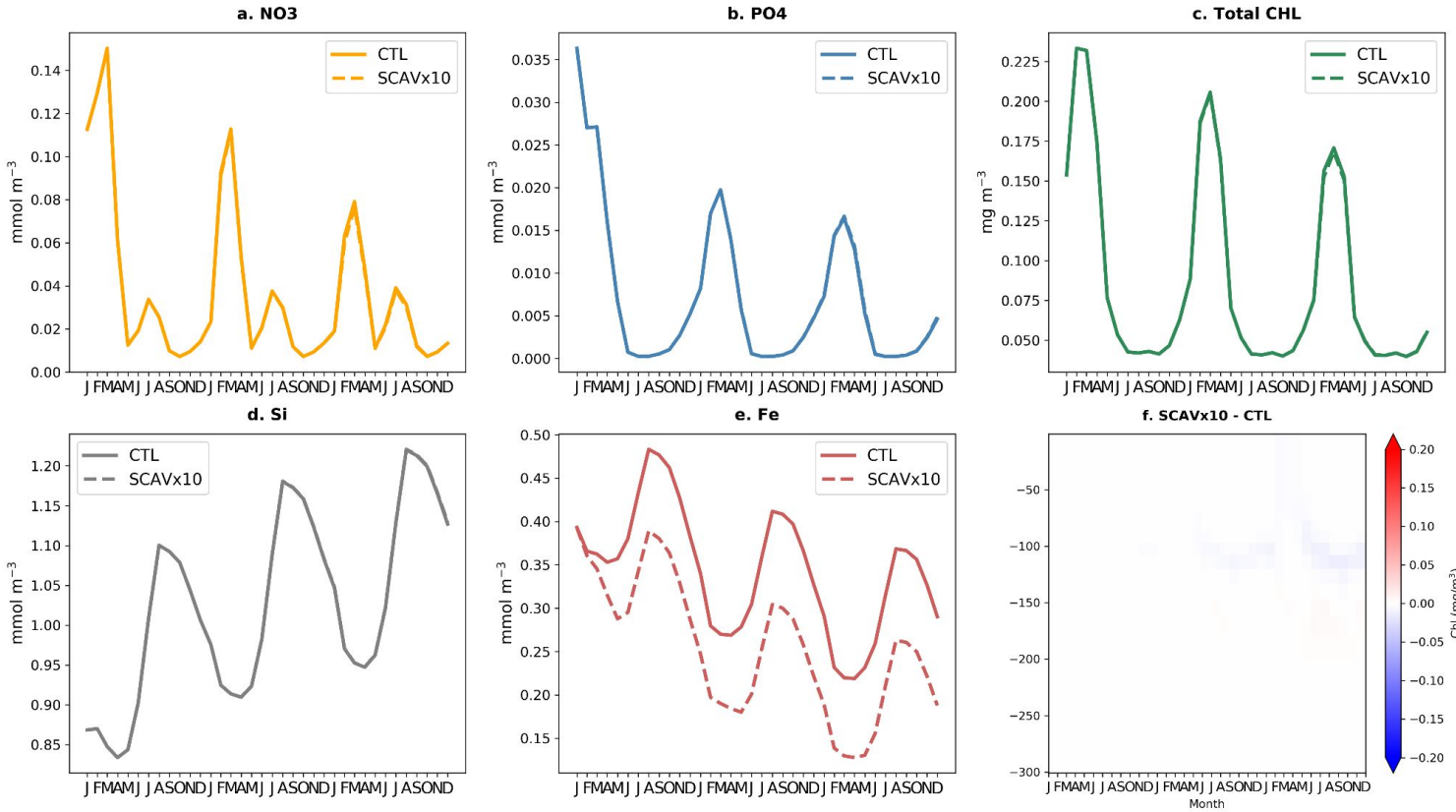


- ➔ Higher grazing rate on nanophyto
- ➔ Less surface Si, more NO3
- ➔ Increased contribution of diatoms to Chl
- ➔ Less light available at depth, shallower DCM

BATS

Scavenging x 10

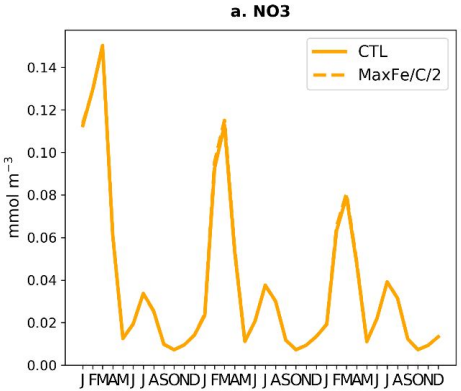
Fe not limiting at BATS, the increase in Fe scavenging has no impacts on nutrient and Chl

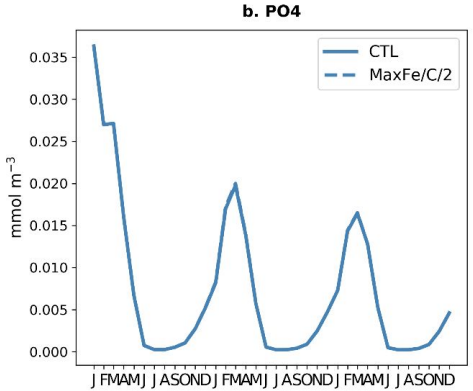


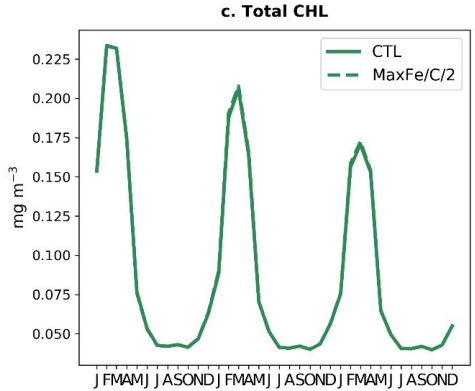
➔ **Lower surface Fe**

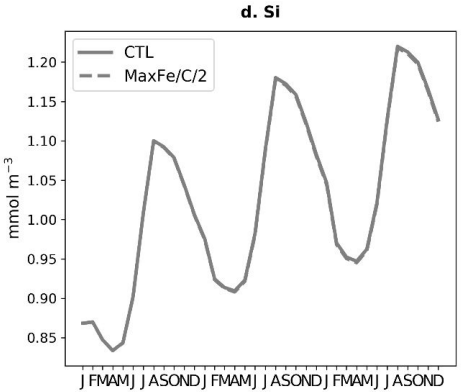
BATS

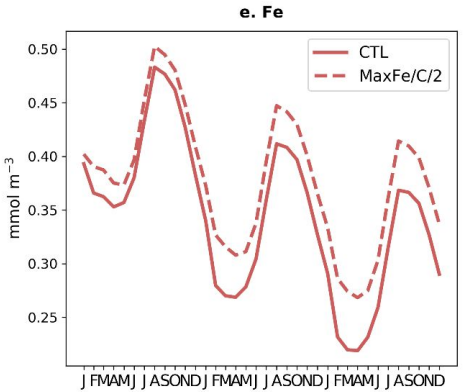
Max phytoplankton Fe/C:2

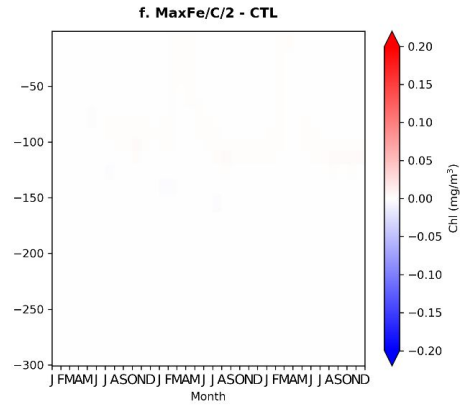








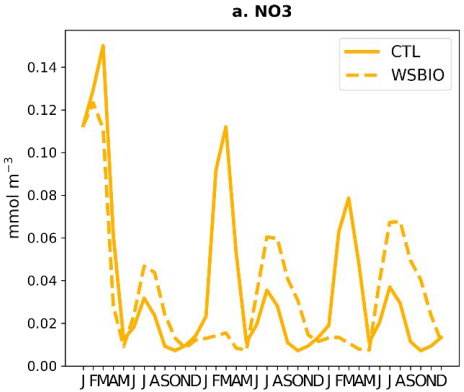


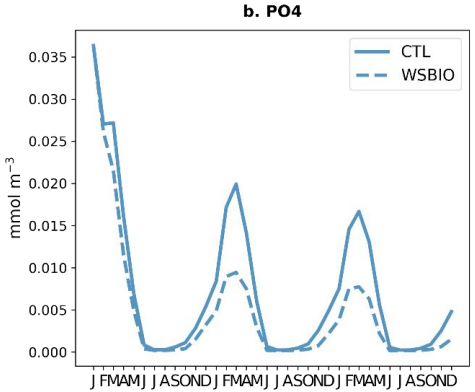


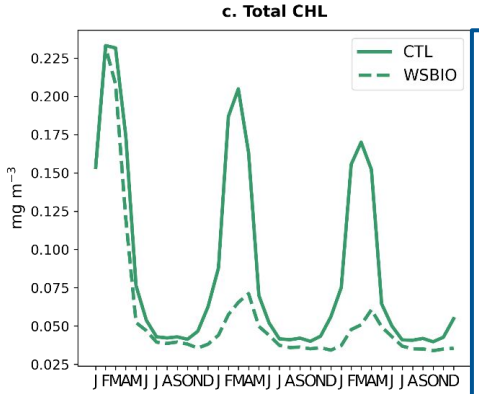
- ➔ Less Fe uptake by phytoplankton
- ➔ Higher Fe concentrations
- ➔ Fe not limiting at this station
- ➔ No impact on Chl

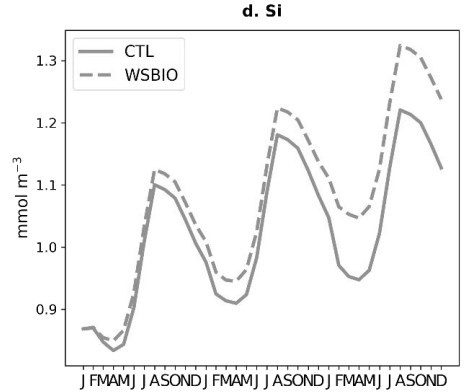
BATS

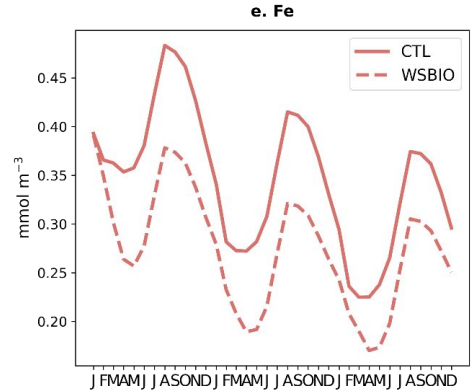
WSBIO = WSBIO2

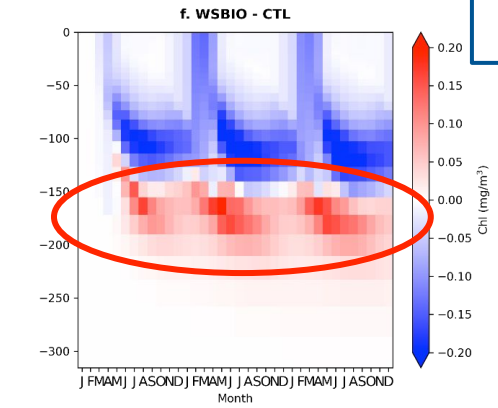












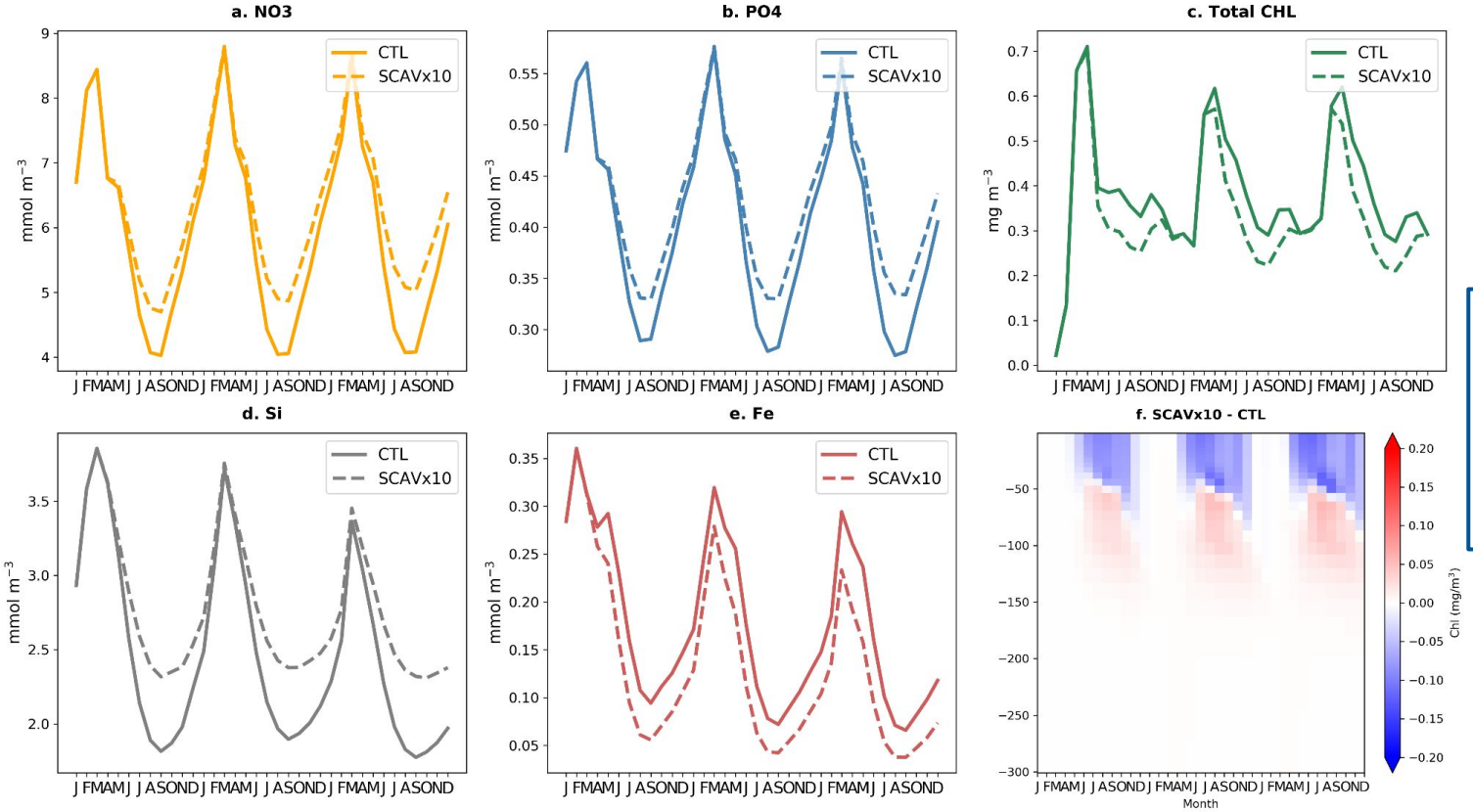
- ➔ small particles sinking fast
- ➔ more export of organic matter in the deep ocean
- ➔ less surface nutrients (NO3, PO4)
- ➔ N fixation summer peak stronger due to a higher PO4 limitation.

Deepening of the Deep Chl Maximum and nutricline

NABE

Scavenging x 10

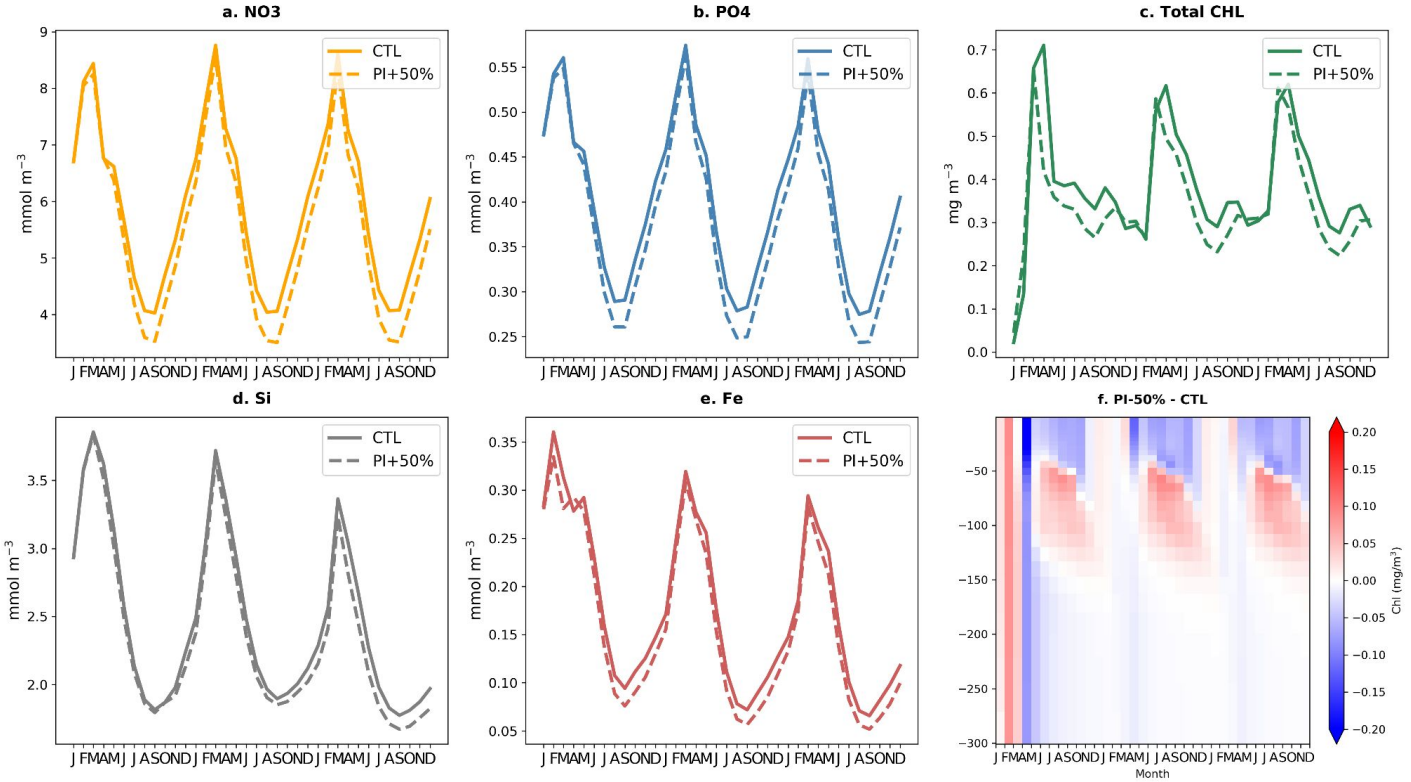
Increased Fe limitation in summer → decrease in surface Chl



- ➔ Higher surface NO3, PO4 and Si in summer
- ➔ Lower surface Fe
- ➔ Increase Chl at depth : Ferricline

NABE

PI slope +50%



Phytoplankton adaptation to lower light availability:

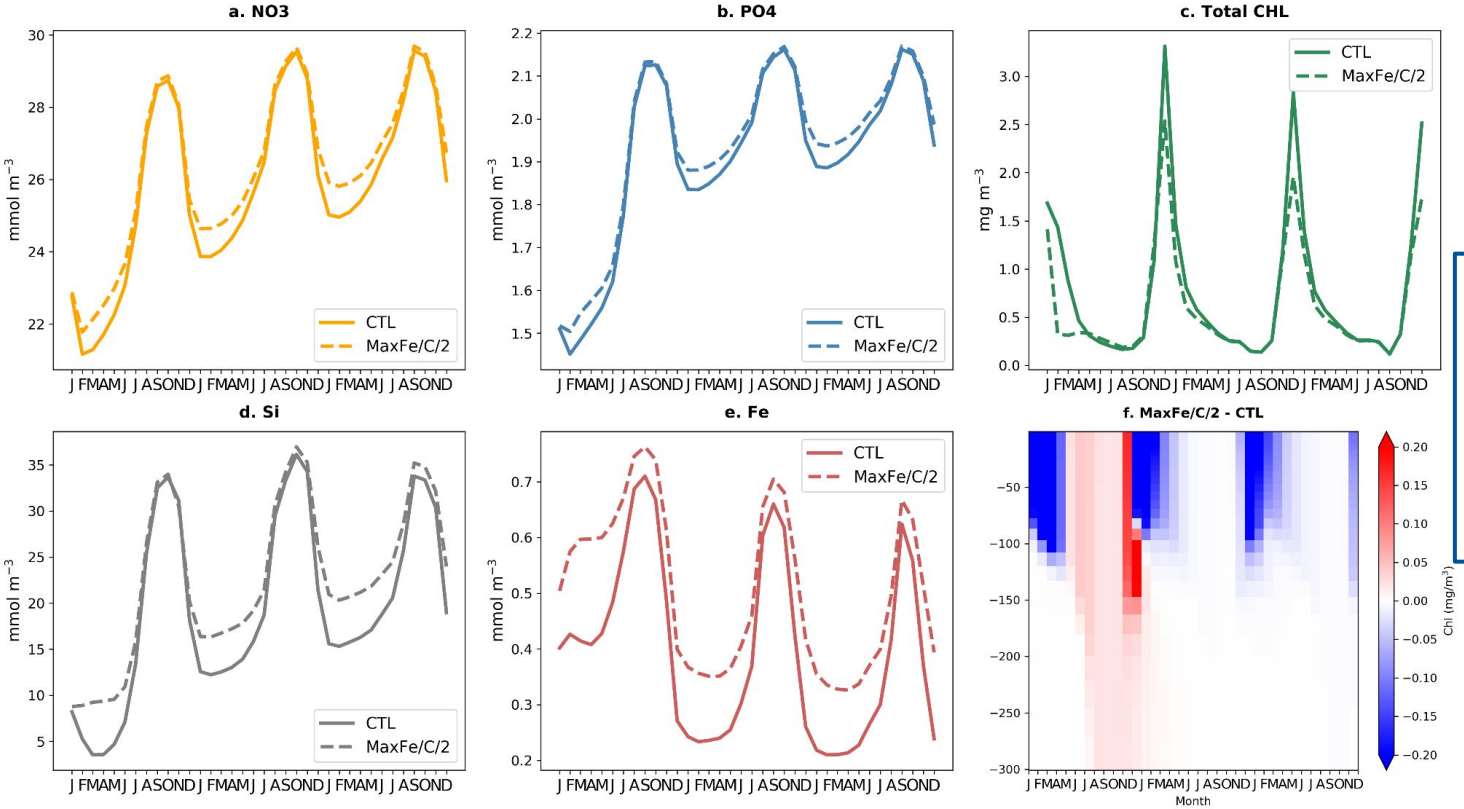
- ➔ **Chl higher at depth**
- ➔ **higher nutrient consumption at depth**
- ➔ **increased Fe limitation at the surface**

Deepening of the nutricline → lower entrainment of nutrient in the mixed layer

KERFIX

Max phytoplankton Fe/C:2

Higher surface Fe concentration but lower Chl concentrations



- ➔ A lower max quota leads to a lower Fe uptake rate
- ➔ Phytoplankton more sensitive to Fe limitation at the bloom season