CC Scenario Simulations with ERGOM

ERGOM-user and -developer team

Physical setup:

MOM 3.1

      Horizontal resolution: 3 NM (app. 5.5 km)

      Vertical resolution: 1.5 – 6.0 m

      Open boundary: Skagerrak

Biogeochemical setup:

      ERGOM (www.ergom.net)

Reference simulations:

Atmosphere:
- sn-remo: NCEP downscaling by REMO (now coast)
- RCA-ERA: ERA40/interims downscaling by RCA
- ERA40

Nutrient loads, runoff:
- data from BED and HELCOM
- bio-availability: N: 75%, P: 50%

Climate change scenarios:

Atmosphere:
    Reference:
    - ECHAM5 – CLM
    - ECHAM5 – RCAO
    - HadCM3 – RCAO

    Climate scenarios (SRES, AR4):
    - A1B
    - B1

Load scenarios:
- mean riverine concentrations 1980-2000
- business as usual (moderate increase)
- BSAP

Not all possible combinations have been performed!

Common results:
- Temperature increase 2-4 K
- Oxygen depletion due to warming stronger than expected from solubility effects only
- BSAP can mitigate further oxygen decrease but hardly can improve oxygenation
- Earlier onset of cyanobacteria bloom
- Less sea ice coverage
- Salinity decrease by 1 to 2 g/kg. (Results controlled by atmospheric models due to fresh water budget)
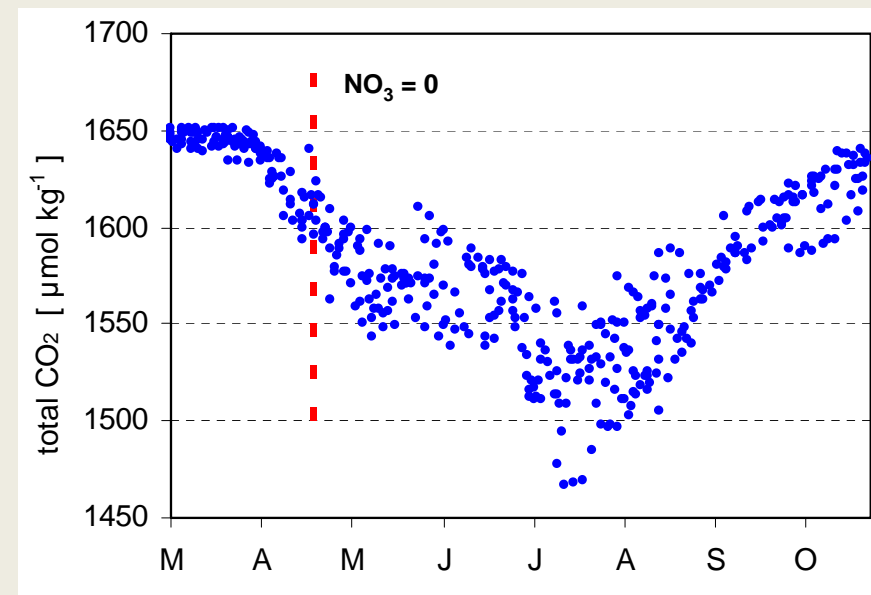
Phosphorus limitation:

Phosphate data (SMHI, Monitoring, BY15):

🟢 **$NO_3 = 0$**

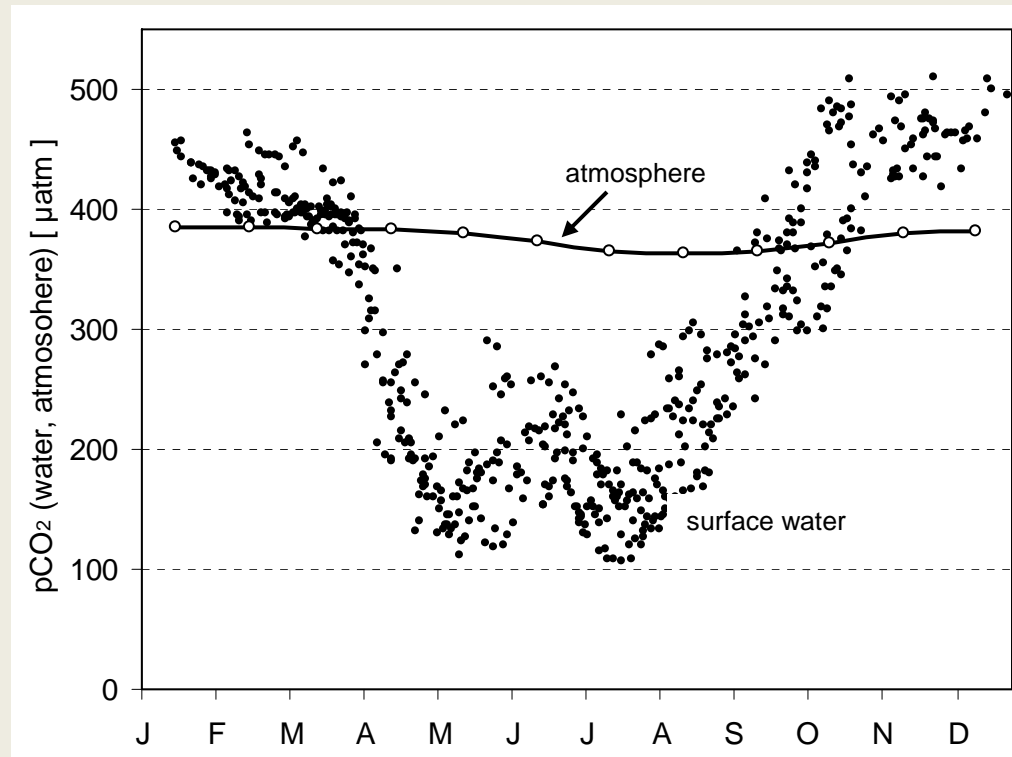🔴 **earliest start of the mid-summer nitrogen fixation**
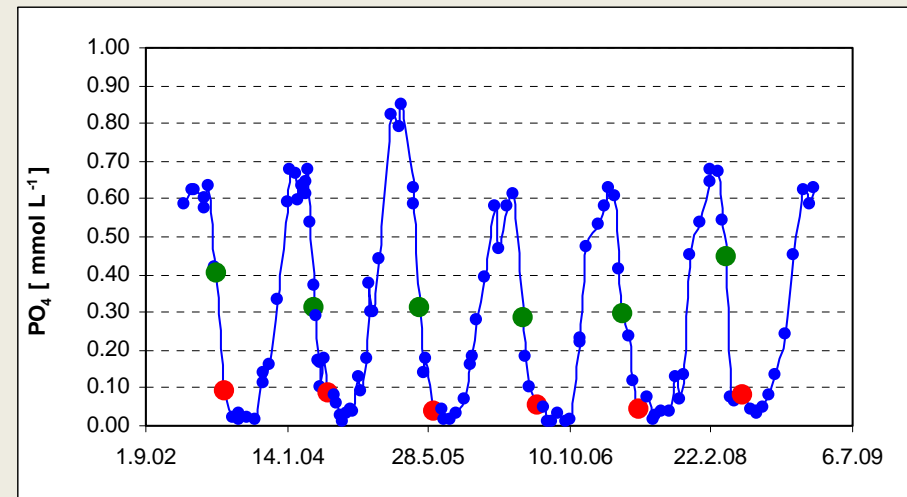
Seasonality of total CO_2 northeastern Gotland Sea (cargoship FINNMAID):
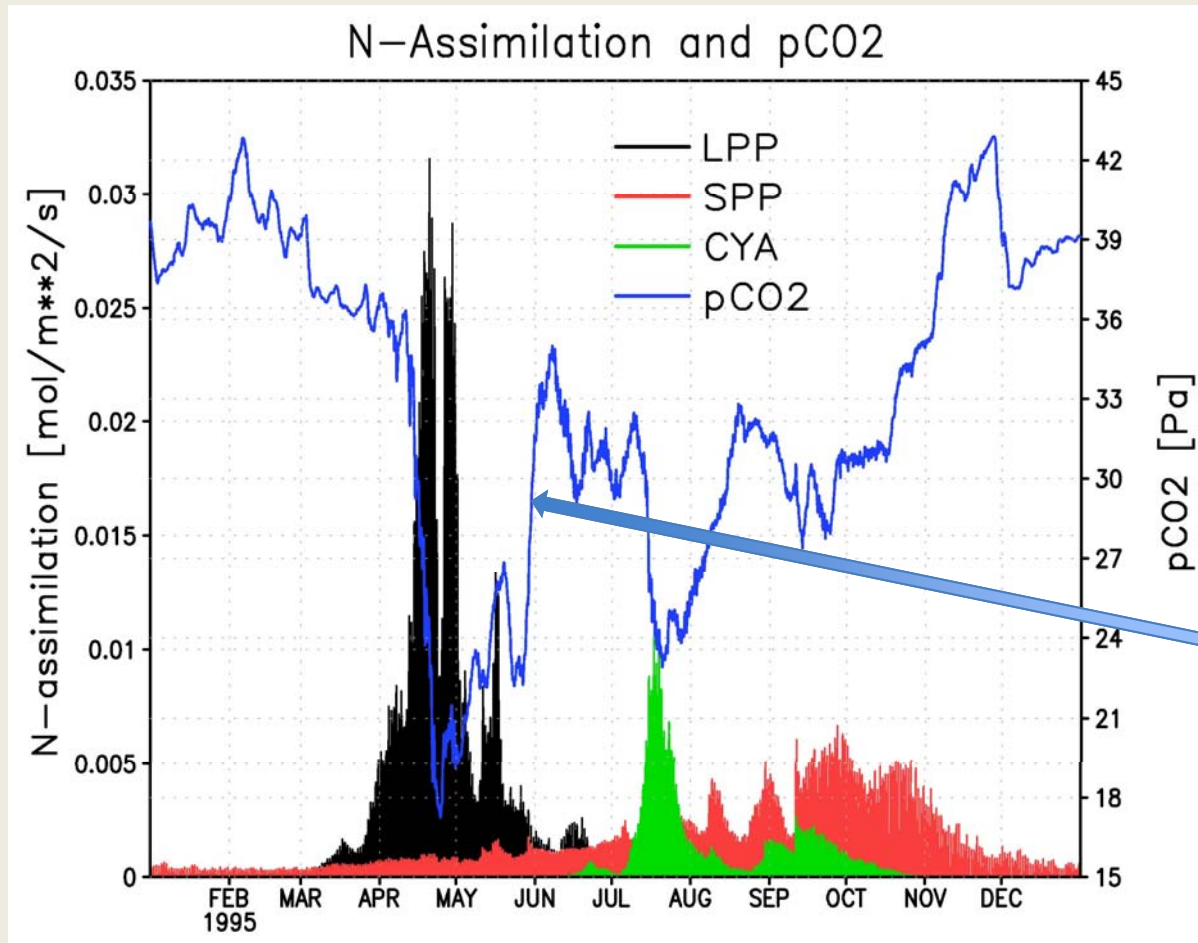

by courtesy of Bernd Schneider (IOW)

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What happens after spring bloom?

Eastern Gotland Basin

pCO2 increase due to temperature cannot be confirmed by observations.
Do we miss something in the model?