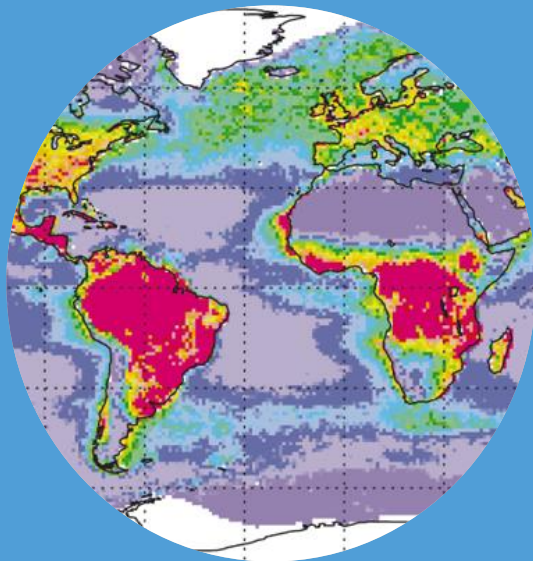


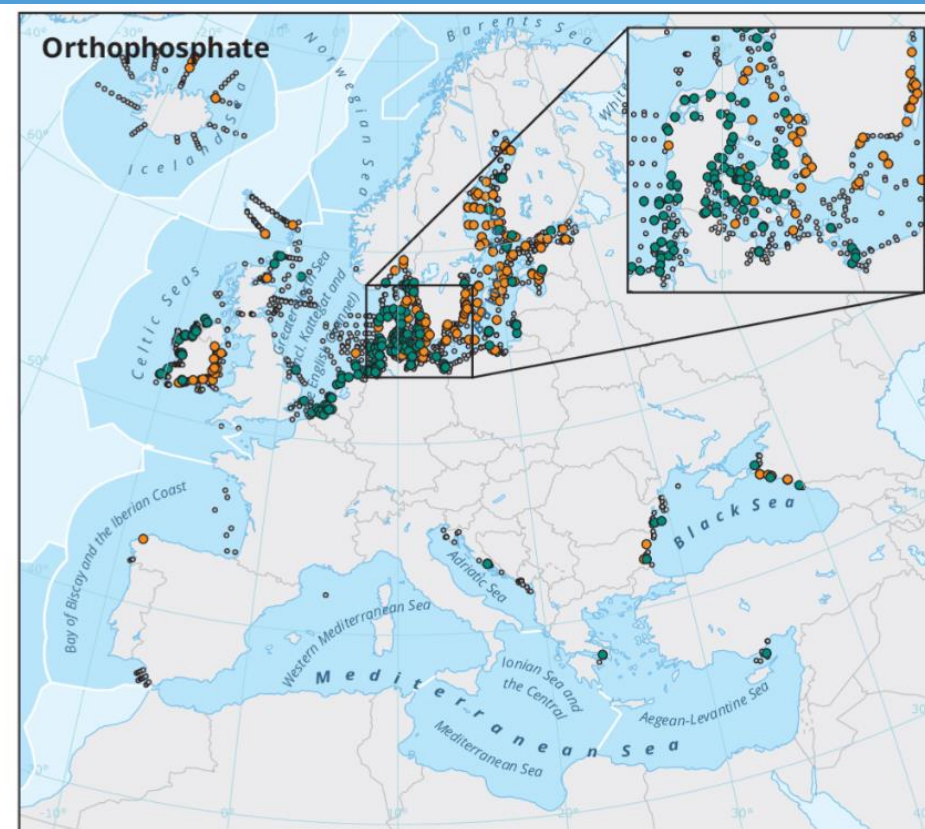
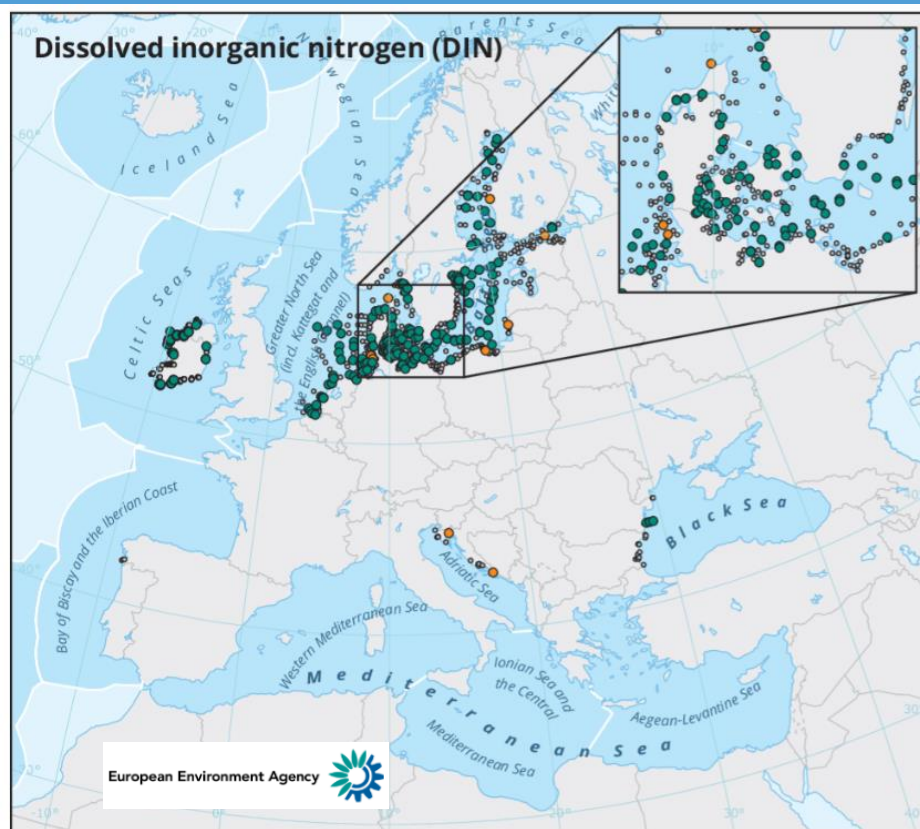
Veranderingen in het plankton van de Noordzee

Jaap van der Meer, Luca van Duren, Peter Herman, Johan van der Molen



Omgevingsvariabelen

- Licht, voedingsstoffen (N en P), temperatuur



Trends in dissolved inorganic nitrogen and orthophosphate concentrations in transitional, coastal and marine waters in Europe, 1980-2019

● Decreasing ● Increasing ● No trend

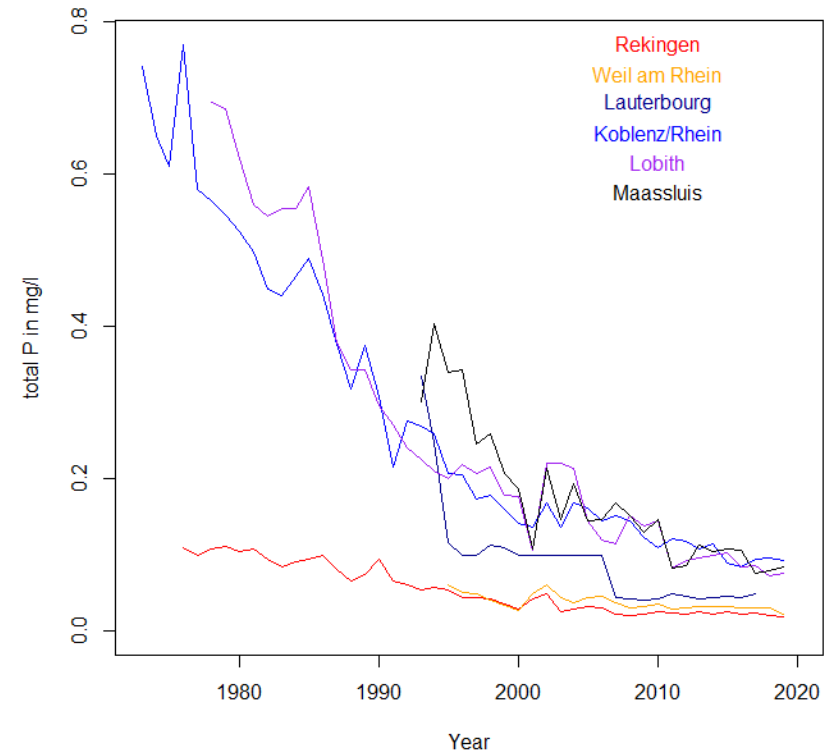
Omgevingsvariabelen

- Licht, voedingsstoffen (N en P), temperatuur

Totaal P vracht



Totaal P concentratie



Omgevingsvariabelen

- Licht, voedingsstoffen (N en P), **temperatuur**

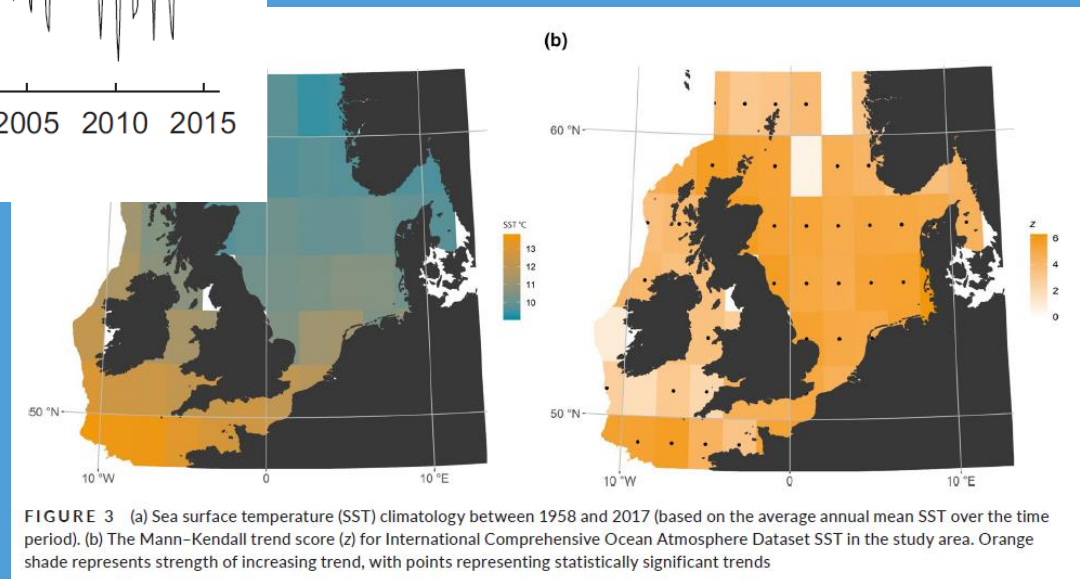
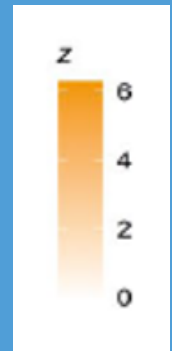
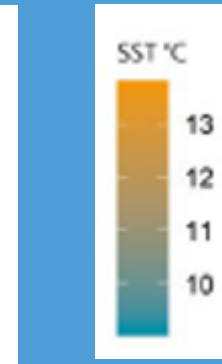
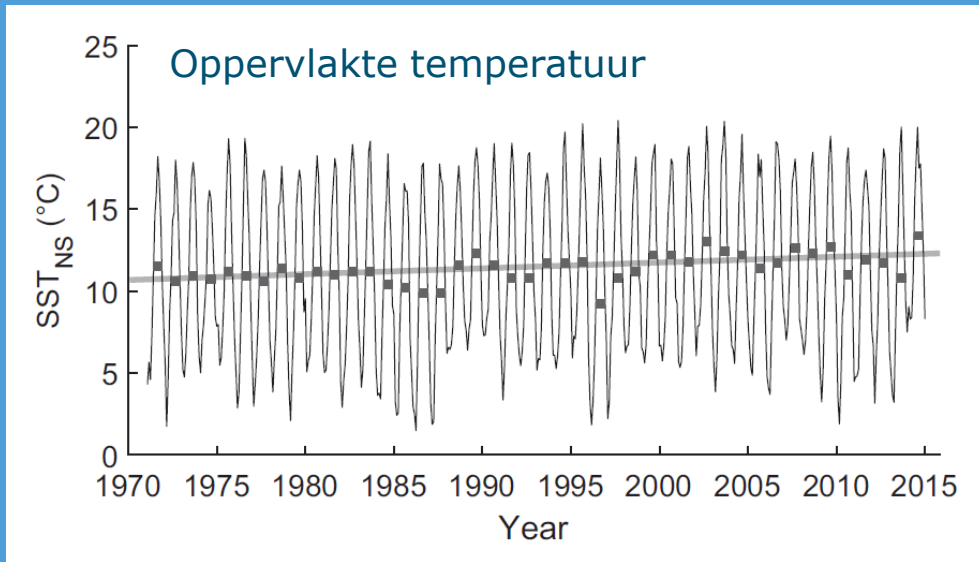


FIGURE 3 (a) Sea surface temperature (SST) climatology between 1958 and 2017 (based on the average annual mean SST over the time period). (b) The Mann-Kendall trend score (z) for International Comprehensive Ocean Atmosphere Dataset SST in the study area. Orange shade represents strength of increasing trend, with points representing statistically significant trends

Desmit et al. (2020);
Bedford et al. (2020)

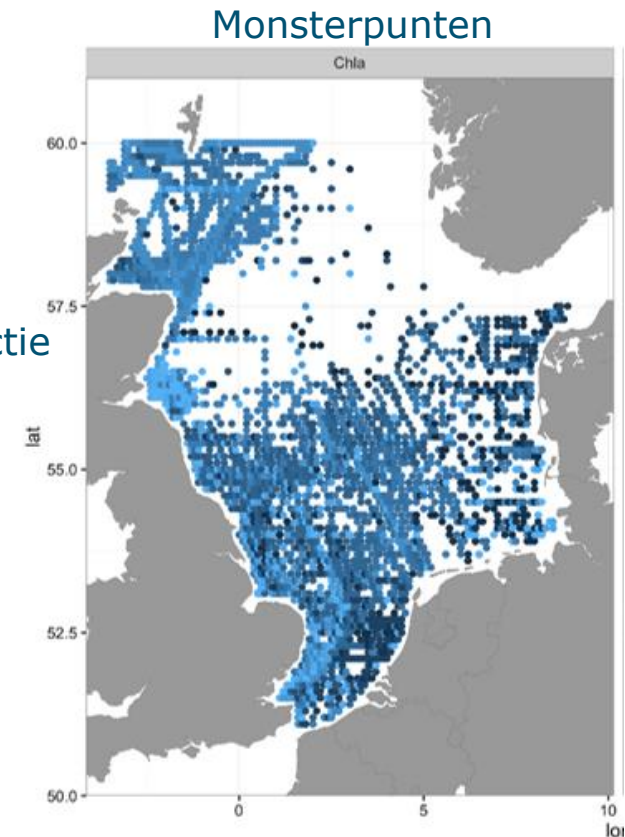
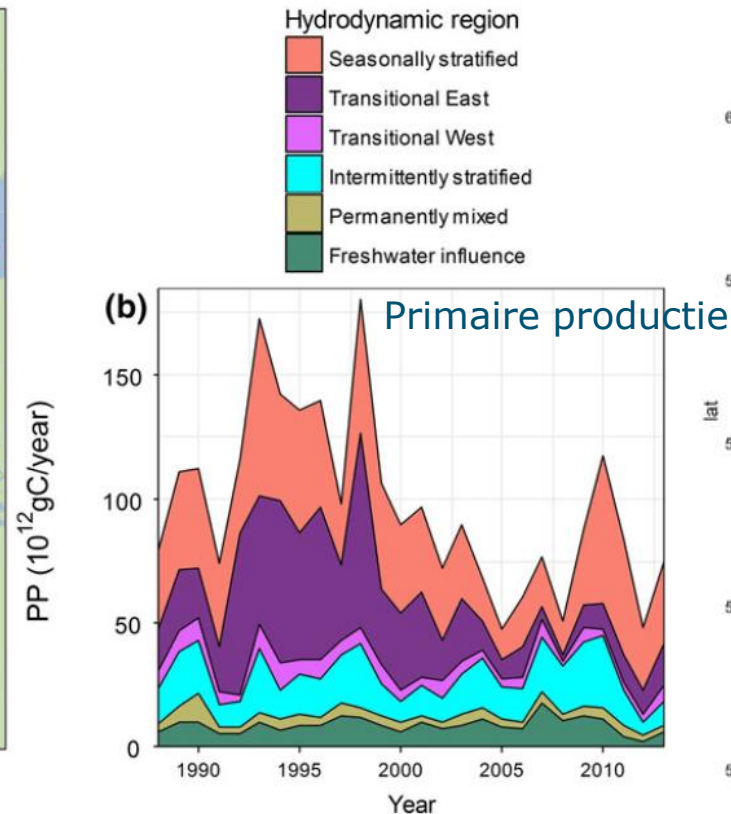
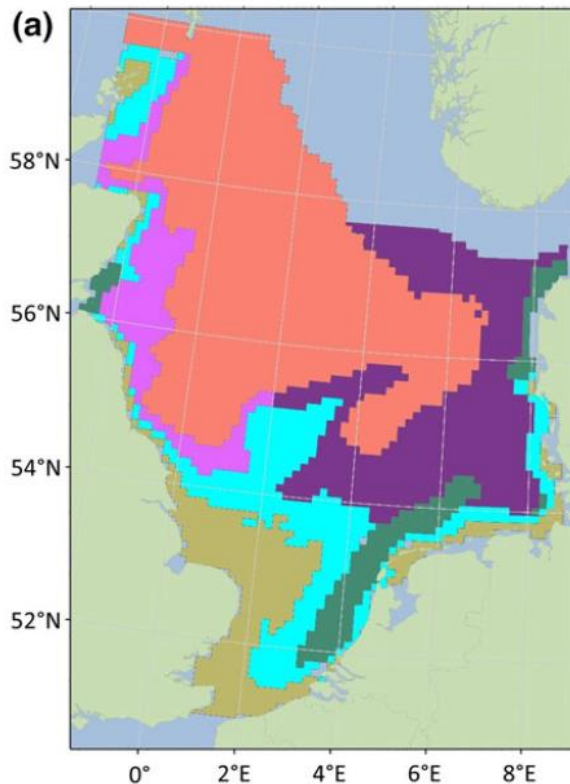
Chlorofyl en primaire productie

- Surveys
- Permanente meetstations (vooral in de kustwateren)
- Satellieten
- Continuous Plankton Recorder
- Modellen

Chlorofyl en primaire productie

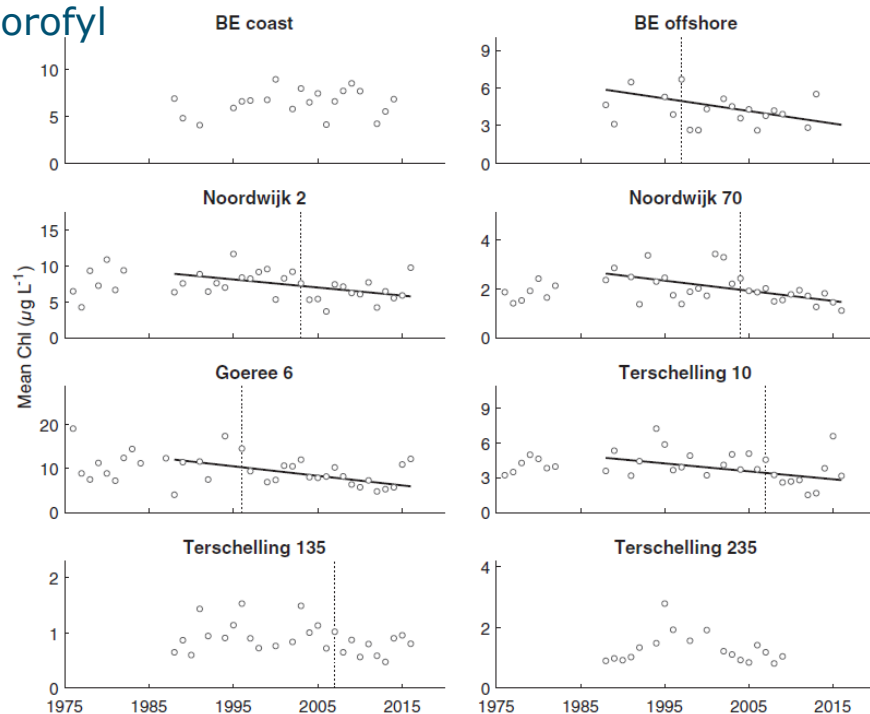
- Surveys
- Models

Capuzzo et al. (2018)



■ Permanente meetstations (vooral in de kustwateren)

Chlorofyl



Chlorofyl

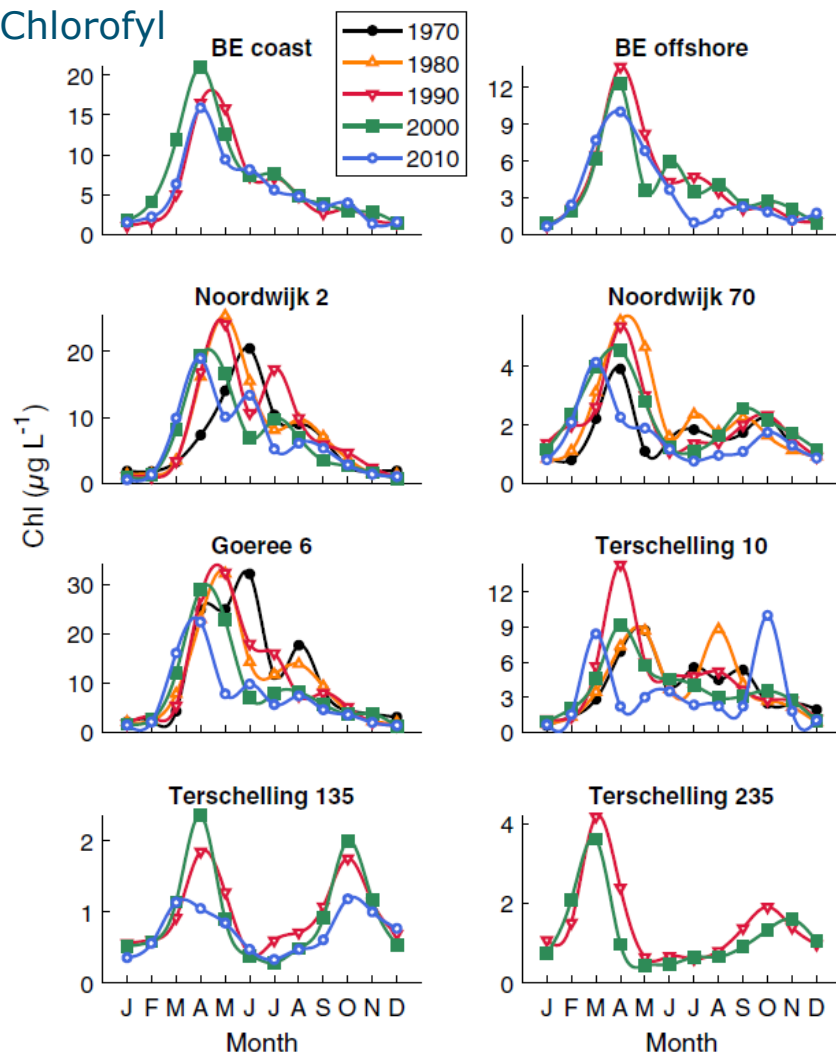
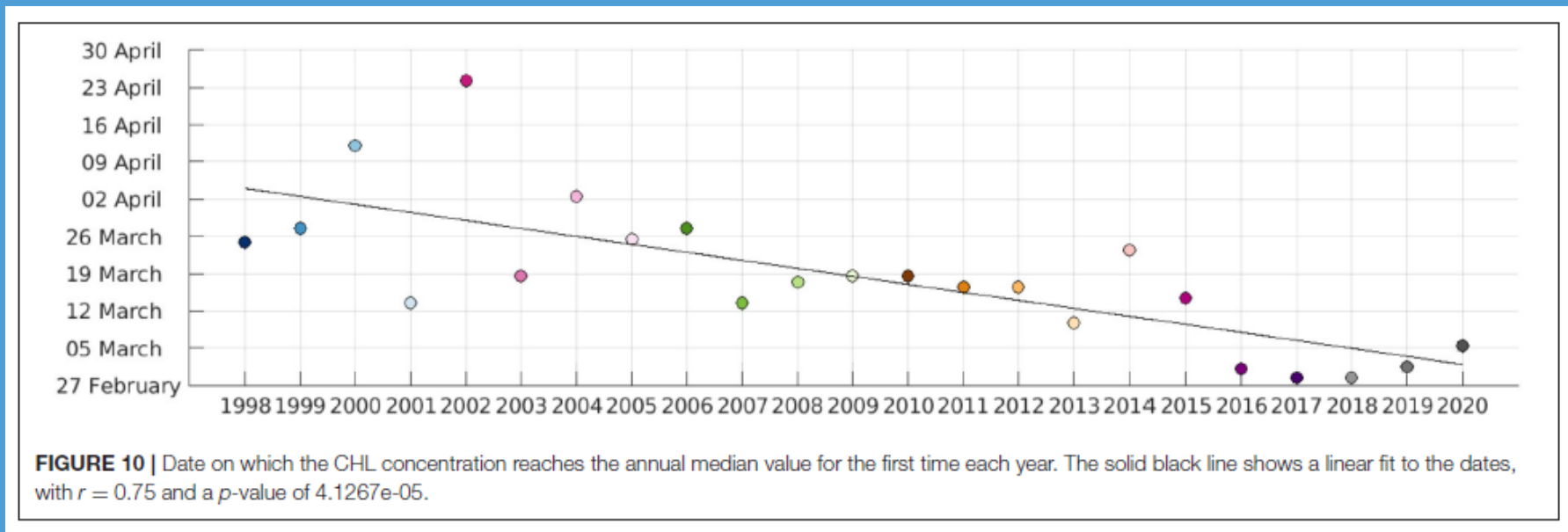


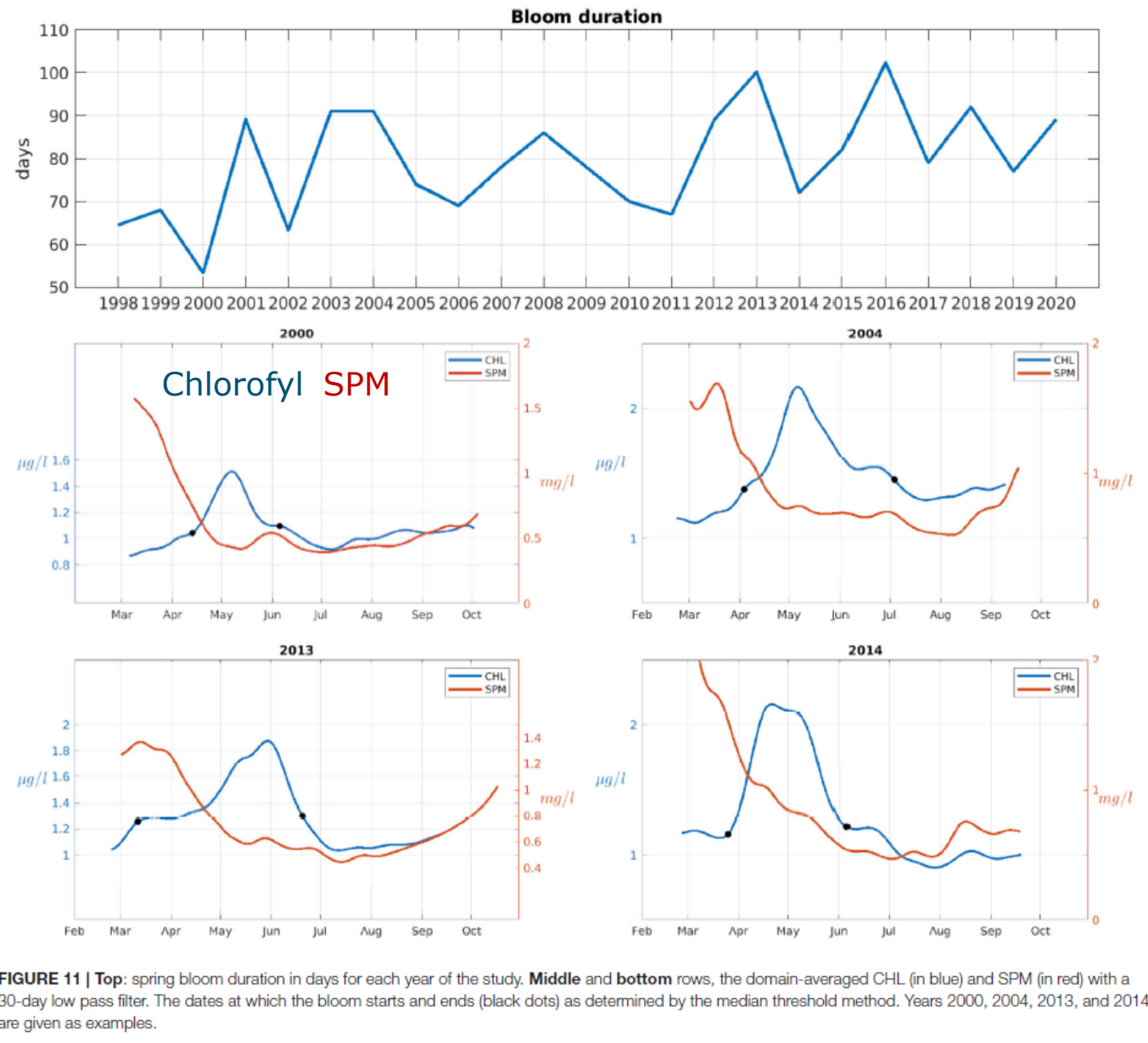
Fig. 5. Time series of annual mean Chl values with their trends (if significant, black lines; see statistics in Table 4) after 1987 for representative sites in the North Sea. The vertical dashed lines indicate the years where a shift in central tendency (Pettitt's test) was detected, if any.

■ Satellieten



Chlorofyl

■ Satellieten



■ Surveys

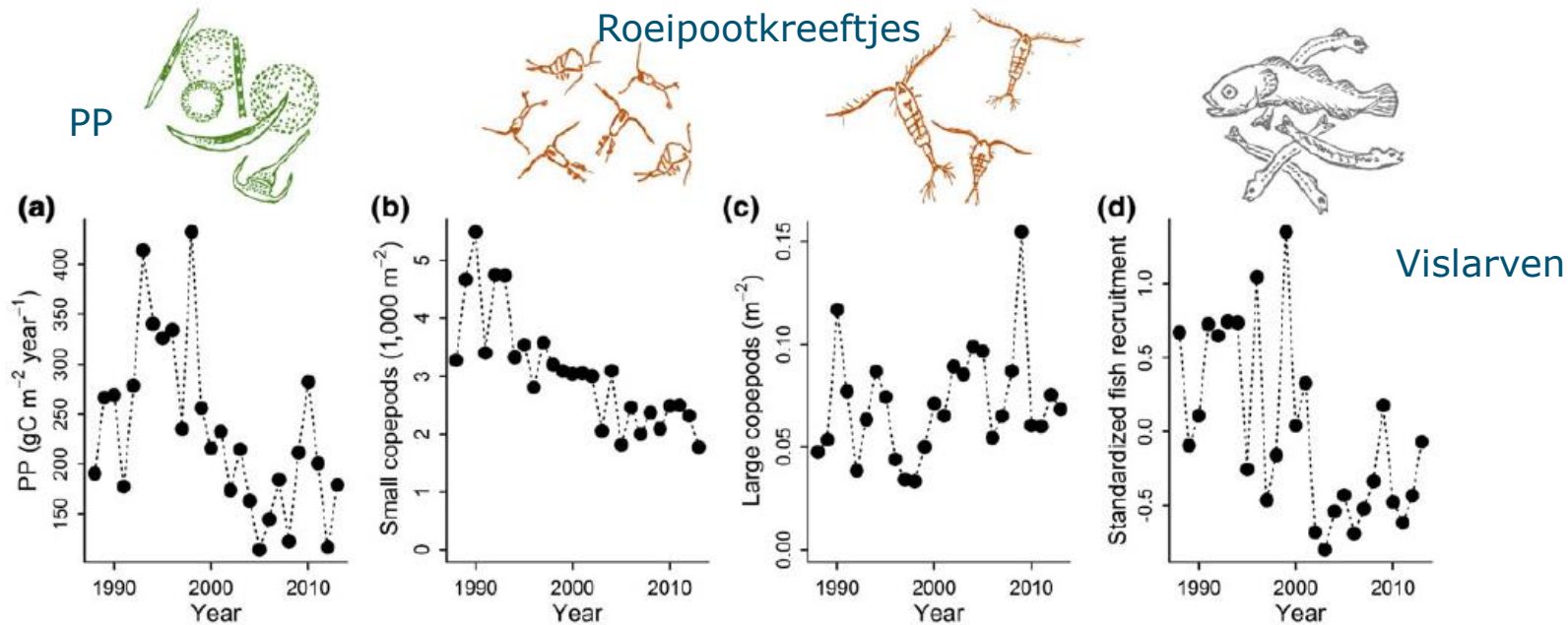


FIGURE 3 Interannual variation in annual primary production, PP (gC m⁻² year⁻¹), mean abundance of small copepods (1,000 × m⁻³) and large copepods (m⁻³), and a standardized index of fish stock recruitment (including sandeel, sprat, herring, Norway pout, cod, haddock and whiting), in the North Sea [Colour figure can be viewed at wileyonlinelibrary.com]

Samenstelling levensgemeenschap

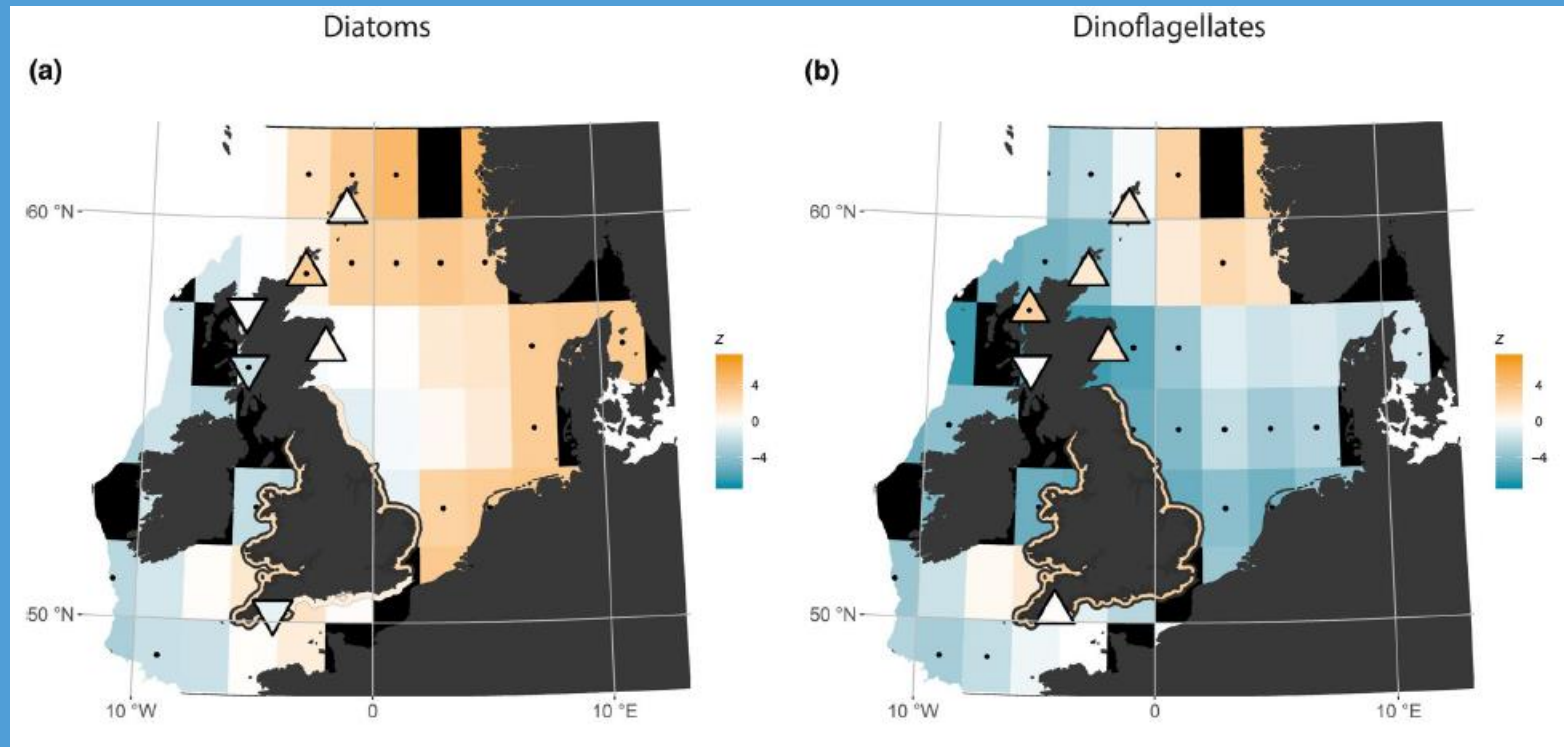
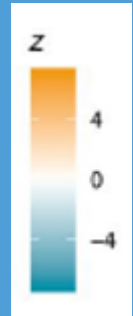
- Diatomeeën en dinoflagellaten
- Trofische status (autotroof, mixotroof)
- Holoplankton en meroplankton
- Grote en kleine roeipootkreeftjes



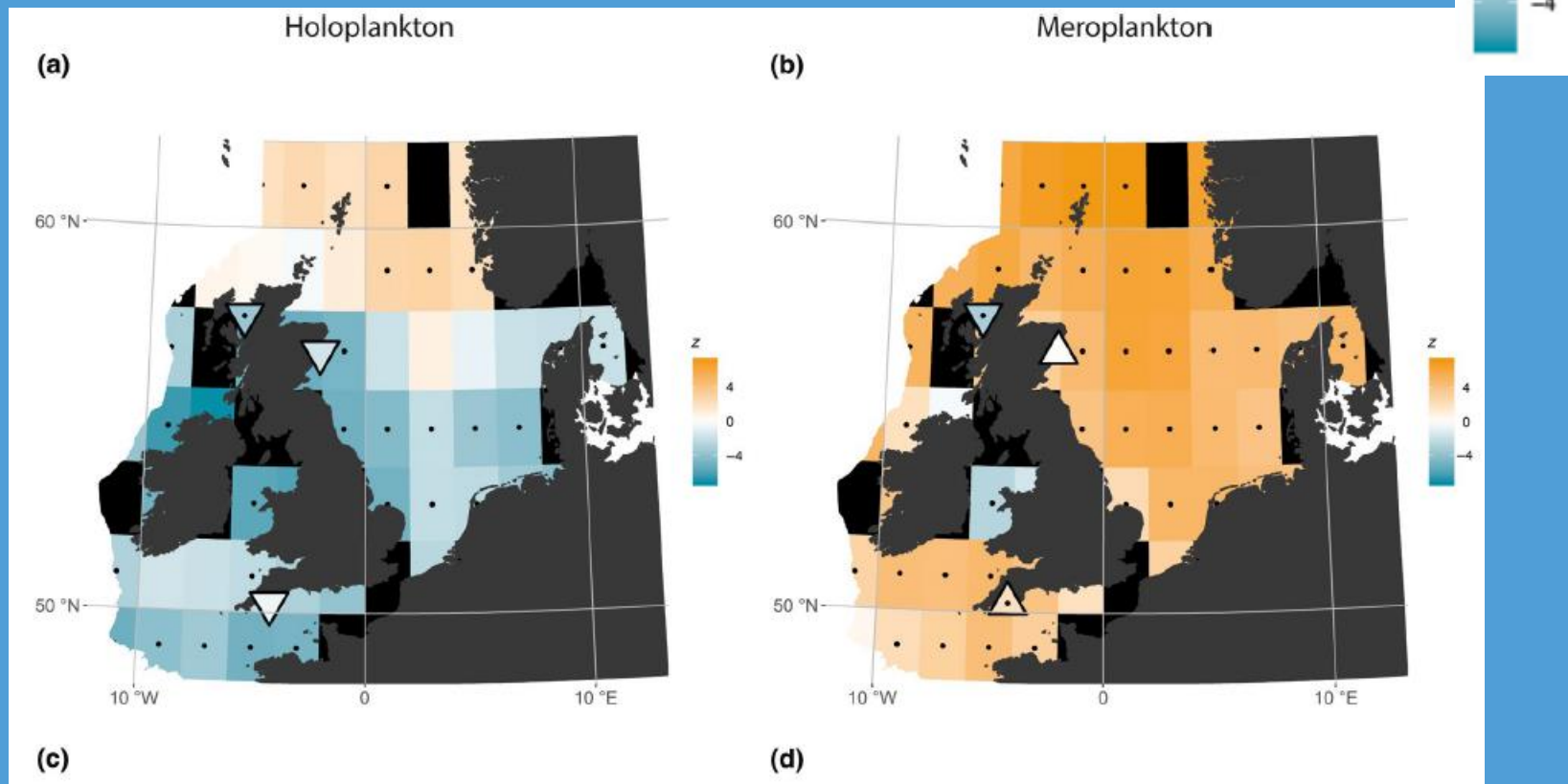
Samenstelling

Bedford et al. (2020)

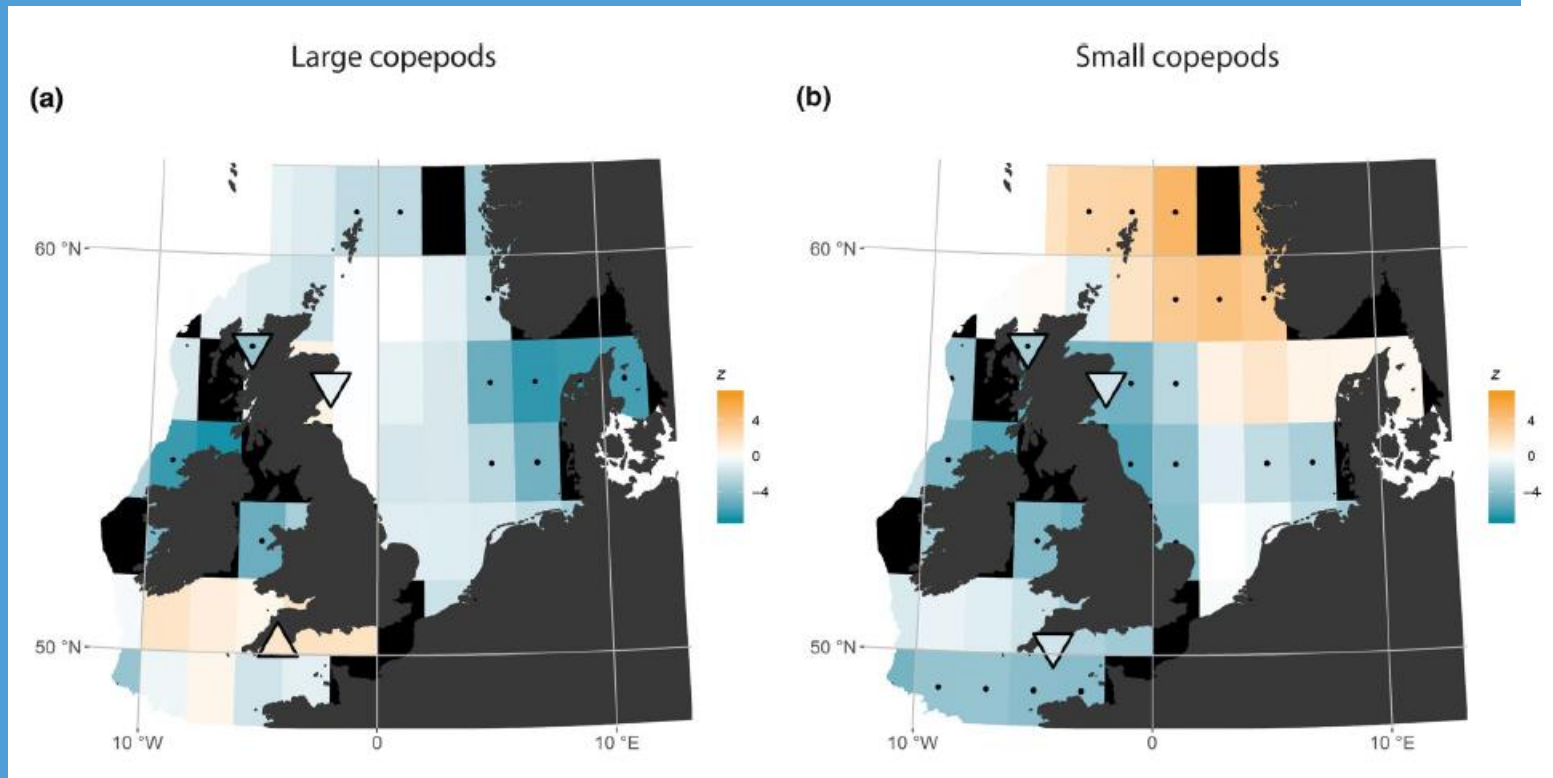
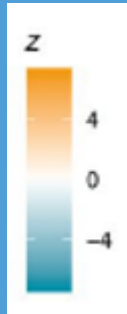
- Diatomeeën en dinoflagellaten
- Continuous Plankton Recorder, meetstations



- Holoplankton en meroplankton
- Continuous Plankton Recorder, meetstations




- Grote en kleine roeipootkreeftjes
- Continuous Plankton Recorder, meetstations




Maar ...

- Is dat wel zo?

 **frontiers**
in Marine Science

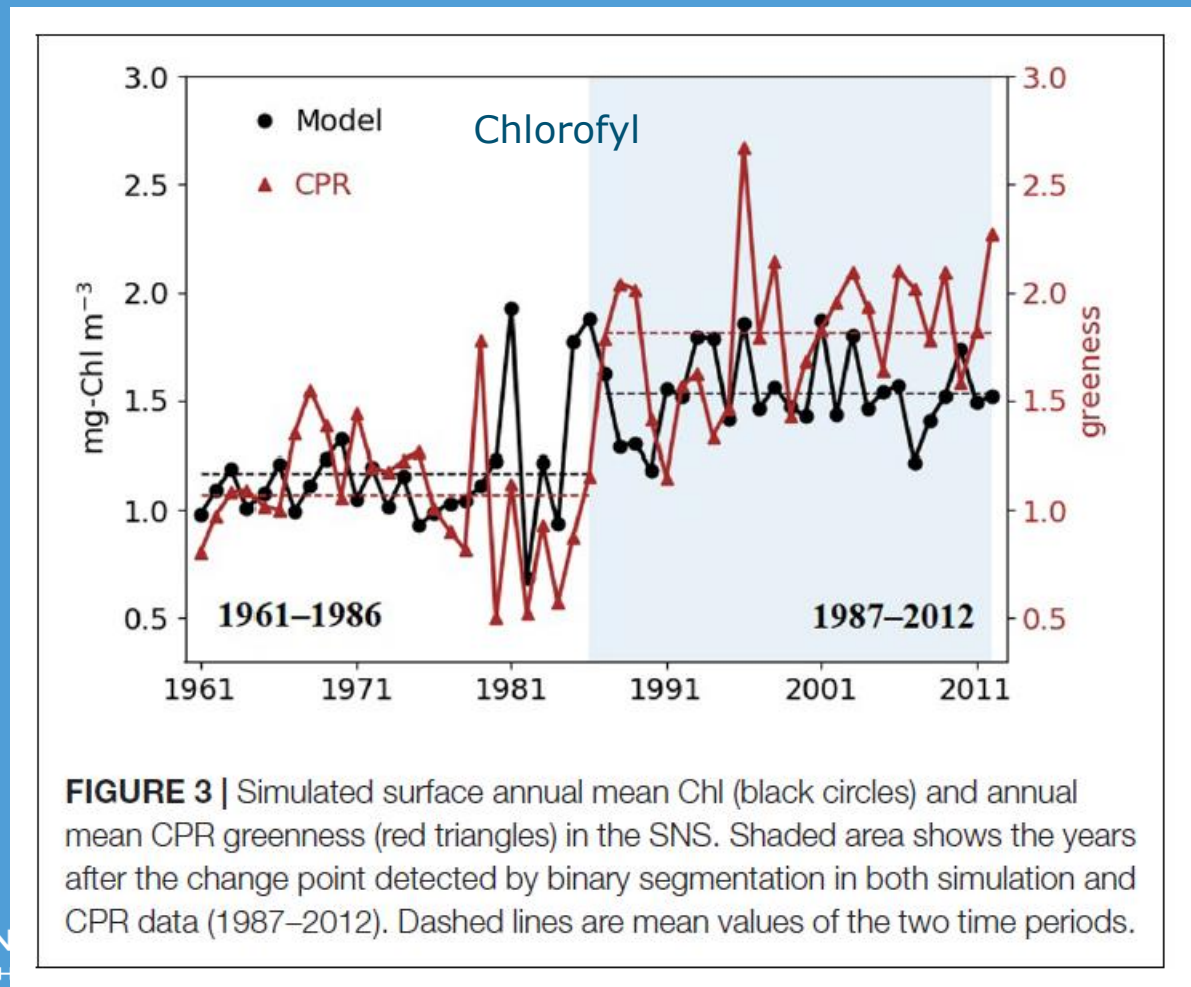
2020



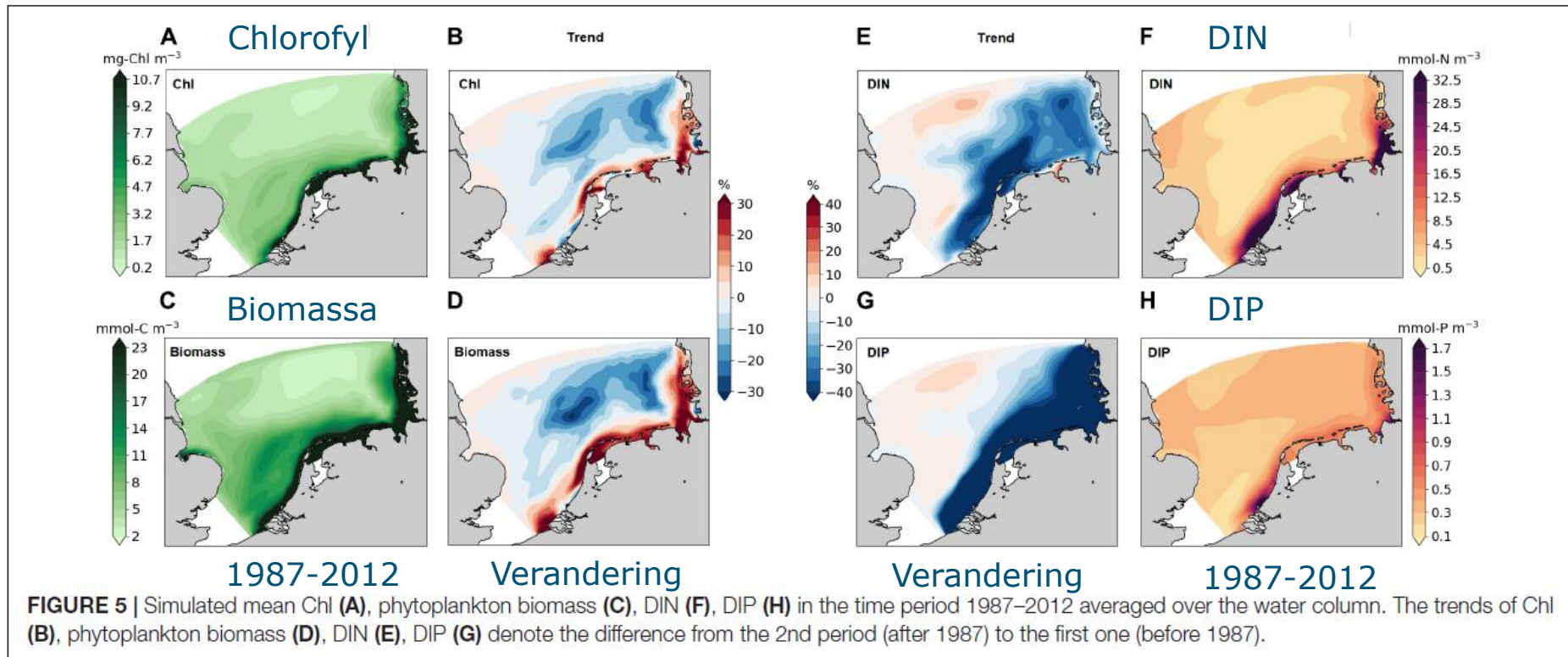
**Less Nutrients but More
Phytoplankton: Long-Term
Ecosystem Dynamics of the
Southern North Sea**

Xu Xu, Carsten Lemmen and Kai W. Wirtz*

■ Continuous Plankton Recorder; modellen



■ Toename fytoplankton in kustzone



- **Licht**, voedingsstoffen (N en P), temperatuur

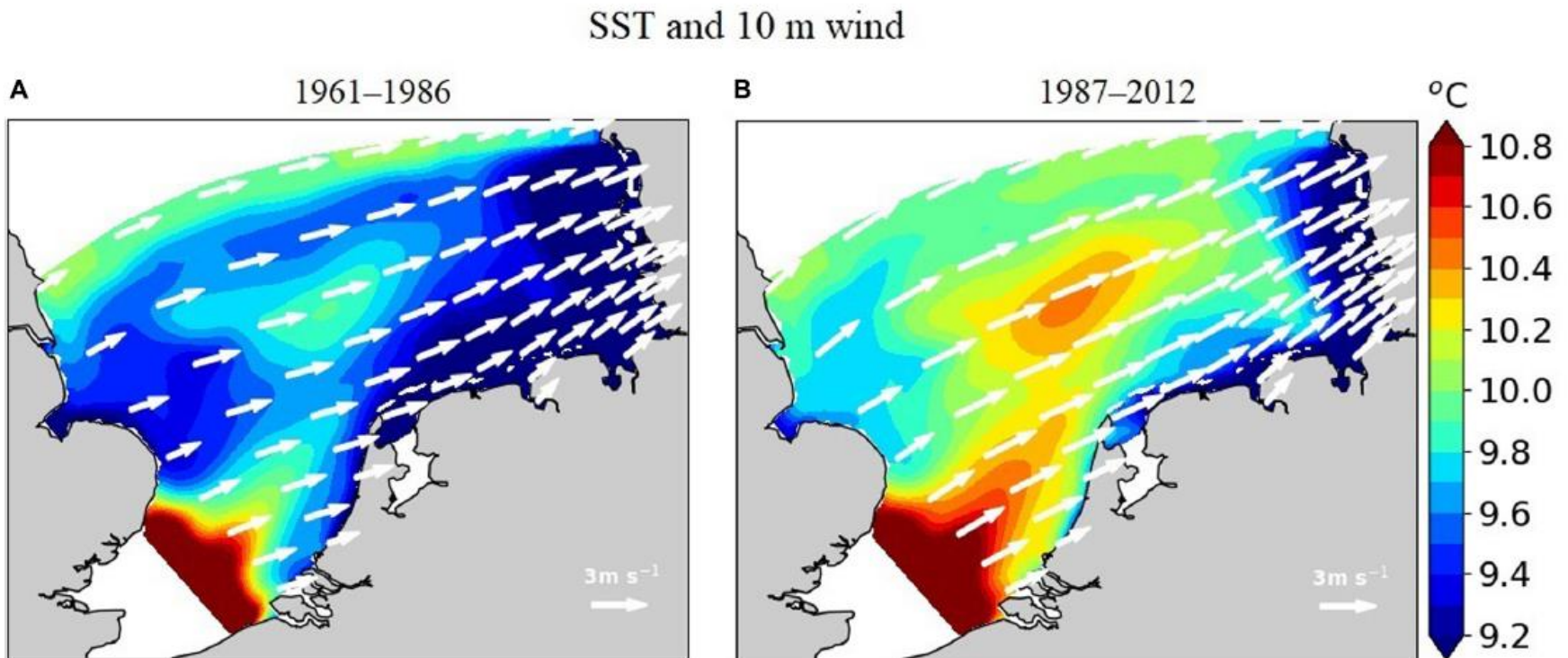


FIGURE 6 | Simulated mean sea surface temperature and 10-m wind speed in **(A)** 1961–1986 and **(B)** 1987–2012.

Onderliggende studies

Alvera-Azcarate (2021) *Frontiers in Marine Science* 8:707632

[Satellite data; 1998-2021; Chl, SPM]

Bedford et al (2020) *Global Change Biology* 26:3482-3497

[CPR and inshore UK stations;1958-2017;lifeforms fyto zoo]

Capuzzo et al (2018) *Global Change Biology* 24:e352-e364

[ICES, NERC and CEFAS in situ sampling;1988-2013;Chl,PP]

Desmit et al (2020) *L&O* 65:828-847

[Dutch and Belgian stations;1975-2015;Chl]

DiPane et al. (2021) *Global Change Biology* 28:2804-2819

[Helgoland;1975-2018;plankton species composition]

McQuatters-Gollop et al. (2019) *Ecological Indicators* 101: 913-925

[CPR;2004-2014;Plankton lifeforms]

Schneider et al. (2020) *Frontiers in Marine Science* 7:586915

[Dutch coastal stations;1990-2014;Trophic status]

Xu et al. (2020) *Frontiers in Marine Science* 7:662

[CPR;;Ecosystem model]



Vragen?

