

The biological pollutant pump: how a phytoplankton bloom alters the concentrations of organic chemicals in the marine environment



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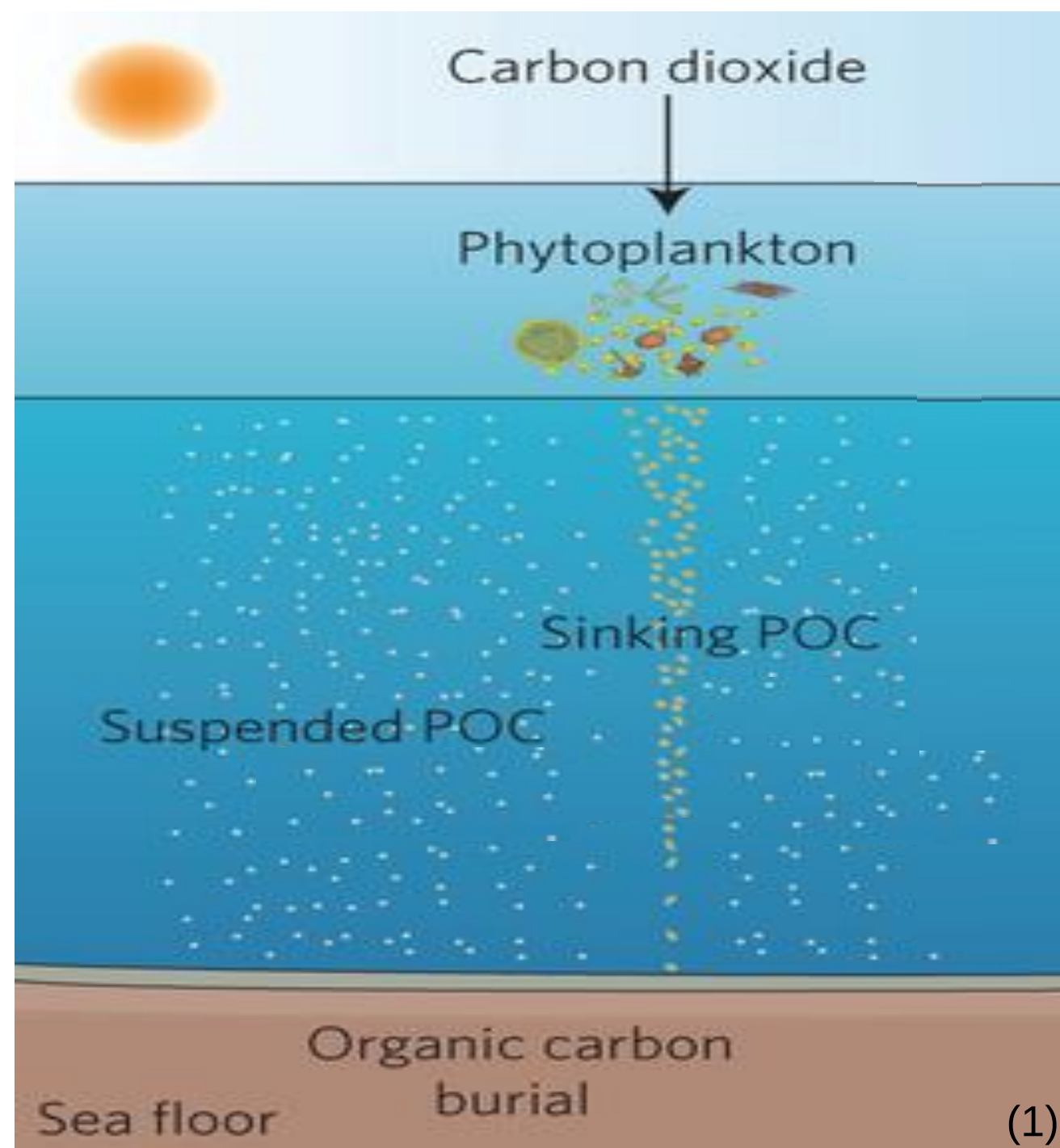
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Introduction

- The marine environment is a sink for many chemical substances
- The biological pump is the biologically driven (e.g. phytoplankton) sequestration of carbon from the atmosphere to the deep sea
- Empirical evidence of the role of the biological pollutant pump is often based on small spatial and temporal scales
- Research question**
 - Do multidecadal field data support the biological pollutant pump theory?



Materials & Methods

Apply regression-based statistics on existing data and compare the inferred trends

Study area

North Sea

Monitoring data

Data via ICES repository (www.ices.dk)

Statistics

Regression-based analysis for each variable

Coupling

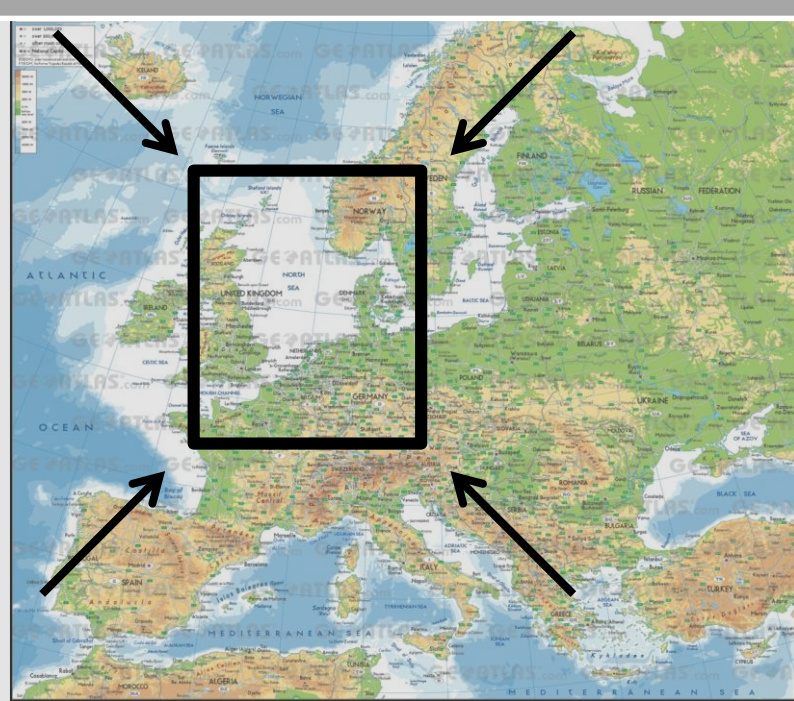
Correlation analysis

1

2

3

4



Concentrations:
(1) Chlorophyll a
440 records (1975 – 2012)
(2) Sediment organic carbon
136 records (1990 – 2012)
(3) PCB concentrations
1,139 records (1994 – 2012)

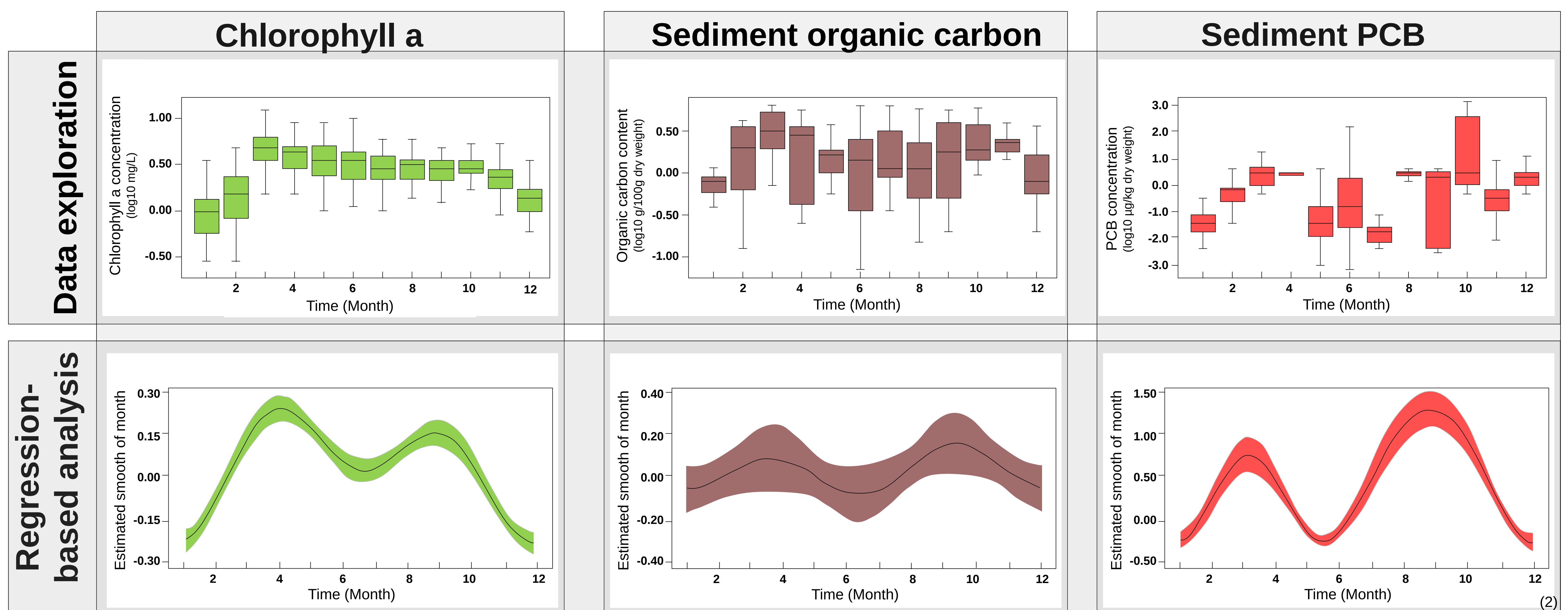
Concentration



+ f()

Are these concentrations correlated?
(1) Chlorophyll a
(2) Sediment organic carbon
(3) PCBs

Results & Discussion



- Boxplots & regression-based analyses: seasonal variations found in chlorophyll a, sediment organic carbon and PCB concentrations in sediment
- Correlation analysis: seasonal trends are coupled

Correlation analysis

	[PCB] _{sediment}	[CHFLa] _{water}
[PCB] _{sediment}	-	
[CHFLa] _{water}	0.57 (0.004)	-
[OC] _{sediment}	0.80 (<0.001)	0.56 (0.004) (2)

Conclusion

Large-scale spatio-temporal coupling between seasonal dynamics of phytoplankton, sediment organic carbon and PCB concentrations was observed and supported the biological pollutant pump theory

