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Biogeochemical North Sea Climatology

Iris Hinrichs[1], Viktor Gouretski[1], Johannes Pätsch[1],

Manfred Bersch[1], Kay Emeis[1,2], Detlef Stammer[1]

[1]CEN (Center for Earth System Research and Sustainability),

University of Hamburg

[2]Institute of Coastal Research, Helmholtz Center Geesthacht

Motivation and Goals
Biogeochemical North Sea Climatology

- Continuation of the NOWESP data set*
- Analysis of data,

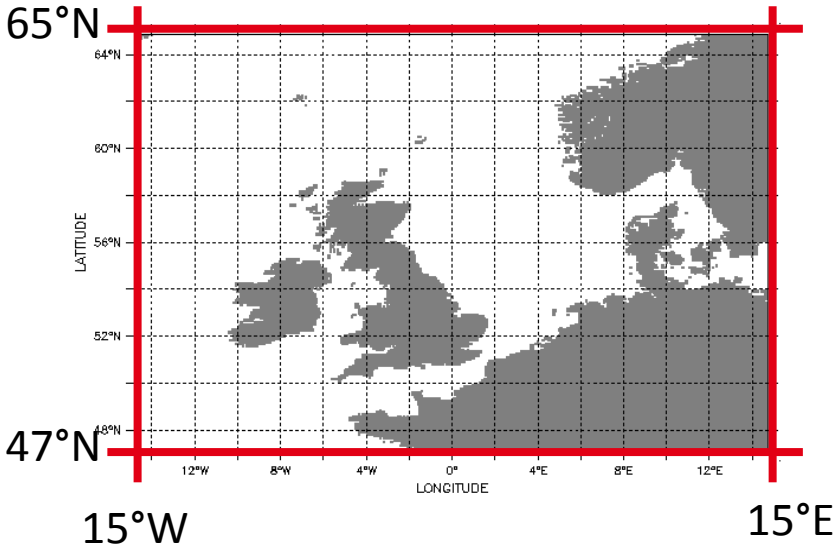
  e.g. natural variability, anthropogenic effects
- Reference and validation data set for biogeochemical modelling in the North Sea region
- Make data products available for users

* **NOWESP**: North Western European Shelf Programme, Research Data Base

Biogeochemical North Sea Climatology

Set of Parameters:

- Ammonium
- Chlorophyll-a
- Nitrate(+Nitrite)
- Dissolved Oxygen
- Phosphate
- Silicate



Time period: 1960-2014

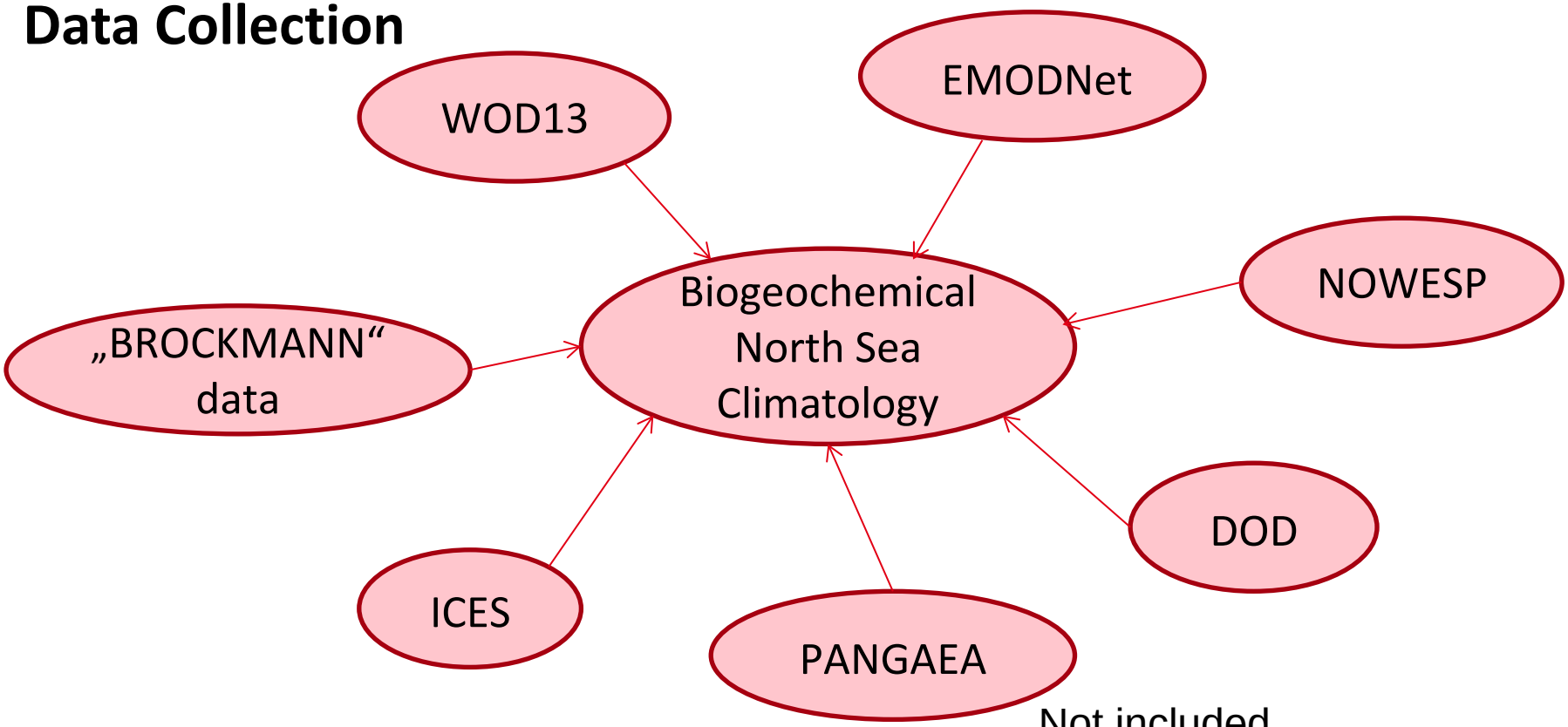
Spatial dimensions: 3D

- Temperature
- Salinity

} KLIWAS North Sea Climatology *

* Bersch, Manfred; Gouretski, Viktor; Sadikni, Remon; Hinrichs, Iris; (2013): KLIWAS North Sea Climatology of Hydrographic Data (Version 1.1); World Data Center for Climate (WDCC). doi:10.1594/WDCC/KNSC_hyd_v1.0

Data Collection



Limitation to
- bottle data
- „CTD“ data

Not included
- „underway“ observations
- mooring data
- high resolution CTD obs.

WOD13: World Ocean Database 2013 **EMODNet**:European Marine Observation and Data Network **NOWESP**: North Western European Shelf Programme, Research Data Base **DOD**:German Oceanographic Data Centre **PANGAEA**: PANGAEA Data Publisher for Earth & Environmental Science **ICES**: International Council for Exploration of the Sea **BROCKMANN**: Institute of Biogeochemistry and Marine Chemistry, University of Hamburg, Germany

Necessary Steps of Data Processing
Goal:
Merge observations from different data sources to one data set

- 7 different data sources means 7 different data formats

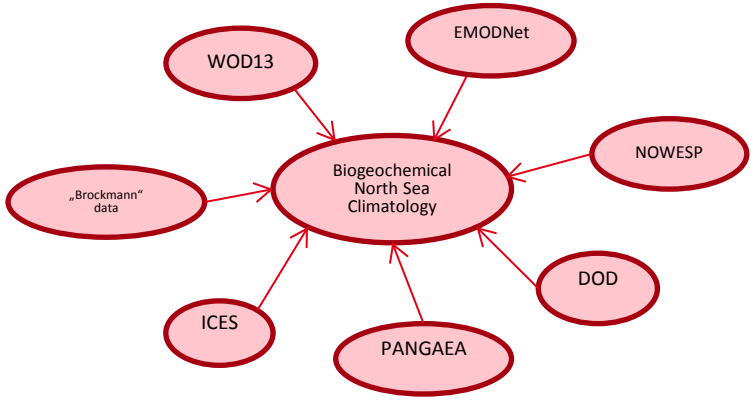
⇒ Unification of data formats

- Observations are likely to occur in more than one data source

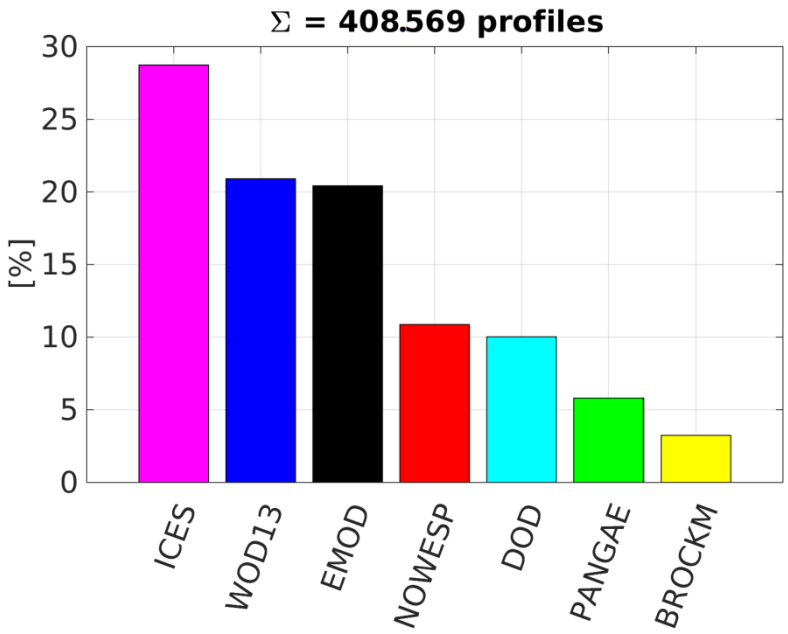
⇒ Elimination of duplicate observations

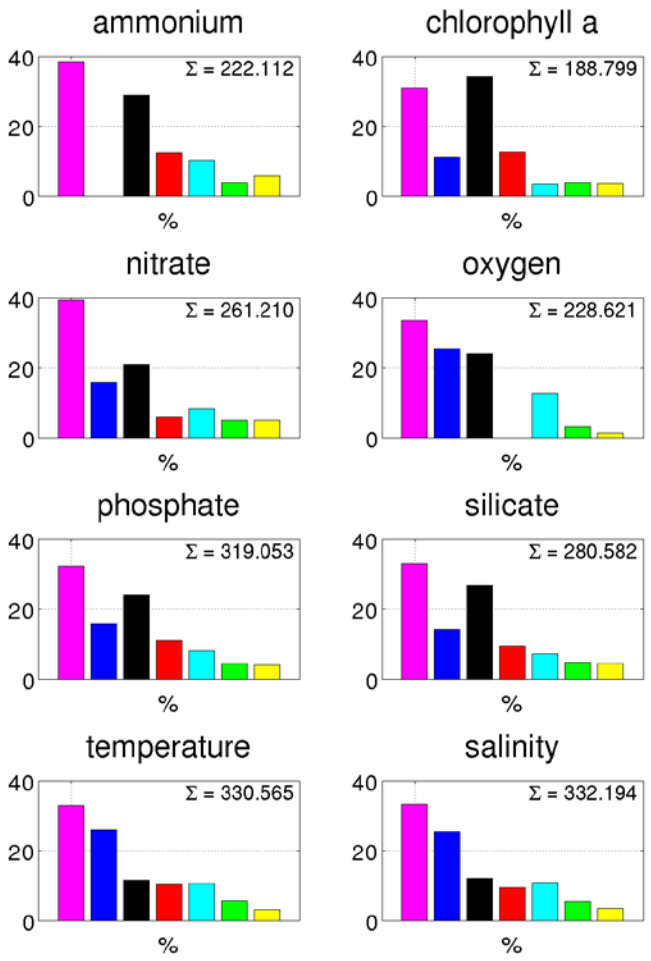
- Observations can be erroneous

⇒ Quality control and flagging

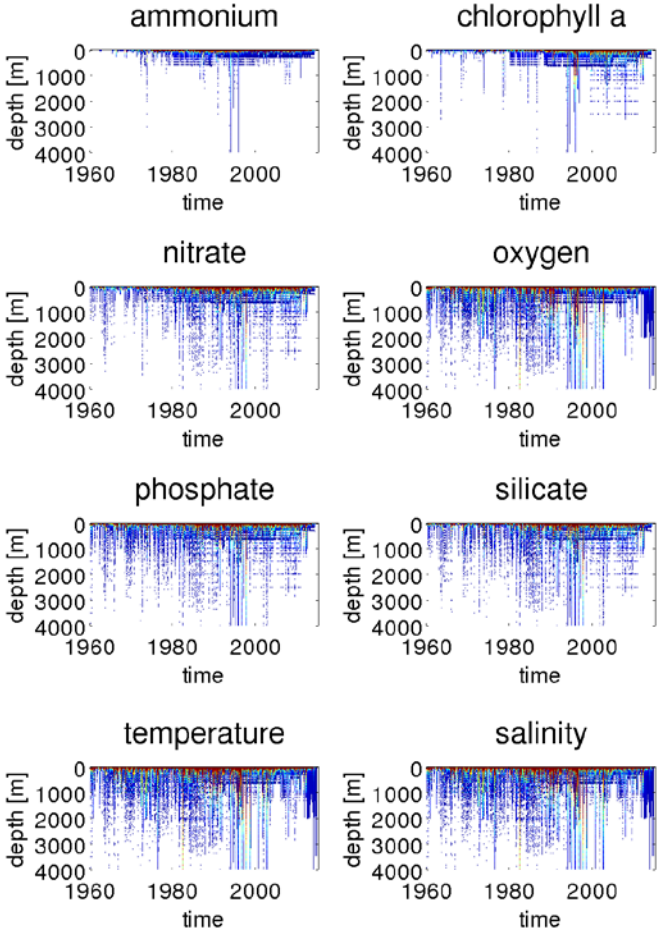


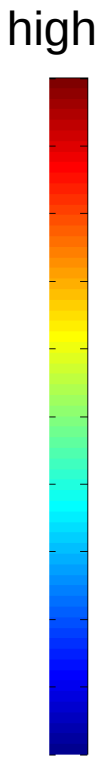
Overview Merged Data Set

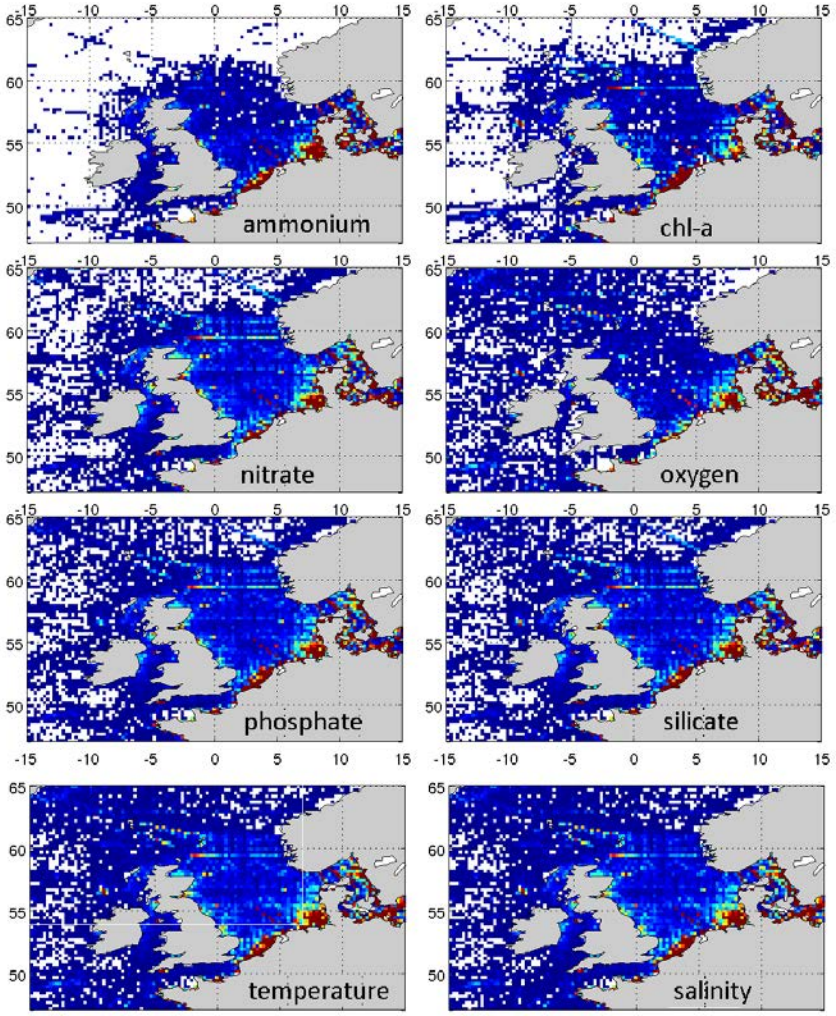




Overview Merged Data Set -data density

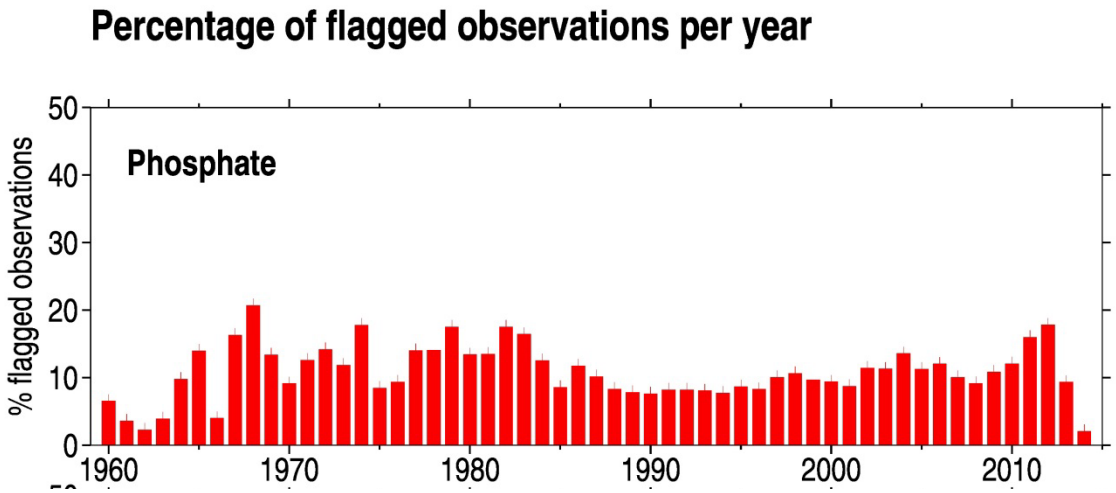






Quality control (QC)

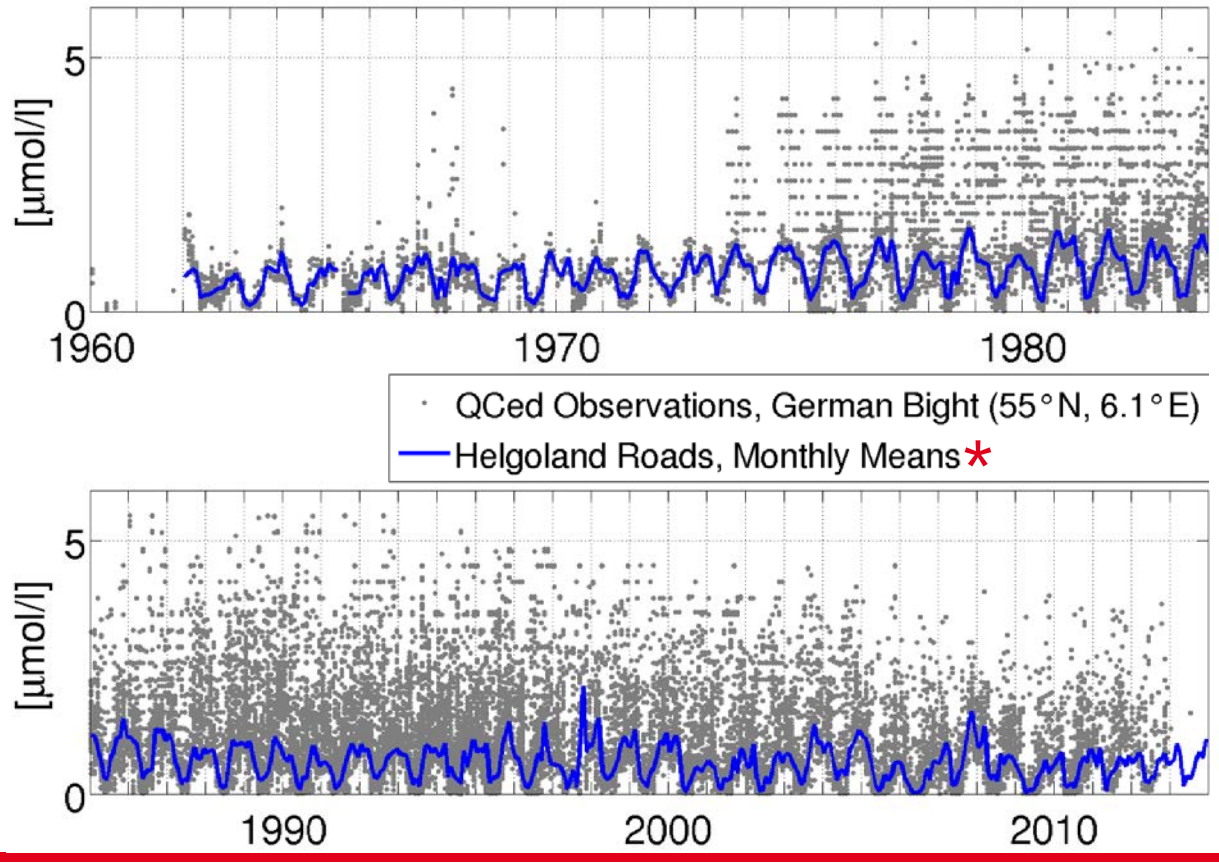
- automatic, objective and tunable
- 9 different quality checks applied to all observations
- Only observations passing all checks are flagged as “good quality“
- Expert quality control in the future



Application of Data Set

Comparison: QCed observations ⇔monthly mean values

Phosphate



* courtesy of Biologische Anstalt Helgoland

Application of Data Set

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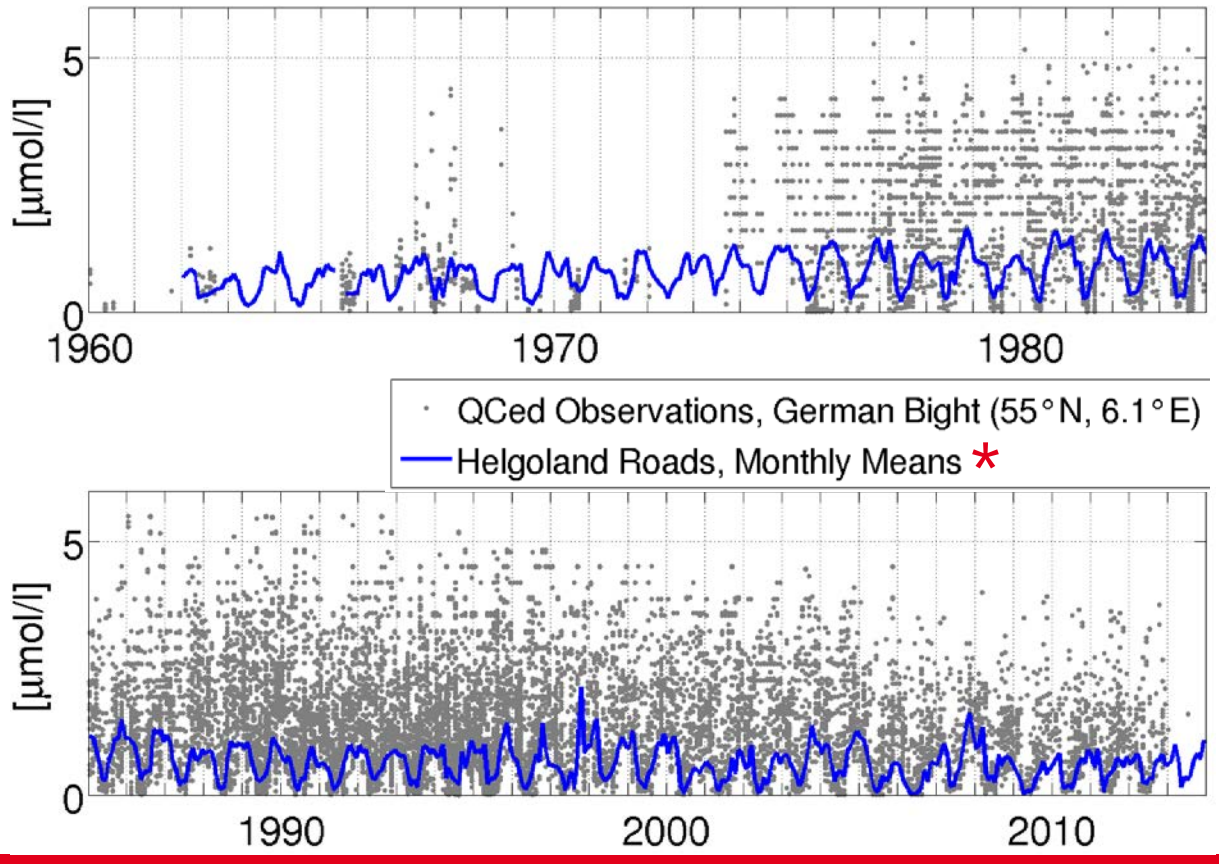
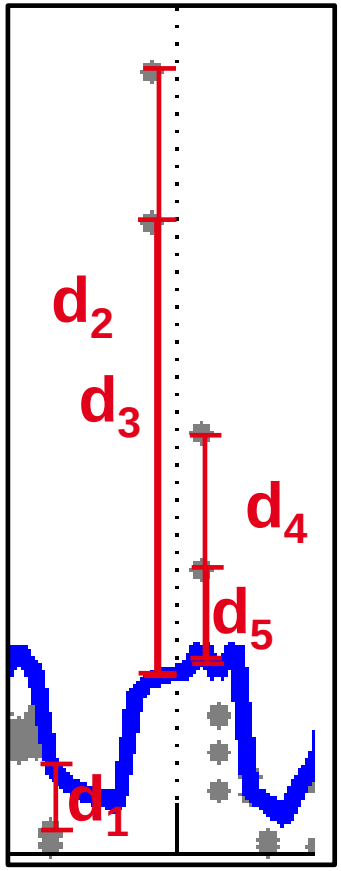


Helgoland Roads observations not included

* courtesy of Biologische Anstalt Helgoland

Application of Data Set

Comparison: QCed observations ⇔monthly mean values



d_x = abs(monthly_mean - observation)

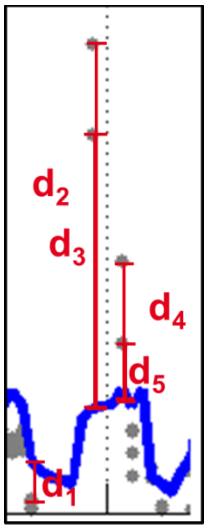
time-averaging of d_x in lat-lon bins

* courtesy of Biologische Anstalt Helgoland

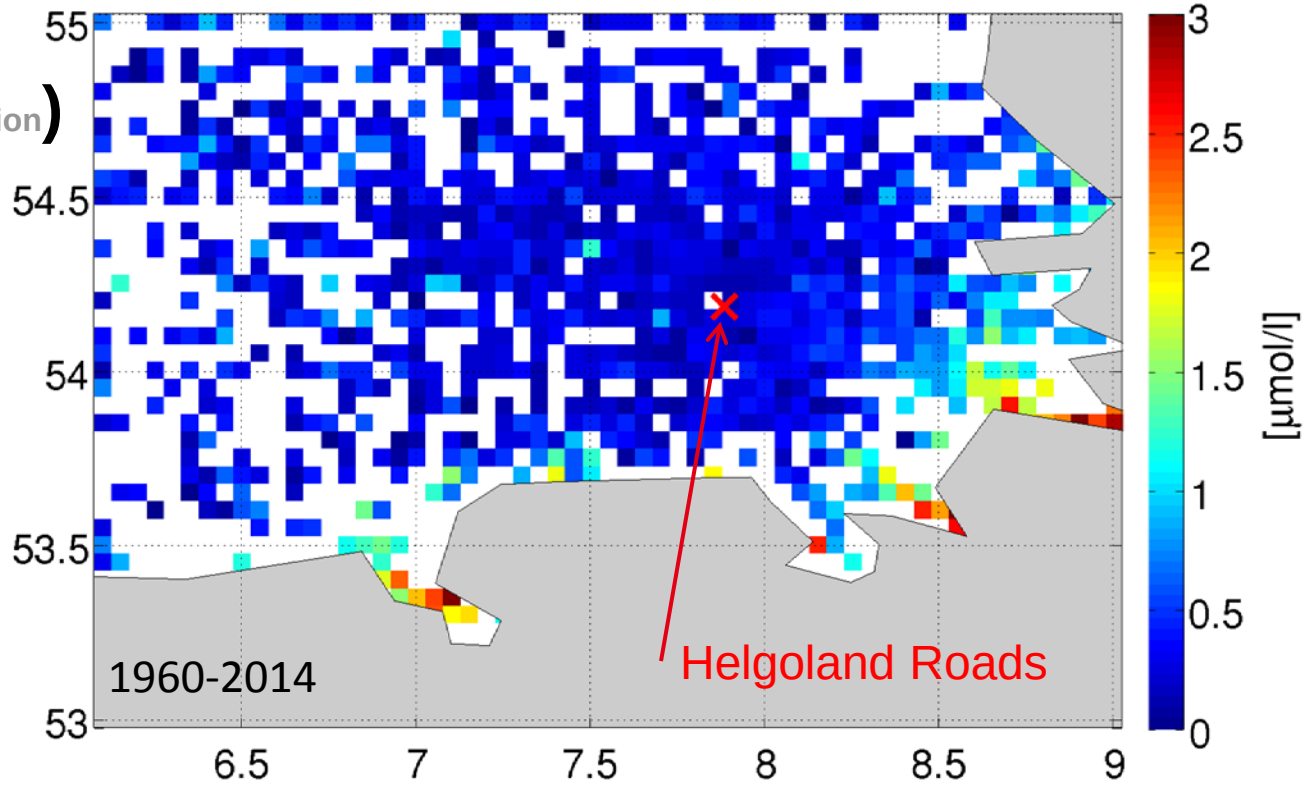
Application of Data Set

Comparison: QCed observations ⇔monthly mean values

d_x = abs(monthly_mean - observation)

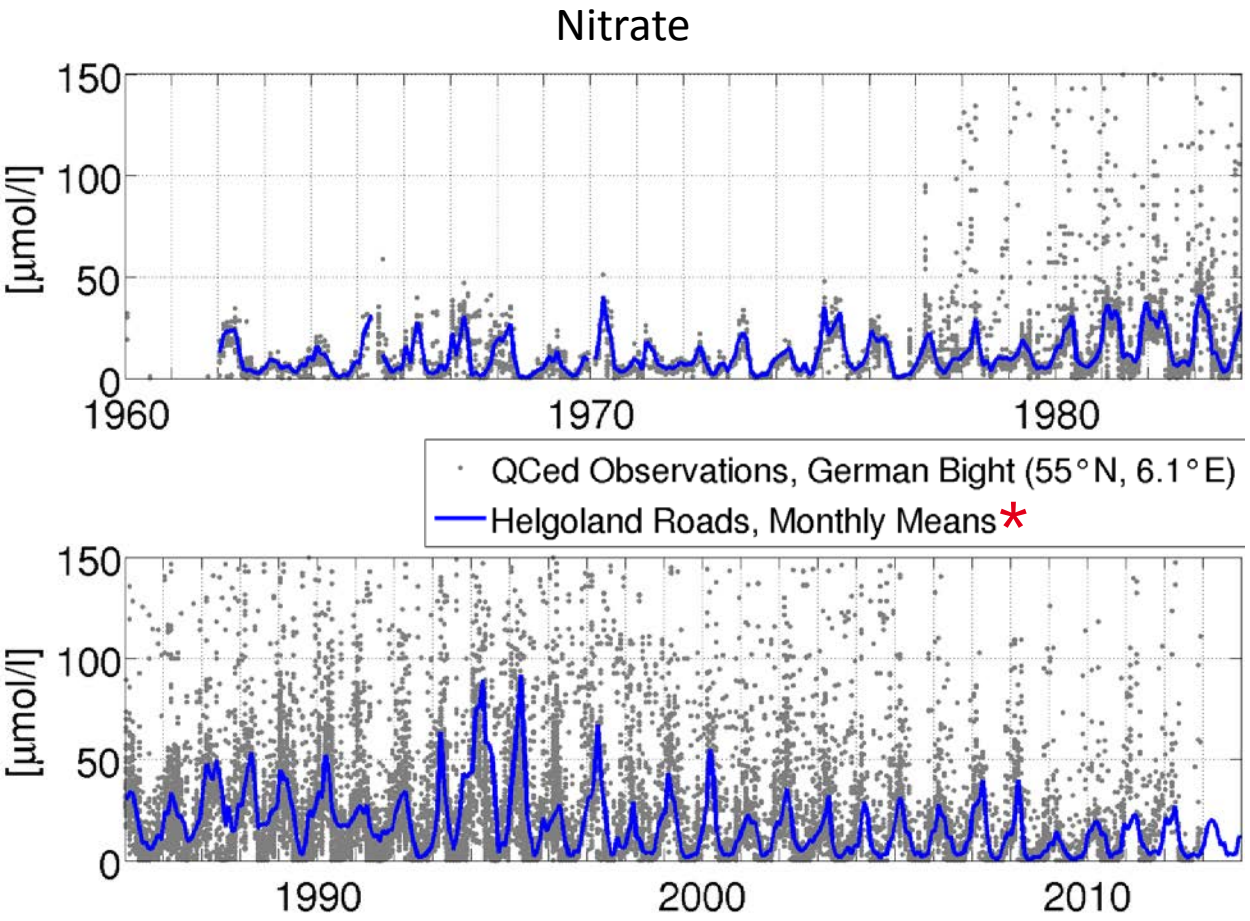


phosphate, time-averaged d_x



Application of Data Set

Comparison: QCed observations ⇔monthly mean values



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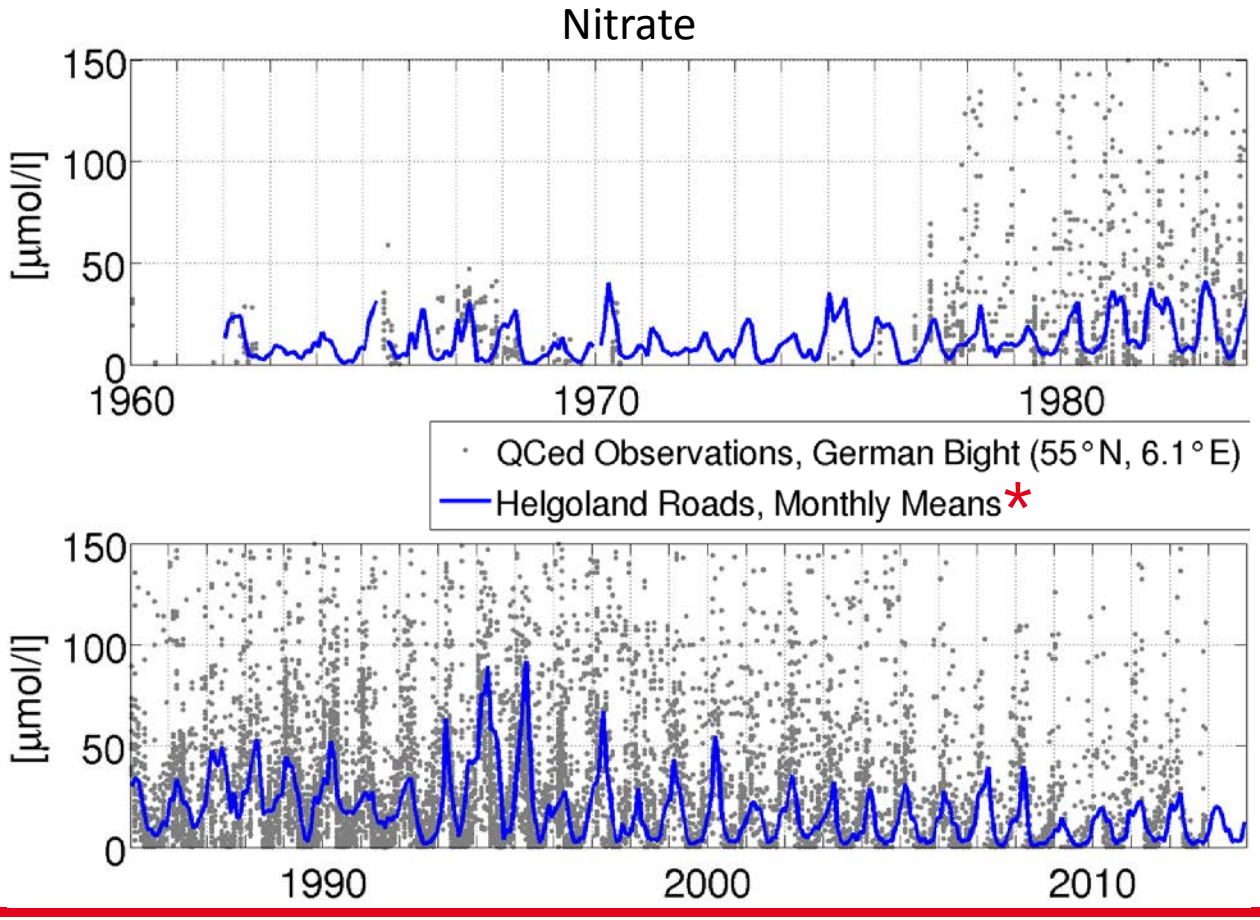
Application of Data Set
Comparison: QCed observations ⇔monthly mean values



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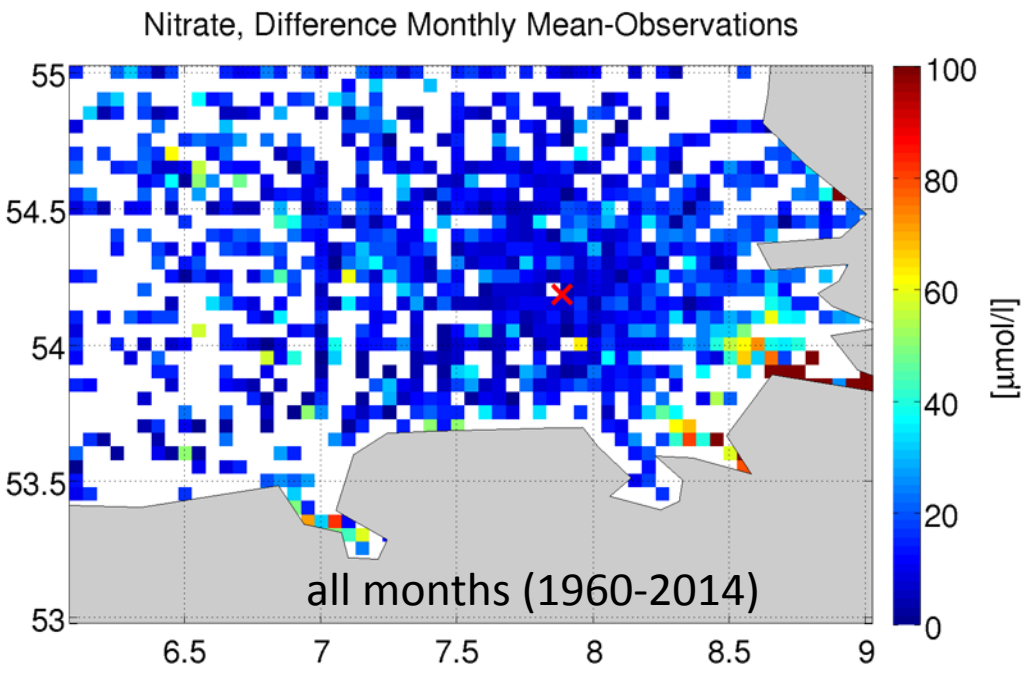
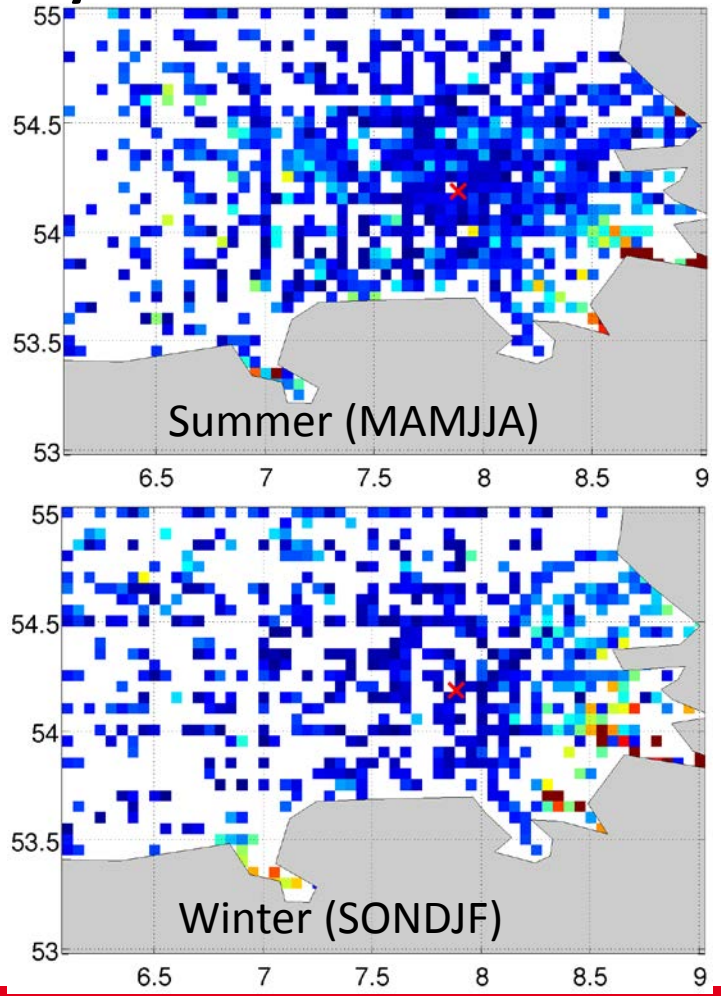
Application of Data Set

Comparison: QCed observations ⇔monthly mean values





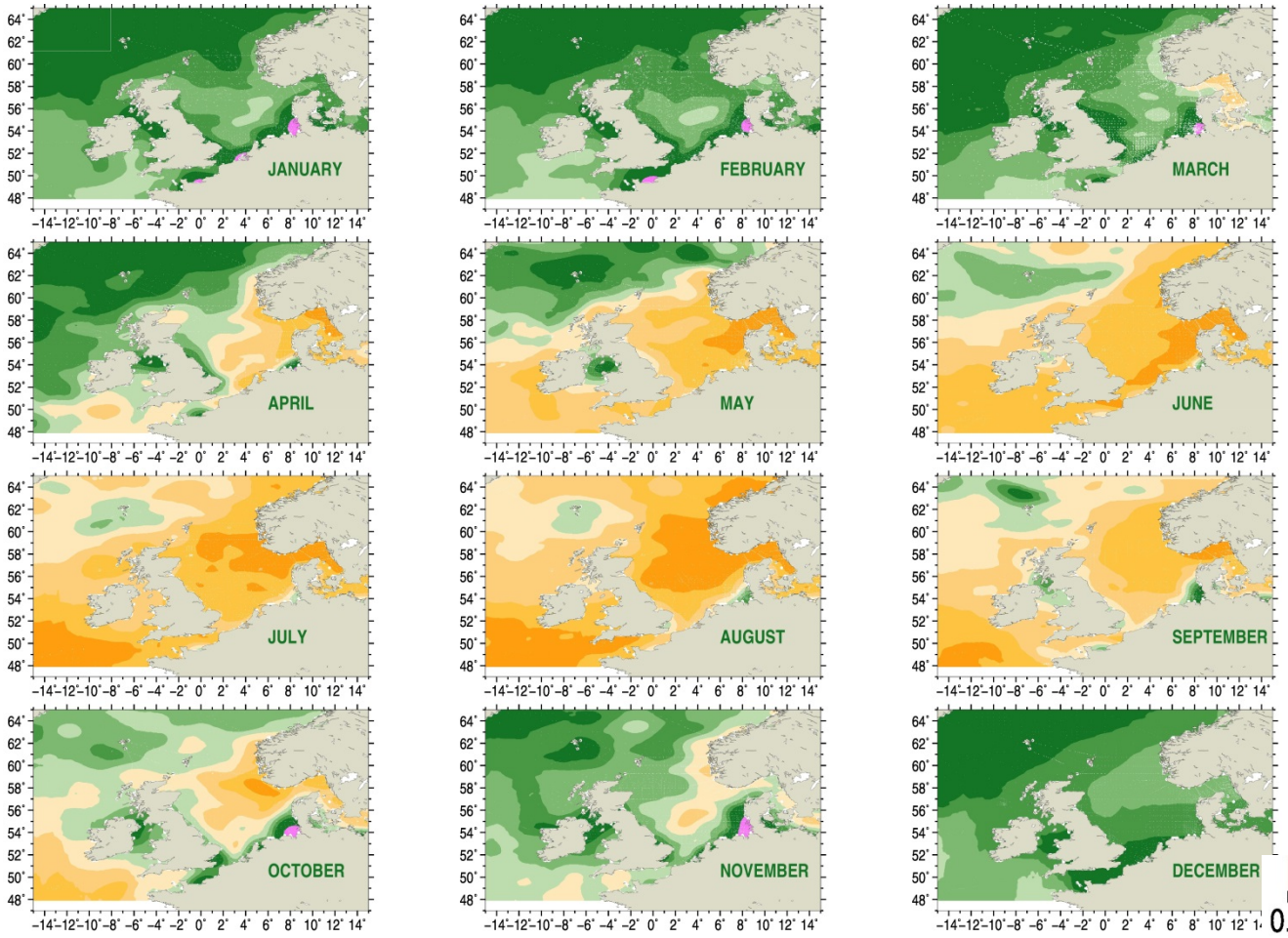
Overview

- Data for 6 different BGC-parameters + temperature and salinity from different sources are

- unified ☑
- merged ☑
- quality controlled (ongoing)
- creation of data products (ongoing)

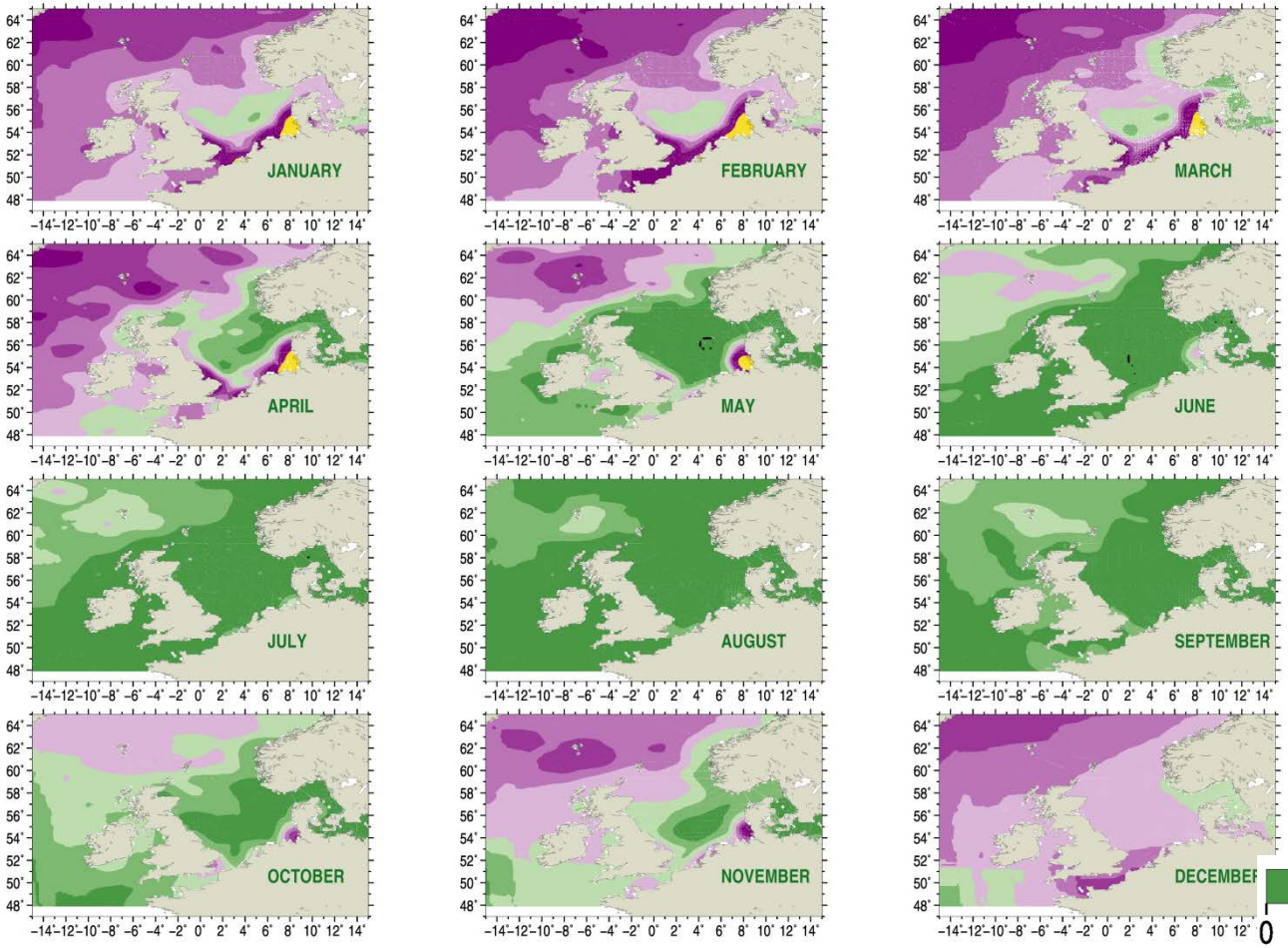
- first application of QCed phosphate data , comparison to Helgoland Road time series

Outlook: data products



Example of a product: Interpolated monthly mean phosphate concentration

Outlook: data products



Example of a product: Interpolated monthly mean nitrate concentration

Contact: iris.hinrichs@uni-hamburg.de

Acknowledgements

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BROCKMANN
Institute of Biogeochemistry and Marine Chemistry, University of Hamburg, Germany

DOD
German Oceanographic Data Centre, BSH

EMODnet
European Marine Observation and Data Network

ICES
International Council for Exploration of the Sea

NOWESP
NOWESP Research Data Base, https://wiki.zmaw.de/ifm/ECOHAM/DATA_NOWESP

PANGAEA
PANGAEA Data Publisher for Earth & Environmental Science
Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research (AWI), Bremerhaven, Germany

WOD13
Boyer, T.P., J. I. Antonov, O. K. Baranova, C. Coleman, H. E. Garcia, A. Grodsky, D. R. Johnson, R. A. Locarnini, A. V. Mishonov, T.D. O'Brien, C.R. Paver, J.R. Reagan, D. Seidov, I. V. Smolyar, and M. M. Zweng, 2013: World Ocean Database 2013, NOAA Atlas NESDIS 72, S. Levitus, Ed., A. Mishonov, Technical Ed.; Silver Spring, MD, 209 pp., http://doi.org/10.7289/V5NZ85MT