Ferry Box Systems in Coastal and Shelf Seas: an overview

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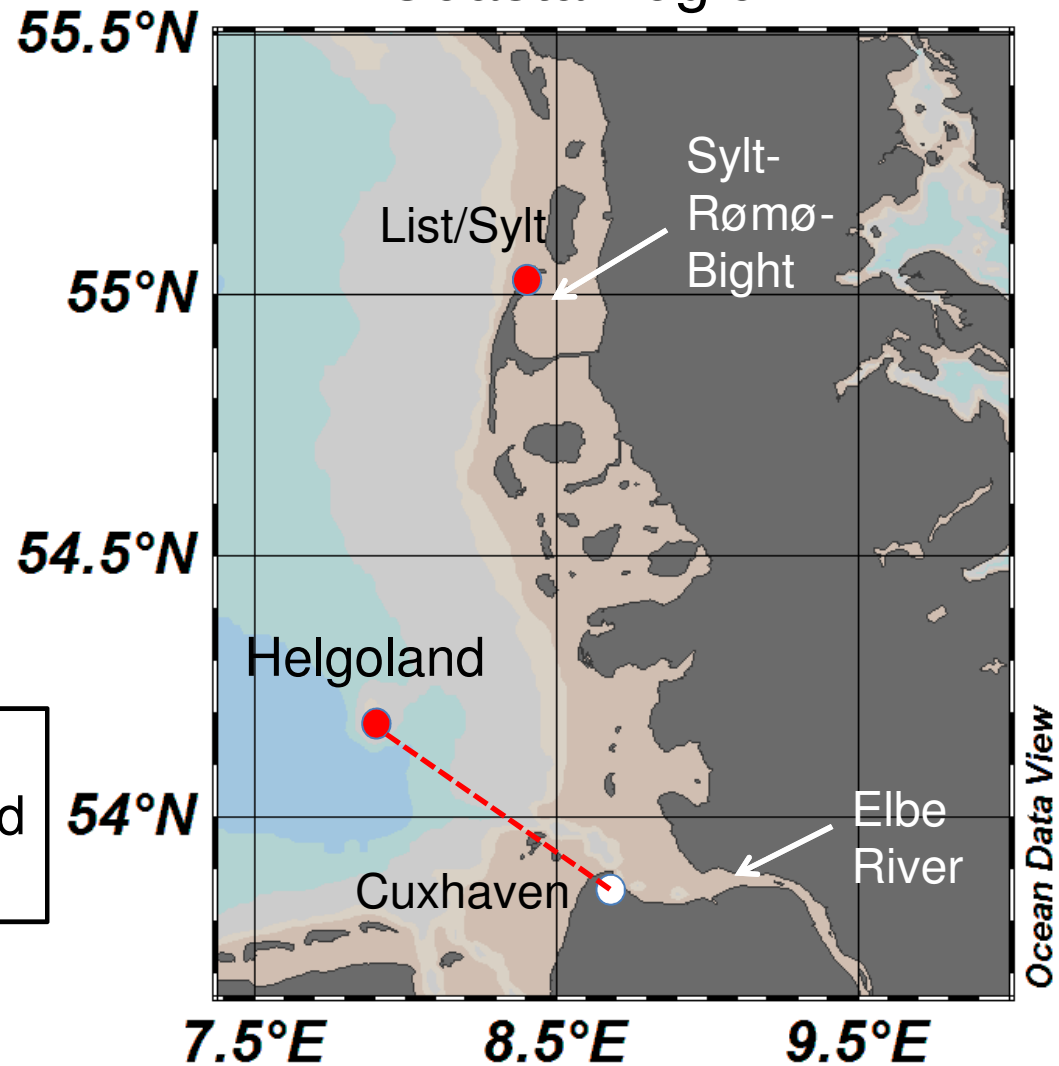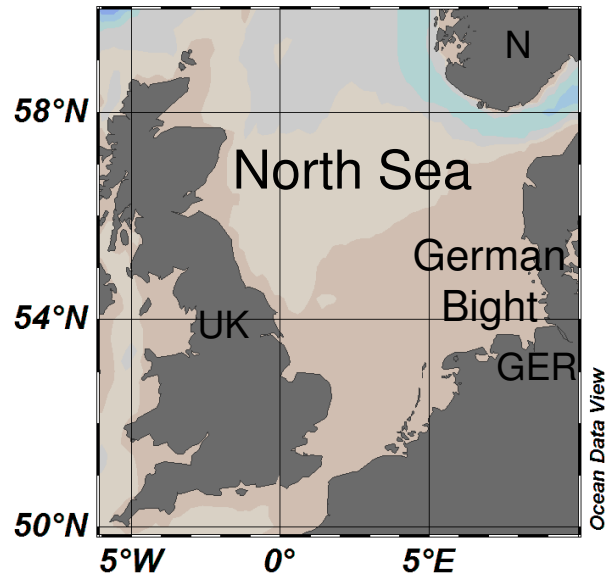7th Ferry Box Workshop, Heraklion/Crete, 7.4.2016

Outline

- Areas of application

- Set up of systems

- Ferry Box Data time series

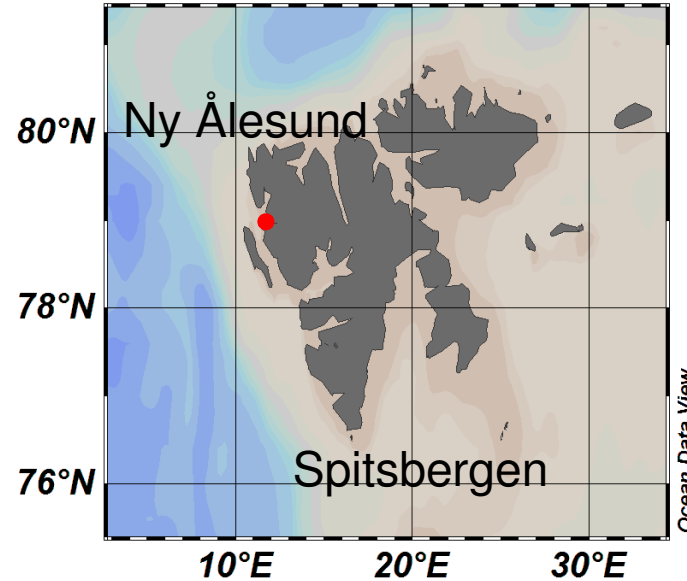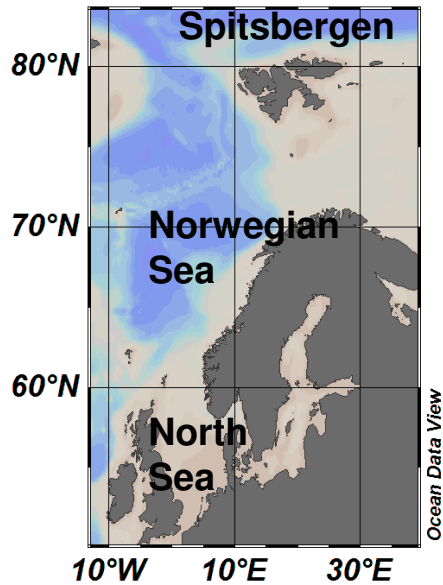- Work in progress

Marine observatories (FerryBoxes)

AWI Coastal Research Sites:
- Biologische Anstalt Helgoland
- Wadden Sea Station Sylt

Marine observatories (FerryBoxes)

AWIPEV
Arctic Research Base
Ny Ålesund

Ferry Boxes in use - overview

- AWI Research vessel Mya II (home port List/Sylt)
- Installation of a FB System in 2013
- Research area: Sylt-Rømø-Bight, adjoining sea area

- MS Helgoland (new passenger ship, Dec 2015)
- Installation of a FB System in 2015
- Transect Cuxhaven-Helgoland-Cuxhaven (daily)

- Helgoland Einlaufbauwerk (54°11'3''N, 7°54'0''E)
- Installation of a stationary FB System in 2005
- Research area: Helgoland area

- AWIPEV base Ny Ålesund, Spitsbergen, Norway
- Installation of a stationary FB System in July 2012 (in cooperation with HZG, in the framework of COSYNA)
- Research area: Kongsfjord

Background of application

- Monitoring of the marine system

- Analysis of physical and biological processes on different temporal and spatial scales

- Improvement of the interpretation of existing time series

- Calibration/validation of models

- Testing new technologies (data transfer, data monitoring)

- Use as reference station (FB Helgoland) for testing devices (e.g. probes after calibration)
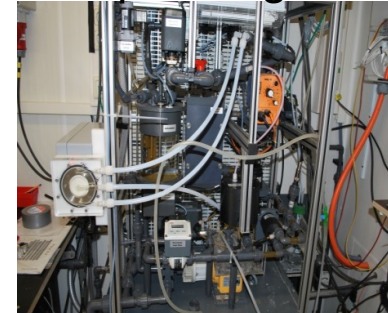
Measuring parameters

Helgoland   MS Helgoland   Spitsbergen   Mya II

Parameter	device	unit	Helgoland	MS Helgoland	Spitsbergen	Mya II (Sylt)
Temperature	SBE38	°C	X	X	X	X
Oxygen	Optode 4835	mg/l, %	X	X	X	X
Salinity, Conductivity	TSNH 2434, SBE45	- , mS/cm	X	X	X	X
pH	EGA 140	-	X	X	X	X
Chlorophyll a	Fluorometer	µg/l	X		X	
Turbidity	Fluorometer	FTU	X		X	
dissolved CO_2	HydroC CO_2 FT		X		X	X
Nitrate	Micromac 1000	ppb (µmol/l)	X			
Nitrite	Micromac 1000	ppb (µmol/l)	X			
Silicate	Micromac 1000	ppb (µmol/l)	X			
Phosphate	Micromac 1000	ppb (µmol/l)	X			
Ammonia	Micromac 1000	ppb (µmol/l)	X			
Total Chl a	AOA	µg/l	X	X		
Green Algae Chl a	AOA	µg/l	X	X		
Cyanobacteria Chl a	AOA	µg/l	X	X		
Diatoms Chl a	AOA	µg/l	X	X		
Cryptophyceae Chl a	AOA	µg/l	X	X		
Yellow Substances	AOA	-	X	X		
Depth		m	2-4	3	11	1-2

Flow diagram stationary FB on Helgoland
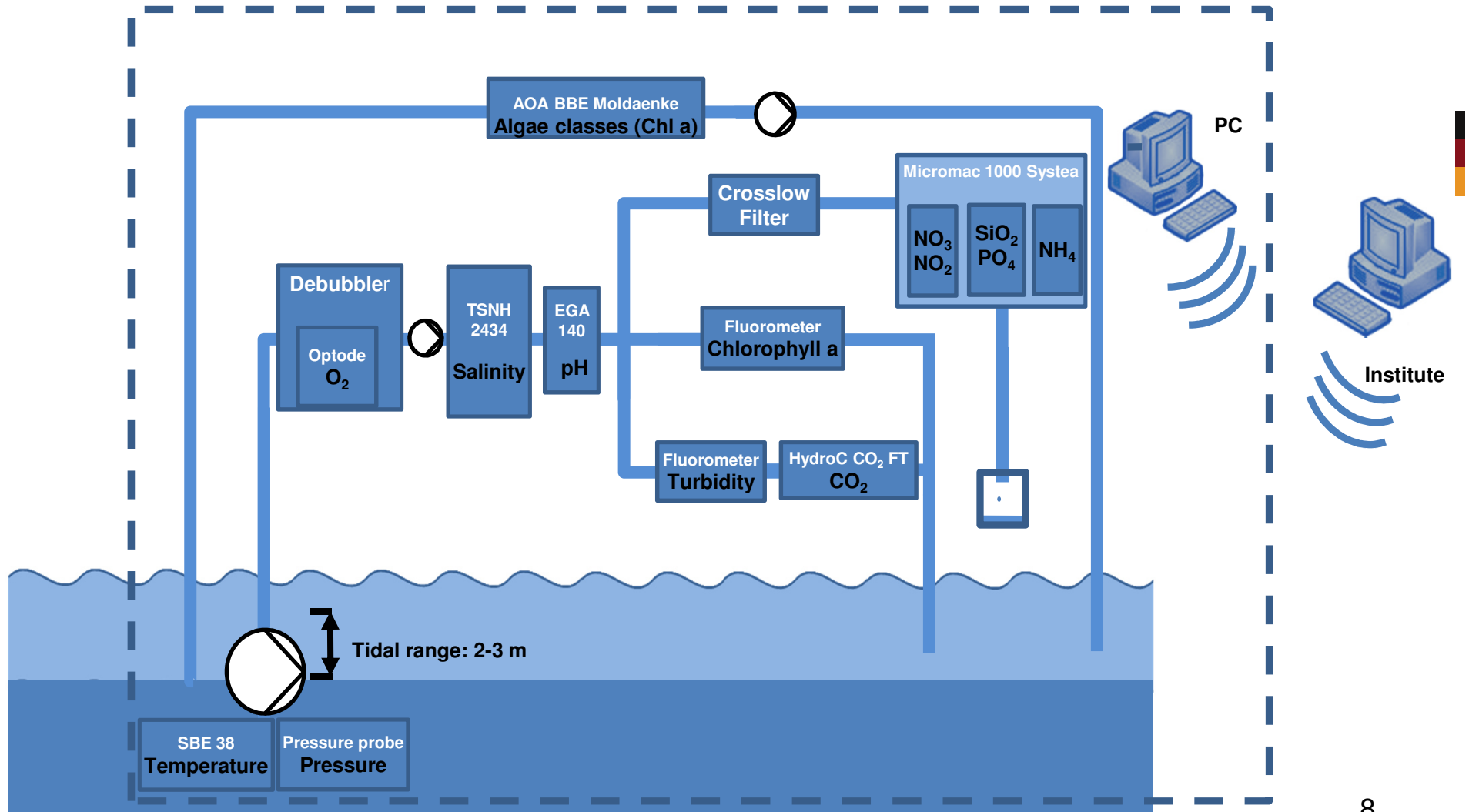
Long-term monitoring at Helgoland
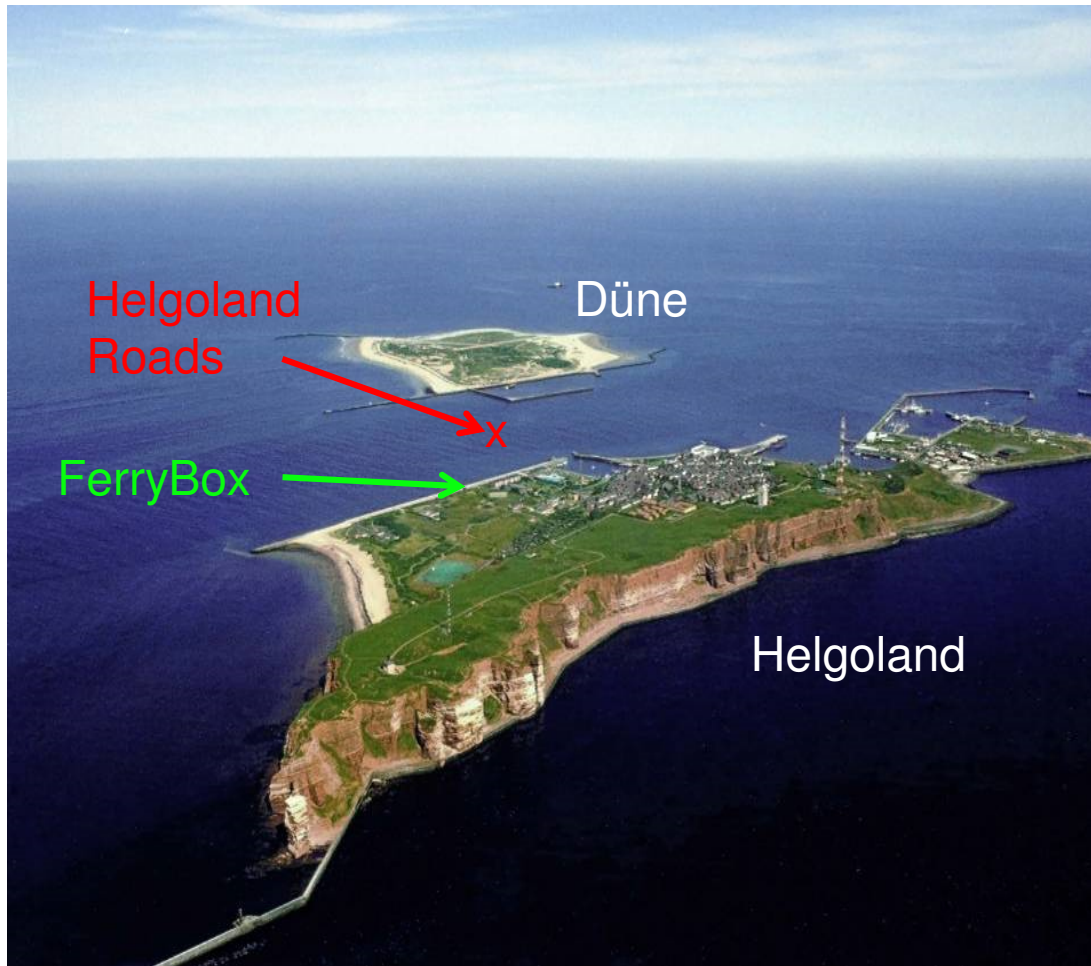

Photo https://de.wikipedia.org/wiki/Helgoland

Helgoland Roads (HR)
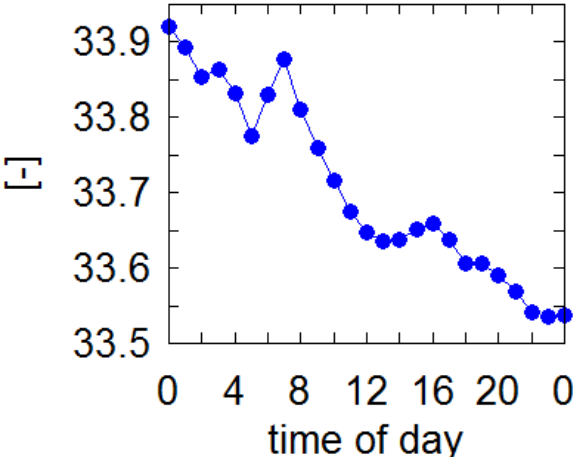Monitoring program of the Biologische Anstalt Helgoland (BAH), (work-daily) surface sampling since 1962
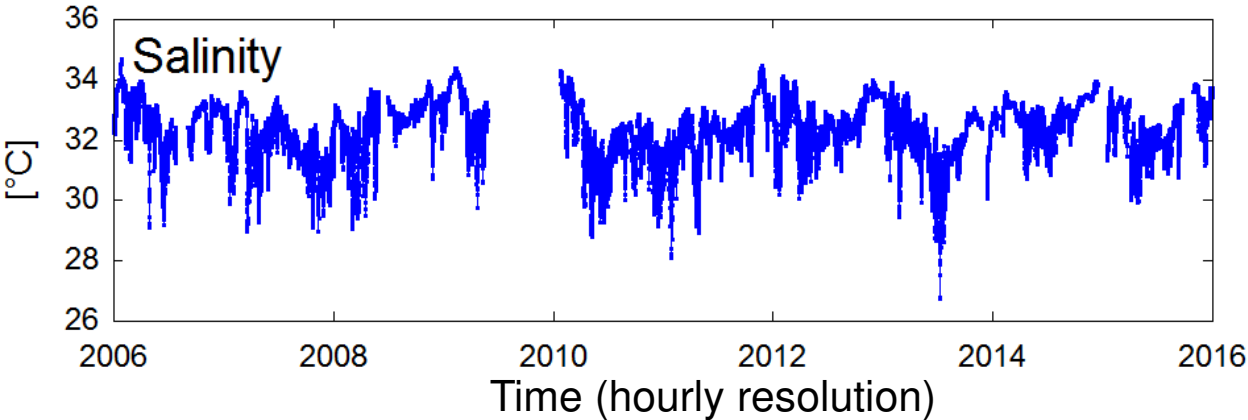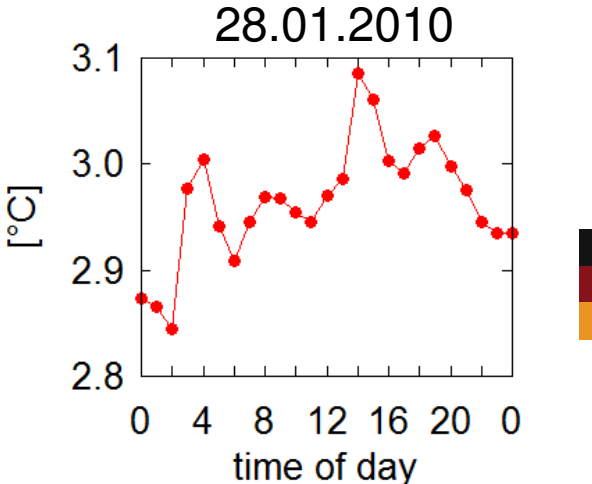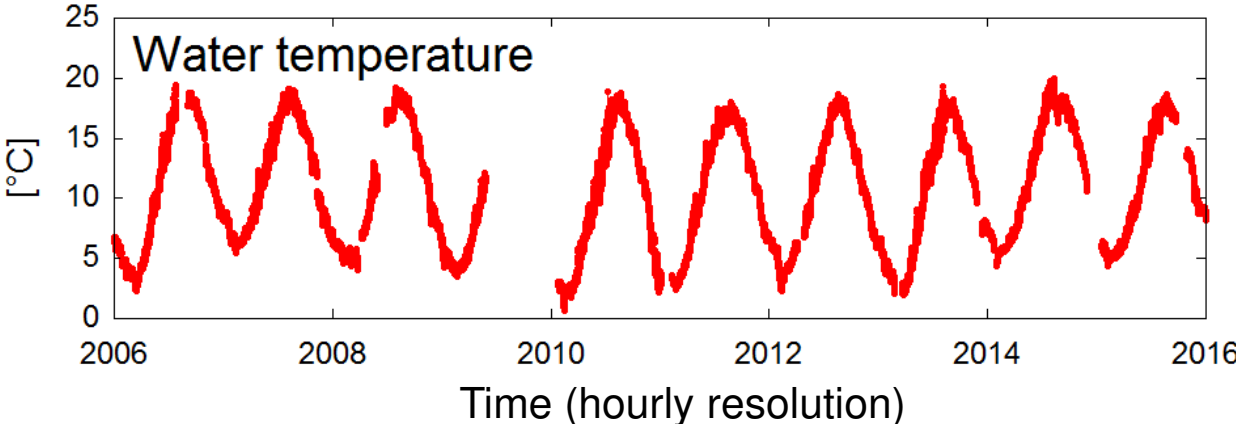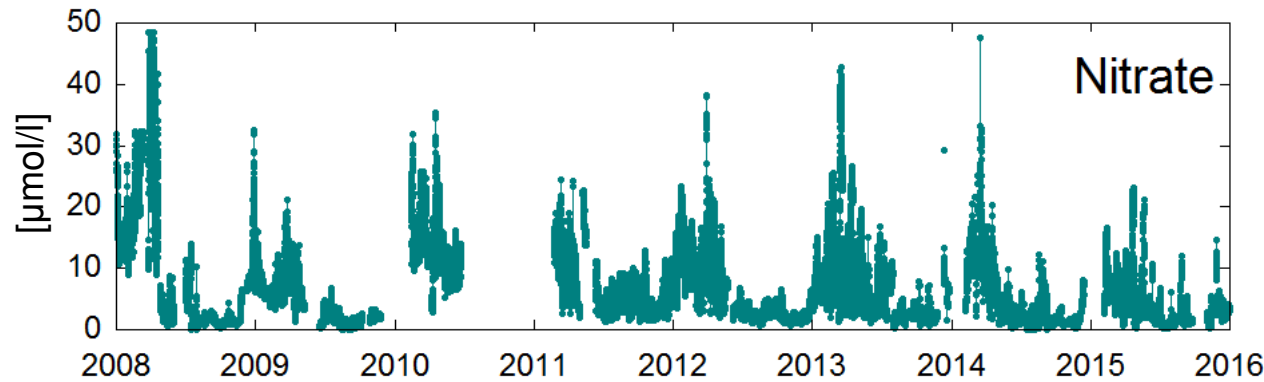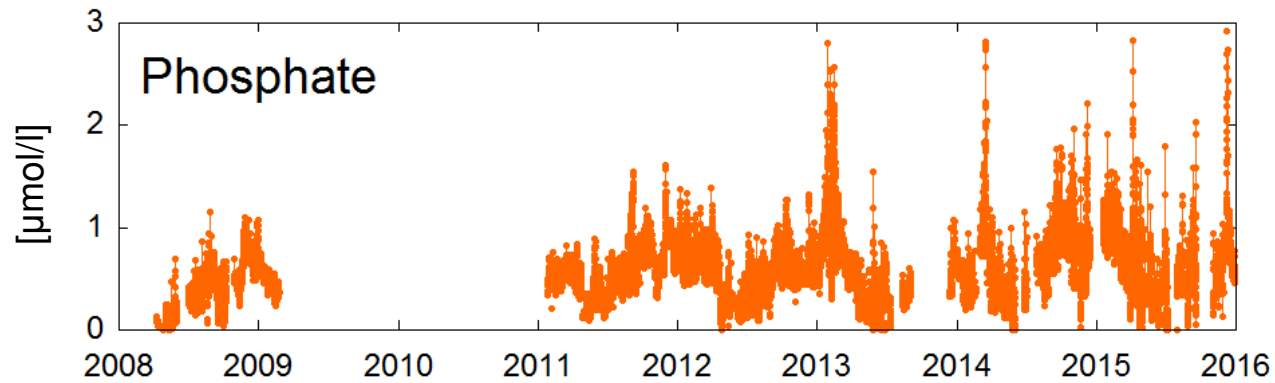
FerryBox Helgoland (FB)
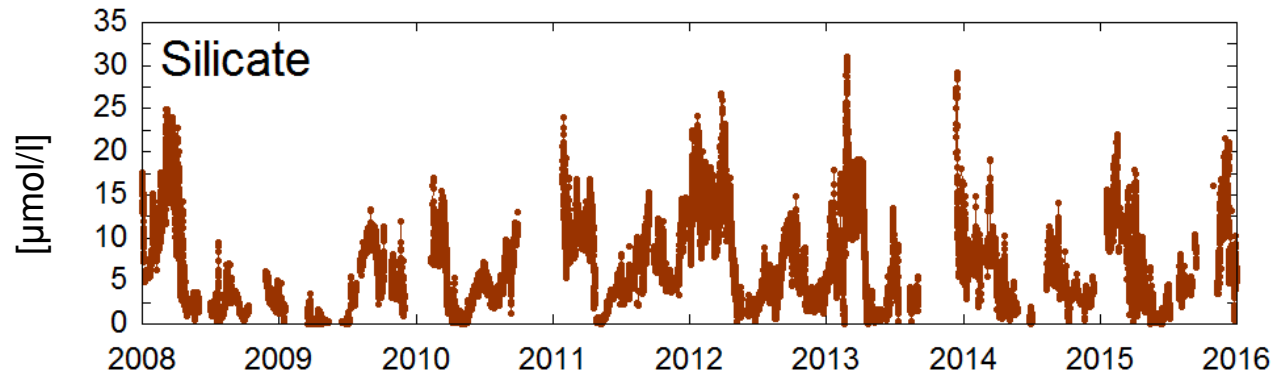("Einlaufbollwerk")
Quasi-continuous monitoring since 2006
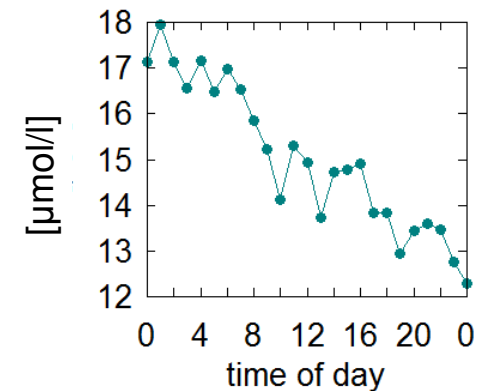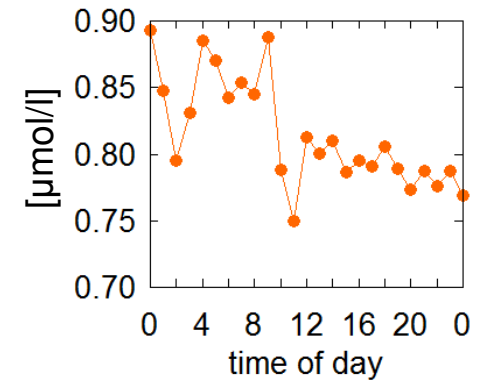
Long-term monitoring: FB Helgoland

High seasonal amplitudes in the Helgoland area (German Bight)
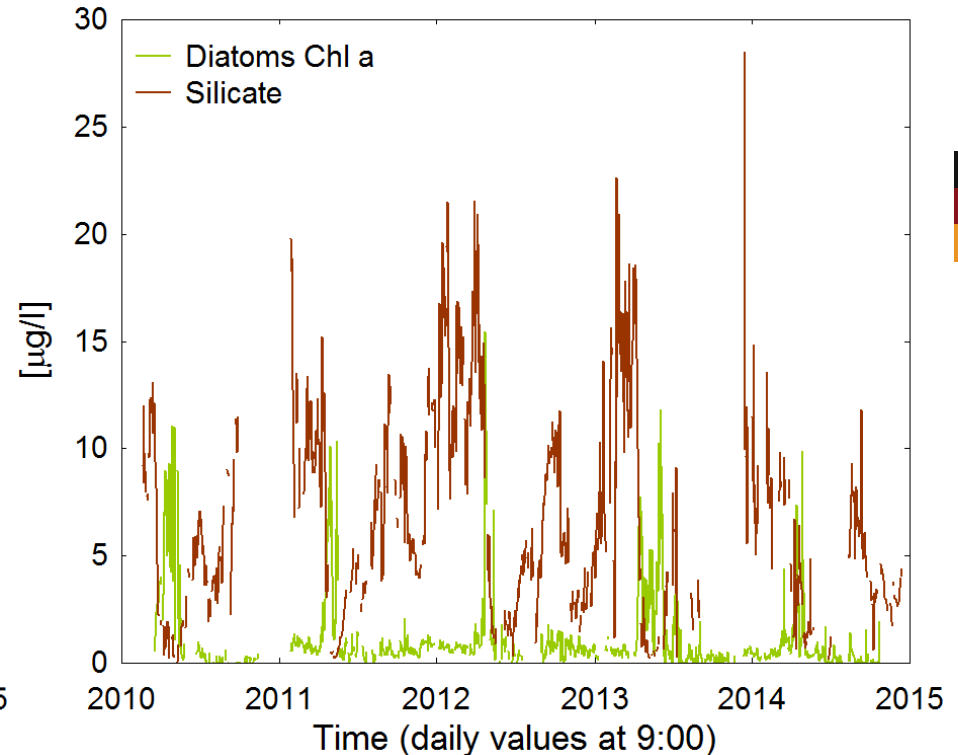
Intraday variation 10

Nutrients – FB Helgoland
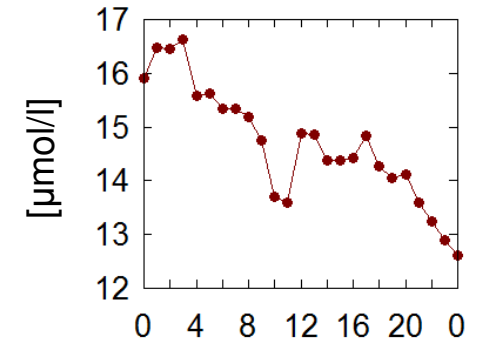
Chlorophyll a – FB Helgoland
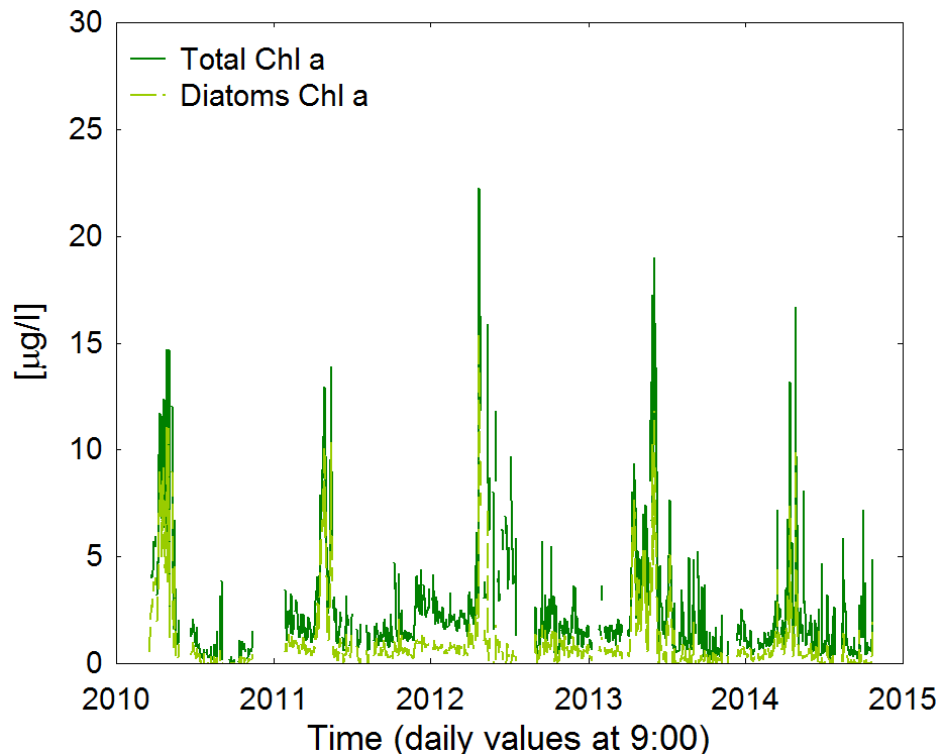
Annual course chlorophyll a:
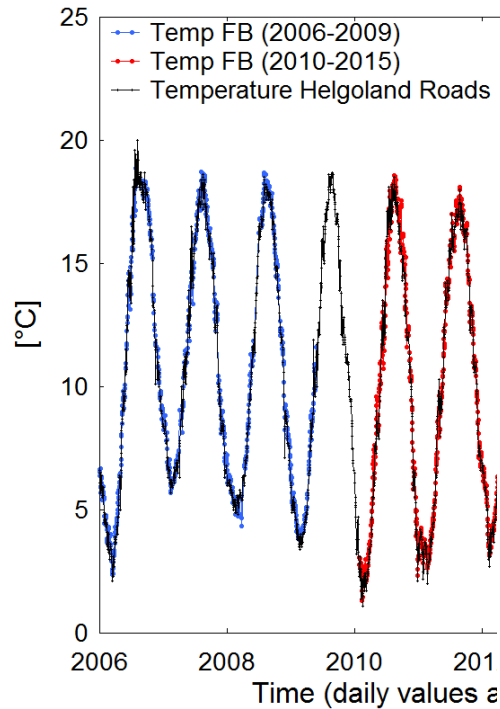Varying phytoplankton composition

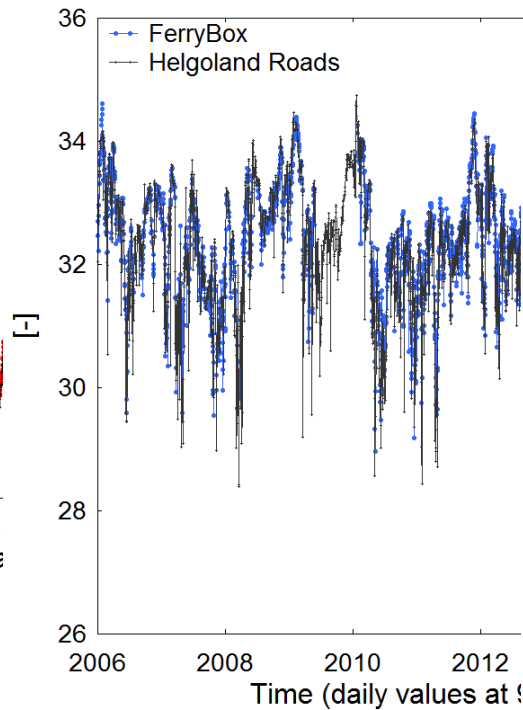Nutrient depletion:
Silicate uptake by diatoms
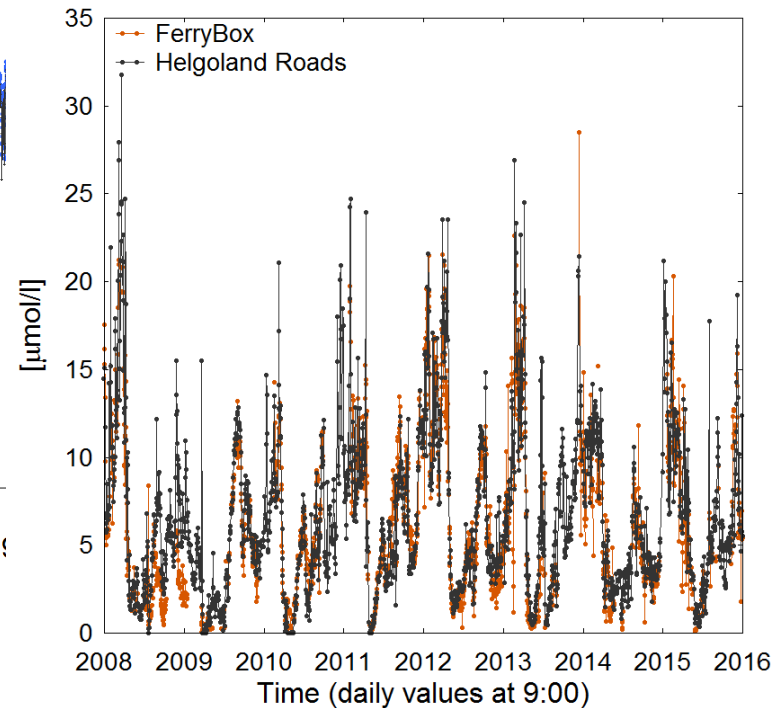
Consistency check: FB and HR

Comparison Water temperature
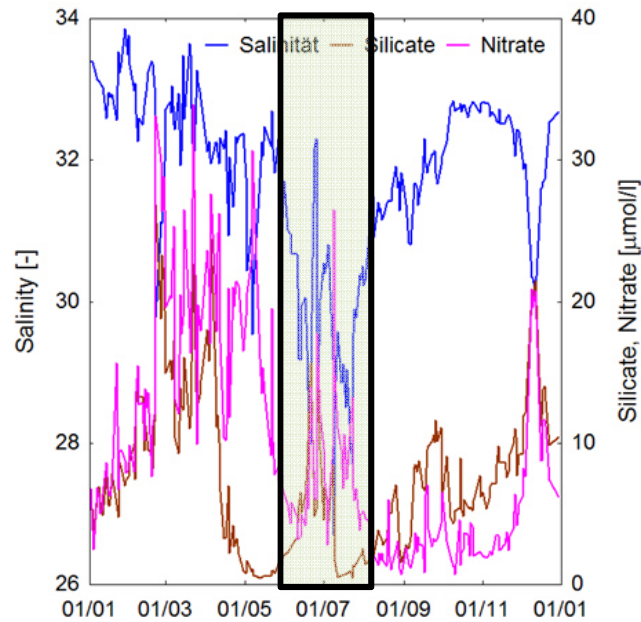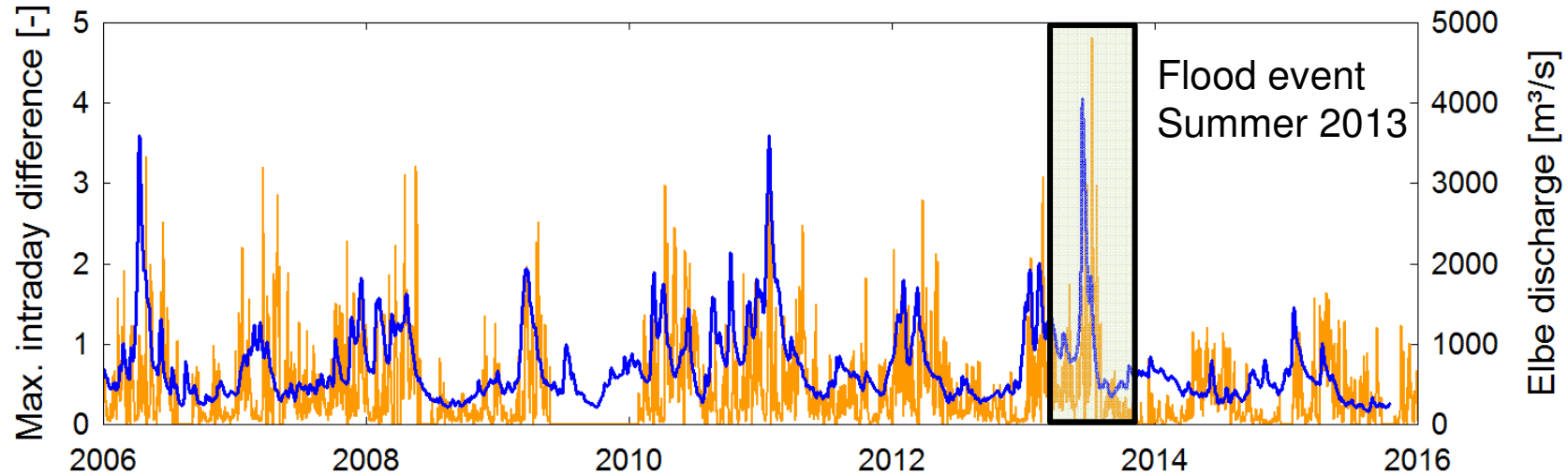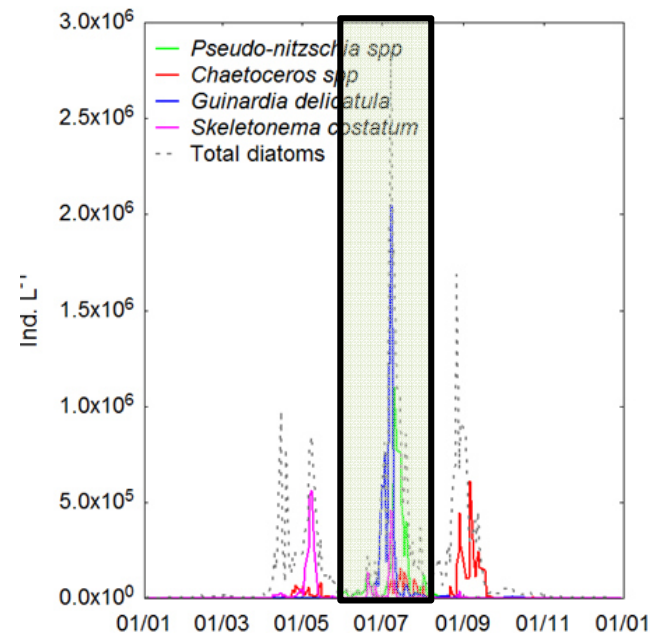
Comparison Salinity

Comparison Silicate

No significant differences in the mean,
(daily) differences are normally distributed around zero
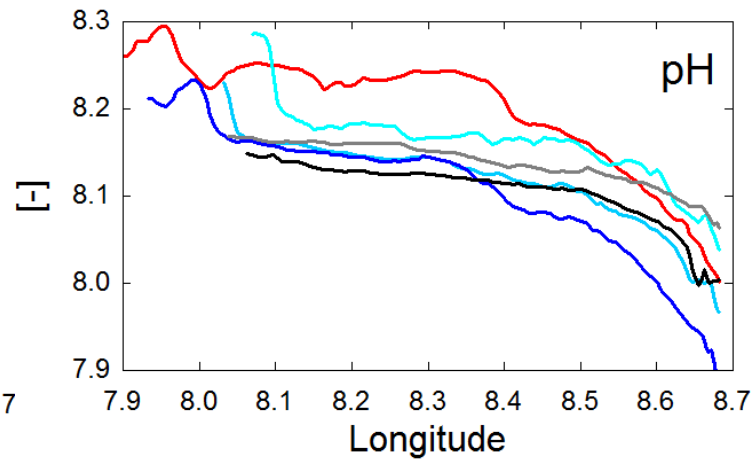
13

Hydrographic variation – Elbe impact
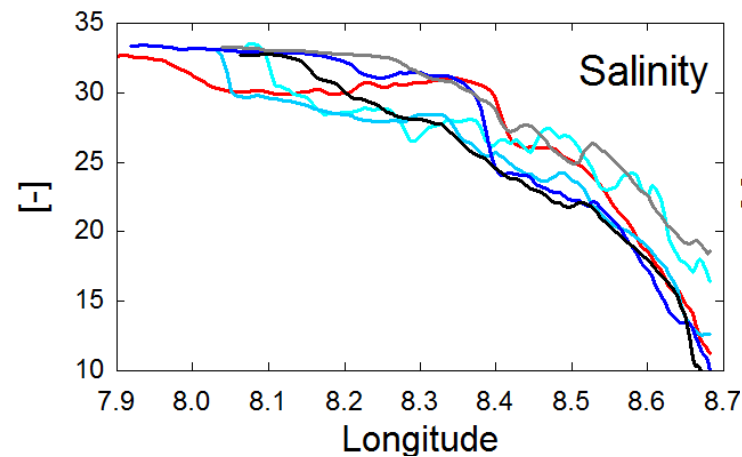

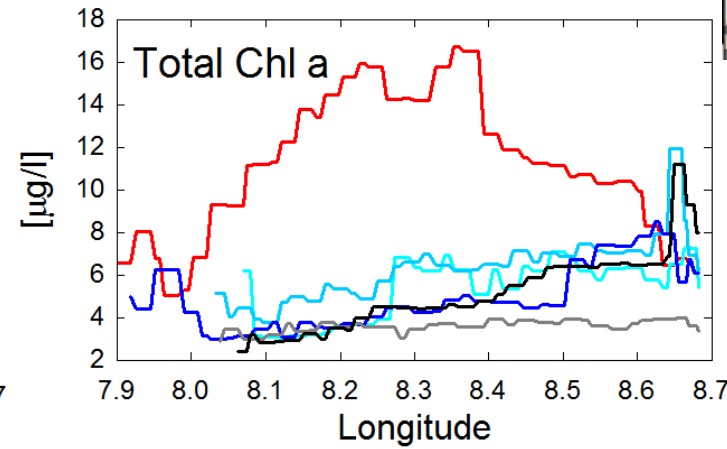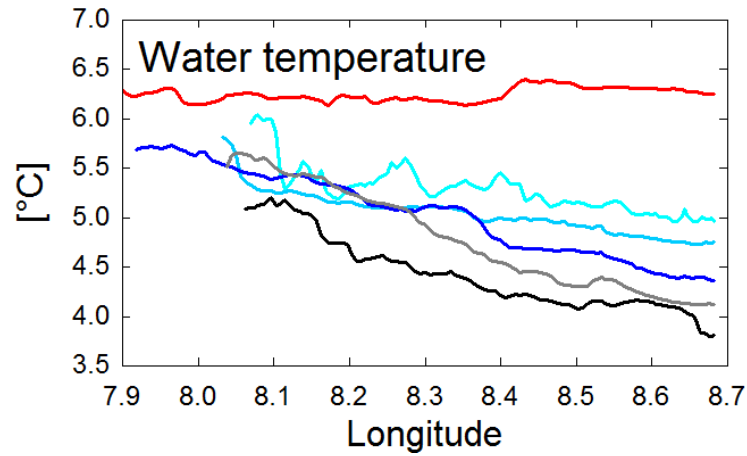Flood event
Summer 2013

year 2013

year 2013

MS Helgoland

Coastal gradients (time resolution 1 min)
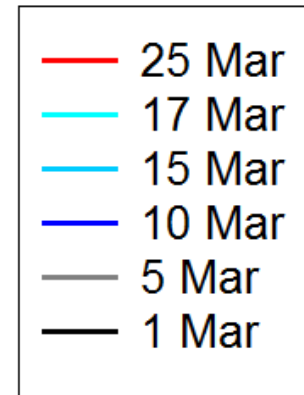
Ny Ålesund/Kongsfjord
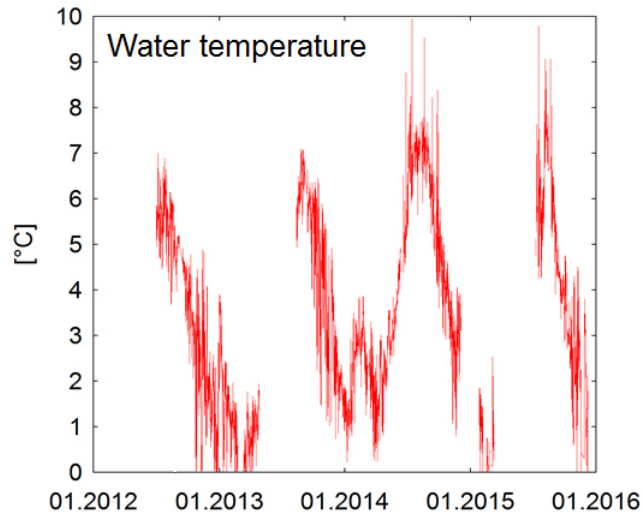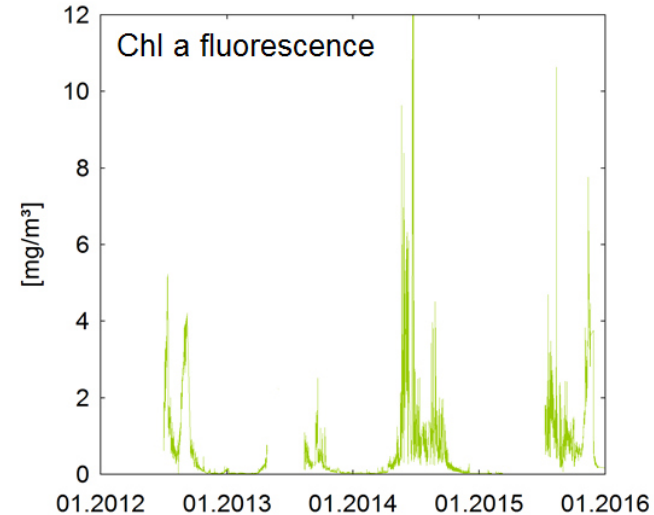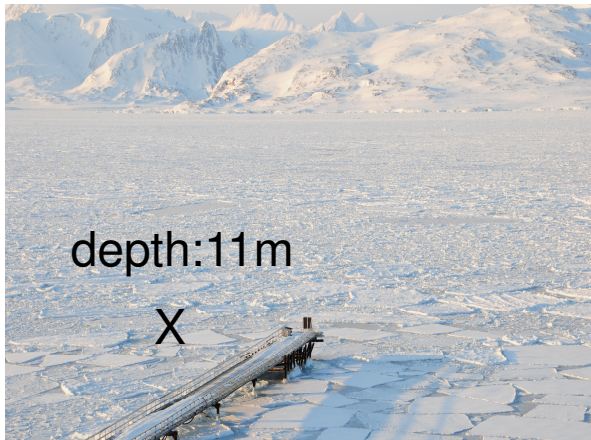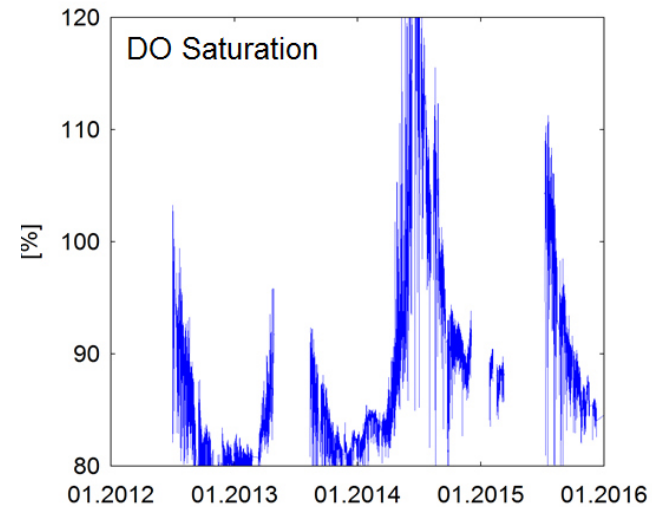
Control checks: example FB Helgoland

Efforts for quality control and reduction of downtimes:

- Weekly control by parallel measurements (additional water samples – inlet/within cycle)

- Inspection of pumps / pump tubes (weather dependent)

- Ongoing visual inspection of data

- Continuous documentation of technical faults / reasons for downtimes (interpretation of past changes)

Ongoing work: data assessment

- Reaching a higher level of automatization with regard to data transfer (NRT data base) and steps for data quality control

- Implementation of knowledge about the data / experience in data analysis in a software based process, linking of data and their calibration history (ID)

- **To reduce human supervision in data assessments and to provide scientifically correct online (sensor) data including precision (uncertainty) information in accessible databases.**

Ongoing work …

- Coupling hydro-climatic simulations with time series of intra-day variation (e.g. Wt, Sal, Chl a), analysis of response lags

- Variability of physical amplitudes on varying time scales and at different locations

- Plankton succession: spring nutrient depletion pattern

- pH variability in coastal areas

Thank you for your attention!