

The benefit of algae class differentiation to get information about the in-situ algae class composition in open waters

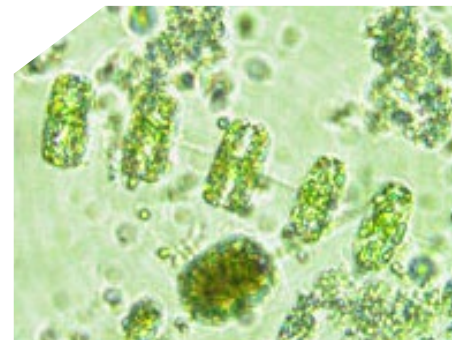
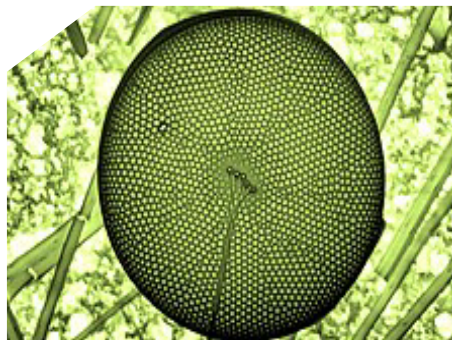
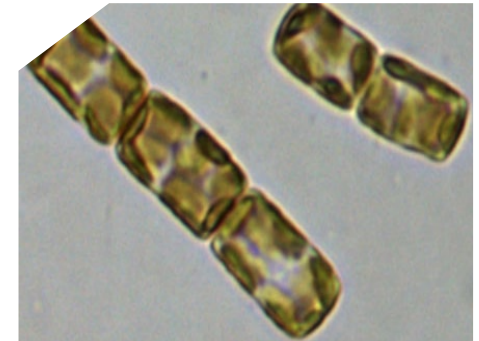
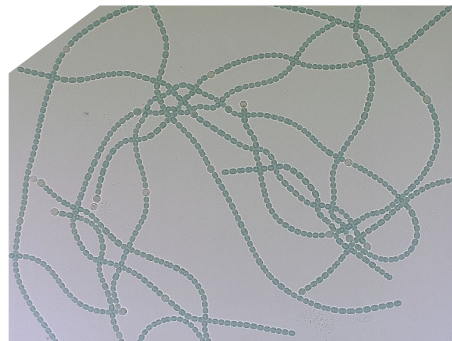
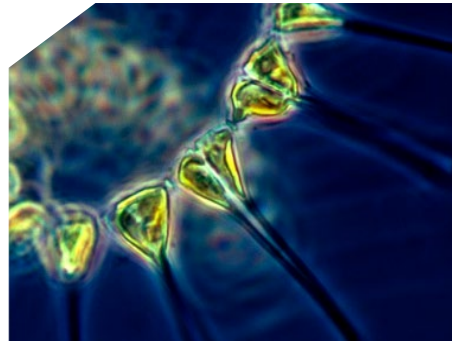
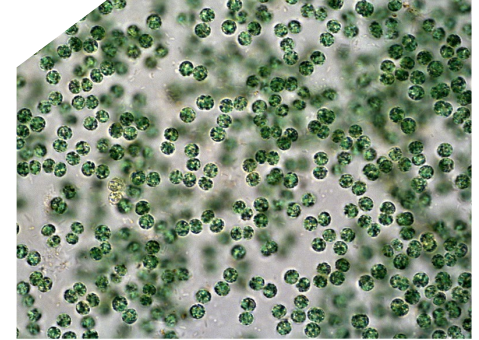
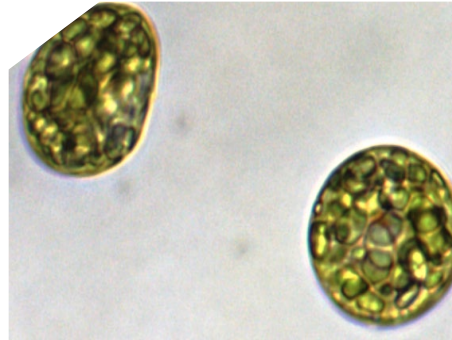
Tobias Boehme

Agenda

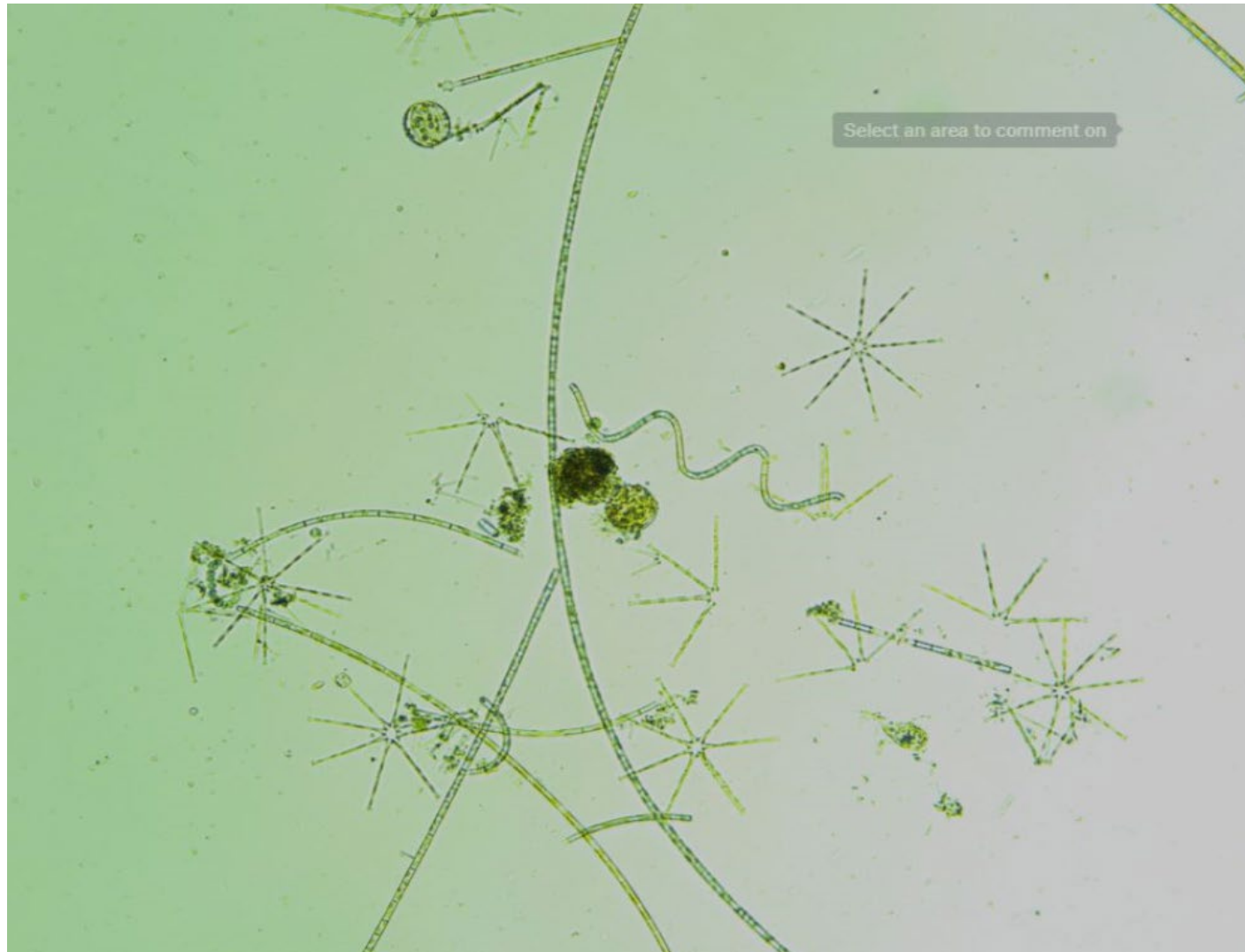
- **Method of the bbe instruments**
- **Using live algae for calibration of Fingerprints**
- **General overview of the FluoroProbe instrument for depth profiling in the field**
- **Optional accessories including WorkStation 25 for laboratory sampling**
- **Data presentation of the FluoroProbe -> Depth dependence of Cyanobacteria**
- **Questions**

Phytoplankton

Microalgae and Cyanobacteria

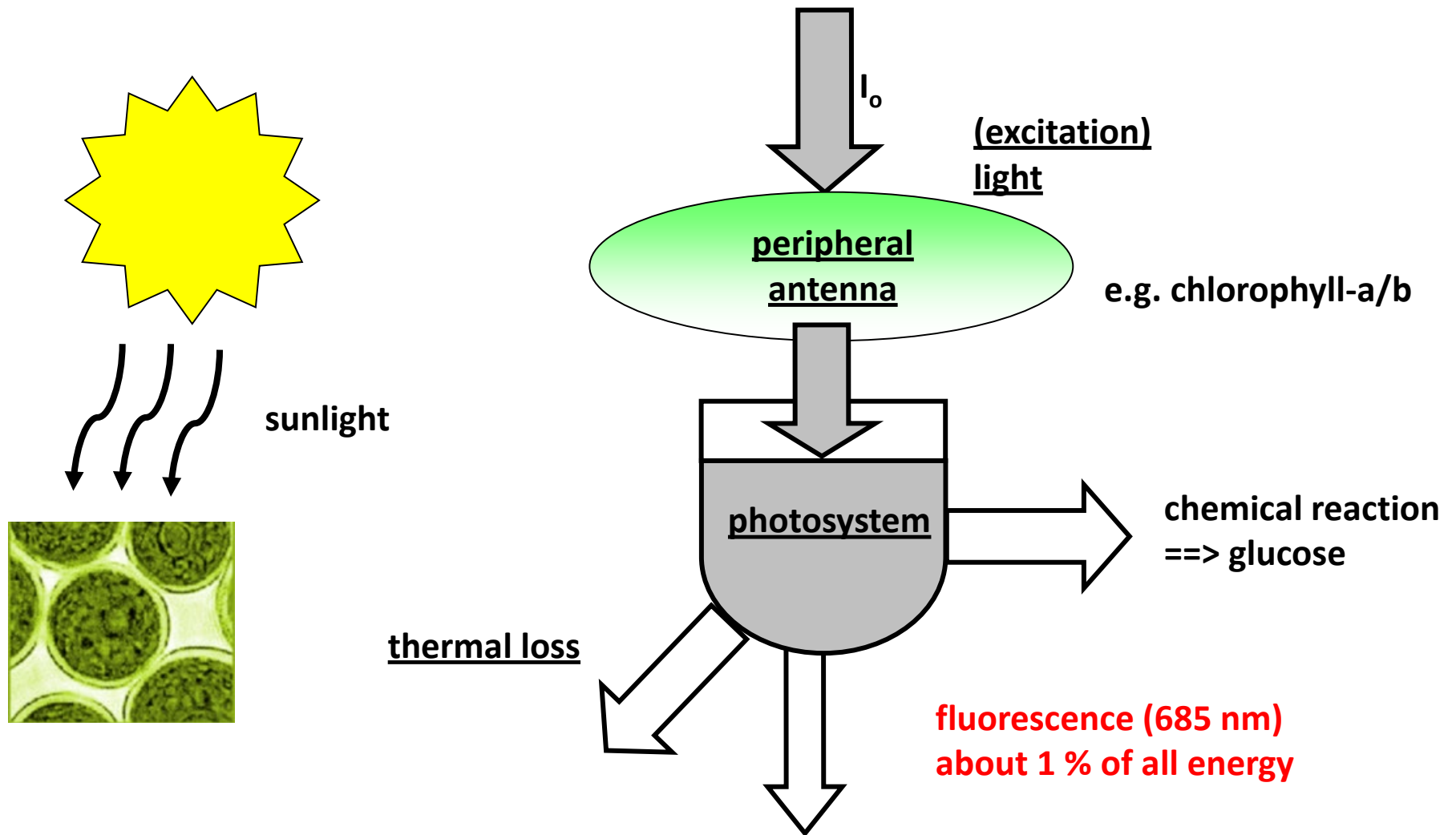


Microscope image of a water sample from Buckingham

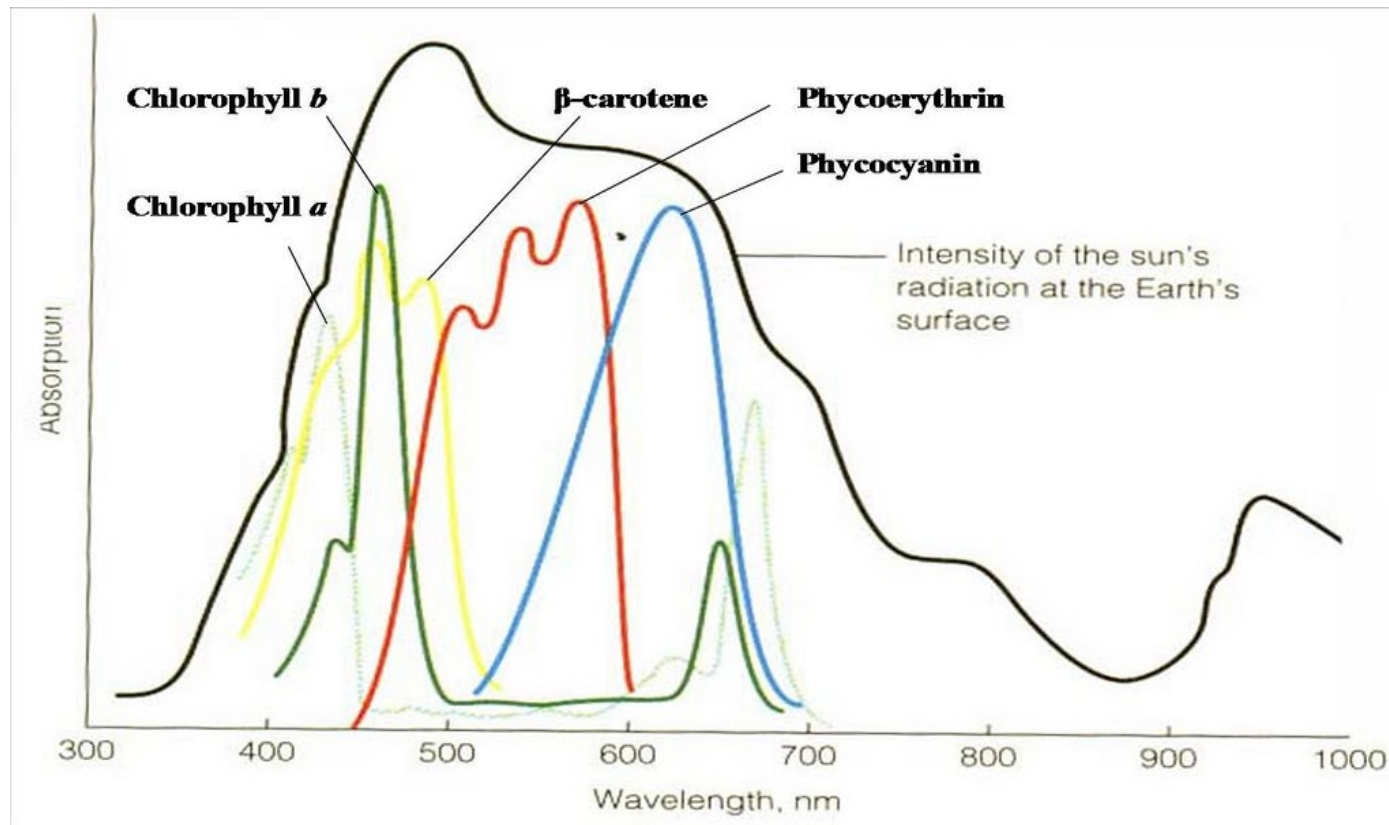


Sarah Ryan, Karola Kennedy

Photosynthesis of algae



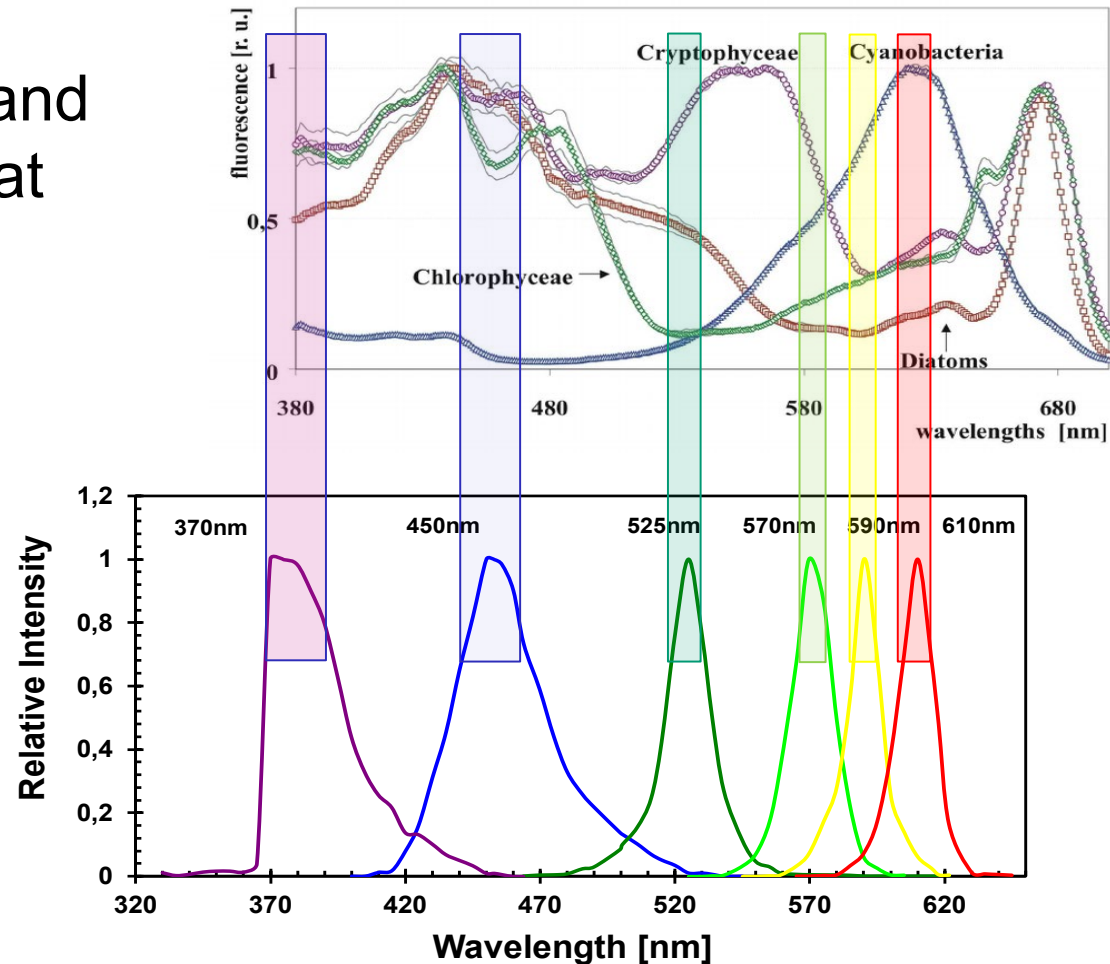
Sun spectra and absorption spectra of the different pigments



Principle of the measurements

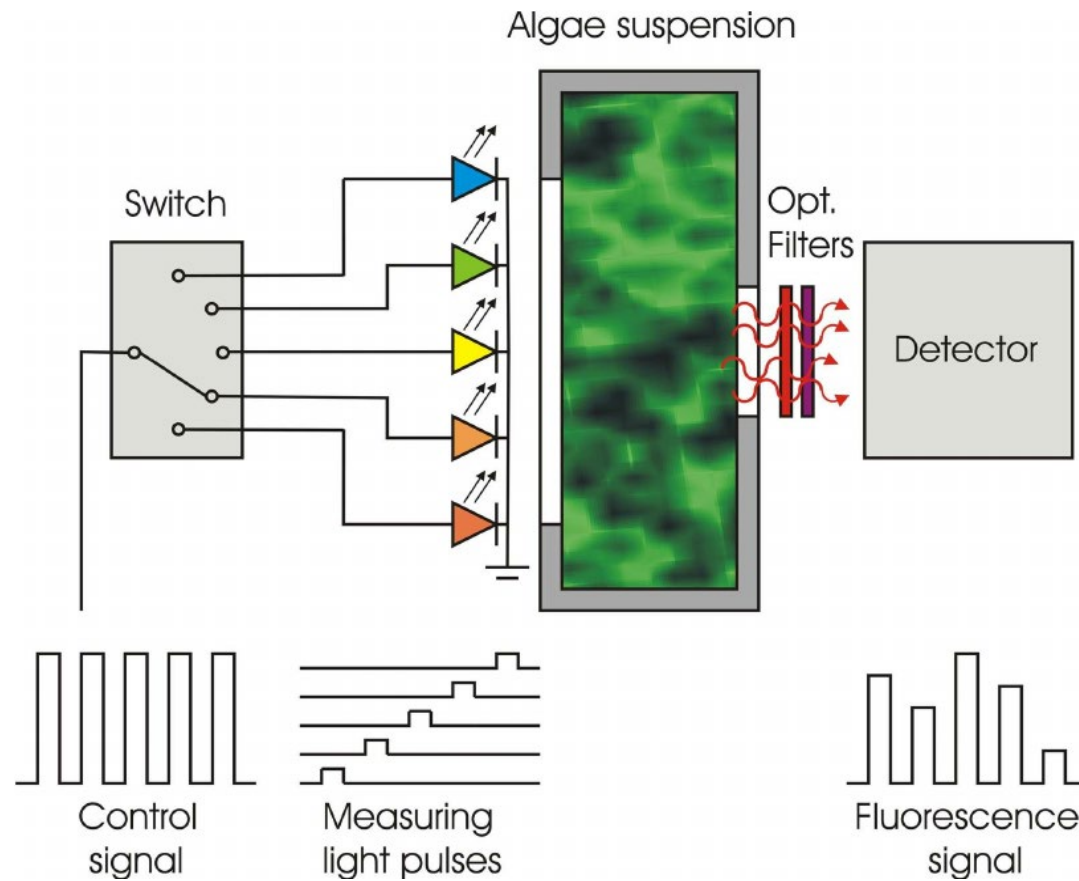
Excitation wave length and fluorescence response at 700 nm

Spectra of the LEDs, used in the bbe instruments

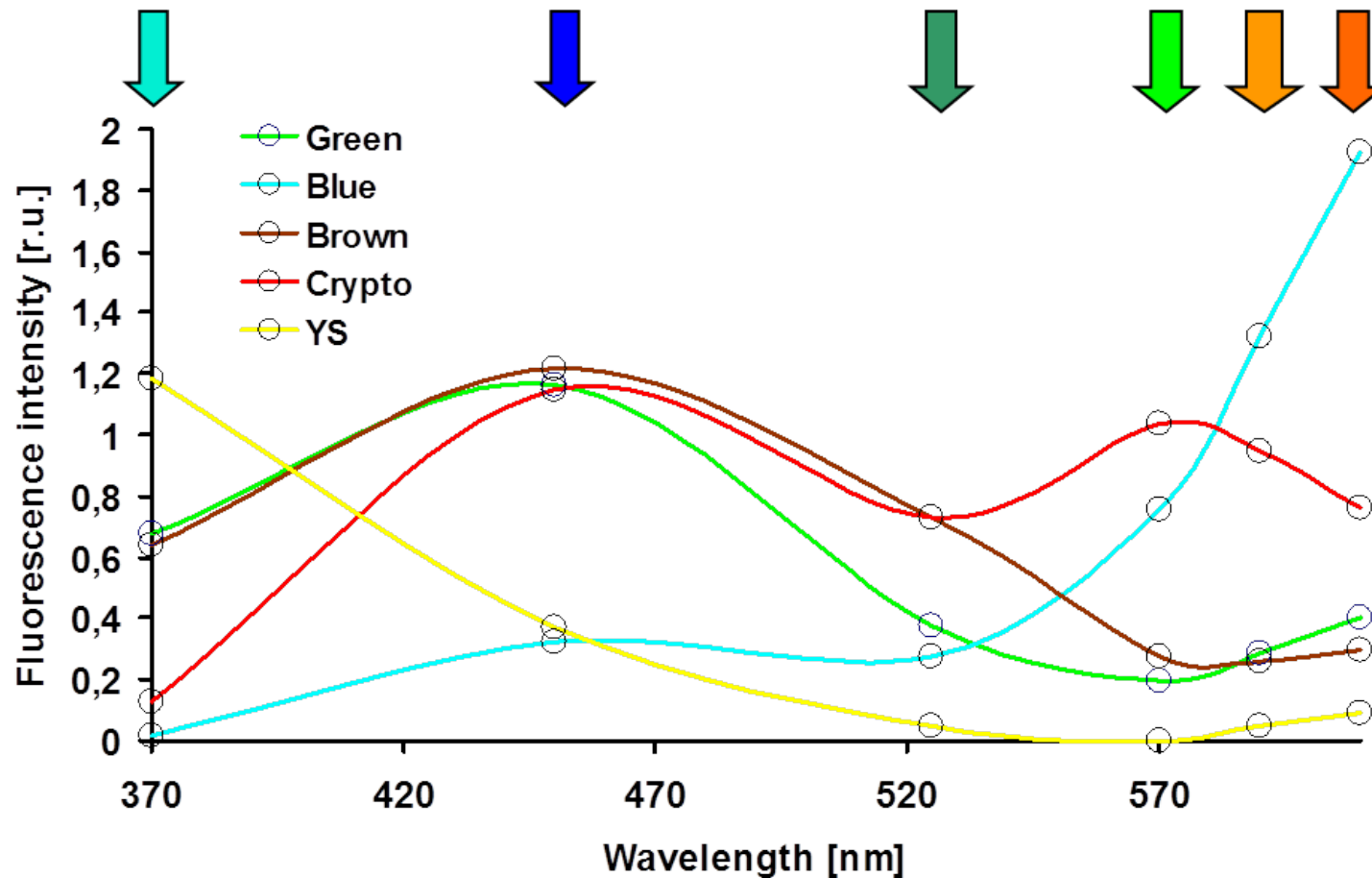


Yellow substances (CDOM) and turbidity measurement and correction

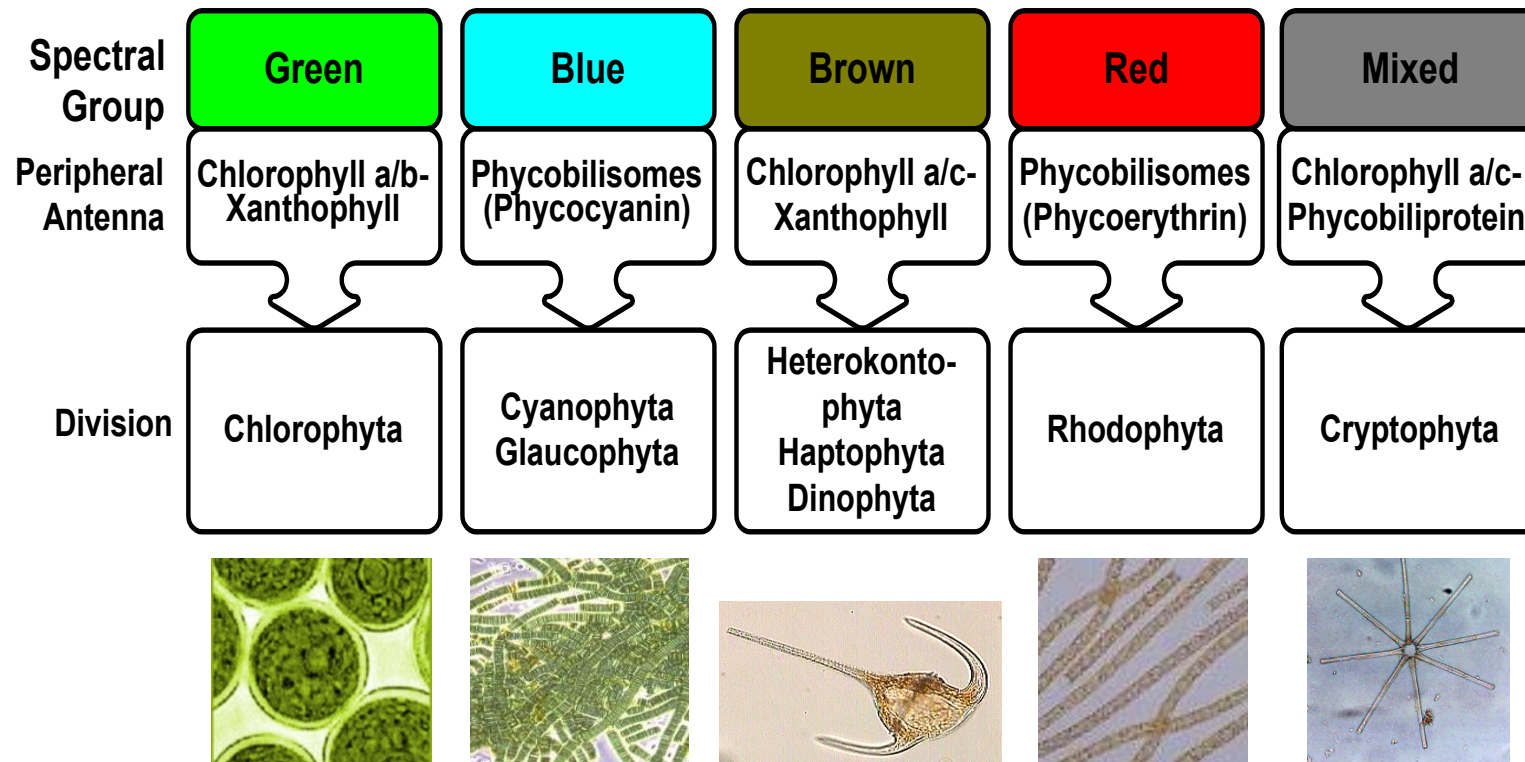
Principle of the measurement



Calibrated excitation spectra for algae class identification -> fingerprints



Spectral groups of phytoplankton



Calibration with real algae



Green algae
Bluegreen
Diatoms
meneghiniana
Cryptos
Options
Isochrysis
Red algae
UP



Chlorella vulgaris
Microcystis aeruginosa
Cyclotella
Cryptomonas sp.
Isochrysis galbana
Planktothrix Rubecense
Unbound Phycocyanin

Calibration with real algae

Calibration Protocol Chlorophyll

Operator: B. Franckowiak

Date: 28.11.16

Instrument: Sensor

Serial No.: CS-18-30

Software vers.: 2.62



Settings Checked:

OK

Offset bidest. Water:

OK

Temperatur compensation:

n.a.

Offset tap water:

OK

Transmission calibration in:

bidest. water

Fingerprint Y.S.:

OK

		Calibration		Check		Deviation [%]
		Calibration conc.	Calibration water	Reference conc.	Actual value conc.	
		Chl-a [µg/l]		Chl-a [µg/l]	Chl-a [µg/l]	
Green algae	<i>Chlorella vulgaris</i>	73,46	Tap water	73,46	73,32	-0,19
Bluegreen algae	<i>Microcystis aeruginosa</i>	103,18	Tap water	103,18	102,70	-0,47
Diatoms	<i>Cyclotella meneghiniana</i>	66,40	Tap water	66,40	66,92	0,78
Cryptos	<i>Cryptomonas sp.</i>	61,59	Tap water	61,59	61,79	0,32
Plankto	<i>Planktothrix rubescens</i>	54,05	Tap water	54,05	53,55	-0,93

Reference instrument

Referenz 2 (UV)

Calibration water temperature sensor:

OK

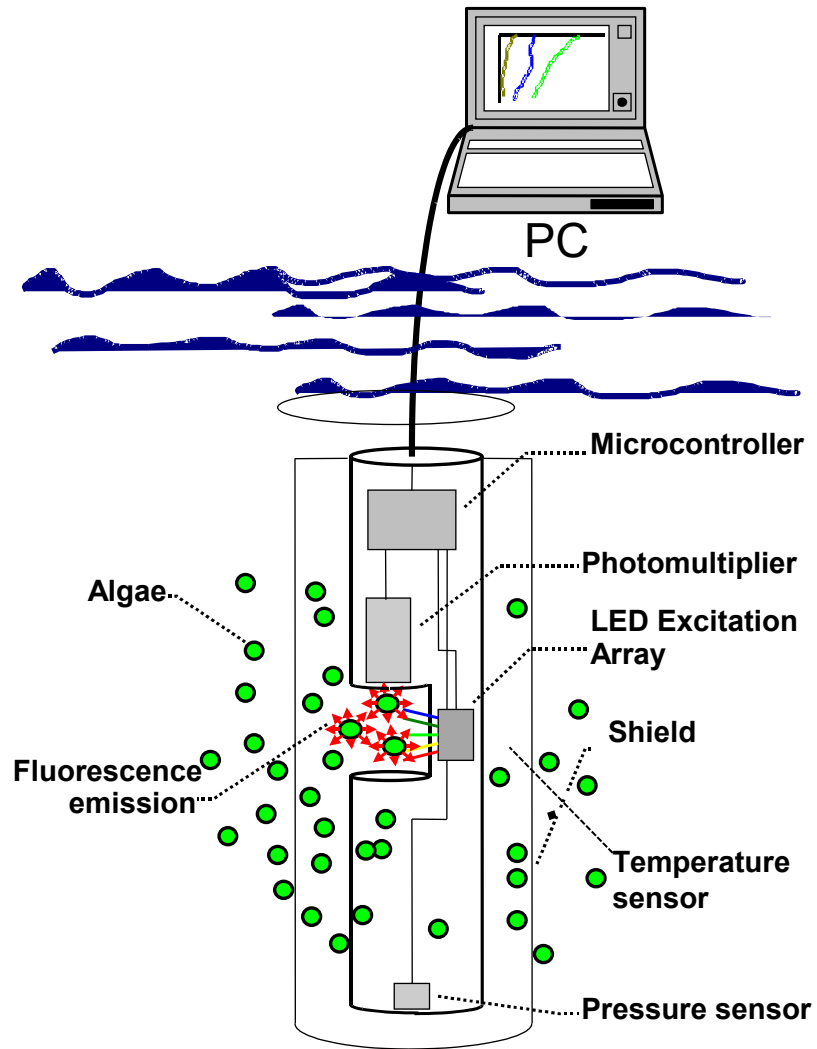
Set time and date:

OK

Parameter file:

CS18-30_28112016

Principle of the bbe FluoroProbe

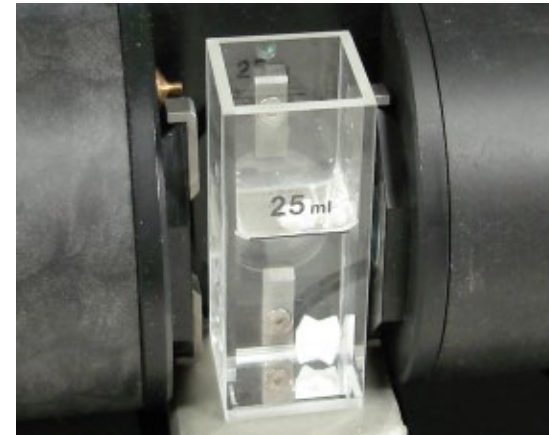


bbe FluoroProbe

- In situ chlorophyll determination
- Determination of 5 algae classes
- Yellow substance measurement and correction
- Turbidity measurement and correction
- measuring range: 0-200 $\mu\text{g/l}$
- Continuous real time measurement
- Pressure (depth) and temperature
- Internal rechargeable battery
- Auto start plug for use without cable
- Cable drum with bluetooth adapter
- Wiper for long-term measurements

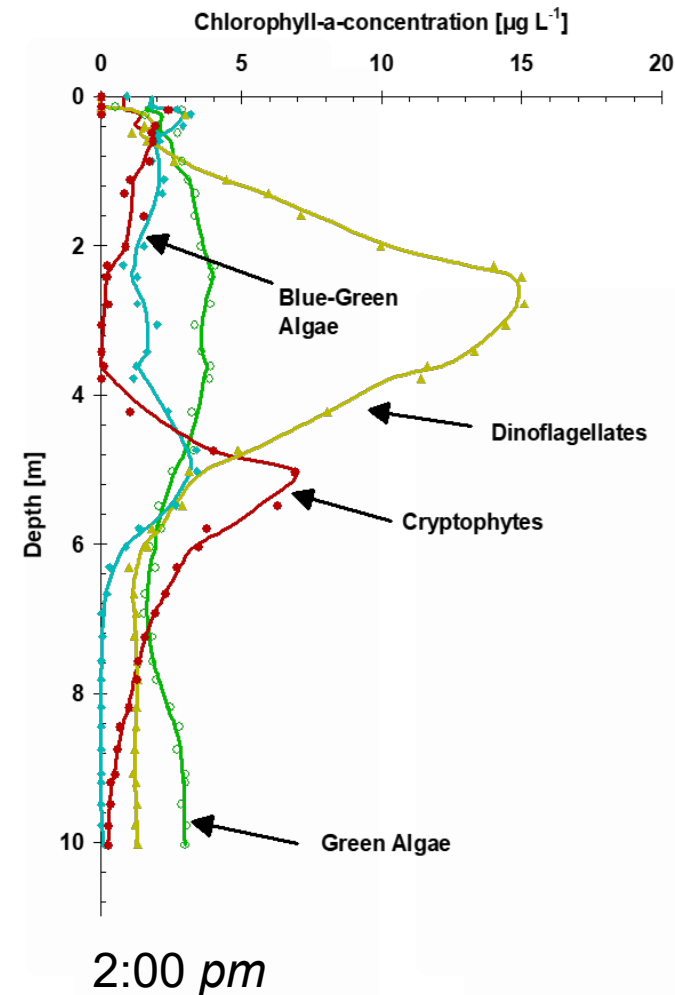
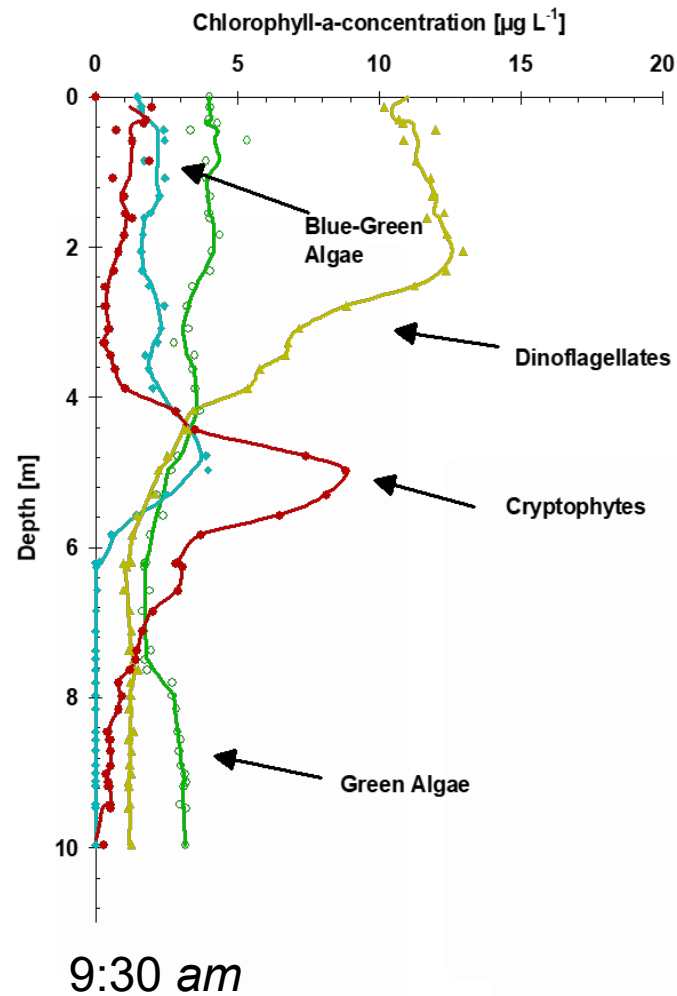


bbe FluoroProbe workstation for lab applications



Attention -> extra calibration with cuvette necessary

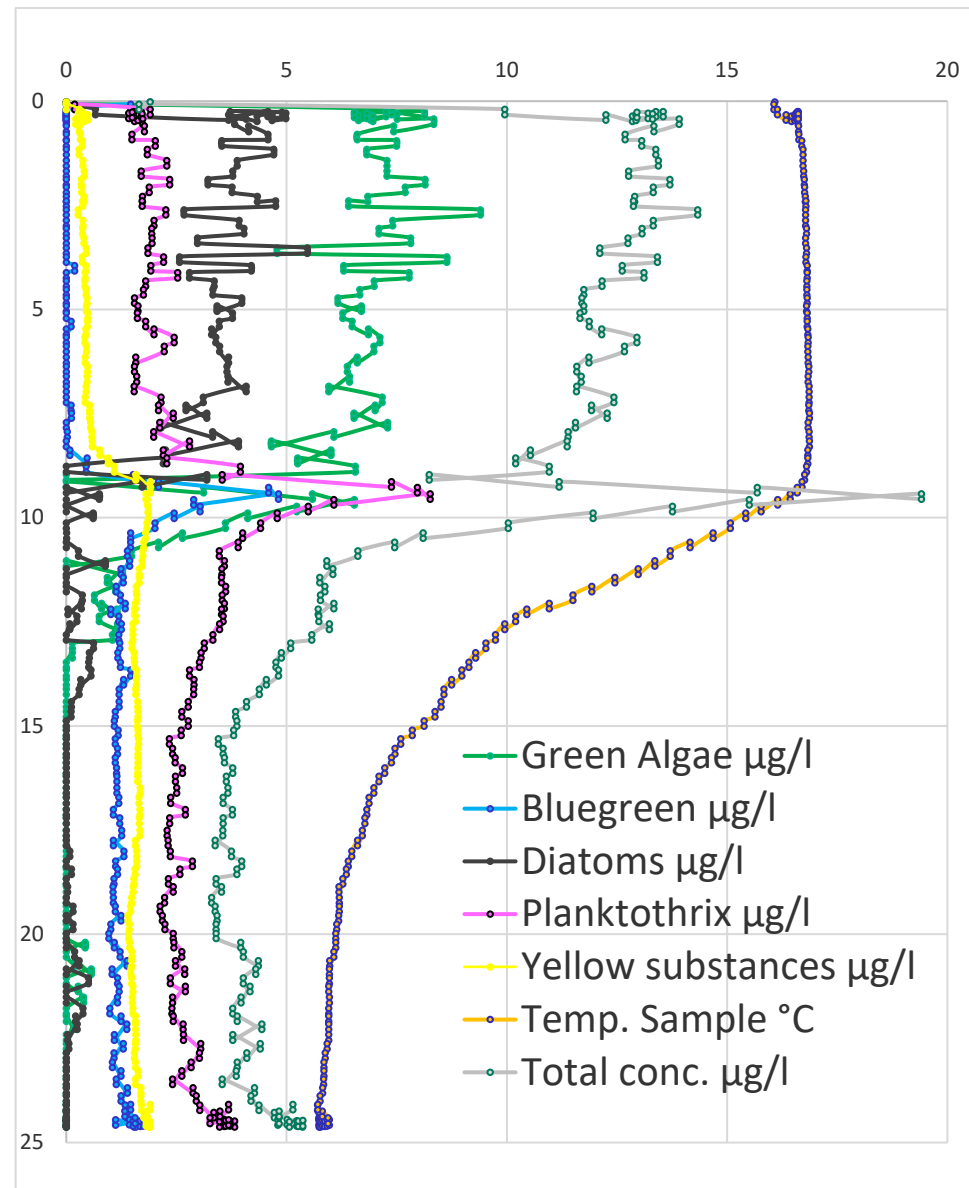
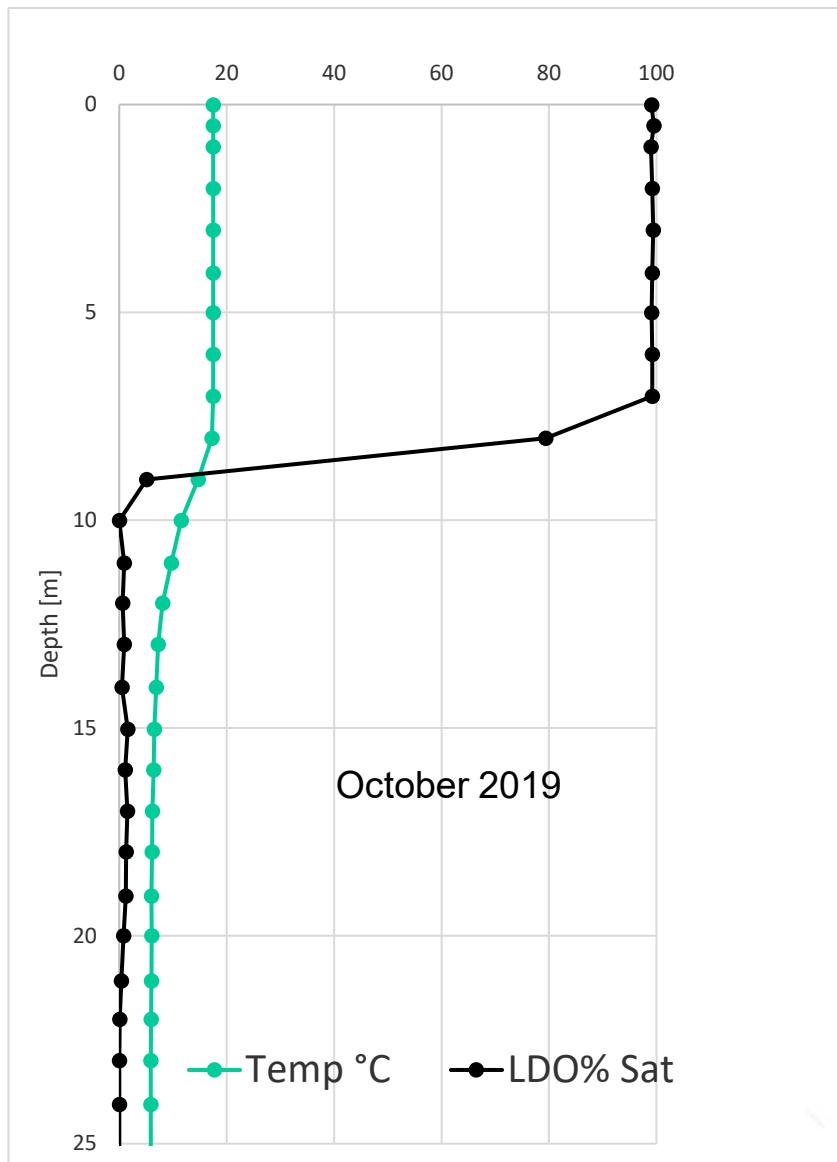
Migration of Dinoflagellates in the eutrophic Plussee



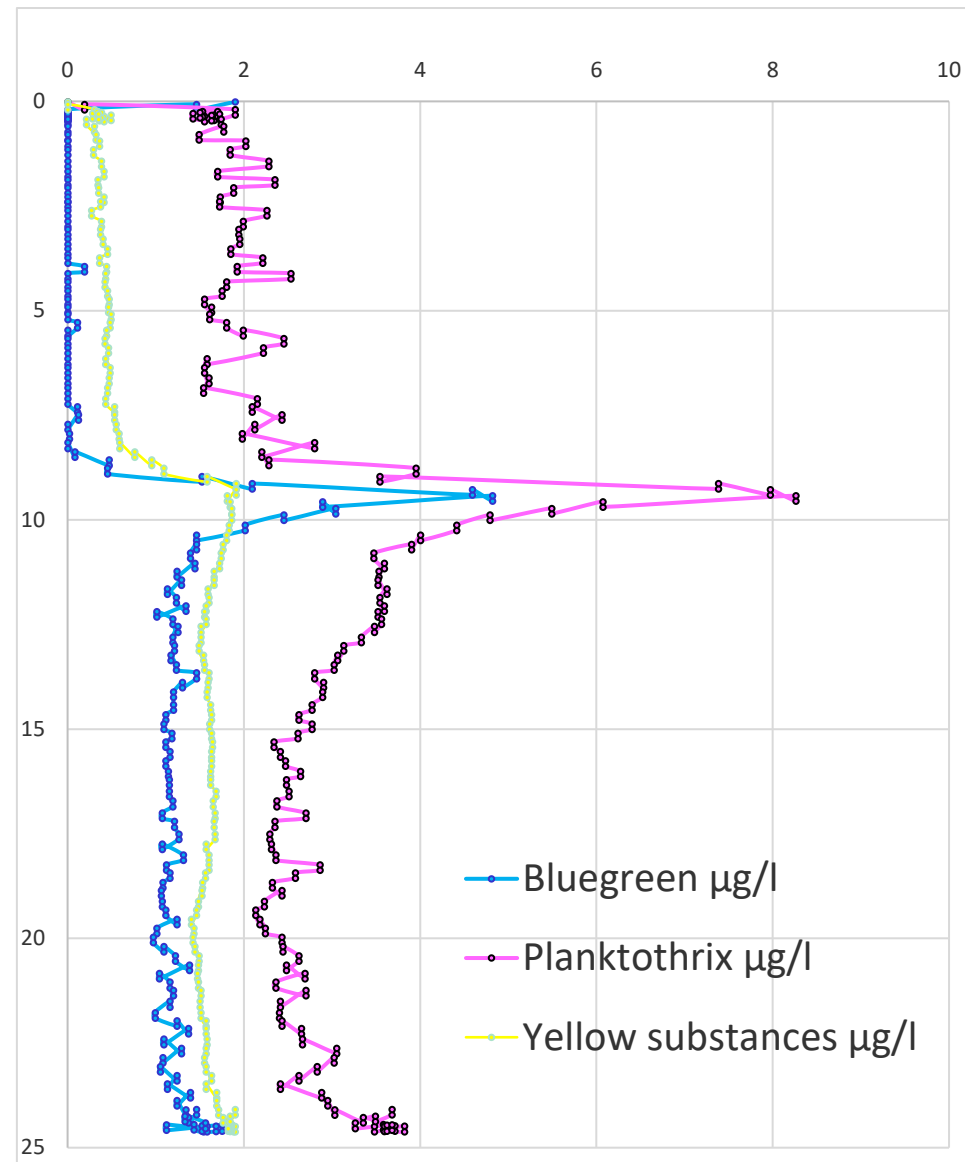
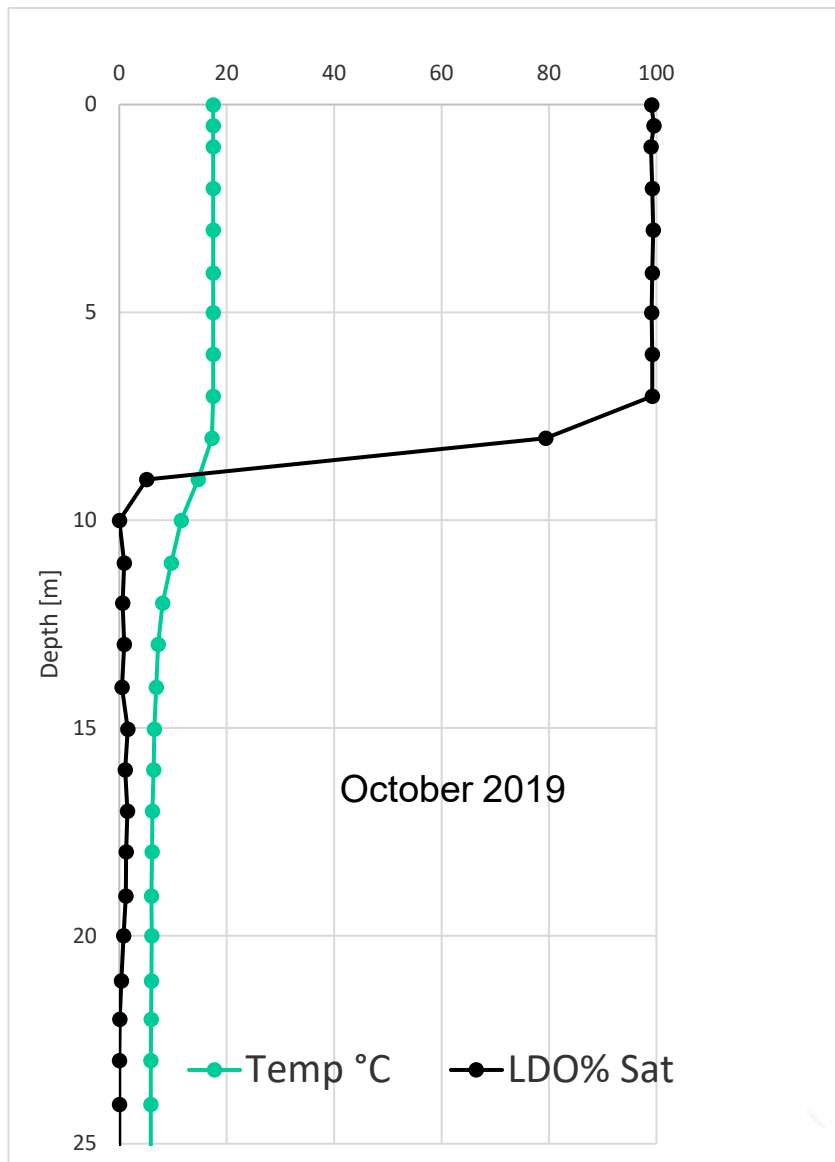
Seepark lake south of Germany



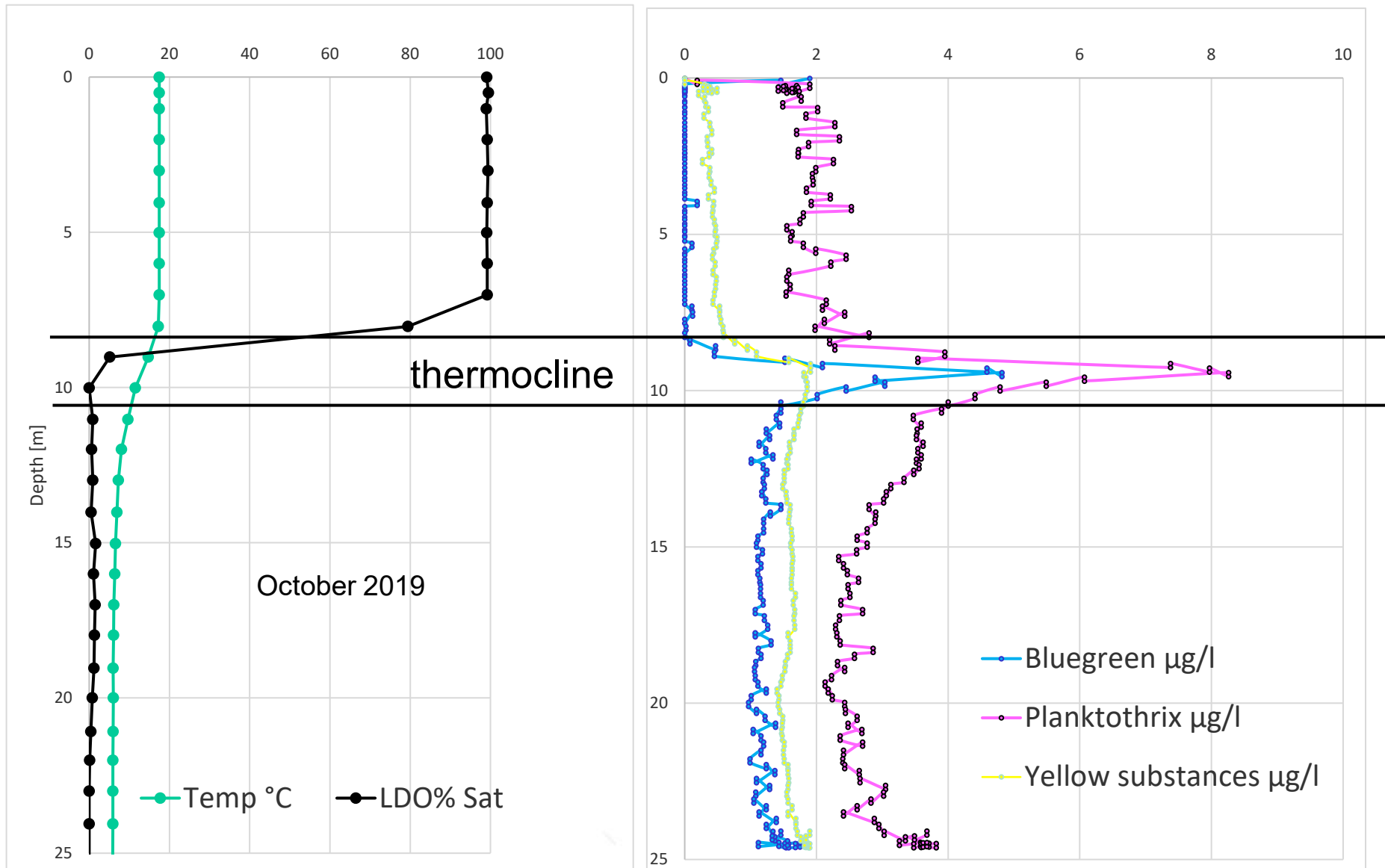
FlouroProbe measurements at lake Seepark



Cyanobacteria

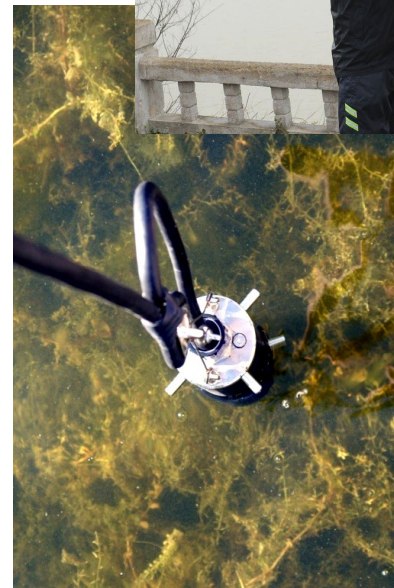
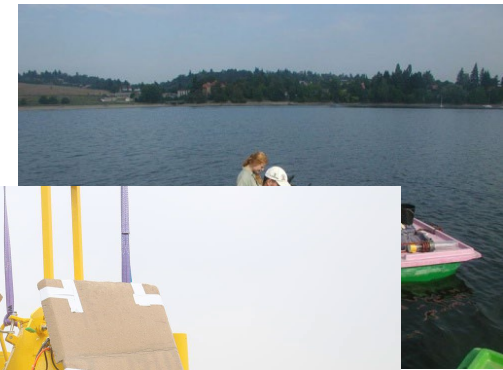
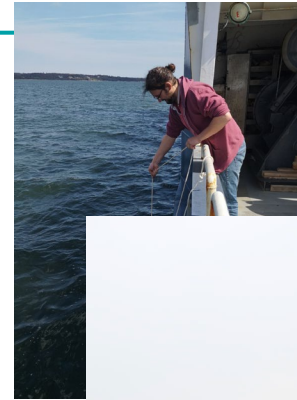


High concentration at a depth of 9 m (30 feet)



Application bbe FluoroProbe

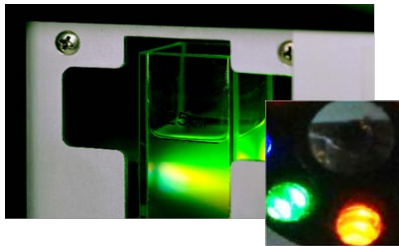
- Long term monitoring of the Algae composition
 - climate change
 - invasive species
 - ecologic changes of the habitats
- Impact of nutrients and pesticides on the phytoplankton
- Eutrophication of lakes
- Field campaign to special aspects
- Installation on buoys and platforms
- Depth range up to 1000 m



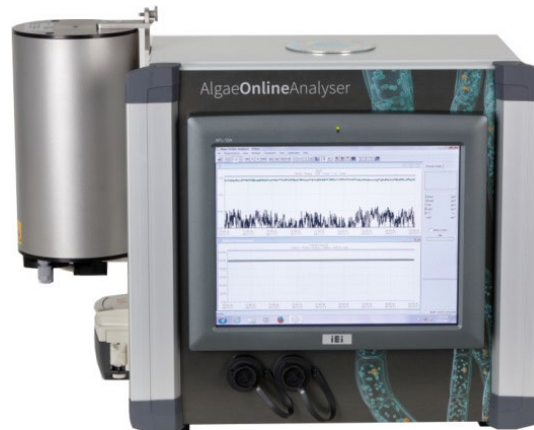
The bbe Fluorometer



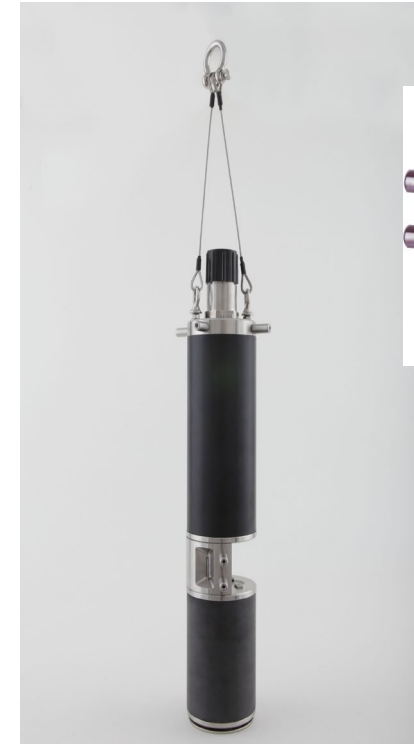
AlgaeGuard



AlgaeLabAnalyser



AlgaeOnlineAnalyser



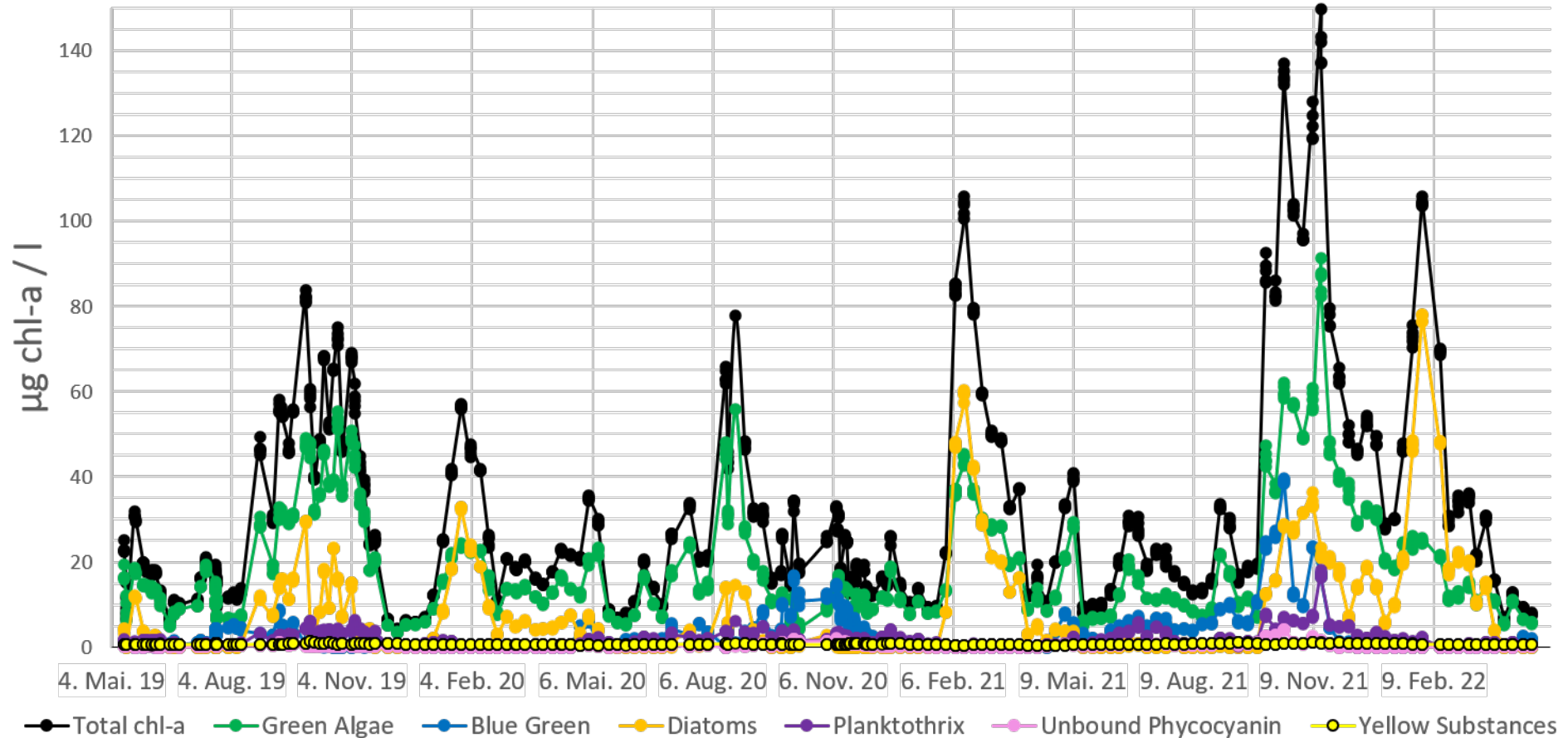
FluoroProbe



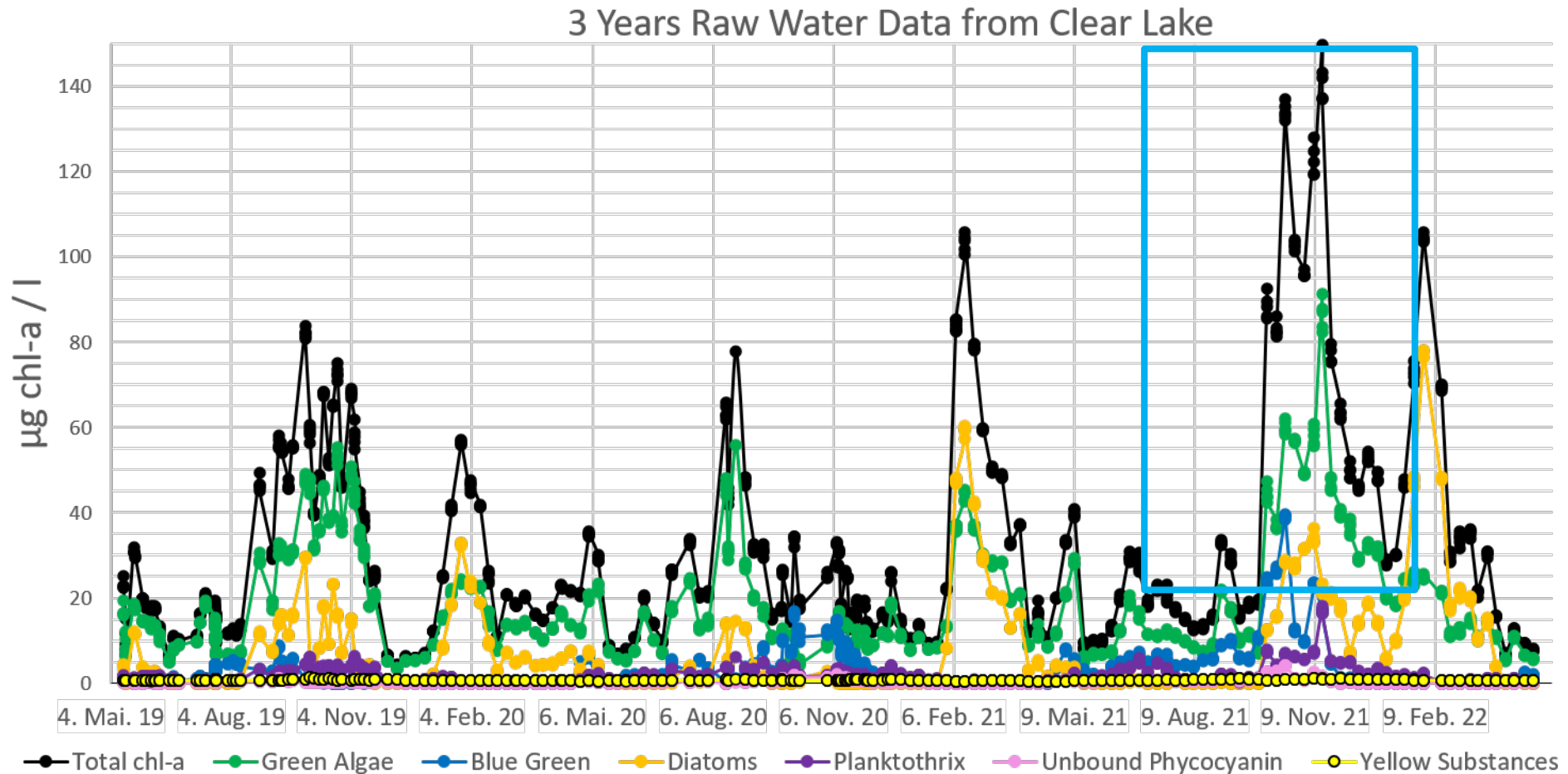
AlgaeTorch

Three Years Data at Buckingham Clear Lake (USA)

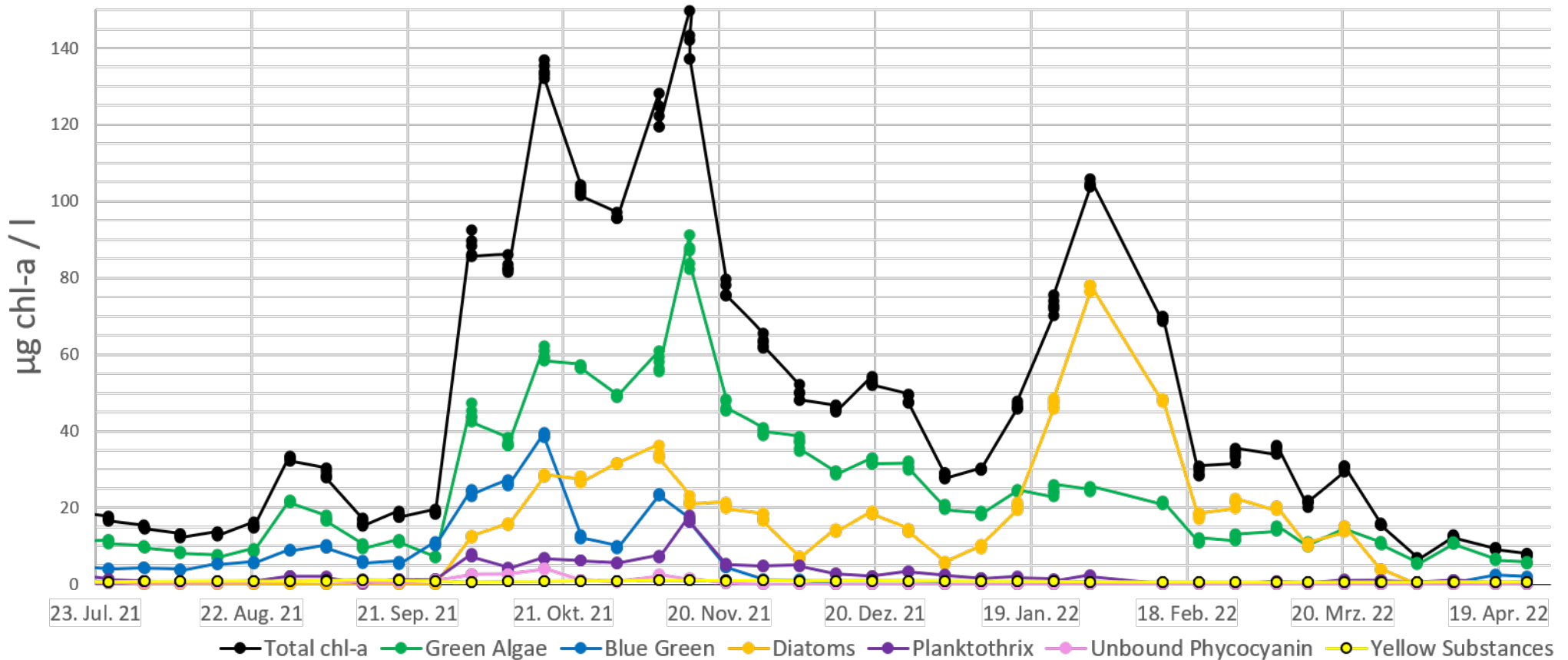
3 Years Raw Water Data from Clear Lake



Three Years Data at Buckingham Clear Lake (USA)

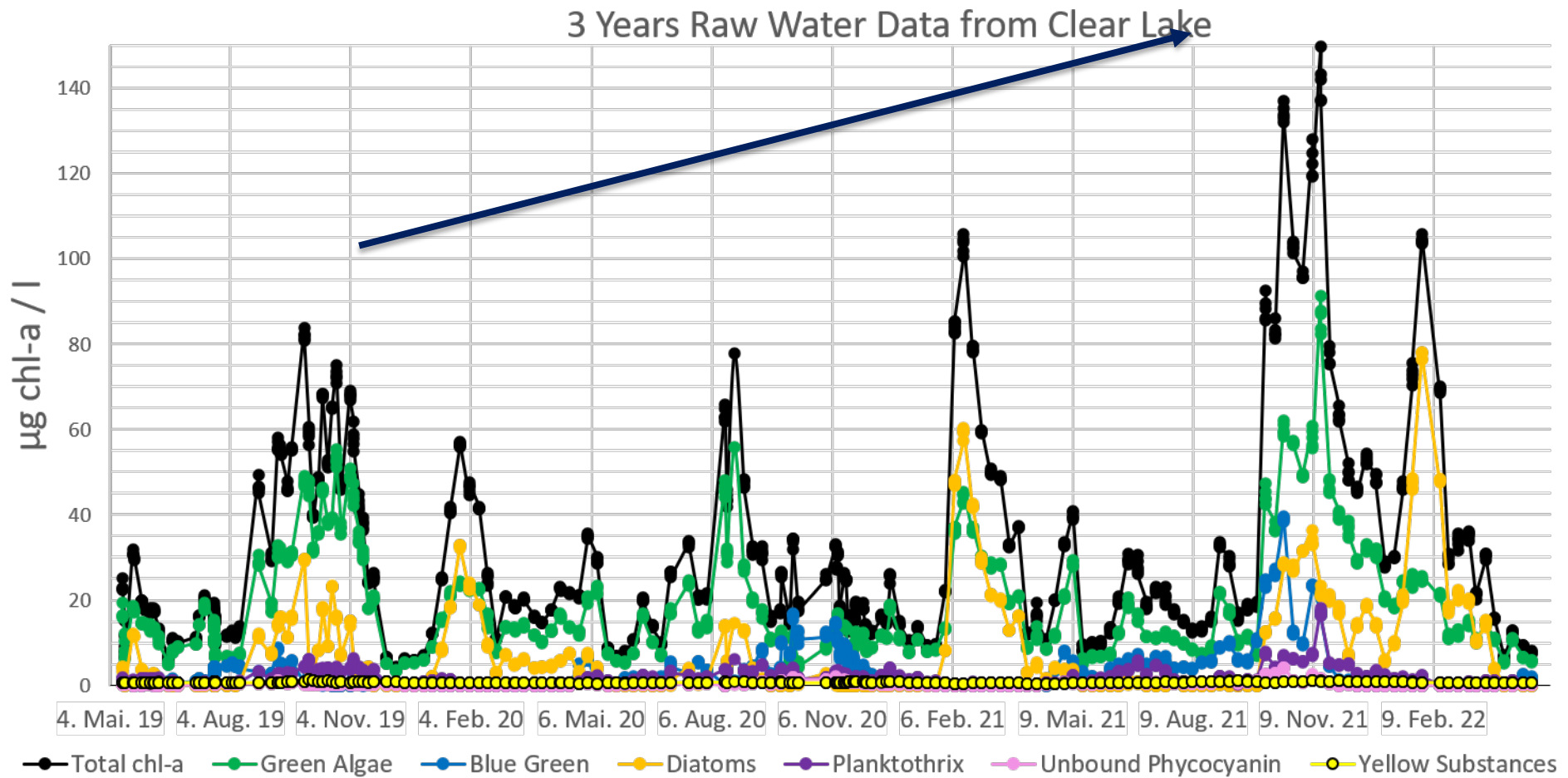


Values Measured from the bbe PhycoLabAnalyser



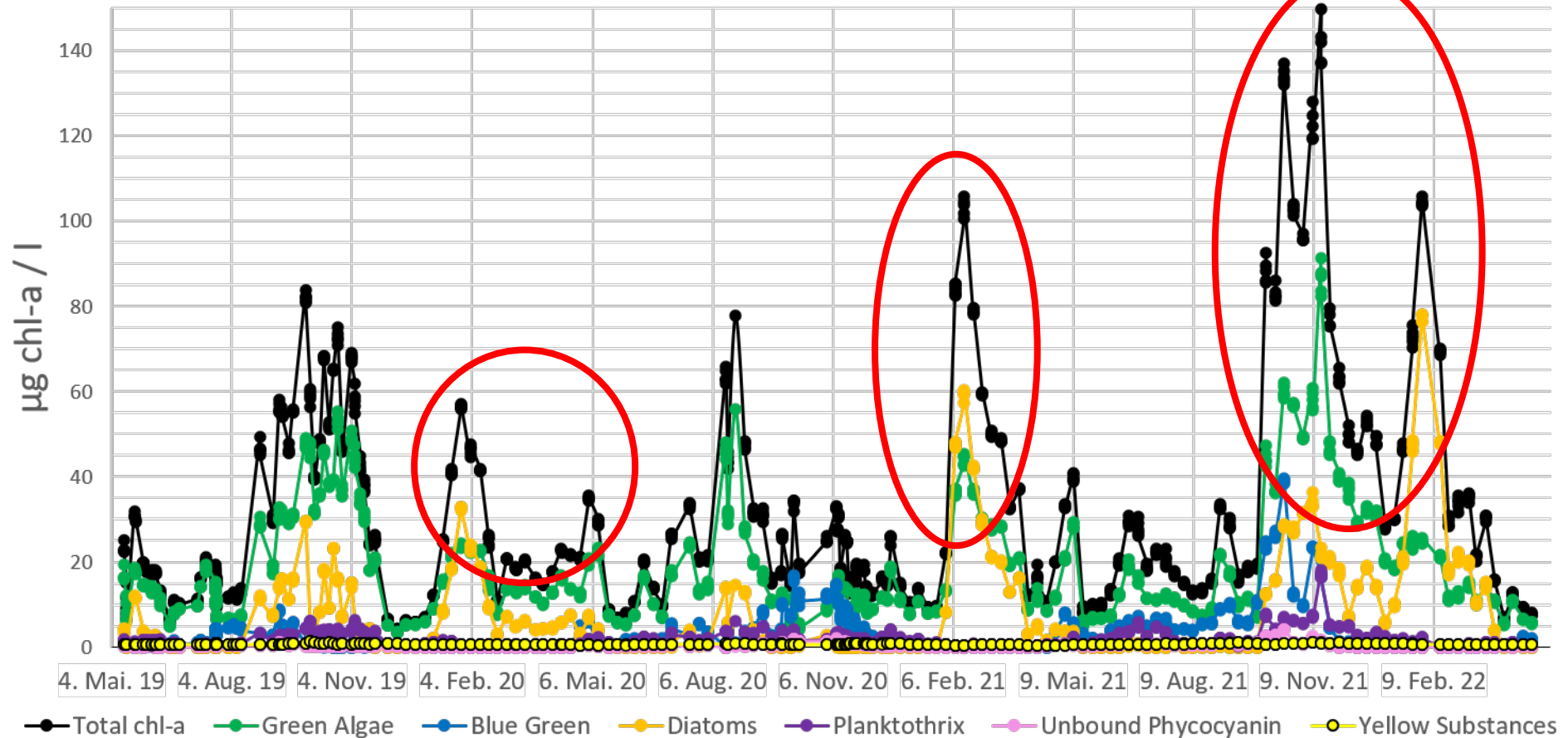
Yellow substances (CDOM) and turbidity measurement with correction and activity (Genty)

Trends of the Algae Composition



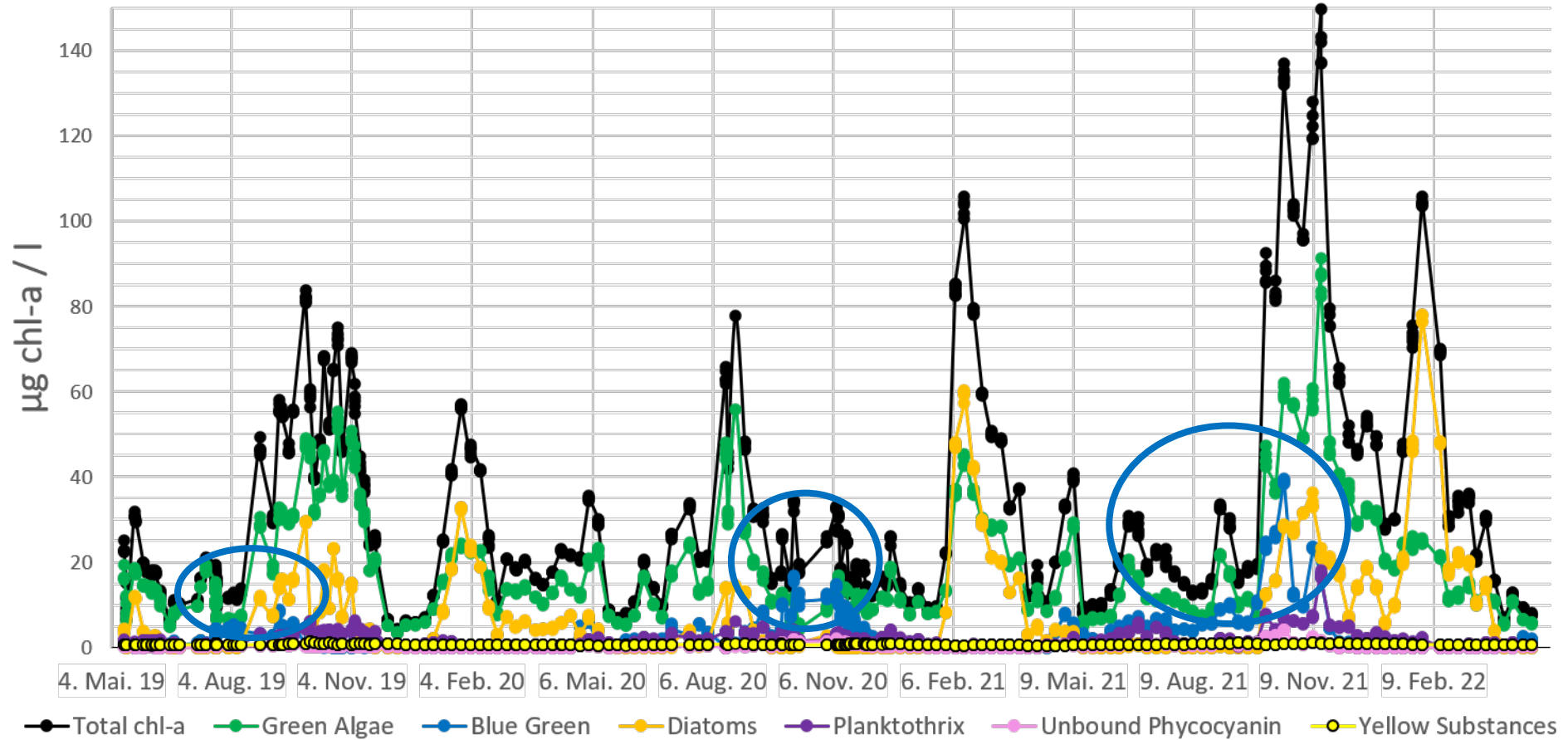
In Spring Diatoms and Green Algae Dominate

3 Years Raw Water Data from Clear Lake



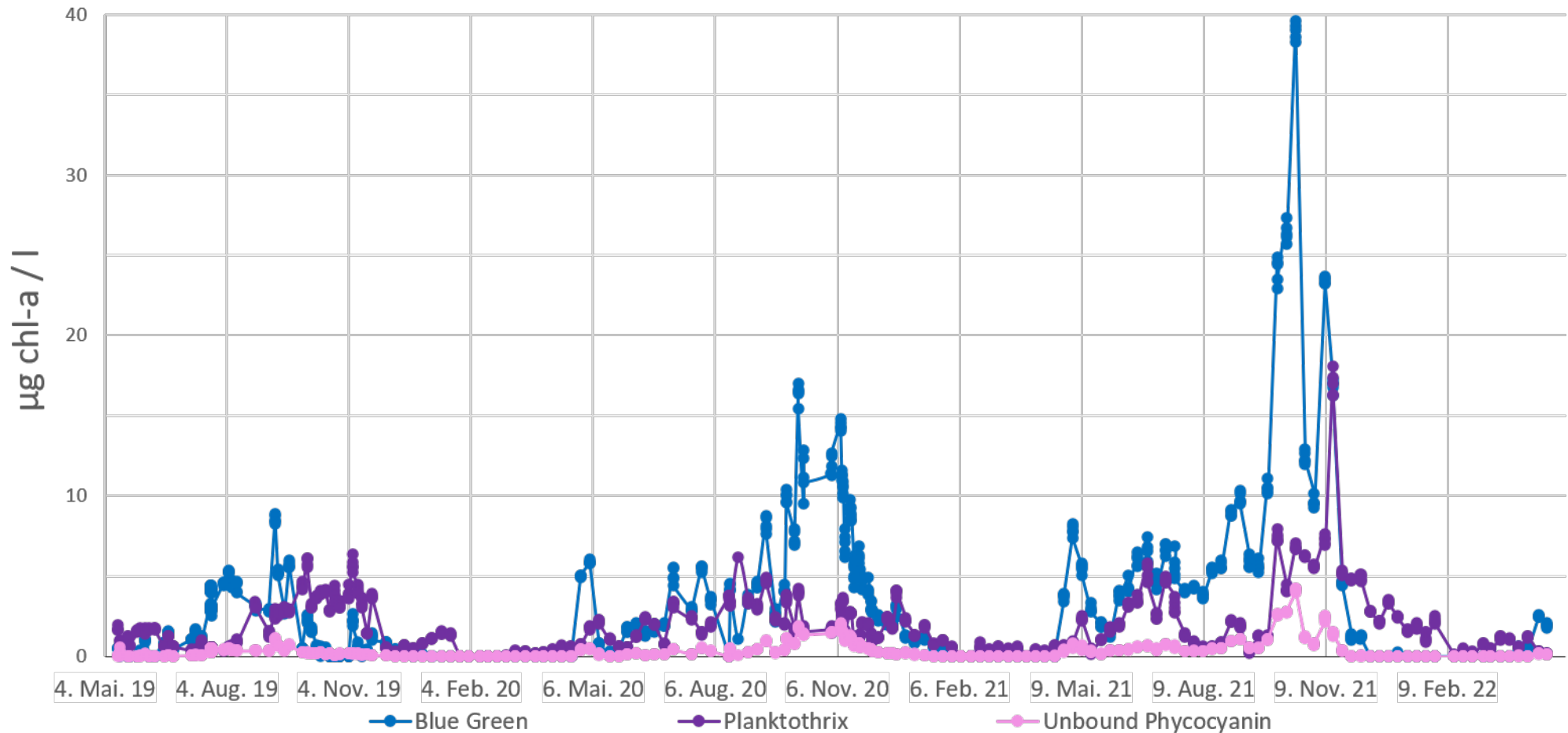
In Autumn Cyanobacteria Dominate

3 Years Raw Water Data from Clear Lake

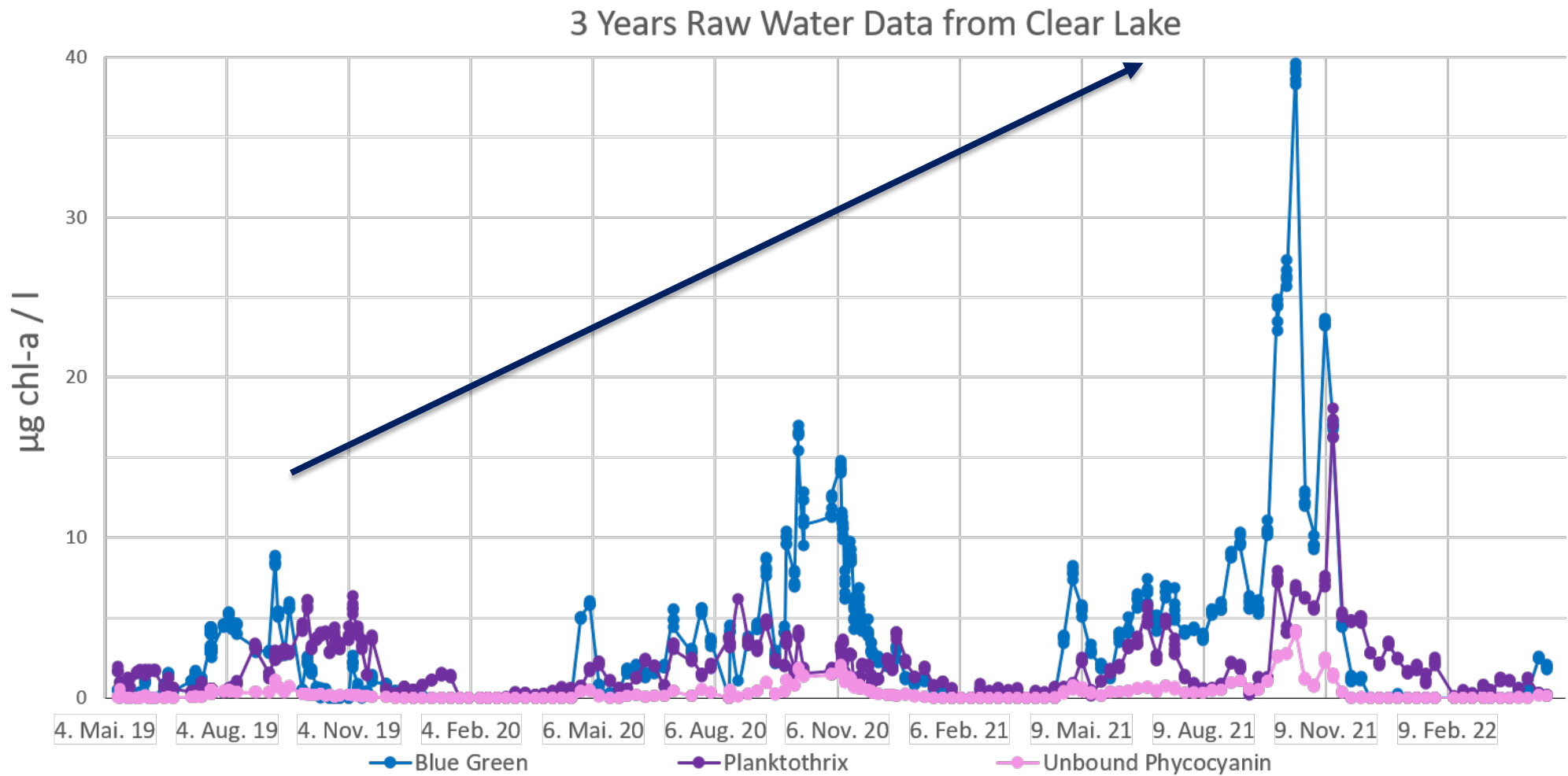


Variability of Cyanobacteria and Unbound Phycocyanin

3 Years Raw Water Data from Clear Lake

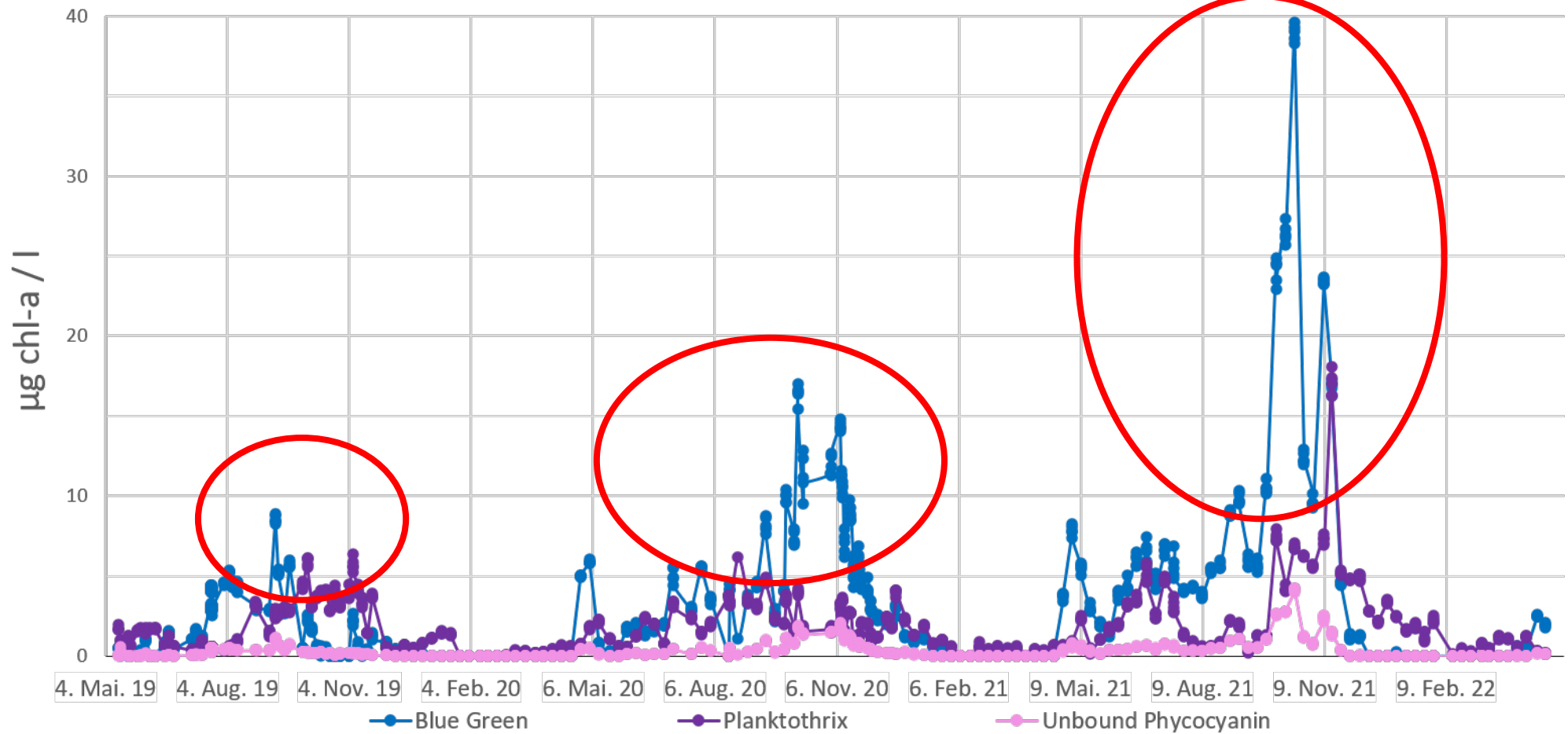


Dramatic Increase of Cyanobacteria within 3 Years



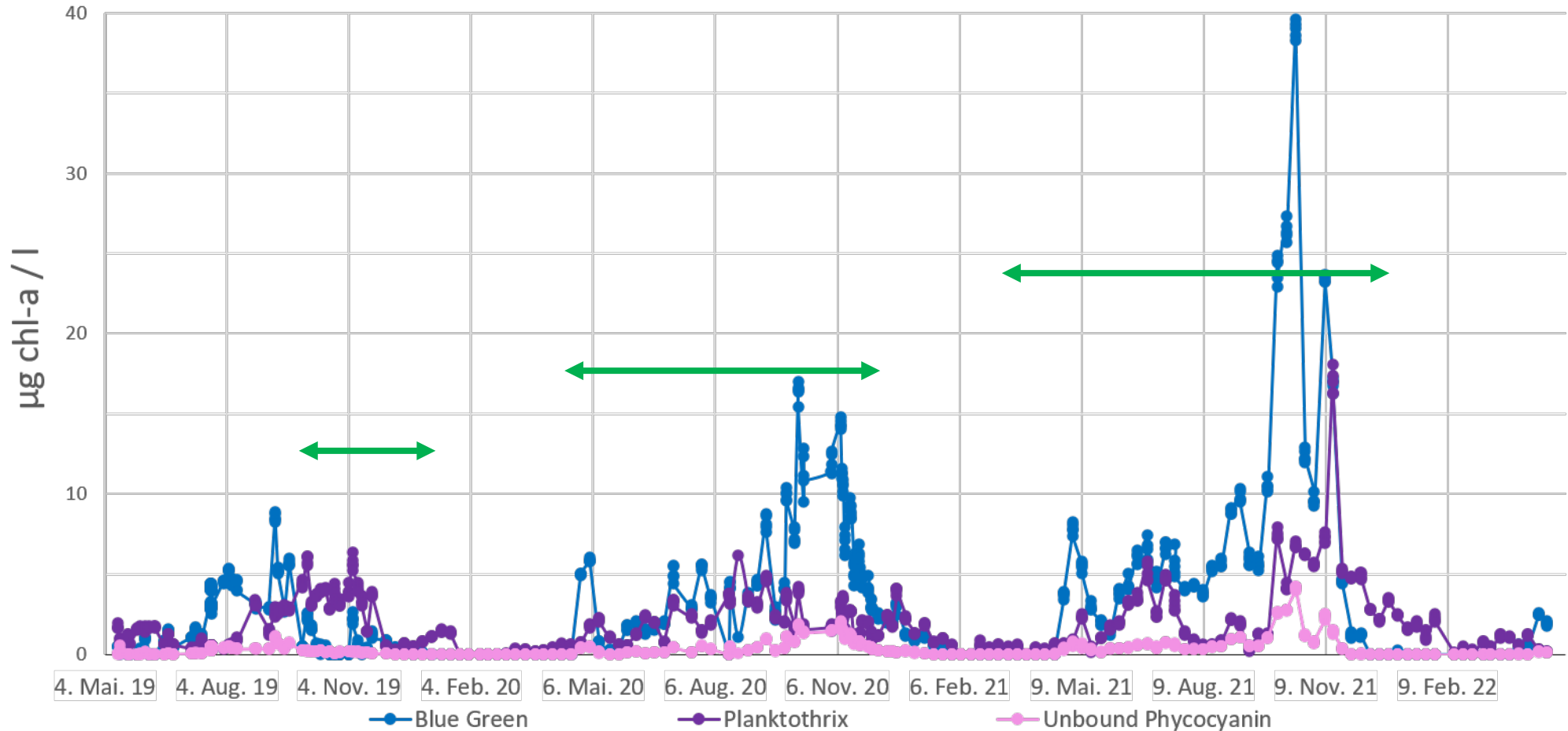
In Autumn Cyanobacteria Dominate

3 Years Raw Water Data from Clear Lake



The Duration of Cyano Blooms Gets Longer

3 Years Raw Water Data from Clear Lake



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