CONNECT

Connectivity and synchronisation of lake ecosystems in space and time

Connectivity and Synchronisation of Lake Ecosystems in Space and Time – CONNECT

Stella A Berger[1] & Sabine Wollrab[1]

Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB)[1]

Jens Nejstgaard[1], Hans-Peter Grossart[1], Gabriel Singer[1], Franz Hölker[1], Andreas Jechow[1], Jürgen Fischer (FU Berlin), Thomas Ruhtz (FU Berlin), Peter Gege (DLR), Torsten Sachs (GFZ), Matthias Labrenz (IOW), Gunnar Lischeid (ZALF), Rüdiger Röttgers (HZG), Thomas Schneider (TUM)

IGB

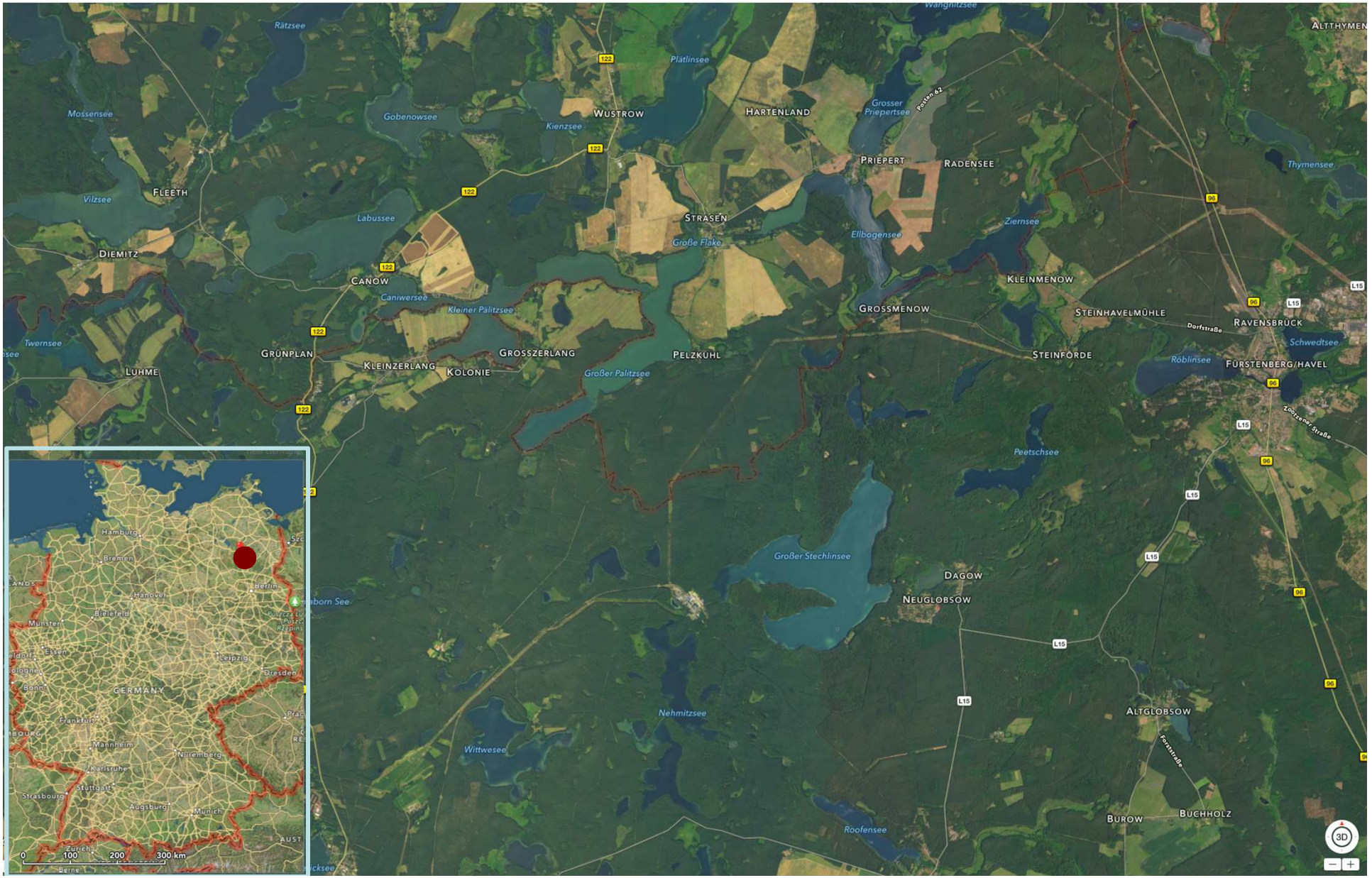
Leibniz-Gemeinschaft

Research for the future of our freshwaters

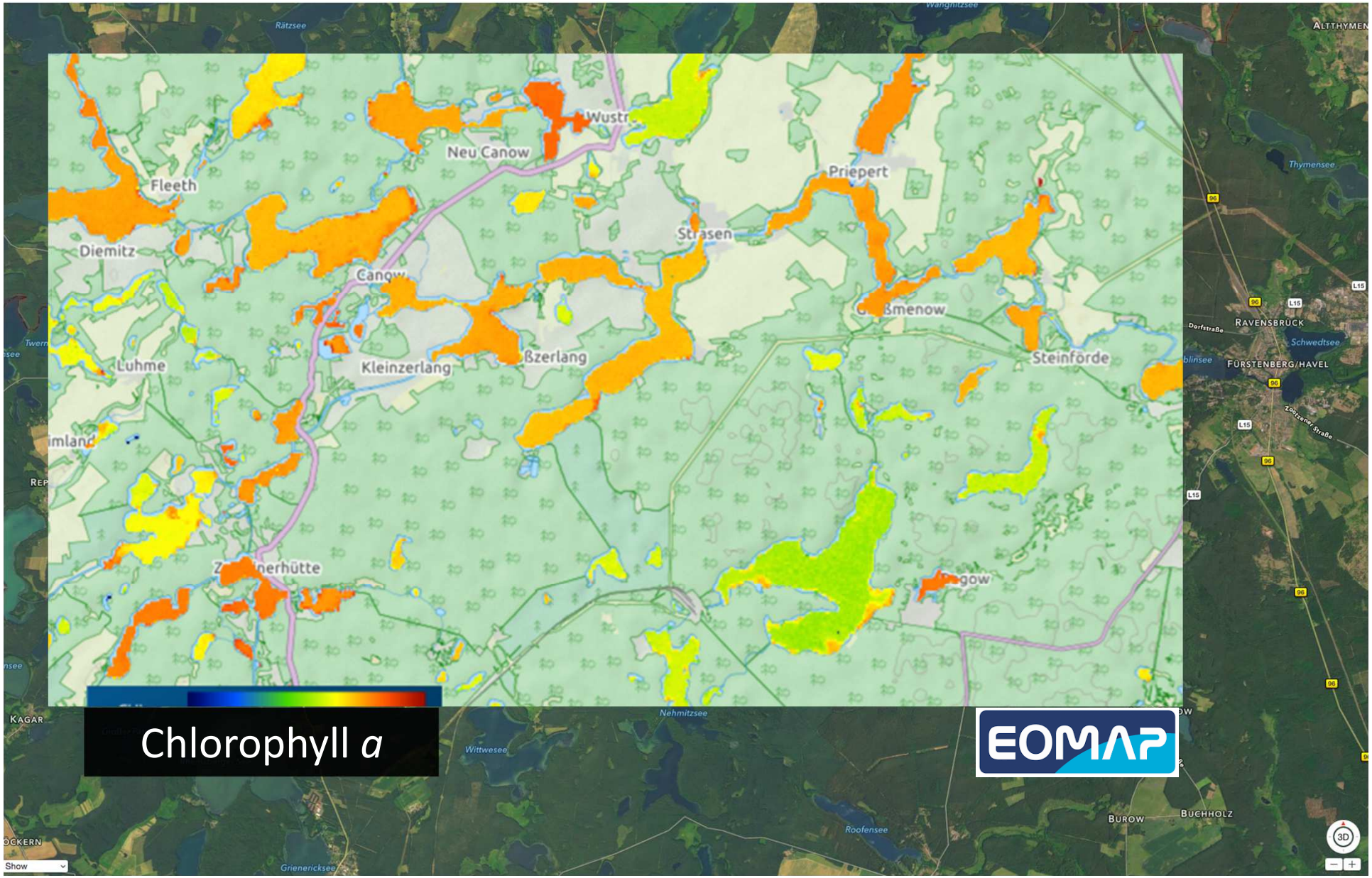
CONNECT - Network of Collaborative Excellence

CONNECT *in situ* measurements and Remote Sensing of inland waters

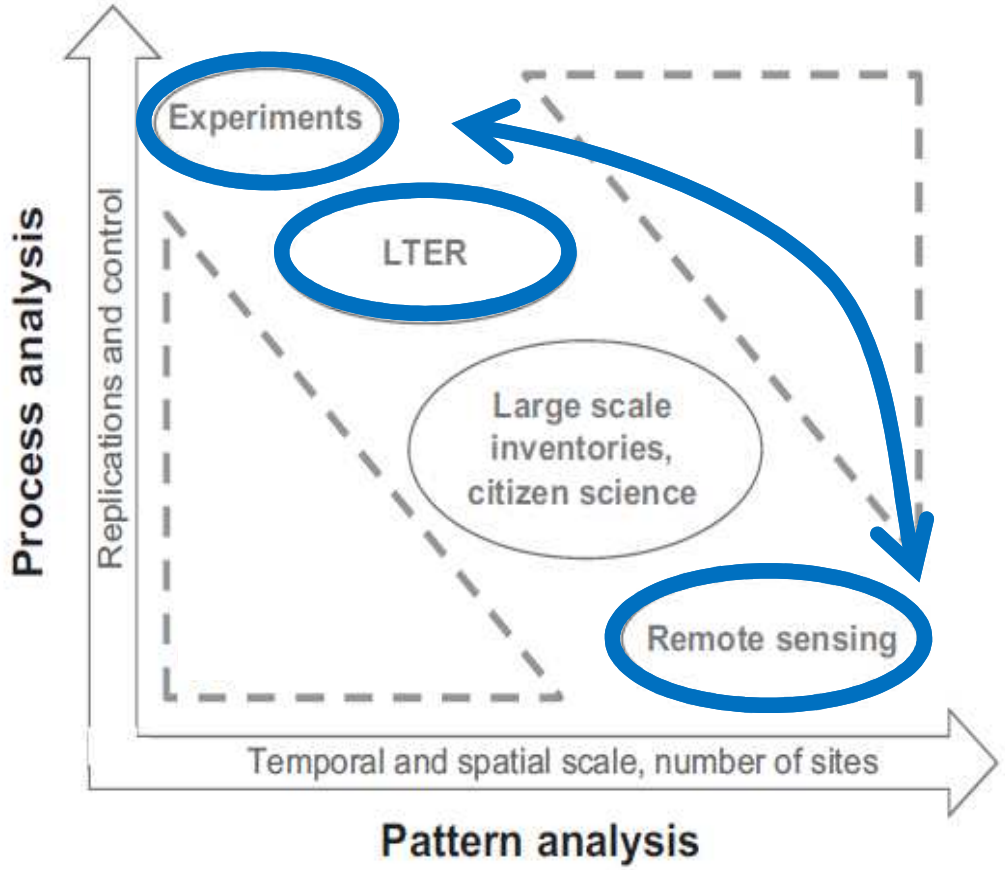
CONNECTivity of lakes chains in North-East Germany



CONNECT combines *In situ* measurements, ground based, airborne and satellite Remote Sensing

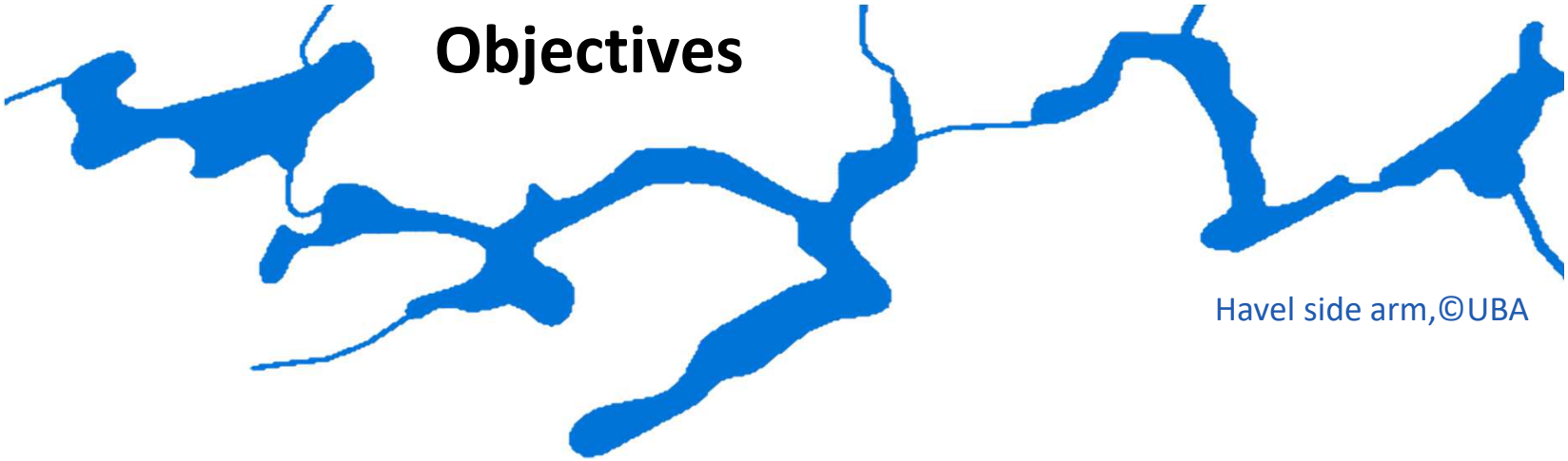


CONNECT – uses the full scale from pattern analysis to process analysis

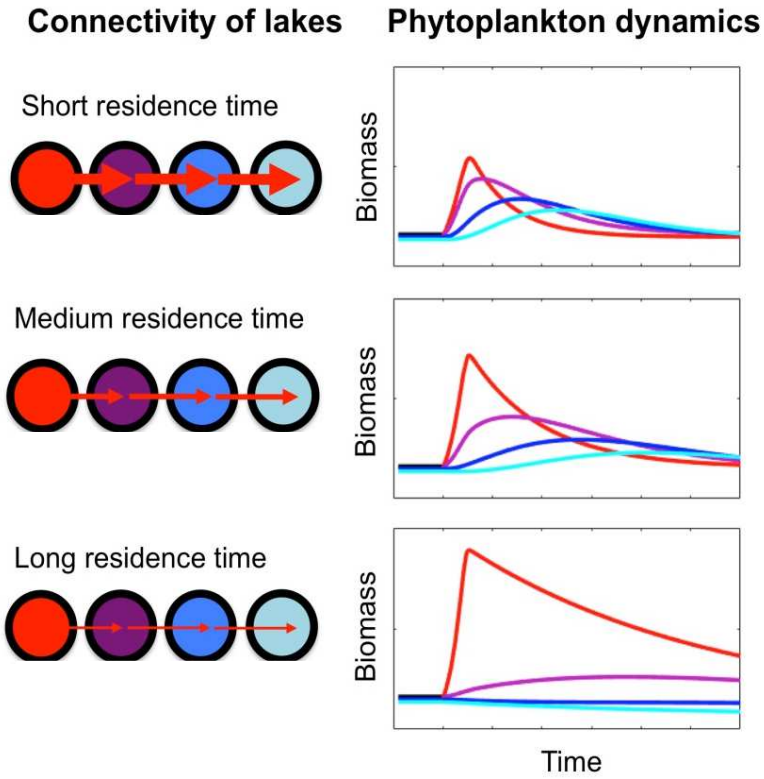


Predictive ecology in a changing world.
Review by Mouquet et al. 2015, J. Appl. Ecol.

Objectives

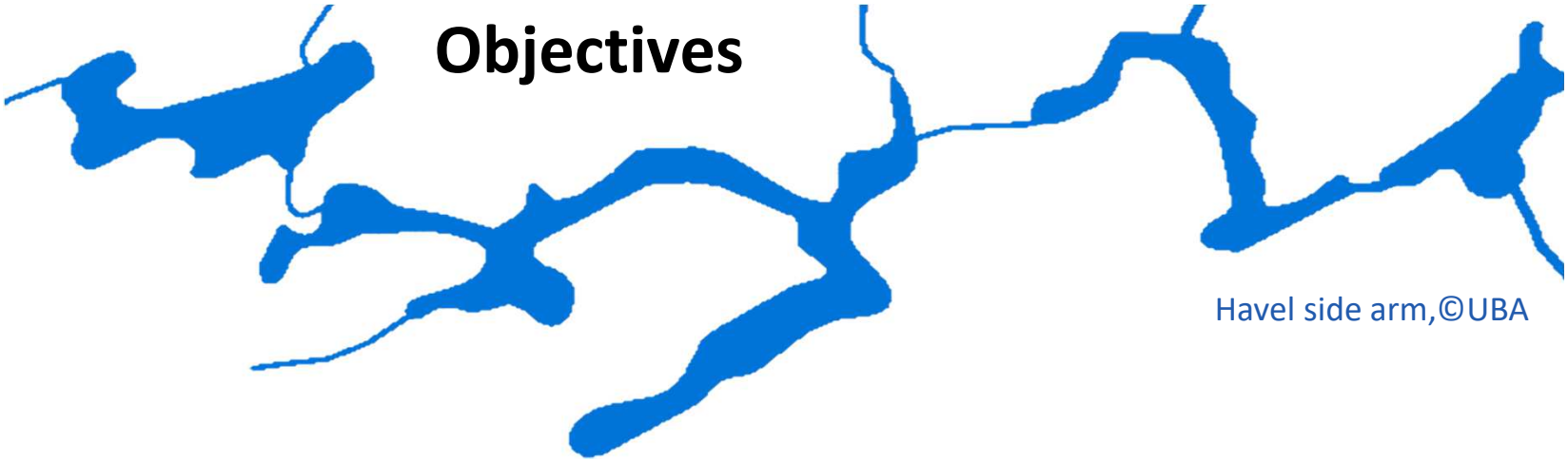


Havel side arm,©UBA

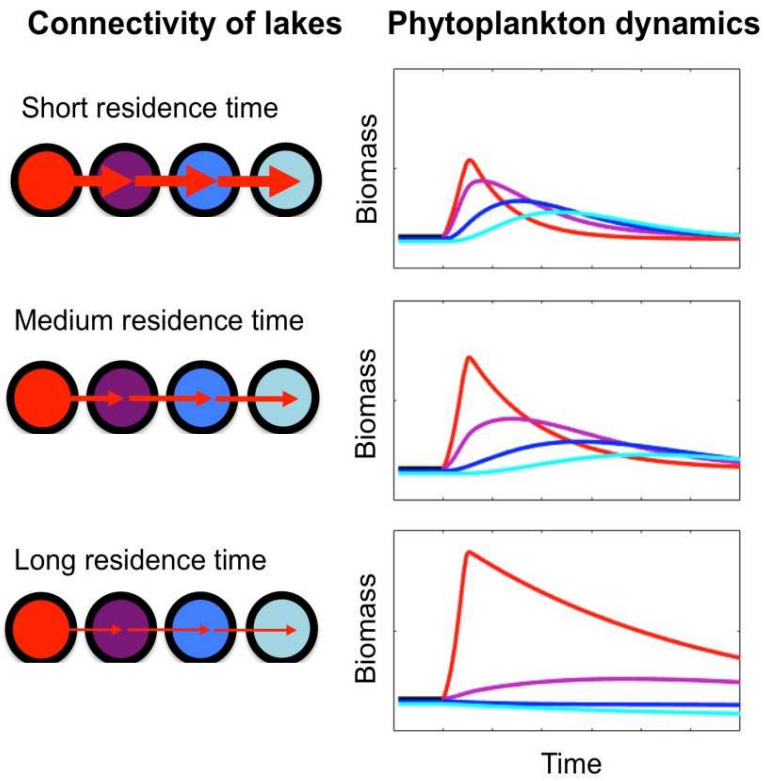


- Study how **lake-to-lake connectivity drives seasonal biological coherence in lake chains**

Objectives

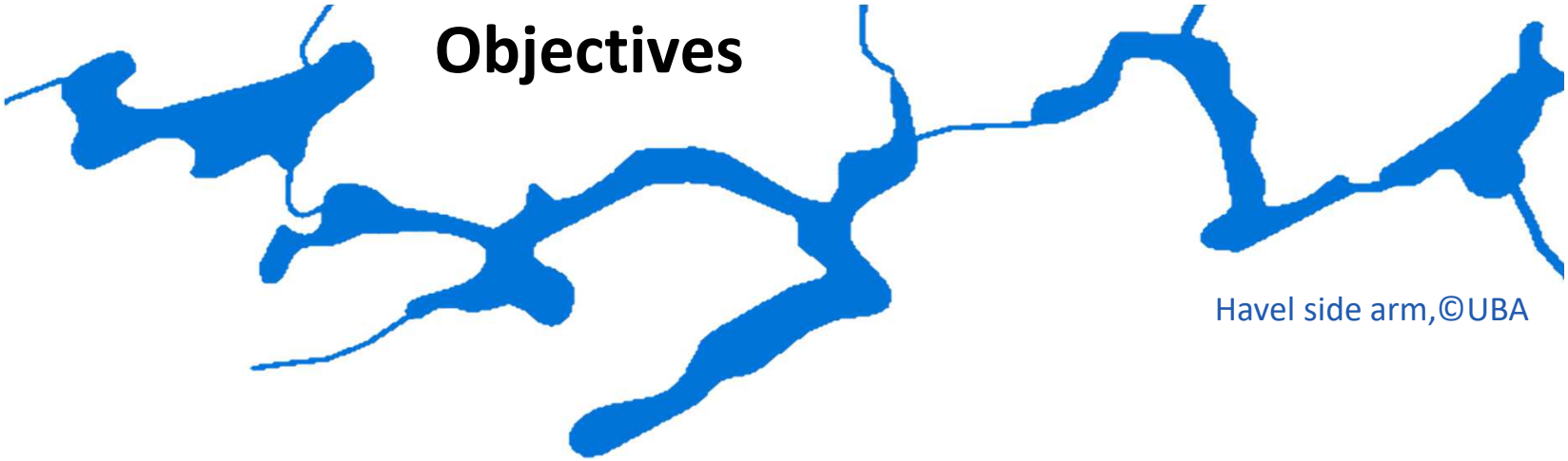


Havel side arm,©UBA

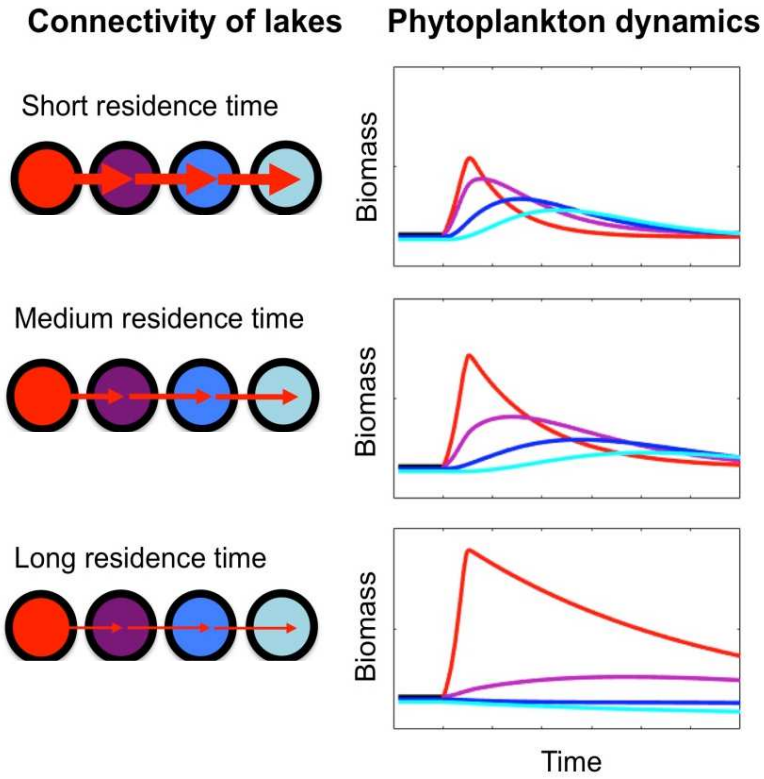


- Study how **lake-to-lake connectivity drives seasonal biological coherence in lake chains**
- Investigate how **lake depth and mixing pattern modulate the effects of lake-to-lake connectivity on coherence**

Objectives

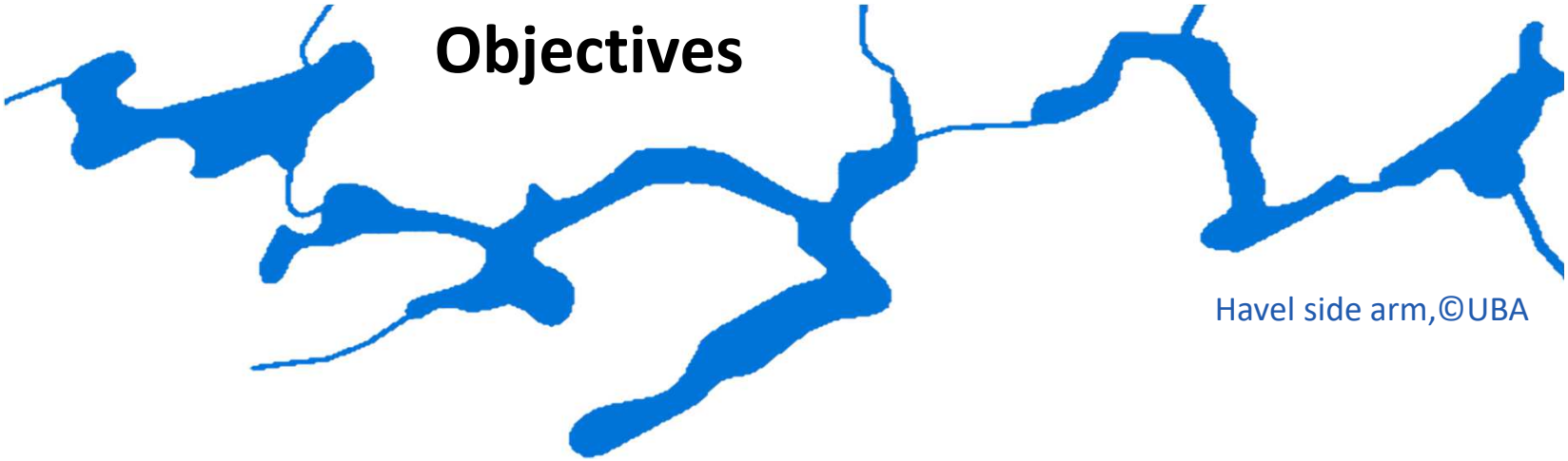


Havel side arm,©UBA

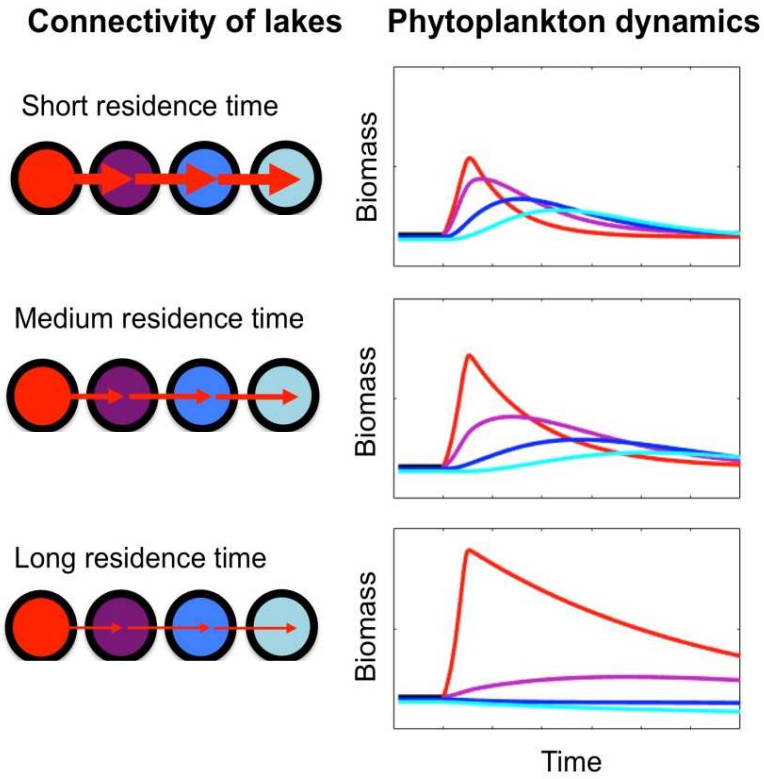


- Study how **lake-to-lake connectivity drives seasonal biological coherence in lake chains**
- Investigate how **lake depth and mixing pattern modulate the effects of lake-to-lake connectivity on coherence**
- Include **Remote Sensing**, backed by ***in situ* sensors**, to allow detection of **coherence patterns of river-connected lakes** and

Objectives



Havel side arm,©UBA



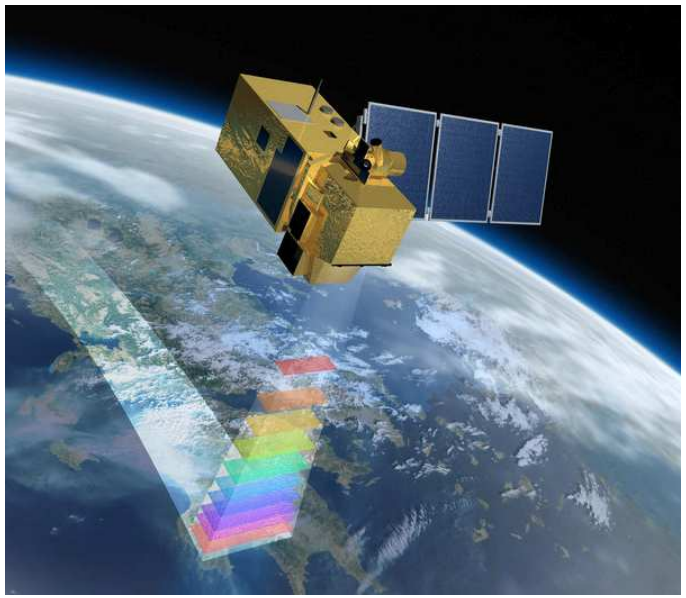
- Study how **lake-to-lake connectivity drives seasonal biological coherence in lake chains**
- Investigate how **lake depth and mixing pattern modulate the effects of lake-to-lake connectivity on coherence**
- Include **Remote Sensing**, backed by ***in situ* sensors**, to allow detection of **coherence patterns of river-connected lakes** and
- **Outlook: Facilitation of regional-scale monitoring and management**.

CONNECT – combines methods to achieve high temporal and spatial resolution

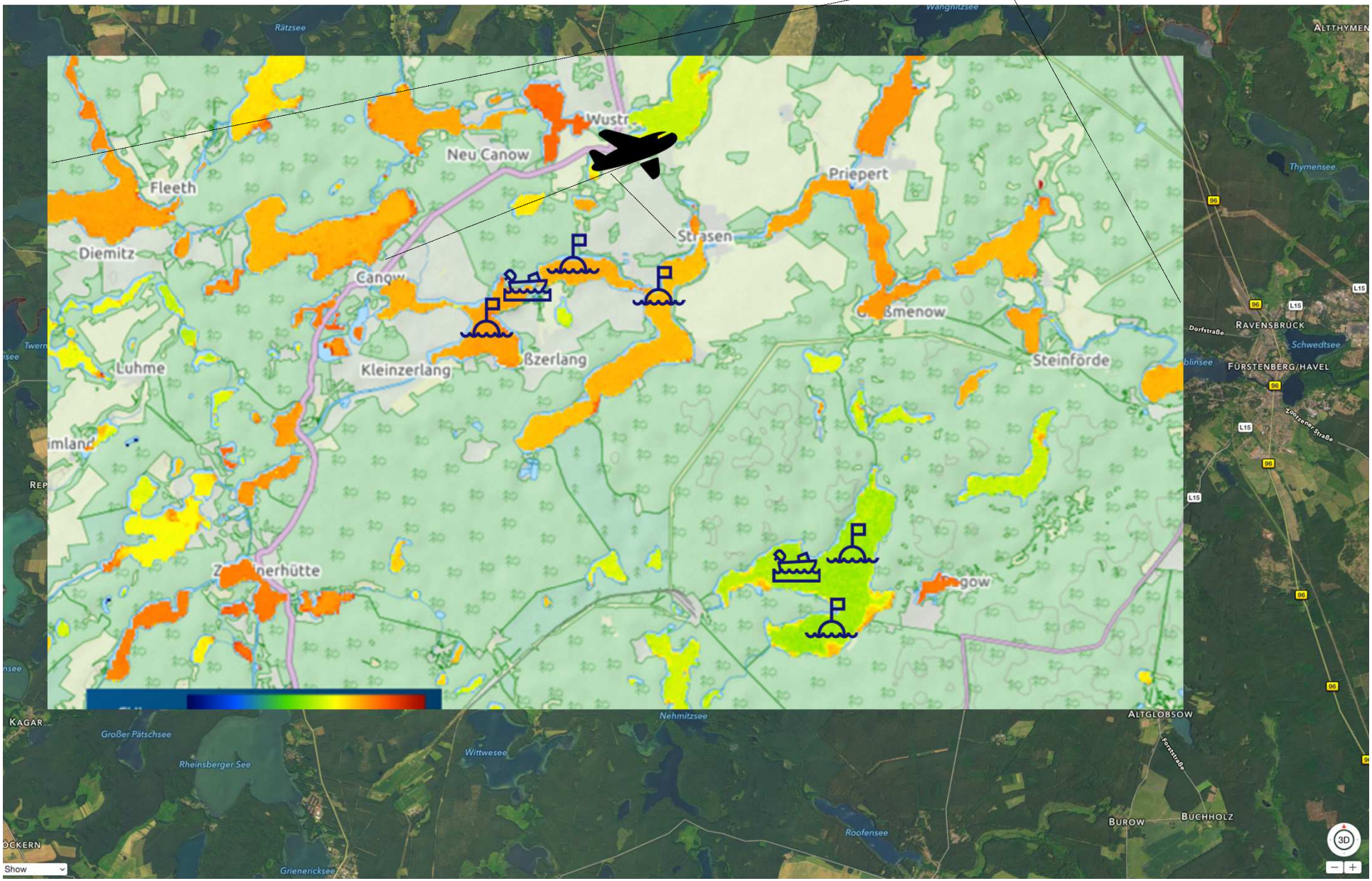
High frequency *in situ* sensors:
Chl-a, cyanos, temp., pH, cond., oxygen

Sampling & Lab:
Phytoplankton and water chemistry, HPLC pigments, FlowCam

Remote sensing:
Hyper- and multispectral cameras, handheld > drone > airplane > satellite

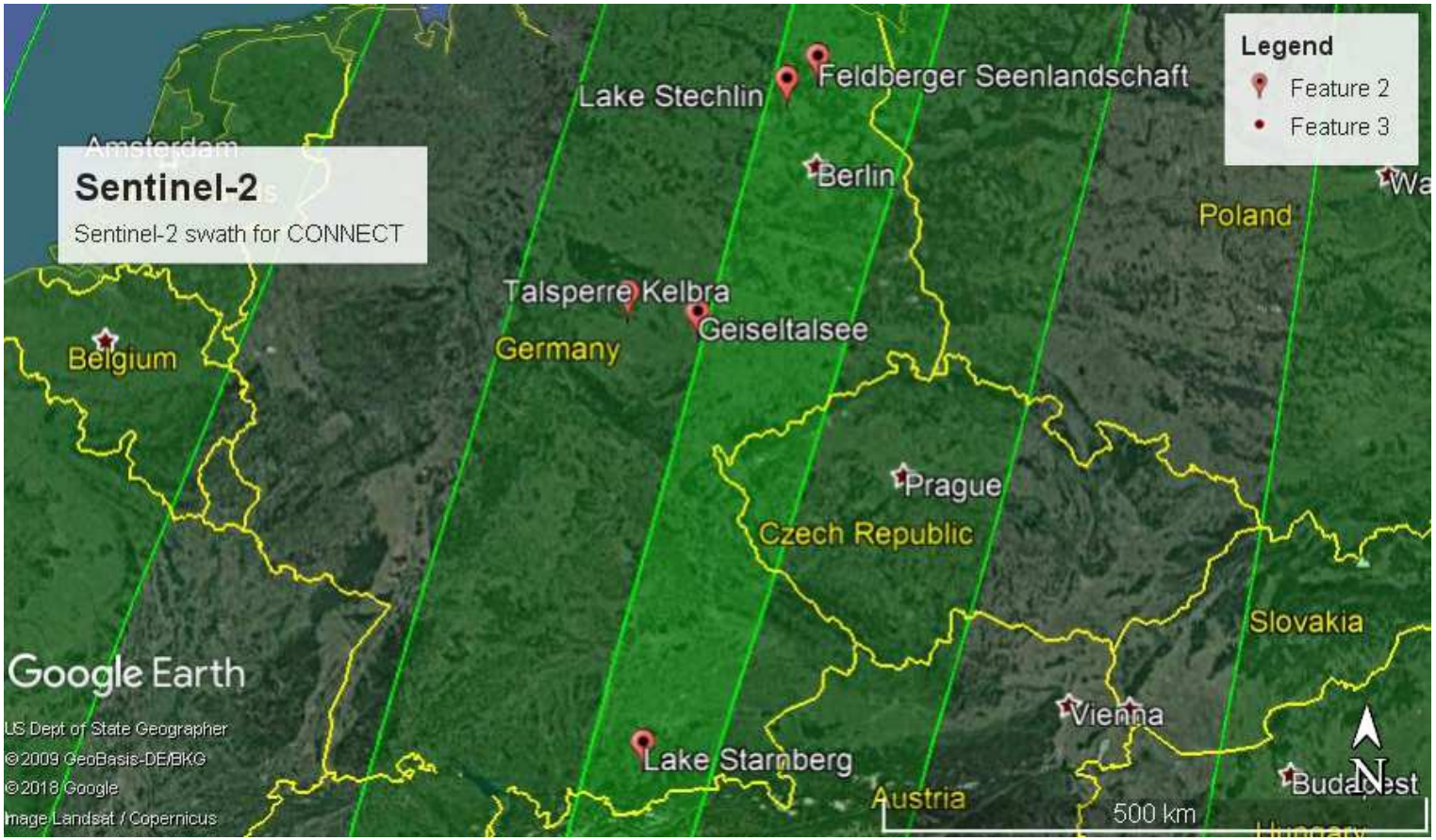


CONNECT – Field study 2019-2020

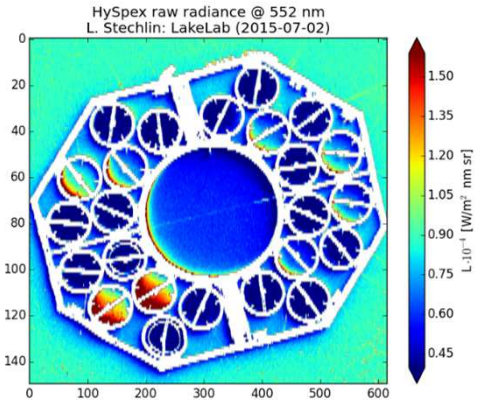


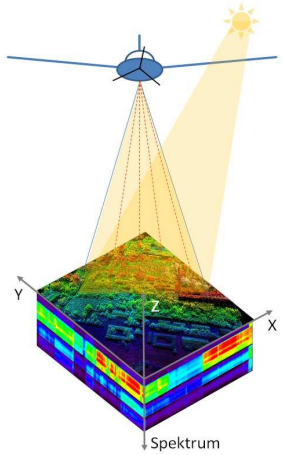
Sentinel 2 - schedule

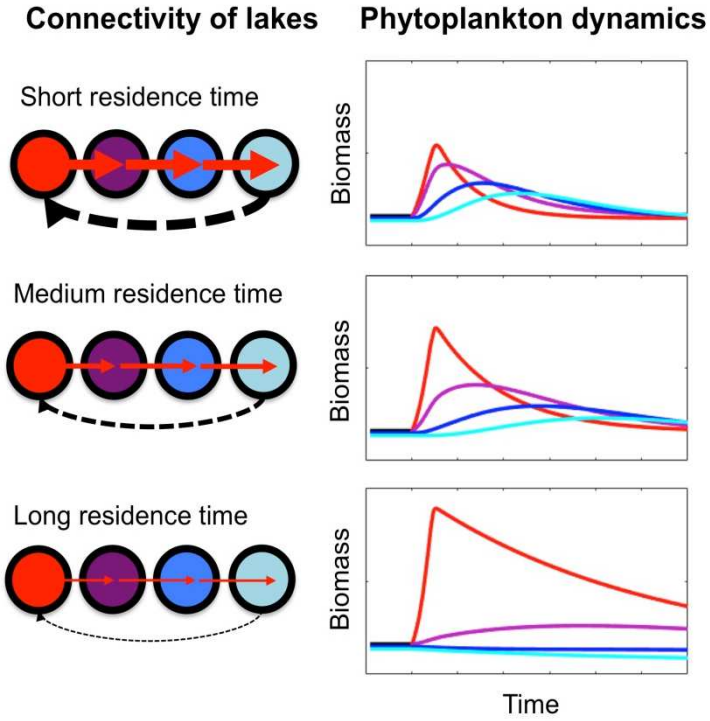
- **Area that is sampled twice within 10 days (center green)**

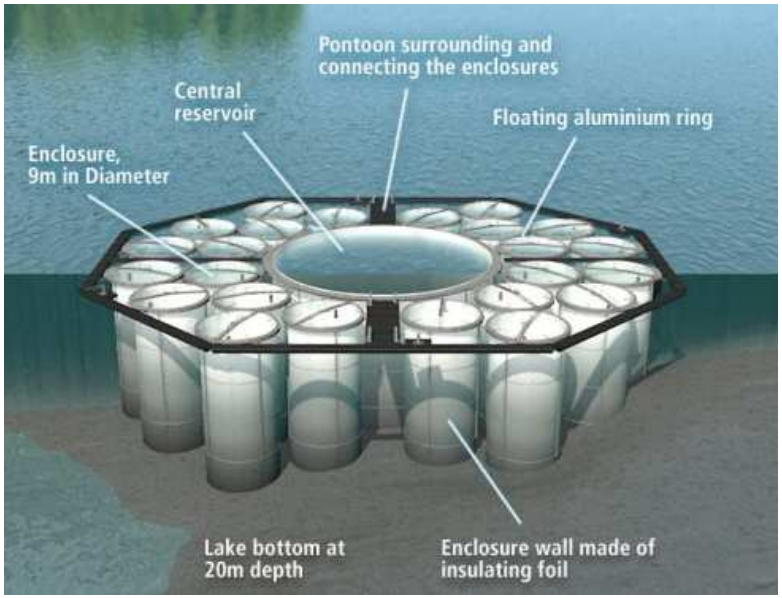


CONNECT - LakeLab Experiment 2019









*Join our **LakeLab connectivity experiment in 2019***

High-frequency in situ probes & in situ sampling & remote sensing tools

*Apply for **AQUACOSM Transnational Access***

www.aquacosm.eu

Licor light meter

YSI multiparameter probe

bbe Moldaenke fluorescence probe

Photo: M. Oczipka (HTW Dresden)

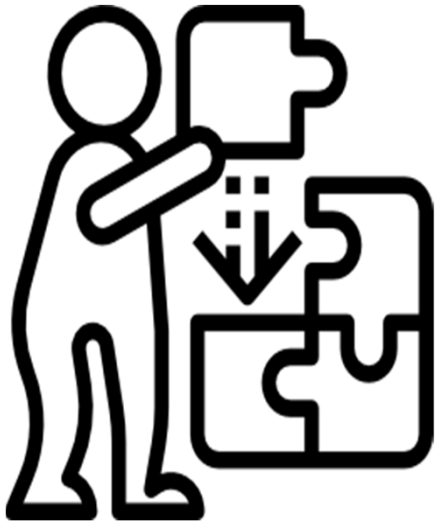
CONNECT

Connectivity and synchronisation of lake ecosystems in space and time

See Poster 33

Thanks for your attention

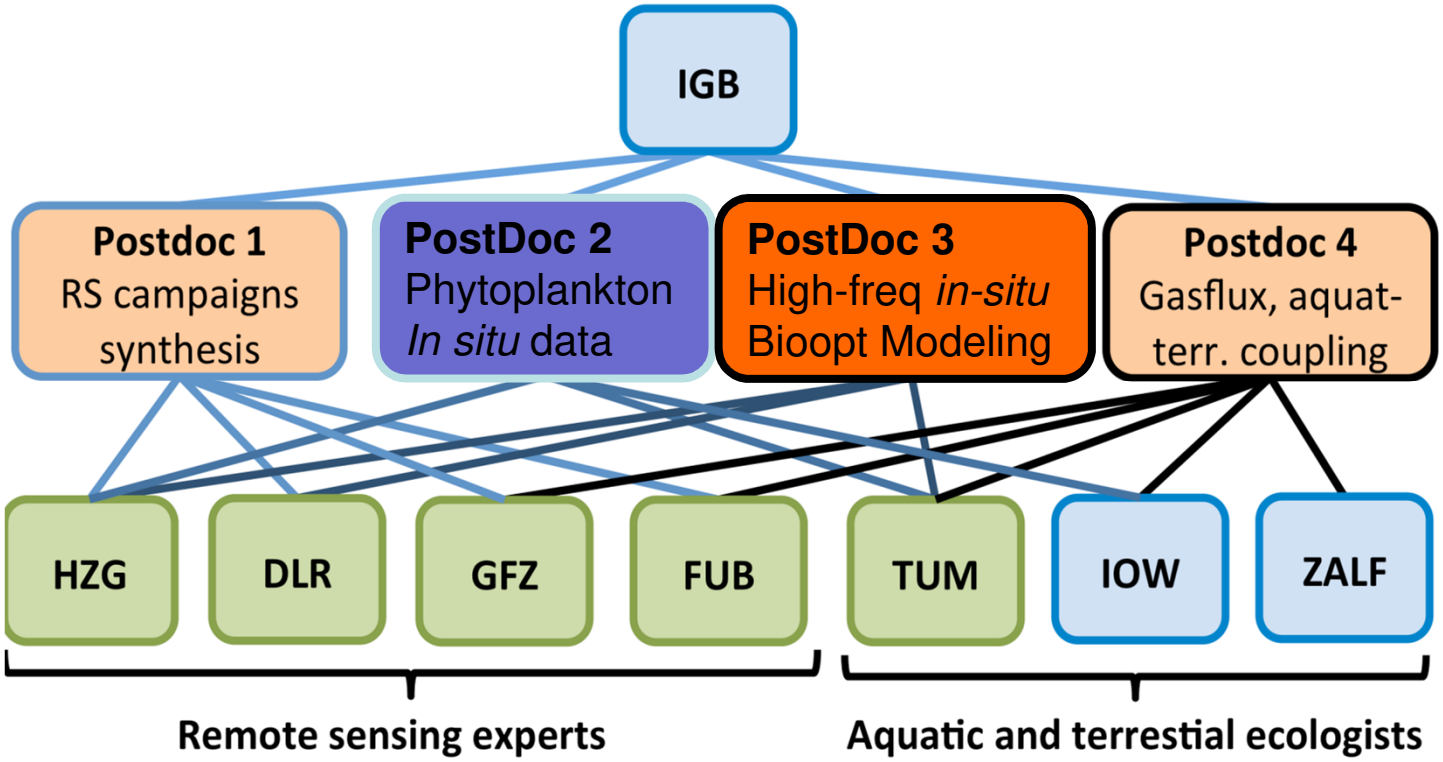
Post-Doc for bio-optical modelling

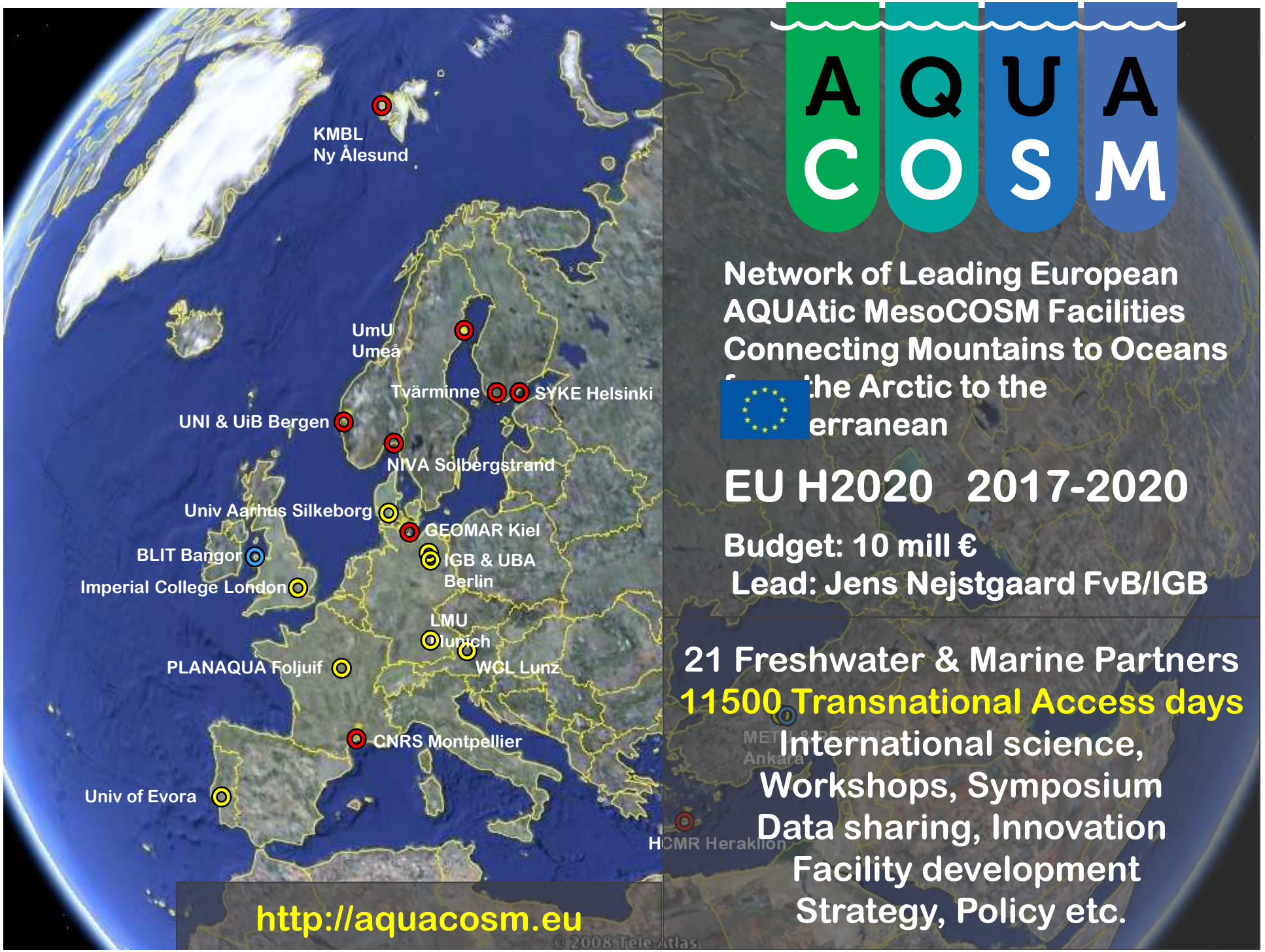


Leibniz-Gemeinschaft

IGB Leibniz-Institut für Gewässerökologie und Binnenfischerei

CONNECT - Network of Collaborative Excellence





AQUACOSM

Network of Leading European AQUAtic MesoCOSM Facilities Connecting Mountains to Oceans from the Arctic to the Mediterranean

EU H2020 2017-2020

Budget: 10 mill €

Lead: Jens Nejstgaard FvB/IGB

21 Freshwater & Marine Partners

11500 Transnational Access days

International science, Workshops, Symposium

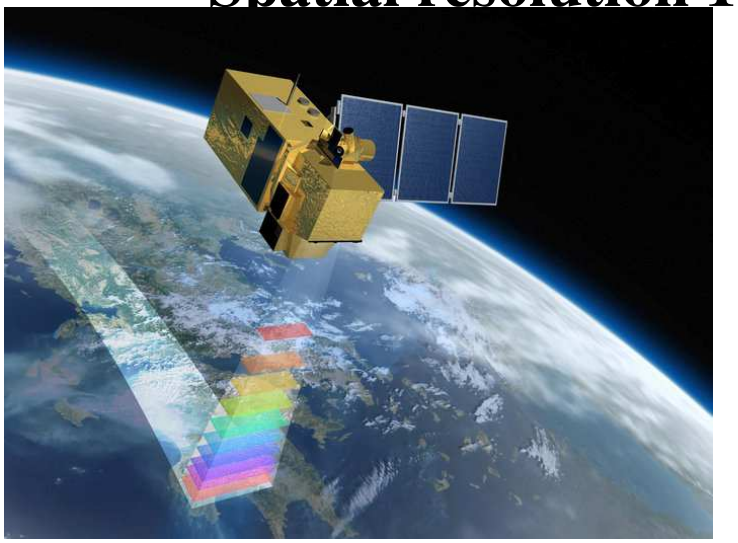
Data sharing, Innovation

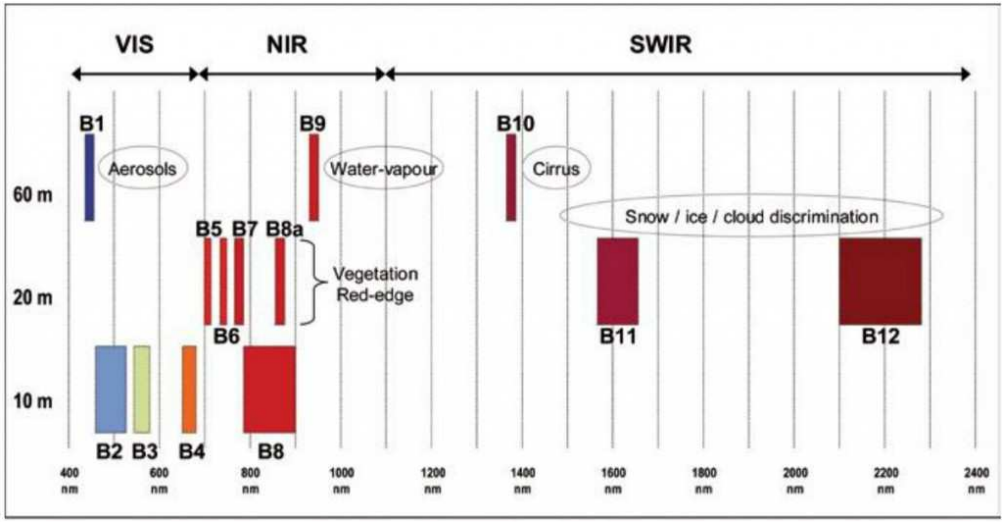
Facility development

Strategy, Policy etc.

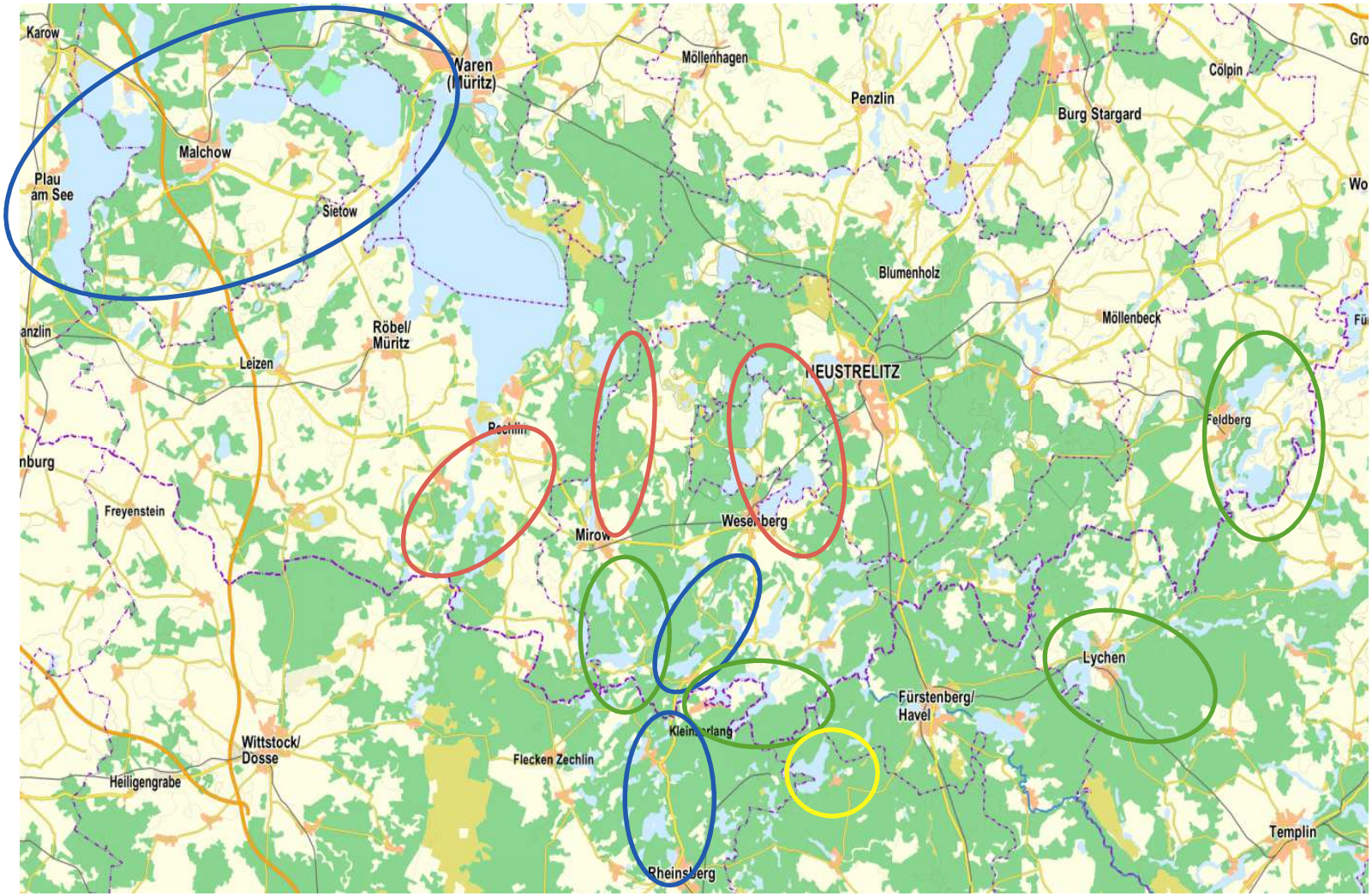
Sentinel 2

- **ESA Copernicus: Sentinel 2 (A+B)**
- **MSI – multi-spectral-imager: 13 bands (tailored for terrestrial applications)**
- **Spatial resolution 10-20m, measures every 2-3 days**





possible lake chains in north-BB and MV



lake types 10/13

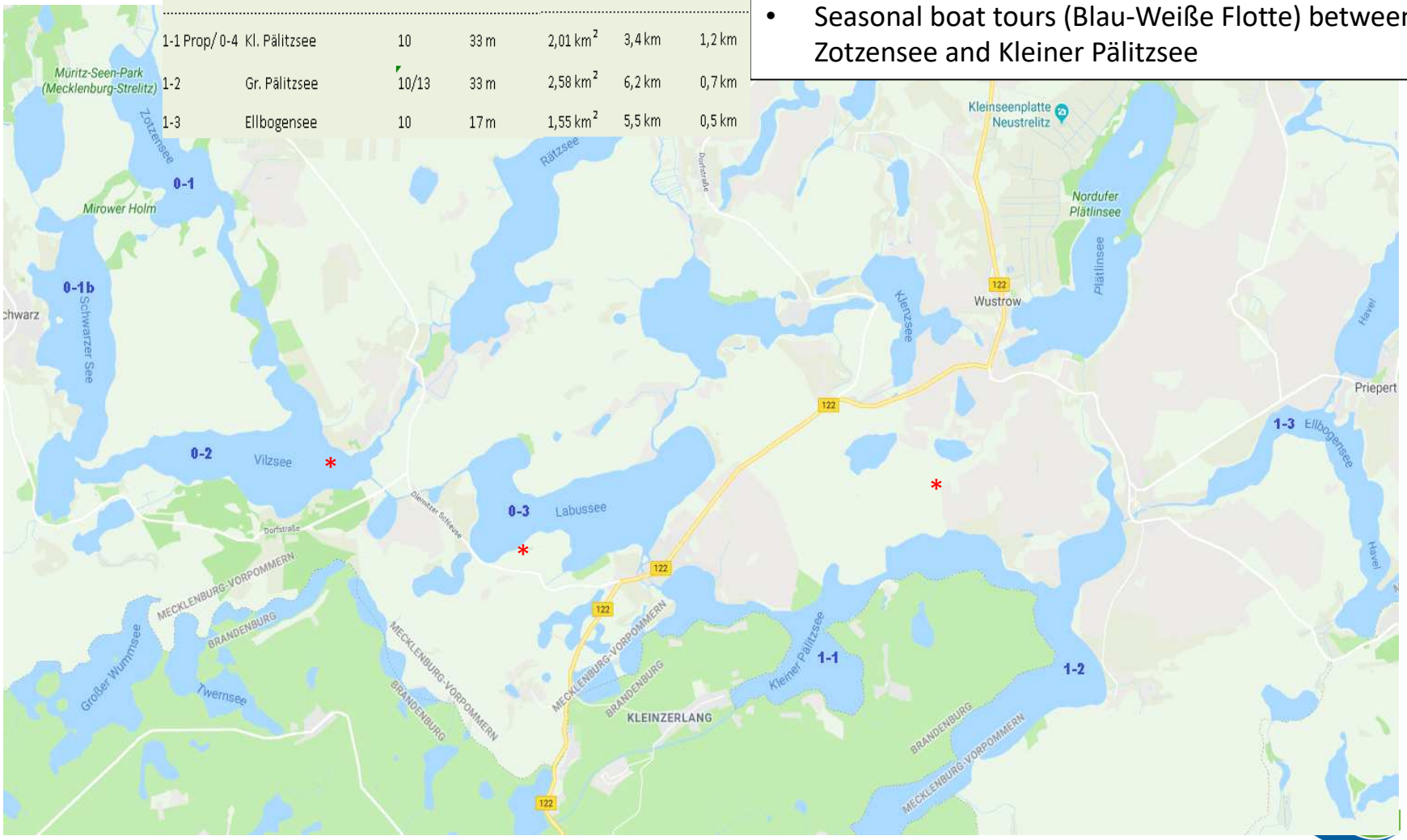
mixed lake types

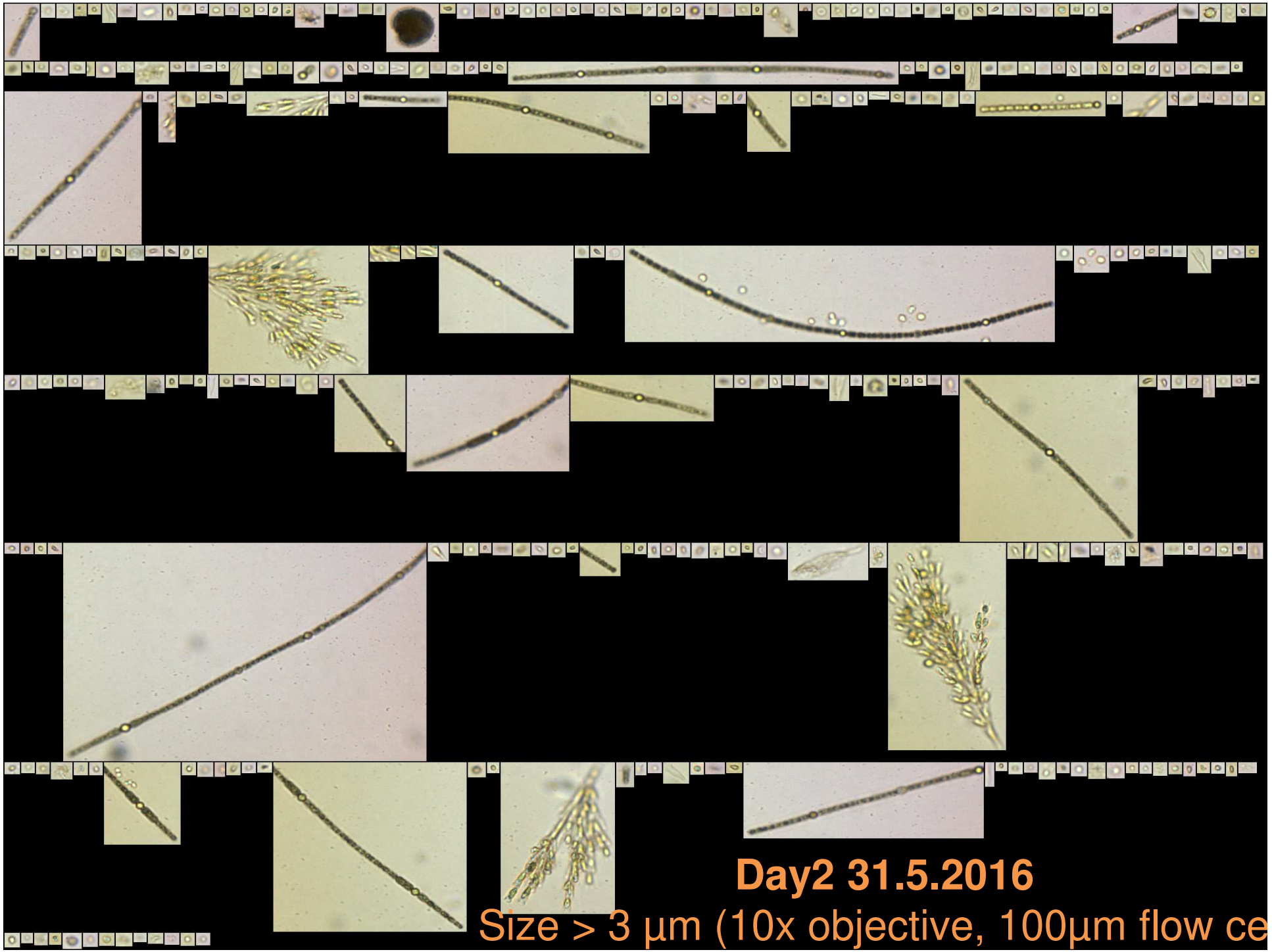
lake types 11/12

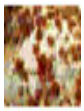
Lake Stechlin

lake chain	lake	type (UBA)	max. depth	area	lenght	width
0-1	Zotzensee (Mirow)	10		1,78 km2	1,9 km	0,5 km
0-1b	Schwarzer See (Schwarz)	13		1,78 km^2	2,6 km	0,9 km
0-2	Vilzsee	10	20 m	2,2 km^2	3,6 km	1 km
0-3/7-3	Labussee	10		2,51 km2	3 km	0,9 km
1-1 Prop/ 0-4	Kl. Pälitzsee	10	33 m	2,01 km^2	3,4 km	1,2 km
1-2	Gr. Pälitzsee	10/13	33 m	2,58 km^2	6,2 km	0,7 km
1-3	Ellbogensee	10	17 m	1,55 km^2	5,5 km	0,5 km

- lake chain 1 from proposal
- alternatively lake chain 0, but only one Sentinel-2 passing in 5 days
- watergates (*) in between
- Seasonal boat tours (Blau-Weiße Flotte) between Zotzensee and Kleiner Pälitzsee




Day2 31.5.2016
Size > 3 µm (10x objective, 100µm flow ce

spectral class	Green algae	Blue-green "algae"	Blue-green "algae" red-type	Green algae	Brown coloured class			Mixed type
Pigments	Chlorophyceae Prasinophyceae 	Microcystis/ Cyanophyceae 	Plankthothrix/ Cyanophyceae 	Euglena/ Euglenopyceae 	Synura Chrysophyceae 	Diatoms Bacillariophyceae 	Dinophyceae Dinoflagellates 	Cryptophytae/ Cryptomonas 
Chlorophylle								
Chlorophyll-a								
Chlorophyll-b								
Chlorophyll-c								
Phycobilines								
Phycocyanine								
Phycoerythrine								
Carotins								
ß-Carotin								
Xanthophylls								
Diadinoxanthin								
Fucoxanthin								
Lutein								
Peridinin								
Alloxanthin								
Zeaxanthin								

Pigment composition of important algae classes

spectral class	Green algae	Blue-green "algae"	Blue-green "algae" red-type	Green algae	Brown coloured class			Mixed type
Pigments	Chlorophyceae Prasinophyceae	Microcystis/ Cyanophyceae	Plankthothrix/ Cyanophyceae	Euglena/ Euglenopyceae	Synura Chrysophyceae	Diatoms Bacillariophyceae	Dinophyceae Dinoflagellates	Cryptophytae/ Cryptomonas
Chlorophylle								
Chlorophyll-a	●	●	●	●	●	●	●	●
Chlorophyll-b	●			●				
Chlorophyll-c					●	●	●	●
Phycobilines								
Phycocyanine		●	●					●
Phycoerythrine		●	●					●
Carotins								
ß-Carotin	●	●	●	●	●	●	●	●
Xanthophylls								
Diadinoxanthin				●	●	●	●	
Fucoxanthin					●	●	●	
Lutein	●		●					
Peridinin							●	
Alloxanthin								●
Zeaxanthin	●	●	●	●	●			

Dolichospermum spp. *Dinobryon spp.*

Pigment composition of important algae classes