

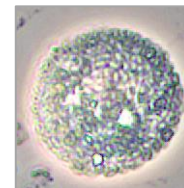
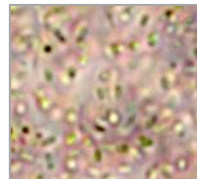


# Gewässer-Monitoring von Algentypen durch synergistische Nutzung von hyper- und multispektralen optischen Satelliten-Messungen (TypSynSat)

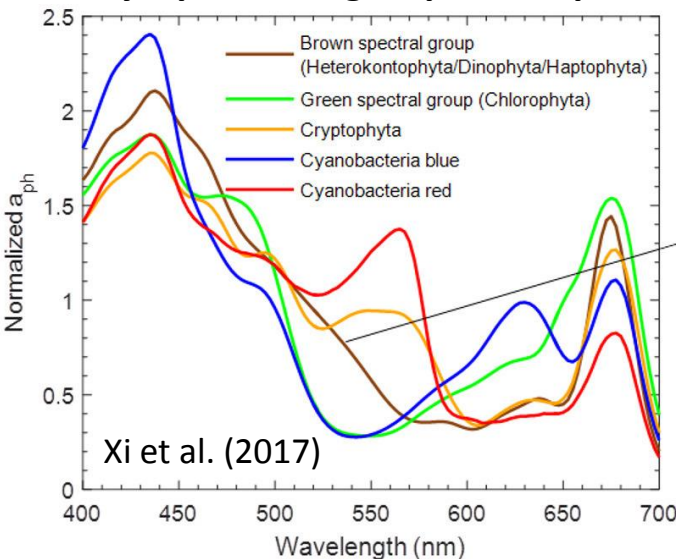
- ✓ Synergistic phytoplankton group data for coastal and inland waters using DESIS/EnMAP and Sentinel-3
- ✓ PI: Astrid Bracher (AWI; also Svetlana Losa) with subcontract to DLR-IMF (Peter Gege)
- ✓ Test sites: Lake Constance, Coast of Portugal, Salish Sea (Canadian Pacific Coast)
- ✓ Cooperation on campaign data with LUBW (Thomas Wolf), University of Victoria (Maycira Costa), University of Lisbon (Vanda Brotas)  
- ✓ Cooperation with EnMAP PI activities (Mariana Soppa, AWI, for water product validation & atmospheric correction; proposal under evaluation)
- ✓ Project Duration: Oct 2019 – Sep 2022; Funding: DLR-RFM/BMWE; FKZ 50EE1915



Photos: Sonja Wiegmann, Phytooptics, AWI

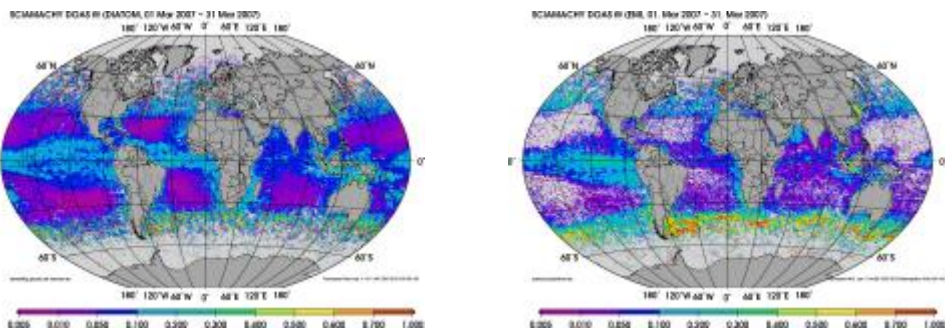
# Hyperspectral data provide the possibility to identify phytoplankton types (PFTs)

## Phytoplankton groups absorption



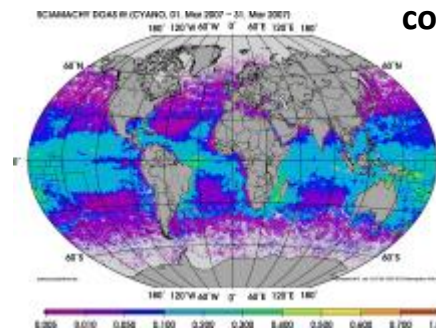
- ✓ Different PFTs play different roles in the aquatic biogeochemical cycles and can be responsible for harmful algal blooms.
- ✓ PFT specific optical signatures can be better differentiated using hyperspectral satellite data

## Phytoplankton Groups biomass from SCIAMACHY with PhytoDOAS Bracher et al. (2009), Sadeghi et al. (2012)



diatoms

coccolithophores

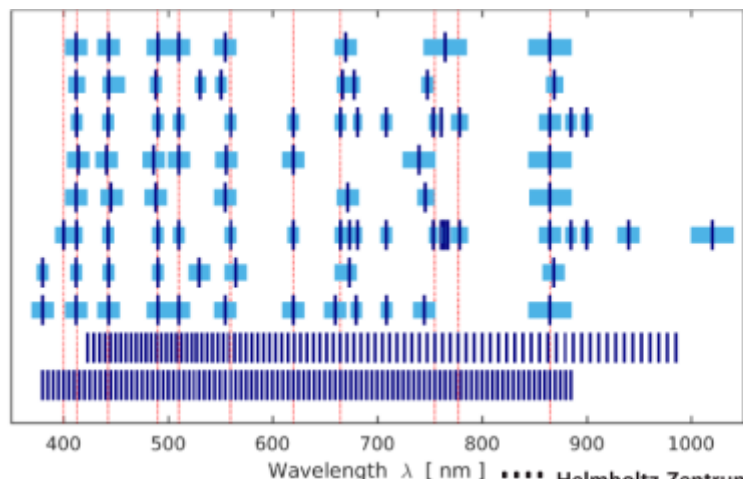


cyanobacteria

Longterm data set:  
 SCIAMACHY (2002-2012)  
<https://doi.pangaea.de/10.1594/PANGAEA.870486>

\*to be launched

## Satellite sensors for detecting water colour



# Phytoplankton Group Algorithm WASI-2D (Gege et al. 2014) & first test with DESIS data: Lake Constance 24 Apr 2019

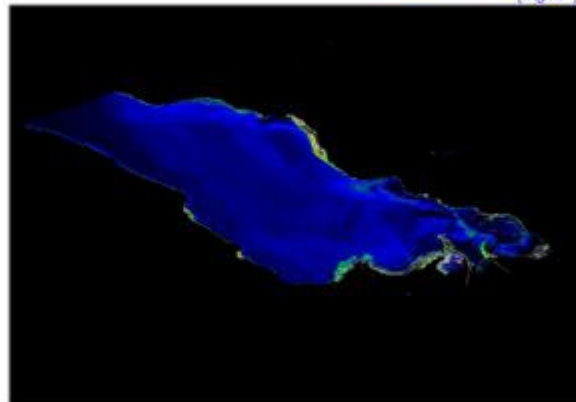
WASI: WATER colour Simulator (Gege 2004; Gege 2014)

- ✓ Simulation and analysis of spectral measurements in water
- ✓ Bio-optical models for deep water and shallow water
- ✓ Analytical model of downwelling irradiance
- ✓ Elementary data base of SIOPs, bottom substrates, atmospheric absorbers
- ✓ Physically traceable and transparent calculation steps

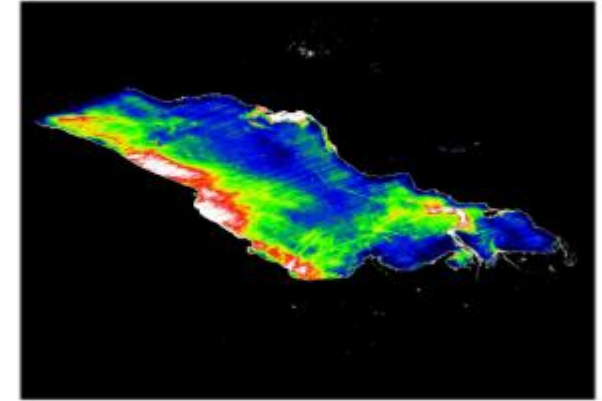
DESIS  
2019-04-24 Bodensee  
Bands 16, 59, 98  
440 nm, 550 nm, 650 nm



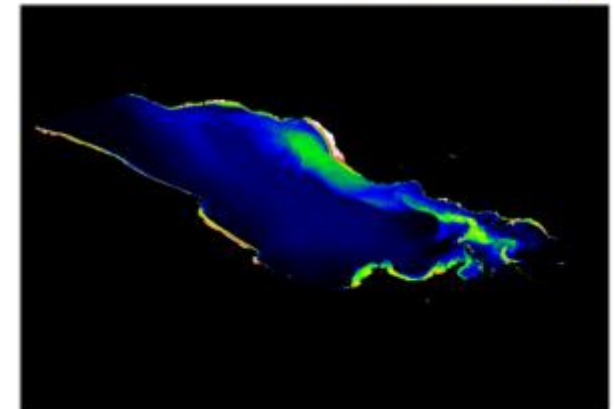
DESIS  
2019-04-24 Bodensee  
0 10  
Phytoplankton concentration  
[mg m<sup>-3</sup>]



DESIS  
2019-04-24 Bodensee  
0 0.5  
Sun glint + path radiance  
[sr<sup>-1</sup>]



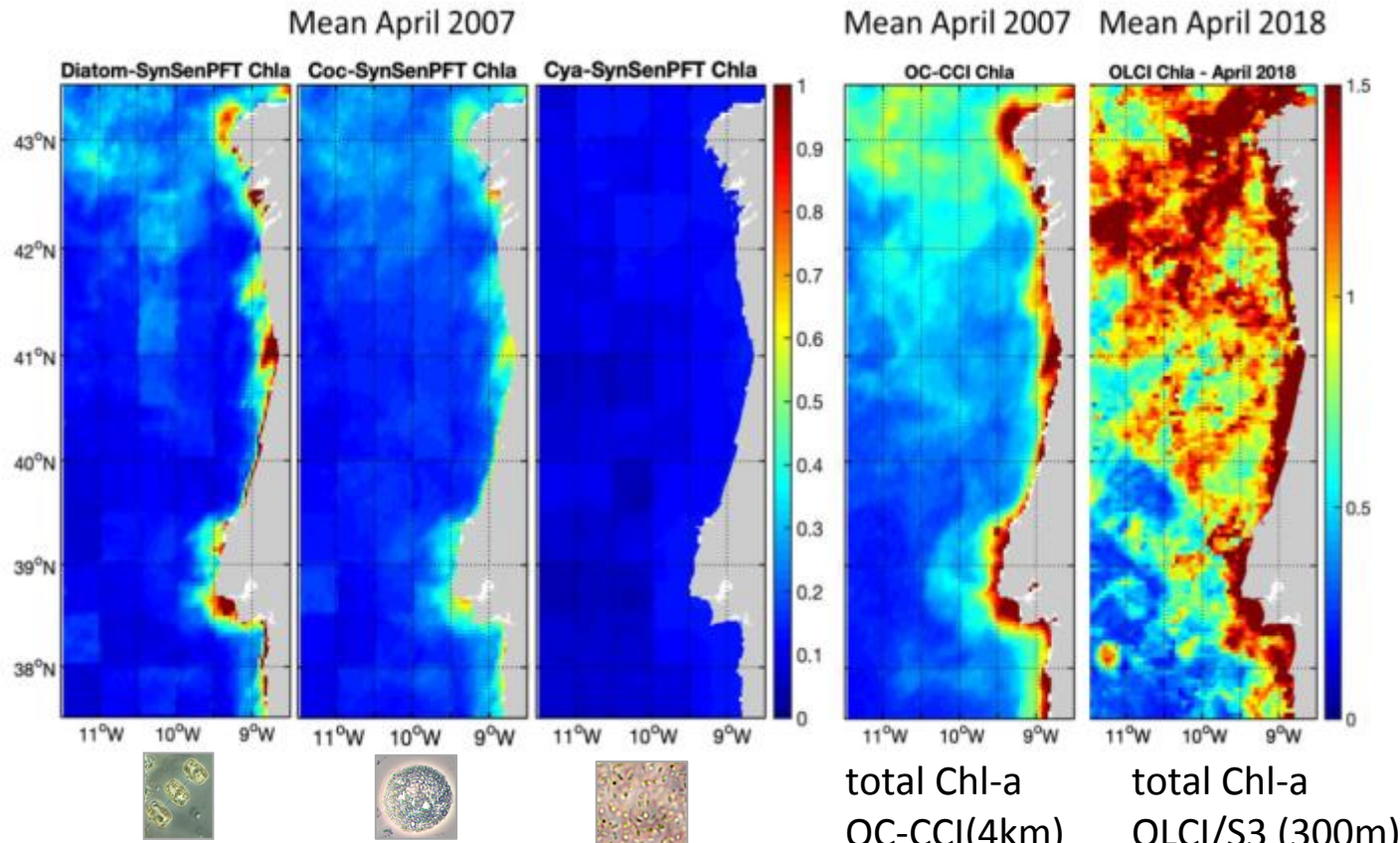
DESIS  
2019-04-24 Bodensee  
0 10  
Total suspended matter concentration  
[g m<sup>-3</sup>]



WASI's backbone is the first (world-wide) retrieval of phytoplankton groups from remote sensing data (Gege 1995; Lake Constance)

# SynSenPFT (Losa et al. 2017): Synergistic algorithm for phytoplankton group data to increase temporal and spatial resolution

Targets: chl-a conc. of diatoms, coccolithophores, cyanobacteria (prokaryotes)



Former SynSenPFT products only  
4kmx4km daily

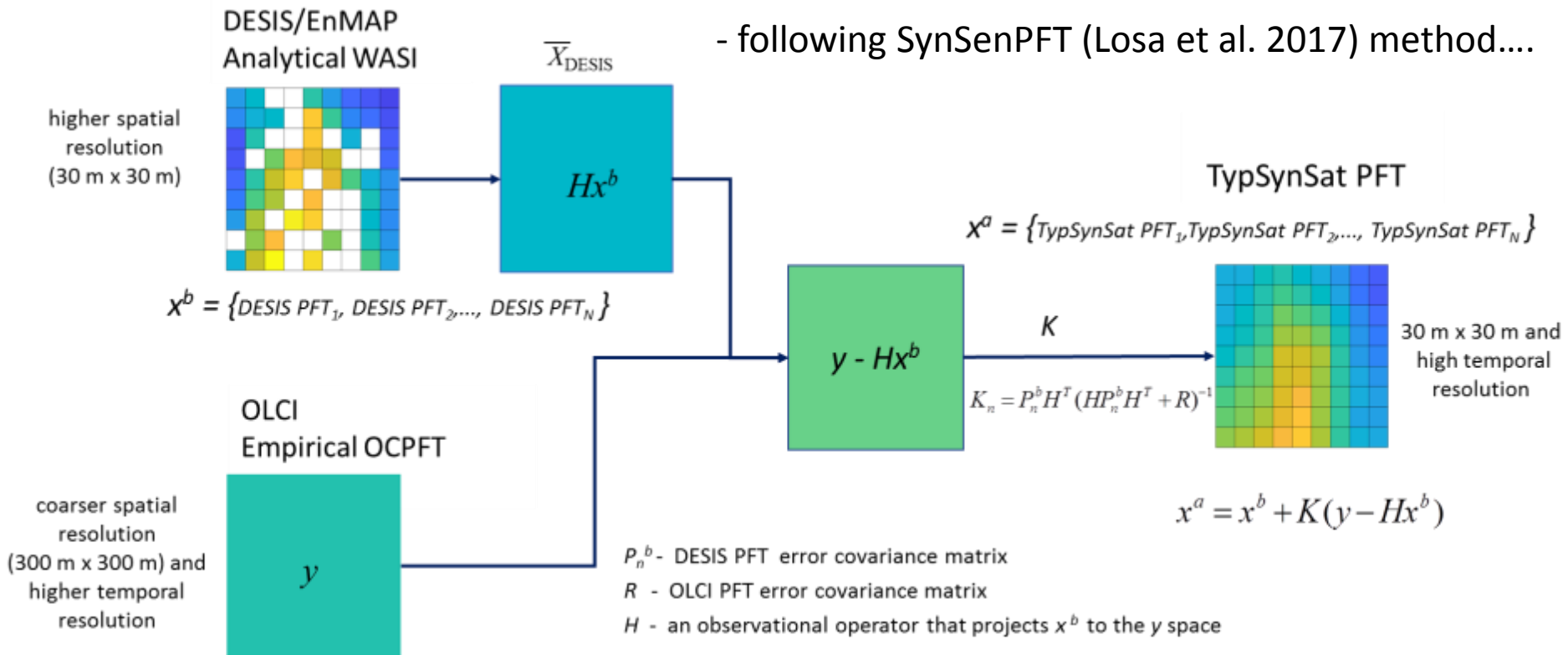
TypSynSat: towards  
30mx30m daily

SCIAMACHY-OC-CCI product SynSenPFT

<https://doi.org/10.1594/PANGAEA.873210>

Validation of Portuguese Coast: field data from University Lisbon, Prof. V. Brotas (EU-PORTWIMS, ESA-S5POC)

# TypSynSat: Extending SynSenPFT for coastal and inland waters using DESIS/EnMAP and Sentinel-3 OLCI



Targets e.g.: chl-a conc. of diatoms, dinoflagellates, coccolithophores, cyanobacteria

Test sites: Lake Constance (cooperation with LUBW), Coast of Portugal (cooperation with University Lisbon), Salish Sea (Canadian Pacific Coast, cooperation with University of Victoria)

EnMAP Box: Within project implementation of WASI-2D and TypSynSat algorithms