DERIVING PHYTOPLANKTON CHARACTERISTICS FROM OPTICAL PROPERTIES IN THE SOUTH CHINA SEA AND SULU SEA

A. Bracher[1,2,3], W. Cheah[1,3], B. Taylor[1,3], T. Dinter[1,2,3], B. Quack[4], F. Steinmetz[5]

[1]Helmholtz-University Young Investigators' Group PHYTOOPTICS, Bremerhaven-Bremen, Germany; [2]Institute of Environmental Physics, University of Bremen, Germany; [3]Alfred Wegener Institute Helmholtz Centre of Polar and Marine Research, Bremerhaven, Germany ; [4]GEOMAR, Kiel, Germany; [5]HYGEOS, Earth Observation, Lille, France

Intro & Objectives

Phytoplankton and optical properties were studied in the South China Sea and Sulu Sea with measurements during the SHIVA (Stratos-phere Halogens in a Varying Atmosphere) field campaign onboard RV Sonne in November 2011.

Objectives were to:

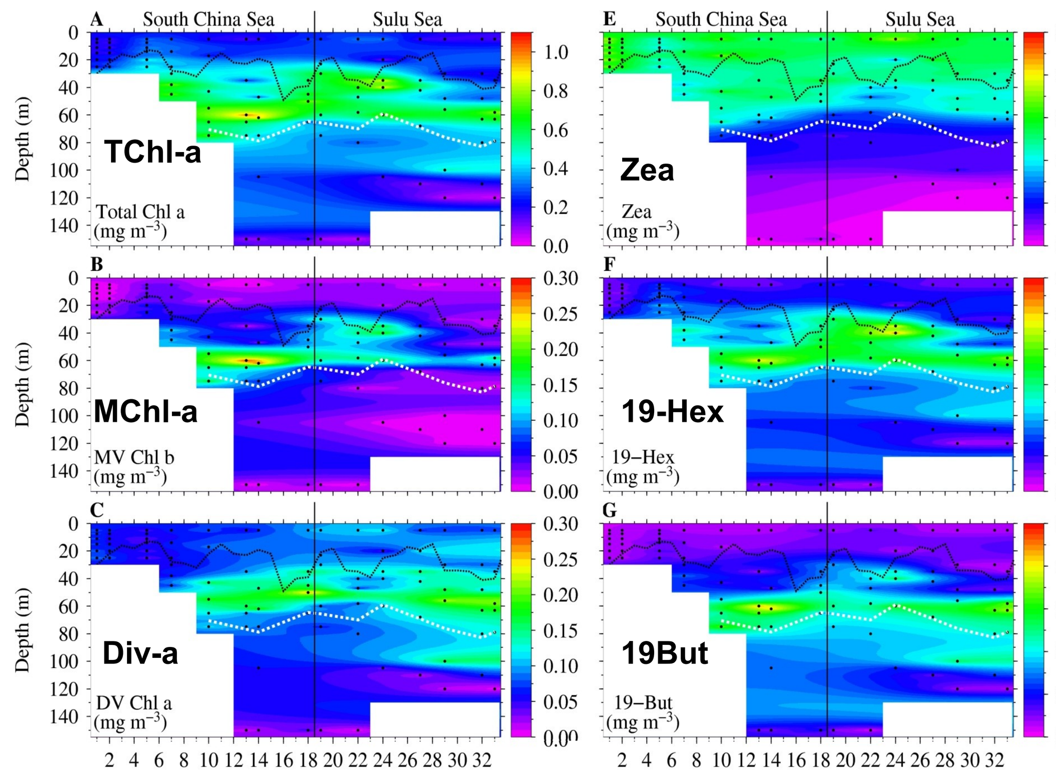
- determine phytoplankton abundance, composition and health and factors driving that
- use in-situ phytoplankton data to validate and improve satellite ocean color products (Polymer-MERIS total chl-a, PhytoDOAS-SCIAMACHY phytoplankton groups' chl-a) in the South China Sea and Sulu Sea

Outlook

- Calculate apparent optical properties (AOPs: RRS, k_d) from radiometric in-situ data.
- Compare AOPs to pigments and IOPs in order to identify region specific relationships .
- Compare in-situ IOP & AOP data and specific relationships to satellite ocean color data.
- Improve satellite algorithms to derive phytoplankton info in the South China Sea and Sulu Sea.

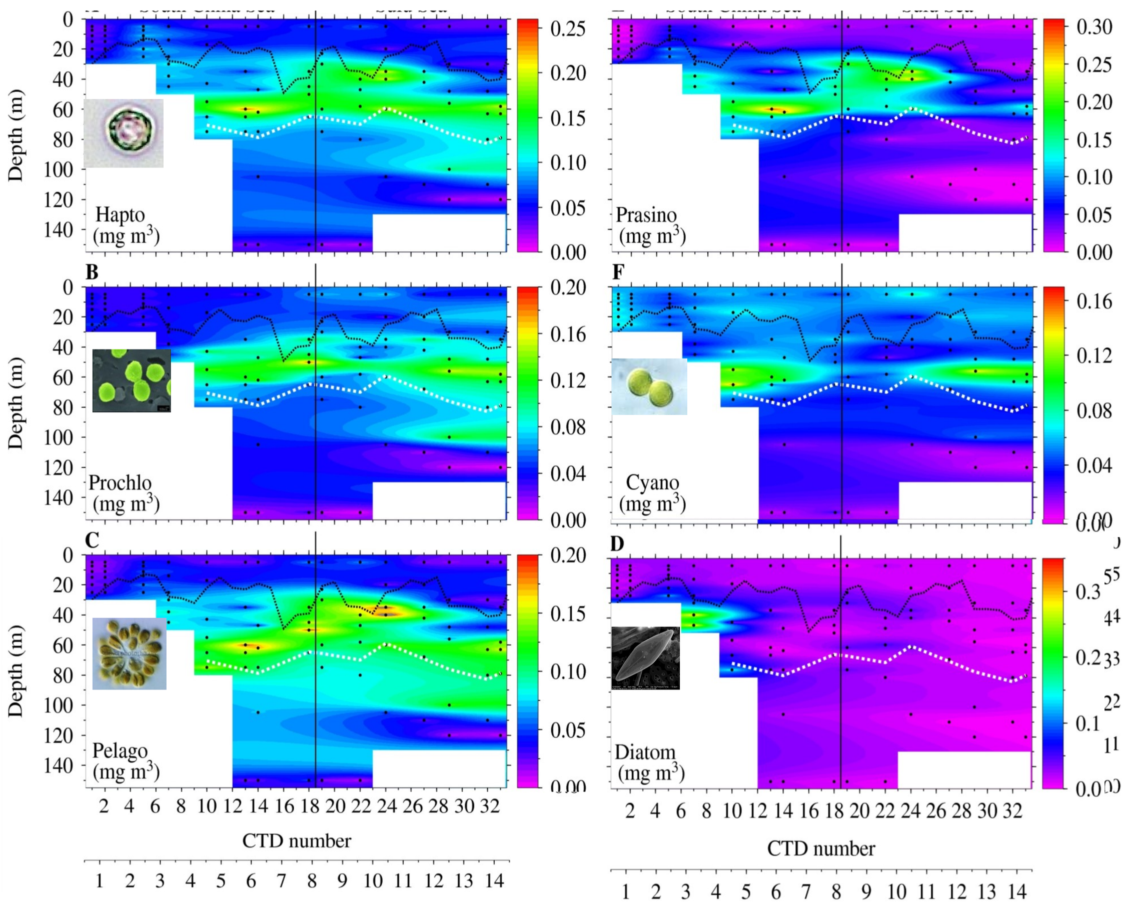
Phytoplankton Pigments, Groups, Absorption and Physiology during SHIVASonne (Cheah et al. 2013)

Pigments (HPLC analysis)



Black line = mixed layer depth
White line = euphotic depth

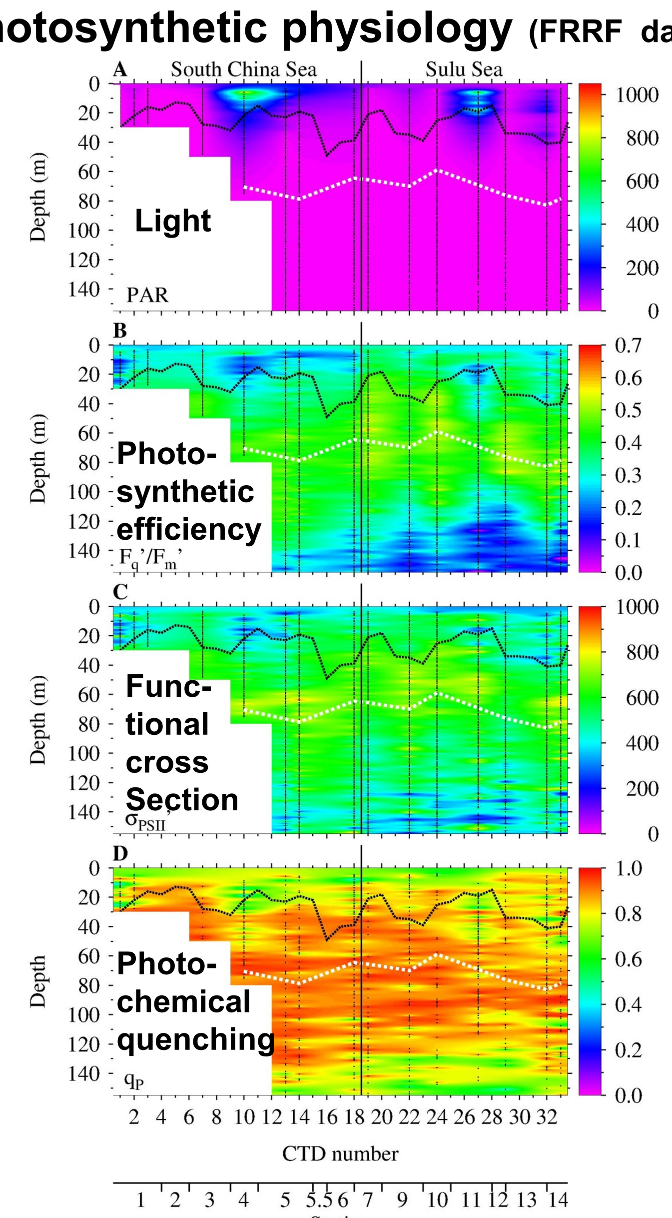
Phytoplankton groups (pigments with CHEMTAX)



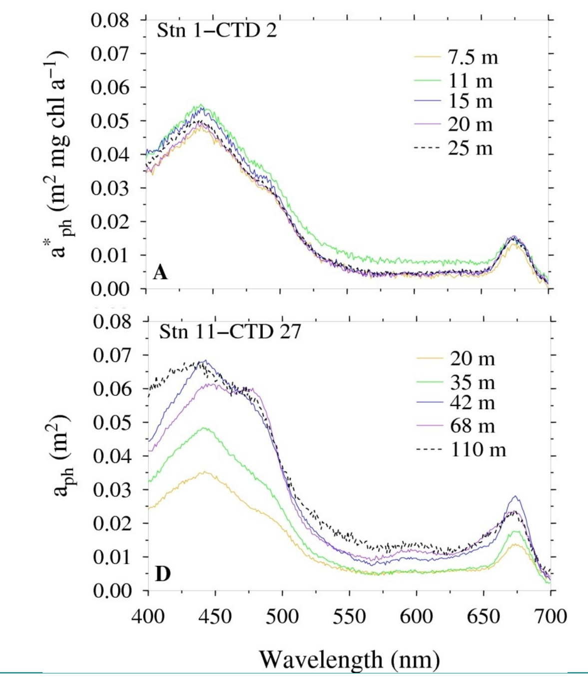
Hapto = Haptophytes
Prochloro = Prochlorococcus
Chryso = Chrysophytes

Diatom = Diatom
Prasino = Prasinophyte
Cyano = Cyanobacteria

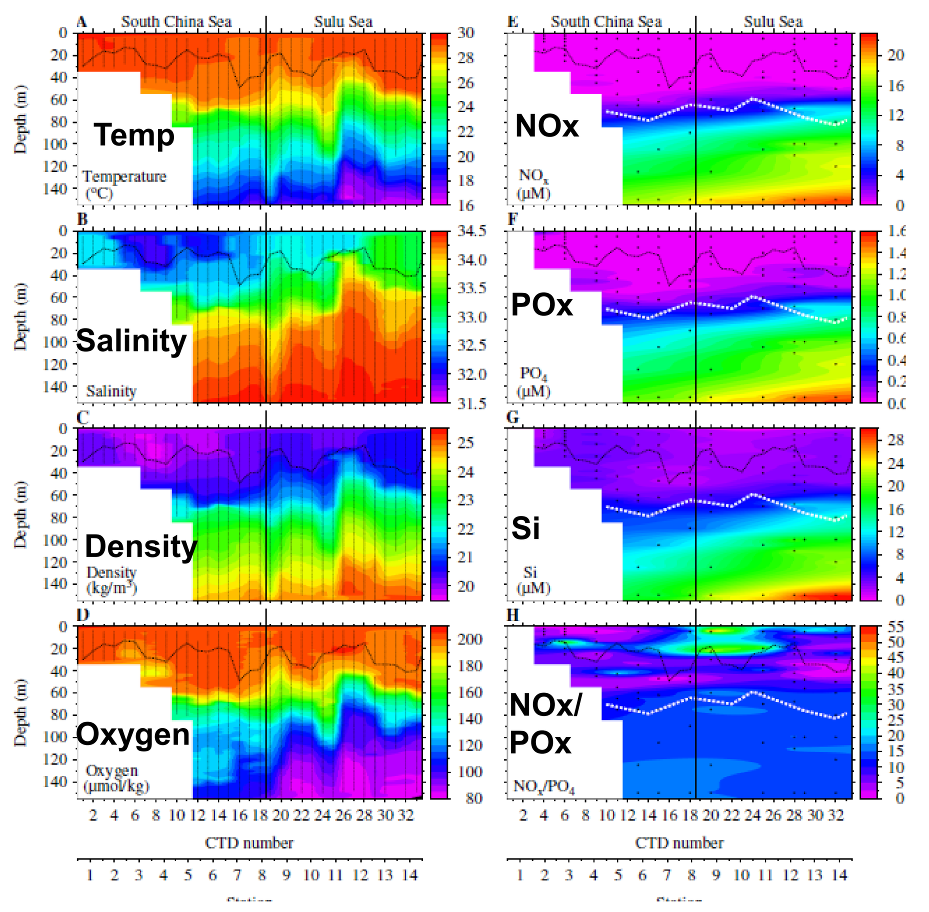
Photosynthetic physiology (FRRF data)



Phytoplankton specific absorption (filter pad)



CTD and nutrient data



Coastal stations:

1. Mixing rates within the mixed layer were faster than photoacclimation as shown in low aph*, Fv/Fm, functional absorption cross sections.
2. Phytoplankton were suffering from excessive irradiance and low nutrient conc. which resulted in low chl-a .

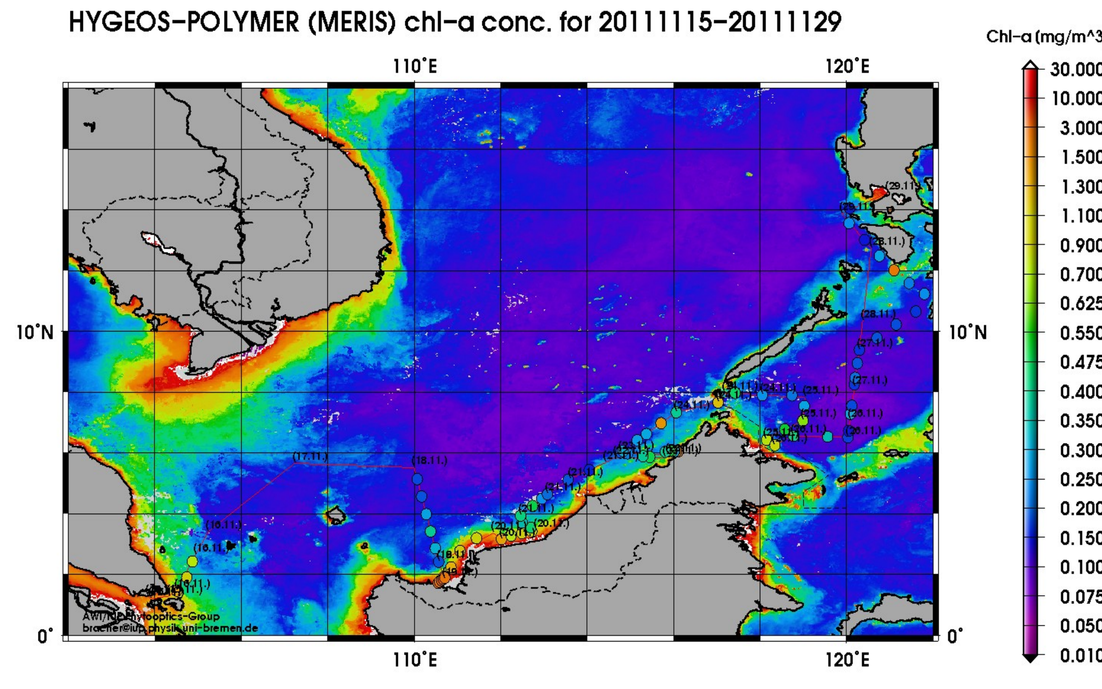
Deeper offshore stations:

1. Within mixed layer, same response as for coastal stations.
2. Below mixed layer, cells were low-light acclimated as indicated by high a_{ph}* and functional absorption cross sections.
3. Below mixed layer, conditions were favorable to phytoplankton (right amount of light, some increase in nutrients although still low). Cells were healthy or more competent (high Fv/Fm) which resulted in maximum chl-a

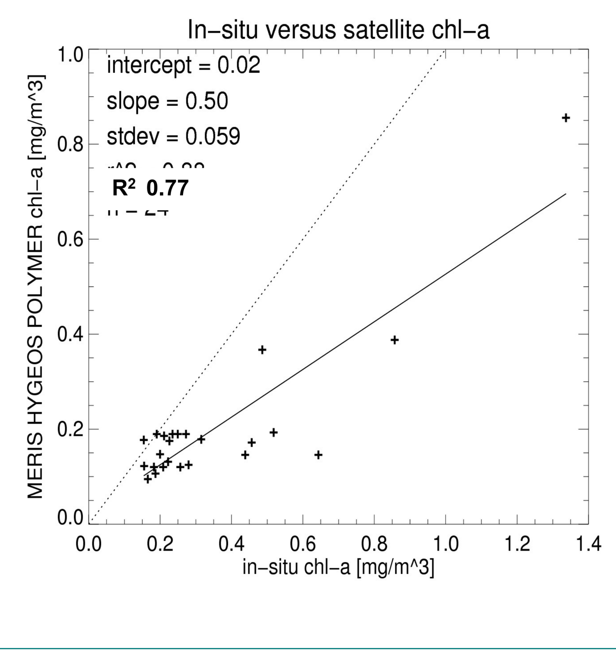
Total Chl-a from Polymer-MERIS Data

(Steinmetz et al. 2010)

Polymer-MERIS chl-a for 15-29 November 2011 compared to in-situ (HPLC)



Polymer-MERIS chl-a validated with in-situ (HPLC) chl-a of same day and within satellite pixel



Phytoplankton satellit products in the South China Sea and Sulu Sea:

Good correlation between satellite-derived and in-situ HPLC chl-a

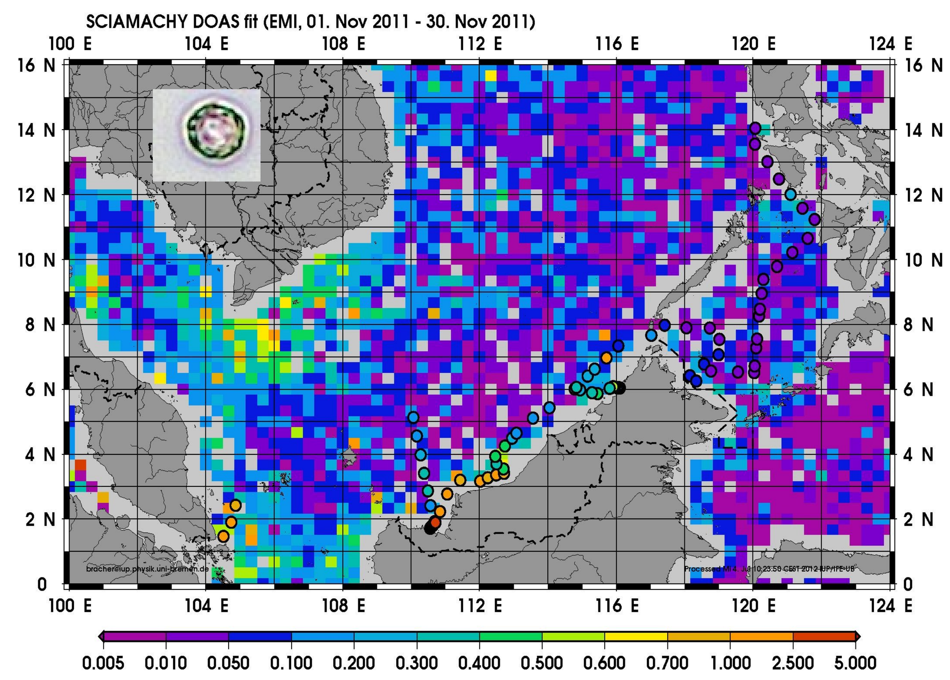
PhytoDOAS large pixel products reflect well the range of phyto-plankton group chl-a from in-situ data

Results indicate satellite-derived chl- a is not too bad, but should be improved to overcome underestimation!

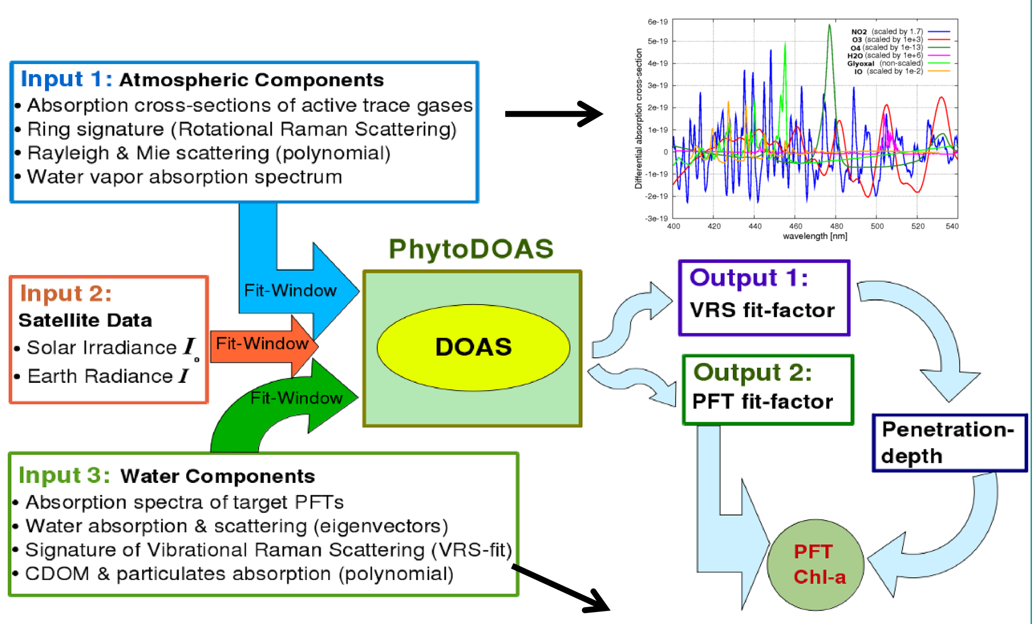
Concurrent Chl-a of Phytoplankton Groups from PhytoDOAS-SCIAMACHY Data

(Vountas et al. 2007, Bracher et al. 2009, Sadeghi et al. 2012, Sadeghi 2012) See also 2-P-150

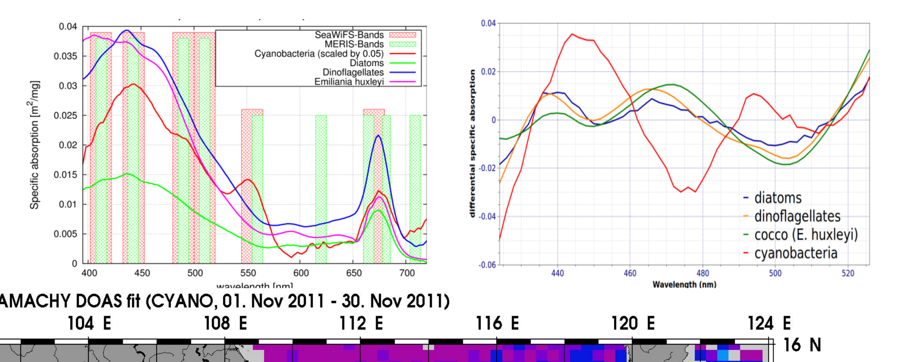
PhytoDOAS-SCIAMACHY phytoplankton groups for mean November 2011 compared to in-situ (HPLC)

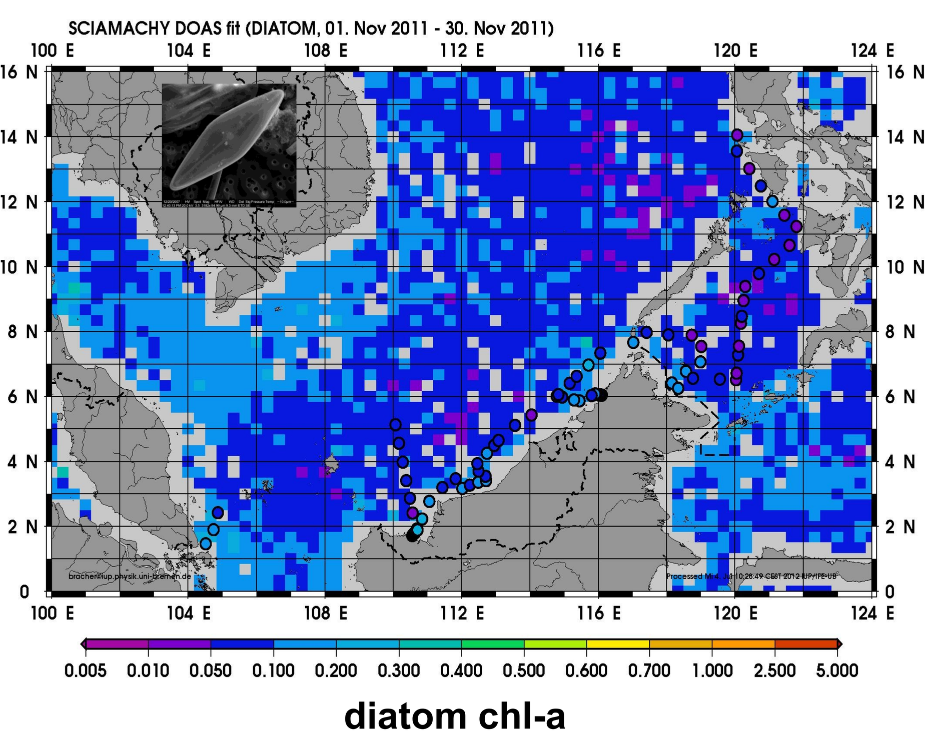


coccolithophore chl-a

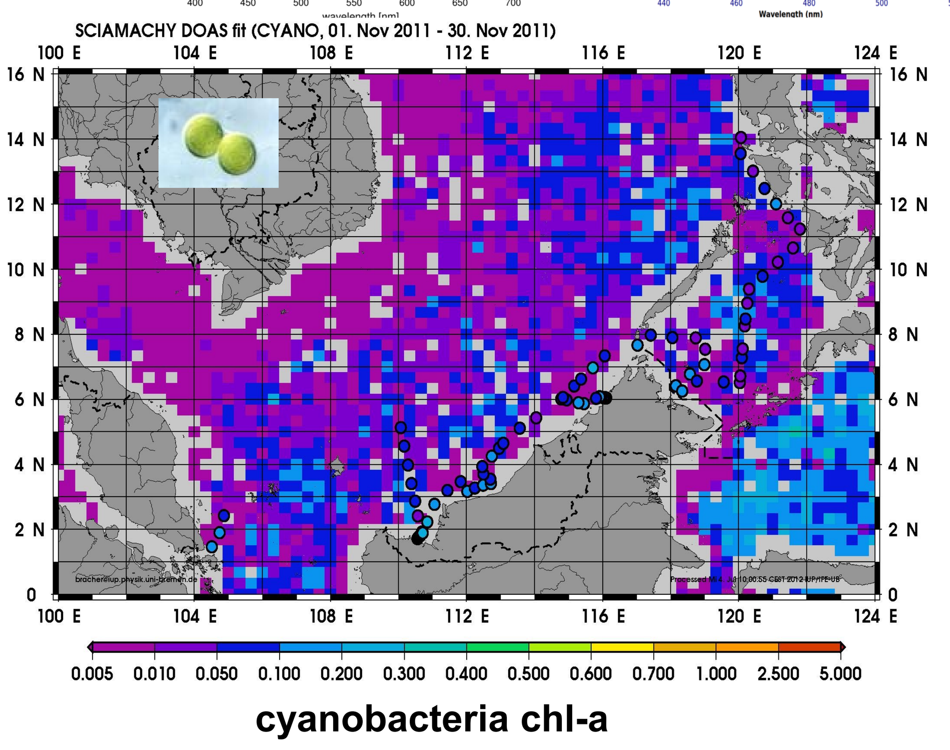


Specific (left) **and differential absorption** (right) **of phyto-plankton groups which are fitted with PhytoDOAS**





diatom chl-a



cyanobacteria chl-a

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