# “Going beyond HPLC: Coming to rapid consensus on science requirements for assessing phytoplankton composition from satellite imagery”

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>15 years of multiple phytoplankton types from space, limitations of multispectral, but more potential for new missions: better coverage, better spatial resolution, more spectral information

HPLC so far most used validation data set – but pigments are not taxonomic groups or size…

more automated in-situ data acquisition

# SCOPE of Breakout Session

1) **What kinds of laboratory, field, airborne, and satellite data are required as comprehensive database to develop PFT bio-optical algorithms across the globe?**

- What is most useful? How accurately and efficiently measured beyond HPLC?
- Which optical metrics are vital for hyperspectral imaging remote sensing?
- Which can be derived from RS? have maximum utility? are monitored robustly over time?

Develop recommendations for minimum set of measurements which meet objectives

2) **Detecting blooms of certain phytoplankton type:**

- What blooms can be differentiated / which ones are challenging with multi- but may be detected with hyperspectral?
- Which ones are useful for water quality, eutrophication, fisheries, other applications?
- How do these blooms fit into Phytoplankton Functional Type categories?

Community consensus on a "minimum" list to attempt to be retrieved globally with sufficient accuracy? – e.g. see list at PACE website

3) **How to best utilise existing programs / recommend new programs to validate satellite approaches for detecting ephemeral blooms & or quantitative PFTs?**

- Useful to define target spots (e.g., lakes, manmade reservoirs, coastal features) which serve as validation spots with "known" optical properties (consistent over time, space)?
- How to best respond to events of opportunity in regions with known blooms occurring?
- Well-placed moorings suited to sufficiently characterise diversity of blooms over time?
- Would it be useful to manufacture experimental blooms for algorithm development?

# Former/on-going activity among international Satellite PFT community

2006-2014 IOCCG PFT working group — IOCCG report 15

2008-2010: 1st PFT algorithm intercomparison (focus on global dominance)
Brewin et al. (2011) RSE 115: 325-339

2011- : 2nd intercomparison round on global PFT algorithms

Kostadinov et al. RSE 2017: Global satellite PFT intercompared based on phenology

Mouw et al. FMARS 2017: User guide on global satellite PFT products

May 2013: IOCS Splinter Meeting on "PFTs from space" with recommendations to agencies

Oct 2014: IOCCG WS on "Phytoplankton Composition from Space: towards a validation strategy for satellite algorithms" NASA TM #217528_01-22-15 - action items & recomm:

Jun 2015: IOCS Splinter Meeting on "PFTs from space" with recommendations to agencies

Sep 2016: Colour and Light from EO (CLEO) Session „Phytoplankton Diversity at Global and Regional Scale" with writing assignment towards scientific roadmap on future directions"
Bracher et al. 2017: Scientific Roadmap on obtaining phytoplankton diversity from space

Oct 2016: Ocean Optics Townhall „Update activities 2nd intercomparison global PFT algorithms"

Oct 2018: Ocean Optics Townhall „Validation phytoplankton community structure beyond HPLC"

# Agenda

14:00-14:05 **Intro: Scope of BO, former efforts and overview** (Astrid Bracher, AWI)

14:05-14:25: **Minimum requirements for lab and field work and measurements for sufficient PFT algorithm evaluation**: Overview (Colleen Mouw), Discussion (chair: Ryan Vandermeulen)

14:25-15:15: **Detection of phytoplankton blooms of specific groups and species**

**Speed talks shall present perspectives from all over the globe**
**Not complete coverage of the topic – just to give the flavour**
**We hope lively discussions after each sub-topic!**

**phytoplankton groups**: GIOP, Hydrolight and coupled atmosphere-ocean modelling (Hongyan Xi), hyper- vs multispectral (Jianwei Wei) ; Discussion (chair: Astrid Bracher)

15:30-16:15 **How do we best utilise existing programs or recommend new programs to validate satellite approaches for detecting ephemeral blooms in the sea?** Global and Australian (Lesley Clementson), NASA (Ryan Vandermeulen), Chinese (Shaoling Shang), Korean (Wonkook Kim), European (Astrid Bracher) efforts; Discussion on gaps and how to move forward to achieve global in-situ validation data sets with common requirements (chair: Stewart Bernard)

16:15-16:30: **Final discussion, summary and recommendations**