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

Co-chairs: Astrid Bracher (AWI), Ryan Vandermeulen (NASA-GFSC), Stewart Bernard (CSIR)

>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**