Breakout Workshop #

Blueprint for large-scale, operational, Earth Observation-based systems for Harmful Algal Blooms monitoring

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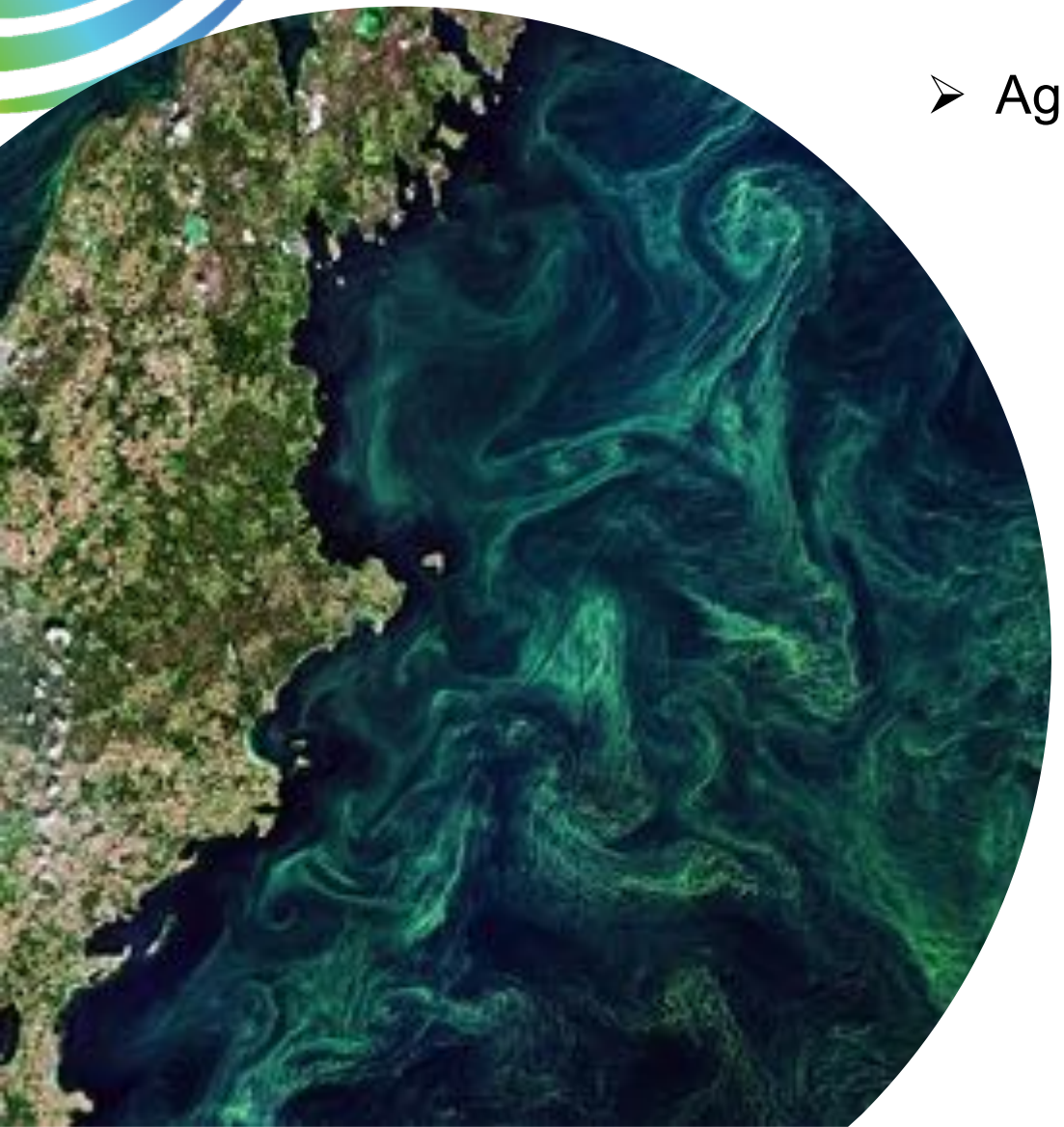
Goals of the Breakout Workshop



- Agree on a clear **definition** of HAB
- **Reconcile methods** (including criteria to identify thresholds for HAB presence)
- **Supersede the regional/empirical** character of HAB-related approaches

Existing IOCS Recommendations

➔ IOCCG report 20+reccomendation #117: **user needs** *(Actioned: Cyan, ECOSTAT)*

- User requirements and **user driven products.** Distinguish between **operational** and research products.
- Better understand **the needs of the management community** and showcase what can be provided
- Better define **the level of uncertainty** that can be accepted

➔ IOCCG report 20+reccomendation #78: **sensors** *(Actioned: S2 NG, PACE, commercial missions…)*

- Future sensors such as the Landsat and Sentinel-2 series should incorporate **additional narrow spectral channels**
- Access to spectral information in the **red and NIR**, around **590** nm, **520—570** nm
- For NRT operational applications, low **latency** ideally should be less than 6 hours
- Constellations of **small, low-earth orbiting satellites** may present opportunities to achieve shorter-term but high imaging frequency requirements for regional HAB monitoring

➔ IOCCG report 20: **algorithms**

- Improve **atmospheric corrections** for optically complex (including HAB) waters
- **Regional optimisation**, apply algorithms optimised for certain water types (CLMS, C3S, ESA-CCI lakes)
- Moving **away from empirical relationships** towards a mechanistic understanding of the causal in-water constituent interactions which result in the bulk satellite-observed optical signals
- Concentrate efforts on the development of **better global suites of high biomass algorithms**

➔ IOCCG report 20: **validation**

(GEO AquaWatch, GLORIA, EUMETSAT ocdb)

- Make data available to the HAB community towards **improved geographic applicability** of algorithms and products
- Encourage **transparency** in algorithm performance (report detection limits, error margins, confidence intervals)

Presentations overview

- **Deepak Mishra** (University of Georgia, Athens): *CyanoTRACKER: Solving CyanoHABs Monitoring Challenges using Sensing Integrated Cyber-Physical Systems Approach*

- **Marie Smith** (CSIR, Cape Town): *The National Oceans and Coastal Information Management System Fisheries and Aquaculture Decision Support Tool*

- **Stefan Simis** (PML, Plymouth): *HABs and gaps: constructing climate data records to assess lake functioning over decadal timescales*

New IOCS Recommendations

➔ Bloom definition (community + agencies)
- No a priori definition can be given. HAB definition and thresholds should be identified together with **users**

➔ Indexes and threshold (community + agencies)
- We should not stay with chl-a concentration alone. Any other information (spectral features, pigment absorption, PFT …) needed to support HAB identification
- Thresholds and anomaly identification criteria depends on the type of application and should be defined through time series analysis
- Multivariate datasets should also support the analysis

➔ Products stability and users' trust (community + agencies)
- We need to generate trust in the user needs. Systems output should be stable and not continuously changing data products

➔ sensors (agencies)
- Constellations of twin sensors may support daily revisit, needed for NRT services
- Identified gaps: limited spectral and spatial capability
- Need to increase observation frequency and observation capabilities for lakes (especially small ones)

➔ In situ data (community+agency)
- Fundings + data curated coordinated system needed to suppport in situ data collection and **sharing**
- Data should be collected also outside bloom conditions, in high non-toxic biomass conditions and in inland clear waters

➔ Avoid overselling (community)
- Let's be clear about what we can provide in terms of products