IOCCG/GEOHAB Working Group on Ocean Colour and Harmful Algal Blooms

Report: WG Second Meeting, 6-8 December 2011, CNR, Milan
Stewart Bernard, December 2011

Working Group Members present:
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Summary:
A well attended meeting, very generously hosted by Claudia Giardino of CNR. There was a very strong representation of inland, brackish and cyanobacteria specialists and this has resulted in the outline of what promises to be an excellent and substantial substantial section on inland and cyanobacterial application that will be a real resource for this field. Other major effort went on reorganizing the case studies by impact (rather by the previous approximate genus grouping) and slightly shifted some of the focus in the introductory chapters to accommodate this. This will not affect the content of the case studies but will give a much more cohesive structure. A new case study template to help authors to prepare material was also put together. Some other chapter reorganization occurred, placing some of the more forward looking and multi-sensor components after the case studies chapters. All the case study and chapters were also appointed their own leads, intended to make progress much less dependent on the chair.

New Monograph Outline

Preface. (2 pages)
IOCCG and GEOHAB backgrounds, WG mandate

1. Introduction. (5 pages)
- HABs as part of ecosystem function;
- different types of HABS across systems;
- increased eutrophication/climate change outlooks and societal impact; methodological challenges for OC;
- larger context of operational, research, and integrated applications including multi-sensor approaches, etc.
- Significance, background, rationale type structure as per IOCCG.

2. HABs and Ecosystems.

Use of GEOHAB science plan introduction (variety, impacts, drivers, etc.), into programme elements and with focus on observation and prediction, into mandala/intaglio approach (with shortcomings for this application) and focus on ecological niche => regional/ecosystem approach needed.

Given OC complexity in coastal zones, need for same regional/ecosystem approach. This gives lead into OC chapter.... changes as needed to outline to reflect case studies by impacts and classification by drivers/ecology. Climate change inclusion will set up multi-parameter chapter later

3. Introduction to HABs and Ocean Colour in Coastal and Inland Waters.

Introduction to OC and algorithm types, review of algorithm structures. Challenges in coastal zone and inland waters, led into from previous chapter. OC technical issues – visual guide from case study material showing AC/algorithm failure, flagging etc.

4. Ocean Colour and Detecting Phytoplankton Biomass and Community Dynamics.

4.1 Introduction: beyond the usual challenges in coastal and inland waters (Case 2, atmospheric correction, adjacency effects, high scales of variability, small targets). Need for high biomass algorithms, PFT. Distinction between operational and research products and change of focus as we move towards near coastal and inland waters.

4.2. (Harmful) Algal Bloom Detection techniques:

- User needs and product types
- Review of algorithm types: High biomass algorithms – red/red edge, MCI type, biomass anomalies (e.g. G. Mexico) and abundance based PFTs. Bright waters – cyanobacteria detection.
- Spectral discrimination – empirical e.g. PC algorithms or explicit e.g. fuzzy, FLH
- Semi-analytical – IOP/bio-optical products or specific assemblage IDs e.g. cell size, diatoms
- Statistical reflectance- reflectance anomalies e.g. Alvain,
- Time series aspect and anomalies – change detection,
- Examples of where OC is of little use: Gulf of Maine, *Dinophysis* in Iberia/Benguela, etc.

4.3. Determining the phytoplankton functional type signal content of ocean colour: what can be said about the assemblage

Brief overview of PFT techniques (see PFT WG, workshop), many statistically derived and global/broad trophic state in applications, few PFT methods are explicit with regard to causality of signal. HAB application 'most events are anomalies from global perspective' – can only consider use of some of these techniques e.g. size based Ciotti and Bricaud, Kostadinov etc.

New sensitivity study:
Analysis e.g. EOF, cluster of available data. Two-stream or Hydrolight modelling? Time scales and phase function inputs most problematic.

5. Case Studies
Grand introduction to case study chapters – ranges/gradients covered. Case studies now grouped by impact, will cause slight reclustering. Introduction will deal with classification by driver/ecology, alignment with classification by impact, and need to highlight range of OC techniques and issues across case studies.

5.1 Toxin Producers
5.1.1 PSP Producers: *A. catenella* California, Benguela, Chile. *A. tamaranse*, St. Lawrence. Mention of *G. catenatum*.
5.1.2 ASP Producers: *Pseudo-Nitzschia* California, Benguela.
5.1.3 NSP Producers: *Karenia brevis*, Florida. *K. mikimotoi*, East China Sea
5.1.4 Cyanotoxin producers (Inland/Brackish section), includes wide variety of lakes using optical proxies, time series, trophic status, multi-sensor/scales and surface scums as themes.

5.2 Fish Killers
5.2.1 Icthyotoxin Producers: *Cochlodinium*, Chesapeake, Korea, Oman. *Prymnesium*, Texas. *Heterosigma, Karlodinium* to be mentioned

5.3. Anoxia/Hypoxia Inducers
5.3.1 non toxic dinoflagellates, Benguela, California (Peru if possible). *Prorocentrum*, East China Sea (if possible). *Mesodinium,* Benguela. *Noctiluca,* global (if possible)

5.4 Ecologically Disruptive Algal Blooms (EDABS)
5.4.1 *Aureococcus*, Chesapeake. *Synechococcus*, Florida Bay
5.5 Scum and foam formers (if possible)
5.5.1 *Phaeocystis* and *Enteromorpha*