



International Ocean Colour Science Meeting 2015

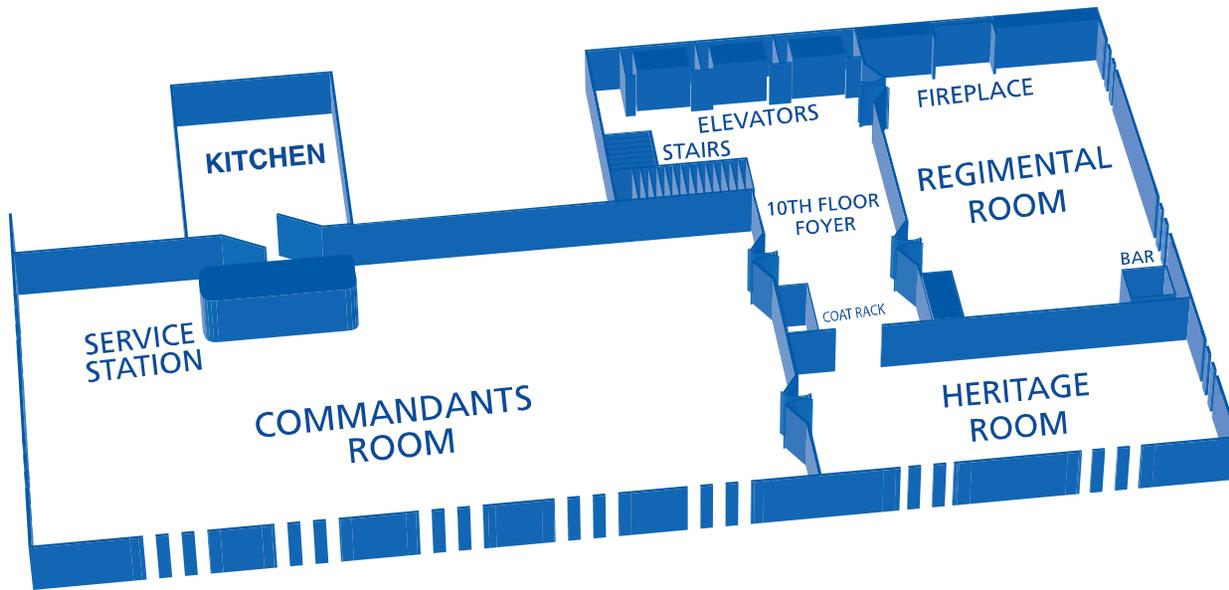
Advancing Global
Ocean Colour
Observations

SCHEDULE

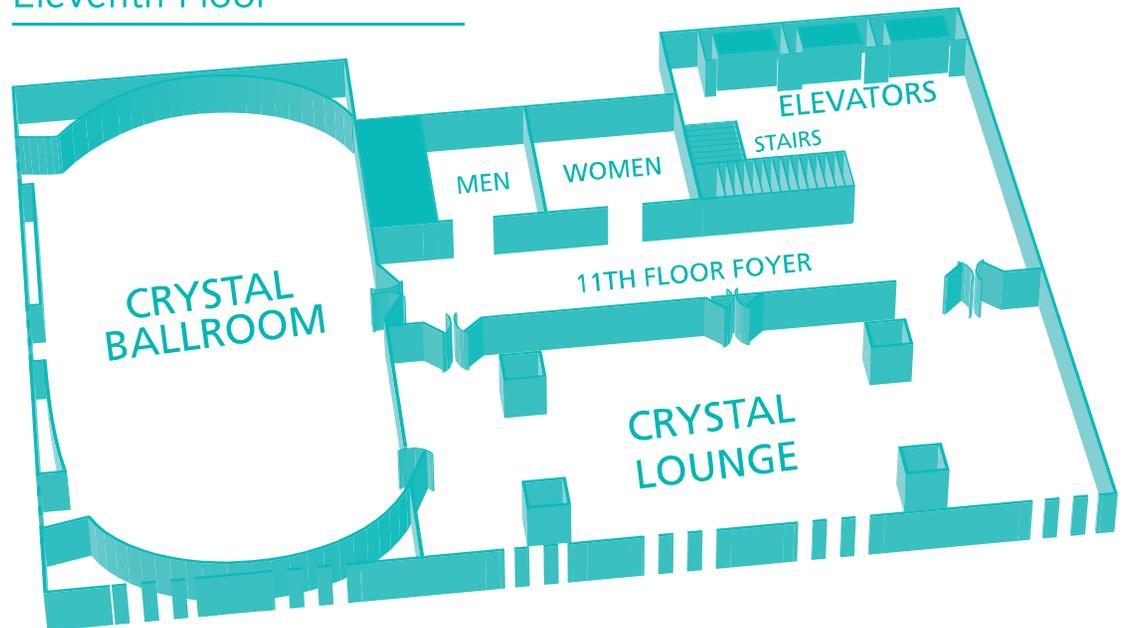
San Francisco, 15-18 June 2015
USA



Tenth Floor



Eleventh Floor



WELCOME!

We wish you a warm welcome to the second International Ocean Colour Science (IOCS) meeting from the International Ocean Colour Coordinating Group (IOCCG).

This is the second of these events, after a very successful IOCS meeting in 2013 in Darmstadt, Germany, attended by 244 scientists from 36 countries. IOCS is important in that it is not another scientific conference, but a community consultation meeting providing communication and collaboration between space agencies and the ocean colour community; building strong ties between international representatives of the ocean colour communities; and providing a forum for discussion and evolution of community thinking on a range of issues.

From an IOCCG perspective the IOCS meetings allow much greater community involvement in IOCCG activities, and also help to reinforce the voice of the global ocean colour user community in strategic engagement with space agencies. IOCS meetings are scheduled to be held every two years, with the next meeting planned for Europe in May 2017.

Many thanks for your attendance and contributions at IOCS 2015 from the IOCCG. Thanks also to NASA and NOAA for being major sponsors of the event, as well as to EUMETSAT, ESA, CNES, SCOR and the Moore Foundation for their support. We look forward to a very lively, engaged and successful meeting.

Stewart Bernard, IOCCG Chair

IOCS Scientific Planning Committee

David Antoine (Past Chair) – Curtin Univ, AU

Stewart Bernard (Chair) – CSIR, South Africa

Paula Bontempi – NASA Headquarters, USA

Prakash Chauhan – ISRO, India

Paul DiGiacomo – NOAA/NESDIS STAR, USA

Philippe Goryl – ESA

Xianqiang He – SIO/SOA, China

Milton Kampel – INPE, Brazil

Ewa Kwiatkowska – EUMETSAT, Germany

Juliette Lambin – CNES, France

Tiffany Moisan – NASA GSFC, USA

Hiroshi Murakami – JAXA, Japan

Joo-Hyung Ryu – KIOST, Korea

Venetia Stuart – IOCCG, Canada

George Wiafe – University of Ghana, Ghana

Cara Wilson – NOAA / NMFS, USA

James Yoder – WHOI, USA

IOCS Organizing Committee

Stewart Bernard – CSIR, South Africa

Paula Bontempi – NASA Headquarters, USA

Paul DiGiacomo – NOAA/NESDIS STAR, USA

Cara Wilson – NOAA/NMFS, USA

Elizabeth Gross – IOCS Meeting Manager

Venetia Stuart – IOCCG, Canada

IOCS 2015 WEEK-AT-A-GLANCE

	Monday, 15 June	Tuesday, 16 June	Wednesday, 17 June	Thursday, 18 June	Friday, 19 June
08:00	SeaDAS/BEAM Workshop	Registration	Registration	Keynote 6 - Cara Wilson Remote Sensing and Fisheries	
08:15					
08:30		Plenary - Welcome, logistics, rationale	Keynote 4 - Daniel Odermatt Water Quality from Space		
08:45		Agency Report from NASA	Address by Jack Kaye (NASA)		
09:00		Keynote 1 - Marina Levy Modelling at the sub-mesoscale			
09:15	Break	Break	Breakout Sessions 4, 5, 6 Coffee break available from 10:15 to 10:45	Breakout Sessions 7, 8, 9, 10 Coffee break available from 10:00 to 10:30	
09:30					
09:45					
10:00					
10:15					
10:30	SeaDAS/BEAM Workshop cont'd	Keynote 2 - Stuart Phinn Coastal and coral reef monitoring	4. Water quality	7. Hyperspectral science	West Coast Workshop Gulf of the Farallons National Marine Sanctuary, Crissy Field, SF (separate registration)
10:45		Agency Reports from NOAA, EUMETSAT, ESA	5. High latitude seas	8. Ecosystems and climate change	
11:00	Registration	Lunch TOWN HALL: Future Polar Field Observations - International Coordination (Crystal Lounge)	Lunch	Lunch	
11:15					
11:30					
11:45					
12:00					
12:15	NASA OCRT	Keynote 3 - Sung Yong Kim Applications using GOCI data	Report from CNES	Reports from Breakout Sessions 4, 5, 6	
12:30		Agency Reports from KIOST, JAXA	Agency Reports from Breakout Sessions 1, 2, 3	Agency Reports from SOA, ISRO	
12:45	Break	Breakout Sessions 1, 2, 3: Coffee break available from 15:45 to 16:15	Keynote 5 - Marcel Babin Climate Change on Polar Ecology	Keynote 7 - Kenneth J. Voss In-situ sensors	
13:00					
13:15	NASA OCRT	1. Phytoplankton functional types 2. Geostationary remote sensing 3. Uncertainties	Break	Break	
13:30					
13:45	Registration	Posters	Posters	PANEL DISCUSSION: Future Directions for Ocean Colour Remote Sensing	
14:00					
14:15					
14:30					
14:45					
15:00	NASA OCRT	Icebreaker Visions & Hallucinations	6: 30 pm - transportation from Marines' Mem. Club & Hotel to St. Francis Yacht Club IOCS mixer: 7:30 - 9:30 pm	Three public lectures on Ocean Colour at the Exploratorium (separate registration) Stewart Bernard - Introduction to ocean colour Raphe Kudela - Harmful algal blooms Cara Wilson - Global chlorophyll distribution	
15:15					
15:30	Registration				
15:45					
16:00					
16:15					
16:30					
16:45	Registration				
17:00					
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18:00	Registration				
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18:45					
19:00					
19:15	Registration				
19:30					

MONDAY, 15 JUNE 2015

- 08:00 – 12:00** **WORKSHOP: WHAT'S NEW WITH BEAM AND SEADAS
COMMANDANT'S ROOM, 10TH FLOOR**
Co-Chairs: Daniel Knowles (NASA) and Carsten Brockmann (Brockmann Consult)
NASA and Brockmann Consult have worked collaboratively over the past few years to develop a pair of publicly-available, synergistic satellite data processing and analysis tools. This event will describe the features and functionalities of these tools, provide an insight into future directions (e.g., the Sentinel Toolboxes) and to answer questions from the community. In addition, there will be a presence during the poster sessions scheduled during the IOCS to offer more one-on-one user support. This session is a workshop with time for two introductions to SeaDAS and BEAM, discussion and questions.
- 12:00 – 13:00** **REGISTRATION: HERITAGE ROOM, 10TH FLOOR**
- 13:00 – 17:00** **NASA OCEAN COLOR RESEARCH TEAM MEETING
COMMANDANT'S ROOM, 10TH FLOOR**
Chair: Paula Bontempi (NASA)
NASA's annual Ocean Color Research Team Meeting is focused on the scientific and technological goals and objectives of the NASA Ocean Biology and Biogeochemistry program. The NASA Ocean Biology and Biogeochemistry program focuses on describing, understanding, and predicting the biological and biogeochemical regimes of the upper ocean, as determined by observation of aquatic optical properties using remote sensing data, including those from space, aircraft, and other suborbital platforms. A detailed agenda will be distributed at the meeting.
- 16:00 – 19:00** **REGISTRATION: HERITAGE ROOM, 10TH FLOOR**
- 17:00 – 19:00** **SIDE MEETING: PHYTOPLANKTON FUNCTIONAL TYPES INTERCOMPARISON (by invitation)
COMMANDANT'S ROOM, 10TH FLOOR**
- 18:00 – 20:00** **IOCCG EXECUTIVE MEETING (by invitation)
REGIMENTAL ROOM, 10TH FLOOR**

TUESDAY, 16 JUNE 2015

07:30-08:30 **REGISTRATION: HERITAGE ROOM, 10TH FLOOR**

08:30-12:00 **PLENARY SESSION**
COMMANDANT'S ROOM, 10TH FLOOR
Chair: Stewart Bernard (Chair of IOCCG South Africa)

08:30 **WELCOME, RATIONALE, LOGISTICS**

09:00 **AGENCY REPORT FROM NASA**
Paula Bontempi

09:15 **KEYNOTE LECTURE:**
MARINA LEVY (LABORATOIRE D'OCÉANOGRAPHIE ET DU CLIMAT, CNRS, FRANCE)
Physical and biogeochemical modeling at the sub-mesoscale

10:00-10:30 **BREAK**
served in the Heritage Room, 10th Floor

10:30-12:00 **PLENARY SESSION**
COMMANDANT'S ROOM, 10TH FLOOR
Chair: David Antoine (Curtin University, Australia)

10:30 **KEYNOTE LECTURE:**
STUART PHINN (UNIVERSITY OF QUEENSLAND, AUSTRALIA)
Collaborative Earth-observation infrastructure for coastal and coral reef monitoring and management

AGENCY REPORTS:

11:15 **NOAA (Paul DiGiacomo)**

11:30 **EUMETSAT (Ewa Kwiatkowska)**

11:45 **ESA (Philippe Goryl)**

12:00-13:15 **LUNCH – SERVED IN THE HERITAGE ROOM, 10TH FLOOR**

TUESDAY, 16 JUNE 2015 CONT'D

**DURING LUNCH A TOWN HALL DISCUSSION
CRYSTAL LOUNGE, 11TH FLOOR**

Future Polar Field Observations - International Coordination

Co-Chairs: B. Greg Mitchell and Rick Reynolds (Scripps, USA), Antonio Mannino (NASA GSFC, USA), and Maria Tzortziou (CUNY, USA)

The Interdisciplinary Coordinated Experiment of the Southern Ocean Carbon Cycle (ICESOCC) and Arctic-COastal Land Ocean interReactions (Arctic-COLORS) projects are field campaign scoping studies funded by NASA's Ocean Biology and Biogeochemistry Program that aim to improve understanding and prediction of ecosystem and carbon cycle dynamics of the Southern Ocean and coastal Arctic, respectively. Both require complex interdisciplinary multi-platform observations, improvement in models and, ideally, international coordination. During this informal lunch "town hall" meeting the leaders of ICESOCC and Arctic - COLORS will provide a brief overview, invite questions and comments from the international community and define action items for future international follow up.

13:15-14:30

**PLENARY SESSION
COMMANDANT'S ROOM, 10TH FLOOR**

Chair: Paul DiGiacomo (NOAA, USA)

**13:15 KEYNOTE LECTURE:
SUNG YONG KIM (KOREA ADVANCED INSTITUTE OF SCIENCE AND TECHNOLOGY)**
Research and applications using sub-mesoscale GOCI data

AGENCY REPORTS:

14:00 KIOST (YoungJe Park)
14:15 JAXA (Hiroshi Murakami)

14:30-17:15

BREAKOUT SESSIONS 1, 2, AND 3

Whenever groups wish to take a break, coffee and tea will be available from 15:45 to 16:15 in the Heritage Room, 10th Floor

**BREAKOUT SESSION # 1
CRYSTAL LOUNGE, 11TH FLOOR**

REMOTE SENSING OF PHYTOPLANKTON COMPOSITION - POSSIBILITIES, APPLICATIONS AND FUTURE NEEDS.
See page 14 for detailed agenda and other information

TUESDAY, 16 JUNE 2015 CONT'D

14:30-17:15

BREAKOUT SESSION # 2
REGIMENTAL ROOM, 10TH FLOOR

BENEFITS AND CHALLENGES OF GEOSTATIONARY OCEAN COLOUR REMOTE SENSING - SCIENCE AND APPLICATIONS.

See page 15 for detailed agenda and other information

BREAKOUT SESSION # 3
COMMANDANT'S ROOM, 10TH FLOOR

UNDERSTANDING AND ESTIMATING UNCERTAINTY IN OCEAN COLOUR REMOTE SENSING DATA AND DERIVED PRODUCTS.

See page 16 for detailed agenda and other information

17:15-18:45

FIRST POSTER SESSION
CRYSTAL BALLROOM, 11TH FLOOR

A directory of the posters on display will be distributed at the meeting

18:45-19:45

VISIONS AND HALLUCINATIONS
CRYSTAL LOUNGE, 11TH FLOOR

This is a new event for IOCS in 2015, which is based on the TED (Technology, Entertainment, Design) talks concept. These 3 five minute talks will briefly outline highly innovative, provocative and even entertaining concepts, focusing on new approaches or capabilities in the field of ocean colour and bio-optical science. This will take place in a casual, social setting, with drinks and light snacks available.

- Emmanuel Boss - *Using your phone as an optical sensor*
- Paula Bontempi - *2015: A Zooplankton Odyssey*
- Stewart Bernard - *1000 Sailing Robots: Swarm Sensing with Low Cost Autonomous Yachts*

WEDNESDAY, 17 JUNE 2015

08:00-08:30 **REGISTRATION: HERITAGE ROOM, 10TH FLOOR**

08:30-09:30 **PLENARY SESSION**
COMMANDANT'S ROOM, 10TH FLOOR
Chair: Paula Bontempi (NASA, USA)

08:30 **KEYNOTE LECTURE:**
DANIEL ODERMATT (ODERMATT & BROCKMANN GMBH, SWITZERLAND)
The Future of Water Quality from Space

09:15 **ADDRESS BY JACK KAYE**
ASSOCIATE DIRECTOR FOR RESEARCH, NASA

09:30-12:15 **BREAKOUT SESSIONS 4, 5, and 6**
Whenever groups wish to take a break, coffee and tea will be available from 10:15 to 10:45 in the Heritage Room, 10th Floor

BREAKOUT SESSION # 4
CRYSTAL LOUNGE, 11TH FLOOR
TOOLS TO HARNESS THE POTENTIAL OF EARTH OBSERVATIONS FOR WATER QUALITY REPORTING AND MANAGEMENT
See page 17 for detailed agenda and other information

BREAKOUT SESSION # 5
REGIMENTAL ROOM, 10TH FLOOR
OCEAN COLOUR REMOTE SENSING IN HIGH LATITUDE AREAS
See page 18 for detailed agenda and other information

BREAKOUT SESSION # 6
COMMANDANT'S ROOM, 10TH FLOOR
NEW APPLICATIONS USING VERY HIGH RESOLUTION SATELLITE OCEAN COLOUR DATA
See page 19 for detailed agenda and other information

12:15-13:30 **LUNCH – SERVED IN THE HERITAGE ROOM, 10TH FLOOR**

WEDNESDAY, 17 JUNE 2015 CONT'D

13:30-16:15

**PLENARY SESSION
COMMANDANT'S ROOM, 10TH FLOOR**

Chair: Cara Wilson (NOAA SWSFC, USA)

13:30 AGENCY REPORT FROM CNES (MARINA LEVY)

13:45 REPORTS FROM BREAKOUT SESSIONS 1, 2, AND 3 (15 MINUTES EACH)

**14:30 KEYNOTE LECTURE:
MARCEL BABIN - UNIVERSITÉ LAVAL, CANADA
Impact of Climate Change on Polar Ecology**

15:15-15:45

BREAK - served in the Heritage Room, 10th Floor

15:45-16:15

**PLENARY SESSION
COMMANDANT'S ROOM, 10TH FLOOR**

Chair: Tiffany Moisan (NASA GSFC, USA)

AGENCY REPORTS:

15:45 INPE (Milton Kampel)

16:00 CSA (Martin Bergeron)

16:15-17:45

**SECOND POSTER SESSION
CRYSTAL BALLROOM, 11TH FLOOR**

A directory of the posters on display will be distributed at the meeting

18:30-19:15

BUSES BEGIN TO DEPART FOR ST. FRANCIS YACHT CLUB

(See invitation in registration folder)

19:30-21:30

**IOCS-2015 RECEPTION
ST. FRANCIS YACHT CLUB**

21:00-21:45

BUSES BEGIN RETURN TRIPS TO MARINES' MEMORIAL CLUB AND HOTEL

THURSDAY, 18 JUNE 2015

07:30-08:00 **REGISTRATION: HERITAGE ROOM, 10TH FLOOR**

08:00-08:45 **PLENARY SESSION**
COMMANDANT'S ROOM, 10TH FLOOR
Chair: Milton Kampel (INPE, Brazil)

08:00 **KEYNOTE LECTURE:**
CARA WILSON (NOAA SWFSC, USA)
Remote Sensing and Fisheries

08:45-12:00 **BREAKOUT SESSIONS 7, 8, 9, AND 10**
Whenever groups wish to take a break, coffee and tea will be available from 10:00 to 10:30 in the Heritage Room, 10th Floor

BREAKOUT SESSION # 7
COMMANDANT'S ROOM, 10TH FLOOR
ADVANCES IN HYPERSPECTRAL REMOTE SENSING SCIENCE
See page 20 for detailed agenda and other information

BREAKOUT SESSION # 8
CRYSTAL BALLROOM, 11TH FLOOR
ECOSYSTEM DYNAMICS AND CLIMATE CHANGE: APPLICATIONS OF OCEAN COLOUR DATA
See page 21 for detailed agenda and other information

BREAKOUT SESSION # 9
CRYSTAL LOUNGE, 11TH FLOOR
SATELLITE INSTRUMENT PRE- AND POST-LAUNCH CALIBRATION
See page 22 for detailed agenda and other information

BREAKOUT SESSION # 10
REGIMENTAL ROOM, 10TH FLOOR
JOINT USE OF BIO-ARGO AND OCEAN COLOUR
See page 23 for detailed agenda and other information

12:00-13:15 **LUNCH – SERVED IN THE HERITAGE ROOM, 10TH FLOOR**

THURSDAY, 18 JUNE 2015 CONT'D

13:15-15:15

PLENARY SESSION

COMMANDANT'S ROOM, 10TH FLOOR

Chair: Ewa Kwiatkowska (EUMETSAT, Germany)

13:15

REPORTS FROM BREAKOUT SESSIONS 4, 5, AND 6 (15 MINUTES EACH)

AGENCY REPORTS:

14:00 **SOA (ZHIHUA MAO)**

14:15 **ISRO (PRAKASH CHAUHAN)**

14:30

KEYNOTE LECTURE:

KENNETH J. VOSS (UNIVERSITY OF MIAMI, USA)

In-situ sensors (MOBY past, current and future)

15:15-15:45

BREAK – SERVED IN THE HERITAGE ROOM, 10TH FLOOR

15:45-16:15

PLENARY SESSION

COMMANDANT'S ROOM, 10TH FLOOR

Chair: David Antoine (Curtin University, Australia)

15:45

REPORTS FROM BREAKOUT SESSIONS 7, 8, 9 AND 10 (15 MINUTES EACH)

16:45

PANEL DISCUSSION

FUTURE DIRECTIONS OF OCEAN COLOUR REMOTE SENSING

Chair: Craig Donlon (ESA, The Netherlands)

Panel Members:

- Stewart Bernard, Chair IOCCG (CSIR, South Africa)
- Paula Bontempi (NASA, USA)
- Paul Di Giacomo (NOAA, USA)

17:45

MEETING ENDS

THURSDAY, 18 JUNE 2015 CONT'D

18:30 – 19:45

THREE PUBLIC LECTURES ON OCEAN COLOUR SAN FRANCISCO'S EXPLORATORIUM PIER 15, FISHER BAY OBSERVATORY GALLERY

Free; RSVP required, email reserve@exploratorium.edu, or call 415.528.4444, and choose option 5.

Conversations About Landscape: What Color Is Your Ocean?

From high above Earth, satellites are tracking the health of the oceans in startling detail by precisely measuring the color of the water. The water's color may reveal blooms of plankton that nourish marine ecosystems, or that can harm fish and wildlife. Scientists use satellite color data to track ocean productivity, and the cycling of nutrients and carbon across the world's oceans. Join three scientists attending the International Ocean Color Science Meeting for a discussion about how satellite color measurements help us track the health of marine ecosystems and how they might be changing over time.

Stewart Bernard - Introduction to Ocean Colour

Raphael Kudela - Harmful Algal Blooms

Cara Wilson - Global Chlorophyll Distribution

FRIDAY, 19 JUNE 2015

09:00-15:35

WEST COAST WORKSHOP GULF OF THE FARALLONES NAT'L MARINE SANCTUARY, 991 MARINE DRIVE, THE PRESIDIO, SAN FRANCISCO, CA

Sponsored by the west coast node of NOAA's CoastWatch program.

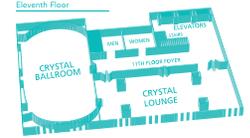
See Cara Wilson during the IOCS Meeting for more information.

The west coast node of CoastWatch invites ocean color scientists to participate in a one-day workshop focused on regional satellite products for the west coast of North America. The workshop will provide an opportunity for scientists to share ideas and to highlight new or planned products. A major goal of the workshop is to identify present and future satellite products that would be most useful to make readily available to the ocean color community via a regional data server.

CoastWatch, in association with the Southwest Fisheries Science Center Environmental Research Division (ERD), serves a large suite of standard ocean color products via its ERDDAP server, plus a smaller number of specialized regional products. Although we often receive requests to serve additional regional products, with our limited resources we must restrict the expansion of our offerings to products that will have the greatest utility for our user base. By participating in the workshop, you will help inform and justify the expansion of satellite products made available to coastal research and management groups by CoastWatch and ERD.

09:00 - 17:00

IOCCG WORKING GROUP ON UNCERTAINTIES IN OCEAN COLOUR REMOTES SENSING (by invitation) BOARDROOM 2ND FLOOR



REMOTE SENSING OF PHYTOPLANKTON COMPOSITION – POSSIBILITIES, APPLICATIONS AND FUTURE NEEDS

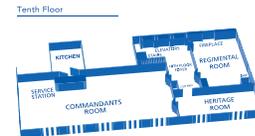
Co-Chairs: Colleen Mouw (MTU), Astrid Bracher (AWI), Nick Hardman-Mountford (CSIRO).

Remote sensing of phytoplankton composition structure indices, including functional types, phytoplankton size classes and particle size distribution has greatly expanded in recent years. Many communities beyond the algorithm developers are interested in engaging with, using and informing this new satellite capability. To set the stage, a review of the strengths and limitations of the current satellite estimates of phytoplankton and particle composition as well as a synthesis of their intercomparison will be presented. However, the focus of the session will be on.

(1) How current satellite phytoplankton composition products are and could be used in modeling (climate, ecosystem, optical) activities and ecosystem and fisheries management.

(2) In situ observational needs and opportunities to support forthcoming satellite capabilities leading to expanded satellite phytoplankton composition algorithm approaches and products.

- | | |
|----------------------|--|
| 14:30 - 14:40 | Introduction and update from satellite PFT community activities
Astrid Bracher (AWI), Colleen Mouw (MIT), Nick Hardman-Mountford (CSIRO) |
| 14:40 - 14:50 | Overview of satellite and model phenology intercomparison results
Tiho Kostadinov (U. Richmond) |
| 14:50 - 15:05 | Modelling of phytoplankton composition - status and remote sensing needs
Stephanie Dutkiewicz (MIT) |
| 15:05 - 15:30 | Phytoplankton functional types in marine services
Kimberly Hyde (NOAA, NMFS), Antoine Mangin (ACRI) |
| 15:30 - 15:45 | Initial Discussion – User’s interests and needs |
| 15:45 - 16:00 | Break |
| 16:00 - 16:10 | In situ observation capabilities and strategies for phytoplankton composition for use in development and validation of satellite PFT algorithms
Heidi Sosik (WHOI) |
| 16:10 - 16:45 | Discussion - Investments required to meet user needs |
| 16:45 - 16:55 | Formulation of actions and recommendations |
| 17:15 | End |



BENEFITS AND CHALLENGES OF GEOSTATIONARY OCEAN COLOUR REMOTE SENSING - SCIENCE AND APPLICATIONS

Co-Chairs: Antonio Mannino (NASA GSFC) & Maria Tzortziou (CCNY)

Ocean colour (OC) remote sensing from geostationary orbit (geo) provides the capability of high temporal resolution measurements (e.g., <hourly) that can revolutionize the scientific application and societal value of OC data from space. This capability is necessary to study nearshore waters where the physical, biological and chemical processes react on short time scales, and apply observations to monitor coastal water quality indicators, detect and track coastal hazards, and improve assimilation of satellite data into operational models. The Korean GOCI sensor is the only OC instrument to operate in geo. Its success has spawned a follow-on mission by the Koreans called GOCI-II. Other geostationary OC missions are in planning stages including NASA's GEO-CAPE, the European OCAP, and others. Despite the advances made with GOCI data, much remains to be resolved to fully utilize OC data from geo. The objectives of this breakout session are to discuss (1) the unique science and applications value of OC observations from a geo-orbit; (2) the advantages of geostationary OC in combination with OC from polar orbiting sensors and the minimum set of requirements to achieve a quasi-global geostationary OC constellation; (3) key issues to resolve for successful application of geostationary OC data including atmospheric correction, sun-earth-sensor geometry, BRDF, sensor pointing stability, etc., and (4) the processes and new products possible from geostationary orbit including the challenges in reducing uncertainties to take full advantage of the high temporal resolution.

This session will build upon the 2012 IOCCG Working Group report on "Ocean-Colour Observations from a Geostationary Orbit" and the Geo Ocean Colour breakout session from the 2013 IOCS Conference.

Part I: *The unique science and applications value of ocean colour observations from a geo-orbit*

- 14:30** **Introduction**
Antonio Mannino (NASA GSFC)
- 14:35-14:40** **Advantages and challenges for geostationary ocean colour remote sensing**
Kevin Ruddick (RBINS)
- 14:40-14:45** **Accuracy requirements on data products and their challenges**
Chuanmin Hu (U. South Florida)
- 14:45-14:50** **Geostationary applications relevant to ecosystems and fisheries**
Cara Wilson (NOAA NMFS)
- 14:50-14:55** **GEO-CAPE Ocean colour applications**
Maria Tzortziou (CCNY)
- 14:55-15:00** **How geostationary ocean colour products could be applied to improve 3D physical-biogeochemical models**
Marina Lévy (UPMC)
- 15:00-15:20** **Discussion**

Part II: *Key issues and challenges to resolve for successful application of geostationary ocean colour data*

- 15:20-15:25** **Application requirements for geostationary ocean colour measurements**
Blake Schaeffer (EPA)
- 15:25-15:30** **Challenges in GOCI data acquisition and processing**
Wonkook Kim (KOSC)
- 15:30-15:35** **Geostationary atmospheric correction issues and future directions**
Ziauddin Ahmad (JHT / NASA GSFC)
- 15:35-15:40** **Water turbidity retrieval from a geostationary meteorological satellite - considerations for future ocean colour missions**
Quinten Vanhellefont (RBINS)
- 15:40-15:45** **Impact of multiple satellite samplings in a day on the study of phytoplankton dynamics**
ZhongPing Lee (U. Massachusetts)
- 15:45-16:00** **Break**
- 16:00-16:30** **Discussion**

Part III: *Existing and future GEO OC sensors, challenges and next steps forward: Towards achieving a quasi-global geostationary OC constellation*

- 16:30-16:35** **Status of GOCI-II development**
Seongick Cho (KOSC)
- 16:35-16:40** **Update on European prospects for geostationary ocean colour**
David Antoine (Curtin University/LOV)
- 16:40-16:45** **GEO-CAPE ocean colour science and engineering challenges**
Antonio Mannino (NASA GSFC)
- 16:45-17:15** **Discussion**



UNDERSTANDING AND ESTIMATING UNCERTAINTY IN OCEAN COLOUR REMOTE SENSING DATA AND DERIVED PRODUCTS

Co-Chairs: Part I: Kevin Turpie (UMBC), Emmanuel Boss (U. Maine), Part II: Stéphane Maritorena (UCSB), Frédéric Melin (JRC ISPRA), Part III: Jeremy Werdell (NASA GSFC).

Quantifying data uncertainty is a critical part of scientific investigation and application. Estimates of uncertainty are vital to determine whether data support hypotheses, e.g., indicating whether a change or trend is significant. Assigning uncertainty also lets us know whether the information derived from the data is of sufficient quality to support decision-making. Despite the necessity of quantifying uncertainty, most ocean colour products have so far been distributed without associated uncertainty estimates, or with indicators only partially describing uncertainty. This requirement is now well recognized and included in the planning of future missions; it should help supporting user confidence, defining the range of possible applications of data products, favoring the operations of data assimilation in ecological and climate models, or allowing trend analysis in climate research. This breakout meeting will showcase work done towards estimating uncertainty in the field of ocean colour remote sensing, with a focus on standard satellite data products. Characteristics and limitations of each approach will be highlighted, followed by a community discussion on the path forward. The meeting will begin with several talks dealing with the various aspects of uncertainties in ocean colour, from top-of-the-atmosphere radiometry; to retrieval of remote sensing reflectance (Rrs); to apparent and inherent optical properties and other environmental parameters derived from the Rrs. Techniques for estimating and evaluating uncertainty will also be considered, including approaches that rely on the compilation of validation results, model-based estimates, class-based techniques, error propagation, or inter-comparison of satellite products. The resulting estimates may have different time and/or space characteristics, rely on various assumptions, and represent different parts of the uncertainty budget. Inherent algorithm uncertainties, algorithm sensitivity, and uncertainty associated with in situ measurements and validation activities, including biases arising from differences in scale between satellite and in situ measurements, are also relevant. Following the talks will be a structured, moderated community discussion about where the community is at about uncertainties in ocean colour and where it needs to go in the future.

QUESTIONS THAT WILL BE ADDRESSED INCLUDE:

Coordinating and Integrating Efforts

- What information is currently not sufficiently characterized, but that would be helpful for the derivation of uncertainty estimates?

- How does the community coordinate and integrate disparate efforts and results?

- What are the pros and cons of the techniques used to derive uncertainties?

Standardizing Methods and Metrics

- How do we standardize data quality metrics and their derivation across multiple missions?

- What are the types of uncertainty statistics that are associated with data measurement types?

- Which specific metrics do we use to quantify uncertainties?

Determining Uncertainty Estimation Quality

- Can we validate, or perhaps verify, uncertainty estimates and to what extent is good enough?

- How do we achieve traceability from in situ data uncertainties to satellite products?

Part I: *Theory and overview*

14:30-14:45 **Uncertainty definitions and theory**

Kevin Turpie (UMBC)

14:45-14:50 **IOCCG/CEOS/GCOS context**

Frédéric Mélin (JRC ISPRA)

Part II: *Surface reflectance uncertainty estimation methods*

14:50-15:00 **Synthesis of published methods and collocation approach**

Frédéric Mélin (JRC ISPRA)

15:00-15:10 **Uncertainties from the Bayesian method**

Robert Frouin (UCSD)

15:10-15:20 **Uncertainty propagation**

Philippe Goryl (ESA)

15:20-15:30 **Neural networks and Rrs uncertainty**

Roland Doerffer (Helmholtz Zentrum Geesthacht)

Part III: *Derived product uncertainty methods*

15:30-15:40 **Status report on in situ uncertainties**

Emmanuel Boss (U. Maine)

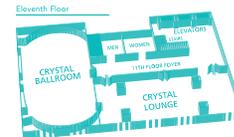
15:40-15:50 **Overview of methods for remotely-sensed IOP uncertainties**

Suhyb Salama (U. Twente)

15:50-16:00 **Spatial, temporal, and content considerations for Level-3 uncertainties**

Tim Moore (U. New Hampshire)

16:00-17:15 **Moderated Community Discussion**



TOOLS TO HARNESS THE POTENTIAL OF EARTH OBSERVATIONS FOR WATER QUALITY REPORTING AND MANAGEMENT

Co-Chairs: Blake Schaeffer (EPA/Office of Research and Development) and Vittorio Brando (Italian National Research Council, CNR)

Earth observation technology has the potential to accelerate the engagement of communities and managers in the implementation and performance of best management practices. Satellite technology has proven useful in coastal waters, estuaries, lakes, and reservoirs, which are relevant to water quality managers. There is the potential to provide water quality assessments, thus providing new decision analysis methodologies and temporal/spatial diagnostics. Earth observation data provides an opportunity to assess current conditions and trends of these environments in response to key environmental and climatic impacts. However, delivery and communication of management relevant water quality information from earth observation data is typically limited between the scientific community and water quality managers. Water quality managers are identified as anyone who is responsible for protecting the beneficial uses of water and are assumed the primary decision maker in this session. Water quality includes the biological, physical, and chemical characteristics required to maintain beneficial uses. Discussions will range from new decision analysis methodologies, to improved temporal/spatial diagnostics, and environmental reporting tools that may improve the delivery and communication of earth observation data to water quality managers and the public.

Proposed questions:

1. How can we overcome barriers to sharing in situ calibration and validation data?
2. How do we see the field of water quality earth observation advancing in the next 5 years?
3. What level of accuracy is needed for the monitoring of lake water quality?
4. How mature are the current in-water and atmospheric correction algorithms over inland and near-shore waters?
5. How to build and maintain user confidence in and encourage uptake of EO data?
6. How can resource scarce monitoring programs leverage the onslaught of new data and assessment methods?
7. What are potential policy barriers and or ways policy can encourage the adoption of new methods that leverage sensor data?
8. What are some opportunities to better leverage citizen science with regards to leveraging remote sensing data for water quality and what should the states and federal roles be?
9. Remote sensing derived products and indicators required for reporting are different. Can we develop a strategy to foster communication between EO scientists and users? How can we technically support this dialogue?

9:30-9:40

Introduction and overview

Blake Schaeffer (EPA) and Vittorio Brando (CNR)

9:40-9:50

Uses and challenges of earth observation data for inland water quality: a GloboLakes perspective.

Evangelos Spyros (U. Stirling)

9:50-10:00

Earth observation in support of reporting to European legislation on surface water quality; technical offers and uptake by users.

Carsten Brockmann (Brockmann Consult GmbH)

10:00-10:30

Moderated Community Discussion

10:30-10:50

Break

10:50-11:00

Water quality assessment frameworks for the 21st Century. Connecting the dots and adapting to change.

Tod Dabolt (EPA/Office of Water)

10:50-11:00

Development of a GEO global water quality monitoring and forecasting service.

Steve Greb (Wisconsin Dept. Natural Resources)

11:00-11:10

Water quality assessment frameworks for the 21st Century. Connecting the dots and adapting to change.

Tod Dabolt (EPA/Office of Water)

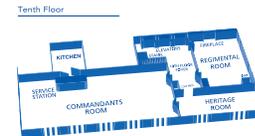
11:10-11:20
action.

Changing the global water quality conversation: from Earth observation to

Francis Gassert (World Resources Institute)

11:20 - 12:15

Moderated community discussion & formulation of recommendations



OCEAN COLOUR REMOTE SENSING IN HIGH LATITUDE AREAS

Co-Chairs: Emmanuel Devred (U. Laval), Maria Tzortziou (CCNY), Toru Hirawake (Hokkaido U.), Antonio Mannino (NASA GSFC), & Rick Reynolds (SIO, UCSD)

The Earth's Polar Seas are crucial for regulating our planet's climate and are particularly sensitive to global warming. In addition to these regions being critically important to our understanding and modeling of key physical and biogeochemical processes, environmental change in high latitude areas is increasingly affecting society in a variety of ways. Ocean colour remote sensing provides a unique tool for monitoring changes in marine and coastal ecosystems, biology, and biodiversity at relatively low cost and across spatial and temporal scales. The use of space-based ocean colour observations at high-latitude regions, however, is hindered by a number of difficulties and intrinsic limitations. These include winter darkness, low sun elevation, persistence of clouds and fog, pixel 'contamination' by ice, specific bio-optical properties, and small-scale spatial variability

Despite these challenges, ocean colour remote sensing has provided valuable spatial and temporal large-scale information on the state of the marine ecosystems of the Antarctic and Arctic. This splinter session will offer a forum for discussion of the successes and the different challenges associated with remote sensing of the Southern and Arctic Oceans. In particular the following topics will be addressed: the need for integrative observational and modeling approaches, recent findings from past oceanographic field campaigns, which and where new observations are needed, and possible integration of passive and active remote-sensing observations from various platforms.

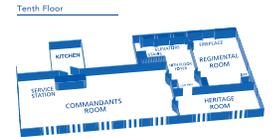
This session will build on a new IOCCG Working Group report on Polar Seas to provide future direction and strategies for carrying out state-of-the-art research and applications using ocean colour remote sensing in high latitude areas.

Part I: *Past field campaigns in Polar Seas: State-of-the-art, challenges, and gaps in existing datasets and remote sensing algorithm approaches*

- 09:30-09:35** **Introduction and overview**
Antonio Mannino (NASA GSFC)
- 09:35-09:45** **Environmental challenges for polar remote sensing: surface to top-of-atmosphere**
Knut Stamnes (Stevens Institute of Technology)
- 09:45-09:55** **Bio-optical relationships in high-latitude seas**
Rick Reynolds (SIO, UCSD)
- 09:55-10:05** **Space-based estimates of marine primary production in polar waters**
Kevin Arrigo (Stanford U.)
- 10:05-10:15** **Using remote sensing observations to address the role of calcifiers in high-latitude seas**
Barney Balch (Bigelow)
- 10:15-10:25** **Ocean colour algorithms and datasets developed within the framework of the GRENE (Green Network of Excellence) Program**
Toru Hirawake (Hokkaido U.)
- 10:25-10:45** **Discussion**
- 10:45-11:00** **Coffee Break**

Part II: *Future oceanographic field campaigns in high-latitude areas, and needs for new remote sensing approaches and capabilities*

- 11:00-11:10** **The green edge project, tracking ice-edge bloom in a changing Arctic**
Emmanuel Devred (U. Laval)
- 11:10-11:20** **Remote sensing of ocean colour in the Arctic using airborne hyperspectral sensors**
Heidi Dierssen (U. Connecticut)
- 11:20-11:30** **"Arctic-ColourS: Coastal Land Ocean Interactions in the Arctic" - A field campaign scoping study funded by NASA's OBB (Ocean Biology and Biogeochemistry) Program**
Maria Tzortziou (CCNY)
- 11:30-11:40** **"ICESOCC: Interdisciplinary Coordinated Experiment of the Southern Ocean Carbon Cycle" - A NASA OBB funded field campaign scoping study**
Greg Mitchell (SIO, UCSD)
- 11:40-12:15** **Discussion**



NEW APPLICATIONS USING VERY HIGH RESOLUTION SATELLITE OCEAN COLOUR DATA

Co-Chairs: Kevin Ruddick (RBINS) and Quinten Vanhellemont (RBINS)

The advent of satellite optical sensors providing very high spatial resolution data at low or no cost opens up important new applications for coastal and inland waters. High quality Landsat-8 data is now available globally and free of charge at 30m resolution (15m panchromatic) and similar data is expected from Sentinel 2/MSI (10m-60m, launch expected 2015).

Worldview and Pléiades provide on demand even higher resolution multispectral data, down to 1-2m (even less for panchromatic). These missions, although designed for terrestrial applications, also reveal features and processes in coastal and inland waters worldwide that have been hitherto accessible only to expensive airborne missions.

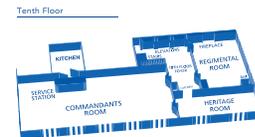
Emerging applications include the assessment of sediment transport associated with offshore constructions; detection of patchy algae distributions; water quality in estuaries, ports and inland waters; small scale discharges; detection of large marine animals; impact of ships; sub pixel scale effects in medium resolution imagery, etc.

Exploitation of these missions raises new challenges/opportunities including the correction of air-water interface reflection for spatially resolved waves, the need to deal with low signal: noise specifications and different spectral band sets.

This breakout session is structured via short talks introducing each of the following emerging questions as a basis for group discussion:

1. Who are the future users of such data?
2. What new marine processes and features can be seen at 10m resolution? At 1m?
3. What new processes and features can be detected in ports, estuaries and inland waters?
4. What are the processing challenges ... and opportunities?
5. What new algorithms will be required?

- | | |
|--------------------|--|
| 09:30-09:50 | Introduction to breakout session
Kevin Ruddick (RBINS) |
| 09:50-10:05 | What new marine processes and features can be seen at 10m resolution? At 1m?
Quinten Vanhellemont (RBINS) |
| 10:05-10:20 | What new processes and features can be detected in ports, estuaries and inland waters?
Stewart Bernard (CSIRO) |
| 10:20-10:35 | Who are the future users of such data?
Antoine Mangin (ACRI-ST) |
| 10:35-10:50 | Break |
| 10:50-11:05 | What are the processing challenges ... and opportunities?
Chuanmin Hu (U. South Florida) |
| 11:10-11:25 | What new algorithms will be required?
Nima Pahlevan (SSAI/NASA GSFC) |
| 11:30-12:15 | Concluding discussion |



ADVANCES IN HYPERSPECTRAL REMOTE SENSING SCIENCE

Co-Chairs: Part I - Kevin Turpie (UMBC GSFC), Cecile Rousseaux (USRA GSFC); Part II - Maria Tzortiou (CUNY), Emmanuel Boss (Univ of Maine); Part III - Michelle Gierach (NASA JPL), Sherry Palacios (BAERI ARC)

Part I: Hyperspectral Remote Sensing Technology for Aquatic Environments

Hyperspectral remote sensing is greatly anticipated to transform marine, coastal, estuarine, and inland aquatic research and applications – accelerating efforts to understand and monitor synoptic and global response to climate change in aquatic ecology, biogeochemical cycling, and water quality. In situ and airborne instruments are already being deployed, including imaging and non-imaging sensors. Airborne hyperspectral imagers are providing valuable, high spatial resolution maps of physical processes and ecosystem structure. Concept spaceborne instruments, such as the Hyperspectral Imager for the Coastal Ocean (HICO), have provided a glimpse of the next generation spaceborne hyperspectral imagers that will scan the global ocean or closely monitor our coasts from geosynchronous orbit. Still, much of the operational infrastructure to support future spaceborne instruments is still being developed and multiple teams are striving to develop algorithms and computational resources for these missions. We will look at the progress and challenges common to all hyperspectral remote sensing supporting aquatic science and applications. Updates will be presented on the development of hyperspectral algorithms, including advances in atmospheric correction and retrieval of inherent optical properties from hyperspectral radiometry. We will also explore available data that is necessary to support future algorithm development.

Part II: Hyperspectral Science and Applications for Shelf and Open Ocean Processes

Hyperspectral remote sensing offers the research and applications communities an unprecedented opportunity to observe changes in pelagic and neritic ecology, marine biodiversity, biological processes, and biogeochemical cycling. Multispectral ocean colour data have provided a vast increase in knowledge of the oceans and their dynamics over the last two decades. With upcoming missions such as PACE, there is a need to assess applications that can be achieved through the hyperspectral remote sensing of ocean colour as well as its challenges. There is much anticipation that these missions will have a variety of applications, including the observation of the ecological response to climate change, changes in water quality, and processes affecting the oceanic carbon cycle. In this session, we will focus on how hyperspectral data can improve oceanic phytoplankton ecology and biogeochemistry research. To that end, we will look at approaches and results using various airborne and satellite sensors, including AVIRIS and HICO respectively, and explore work towards future missions (e.g. PACE, HypSI, and GeoCAPE).

Part III: Hyperspectral Studies of Coastal and Inland Waters

The objective of this session is to address science-driven questions for coastal and inland waters and provide a venue for how the research and applications community may identify and guide the development of remote sensing resources (in situ, airborne, and satellite) to facilitate the science. Recent advances will be presented on the subjects of biodiversity, habitat ecology, water quality, harmful algal blooms, and human health and safety. The focus of this session will be on the use of spaceborne, airborne, and in situ hyperspectral resources to understand near-coast, littoral, estuarine, and lacustrine environments, where high spatial and high spectral resolution imagery is needed to understand the mechanisms driving these systems and where problems inherent to atmospheric correction of optically complex waters are particularly acute. This session will showcase recent scientific advances in these environments using hyperspectral imagery.

Part I: *Hyperspectral Remote Sensing Technology for Aquatic Environments*

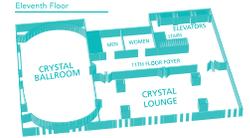
- 08:45-08:50** **Introduction and overview**
Cecile Rousseaux (USRA, NASA GSFC)
- 08:50-09:10** **Hyperspectral atmospheric correction**
Bo-Cai Gao (Naval Research Lab)
- 09:10-09:30** **IOP and derived products from hyperspectral measurements.**
Steve Ackleson (Naval Research Lab)
- 09:30-09:45** **Hyperspectral datasets for algorithm development**
Kevin Turpie (UMBC)

Part II: *Hyperspectral Science and Applications for Shelf and Open Ocean Processes*

- 09:45-10:05** **Hyperspectral ocean colour imagery and applications to studies of phytoplankton ecology**
Astrid Bracher (Alfred Wegener Institute)
- 10:05-10:25** **Hyperspectral remote sensing and applications to studies of the oceanic carbon pump**
David Siegel (UCSB)
- 10:25-10:45** **Benefits and challenges of applying hyperspectral ocean colour imagery to monitor and understand ecological global and synoptic response to climate change**
Mike Behrenfeld (Oregon State U.)
- 10:45-11:00** **Coffee Break**

Part III: *Hyperspectral Studies of Coastal and Inland Waters*

- 11:00-11:20** **Hyperspectral remote sensing and application to phytoplankton biodiversity**
Stewart Bernard (CSIR)
- 11:20-11:40** **Coral reef colour: Remote and in-situ hyperspectral sensing of reef structure and function**
Eric Hochberg (BIOS)
- 11:40-12:00** **Remote sensing of water quality: Can hyperspectral imagery improve public health?**
Clarissa Anderson (UCSC)



ECOSYSTEM DYNAMICS AND CLIMATE CHANGE: APPLICATIONS OF OCEAN COLOUR DATA

Co-Chairs: Cara Wilson (NOAA/NMFS) and Paul DiGiacomo (NOAA/NES-DIS)

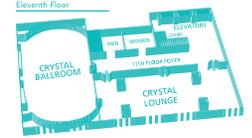
The three invited talks were designed to give an overview of the applications of ocean colour data over the full suite of timescales – retrospective analyses, near real-time monitoring, and, forecasting and predictions – relative to ecosystem dynamics and climate change.

Our overarching goal is to apply scientific knowledge and lessons learned from ocean colour radiometry data to improve ecological assessments, monitoring and forecasts along all of these timescales.

Specific questions:

1. What are the gaps/issues in our scientific knowledge, and/or underpinning observing system and modeling capabilities, relative to the above goal.
2. Are there specific challenges or obstacles that affect our ability to address these specific gaps and issues? How can/should these be addressed? By whom?
3. What are the key priorities relative to addressing these gaps and challenges?
4. What are some success stories that we can use to better promote the utility of ocean colour, and the need to sustain but more so improve our existing/planned OCR capabilities?

- 08:45-09:15** **What can we say about long-term changes in the ocean ecosystem as observed from space?**
David Antoine (LOV)
- 09:15-09:45** **What have we learned about harmful algal blooms from ocean colour data?**
Raphael Kudela (U. California, Santa Cruz)
- 09:45-10:15** **What are the challenges and opportunities for using ocean colour data for ecological forecasting?**
Marion Gehlen (LSCE/IPSL)
- 10:15-12:00** **Discussion, moderated by the co-chairs**

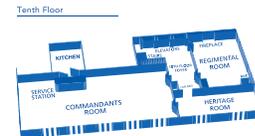


SATELLITE INSTRUMENT PRE- AND POST-LAUNCH CALIBRATION

Co-Chairs: Gerhard Meister (NASA, GSFC) and Bertrand Fougnie (CNES, France)

The goal of this session is to discuss the current state of the art for on-orbit ocean colour instrument calibration and characterization. The discussion topics include recent and currently on-going efforts for improving the radiometric accuracy for past, current and future ocean colour sensors including on-orbit approaches (solar diffuser calibration, lunar calibration, cross-calibration to other sensors) as well as relevant prelaunch characterization efforts (temperature or polarization sensitivity, straylight, spectral characterization, etc.). Discussions will include calibration related aspects of the on-orbit commissioning phase from teams actively planning for upcoming sensors as well as lessons learned from established ocean colour sensors. This session is held in the framework of the Ocean Colour Calibration Task Force.

- | | |
|--------------------|---|
| 8:45-8:50 | Introduction
Gerhard Meister (NASA GSFC) |
| 8:50-9:05 | SeaWiFS Calibration Update – The story of less than 1 digital count
Frederick Patt (NASA GSFC/SAIC) |
| 9:05-9:20 | Status of Aqua MODIS calibration and performance
Xiaoxiong Xiong (NASA GSFC) |
| 9:20-9:35 | Status of MERIS Calibration for 4th Reprocessing
Ludovic Bourg (ACRI-ST) |
| 9:35-9:50 | Updates on OCM-2 calibration through vicarious and lunar calibrations
Prakash Chauhan (ISRO) |
| 9:50-10:05 | GOCI postlaunch calibration and GOCI-II pre-launch calibration plan
Seongick Cho (KIOST) |
| 10:05-10:20 | HY-1B/COCTS calibration
Xianqiang He (SOA) |
| 10:20-10:35 | Break |
| 10:35-10:50 | S-NPP VIIRS on-orbit calibration for ocean colour applications
Gene Eplee (SAIC) |
| 10:50-11:05 | S-NPP VIIRS calibration
Junqiang Sun (GST) |
| 11:05-11:20 | Challenges of system vicarious calibration for non-standard atmospheric correction
Constant Mazeran (Solvo) |
| 11:20-11:35 | EUMETSAT calibration activities
Ewa Kwiatkowska (EUMETSAT) |
| 11:35-12:00 | Future activities and organizational structure of the IOCCG Calibration Task Force
Kwiatkowska/Meister |



JOINT USE OF BIO-ARGO AND OCEAN COLOUR

Co-Chairs: Antoine Mangin (ACRI-ST) and Xiaogang Xing (OUC/Takuvik)

The recent progress of bio-profiling technology and the increase of bio-float deployments open the way to a much better description of marine biology. This breakout session deals with the combined use of bio-profiler acquisitions and ocean colour radiometry. On-going work focuses on the capability of inter-validation of the two techniques of observation - this capability could be of great use in upcoming ocean colour missions (e.g. OLCI aboard Sentinel 3). The combined use of remote sensing and bio-floats is also very important to better classify the types of waters, as it offers an enhanced 3-dimensional view of the marine biology. Thanks to this new perspective, it will soon be possible to propose updated climatology (through the bio-regions approach) and to provide recommendations for an optimized deployment of bio-floats.

Presentations during this breakout session will focus on i) recent progress of the bio-floats technology and deployment, ii) harmonized protocols for sampling and QC, iii) RD works on blending (either statistically or through assimilation) EO data and bio-floats data, and iv) the near-future of the Bio-Argo network. These presentations should facilitate animated discussions (round table) on the deployment strategy of bio-floats and the synergies with ocean colour remote sensing from space (e.g., strategies for cross validation).

QUESTIONS THAT WILL BE ADDRESSED INCLUDE:

1. How the in situ observation at BOUSSOLE and MOBY could become the important reference before deployment of Bio-Argo?
2. How biogeochemical and bio-optical cruises for deployment of Bio-Argo should be organized?
3. Elements of/needs for cooperation between OCR and Bio-Argo
4. Criteria for optimization of Bio-Argo deployment (in complementarity with other observations means)

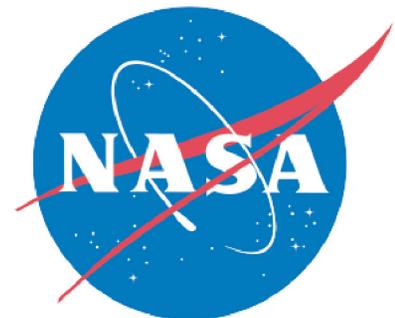
- 08:45 – 08:55** **Brief introduction (from IOCCG report to an emerging Bio-Argo program)**
Xiaogang Xing (OUC/Takuvik)
- 08:55 – 09:15** **Satellite radiometric validation with VAL-Argo and hyperspectral floats**
Emmanuel Boss (U. Maine)
- 09:15 – 09:35** **Complementarity between Bio-Argo and OCR**
Antoine Mangin (ACRI-ST)
- 09:35 – 09:50** **Bio-optical product validation**
Emanuele Organelli (LOV)
- 09:50 – 10:05** **Merged products of Bio-Argo and OCR**
Raphaëlle Sauzède (LOV)
- 10:05 – 10:15** **Break**
- 10:15 – 10:45** **Regional approaches of Bio-Argo at high latitude**
Nick Hardman-Mountford (CSIRO); Marcel Babin (Takuvik/CNRS)
- 10:45 – 12:00** **Discussion moderate co-chairs**

The **International Ocean-Colour Coordinating Group (IOCCG)** is an international group of experts in the field of satellite ocean colour, acting as a liaison and communication channel between users, managers and space agencies in the ocean-colour arena.

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