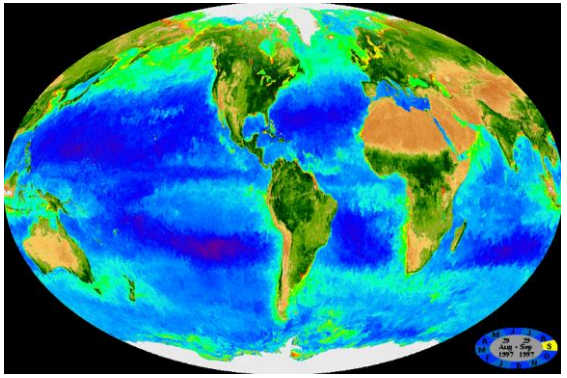


In situ Protocols Update - Field Program Support Group (FSG)

Antonio Mannino

NASA Goddard Space Flight Center

NASA OCRT Meeting – May 5-7, 2014

Outline

- Brief introduction to the FSG
- CDOM protocol activity
  - November 2013 Workshop
  - Round robins
- Particle absorption protocol workshop
- Future plans
- IOCCG committee on protocols

Field support group - Introduction

Goal: to provide field observations and data analysis capabilities in support of the NASA OBB Program and related missions

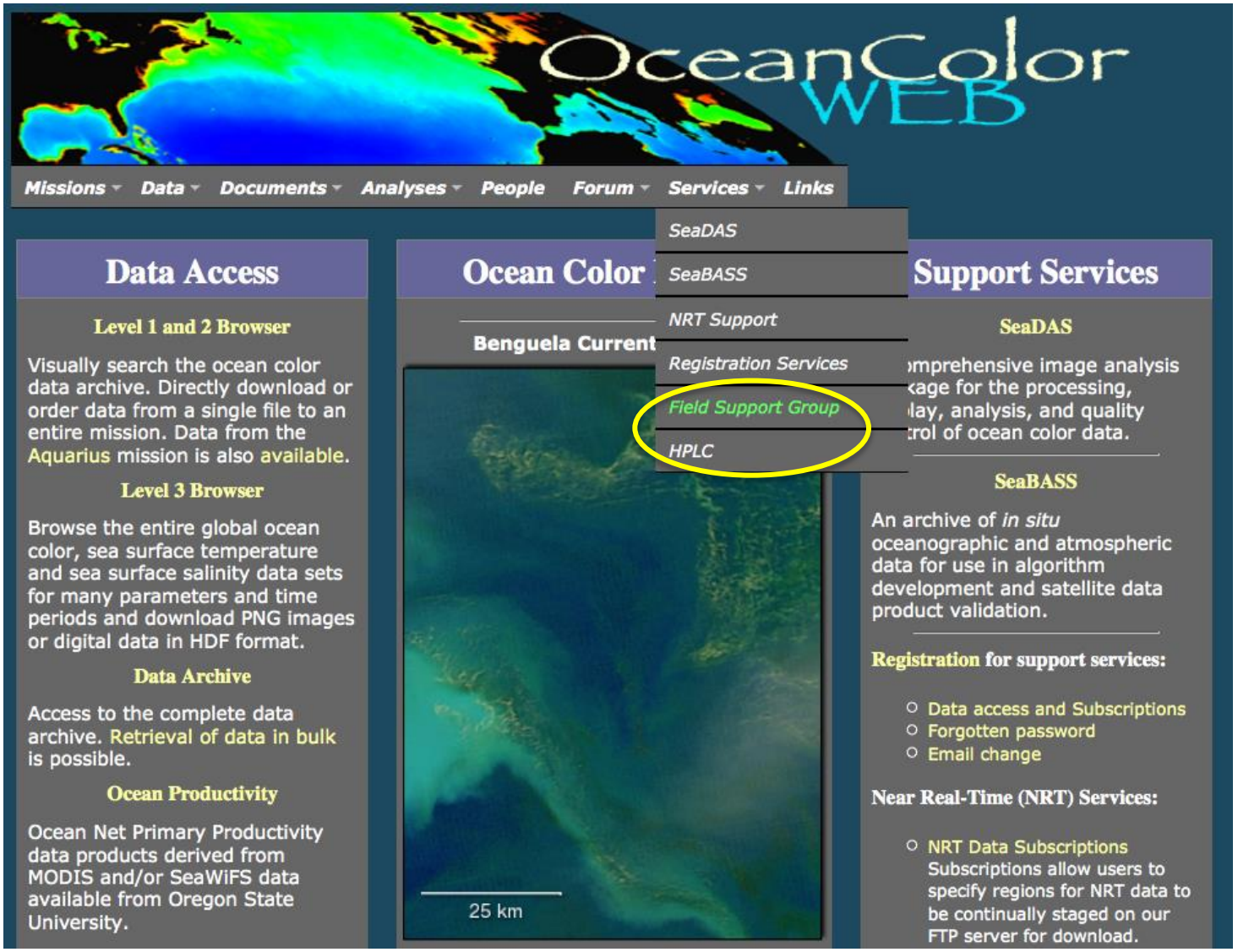
FSG Roles & Activities

- Obtain complete field datasets for satellite validation & algorithm development.
- Update/develop field and lab measurement protocols with the community.
  - Document in new NASA OOPs
- Quantify and refine uncertainties of field and lab measurements
  - appropriate for satellite product validation and algorithm development
- Inform, interact & collaborate with OC community
- Foster international partnerships
  - Sharing of field & satellite data
  - protocols and QA/QC of field observations

Assist OBB in preparing for PACE, ... GEO-CAPE, etc.

For more information on FSG …

http://oceancolor.gsfc.nasa.gov/FSG/



antonio.mannino@nasa.gov

Scientific Input Group

- Informal ~~"advisory"~~ group that provides input on our activities
- Members
  - Bob Arnone
  - Barney Balch (since 2014)
  - Chuanmin Hu
  - Colin Roesler
  - Rick Stumpf
- Site visit in October 2013
  - SIG provided written "recommendations"
    - See backup slides and website (in ~2 weeks)
- Next site visit planned for Dec. 2014

CDOM Protocol Activity

- NASA OOPs on CDOM absorption published as NASA TM in 2003 (Mitchell et al.)
  - TM does not address technologies developed over the past 10 years such as the WPI Ultrapath
  - Ultrapath with 2m pathlength enables higher SNR CDOM absorption measurements, which is critical for visible and UV wavelengths in oligotrophic ocean.

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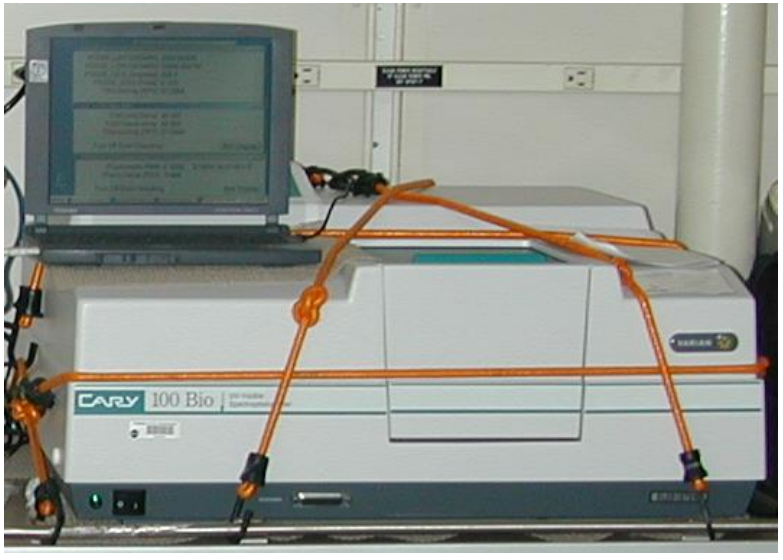
  - Ultrapath with 2m pathlength enables higher SNR CDOM absorption measurements, which is critical for visible and UV wavelengths in oligotrophic ocean.
- FSG convened a workshop at Goddard in November 2013 in collaboration with OC community of CDOM experts
  - Participants were familiar with the Ultrapath and considered CDOM experts
- Activity has continued with round robin activities to resolve protocol issues

CDOM Workshop/Protocol Objectives 1

- Develop community consensus protocols for CDOM absorption using the WPI Ultrapath
  - Salinity/refractive index correction (0-40 psu).
  - Document variability between different Ultrapaths.
    - Define the causes of any revealed differences.
- Compare results from double-beam spectrophotometers, Ultrapaths, PSICAM, a-sphere, and ac-s instruments
- Document precision and accuracy of CDOM measurements for each type of instrument.



CDOM Workshop/Protocol Objectives 2

- Review and update protocols for CDOM measurements
  - sample collection, storage and analysis from raw optical density to a_{CDOM} and CDOM spectral slopes.
- Identify and recommend NIST-traceable calibration standards to confirm instrument performance for spectrophotometers and Ultrapaths.
- Recommendations or plans for a NIST-traceable CDOM standard materials or community consensus reference material (similar to deep seawater DOC)
- Complete protocol document for discrete a_{CDOM} bench measurements

CDOM Protocol Status

- Pre-workshop round robin CDOM/salinity dilution series (prepared by Rick Miller)
- Workshop convened in November 2013
  - **Participants:** Rick Miller, Norm Nelson, Rossana Del Vecchio, Eurico D'Sa, Neil Blough, Mathias Belz, Rüdiger Röttgers, Emmanuel Boss, Atsushi Matsuoka, Jean-Francois Bertrand, Maria Tzortziou, Mike Novak, Joaquin Chaves, Scott Freeman, Jeremy Werdell, Aimee Neeley, Carlos Del Castillo, Antonio Mannino.
  - **Instruments:** 6 Ultrapaths, LWCC, PSICAM, 2 double-beam spectrophotometers, HOBI Labs a-sphere

See Rick Miller's poster #35 (Tuesday)

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  - **Instruments:** 6 Ultrapaths, LWCC, PSICAM, 2 double-beam spectrophotometers, HOBI Labs a-sphere
- First Post-workshop round robin - January 2014
  - FSG prepared and distributed various CDOM samples including Suwannee River fulvic acid from IHSS (recommended as CDOM reference material at the workshop)
- Second post-workshop round robin - summer 2014
- Draft protocol document (Norm Nelson coordinating)

See Rick Miller's poster #35 (Tuesday)

Suwanee River Fulvic Acid in Ultrapure water

a_{CDOM} (m^{-1})

% Error

SWinSavg
+sd
−sd

Suwanee River Fulvic Acid in NaCl solution

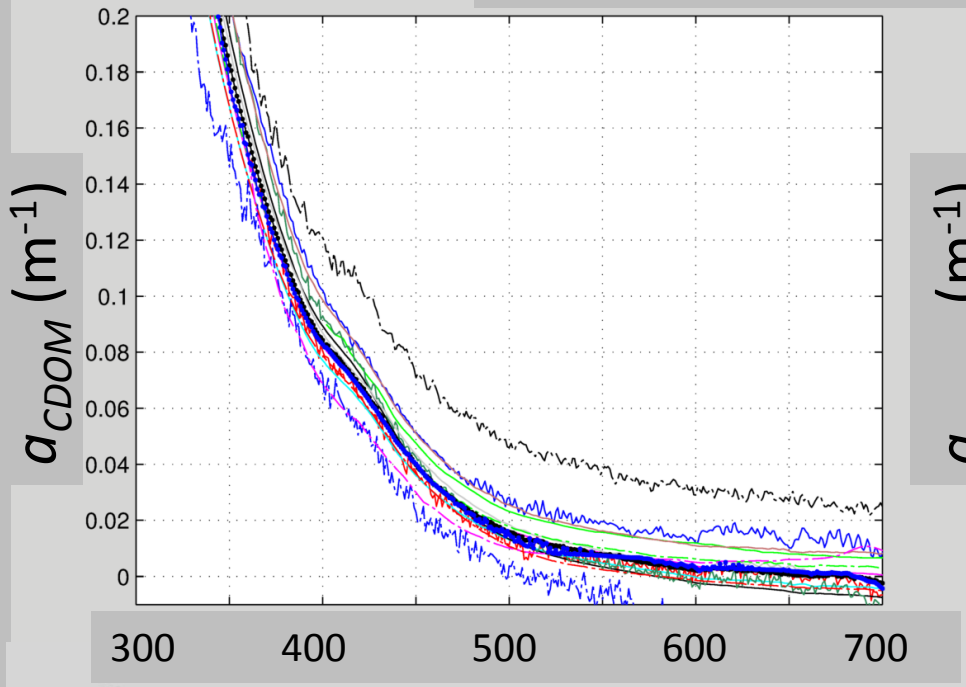
a_{CDOM} (m^{-1})

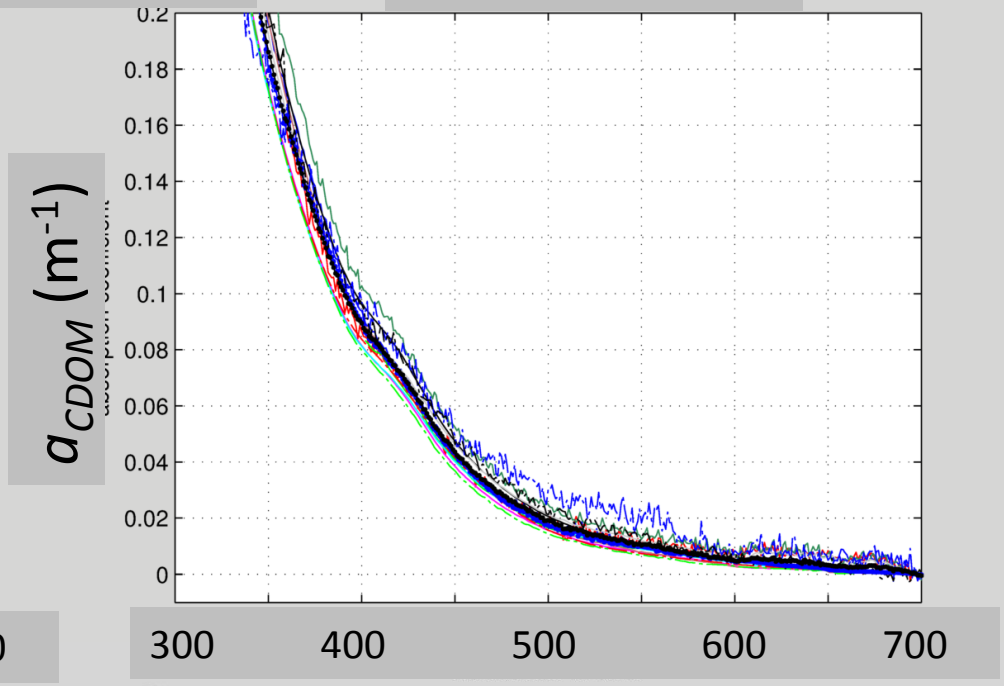
Ultrapaths - 8
LWCC - 1
Spectrophotometers - 5
ac-s - 1
a-sphere - 1

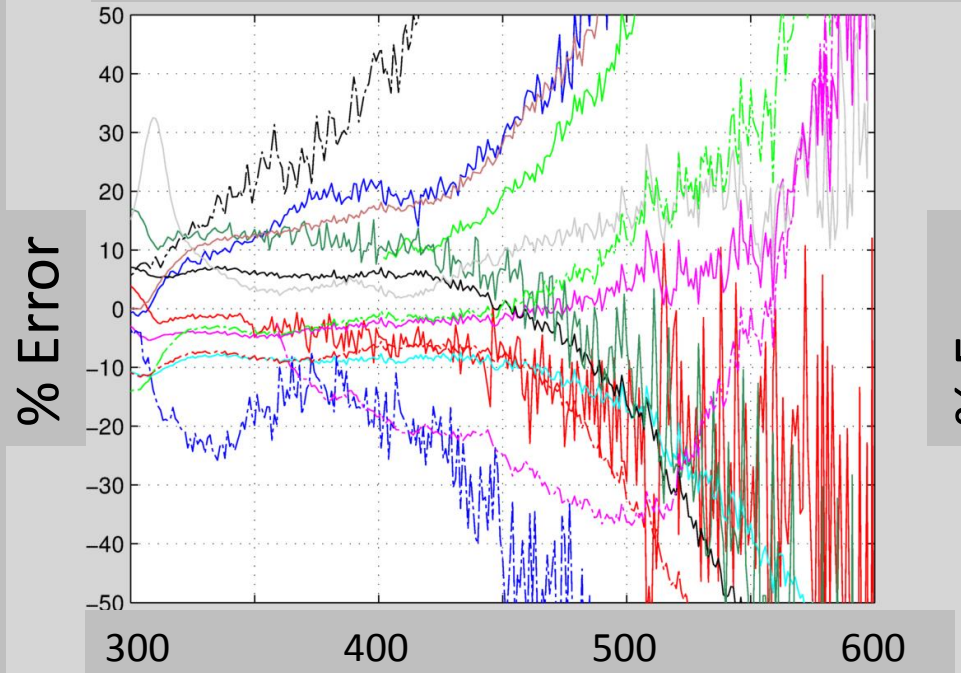
% Error

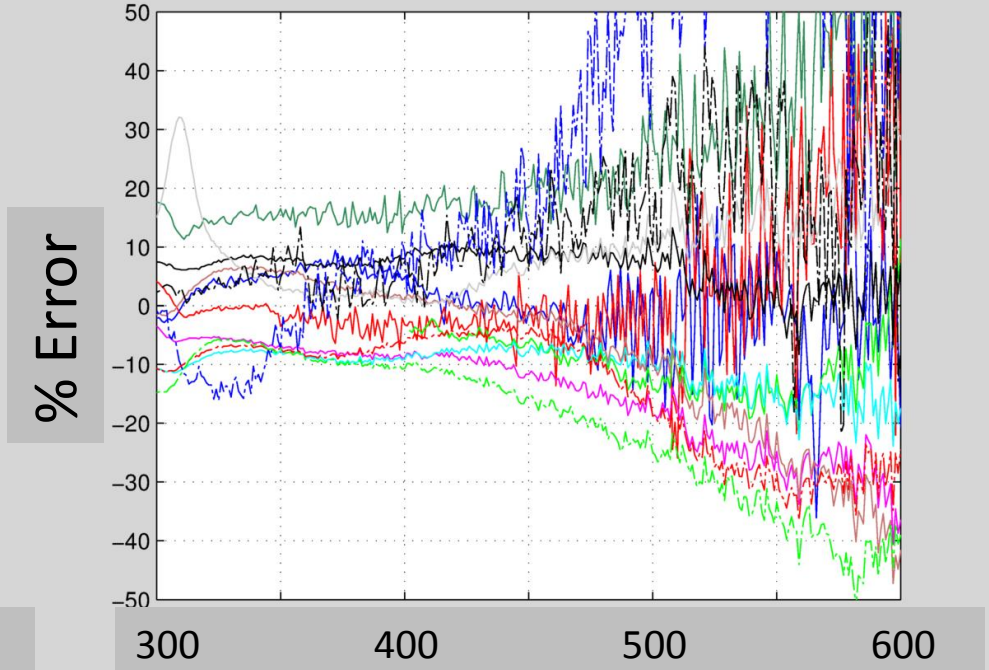
Coastal Hawaii Seawater

Null-corrected



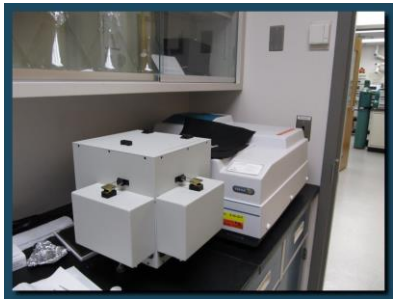






Particle Absorption Protocol Activity

- NASA OOPs published as NASA TM in 2003 (Mitchell et al.)
- Workshop scheduled for June 2014
  - Refine and update protocols for filter pad measurements of particle absorption.
    - Compare traditional QFT, T-R technique, internal integrating sphere, ac-s, a-sphere, and PSICAM.
    - Sample collection, storage and analysis
    - Amplification factors, hysteresis, etc.
    - Depigmentation protocol



  - **Participants:** Collin Roesler, Rick Reynolds, Dariusz Stramski, Emmanuel Boss, Mike Twardowski, Jim Sullivan, Eurico D'Sa, Marcel Babin, Rüdiger Röttgers, Brian Schieber, Aimee Neeley, Mike Novak, Scott Freeman, Joaquin Chaves, Jeremy Werdell & Antonio Mannino.

Future Plans

- Working on resolving how to account for DOC sorption onto POC samples
- *in situ* IOP Workshop Winter/Spring 2015
- TBD Summer 2015

IOCCG Sponsored Protocol Activity

- IOCCG Committee to follow ocean color protocol development activities
- Optics protocol workshop on Oct. 25 (day before OO XXIII begins in Portland, Maine) - coordinated by Steve Ackleson
  - bring together experts from around the world to discuss the next steps towards the establishment of community protocols for *in situ* and above-water observations in support of ocean color science.
  - Advise the IOCCG: workshop report, research community plans for updating and expanding existing protocols.

BACKUP SLIDES

FSG staff & capabilities

Antonio Mannino	PI; biogeochemistry
Jeremy Werdell	Consigliore; satellites
Win Decker	SSAI Program Manager
Joaquin Chaves	biogeochemistry; biology
Scott Freeman	in-water IOPs & AOPs
Mike Novak	biogeochemistry
Aimee Neeley	phytoplankton ecology
Crystal Thomas	HPLC
Chris Kenemer	HPLC
Giulietta Fargion	SeaBASS/HPLC data management; HQ liaison
Chris Proctor	SeaBASS; validation
Karen Mitchell	operations
Vince Wilding	Web developer
Stan Hooker	optical instrumentation development; AOPs

Scientific Input Group Oct. 2013 Site Review Recommendations

Summary of Review:

The program review for the FGS program was well received and the SIG was impressed with their progress. Their vision for the future role for in situ ocean measurements clearly identifies and justifies their activities for emerging satellite sensors and algorithms. The SIG encourages continuation of the FGS development and fully support their activities.

Below is a list of suggestions that are most critical to make further improvement.

1) Conduct more outreach both to engage the community in defining and evaluating protocols but also to better expose the capabilities and activities of FSG;

2) Develop protocols for water leaving radiance. Confirm and work with the community on new developments for in situ methods and emerging ocean instruments, etc. Are existing off the shelf capabilities sufficient, are some better than others, what are the evaluation criteria?

3) Continue development of protocols or IOP / AOP measurements- and instruments used. Inform the community on instruments and advances being made etc. Provide an organic website for SOPs which evolves via FSG and community engagement and coordination.

3) Workshops for CDOM, HPLC, POC, PIM etc are important , glad to see they are emerging . Suggest several per year which can coincide with major meetings.

4) Suggest minimize cost of some workshops and protocols which can be conducted from a pier with participants for ~2 days, rather that going on cruise with extensive cost. Save research cruise activities and costs for high value sample collections (unique region, process).

Congratulations on a job well done.

Scientific Input Group: Robert Arnone; Collin Roesler; Chuanmin Hu

Field support group - Introduction

Goal: to provide field observations and data analysis capabilities in support of the NASA OBB Program and related missions