

Ocean Colour Algorithms and Models for Southern Ocean Pigments and Primary Production

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Goal: *Goal is to define current understanding, new data that may be coming on line, role of new technologies, and concepts for better international cooperation for observations, data sharing, algorithm development and implementation of alternative algorithms in satellite data processing.*

Outcome: Recommendations to space agencies and international science community including fostering collaborative ideas among the people attending the workshop. The Outline for the Draft Report is to be written during the meeting (5-10 pages).

Description of Breakout Workshop

The Southern Ocean, defined here as the area south of the Sub-Antarctic Front (Orsi et al. 1995), comprises more than 20% of the global oceans and is very important in carbon cycle dynamics and in support of higher trophic levels. Yet there is less observational data, compared to other oceans, due to logistical challenges, especially in winter. Various publications indicate significant differences in bio-optical relationships for the Southern Ocean compared to lower latitudes (See a review in IOCCG report [Ocean Colour Remote Sensing in Polar Seas](#)). There remain many uncertainties regarding ocean color algorithms and models for pigments, phytoplankton functional groups, primary production and export production for the Southern Ocean. Differentiation between the Southern Ocean and low latitudes, as well as regional differentiation within the Southern Ocean, has been reported. Furthermore there is very little winter data although much of the region has sufficient light for net positive primary production. This break out session seeks to review the status of different algorithms and models, to define open source data sets that can be integrated to form a better understanding, and to define opportunities for international cooperation in the future to merge data from ships, autonomous observers and satellites to improve algorithms and models and to reduce uncertainties in satellite estimates of Southern Ocean pigments, plankton biomass, primary production and export production.

Key Questions

Key questions to be discussed during the workshop, along with possible outcomes.

1. Can we explain discrepancies between different investigations of Southern Ocean bio-optical algorithms based on time, sector and proximity to sea ice and continental shelves, temperature, latitude, and methodology?
2. Can atmospheric corrections be improved to expand the time-space domain of ocean color data at higher solar zenith angles?
3. What is the pigment concentration, primary production and carbon export for ice-free oceans in winter for which no ocean color data can be retrieved due to solar zenith angle being too large?
4. What are emerging technologies that can improve the quality and number of observations in situ and airborne in the Southern Ocean needed to improve algorithms and models?

5. How can we merge bio-optical-ARGO and satellite data for a better 4-D representation of plankton biomass and productivity for the SO?
6. What are the plans in the international community for future field campaigns to advance our understanding of Southern Ocean carbon cycle using satellite ocean color and other observations?
7. How can we improve the understanding of relationship between surface satellite observations and organic carbon export?

Draft Agenda:

14:00 – 14:05 Welcome (*M. Vernet*)

14:05 – 14:20 Experiences in building a Southern Ocean chlorophyll algorithm (*Mati Kahru and B. Greg Mitchell*)

14:20 – 14:35 Revisiting Ocean Color algorithms for chlorophyll a and particulate organic carbon in the Southern Ocean using biogeochemical floats (*Emmanuel Boss*)

14:35-14:50 Southern Ocean backscattering: bubbles, coccolithophores, *Phaeocystis*, and protein (*Heidi Dierssen*)

14:50 – 15:05 Panel Discussion (15 min)

15:05 – 15:35 Speed talks, 10 presenters, 3-minute presentation with 1-2 slides each

15:35 – 16:45 General Discussion and Report Outline (70 min)

If you are interested and willing to give a **Speed Talk** (3 min) presentation (with 2 slides) on results, ideas, new questions, etc. please send us (mvernet@ucsd.edu, mkahru@ucsd.edu, david.antoine@curtin.edu.au)

- Title, name of presenter and co-author(s)
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