

OCB Ocean-Atmosphere Interactions Workshop: Scoping Directions for US Research

William L. Miller, University of Georgia
(on behalf of the OCB Ocean-Atmosphere Interaction Subcommittee)

Summary: This proposal requests funding to support a workshop that would assemble the U.S. oceanic and atmospheric scientific community working at the air-sea interface to identify research priorities and organize the communication and collaboration required for future significant research advances. It is submitted and promoted by the new OCB Ocean Atmosphere Interaction Committee (OAIC); representing a critical first step in pursuing its stated charge to “build a flourishing, collaborative air-sea interaction research community in the U.S. and encourage synergistic activities between U.S. Scientists and the international initiative Surface Ocean Lower Atmosphere Study (SOLAS).” The 2-3 day workshop would be “open invitation” but with attendance likely limited to a maximum of 60-80 active U.S. scientists. Participants, selected by the OAIC with OCB oversight, would present overview talks and cutting edge research, and participate in directed discussions to identify key knowledge gaps and priority research needed for advance in the field. The OAIC would then assemble outcomes from the workshop to first generate a timely workshop report to OCB for distribution, and after community vetting, a new, “grass-roots” based U.S. SOLAS Science and Implementation Plan. These will benefit the OCB community and the work of the OAIC by providing a cohesive and accessible focal point for future development and advancement of air-sea interface research in the U.S.

Background and Rationale for the Workshop: The interface between oceans and atmosphere represents over 70% of the planet’s surface area and a better understanding of this interface is key to our ability to predict heat exchange, biogeochemical cycling, and feedbacks in order to ascertain future climate scenarios. As Earth System Models (ESMs) evolve, new levels of understanding can be incorporated. This can include resolving high and extreme wind events, gas and aerosol exchange, as well as the impacts of large-scale oscillations such as ENSO, AMO, etc. These phenomena impact the lower atmosphere and surface ocean across scales and ranges that we have only begun to ascertain. These have clear and significant links to ocean carbon biogeochemistry.

SOLAS is an established international initiative aimed at increasing understanding of interactions between the ocean and atmosphere and linking such knowledge with climate and society. It focuses on this critical element of earth system science and overlaps extensively with a great deal of current U.S. research activity (e.g. NASA funded EXPORTS & NAAMES, GO-SHIP, NSF funded core atmospheric, polar, physical & chemical oceanography programs as well as OOI activities, NCAR and CAICE research, etc.). This demonstrates the strong interest and current priority in pursuing SOLAS science within the U.S. research community. Despite this activity, there is surprisingly little coordination between U.S. initiatives and the international SOLAS community. One of the goals of the OCB OAIC is to support the development of a strong, coordinated and connected U.S.

SOLAS community and the workshop proposed here represents a timely and important step towards achieving this goal.

Support for OCB Research Priorities: The updated international SOLAS science plan (Breviere et al. 2016) describes 5 core research themes: (i) greenhouse gases and the ocean, (ii) air-sea interface and exchange of mass and energy, (iii) atmospheric deposition and ocean biogeochemistry, (iv) interconnections between aerosols, clouds and marine ecosystems, and (v) ocean biogeochemical control on atmospheric chemistry. Figure 1 (below), shows these core themes with OCB-relevant subtopics circled in red.

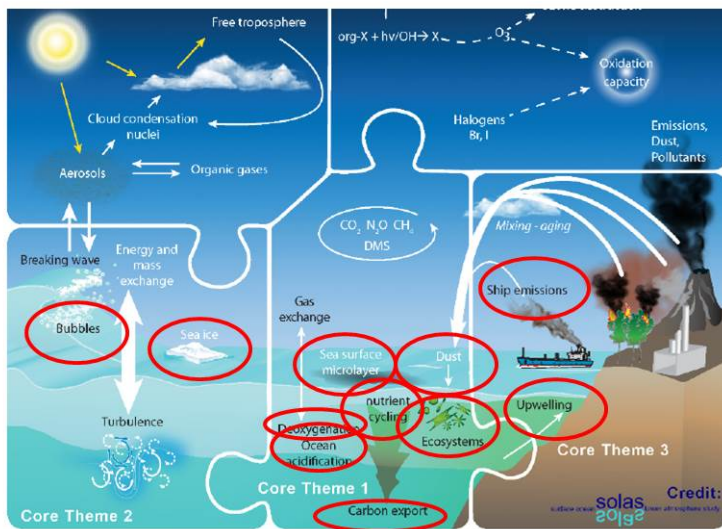


Fig. 1. SOLAS core themes and overlapping OCB priorities (circled in red). Modified from (Breviere et al., 2016)

The four over-arching science questions of SOLAS are all related to OCB science:

1. What controls the ocean-atmosphere exchange of greenhouse gases?
2. How does atmospheric deposition of materials impact ocean biological systems?
3. How do oceanic emissions of highly reactive gases impact atmospheric chemistry?
4. What are important feedback loops between the oceanic and atmospheric systems?

In particular, there is enormous overlap between OCB research priorities of ocean acidification, low O₂ conditions, and carbon uptake and export with SOLAS science in the international plan. These OCB research priorities are specifically called out in Figure 2 (left) from SOLAS core Theme 1. While identifying overlapping activity and interest is important, it is perhaps more critical to take stock of current U.S. priorities and build a U.S.-centric plan to participate in SOLAS science.

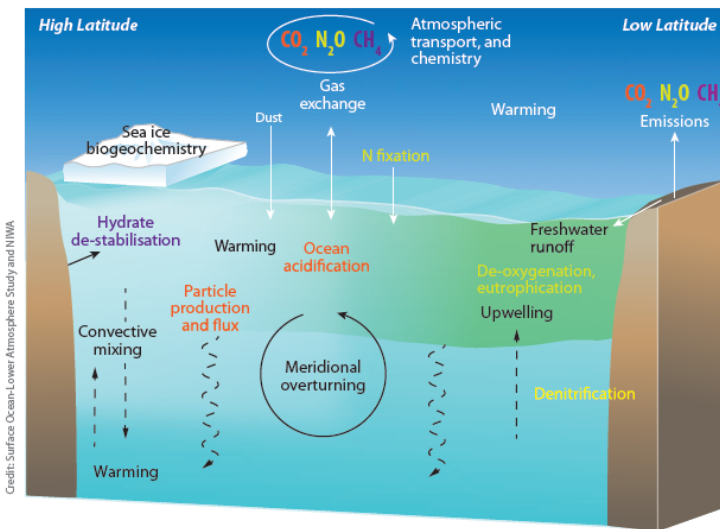


Fig. 2. Processes associated with SOLAS Theme 1 and overlapping OCB science priorities. (Breviere et al., 2016)

Products, Outcomes, and Benefit to the Broader OCB Community: The OAIC, operating within the OCB framework, has defined and posted its Charge and Terms of Reference (<https://www.us-ocb.org/wp-content/uploads/sites/43/2018/09/OAIC-Charge-and-Terms.pdf>).

Several of its specific activities include:

- Organizing dedicated air-sea interaction workshops on critical topics or organizing sessions and short workshops highlighting research associated with air-sea interaction at existing conferences (AGU, Ocean Sciences, etc.)
- Communicating the goals of this committee, possibilities for involvement, and “hot topic” issues through short articles (e.g. EOS, BAMS, ASLO Bulletin) and through emailed announcements.
- Assisting in exploring mechanisms in which research at the boundary of traditional atmospheric and oceanic disciplines can be successfully supported by US funding agencies.

One mechanism to advance U.S. research on air-sea interactions is to create stronger links to the international SOLAS community. Synergy and expanded collaborations will benefit the broader OCB community; fueling new ideas, opportunities and incentives to explore this critical area of research. It is the intention of the OAIC to develop a “grass-roots” based U.S. SOLAS Science Plan and Implementation Strategy based on information shared at this workshop.

The scientific presentations will be the basis for focused discussions to identify and prioritize key knowledge gaps and approaches to investigating them, given current state of the art methods and innovative approaches. Members of the OAIC, some with direct experience in developing the international SOLAS plans, will work with other attendees to facilitate discussions and the translation of workshop exchanges into a focused, coordinated U.S. plan for advancing ocean-atmosphere research over the next 5-10 years. The initial document will be open for community comment and input, with a final document completed within a year of the workshop. This will benefit the OCB community and the work of the OAIC by providing a cohesive and accessible focal point for future development, advancement and funding of air-sea interface research in the U.S.

Preliminary Details for the Workshop: Given the very short timeline between formation of the OAIC and the submission deadline of this proposal, inquiries based on teleconference discussion/suggestions into possible venues and workshop timing are ongoing and not yet finalized. As our current best option, this proposal represents preliminary logistical information for a workshop at the Bermuda Institute of Ocean Science. Conversations with Andrew Peters at BIOS indicate a strong interest in SOLAS science by the resident researchers (with the BATS & Tudor Hill programs based in Bermuda) and facilities suited for a workshop the size we have in mind.

Timing: The workshop would follow the International SOLAS Open Science Meeting that will take place in Japan, Spring of 2019. This takes advantage of community and OAIC member participation there that will leverage exposure to, and evaluation of current developments and initiatives. While a summer venue was considered, the cost, perceived

potential scheduling conflicts, preliminary inquiries into available space, and lead-time for logistical arrangements all led to late summer or early fall 2019 as the earliest reasonable date to follow the International meeting. If successful, and OCB notification comes early in 2019, giving us 6-8 months to assemble participants and finalize logistics. This is fast but should be doable with effort distributed over the OAIC committee.

Participation and General Approach: The workshop would take place over 2-3 days (Sunday arrival and Wednesday departure) and be “open invitation” but with attendance likely limited to a maximum of 60-80 active U.S. scientists, depending on response and final logistics. This will be large enough to allow for representation of established and early career scientists, good geographic distribution, and distribution of research expertise over the atmospheric and oceanic disciplines required for fruitful exchange and knowledgeable insight into plans for future research directions. Participants, selected from applicants by the OAIC with OCB oversight, would present overview talks and new research in themed poster sessions, and participate in directed discussions to identify key knowledge gaps and priority research needed for advance in the field. OAIC will examine options to invite well-known keynote speakers as deemed reasonable (perhaps 2-3).

“Rough” Potential Meeting Agenda:

Sunday:

Afternoon – early arrivals for fieldtrip, educational activity

Evening - Welcome, short presentation of expectations, mixer/reception

Monday:

Morning – breakfast, keynote and oral presentations

Afternoon – lunch, topical poster session, separate topical group discussions

Evening – dinner in town, group reports from 1st day discussion in plenary

Tuesday:

Morning – breakfast, keynote and oral presentations

Afternoon – lunch, topical poster session, separate topical group discussions

Evening – dinner in town, group reports from 2nd day discussion in plenary

Wednesday:

Morning – breakfast, plenary summary of discussions, assemble information for

OAIC’s task of creating a workshop document and US SOLAS Research and Implementation plan for community consideration.

Afternoon: Optional educational activities (fieldtrip, etc.); flights home

Venue: BIOS has hosted successful OCB workshops in the past. Hanson Hall will seat 150 people comfortably and BIOS has recently added 4 teaching rooms (with digital projectors and/or smartboards) that can accommodate up to 85 people for breakout groups and discussions. 2 additional meeting rooms can accommodate 12 people each. BIOS has dormitory housing for about 80 people maximum (perhaps 60 available to the meeting) with guest houses, and hotel accommodation in the area. Group rates are available. Transportation with the BIOS bus and commercial mini-bus services can be arranged. Depending on final size, either the BIOS staff or local caterers can be employed to cater meals and dining facilities are available on site. Flights from the U.S. are regular and

reasonably priced if reservations are made with adequate lead time. The Tudor Hill atmospheric sampling tower is a relatively short drive from BIOS and there are other activities that could be integrated into the workshop. Bermuda is an attractive destination.

Budget and Budget Justification: The OAIC members will serve as the workshop steering committee to provide planning and participant selection services, and will oversee and participate on-site as logistical support, scribes and liaisons for group discussions. The steering committee, 2 keynote speakers, and 2 topic-specific invited speakers will be covered in full, with any remaining funds used to cover hotel expenses, catering, supplies, etc. Participants (who are not invited speakers) are expected to pay for their own travel to and from the workshop. Cost estimates for ground transportation, catering/per diem, housing, meeting room and A/V costs, transportation, publications, etc. are ~\$760 per person. Based on an estimated total participation of 80 (12 OAIC workshop committee, 4 invited speakers, and 62 additional attendees), we propose the following Budget:

Travel (to and from Workshop)	16 x \$550 (airfare)	\$ 8,800
Estimated Participant costs (as above)	80 x \$760	\$60,800
	TOTAL	\$69,600

Justification for the \$760/person Participant Cost:

Facilities: Large hall \$500/day x 2.5; small rooms \$200/day x 2.5 =	\$ 1,750
IT tech support: \$115/hr x 4hrs =	\$ 460
BIOS Bus (28 capacity) /Ground Transportation: \$155/hr x 6 hrs =	\$ 930
BIOS dorm lodging: \$90/day x 60 person x 3 nights =	\$16,200
Off-site lodging: \$200/day x 20 person x 3 nights =	\$12,000
Catered breakfast/boxlunch: \$50/day x 80 person x 3days =	\$12,000
Dinner per diem: \$75/person x 80 x 3 =	\$18,000

With a favorable OCB decision, preliminary conversations with NSF (Hedy Edmonds, Chemical Oceanography) suggest potential support, with interest from NSF Polar Programs, Atmospheric Sciences, and Physical Oceanography also possible. NASA, UCAR and SCOR are other potential sources of support. Any additional funding would be used to expand participation and increase the number of invited speakers if needed.

Members of the OCB subcommittee for Ocean Atmosphere Interaction and sponsors of this proposal ([Rachel Stanley](#) (Chair) - Wellesley College; [Thomas Bell](#) - Plymouth Marine Laboratory; [Yuan Gao](#) – Rutgers; [Cassandra Gaston](#) - Univ. Miami, RSMAS; [David Ho](#) - Univ. Hawaii; [David Kieber](#) - SUNY Syracuse; [Kate Mackey](#) - UC Irvine; [Nicholas Meskhidze](#) - NC State Univ.; [Bill Miller](#) - Univ. Georgia; [Henry Potter](#) (Early Career) – TAMU; [Penny Vlahos](#) - Univ. Connecticut; [Patricia Yager](#) - Univ. Georgia.)

References:

Brévière, E. and the SOLAS Scientific Steering Committee (eds.) (2016): *SOLAS 2015- 2025: Science Plan and Organisation*. SOLAS International Project Office, GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, 76 pp.
(available at <http://www.solas-int.org/about/solas.html>)