surface ocean solas lower atmosphere study

OASIS Observing Air-Sea Interactions Strategy

Joint Statement of Collaboration

Between the Surface Ocean-Lower Atmosphere Study (SOLAS)
and the Observing Air-Sea Interactions Strategy (OASIS)

I. Introduction

SOLAS and OASIS recognize the value of coordinated research on air-sea interactions. While both highlight the interdependencies of the air-sea fluxes associated with the energy, water, carbon and life cycles, these complementary initiatives bring different strengths. OASIS initial activities have focused primarily on recommended practices and technologies for improving and expanding the Global Ocean Observing System (GOOS) and remote sensing capabilities for physical flux measurements, while SOLAS specializes in studying biogeochemical-physical processes. This collaboration leverages both programs' expertise to enhance global ocean-atmosphere research, aligning with their shared scientific missions.

II. Background

SOLAS, initiated in 2000, possesses a more extended operational history and a broader scientific scope, with a strong emphasis on process studies. SOLAS investigates the mechanisms and consequences of air-sea exchanges of gases, particles, and energy, as well as the processes in the oceanic and atmospheric boundary layers that control the air-sea exchange. SOLAS is developing its third decadal science plan (SOLAS 2026-2035), which represents a pivotal transition from the current research framework to a new paradigm that harmonizes “discovery science” with “science towards solutions” and “community and skill development”. The organization is sponsored by the Scientific Committee on Oceanic Research (SCOR), Future Earth, the World Climate Research Programme (WCRP), and the International Commission on Atmospheric Chemistry and Global Pollution (iCACGP).

OASIS, borne out of the OceanObs’19 conference, began first as a SCOR Working Group #162 that included a diverse range of OceanObs’19 authors focused on synthesizing more than 50 community white papers into a practical, integrated approach for observing air-sea interactions globally. With the ambitious goal to improve Earth system forecasts, assess CO_2 uptake, and provide valuable surface ocean information for decision-makers, while promoting healthy oceans and sustainable development, their first activity was to create a UN Ocean Decade programme by the same name. During this first half of the Ocean Decade, OASIS’s core activities include establishing and enhancing global observational networks and satellite observations (particularly related to the energy cycle), identifying gaps in flux measurements and products, developing standardized observational protocols, and building capacity for making and using air-sea interaction observations and information globally, including in the Global South. Through OASIS efforts, an Uncrewed Surface Vehicle (USV) global network for observing air-sea interactions has been formed and endorsed by the Observations Coordination Group overseeing GOOS.

SOLAS and OASIS are distinct yet complementary international research initiatives focused on air-sea interactions. They share common objectives, including supporting and empowering early career researchers (ECRs), improving air-sea interaction representations in numerical models, and utilizing remote sensing techniques for these studies.

III. Areas of Collaboration

The partnership between SOLAS and OASIS targets critical aspects of ocean-atmosphere interactions to advance scientific understanding and operational capabilities. The following areas outline the scope of this joint effort, driving innovation and insight into the interconnected ocean-atmosphere system.

1.) Air-Sea Interactions and Exchange Pathways:
- Air-sea exchange processes
- Interaction of physical and biogeochemical fluxes
- Role of physical ocean-atmosphere interactions in carbon cycling
- Ecosystems and biology

2.) Observations and Data:
- Synergies between in situ and remote sensing observations
- Integration of atmospheric and oceanic datasets
- Field campaigns for process studies

3.) Modeling and Climate Systems:
- Parameterization of ocean-atmosphere fluxes in models
- Observational requirements for coupled climate models
- Advancing Earth System Modeling with flux constraints
- Impact of small-scale processes on large-scale climate systems

4.) Training, Engagement, and Outreach:
- Collaboration in training and capacity-building efforts
- Interdisciplinary training for early career professionals
- Coordinating workshops and conference participation
- Enhancing participation in global ocean science initiatives
- Shared proposals for coordinating research
- Collaborating on outreach to boost air-sea science visibility

V. SOLAS and OASIS Collaborative Framework

SOLAS and OASIS will establish an official partnership, designating OASIS as an affiliated program of SOLAS to strengthen collaboration without implying oversight. SOLAS will appoint a liaison to the OASIS Scientific Steering Committee to ensure robust communication, and OASIS will send a

representative to the SOLAS annual meeting for ongoing engagement. Early career professionals will be involved as liaisons where feasible. Progress will be assessed through regular check-ins.

1.) Governance and Representation:

- Establish OASIS as an officially affiliated organization of SOLAS
- Include a formal mention of OASIS in the SOLAS science plan (2026-2035)
- Designate a SOLAS liaison to serve on the OASIS SSC
- Designate ECOP/ECR liaisons from each organization for participation in committees
- Maintain communication between SOLAS and OASIS IPOs

2.) Events and Engagement:

- Schedule a joint kickoff meeting at the Ocean Sciences or AGU Fall Meeting
- Organize annual events like town halls, UN side events, and partnership meetings
- Host joint ECR/ECOP-focused events to engage emerging professionals
- Collaborate on curriculum development and capacity-building activities

3.) Engagement:

- Send messaging documents through OASIS and SOLAS newsletters
- Emphasize the formal partnership in presentations

This statement of collaboration establishes a foundation for collaboration through an affiliate model without binding obligations. This model enables specific joint efforts to move the global air-sea community forward effectively. Together, SOLAS and OASIS aim to advance ocean-atmosphere research that benefits both the scientific community and society.

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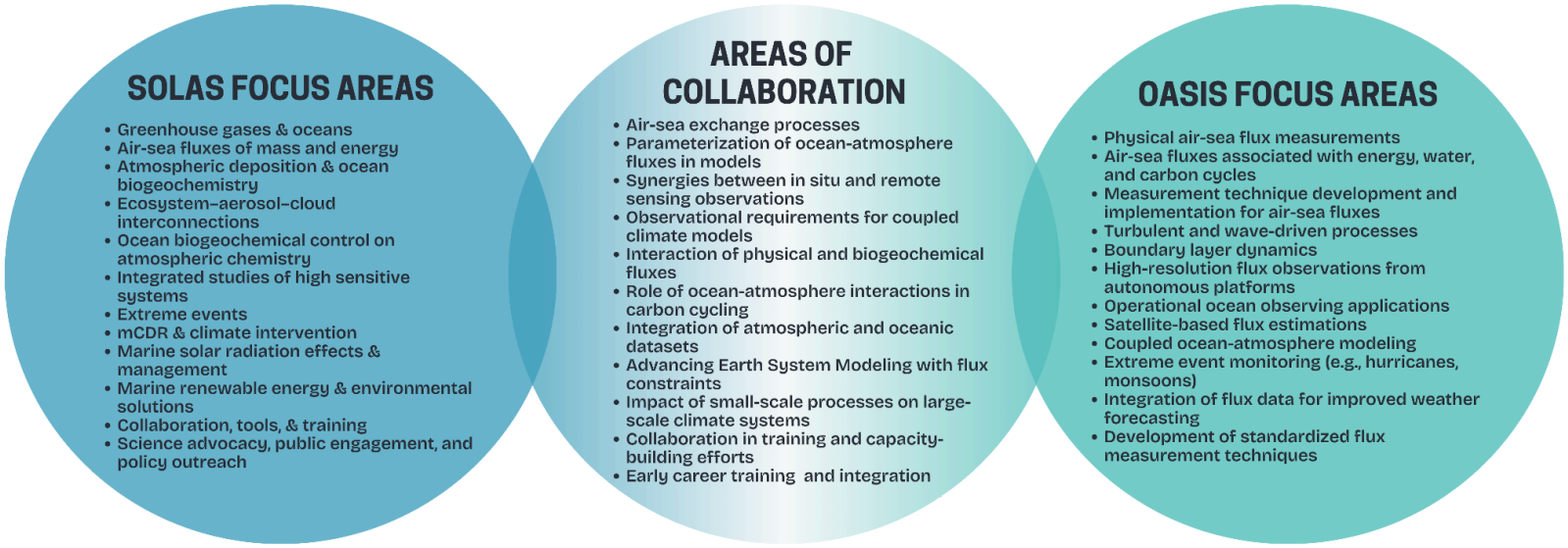
SOLAS & OASIS Conceptual Figure



SOLAS Focus Areas (Primarily Biogeochemical-Physical Processes, Solution-oriented Studies, Community and Skill Enhancement)*

Greenhouse gases & oceans
Air-sea fluxes of mass and energy
Atmospheric deposition & ocean biogeochemistry
Ecosystem–aerosol–cloud interconnections
Ocean biogeochemical control on atmospheric chemistry
Integrated studies of high sensitive systems
Extreme events
mCDR & climate intervention
Marine solar radiation effects & management
Marine renewable energy & environmental solutions
Collaboration, tools, & training
Science advocacy, public engagement, and policy outreach

OASIS Focus Areas (Primarily Physical Flux & Observing Systems)

Physical air-sea flux measurements
Air-sea fluxes associated with energy, water, and carbon cycles
Measurement technique development and implementation for air-sea fluxes
Turbulent and wave-driven processes
Boundary layer dynamics
High-resolution flux observations from autonomous platforms
Operational ocean observing applications
Satellite-based flux estimations
Coupled ocean-atmosphere modeling
Extreme event monitoring (e.g., hurricanes, monsoons)

Integration of flux data for improved weather forecasting
Development of standardized flux measurement techniques

Overlapping Areas (Shared Science & Observing Priorities)

Air-sea exchange processes
Parameterization of ocean-atmosphere fluxes in models
Synergies between in situ and remote sensing observations
Observational requirements for coupled climate models
Interaction of physical and biogeochemical fluxes
Role of ocean-atmosphere interactions in carbon cycling
Integration of atmospheric and oceanic datasets
Advancing Earth System Modeling with flux constraints
Impact of small-scale processes on large-scale climate systems
Collaboration in training and capacity-building efforts
Early career training and integration

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*Detailed SOLAS Focus Areas from the Science Plans:
2015-2025
Greenhouse gases and the oceans
Air-sea interface and fluxes of mass and energy
Atmospheric deposition and ocean biogeochemistry
Interconnections between marine ecosystems, aerosols, and clouds
Ocean biogeochemical control on atmospheric chemistry
Integrated studies of high sensitive systems
Climate intervention
Science and society

2026-2035 (draft)
Core science in the SOLAS domain
Extreme events in the SOLAS domain
Marine carbon dioxide removal
Marine solar radiation effects and management
Marine renewable energy
Solutions for specific environmental problems
Scientific synergy, collaboration and communication
Early career training and integration
Skill enhancement through tool and resource accessibility
Science advocacy, public engagement, and policy outreach