2021-2022 Annual SCOR Working Group Report: OASIS

1. Name of group

Developing an Observing Air-Sea Interactions Strategy (OASIS)

2. Activities since previous report to SCOR (e.g., virtual or in-person meetings, email discussions, special sessions). Limit 1000 words

- The SCOR Working Group (WG) #162 for Developing an Observing Air-Sea Interactions Strategy (OASIS) has held regular meetings and means of communication that can be summarised in 4 main categories over the past year. These have been telecons in the form of (1) weekly to bi-weekly SCOR WG #162 co-chair + COL (Consortium for Ocean Leadership) staff meetings; (2) monthly SCOR WG #162 meetings, several of which have been open to the full OASIS community (approximately 50 attendees); (3) OASIS Theme Team meetings occurring regularly (approximately 1-2 monthly) that progress the 5 core themes of OASIS, (4) approximately quarterly newsletters distributed to a broad mailing.
- In June 2021, OASIS was selected as a UN Ocean Decade Programme
- OASIS has facilitated several UN Ocean Decade Laboratory events via virtual presentation, poster and discussions sessions (see https://airseaobs.org/workshops):

(a) UN Decade Lab: Air-Sea Observations for a Predicted Ocean, 16 September 2021, (Cronin et al. 2021)
(b) UN Decade Lab: Air-Sea Observations for a Clean Ocean, 18-19 November 2021; (Marandino et al., 2022)
(c) UN Decade Lab: Air-Sea Observations for a Safe Ocean, 7 April 2022 (Venkatesan et al. 2022)
(d) UN Decade Lab: Air-Sea Observations for an Accessible Ocean, 11 May 2022
(e) UN Decade Lab: Air-Sea Observations for Offshore Wind Energy, 1 June 2022

- At the recent UN Ocean Conference in Lisbon, June 2022, OASIS Co-Chair Meghan Cronin presented OASIS in the high-profile side event: “Our Changing Ocean: Navigating Observations and Building Research-Driven Solutions”.
- Best Practices Workshop on Surface Radiation Observations, 20-24 Sept 2021
- AGU Ocean Sciences Meeting - Feb 2022: “OASIS Ocean Shots for 2030” & Townhall: “Get Involved! Observing Air-Sea Interactions Strategy (OASIS) Theme Teams”

- SCOR WG #162 and community members have presented OASIS activities and plans at several meetings/programmes including: East Asian Workshop on a Predicted Ocean, DBCP 37th Session, OOPC, OCG-13 (An emerging USV Network for GOOS), OASIS funding prospectus video address to the UN Ocean Decade Philanthropist Meeting, Morocco in June 2022, US CLIVAR Air-Sea Transition Zone Study Team telecon, and various other national and international forums.
- OASIS Community Youtube Channel has 45 videos and 10 playlists
- SCOR WG #162 has a vibrant slack workspace with 13 active channels.

3. Documents published since previous report to SCOR (e.g., peer-reviewed journal articles, reports, Web pages) and should be limited to publications that resulted directly from WG activities and which acknowledge SCOR support

- A publication of OASIS goals and visions is expected in the coming 1-2 months (minor revisions received) in ICES Journal of Marine Science. The SCOR WG and broader community (>40 authors) has summarised more than 40 OceanObs19 Community Strategy Papers to help define the 10 year OASIS and its Theme Teams.
- OASIS website: www.airseaobs.org
- OASIS continues to publish its community wide newsletters approximately each quarter with approximately 180 email recipients.
- As part of OASIS Best Practice activities, a manuscript is in final preparation 'Ocean Surface Radiation Best Practices' on best practice towards radiation measurements with 33 authors (Riihimaki et al. in prep).
- OASIS has completed reports as part of the UN Decade Laboratories: Cronin et al. (2021), Marandino et al. (2022), Venkatesan et al (2022). The Safe Ocean Workshop Report is currently being rewritten as a peer-review article. Workshop reports for the Accessible Ocean and for Offshore Wind Energy are in preparation.

4. Progress toward achieving group's terms of reference. List each term of reference separately and describe progress on each one. Limit 1000 words

Here we list progress towards each of the OASIS TOR listed in the OASIS prospectus.

1. **Harmonize the recommendations from the OceanObs'19 CWPs into a unified Observing Air-Sea Interaction Strategy (OASIS)**

   This ToR has largely been completed through the efforts to synthesize the recommendations of >40 OceanObs19 Community White Papers to create a "grand spreadsheet", other more recent flux-related papers and several workshops completed over the past year, to form 3 main Goals of OASIS for the coming decade: #1 deploy a globally distributed network of mobile air-sea interaction observing platforms built around a network of fixed stations that provide long-term time series in key regions; #2 develop a satellite virtual constellation designed to achieve high spatial and temporal coverage while providing simultaneous measurements of sea surface and atmospheric boundary layers; and #3 leverage improved understanding to enhance process representation of coupling in a hierarchy of Earth System models.

   These main Goals, as well as depiction how OASIS is organised across its 5 Theme Teams (Observing Network Design & Model Improvement, Partnership & Capacity Strengthening, UN Decade OASIS Actions, Best Practices & Interoperability Experiments, Findable-Accessible-Interoperable-Reusable (FAIR) models, data, and OASIS products) is summarised in a manuscript that is currently in minor revision for ICES Journal of Marine Science titled 'Developing an Observing Air-Sea Interactions Strategy (OASIS) for the global ocean' (Cronin et al., in review, 2022).

2. **Produce a capacity building strategy that enables developing nations (including least developed nations and island nations) to actively participate in and benefit from local-to- global air-sea interaction observations.**

   Capacity Strengthening and Partnerships is one of the five main Theme Teams within OASIS. Capacity strengthening remains a core aspect and discussion point in all forms of meetings, workshops and discussions within the OASIS Theme Teams. The spin up of the UN Ocean Decade and OASIS being accepted as a Decade programme has expanded the visibility and needs of capacity building initiatives for surface ocean and air-sea observations and understanding. Recent focus has been placed on building partnerships with Small Island Developing States (SIDS) that are seen as crucial communities to benefit from and support future air-sea related observations and networks. Some specific highlights/events include:

   - OASIS Webinar "Towards a Truly Global Ocean Science Enterprise: Ocean Corps and the Coastal Ocean Environment Summer School in Ghana." – Brian Arbic (University of Michigan) and Ebenezer Nyadjro (Mississippi State University) – October 13th, 2021 available on Youtube.
   - OASIS has assisted the recent virtual SOLAS summer school (16 June 2022) with instructors, lectures and exercises related to using air-sea flux data (CO2 and heat) and deriving calculated fluxes of heat and carbon.
   - In May 2022, OASIS developed a financial video pitch for the resource mobilization efforts of the Ocean Decade and presented at a global meeting of

philanthropic and corporate Foundations in Morocco in early June 2022. This event, hosted by the Mohamed VI Foundation for the Environment, presented capacity building financial pitches towards SIDS (American Samoa) and educational/outreach tools (SOFAR Buoys and tracking).

- OASIS co-chairs, WG members and community at large plan to engage with the South African and other community members from developing states around OASIS during the upcoming SOLAS Open Science Conference in Cape Town in September 2022. OASIS sees the 'Global South' getting involved and contributing to future activities as key to fulfilling the needs of a truly effective air-sea/surface ocean observing system, particularly in the Southern Hemisphere Ocean which lacks data coverage and capability.
- OASIS activities around best practice workshops and publications (e.g. Surface ocean radiation observations and Direct Eddy Covariance Fluxes) as well as toolboxes for calculating/deriving fluxes are seen as key tools for improving capability for all the community, from the established to emerging. These efforts allow for new communities/users to access flux-related observations/estimates more fluidly and easily, with better accuracy and interoperability around observations.
- Within the Capacity Strengthening and Partnership Theme Team, OASIS together with SOLAS is helping to develop air-sea flux curriculum to be used at summer schools and training workshops.

3. **Develop and assess network designs that optimize air-sea interaction observations**

1) As part of the UN Ocean Decade second Action Call, a project linked to OASIS "The Southern Ocean Air-Sea Flux working group" submitted an application and was subsequently endorsed;

2) Ruth Patterson, with contributions from many SCOR WG & Community members, presented "Uncrewed Surface Vehicles (USV) -- An emerging network for GOOS"

3) As part of the UN Ocean Decade Third Action Call, a project linked to OASIS "An Uncrewed Surface Vehicle Network for the Global Ocean Observing System" is being submitted. This project would create a Community of Practice that includes an International Science Steering Team and a Data Management Team for overseeing this network.

4) The Super Sites concept, published in 2021 (Clayson et al., 2021: https://doi.org/10.4031/MTSJ.55.3.11), was discussed in several forums, including the "Air-Sea Observations for Offshore Wind Energy" virtual workshop organized by OASIS, the US CLIVAR Air-Sea Transition Zone Study Group and US CLIVAR Wither the Gulf Stream Workshop, that included OASIS members.

4. **Develop a strategy for air-sea interaction process studies**

   Through our synthesis effort describe in item #1, we have folded this TOR into the Network Design and Model Development theme described in item #3 above.

5. **Develop a strategy for assessing interoperability of surface observing platforms**.

   This topic has emerged strongly within OASIS over the past year. In June 2022, the OASIS community prepared and submitted a proposal the "Uncrewed Surface Vehicle Network for the Global Ocean Observing System" to be an endorsed project of the UN Ocean Decade. This proposal has brought key players from around the world together to start realizing the needs, challenges and network design requirements for Autonomous Surface Vehicles. In OASIS, this new network needs to be well aligned to existing core observational platforms, such as ships and moorings to be an effective and integrated observing system for the surface ocean.

   Interoperability relies upon use of best practices. OASIS the SCOR WG #162 has developed its Theme Team on Best Practices and Interoperability. OASIS has hosted the Ocean Best Practice Community Workshop in September 2021 and a workshop for Ocean Surface Radiation Best Practices, which has resulted in a scientific manuscript currently being finalised by over 33 authors.

6. **Build community and capacity for using, operating, and developing air-sea interaction observational platforms that allow collaborative partnerships**

   At the core, OASIS believes in the value of having multifunctional platforms that measure many co-located, co-incident variables. This lends itself towards working in collaborative partnerships. At present, SCOR WG #162 is actively working to build community (and partnerships) through its website (airseaobs.org) which has a “Get Involved” button that invites community to join an OASIS slack workspace.

   Within several ongoing projects and initiatives, surface ocean and flux observing platforms are being tested and used within field campaigns that extend from larger, sophisticated platforms to simpler, cheaper, yet highly valuable buoys and small autonomous vehicles. Examples include currently deployed Saildrones, Sailbuoys and CO2 Carioca buoys deployed in the Southern Ocean winter within the EU SO-CHIC project, and SOFAR buoys that are relatively cheap and easily deployed drifters that measure sea state and other surface ocean properties and were discussed as relevant technologies with the UN Decade Safe Ocean workshop (Venkatesan et al. 2022).

5. WG activities planned for the coming year. Limit 500 words

Several conferences and meeting opportunities are planned for the year ahead, including: (1) the SOLAS Conference in Cape Town in September which will include a side event aimed at the SCOR WG and OASIS engaging with the local flux community in South Africa and other 'Global South' participants so as to see how to engage these communities into OASIS activities and themes. (2) OASIS session at AGU Fall 2022 Science Meeting. (3) The WG continues to seek the right opportunity to meet in person, and is contemplating how this is done to minimize the WG's carbon footprint and whether this would be help alongside another meeting in the future.

As OASIS matures, several papers are now in various stages of being prepared, finalised and submitted in the coming months to year, including: (1) OASIS Food for Thought paper (Cronin et al, 2022, minor revisions), (2) Surface ocean radiation best practise manuscript (Riihimaki et al. in prep), (3) USV Community of Practise paper, (4) Decade Safe Ocean manuscript, (5) OASIS Synthesis manuscript.

6. Is the group having difficulties expected in achieving terms of reference or meeting original time schedule? If so, why, and what is being done to address the difficulties Limit 200 words

Having emerged from the height of the COVID pandemic has meant that the majority of meetings have remained in a virtual format which suffers from well-known issues such as global inclusivity and virtual meeting fatigue. However, OASIS has managed to continue making great progress in its development via a purely virtual format as well within capacity building, for example within the recent SOLAS summer school during June 2022.

We are now starting to realise the first in person meetings towards the later half of 2022, such as the recently held UN Ocean Conference in Lisbon where OASIS was represented by its Co-Chair, Meghan Cronin and hosted a side event "Our Changing Ocean: Navigating Observations and Building Research-Driven Solutions". In September 2022, OASIS will participate at the SOLAS conference in Cape Town and hold side events associated with capacity strengthening with a focus on the African community. OASIS will also be organizing a special session at AGU Fall 2022 titled "Observing Air-Sea Interactions Strategy (OASIS) "Big Asks" and "Grand Ideas" for 2030".

7. Any special comments or requests to SCOR. Limit 100 words.

Additional information can be submitted and will be included in the background book for the SCOR meeting at the discretion of the SCOR Executive Committee Reporter for the WG and the SCOR Secretariat.