

SOLAS Annual Report to SCOR

For further details, please also see the SCOR Review of SOLAS.

Reporting period: May 2020 - May 2021

Version of 12 July 2021 by Jessica Gier

I. SOLAS Mission and Organisation

The SOLAS mission is:

To achieve quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and the atmosphere, and of how this coupled system affects and is affected by climate and environmental change.

The **2015-2025: Science Plan and Organisation** organised this mission around five core themes:

Core Theme 1: Greenhouse gases and the oceans

Core Theme 2: Air-sea interface and fluxes of mass and energy

Core Theme 3: Atmospheric deposition and ocean biogeochemistry

Core Theme 4: Interconnections between aerosols, clouds, and marine ecosystems

Core Theme 5: Ocean biogeochemical control on atmospheric chemistry

In addition, the study of these themes are integrated in efforts to understand key environments, e.g. upwelling systems, polar oceans, and the Indian Ocean, as well as to evaluate the environmental efficacy and impacts of climate intervention proposals, policy decisions, and societal developments.

The SOLAS 2015-2025: Science Plan and Organisation (SPO) is available to download from the SOLAS website (<https://www.solas-int.org/science/science-plan.html>), and hardcopies are available upon request from the IPO.

With the launch of the new science plan in 2015, SOLAS chose to use a pragmatic approach to the implementation strategy with a continually-evolving live document developing plans at least 2 years into the future. This approach means that the document is a moving target that is regularly updated. The implementation strategy is intended to be a live web-based document only and a new version will be available for download from the SOLAS website soon at: <https://www.solas-int.org/science/implementation-strategy.html>

The latest iteration of the Implementation Strategy was released online in October 2022 and will be revised again in Fall 2022.

Upcoming SOLAS activities include:

- 13th Meeting of the Subsidiary Body for Scientific and Technological Advice (SBSTA), online, **2 June 2021**
- China Forum on ‘‘The United Nations Decade of Ocean Science for Sustainable Development’’, Qingdao, China, **8 June 2021**
- SRI2021 sessions on 1) SOLAS Science & Society: The apparent mismatch between science and policy at the air-sea interface, 2) The Atmosphere - the ‘‘forgotten’’ domain in the SDGs? and 3) Air Quality and Human Health, online, **12-15 June 2021**

- Aerosol emissions from POLAR CHANGing Environments (POLAR CHANGE) Workshop, including BEPSII and CATCH communities, online, **7 July 2021**
- Workshop with sister organisations to discuss a joint Climate Intervention initiative for submission to the UN Ocean Decade, **August 2021**
- SOLAS Science Webinar series, online, in preparation for **2021**
- GEOTRACES-SOLAS workshop on Iron at the Air-Sea Interface, Online and in Asheville, NC, USA, **26-30 July 2021**
- Synthesis workshop for Southern Ocean expeditions, online, **August 2021**
- BEPSII annual meeting and early-career researcher day, virtual, **20-27 August 2021**
- CATCH session at the 16th IGAC Science Conference, online, **12-16 September 2021**
- Session on Atmospheric nutrient deposition and microbial community responses, and predictions for the future in the North Pacific Ocean, online, **18-22 Oct, 25-29 Oct 2021**
- European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)-SOLAS workshop on Remote sensing for ocean-atmosphere interactions studies and applications, online, **November 2021**
- COP26 side meeting on Options for carbon dioxide removal in oceans and on land, Glasgow, UK, **November 2021**
- SOLAS 2021 22nd edition of SSC meeting, online in Xiamen, China, **Fall/winter 2021**
- Workshop on Reconciling atmospheric and oceanic measurements at time-series stations, online, **Fall/winter 2021**
- ESA-SOLAS workshop on Eddy covariance measurements, online, **Fall/winter 2021**
- Conference on Eastern Boundary Upwelling Systems (EBUS), Lima, Peru, **2022**
- ESA-NASA-SOLAS Remote Sensing workshop series, tbd, **Spring 2022**
- Measuring Essential Climate Variables in Sea Ice (ECV-Ice) intercalibration experiment and BEPSII winter school, Cambridge Bay, Canada, **Spring 2022**
- 8th International Symposium on Gas Transfer at Water Surfaces (GTWS), Plymouth, UK, **17-20 May 2022**
- Virtual SOLAS Summer School, online, **June 2022**
- SOLAS Open Science Conference, online and in Cape Town, South Africa, **20-30 September 2022**

II. Progress on implementation of project science

II.a. Integrated activities

SOLAS Summer School

The first SOLAS summer school took place in July 2003 in Cargèse, France. The success of this first school was such that the SOLAS summer school became a regular, highly successful, and productive event. SOLAS is proud to have offered 7 schools between 2003 and 2018, involving 477 international students and produced a textbook (Le Quéré and Saltzman 2009). Typically, four applications are received for every available place. SOLAS is contributing to SDG 5 (Gender equality), with a gender balance of 55% females to 45% males in SOLAS Summer School participants.

An alumni-dominated organising committee is now carrying the success of the SOLAS Summer School forward, with Christa Marandino from GEOMAR, Kiel, Germany being the director of

the summer school. Due to worldwide travel restrictions, SOLAS will launch a virtual version of the school in summer 2022. The in-person school will take place at the Ocean Science Centre Mindelo, Mindelo, Cape Verde (<https://www.oscm.cv/>) in summer 2023 (see more details [here](#)). Both schools will each host about 70 students and 20 lecturers and make significant efforts to promote sustainability and diversity in science. The aim is to integrate these important topics more permanently in the school's mission in the long-term.

SOLAS Network of Integrated Atmosphere-Ocean time-series stations

Numerous efforts are underway around the globe to integrate atmospheric and oceanic time series stations to better understand ocean-atmosphere interactions. To better facilitate collaboration and capacity building between these air-sea observatories, SOLAS implemented a formal endorsement process for integrated air-sea time series programmes in June 2020. Currently, SOLAS has three endorsed time-series stations (<https://www.solas-int.org/science/project-endorsement.html>). In addition, an international collaborative proposal is being prepared, with SOLAS support, to upgrade the observatories at Cape Verde to include a dedicated air-sea interaction spar providing direct information on fluxes and the sea-surface microlayer.

Collaboration with the European Space Agency (ESA)

The long-standing and fruitful collaboration between ESA and SOLAS is continuing on a number of fronts. Following the ESA-SOLAS session at the ESA Living Planet Symposium in Milan, Italy, in 2019, a Special Issue in the journal Remote Sensing on ‘Remote Sensing of Air-Sea Fluxes’ was published. An ESA-SOLAS satellite-focused discussion session will be held at the 8th International Symposium on Gas Transfer at Water Surfaces, Plymouth, UK, in May 2022. Topics of particular joint interest include the physical and chemical dynamics of upwelling regions and air-sea interactions in polar oceans and coastal waters.

Ocean Carbon & Biogeochemistry (OCB) Ocean-Atmosphere Interaction Subcommittee

<https://www.us-ocb.org/about/ocb-subcommittees/subcommittee-on-ocean-atmosphere-interactions/>

The Ocean Atmosphere Interaction Committee (OAIC) was formed by OCB to coordinate research on ocean-atmosphere interactions and their role in marine biogeochemical cycles. Their recent workshop on “Ocean-Atmosphere Interactions: Scoping directions for U.S. research”, in 2019 (<https://web.whoi.edu/air-sea-workshop/>) and the emerging US SOLAS science plan seek to strengthen ties between OCB and SOLAS, build a stronger community in the US, and help to provide training and networking opportunities for early career researchers. The US SOLAS science plan is nearly ready to be released for community input and will offer a common framework, both for prioritising US contributions to SOLAS science and identify key challenges and opportunities of interest in the US community. As a partner program, OCB helps share program-specific news and provides funding opportunities for US-based early career researchers to participate in SOLAS training events and workshops.

II.b. Progress on Core Themes

Core Theme 1: Greenhouse gases and the oceans

SOLAS-IMBER Ocean Acidification Working Group (SIOA)

<https://www.solas-int.org/science/sponsored-science.html>

The SOLAS-IMBER Ocean Acidification (SIOA) group is a SOLAS-sponsored activity that provides a key advisory role to the Ocean Acidification International Coordination Centre (OA-

ICC) based at the International Atomic Energy Agency Environment Laboratories in Monaco. SIOA facilitates OA-ICC activities, which include support for the Global Ocean Acidification Observing Network (GOA-ON), updating and improving best practices for making ocean acidification measurements and building global capacity.

In 2020, the SIOA/IAEA OA-ICC continued to act as an international coordination platform for ocean acidification research and collaboration by

- Ensuring that scientists have access to recently updated, state-of-the-art software to calculate ocean acidification parameters, and that ocean acidification data collected across the globe are properly archived, accessible, and comparable. This is particularly relevant in the context of reporting from countries on the UN SDG 14.3.
- Acting as a hub for global stakeholders interested in ocean acidification, providing unique resources such as a comprehensive bibliographic database and a news stream updated daily with info on ocean acidification scientific articles, media coverage, jobs, and meetings.
- Providing increased awareness about ocean acidification with contributions to major reports and working groups, highly visible international events and meetings, training courses, the OA-ICC web site, news stream, and communication products.
- Contributing to the development of international and regional coordination activities and networks, such as GOA-ON, LAOCA, and OA-AFRICA.
- Contributing to methodology development for UN SDG14.3 on Ocean Acidification and helping countries to get ready to report towards that target.

The largest OA community meeting, “The Ocean in a High CO₂ World”, has been postponed to 2022. The 2020 SIOA and OA-ICC annual meeting took place online 20-21 April 2020. The 2021 annual meeting is being planned.

Integrated Ocean Carbon Research (IOC-R)

<https://www.solas-int.org/science/sponsored-science.html>

The Working Group on Integrated Ocean Carbon Research (IOC-R) is a SOLAS sponsored activity that was initiated in 2018 and is coordinated by the Intergovernmental Oceanographic Commission (IOC). IOC brought together five international research and coordination programmes on ocean-climate interaction, including SOLAS, the International Ocean Carbon Coordination Project (IOCCP), the Integrated Marine Biosphere Research Project (IMBeR), the Climate and Ocean Variability, Predictability and Change (CLIVAR) project, and the Global Carbon Project (GCP). The first in-person workshop of IOC-R, took place at IOC-UNESCO in Paris, France, in October 2019, and resulted in a comprehensive high-level vision for ocean carbon research in the next decade that details a framework enabling science-policy interaction ([Arico et al., 2021](#)), and identifies integrated research approaches to meet the requirements of the IPCC, UNFCCC and the Subsidiary Body on Scientific and Technological Advice (SBSTA). The report presents a synthesis of the state of knowledge about the oceans’ role in the carbon cycle and points to the way ahead. Its objective is to provide decision-makers with the knowledge needed to develop climate change mitigation and adaptation policies for the coming decade. The report was developed as part of the ongoing



[UN Decade](#) of Ocean Sciences for Sustainable Development (2021-2030). SOLAS will further contribute to on-going discussion relating to the implementation plans of IOC-R's science and policy objectives.

The Surface Ocean CO₂ Atlas (SOCAT)

<https://www.socat.info/>

The Surface Ocean CO₂ Atlas (SOCAT) documents the increase in surface ocean CO₂ (carbon dioxide), a critical measure as the oceans are taking up one quarter of the global CO₂ emissions from human activity. SOCAT has had annual public releases in 2020 and in June 2021. SOCAT version 2020 has 28.2 million in situ quality-controlled surface ocean *f*CO₂ (fugacity of CO₂) measurements for the global oceans and coastal seas. SOCAT-based data products are used for quantification of the ocean carbon sink, to estimate ocean acidification, to evaluate climate models, and inform the annual Global Carbon Budget. The SOCAT community-led synthesis product is a key step in the value chain based on in situ inorganic carbon measurements of the oceans, which provides policy makers with essential information on ocean CO₂ uptake in climate negotiations. The global need for accurate knowledge of ocean CO₂ uptake and its variation (including ocean acidification) makes sustained funding for in situ surface ocean CO₂ observations imperative.

Core Theme 3: Atmospheric deposition and ocean biogeochemistry

Collaborations with GEOTRACES

Following a joint session at the SOLAS Open Science Conference in April 2019 in Sapporo, Japan, a GEOTRACES - SOLAS workshop is being organised for 26-30 July 2021 on Iron at the Air-Sea Interface, online and in Ashville, North Carolina, USA.

Collaboration with PICES

The PICES Section on Carbon and Climate includes SOLAS members at its annual meeting, to maintain two-way communication between PICES and SOLAS.

A SOLAS session on 'Atmospheric nutrient deposition and microbial community responses, and predictions for the future in the North Pacific Ocean' has been organised as part of the PICES 2020 virtual meeting (see SOLAS Event Report, [Issue 19](#)), to be followed by a session at the 2021 PICES meeting.

Core Theme 4: Interconnections between aerosols, clouds, and marine ecosystems

Core Theme 5: Ocean biogeochemical control on atmospheric chemistry

New Initiatives in Atmospheric Chemistry

In collaboration with the International Global Atmospheric Chemistry (IGAC) program, SOLAS has launched a scoping exercise to identify critical science on which our two organisations should collaborate. Ideas include virtual IGAC-SOLAS science speed dating to facilitate discussions, reworking the IGAC-SOLAS survey (conducted in 2020) into articles for the IGAC and SOLAS Newsletters, and convening joint conference sessions. Other suggestions include organising side meetings at the OSCs and planning a jointly supported networking event around atmosphere-ocean interactions. SOLAS and IGAC are co-sponsoring two sessions at SRI2021. Topics for future collaborations include the interplay between ocean and the urban environment in coastal cities that impact the environ-

ment and human health, studies over the remote oceans, and also the impact of ship plumes, nitrogen deposition, and background atmospheric chemistry.

II.c. Progress on Integrated Topics

Polar

Biogeochemical Exchange Processes at Sea Ice Interfaces (BEPSII)

<http://www.bepsi.org>

Biogeochemical Exchange Processes at Sea-Ice Interfaces (BEPSII) started in 2011 with a focus on sea-ice biogeochemistry, was a SCOR working group from 2012 until September 2016, and has since been endorsed as a SOLAS-CliC Activity (from 2016) and as a SCAR Action Group (from 2017). A successful around-the-world online BEPSII and ECV-Ice workshop, replacing the annual meeting, was held in August 2020, with an ECS event prior to the meeting. Also the 2021 meeting is planned as an online event, with a dedicated ECS day on the first day. BEPSII published a community paper in Nature Climate Change on the future of Arctic sea-ice biogeochemistry (Lannuzel et al. 2020) and a commentary on sea-ice management for Arctic biogeochemistry (Miller et al., 2020). Just recently, BEPSII called for a new special issue to collate upcoming BEPSII/ECV-Ice publications in the journal Elementa - Science of the Anthropocene. The new Horizon 2020 project on Climate relevant interactions and feedbacks: the key role of sea ice and snow in the polar and global climate system (CRiceS) is linking BEPSII with the atmosphere. In addition, several BEPSII researchers participated in the year-round Arctic sea-ice expedition MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate; <https://mosaicexpedition.org/expedition/>).

Cryosphere and Atmospheric Chemistry (CATCH)

<https://sites.google.com/view/catchscience/home>

Cryosphere and Atmospheric Chemistry (CATCH), cosponsored by SOLAS and the International Global Atmospheric Chemistry (IGAC) program, facilitates atmospheric chemistry research within the international community, with a focus on natural processes specific to cold regions of the Earth. A CATCH working group structure has been implemented in 2020 in order to push CATCH actions and science forward. A recent CATCH study highlighted the direct observation of sea salt aerosol production from blowing snow above sea ice (Frey et al., 2020).

Several CATCH scientists have been involved in the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate; <https://mosaicexpedition.org/expedition/>) expedition. In addition, a CATCH-BEPSII initiative that grew out of a joint discussion session at the 2019 SOLAS OSC in Sapporo, Japan has recently resulted in submission of a SCOR WG proposal in 2021, which is co-chaired by an early career researcher. In January 2021, CATCH launched a science seminar series, with early career researchers leading the discussion part. The CATCH science meeting, a virtual side meeting, and SSC meeting will be held during the IGAC virtual science conference in Fall 2021.

Climate Intervention

Following our successful workshop in Sapporo, Japan, in spring, 2019, SOLAS is building a coalition of global research programmes to form a scientific oversight community on climate intervention. The intent is to provide a forum through which the efficacy and potential side effects of climate intervention proposals can be evaluated, as well as to explore governance concerns. An initial workshop with leaders of key programs is being planned for August 2021, where a discus-

sion with IMBeR, WCRP, the Ocean KAN, and other organisations will take place to consider a proposal to the UN Ocean Decade. Alternatively, there may be potential for engagement and collaboration with the Global Ocean Ecosystem Solutions (GOES) project endorsed by the UN Decade, which has interests in ocean-based carbon removal.

The Indian Ocean

In September 2020, SOLAS organised two online events focussing on the Indian Ocean (<https://solas.tropmet.res.in/>, see SOLAS event Report, [Issue 18](#)). The SOLAS Indian Ocean workshop aimed at presenting and discussing current, ongoing, and planned SOLAS research and initiatives taking place in the Indian Ocean and help forge collaborations. The SOLAS India meeting took place to review current SOLAS activities in the Indian Ocean, develop potential contributions to future Indian Ocean region research programs, and discuss the structure and future of SOLAS India. Following the workshop, the SOLAS community developed a new integrated topic on the Indian Ocean region, with an implementation plan aimed at evaluating SOLAS-related processes and perturbations within field campaigns and long-term observations in collaboration with the International Global Atmospheric Chemistry (IGAC) project, the Second International Indian Ocean Expedition (IIOE-2) project and CLIVAR's Indian Ocean Regional Panel (IORP).

III. Summary of 2020-2021 SOLAS activities

Contributions to the UN Ocean Decade

SOLAS provided feedback to the UN Decade Implementation Plan (Zero Draft). During the SOLAS co-sponsored Fifth Xiamen Symposium on Marine Environmental Sciences (XMAS-V, January 2021), a special forum designated to the UN Ocean Decade was held in hybrid mode to promote the initiative through insightful talks and in-depth discussions with international and regional representatives (Zhao *et al.*, 2021). SOLAS is a partner of the proposal on Coastal-SOS, which was submitted for UN Ocean Decade endorsement in January 2021 by Xiamen University. In addition, SOLAS is planning a meeting in August 2021 with other GRPs and organisations with interests in ocean-based carbon removal that will consider a proposal to the UN Ocean Decade. Another area SOLAS is exploring with partner programmes such as GEOTRACES, for potential UN Ocean Decade endorsement is nitrogen and iron supply to the ocean and their impact on biological (fisheries) production and carbon sequestration.

III.a. SOLAS participation in events:

- Session on Atmospheric Acidity, Air-sea Chemical Fluxes and their Impacts at the EGU, online, **4-8 May 2020**
- 41st session of the WCRP Joint Scientific Committee, online, **18-20 May 2020**
- Indian Ocean Workshop, online, **30 September 2020**
- SOLAS 2020 SSC meeting, online, **7-8 September, 5-8 October, 11-13 November 2020**
- SCOR 2020 Annual Meeting, **20-22 October 2020**
- SOLAS session on Atmospheric nutrient deposition and microbial community responses, and predictions for the future in the North Pacific Ocean at PICES annual meeting, online, **26-30 October 2020**
- Town hall on Full Steam Ahead: The SOLAS Midterm Course Correction at the 2020 AGU meeting, online, **2 December 2020**

- Extraordinary meeting WCRP Joint Scientific Committee, online, **30 November - 3 December 2020**
- SCOR China annual meeting, Qingdao, China, **13-14 December 2020**
- Monsoon Asia Integrated Research for Sustainability - Future Earth (MAIRS-FE) Scientific Steering Committee Meeting, online, **17 December 2020**
- 1st Planning Committee Meeting of OceanObs'29, Qingdao, China, **19 December 2020**
- 5th Xiamen Symposium on Marine Environmental Sciences, online, **11-14 January 2021**
- CATCH science seminar series, online, monthly from **14 January 2021**
- Global University Presidents' Forum on University Mission in the Post-COVID Era and Information of World-Class Universities, online and in Xiamen, China, **5 April 2021**
- SOLAS 2021 21st edition of SSC meeting, online, **20, 22, and 23 April 2021**
- "Bite-size" Gas Transfer at Water Surfaces Symposium, online, **19 May 2021**

III.b. Communications

Website: <http://www.solas-int.org/>

Newsletter: 12 SOLAS newsletters have been sent to over 1000 SOLAS scientists since the last SCOR report. The monthly newsletter releases compile scientific highlights, news from SOLAS, opportunities for meetings, abstract submission deadlines, recent publications, vacancies, and news from relevant partner projects and collaborators. Past issues of the e-news can be viewed on the SOLAS website: <https://www.solas-int.org/news/newsletter-archive.html>

Event Report series: Reports on SOLAS sponsored or co-sponsored events are published after each SOLAS-sponsored event. These reports are sent to the SOLAS sponsors and other interested parties and are released in combination with the monthly Newsletters.

<https://www.solas-int.org/publications/event-reports.html>

- [Issue 18, February 2020](#). SOLAS Indian Ocean meeting, online, 30 September 2020.
- [Issue 19, March 2020](#). SOLAS session at the North Pacific Marine Science Organization (PICES) annual meeting, online, 29 October 2020.
- **Issue 20**. SOLAS session at SRI2021 on 'SOLAS Science & Society: The apparent mismatch between science and policy at the air-sea interface' is currently under development.

Twitter: Regular posts (currently 1417) are being sent out and the number of followers is steadily increasing (currently 1074). [@SOLAS_IPO](#)

ResearchGate: Connects the SOLAS research network and includes nearly 600 SOLAS-related publications with 208 followers and 1467 reads.

<https://www.researchgate.net/project/Surface-Ocean-Lower-Atmosphere-Study-SOLAS-2>

Flickr: SOLAS public photo stream shows pictures (currently 62) of the most recent SOLAS events and SOLAS related research. In addition, SOLAS distributes event pictures (currently 369) among participants via private links.

<https://www.flickr.com/photos/182357030@N02>

Outreach: SOLAS figures, conceptual diagrams, 3-fold SOLAS flyer, and logos are available for download from the SOLAS website

<https://www.solas-int.org/publications/downloads.html>

Presentation: A SOLAS presentation for workshop organisers is available upon request from the IPO.

III.c. SOLAS publications

Please see the SOLAS project on ResearchGate for an extensive list of relevant publications from the community: <https://www.researchgate.net/project/Surface-Ocean-Lower-Atmosphere-Study-SOLAS-2>

Key integrative SOLAS publications from 2020 and early 2021 are summarised on the SOLAS website: <https://www.solas-int.org/publications/publications.html>

III.d. SOLAS national and regional networks

SOLAS has national/regional representatives in 29 countries and/or regions around the globe. The representatives are asked to report annually on SOLAS activities in their countries. To facilitate the reporting effort, a template form is provided. In June 2021, 13 reports from 2020 had been received and are posted on the SOLAS website. The information contained in the reports is a valuable source of information for the IPO to report to sponsors but also to facilitate coordination and dissemination of results and progress from national projects to the rest of the SOLAS community. Information provided through the reports is also used by the Scientific Steering Committee to develop the implementation strategy.

All reports received during the reporting period are available in an Addendum to this document. Current national networks:

- Australia: Andrew Bowie and Ruhi Humphries
- Belgium: Nathalie Gypens *
- Brazil: Leticia Cotrim Da Cunha
- Canada: Martine Lizotte *
- Chile: Laura Farias
- China (Beijing): Huiwang Gao *
- China (Taipei): Chonlin Lee *
- Denmark: Lise Lotte Soerensen and Mikael Sejr
- Finland: Lauri Laakso *
- France: Rémi Losno #
- Germany: Christa Marandino and Hartmut Herrmann #
- India: Sheryl Oliveira Fernandes *
- Israel: Yoav Lehahn *
- Ireland: Peter Croot
- Italy: Chiara Santinelli
- Japan: Yuzo Miyazaki *
- Korea: Kitack Lee *
- Mexico: Jose Martin Hernandez Ayon
- Netherlands: Jan-Berend Stuut
- New Zealand: Mike Harvey
- Norway: Siv Lauvset *
- Peru: Michelle Graco

- Poland: Timo Zielinski *
- South Africa: Katy Altieri
- Spain: Alfonso Saiz-Lopez *
- Sweden: Paul Zieger *
- Turkey: Baris Saglihoglu, Mustafa Koçak, Nazli Olgun
- UK: Tom Bell
- USA: Rachel Stanley #

* SOLAS has received the 2020 report

report to be submitted shortly

III.e. Current endorsed projects and time series

- June 2021: Climate Relevant interactions and feedbacks: the key role of sea ice and Snow in the polar and global climate system (CRiceS), <https://en.ilmatieteenlaitos.fi/press-release/7Hl5wqSzMeJvUizgtMZgTb>
- April 2021: Breathing Oceans: understanding the organic skin that modulates the exchange of greenhouse gases between the atmosphere and the ocean (BOOGIE), <https://carbonwaterdynamics.wordpress.com/projects/boogie/>
- November 2020: Global shipping: Linking policy and economics to biogeochemical cycling and air-sea interaction (ShipTRASE), YouTube information: <https://www.youtube.com/watch?v=2bygnQYK7fc>
- July 2020: Penlee Point Atmospheric Observatory, <https://www.westernchannelobservatory.org.uk/penlee/>
- July 2020: Boknis Eck Time-Series Station, <http://www.bokniseck.de>
- April 2020: Shipping Emissions in the Arctic and North Atlantic Atmosphere (SEANA), www.birmingham.ac.uk/seana
- December 2019: Are marine microorganisms influencing clouds? (Sea2Cloud), <https://www.europeandissemination.eu/sea2cloud-by-karine-sellegr-2/2704>
- November 2019: Atmospheric Composition and Radiative forcing changes due to UN International Ship Emissions regulations (ACRUISE), <https://www.pml.ac.uk/Research/Projects/ACRUISE>
- October 2019: Atlantic Meridional Transect Ocean Flux from Satellite Campaign (AMT4oceanSatFlux), <https://amt4oceansatflux.org/>
- September 2019: Role of Eddies in the Carbon Pump of Eastern Boundary Upwelling Systems (REEBUS), <https://www.ebus-climate-change.de/reebus>
- March 2019: Impact of atmospheric multi-stressors to coastal marine systems in a changing climate scenario (AMBIEnCE), <https://projectambience.wordpress.com/>
- October 2017: Processes Influencing Carbon Cycling: Observations of the Lower limb of the Antarctic Overturning (PICCOLO), <https://roses.ac.uk/piccolo/>
- September 2016: The Great Barrier Reef as a significant source of climatically relevant aerosol particles
- June 2016: Tudor Hill Marine-Atmospheric Observatory, <http://www.bios.edu/research/projects/tudor-hill-marine-atmospheric-observatory/>
- November 2015: North Atlantic Aerosols and Marine Ecosystems Study (NAAMES), <http://naames.larc.nasa.gov/>

- October 2013: Network on Climate and Aerosols: Addressing Key Uncertainties in Remote Canadian Environments (NETCARE), <http://www.netcare-project.ca/>
- August 2011: Marine ecosystems response in the Mediterranean experiment (MERMEX), <https://mERMEX.mio.univ-amu.fr/>

Information on all endorsements and the formal application processes is available on the SOLAS website: <http://www.solas-int.org/activities/project-endorsement.html>.

III.f. SOLAS metadata portal

The SOLAS metadata portal was set up by the SOLAS project integration initiative (2007-2013) with the intention to help SOLAS scientists identify what data exist, where they are stored, and the data originators. The portal is hosted by the BODC, and the metadata files are stored on the international standard Global Change Master Directory (GCMD). The resource is freely available at https://www.bodc.ac.uk/solas_integration/research_objectives/metadata_portal/

The SOLAS metadata portal is an ongoing effort. Scientists can help expanding the SOLAS metadata base by completing a simple template available at https://www.bodc.ac.uk/solas_integration/implementation_products/data_submission/

IV. Income and expenses for the past year and budget for the coming year, including funding from all sources (not only SCOR funding)

- Executive director salary, office space and in kind provided by GEOMAR until August 2021.
- Executive director salary, office space and in kind provided by NUIG from September 2021 until August 2026.
- Project officer salary, office space and in kind provided by MEL until December 2020.
- Deputy executive director salary, office space and in kind provided by MEL from January 2021 until December 2026.
- Project officer salary, office space and in kind provided by US-NSF via SCOR/ GEOMAR until December 2021. A new NSF proposal was submitted in May 2021.
- Project officer salary, office space and in kind provided by MEL until May 2024.
- US-NSF via SCOR annual grant of 32-35kUSD until September 2021. New proposal was submitted in May 2021.
- Future Earth annual block grant of 15kEUR in 2020, contributing to the costs of the SSC meetings. In 2020, Future Earth will provide 10kEUR without strings attached.

Income, expenses and budget for 2020-2021:

INCOMES		Credit (EUR)	Debit (EUR)
	Funds and in kind from GEOMAR Helmholtz Center for Ocean Research Kiel	90.000	
	Funds from NSF via SCOR for PO salary	51.000	
	Funds from MEL for PO salary	50.600	
	SCOR-NSF Travel (year 3)	16.000	
	SCOR-NSF Subsistence (year 3)	8.000	
	SCOR-NSF Publication (year 3)	1.800	
	SCOR-NSF Other (year 3)	3.600	
	Future Earth block grant for SSC meeting 2020	15.000	
Total Income		236.000	
EXPENSES		Credit (EUR)	Debit (EUR)
IPO	Salaries		191.600
	Consumables		430
Representational travel			4.000
Events	SSC meeting 2020 - cancellation fees		2.300
	SOLAS Indian Ocean meeting, Sep 2020		200
	SRI2021, Jun 2021		150
Capacity building	For ECs to attend SOLAS-GEOTRACES workshop and the BEPSII annual meeting		7.000
Publications	SOLAS Website subscription 2019 and 2020		160
Total Expenses			205.840
Balance			30.160
Note:			
Almost all SOLAS events and SOLAS co-sponsored events were postponed or were held online.			
This does not include the following items:			
In kind from GEOMAR and MEL with office space/computer/printing/administration etc.			

V. Update on the Scientific Steering Committee and International Project Office status since the last report

IV.a. SOLAS Scientific Steering Committee

Minhan Dai (M, China) and Cliff Law (M, New Zealand) are the 6th and 7th SOLAS SSC Co-chairs, acting for 3 years, from January 2021 through December 2023.

SOLAS has an Executive Committee composed of the Co-chairs Minhan Dai and Cliff Law, Katy Altieri (F, South Africa), Jun Nishioka (M, Japan), and Jurgita Ovadnevaite (F, Ireland).

The following SSC members rotated off at the end of 2020:

- Cristina Facchini (F, Italy)
- Laura Gallardo (F, Chile), requested to rotate off
- Maurice Levasseur (M, Canada)
- Lisa Miller (F, Canada) finished her SSC chair term at the end of 2020 and will remain on the committee, ex-officio, as past-chair, until the end of 2021.

In January 2021, two new SSC members were appointed:

- Cornejo, Marcela (F, Chile)
- Kanakidou, Maria (F, Greece)

Arne Körtzinger (M, Germany), Katye Altieri (F, South Africa), Santiago Gassó (F, USA), and Talib Mohd Latif (M, Malaysia) finished their first terms at the end of 2020, and were renewed for a second term.

Last name	First name	Country of employment	Gender	Scientific expertise	SOLAS expertise	Term	End
Suntharalingam	Parvatha	UK	F	Numerical modelling / C, N, S bgc cycles	Themes 1 and 3	2	2021
Körtzinger	Arne	Germany	M	Carbon cycle, Ocean observation	Theme 1, Upwelling	2	2023
Cornejo	Marcela	Chile	F	Nutrient and greenhouse gases cycling, upwelling	Theme 1, Upwelling	1	2023
Zhang	Guiling	China	F	Bgc of trace gases	Theme 1, Coastal ocean	2	2022
Minnett	Peter	USA	M	Remote sensing, physical air-sea exchange	Theme 2	2	2021
Rutgersson	Anna	Sweden	F	Air-sea physical interaction	Theme 2, Coastal ocean, Science & Society WCRP rep	2	2022
Latif	Mohd Talib	Malaysia	M	Microlayer, atmosph. aerosols	Themes 2 and 5	2	2023
Altieri	Katye	South Africa	F	Atmospheric molecules, climate policy	Themes 3 and 5, Polar oceans, Science & Society	2	2023
Lenton	Andrew	Australia	M	Marine bgc	Theme 1, Climate intervention	1	2022
Gassó	Santiago	USA	M	Remote sensing, aerosols, dust transport	Themes 3 and 4, NASA connection	2	2023
Ovadnevaite	Jurgita	Ireland	F	Aerosol chem, physics and cloud processes	Themes 4 and 5	1	2021
Kanakidou	Maria	Greece	F	Atmospheric modelling and pollutants	Themes 4 and 5, iCACGP connection	1	2023
Mahajan	Anoop	India	M	Atm chemistry, halogens, climate modelling	Theme 5, Indian Ocean	1	2021
Nishioka	Jun	Japan	M	Oc. trace metal bgc cycle, Polar oc, sea-ice bgc	Theme 3, Polar oceans, Coastal ocean	2	2022
Van Doorn	Erik	Germany	M	Law of the Sea	Science and Society	2	2022
Dai	Minhan	China	M	Carbon and nutrient bgc, trace metals, ocean acidification	Co-chair, Theme 1	1	2023
Law	Cliff	New Zealand	M	trace gas cycling, marine bgc aerosol precursors	Co-Chair, Theme 1,4 Climate intervention	1	2023

Lisa Miller will also remain on the committee, ex-officio, as Past-Chair, until the end of 2021.

The current gender and country balance of the SSC for 2 co-chairs and 15 members:

- 7 female members and 10 male members
- 5 members from developing countries and 12 from developed countries

IV.b. SOLAS International Project Office

IPO at GEOMAR in Kiel, Germany

The SOLAS IPO is hosted at the GEOMAR Helmholtz Centre for Ocean Research Kiel in Kiel, Germany. Jessica Gier was appointed the **executive director** in April 2018. The salary of the executive director and office space for the IPO, are supported by GEOMAR. In order to facilitate a smooth transition, GEOMAR agreed to allow the office to remain in Kiel until August 2021.

A proposal to NSF to maintain a **project officer** position at GEOMAR was approved in September 2018, and Esther Rickert was appointed on a half-time basis until December 2021. Every three months, GEOMAR sends an invoice to SCOR, and Esther submits a job description to SCOR. In order to maintain the project officer position, we applied for it again in the NSF proposal submitted in May 2021.

IPO at the National University of Ireland in Galway, Ireland

From September 2021, the National University of Ireland (NUIG), in Galway, Ireland, will host the IPO and the executive director. The hosting agreement is connected to the development and administration of a 1-year international SOLAS research master's program, with the first master students joining in September 2022. The hosting agreement will be for 5 years with the possibility of an extension.

IPO at the State Key Laboratory for Marine Environmental Science (MEL) in Xiamen, China

Minhan Dai (co-chair) from the State Key Laboratory for Marine Environmental Science (MEL), Xiamen University supported the SOLAS **regional office** and a project officer, Li Li, until December 2020. In January 2021, the nodal office was elevated into a full IPO, with Li Li taking over the position as **deputy executive director**. In June 2021, Chengcheng Gao joined the IPO-China as the new **project officer**. The hosting agreement will be for 5 years.

The dual-IPO setup between Galway, Ireland and Xiamen, China

The elevation of the nodal office in China into a full IPO resulted in a balanced, dual-IPO structure. While both SOLAS IPOs (Ireland and China) will fulfill separate responsibilities, they will closely collaborate and provide mutual support on major SOLAS tasks. Each IPO will be staffed and funded by their respective host institutions and manage the funds required for their responsibilities, respective staff, travel, and activities. The dual IPO arrangement enhances information exchange and response to opportunities and international communication via increased geographical coverage.