surface ocean solas lower atmosphere study

Report for the year 2021 and future activities

SOLAS *Spain*
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This report has two parts:

***- Part 1:** reporting of activities in the period of January 2021 - Jan/Feb 2022*
***- Part 2:** reporting on planned activities for 2022 and 2023.*

The information provided will be used for reporting, fundraising, networking, strategic development and updating of the live web-based implementation plan. As much as possible, please indicate the specific SOLAS 2015-2025 Science Plan Themes addressed by each activity **or specify an overlap between Themes or Cross-Cutting Themes.**

1 Greenhouse gases and the oceans;
2 Air-sea interfaces and fluxes of mass and energy;
3 Atmospheric deposition and ocean biogeochemistry;
4 Interconnections between aerosols, clouds, and marine ecosystems;
5 Ocean biogeochemical control on atmospheric chemistry;
Integrated studies of high sensitivity systems;
Environmental impacts of geoengineering;
Science and society**.**

***IMPORTANT**: This report should reflect the efforts of the SOLAS community in the **entire country** you are representing (all universities, institutes, lab, units, groups, cities).*

First things first…Please tell us what the IPO may do to help you in your current and future SOLAS activities. ?

PART 1 - Activities from January 2021 to Jan/Feb 2022

1. Scientific highlight

*Describe one scientific highlight with a title, text (**max. 300 words**), a figure with legend and full references. Please focus on a result that would not have happened without SOLAS, and we are most interested in results of international collaborations. (If you wish to include more than one highlight, feel free to do so).*

Dissolved black carbon (DBC) plays a role in the oceanic carbon cycle. DBC originates from the heating and incomplete combustion of organic matter, including fossil fuels, a shared origin with polycyclic aromatic hydrocarbons

(PAH). DBC is quantified using the benzene polycarboxylic acids produced by oxidation of the organic extract, a fraction of which derive from PAHs and other semivolatile aromatic-like compounds (SALCs). However, the current view of the DBC cycle does not take into account the inputs and sinks known for PAHs, such as diffusive air−water exchange and degradation. A meta-analysis of oceanic PAHs, SALCs, and DBC concentrations shows that SALCs account for 16% of DBC (ranging from 5% to 31%). Such a large contribution of semivolatile aromatic hydrocarbons to DBC is consistent with the large atmospheric input of SALCs (estimated as 400 Tg C y−1). Furthermore, photodegradation at the surface ocean and microbial degradation in the water column of semivolatile DBC can be important sinks, consistent with the ubiquitous occurrence of the degradation genes of the metabolic routes for aromatic hydrocarbons. Future work should focus on the characterization of semivolatile DBC and its degradation in order to constrain its contribution to refractory organic matter and the anthropogenic perturbation of the carbon cycle.

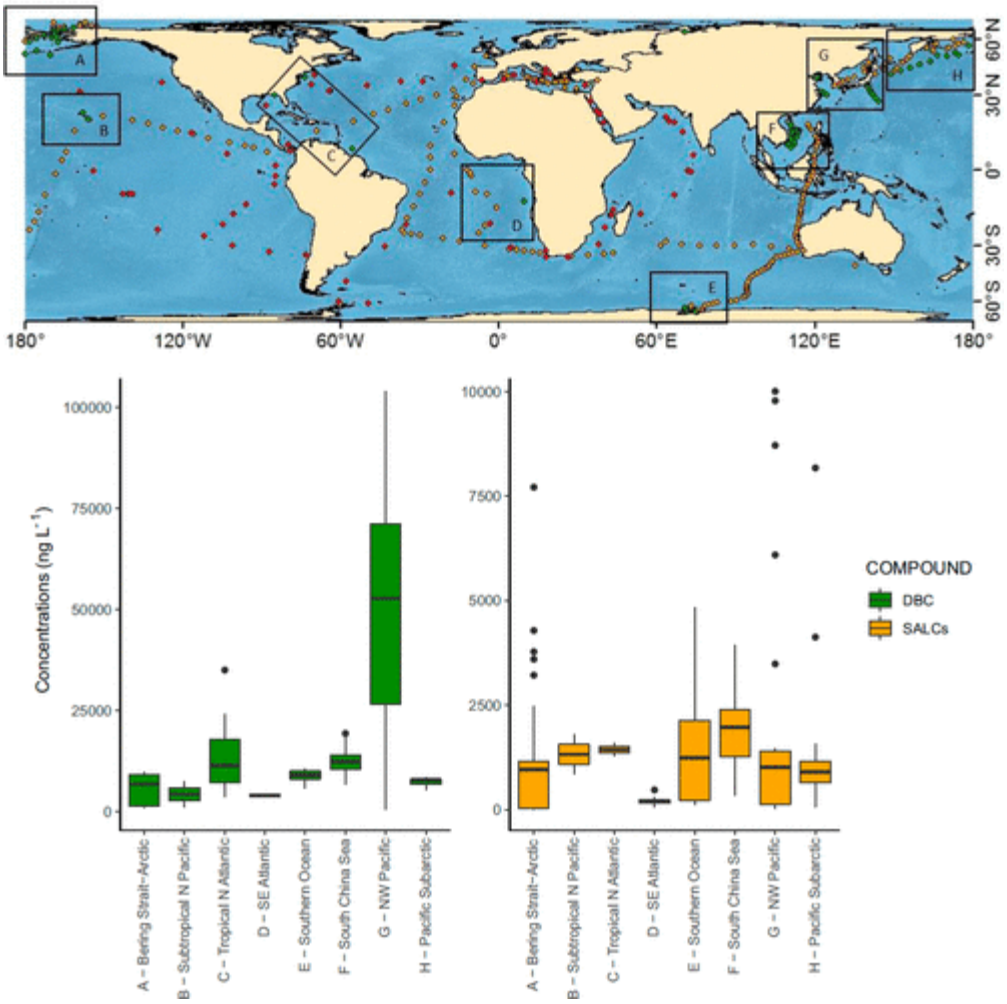

Figure: Comparison of dissolved black carbon and semivolatile aromatic-like hydrocarbons (SALCs) in the ocean. Upper panel shows all data points collected in the compilation. Green dots mark all DBC measurements, orange dots all PAHs measurements, and red dots all gene data points from Tara Oceans. Lower panel shows the box-plots of the dissolved black carbon and dissolved aromatic hydrocarbons for the eight oceanic regions shown in the upper panel

Citation: Núria Trilla-Prieto, Maria Vila-Costa, Gemma Casas, Begoña Jiménez, and Jordi Dachs *Environmental Science & Technology Letters* **2021** *8* (10), 918-923
DOI: 10.1021/acs.estlett.1c00658

2. Activities/main accomplishments in 2021 (e.g., projects; field campaigns; workshops and conferences; model and data intercomparisons; capacity building; international collaborations; contributions to int. assessments such as IPCC; collaborations with social sciences, humanities, medicine, economics and/or arts; interactions with policy makers, companies, and/or journalists and media).

3. List SOLAS-related publications published in 2021 (only PUBLISHED articles). If any, please also list weblinks to models, datasets, products, etc.

Spolaor, A., Burgay, F., Fernandez, R.P. *et al.* Antarctic ozone hole modifies iodine geochemistry on the Antarctic Plateau. *Nat Commun* **12,** 5836 (2021). https://doi.org/10.1038/s41467-021-26109-x.

Brean J, Dall'Osto M, Simó R, Shi Z, Beddows D. C, Harrison R. M. Open ocean and coastal new particle formation from sulfuric acid and amines around the Antarctic Peninsula. *Nature Geoscience* 2021;14:383-388.

Pérez G. L, Galí M, Royer S. J, Gerea M, Ortega-Retuerta E, Gasol J. M et al. Variability of phytoplankton light absorption in stratified waters of the NW Mediterranean Sea: The interplay between pigment composition and the packaging effect. *Deep Sea Research Part I: Oceanographic Research Papers* 2021;169:103460.

García-Lafuente J, Sammartino S, Huertas IE, Flecha S, Sánchez-Leal RF, Naranjo C, Nadal I and Bellanco MJ (2021) Hotter and Weaker Mediterranean Outflow as a Response to Basin-Wide Alterations. *Front. Mar. Sci.* 8:613444. doi: 10.3389/fmars.2021.613444.

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2021? If yes, who? How did you engage?

PART 2 - Planned activities for 2022 and 2023

1. Planned major national and international field studies and collaborative laboratory and modelling studies (incl. all information possible, dates, locations, teams, work, etc.).

CSIC has planned modelling studies in collaboration with Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention: Studying coastal atmospheric chemistry using the WRF-Chem model.

2. Events like conferences, workshops, meetings, summer schools, capacity building etc. (incl. all information possible).

Several Spanish groups have been and will be presenting research at the EGU and AGU 2021-2022.

3. Funded national and international projects/activities underway.

4. Plans / ideas for future national or international projects, programmes, proposals, etc. (please indicate the funding agencies and potential submission dates).

5. Engagements with other international projects, organisations, programmes, etc.

Comments