surface ocean solas lower atmosphere study

Report for the year 2018 and future activities

SOLAS *'Spain'*
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This report has two parts:

***- Part 1:** reporting of activities in the period of January 2018 – Jan-Feb 2019*
***- Part 2:** reporting on planned activities for 2019/2020 and 2021.*

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;
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).*

PART 1 - Activities from January 2018 to Jan/Feb 2019

1. Scientific highlight

Describe one scientific highlight with a title, text (max. 200 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).

Atmospheric iodine causes tropospheric ozone depletion and aerosol formation, both of which have significant climate impacts, and is an essential dietary element for humans. However, the evolution of atmospheric iodine levels at decadal and centennial scales is unknown. Recently, measurements of iodine concentrations in the RECAP ice-core (coastal East Greenland) have investigated how atmospheric iodine levels in the North Atlantic have evolved over the past 260 years (1750–2011). The levels of iodine tripled from 1950 to 2010. The results suggest that this increase is driven by anthropogenic ozone pollution and enhanced sub-ice phytoplankton production associated with the recent thinning of Arctic sea ice. Increasing atmospheric iodine has accelerated ozone loss and has considerably enhanced iodine transport and deposition to the Northern Hemisphere continents. Future climate and anthropogenic forcing may continue to amplify oceanic iodine emissions with potentially significant health and environmental impacts at global scale.

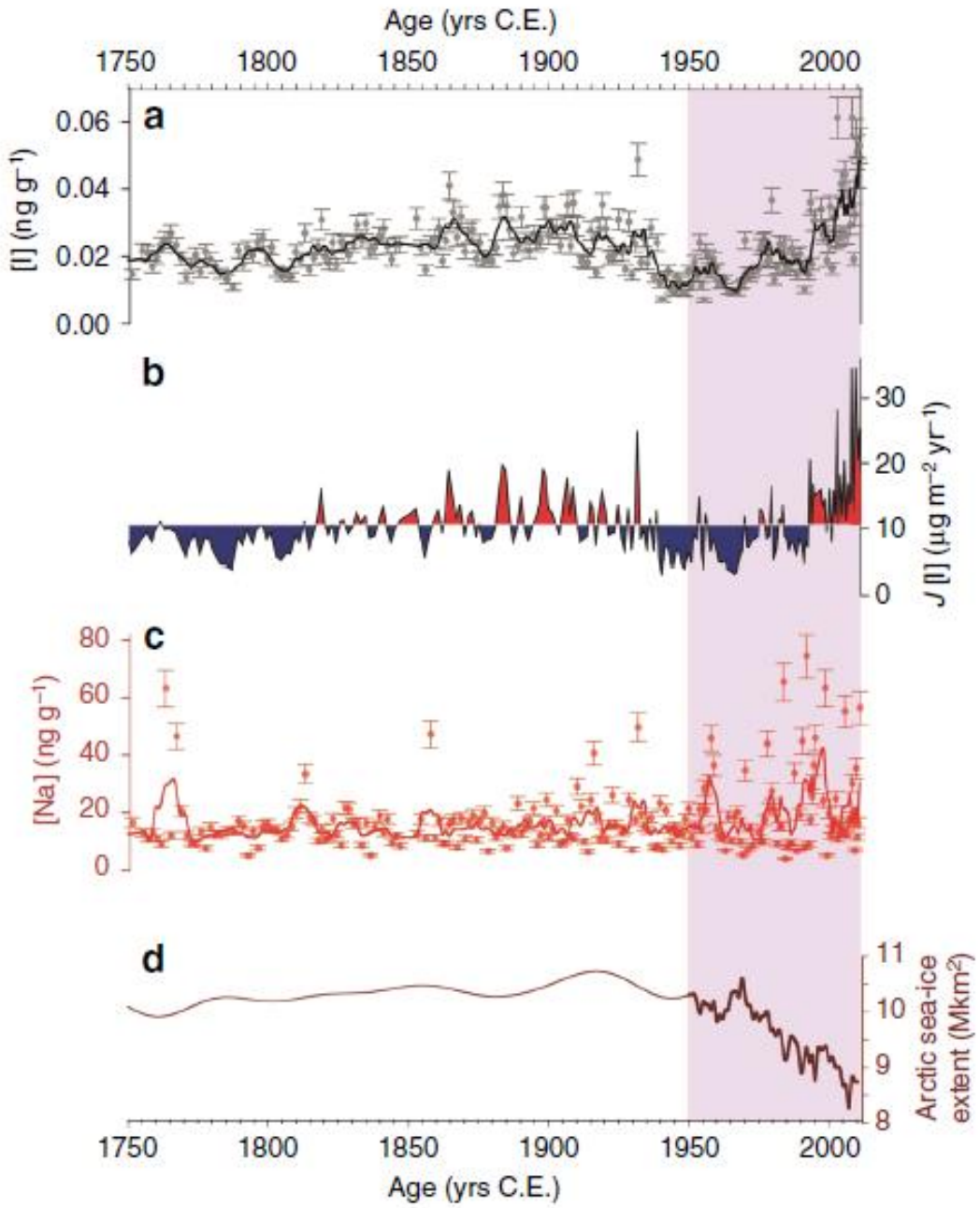

Figure: Time series of geochemical elements in the Renland ice-core during the Industrial Period. a) Iodine [I] concentration and standard deviation, b) positive (red) and negative (blue) variation of iodine depositional fluxes J[I] with respect to the 1750–2010 average and c) sodium [Na] concentrations and standard deviation from Renland ice core (black and red lines represent the 5-samp. running averages for iodine and sodium, respectively); d) Arctic sea ice extent reconstruction.

Citation: C. A. Cuevas, N. Maffezzoli, J. P. Corella, A. Spolaor, P. Vallelonga, H. A. Kjær, M. Simonsen, M. Winstrup, B. Vinther, C. Horvat, R. P. Fernandez, D. Kinnison, J.-F. Lamarque, C. Barbante, A. Saiz-Lopez, Rapid increase in atmospheric iodine levels in the North Atlantic since the mid-20th century. *Nature Communications* **9**, 1452 (2018).

2. Activities/main accomplishments in 2018 (projects, field campaigns, events, model and data intercomparisons, capacity building, international collaborations, contributions to int. assessments such as IPCC, interactions with policy makers or socio-economics circles, social sciences, and media).

SOLAS-related funded projects:

Effects of ocean acidification, temperature and organic matter on Fe(II) persistence in the Atlantic Ocean (ATOPFe), funded by the Spanish Ministry of Economy and Competitiveness running during 2018-2020.

Project ANIMA (ongoing). ANIMA is a research project funded by the Spanish Ministry of Economy and Competitiveness (CTM2015-65720-R), running from 2016 to 2018. http://anima.icm.csic.es

Other research activities:

OVIDE line cruise Jun-Jul 2018. pCO_2 measurements.

FICARAM-18 from Ushuaia-Cartagena: pCO_2 measurements.

The BIOGAPS Expedition to Moorea. An island-based intensive sampling study in the open ocean and coral reef waters of the tropical South Pacific. (UC Berkeley . April 4 to 27, 2018).

3. Top 5 publications in 2018 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.

PAPERS:

C. A. Cuevas, N. Maffezzoli, J. P. Corella, A. Spolaor, P. Vallelonga, H. A. Kjær, M. Simonsen, M. Winstrup, B. Vinther, C. Horvat, R. P. Fernandez, D. Kinnison, J.-F. Lamarque, C. Barbante, A. Saiz-Lopez, Rapid increase in atmospheric iodine levels in the North Atlantic since the mid-20th century. Nature Communications **9**, 1452 (2018).

Abrahamsson, K., Granfors, A., Ahnoff, M., Cuevas, C. A., & Saiz-Lopez, A. (2018). Organic bromine compounds produced in sea ice in Antarctic winter. Nature Communications, 9(1), (2018). https://doi.org/10.1038/s41467-018-07062-8

Huertas IE, Flecha S, Navarro G, Perez FF, de la Paz M. Spatio-temporal variability and controlling parameters of methane and nitrous oxide in the Guadalquivir estuary, Southwestern Europe. Aquatic Sciences 80 (3), 29-45. DOI: 10.1007/s00027-018-0580-5, (2018).

Samperio-Ramos, G., Santana-Casiano, J.M., González-Dávila, M. Effect of Organic Fe-Ligands, Released by Emiliania huxleyi, on Fe(II) Oxidation Rate in Seawater Under Simulated Ocean Acidification Conditions: A Modeling Approach. Front. Mar. Sci. 5, 210. https://doi.org/10.3389/fmars.2018.00210, 2018.

Paulo Casal, Ana Cabrerizo, Maria Vila-Costa, Mariana Pizarro, Begoña Jimenez, and Jordi Dachs. Pivotal role of snow deposition and melting driving fluxes of polycyclic aromatic hydrocarbons at coastal Livingston Island (Antarctica). Environ. Sci. Technol., 52, 12327, 2018.

DATASETS:

1. https://digital.csic.es/handle/10261/173204 doi: 10.20350/digitalCSIC/8588. Methane emissions in Doñana saltmarshes over 2016-2018. Huertas IE and de la Paz M.

2. https://digital.csic.es/handle/10261/160022, doi:10.20350/digitalCSIC/8528. Methane and Nitrous Oxide in the Guadalquivir estuary (SW Spain) over 2016-2017. Huertas IE and de la Paz M.

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2018? If yes, who? How did you engage?

The Antarctic Circumnavigation Expedition has been a major endeavour of a number of research institutions with a private foundation (Editions Paulsen and the ACE Foundation).

PART 2 - Planned activities for 2019/2020 and 2021

1. Planned major field studies and collaborative laboratory and modelling studies, national and international (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, schools, capacity building etc. (incl. all information possible).

Several Spanish groups will be presenting research at the EGU and AGU 2019.

3. Funded national and international projects / activities underway.

1. Our common future ocean –quantifying coupled cycles of carbon, oxygen, and nutrients for determining and achieving safe operating spaces with respect to tipping points (COMFORT, project# 820989). Funding agency: European Commission (H2020), Call H2020-LC-CLA-2018-2019-2020. Building a low-carbon, climate resilient future: climate action in support of the Paris Agreement. International consortium formed by 32 partners. (2019-2023)

2. Response of Mediterranean jellyfish to the interacting effect of climate-related drivers of impacts: survival in a warmer and more acidic Mediterranean (CTM2016-75487-R). Funding agency: Spanish Ministry of Economy, Industry and Competitiveness. (2017-2019)

3. Effect of permeabilization of Doñana marshland on the biogeochemical status of its aquatic ecosystems (1539/2015). Funding agency: Spanish Ministry of Agriculture, Food and Environment. (2016-2018).

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

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

- Several Spanish groups are involved in the MOSAiC project.
- Contribution to the Global Ocean Acidification Observing Network (GOA-ON) through the monitoring program at the Strait of Gibraltar. (http://portal.goaon.org/Explorer?action=oiw:mobile_platform:STS_235:details)

Comments