

Report for the year 2016 and future activities

SOLAS 'Spain'

compiled by: 'Alfonso Saiz-Lopez'

This report has two parts:

- **Part 1:** reporting of activities in the period of January 2016 – Jan-Feb 2017
- **Part 2:** reporting on planned activities for 2017/2018 and 2019.

The information provided will be used for reporting, fundraising, networking, strategic development and updating of the live web-based implementation plan.

IMPORTANT: May we remind you that 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 2016 to Jan/Feb 2017

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 international collaboration. (If you wish to put more than one, feel free to do so).

Polycyclic aromatic hydrocarbons (PAHs), and other semivolatile aromatic-like compounds (SALCs), are an important and ubiquitous fraction of organic matter in the environment. The occurrence of semivolatile aromatic hydrocarbons is due to anthropogenic sources like incomplete combustion of fossil fuels or oil spills, and other biogenic sources. However, their global transport, fate and relevance for the carbon cycle have been poorly assessed, especially in terms of fluxes. In this contribution, an assessment of the occurrence and atmosphere-ocean fluxes of 64 polycyclic aromatic hydrocarbons analyzed in paired atmospheric and seawater samples from the tropical and subtropical Atlantic, Pacific and Indian oceans was performed. The global atmospheric input of polycyclic aromatic hydrocarbons to the global ocean is estimated at $0.09 \text{ Tg month}^{-1}$, four-fold greater than the PAH input from the Deepwater Horizon spill. Moreover, the environmental concentrations of total semivolatile aromatic-like compounds (SALCs) were 10^2 - 10^3 folds higher than those of the targeted polycyclic aromatic hydrocarbons, with a relevant contribution of an aromatic unresolved complex mixture. These concentrations drive a large global deposition of carbon, estimated at 400 Tg C y^{-1} , around 15% of the oceanic CO_2 uptake. Future efforts should focus on a comprehensive assessment of the different fraction of organic matter

contributing to the atmosphere ocean exchange fluxes, and on the elucidation of the biogenic and anthropogenic contribution to these pools of exchangeable organic matter and their fluxes in the environment.

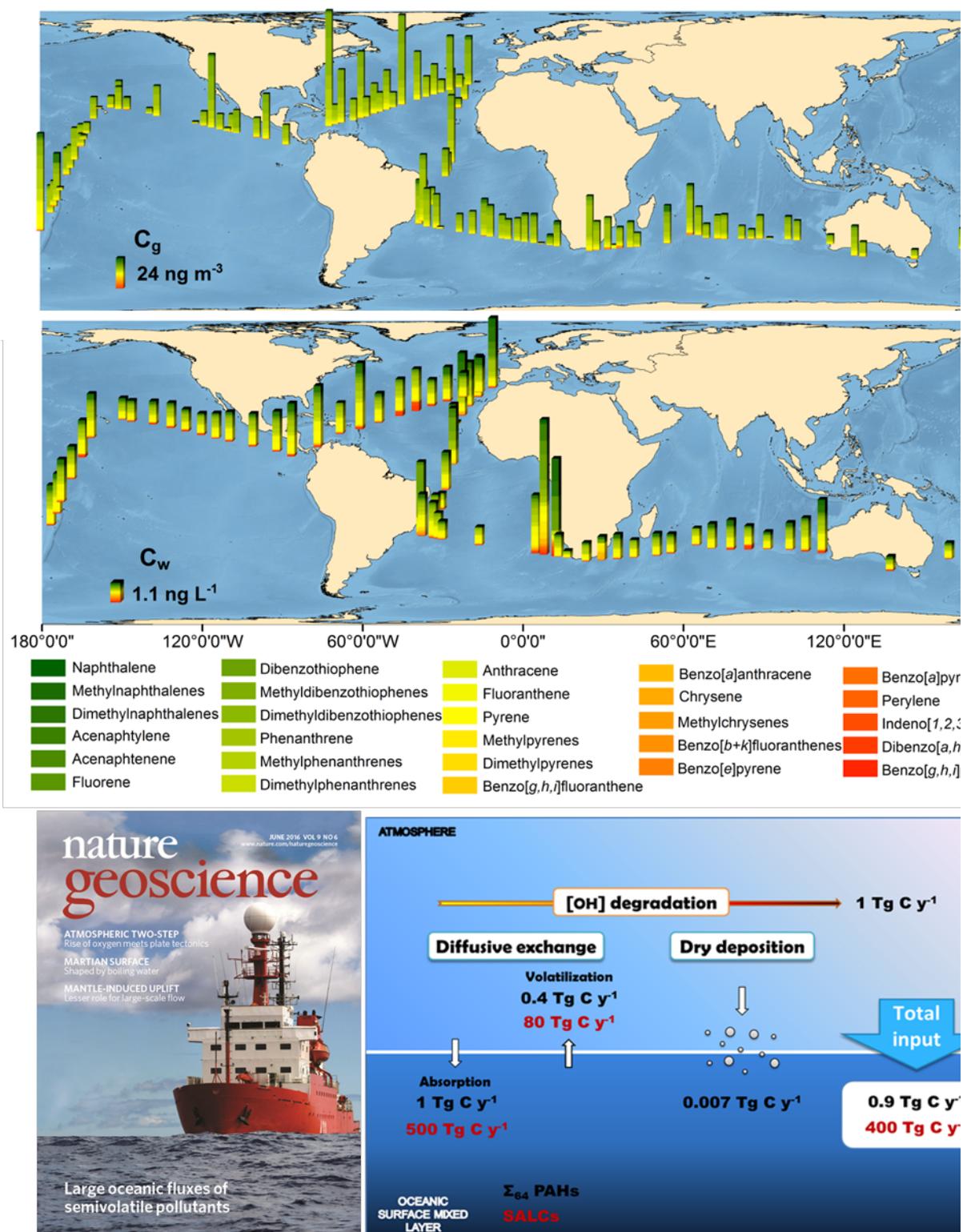


Figure 1. Measured concentrations of 64 polycyclic aromatic hydrocarbons (PAHs) in the gas phase (upper panel) and surface seawater (middle panel) for the global oceans during the

Malaspina Circumnavigation cruise. Lower panel-right shows the estimated global atmosphere-ocean exchange fluxes of PAHs and semivolatile aromatic-like hydrocarbons (SALCs). This paper was highlighted at the cover of *Nature Geoscience* (lower panel-left) with a picture of RV *Hepérides* during the Malaspina expedition.

Manuscript citation:

González-Gaya, B., Fernández-Pinos, M.-C., Morales, L., Méjanelle, L., Abad, E., Piña, B., Duarte, C.M., Jiménez, B., Dachs, J. High atmosphere-ocean exchange of semivolatile aromatic hydrocarbons (2016) *Nature Geoscience* 9 (6), pp. 438-442.

2. Activities/main accomplishments in 2016 (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, etc.)

Research Projects:

NICANOR: Nitrogen fixation and diffusive fluxes in the upwelling region off NW Iberia.
Xunta de Galicia, PI: Beatriz Mouriño

SCORE: Sediments and cold water Corals to address key questions of the Oceans in the past: two case-study Regions and one Experiment.
Funded by Spain's Ministerio de Economía y Competitividad. PI: Carles Pelejero

3. Top 5 publications in 2016 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.

- González-Gaya, B., Fernández-Pinos, M.-C., Morales, L., Méjanelle, L., Abad, E., Piña, B., Duarte, C.M., Jiménez, B., Dachs, J. High atmosphere-ocean exchange of semivolatile aromatic hydrocarbons (2016) *Nature Geoscience* 9 (6), pp. 438-442.
- Bunse, C., Lundin, D., Karlsson, C.M.G., Akram, N., Vila-Costa, M., Palovaara, J., Svensson, L., Holmfeldt, K., González, J.M., Calvo, E., Pelejero, C., Marrasé, C., Dopson, M., Gasol, J.M. and Pinhassi, J. (2016) Response of marine bacterioplankton pH homeostasis gene expression to elevated CO₂. *Nature Climate Change*, doi:10.1038/nclimate2914.
- Fernández-Castro B, Pahlow M, Mouriño-Carballido B, Marañón E., Oschlies A (2016). Optimality-based Trichodesmium Diazotrophy in the North Atlantic Subtropical Gyre. *Journal of Plankton Research*, DOI: 10.1093/plankt/fbw047.
- Galí, Martí; Kieber, David; Romera-Castillo, Cristina; Kinsey, Joanna D.; Devred, Emmanuel; Pérez, Gonzalo Luis; Westby, George R.; Marrasé, Cèlia; Babin, Marcel; Levasseur, Maurice; Duarte, Carlos; Agusti, Susana; Simo, Rafel (2016) CDOM sources and photobleaching control quantum yields for oceanic DMS photolysis *Environmental Science & Technology* 50: 13361-13370.

- Saiz-Lopez, A., and R.P. Fernandez (2016), On the formation of tropical rings of atomic halogens: Causes and implications, *Geophys. Res. Lett.*, 43, 2928-2935, doi:10.1002/2015GL067608.

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2016? If yes, who? How did you engage?

PART 2 - Planned activities from 2017/2018 and 2019

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

Field studies

Periodic cruises for data collection at the GIFT time series located at the Strait of Gibraltar to monitor air-sea fluxes of GHGs (CO₂, CH₄, N₂O) and track ocean acidification in the Mediterranean basin.

Seasonal samplings at the coastal fringe comprising the complex Guadalquivir river estuary- Doñana wetlands are scheduled from 2016 to 2018 to compute air-water GHGs (CO₂, CH₄, N₂O) exchange. Close collaboration with University of Liege (Belgium).

PEACETIME: Process studies at the air-sea interface after dust deposition in the Mediterranean sea

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

ICM-CSIC is organizing The Ramon Margalef summer colloquia "A view of the ocean from Barcelona" in Barcelona, Spain, July 2017.

3. Funded national and international projects / activities underway (if possible please list in order of importance and indicate to which part(s) of the SOLAS 2015-2025 Science Plan and Organisation (downloadable from the SOLAS website) the activity topics relate – including the core themes and the cross cutting ones)

CLIMAHAL: Climate dimension of natural halogens in the Earth system: Past, present, future. Funded by the European Research Council Consolidator Grant, 2017-2023. PI: Alfonso Saiz-Lopez

4. Plans / ideas for future projects, programmes, proposals national or international etc. (please precise to which funding agencies and a timing for submission is any)

Several groups are actively seeking funds from national (Spanish National Plan for Research) and international (H2020, ERC, etc).

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

Comments