

Report for the year 2017 and future activities

SOLAS: USA

compiled by: Rachel Stanley

This report has two parts:

- **Part 1:** reporting of activities in the period of January 2017 – Jan-Feb 2018
- **Part 2:** reporting on planned activities for 2018/2019 and 2020.

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 2017 to Jan/Feb 2018

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).

Title: A global intercomparison of oceanic methane and nitrous oxide measurements

Intercomparison exercises are invaluable for scientists as they allow the variability that exists between independent laboratories conducting the same analyses to be determined. During 2013-2017, the Scientific Commission on Oceanic Research Working Group #143 exchanged multiple batches of seawater samples between twenty laboratories to determine the inter-laboratory variability that exists for measurements of dissolved methane and nitrous oxide. Simultaneously, compressed gas standards were distributed between Working Group members. Several prominent trends were observed for both methane and nitrous oxide (Figure 1) and the intercomparison exercise also facilitated comparisons of sampling techniques, sample storage, gas extraction, gas calculations, and other procedures relevant to the quantification of dissolved methane and

nitrous oxide. The study is currently being prepared for publication and although the SCOR Working Group will formally end in 2018, the momentum will continue with an OCB workshop in October 2018 on Oceanic Methane and Nitrous Oxide: The Present Situation and Future Scenarios'. An objective of the workshop is to build on the intercomparison exercises and ask the question 'Where in the oceans should spatial-temporal surveys be conducted to discern climatologically-relevant changes in water-column inventories of methane and nitrous oxide?'

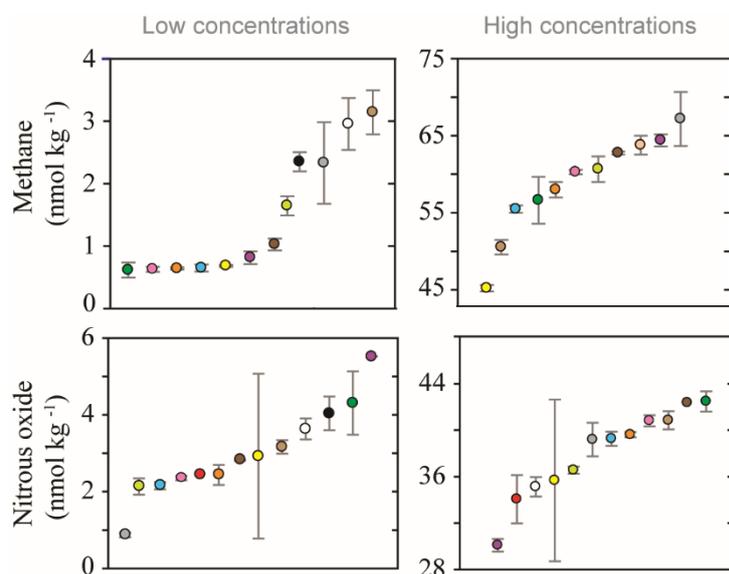


Figure: The intercomparison revealed several prominent trends for both methane and nitrous oxide including a skewed distribution of data values at low concentrations and a large range in data values at the highest concentrations. Each color represents a different laboratory with consistency for the separate figures. The data values are represented by the mean and standard deviation.

Citation: Wilson et al., in preparation.

2. Activities/main accomplishments in 2017 (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).

Enzymes in Coastal Air: Lihini Aluwihare and Matthew Pendergraft (UCSD) surveyed coastal air for enzymes, investigated the photodioxidative effects on enzymes in aerosols and tested the ice nucleating ability of specific enzymes as part of CAICE, the Center for Aerosol Impacts on the Chemistry of the Environment.

Hydrocarbon emissions from marine plastics: Sarah-Jeanne Royer, Dave Karl, and colleagues have measured emission of hydrocarbon gases from polypropylene debris collected in the North Pacific Subtropical Gyre over a time-series from September, 2016 to April, 2017. They found that due to the longevity of the plastics and the large amount of plastics in the environment, gas production from plastics may represent a source of climate-relevant trace gases for an extended period of time.

Gas Exchange: Brian Haus, Rachel Stanley, and colleagues are investigating gas exchange at high wind speeds and wave conditions in the SUSTAIN wind-wave tank by simultaneously collecting high-temporal resolution records of noble gases, oxygen, and carbon dioxide, imaging

bubbles, and measuring wave properties. The first “field” campaign took place in July, 2017. An additional series of experiments will take place in July, 2018.

NAAMES: The NASA funded North Atlantic Aerosol and Marine Ecosystem Study (NAAMES) is currently conducting its last field campaign – a combination aircraft and ship campaign designed to understand how environmental changes are altering plankton production, species composition, and aerosol emissions. For more information on NAAMES and access to data from the cruise, visit <https://naames.larc.nasa.gov/>

Workshop: A workshop on “Ocean Carbon Hotspots”, co-sponsored by Ocean Carbon Biogeochemistry Office and US-CLIVAR was held in Moss Landing, CA from Sept 25-26, 2017, brought together much of the current research community studying carbon uptake and storage in Western Boundary Current regions, regions which display the largest magnitude air-to-sea carbon dioxide fluxes.

Workshop: A workshop on 'Remote Sensing for Studying the Ocean-Atmosphere Interface', co-sponsored by the European Space Agency (ESA), the National Aeronautics and Space Administration (NASA), and the Surface Ocean - Lower Atmosphere Study (SOLAS) was held 13 - 15 March 2018, in Potomac, Maryland. The international workshop highlighted current research in remote sensing.

3. Top 5 publications in 2017 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.

Brumer, S E., C J Zappa, B W Blomquist, C W Fairall, A Cifuentes-Lorenzen, J B Edson, I M Brooks, and B J Huebert (2017), Wave-related Reynolds number parameterizations of CO₂ and DMS transfer velocities, *Geophysical Research Letters*, 44(19), 9865-9875, doi:10.1002/2017GL074979.

Cassar, N, W Tang, H Gabthuler, and K Huang. (2018) Method for High Frequency Underway N₂ Fixation Measurements: Flow-Through Incubation Acetylene Reduction Assays by Cavity Ring Down Laser Absorption Spectroscopy (FARACAS). *Analytical Chemistry*. doi: 10.1021/acs.analchem.7b04977

Sanchez, K J, C-L Chen, et al. (2018) Substantial Seasonal Contribution of Observed Biogenic Sulfate Particles to Cloud Condensation Nuclei. *Nature Scientific Reports*. 8: 3235. doi:10.1038/s41598-018-21590-9 1

Sedwick P N, P W Bernhardt, M R Mulholland, R G Najjar, L M Blumen, B M Sohst, C Sookhdeo, B Widner. (2018) Assessing phytoplankton nutritional status and potential impact of wet deposition in seasonally oligotrophic waters of the Mid-Atlantic Bight. *Geophysical Research Letters*. doi: 10.1002/2017GL075361.

Stanley, R H R., D J McGillicuddy Jr., Z O Sandwith, and H M Pleskow,(2017) Submesoscale hotspots of productivity and respiration: Insights from high-resolution oxygen and fluorescence sections. *Deep Sea Research I* 130: 1-11. doi: 10.1016/j.dsr.2017.10.005

Stephans, B, M C Long, et. al (2018) The O₂/N₂ Ratio and CO₂ Airborne Southern Ocean Study. *Bulletin of the American Meteorology Society*. doi: 0.1175/BAMS-D-16-0206.1

For journal articles please follow the format:

Author list (surname and initials, one space but no full stops between initials), year of publication, article title, full title of journal (italics), volume, page numbers, DOI.

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2017? If yes, who? How did you engage?

PART 2 - Planned activities for 2018/2019 and 2020

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

EXPORTS: The NASA EXPORTS program will commence its first fieldwork activities with a cruise in the North Pacific in August, 2018. The cruise will use 2 ships and a fleet of autonomous platforms (gliders, floats, etc) to collect data in support of EXPORT's goal of understanding and predicting the fate of marine net primary production.

https://cce.nasa.gov/ocean_biology_biogeochemistry/exports/index.html

CLIVAR GO-SHIP Cruises: US CLIVAR will be conducting GO-SHIP (formerly known as Repeat Hydrography) Cruises that aim to quantify changes and storage of CO₂, heat and freshwater in the ocean. The cruises reoccupy WOCE lines and scientists onboard measure many variables from the atmosphere, the surface ocean and the deep ocean. Upcoming planned cruises consist of cruises in the Indian Ocean (I05, I06S, I07N) in 2018 and 2019, and in the Atlantic Ocean (A13.5) in 2020.

GEOTRACES: A 60 day cruise along a transect from Alaska to Tahiti at 152 W will be taking place in Fall, 2018 as part of the US GEOTRACES project. The cruise focuses on the study of trace elements and their isotopes. The cruise will include sampling in the high nutrient low chlorophyll equatorial upwelling regions in the equatorial Pacific and subarctic as well as the oligotrophic subtropical gyres.

Ongoing US Time-series: Regular cruises (typically monthly but each time-series differs) will occur in 2018 and 2019 in the Pacific Ocean near Hawaii as part of the Hawaii Ocean Time-series (HOT), in the Sargasso Sea as part of the Bermuda Atlantic Time-series Study (BATS), in the Cariaco Basin as part of the CARIACO Ocean Time-series, and in coastal California waters as part of the California Cooperative Oceanic Fisheries Investigations (CalCOFI) time series.

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

Cornell Satellite Remote Sensing Training Program. June 4-15, 2018. Ithaca, New York. A short course to teach graduate students and other researchers the basic skills to acquire and use data sets derived from a variety of satellite sensors. Course is intended for scientists with essentially no experience in remote sensing.

Gordon Research Conference: Mesophotic Coral Reef Ecosystems. June 17-22. Lewiston, Maine. The Functional Roles of Mesophotic Coral Reefs in the Anthropocene

Ocean Carbon Biogeochemistry Workshop: June 25-28, 2018, Woods Hole, Massachusetts. Annual workshop that highlights research and includes substantial time for community discussion of new directions.

OCB Biogeochemical Profiling Float Workshop, July 9-13 2018. Seattle, Washington. This workshop will bring together potential users to discuss biogeochemical profiling float technology, sensors, and data management, in order to begin the process of the intelligent design of future scientific experiments.

Gordon Research Conference Ocean Global Change Biology: July 15-20. Waterville Valley, New Hampshire Theme: Integrative Research Addressing Responses, Refuges and Rescue in Marine Ecosystems

Gordon Research Conference Atmospheric Chemistry. July 28-Aug 2. Newry, Maine.

Goldschmidt 2018. August 12-17. Boston, MA. International conference on geochemistry. Abstracts due March 30.

10th International Aerosol Conference. Sept. 2-7, 2018. St. Louis, Missouri.

Fall American Geophysical Union (AGU) Meeting: Dec. 10-14, 2018. Washington D.C.,

American Meteorological Society Annual Meeting. Jan 6-10, 2019. Pheonix, Arizona.

3. Funded national and international projects / activities underway.

Too many to report though some major ones are listed in the upcoming studies section of this report (section 2).

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

Too many to report.

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

Too many to report.

Comments