

Report for the year 2018 and future activities

SOLAS JAPAN

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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

The GESAMP atmospheric iron deposition model intercomparison study

Intercomparisons of the global modelling of iron (Fe) deposition fluxes and atmospheric concentrations were made, in the framework of the United Nations Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) WG 38, "The Atmospheric Input of Chemicals to the Ocean". The intercomparison indicates that the representation of the atmospheric Fe cycle varies among models, in terms of both the magnitude of natural and combustion Fe emissions and the atmospheric processing parameterizations of Fe-containing aerosols. The comparison with the observations over oceans indicates that most models overestimate total Fe (TFe) mass concentrations at surface level near dust source regions and underestimate the low concentrations in remote oceans. All models can simulate the tendency of higher Fe concentrations near/downwind from the dust source regions, with the mean normalized bias for the Northern Hemisphere (~14), larger than that of the Southern Hemisphere (~2.4) for the ensemble model mean. This study reveals two critical issues in the mean global labile Fe (LFe) simulations that require further exploration: (1) the Fe-containing aerosol size distribution and (2)

the relative contribution of dust and combustion sources of Fe to labile Fe in atmospheric aerosols over the remote oceans.

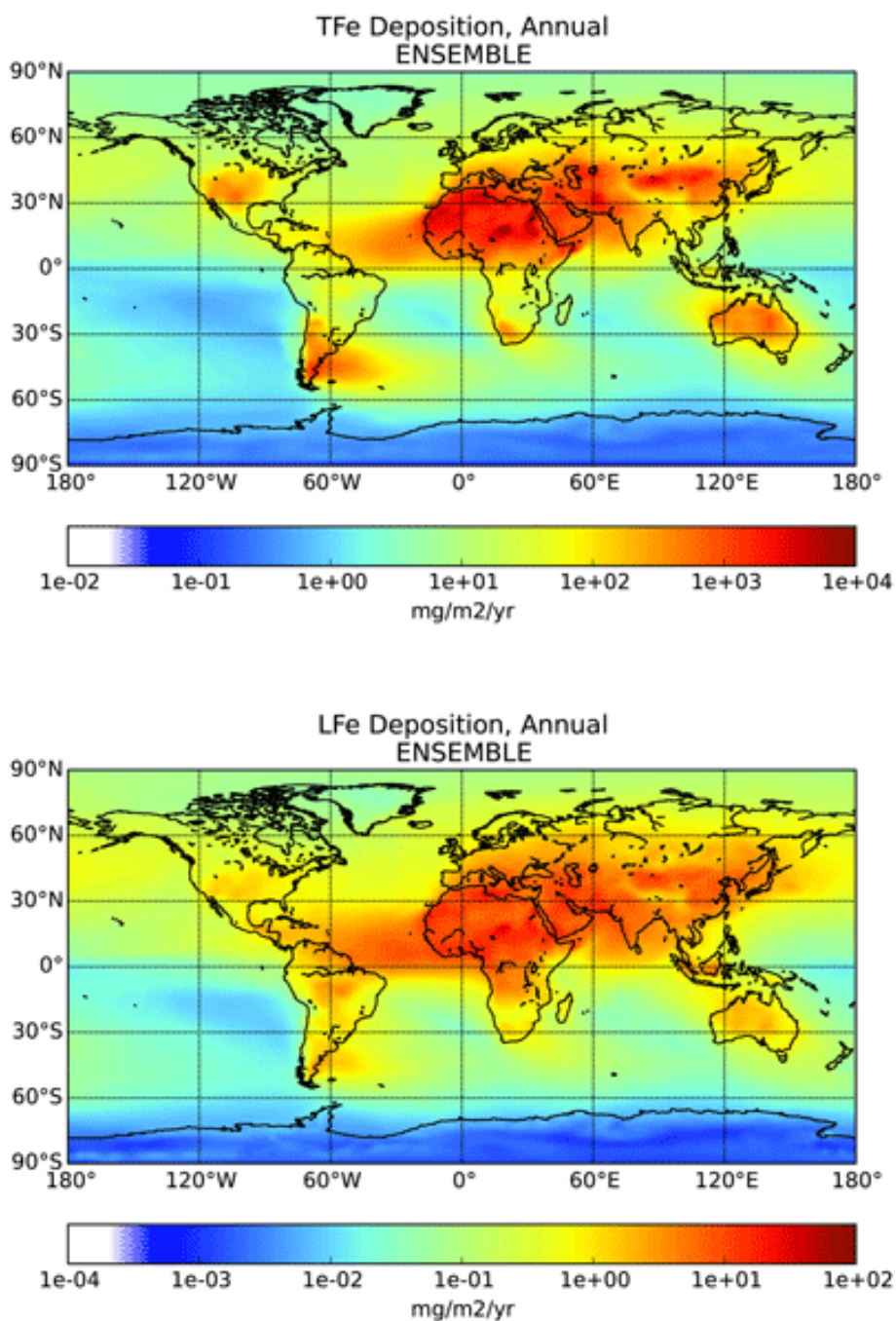


Figure: Ensemble model results for annual deposition fluxes ($\text{mg m}^{-2} \text{yr}^{-1}$) for TFe (top) and for LFe (bottom).

Citation: Myriokefalitakis, S., Ito, A. et al., The GESAMP atmospheric iron deposition model intercomparison study, *Biogeosciences*, 15, 6659–6684, (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).

Theme 1: Greenhouse gases and the oceans

Cruise/Field campaigns

- Seisui-maru SE18-33 cruise at Ise Bay and coastal area of western North Pacific (chief scientist: Urumu Tsunogai) (Nov 20-22, 2018).
- Underway measurement of sea surface CO₂ and CH₄ in the Arctic Ocean, the Bering Sea, and the subarctic North Pacific (2018/08-09; R/V Mirai; ArCS project; by A Murata)
- Deployment of drifting buoys with pCO₂ sensor in the Pacific Ocean founded by the Ministry of Environment of Japan (PI, A Murata; 2016-2021)
- NIES VOS Program (Atmosphere/Ocean Greenhouse Gas Observation: Japan-North America, Japan-Oceania; Atmosphere Greenhouse Gas Observation: Japan-Southeast Asia)

Meetings/collaboration/ workshop

- May 2018: JpGU Meeting 2018, Chiba, Japan. Oceanic responses to global warming and ocean acidification in coastal regions (Convenors: Tsuneo Ono, Masahiko Fujii, Takeshi Yoshimura)

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

Cruise/field campaigns

- July – August 2018: Aerosol and gas observation over the Western Pacific Ocean cruise by R/V Mirai (MR18-04)
- November – December 2018: Aerosol and gas observation over the Indian Ocean cruise by R/V Hakuho-maru (KH-18-6 leg2)
- October – December 2018: Aerosol and gas observation over the Arctic Ocean, Bering sea and North Western Pacific Ocean cruise by R/V Mirai (MR18-05C) as part of the ArCS project
- 6 November - 3 December 2018: Gas, aerosol and rainwater observation during R/V Hakuho Maru cruise (KH-18-6 Leg 2 led by H. Saito) which sailed Bay of Bengal and Southeastern Indian Ocean (from Phuket to Jakarta) (PI: F Taketani)

Theme 5: Ocean biogeochemical control on atmospheric chemistry

Cruise/field campaigns

- Mar-June 2018: Oxygenated Compounds in the Tropical Atmosphere– Variability and Exchanges (OCTAVE) project: Investigating the impact of tropical marine/biogenic sources to OVOCs, halogens, and aerosols in the atmosphere at the Maïdo high-altitude observatory, Reunion Island (PI: Yuzo Miyazaki)
- 6 November - 3 December 2018: Aerosol and microlayer observation during R/V Hakuho Maru cruise (KH-18-6 Leg 2 led by H. Saito) which sailed Bay of Bengal and Southeastern Indian Ocean (from Phuket to Jakarta) as part of SSMAP project (PI: K Hamasaki)

Meetings/international collaboration/workshop

- "Biogeochemical linkages between the surface ocean and atmosphere" session at Japan Geoscience Union meeting 2018, May 2018 (convenors: Y. Miyazaki, J. Nishioka, K. Suzuki, Y. Iwamoto)

- Oxygenated Compounds in the Tropical Atmosphere– Variability and Exchanges (OCTAVE) Intensive Field Campaign Workshop, Brussels, Oct. 2018 (Organizers: T. Stavrakou, J. Brioude, Presentation: Y. Miyazaki)

Cross-Cutting Theme:

Cruise/field campaigns

- R/V Pro. Multanovskiy (Russian research vessel) cruise (Japan-Russia Joint expedition), Biogeochemistry-marine ecosystem observation in the western Bering Sea, (On board: Jun Nishioka (PI), Daiki Nomura, Maki Noguchi, Yohei Yamashita, Kyumei Waga) (July-Sep, 2018)

General SOLAS

Meetings/international collaboration/workshop

- Japanese-SOLAS committee have launched Local organizing committee and had meetings for preparing SOLAS OSC in Sapporo 2019 with SOLAS IPO (in April) and SOLAS chair (Lisa Millar in Nov.)

- 2018 Japan-SOLAS committee meeting, 22 May, 2018

- Institute of Low Temperature Science (ILTS) Workshop on Biogeochemical Interactions between Ocean and Atmosphere, ILTS, Hokkaido University, Nov. 1-2, 2018 (Organizer: Y. Miyazaki)

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

Nelson, D. M., Tsunogai, U., Dong, D., Ohyama, T., Komatsu, D. D., Nakagawa, F., Noguchi, I., and Yamaguchi, T. (2018) Triple oxygen isotopes indicate urbanization affects sources of nitrate in wet and dry atmospheric deposition. *Atmospheric Chemistry and Physics*, 18, 6381-6392, doi:10.5194/acp-18-6381-2018.

Yasunaka, S., Siswanto, E., Olsen, A., Hoppema, M., Watanabe, E., Fransson, A., Chierici, M., Murata, A., Lauvset, S. K., Wanninkhof, R., Takahashi, T., Kosugi, N., Omar, A. M., van Heuven, S., Mathis, J. T. (2018), Arctic Ocean CO₂ uptake: an improved multi-year estimate of the air-sea CO₂ flux incorporating chlorophyll-a concentrations, *Biogeosciences*, 15, 1643-1661, doi:10.5194/bg-15-1643-2018.

Taketani, F., Aita, M. N., Yamaji, K., Sekiya, T., Ikeda, K., Sasaoka, K., Hashioka, T., Honda, M. C., Matsumoto, K. and Kanaya, Y. (2018) Seasonal response of North Western Pacific marine ecosystems to deposition of atmospheric inorganic nitrogen compounds from East Asia, *Scientific Reports*, 8, 9324, doi:10.1038/s41598-018-27523-w.

Nagao, I., Eum, Y.-J., Iwamoto, Y., Tada, Y., Suzuki, K., Tsuda, A., Toratani, M., Hamasaki, K., Uematsu, M. (2018) Biogenic sulfur compounds in spring phytoplankton bloom in the western North Pacific off the coast of northern Japan, *Progress in Oceanography*, 165, 145-157, doi:10.1016/j.pocean.2018.05.006.

Miyazaki, Y., Yamashita, Y., Kawana, K., Tachibana, E., Kagami, S., Mochida, M., Suzuki, K., and Nishioka, J. (2018), Chemical transfer of dissolved organic matter from surface seawater to sea spray water-soluble organic aerosol in the marine atmosphere, *Scientific Reports*, 8, 14861, doi:10.1038/s41598-018-32864-7.

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?

- OCEAN-KAN discussion session have been preparing for the SOLAS OSC by Mitsuo Uematsu and Anna Zivian.

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.).

General SOLAS

- Seisui-maru (Mie University) cruise in Ise Bay, Mikawa Bay, and coastal area of western North Pacific (chief scientist: Fumiko Nakagawa) (Sep 3-5, 2019).
- Shinsei-maru (JAMSTEC) cruise in Japan sea (chief scientist: Urumu Tsunogai) (Jun 25-29, 2019).
- Shinsei-maru (JAMSTEC) cruise in Japan sea (chief scientist: Urumu Tsunogai) (Oct 20-23, 2019).
- SOLAS session (C4) at the Forth Xiamen Symposium on Marine Environmental Sciences (XMAS-IV) , Xiamen, 9 January 2019 (Co-convener: J. Nishioka, Invited speaker: Y. Miyazaki)
- January 2019, Workshop for Role of Atmospheric Species at Atmosphere-Ocean Boundary from the View Point of Field Study (46 participants(3 oral, 30poster presentation)) Organizer: F. Taketani, Y. Iwamoto, T. Nakamura, M. Yoshizue, K. Miura and M. Uematsu.

Theme 1: Greenhouse gases and the oceans

- Continuous measurements of atmospheric and surface seawater pCO₂ and CH₄ by R/V Mirai in the Arctic Ocean and subpolar region of the North Pacific (Sep- Nov 2019; by A. Murata).
- Continuous measurements of atmospheric and surface seawater pCO₂ by R/V Mirai in the Indian Ocean (Dec 2019- Feb2020; by A. Murata).
- NIES supports international pCO₂ database of Surface Ocean CO₂ Atlas (SOCAT) by providing NIES VOS pCO₂ data as well as by quality control to the submitted data measured by other institutes mainly in the North Pacific as a responsible institute of the SOCAT.

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

- March 2019: Aerosol and gas observation over the Pacific Ocean cruise by R/V Mirai (MR18-06 leg4) (Papeete -> Japan) (on board: Fumikazu Taketani, Kazuhiko, Matsumoto, and Kaori, Kawana)
- September - November 2019: Aerosol and gas observation over the Arctic Ocean, Bering sea and North Western Pacific Ocean cruise by R/V Mirai as part of the ArCS project

Theme 5: Ocean biogeochemical control on atmospheric chemistry

- 28 February-3 March 2019: Sampling of aerosol and reactive oxygen species in seawater during R/V Toyoshio Maru cruise in Seto Inland Sea, Japan (PI: Y. Iwamoto)
- 8-12 July 2019: Sampling of aerosol and reactive oxygen species in seawater during R/V Toyoshio Maru cruise in Seto Inland Sea, Japan (PI: Y. Iwamoto)
- Oxygenated Compounds in the Tropical Atmosphere– Variability and Exchanges (OCTAVE) Intensive Field Campaign Workshop, Brussels, May 2019 (Organizers: T. Stavrakou, Presentation: Y. Miyazaki)

Cross-Cutting Theme:

- February 2019: Southern Sea of Okhotsk, ice breaker SOYA, Sea ice Ocean biogeochemical dynamics and flux (On board: Daiki Nomura, Jun Nishioka, Koji Suzuki, Yohei Yamashita).

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

- April 21-25, 2019: SOLAS Open Science Conference in Sapporo 2019

- April 21, 2019: Early Career Scientist Day in SOLAS Open Science Conference in Sapporo 2019, Organizer M. Lizzote, S. Kameyama, Y. Iwamoto

- "Biogeochemical linkages between the surface ocean and atmosphere" session at Japan Geoscience Union (JpGU) meeting 2019, May 2019 (conveners: Y. Miyazaki, J. Nishioka, K. Suzuki, Y. Iwamoto)

- May 2019 Japan-SOLAS committee meeting,

3. Funded national and international projects / activities underway.

- Quantifying nitrate dynamics in hydrosphere using triple oxygen isotopes as tracers, MEXT/JSPS Grant-in-Aid for Scientific Research (A) (PI: U. Tsunogai, FY2017-2020).

- A simple tracer assay for denitrification rates using natural stable isotopes, MEXT/JSPS Grant-in-Aid for Challenging Research (Exploratory) (PI: F. Nakagawa, FY2018-2019).

- Air-sea interaction of non-volatile organic sulfur, (JSPS Research Fellowships for Young Scientists, PI: K. Sakata, 2018-2021)

- Biogeochemical linkage between polar and subpolar ocean. KAKENHI Grant-in-Aid for Scientific Research A, PI: Jun Nishioka, FY2017-2020

- Grant-in-Aid for Scientific Research (A), 18H04143, PI: Yugo KANAYA, FY2018-2020, Origins and ice nucleating abilities of bioaerosols in the marine atmosphere: Links among ecosystems, chemical substances, and clouds explored with fluorescence properties

- Grant-in-Aid for Scientific Research (B), 18H03369, PI: Fumikazu TAKETANI, FY2018-2020, Influence of deposition of atmospheric nitrogen compounds on the marine ecosystem at North East Indian Ocean

- GO-SHIP: Global Ocean Ship-based Hydrographic Investigations Program Co-chair: E McDonagh, R Wanninkhof 2007-

- ArCS: Arctic Challenge for Sustainability Project , Project Director: M. Fukasawa 2015-202

- NIES grant confirms to support NIES VOS Program at least for 2 years (Atmospheric/Oceanic Greenhouse Gas Observation: Japan-North America, Japan-Oceania; Atmospheric Greenhouse Gas Observation: Japan-Southeast Asia)

- Grant-in-Aid for Scientific Research (B), 16H02931, PI: Yuzo Miyazaki, FY2016-2019, Origin of organic nitrogen in atmospheric aerosols

- Analysis of global budget and atmospheric impacts of oceanic volatile organic compounds with integrated observations and chemistry-transport modeling (KAKENHI, PI: H. Tanimoto, 2018-2020)

- Long-term observations of the impacts of climate change on air quality and oceanic deposition in the Asia-Pacific regions, Ministry of Environment, (PI: H. Tanimoto, 2018-2022)

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

- TPOS 2020; Tropical Pacific Observing System 2020 Co-chair: S Wijffels, S. Cravatte 2014-2020

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

- IOCCP SOCONET: International Ocean Carbon Coordination Project / Surface Ocean Carbon Observing Network Proposer: R Wanninkhof, U Schuster, A Sutton, K Tedesco, M Telszewski 2018-

Comments