

Report for the year 2017 and future activities

SOLAS JAPAN

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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.

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 2017 to Jan/Feb 2018

1. Scientific highlight

Rapid increases of VOIs in the surface and bottom waters of Funka Bay

Volatile organic iodine compounds (VOIs) emitted from the ocean surface to the air play an important role in atmospheric chemistry. Shipboard observations were conducted in Funka Bay, Hokkaido, Japan, bimonthly or monthly from 2012 to 2014. The VOI concentrations began to increase after early April at the end of the diatom spring bloom, and represented substantial peaks in June or July. The temporal variation of the C_2H_5I profile, which showed a distinct peak in the bottom layer from April to July, was similar to the PO_4^{3-} variation profile. It was suggested that C_2H_5I production was associated with degradation of organic matter deposited on the bottom after the spring bloom. CH_2I_2 and CH_2ClI concentrations increased substantially in the surface and subsurface layers (0–60 m) in June or July resulted in a clear seasonal variation of the sea-to-air iodine flux of the VOIs (high in summer or autumn and low in spring).

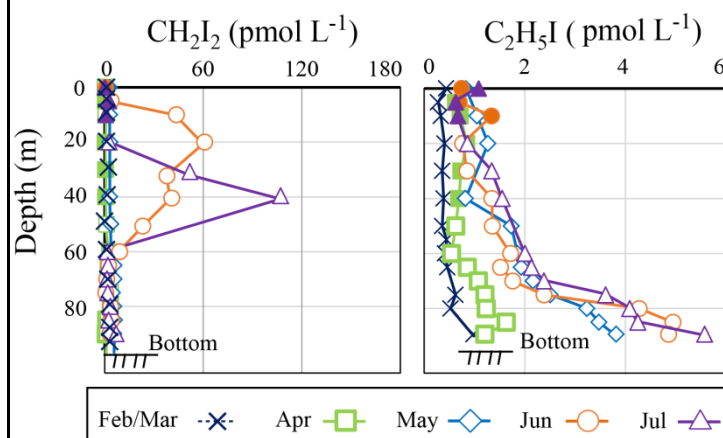


Figure Temporal variations of CH_2I_2 and C_2H_5I concentration profiles in the water column in Funka Bay in 2014. Surface mixed layer is shown by solid symbols, and subsurface (below the mixed layer) is shown by open symbols. Sub-arctic open ocean water (Oyashio water) flows in the bay in March, and stays until August every year. Diatom spring bloom was found in March, 2014. [Modified figures from Shimizu et al., 2017]

Shimizu, Y., A. Ooki, H. Onishi, T. Takatsu, S. Tanaka, Y. Inagaki, K. Suzuki, N. Kobayashi, Y. Kamei, K. Kuma, 2017. Seasonal variation of volatile organic iodine compounds in the water column of Funka Bay, Hokkaido, Japan. *J. Atmos. Chem.* 74, 205-225.

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). Please fill in the specific SOLAS 2015-2025 Science Plan and Organisation Core Theme or Cross-Cutting Theme.

Theme 1: Greenhouse gases and the oceans

Cruise/observation

- Jan-Feb 2017: R/V Mirai (Japanese research vessel) cruise MR16-09, Off Chile and Southern Ocean, Trans South Pacific Project: Ocean acidification, Marine Biodiversity, Pacific Meridional Overturning Circulation, Crustal Evolution (On board: Naomi Harada (PI) and other 10 Japanese), Leonardo Román Castro Cifuentes and other 6 Chilean), Frank Lamy and other 2 German)
- May 2017: R/V Wakataka Maru (Japanese research vessel) cruise, Oyasho area, Ocean acidification and its impact on marine ecosystem on A-line, western North Pacific (On board: Katsunori Kimoto)
- Jul-Aug 2017: R/V Mirai cruise MR17-04, western North Pacific, Biogeochemistry-marine ecosystem observation in the North Pacific and Bering Sea (On board: Tetsuichi Fujiki (PI) and other 10 Japanese).
- Dec 2017: R/V Hakuho maru (Japanese research vessel) cruise KH-17-5, subtropical North Pacific, Physical, chemical and biological observation on the Kuroshio stream (Ichiro Yasuda (PI) and other Japanese)
- Underway measurement of sea surface CO₂ and CH₄ in the western Arctic Ocean (2017/08-09; R/V Mirai; ArCS project; by A Murata)
- Seisui-maru SE17-14 cruise in Ise Bay and coastal area of western North Pacific (chief scientist: Urumu Tsunogai) (from Sep 4 to 7, 2017).

Meetings/collaboration/ workshop

- May 2017: JpGU-AGU Joint Meeting 2017, Chiba, Japan. Responses of marine ecosystems to global warming and ocean acidification in coastal and offshore regions (Convenors: Tsuneo Ono, Masahiko Fujii, Takeshi Yoshimura)
- October 2017: The Oceanographic Society of Japan Fall meeting in 2017, Sendai, Japan. Responses of marine ecosystems to global warming and ocean acidification in coastal and offshore regions (Convenors: Takeshi Yoshimura, Masahiko Fujii, Tsuneo Ono)
- JAMSTEC and Univ. of Concepcion, Chile: Basic research on paleoceanography, biogeochemistry, biology, physical oceanography and geophysics in the coastal area off Chile.

Theme 2: Air-sea interfaces and fluxes of mass and energy

Cruise/observation

- Jun-Aug 2017: Oshoro-maru cruise (C-040) in the northern Bering Sea and southern Chukchi Sea. Observations of physical, chemical, and biological oceanographic parameters. (PI: Atsushi Ooki, Hokkaido University)

- Feb, Mar, Apr, May, Jun, Aug, Oct, and Dec 2017: Ushio-maru cruises in the Funka-Bay, Hokkaido, Japan. Observations of physical, chemical, and biological parameters of oceanography. (Contributor: Atsushi Ooki, Hokkaido University)

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Meetings/collaboration/ workshop

- NIES VOS Program (Atmosphere/Ocean Greenhouse Gas Observation: Japan-North America, Japan-Oceania; Atmosphere Greenhouse Gas Observation: Japan-Southeast Asia)

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Theme 3: Atmospheric deposition and ocean biogeochemistry

Meetings/collaboration/workshop

- August 2017: Goldschmidt 2017, Paris, France, 16d: Atmosphere-Land-Ocean-(Sea)Ice Interaction: LINKS WITH BIOLOGY, CLOUDS, AND CLIMATE (conveners: Markus Frey, Martin King, Nicholas Meskhidze, Akinori Ito, Yves Balkanski, Paul Ginoux, Adi Torfstein, Sophie Bonnet, Eyal Rahav, William Landing)
- January 2018: PAGES-DICE workshop, Las Cruces, Chile (invited speaker: Akinori Ito)
- February 2017: GESAMP WG38 Workshop, Norwich, UK (invited speaker: Akinori Ito)

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

Cruise/observation

- 3-7 July 2017: Sampling of reactive oxygen species in atmosphere and seawater during R/V Toyoshio Maru cruise in Seto Inland Sea, Japan, (PI: Y. Iwamoto)
- 9 August - 6 September 2017: Aerosol and microlayer observation during R/V Hakuho Maru cruise (KH-17-4 led by K. Furuya) which sailed eastern North Pacific (from Vancouver to Honolulu) as part of SSMAP project (PI: K. Hamasaki)

Meetings/collaboration/workshop

- May 2015: JpGU-AGU Joint Meeting 2017, Makuhari Messe, Chiba, Japan. A-TT42 Applying flying boat for promoting Clinical Geosciences (Conveners: Urumu Tsunogai, Mitsuo Uematsu, Hiroshi Tanimoto, and Hiroshi Shinohara) (Presentation: e.g., Urumu Tsunogai, Joji Ishizaka, and Hiroshi Tanimoto).

Theme 5: Ocean biogeochemical control on atmospheric chemistry

Cruise/observation

- A study on efficient heterogeneous activation of sea-salt bromide to the gas-phase by the integrated analysis of TORERO halogen radical and aerosol bromide observations (by R. Volkamer, Y. Miyazaki, et al.).
- 9 August - 6 September 2017: Aerosol and microlayer observation during R/V Hakuho Maru cruise (KH-17-4 led by K. Furuya) which sailed eastern North Pacific (from Vancouver to Honolulu) as part of SSMAP project (PI: K. Hamasaki)

Meetings/collaboration/workshop

- June 2017, Workshop La Reunion, Brussels, Belgium (Convenor: Rainer Volkamer) (Presentation: Y. Miyazaki).
- Ocean and Atmosphere session at Japan Geoscience Union-AGU joint meeting, May

2017, Biogeochemical linkages between the ocean and the atmosphere during phytoplankton bloom (conveners: H. Tanimoto, Y. Miyazaki, K. Suzuki, J. Nishioka).

Cross-Cutting Theme: Upwelling systems, polar oceans, coastal waters

Cruise/observation

- Aug-Oct 2017: R/V Mirai cruise MR17-05c, Chukchi and Beaufort Seas, Ocean warming and acidification: their impact on marine plankton (On board: Shigeto Nishino (PI) and other 15 Japanese).
- February 2017: Southern Sea of Okhotsk, ice breaker SOYA, Ice covered ocean CO₂, CH₄, VOC and Fe dynamics and flux (On board: Jun Nishioka, Daiki Nomura) (Team: Jun Nishioka, Atsushi Ooki, Daiki Nomura, Osamu Yoshida, Yohei Yamashita).
- July 2017: Bowdoin Fjord in northwest Greenland. Effect of glacier melt water input on biogeochemical components in surface water and air-sea flux (On site: Kanna Naoya, Daiki Nomura) (Team: Kanna Naoya, Daiki Nomura, Jun Nishioka).
- August - October 2017: Aerosol and gas observation over the Arctic Ocean, Bering sea and North Western Pacific Ocean
cruise by R/V Mirai (MR17-05C) as part of the ArCS project
- October – December 2017: Aerosol and gas observation over the North Western Pacific Ocean cruise by R/V Hakuohmaru(KH-17-5)
- November 2017 - January 2018: Aerosol and gas observation over the Indian Ocean cruise by R/V Mirai (MR17-08)

Meetings/collaboration/workshop

- ECV-Ice (Measuring Essential Climate Variables in Sea Ice, SCOR working group 152 (Co-chair: Daiki Nomura, François Fripiat, and Brent Else).
- CATCH (The Cryosphere and Atmospheric Chemistry), IGAC (lead: Jennie Thomas, Thorsten Bartels-Rausch, Markus Frey) (SSC member: Daiki Nomura).
- BEPSII (Biogeochemical Processes at Sea Ice Interfaces), SCOR working group 140, and now co-sponsored by CliC (Climate and Cryosphere) and SOLAS (Surface Ocean Lower Atmosphere Study). (Co-chair: Jacqueline Stefels and Nadja Steiner) (Associate Member: Jun Nishioka, Daiki Nomura).
- September 2017, Atmosphere-ice interaction workshop, Tachikawa, Japan (Convenors: SKeiichiro Hara) (Presentation: e.g., Daiki Nomura, Sumito Matoba).
- 15 September 2017: SOLAS related special session in Annual meeting of Geochemical Society of Japan (convener: S. Kameyama, Y. Omori, A. Ooki) (Presentation: e.g., Koji Hamasaki and Hiroshi Tanimoto)
- JAMSTEC and Institute of Marine Research, Norway: Basic Research for Evaluation on the Impacts of Polar Environmental Change on Marine Ecosystem and Climate Change
- JAMSTEC and CSIRO, Australia: Basic Research for Evaluation on the Impacts of Southern Ocean Change on Marine Ecosystem
- January 2018, Workshop for Role of Atmospheric Species at Atmosphere-Ocean Boundary from the View Point of Numerical-Model Study (50 participants(3 oral, 31 poster presentation)) Organizer: Y. Iwamoto, F. Taketani

Cross-Cutting Theme: Science and society

Meetings/collaboration/workshop

- Workshop with stakeholder (Government, Companies, Environmental NGOs) Resilience and Adaptive Capacity of Arctic marine systems under a changing climate (RACArctic) Stakeholder workshop “Responses of Arctic marine ecosystems to climate change: fish and fisheries in the Pacific Arctic, Juneau, Alaska, Mar 21, 2017 (This is international collaboration work between Japan, Norway and USA sponsored by Belmont Forum)

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

- Hu, W., Murata, K., Fukuyama, S., Kawai, Y., Oka, E., Uematsu, M., & Zhang, D. 2017. Concentration and viability of airborne bacteria over the Kuroshio Extension region in the northwestern Pacific Ocean: Data from three cruises. Journal of Geophysical Research, 122, <https://doi.org/10.1002/2017JD027287>.
- Tsunogai, U., T. Miyauchi, T. Ohyama, D.D. Komatsu, M. Ito, and F. Nakagawa, 2018. Quantifying nitrate dynamics in a mesotrophic lake using triple oxygen isotopes as tracers. Limnology and Oceanography, doi:10.1002/lno.10775.
- Ito, A., and J. F. Kok, 2017. Do dust emissions from sparsely vegetated regions dominate atmospheric iron supply to the Southern Ocean?, J. Geophys. Res., 122, 3987 ? 4002, doi:10.1002/2016JD025939.
- Nagashima, K., Nishido, H., Kayama, M., Kurosaki, Y., Ohgo, S. and Hasegawa, H. 2017. Composition of Asian dust from cathodoluminescence spectral analysis of single quartz grains, Geology, 45(10), 879-882.
- Nara H., Tanimoto H., Tohjima Y., Mukai H., Nojiri Y., Machida T. 2017. Emission factors of CO₂, CO and CH₄ from Sumatran peatland fires in 2013 based on shipboard measurements. Tellus B: Chemical and Physical Meteorology, 69:1, 1399047, DOI: 10.1080/16000889.2017.1399047

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.). Please indicate to which of the SOLAS 2015-2025 Science Plan and Organisation Core Themes or Cross-Cutting Themes your information belongs to or specify an overlap between Themes.

General SOLAS

- Seisui-maru (Mie University) cruise in Ise Bay, Mikawa Bay, and coastal area of western North Pacific (chief scientist: Urumu Tsunogai) (from Sep 3 to 6, 2018).
- 18 Jul- 10 Aug, 2018 R/V Mirai cruise, Biogeochemical study by Recover and redeploy of hybrid mooring system at St. K2 (western North Pacific) (Onboard: Tetsuichi Fujiki (PI), Minoru Kitamura, Katsunori Kimoto)
- 17 Jul- 21 Sep, 2018 Prof. Multanofsky (Russian research vessel) cruise, Kuril islands and Bering Sea (Onboard: Jun Nishioka (PI), Maki Noguchi)

Theme 1: Greenhouse gases and the oceans

- 14-26 Jun, 2018 T/V Oshoro maru cruise, Bering Sea, Multi stressors in the Ocean and its impact on marine ecosystem (zooplankton sampling) (On board: Koji Sugie)
- 29 Jun- 15 Jul, 2018 T/V Oshoro maru cruise, Bering and Chukchi Seas Multi stressors in the Ocean and its impact on marine ecosystem (On board: Koji Sugie)

Theme 2: Air-sea interfaces and fluxes of mass and energy

- Mar, Apr, May, Jun, Aug, Oct, and Dec 2018: Ushio-maru cruises in the Funka-Bay, Hokkaido, Japan. Observations of physical, chemical, and biological parameters of oceanography. (Contributor: Atsushi Ooki, Hokkaido University)
- 9-13 July 2018: Sampling of reactive oxygen species in atmosphere and seawater during R/V Toyoshio Maru cruise in Seto Inland Sea, Japan (Y. Iwamoto)

Theme 3: Atmospheric deposition and ocean biogeochemistry

- October - December 2018: 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
- October - December 2018: Aerosol and gas observation over Bay of Bengal cruise by R/V Hakuohmaru (M. Honda)

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

- August 2018: NIES-Hokkaido Univ-KOPRI joint field work on Arctic observation (H. Tanimoto, S. Kameyama, joint with Jinyoung Jung at KOPRI).

Theme 5: Ocean biogeochemical control on atmospheric chemistry

- Mar-June 2018: BIO-MAIDO, 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: Y. Miyazaki)
- Observation by R/V Mirai in Spring 2020, Title: Impact assessment of Asian atmospheric trace species on the marine biogeochemistry in the western North Pacific (Grant-in-Aid for Scientific Research) Microbiology of the sea surface microlayer and atmospheric aerosols: The frontier of linking biological activities and the climate" (PI: K. Hamasakai, FY2016-2019)

Cross-Cutting Theme: Upwelling systems, polar oceans, coastal waters

- February 2018: Southern Sea of Okhotsk, ice breaker SOYA, Surface Ocean CO₂, CH₄, VOC and Fe dynamics and flux (On board: Daiki Nomura) (Team: Daiki Nomura, Jun Nishioka, Atsushi Ooki, Osamu Yoshida, Yohei Yamashita).
- March 2018: Saroma-ko Lagoon, Hokkaido, Japan. Intercalibration experiment for sea ice biogeochemistry (primary production and gas flux) for SCOR Working Group 152 (ECV-Ice) (On ice: Daiki Nomura, Koji Suzuki, Toru Hirawake) (Team: Daiki Nomura, Fripiat Fripiat, Brent Else, Koji Suzuki, Toru Hirawake, ECV-Ice and BEPSII members)
- June 2018: The Roland von Glasow Air-Sea-Ice Chamber, UEA, UK. Intercalibration experiment for sea ice biogeochemistry (gas measurement in sea ice) for SCOR Working Group 152 (ECV-Ice) (On site: Daiki Nomura) (Team: Daiki Nomura, Atsushi

- Ooki, ECV-Ice and CATCH members)
- March 2019: Cambridge Bay, Canada. Intercalibration experiment for sea ice biogeochemistry (primary production and gas flux) for SCOR Working Group 152 (ECV-Ice) (On ice: Daiki Nomura) (Team: Daiki Nomura, Fripiat Fripiat, Brent Else, ECV-Ice and BEPSII members)
 - Fall 2019- Fall 2020: MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) A year Cruise. Arctic Ocean, ice breaker Polarstern. Surface Ocean and sea ice CO₂, CH₄, VOC and flux (On board (one of leg): Daiki Nomura) (Team: Daiki Nomura, Atsushi Ooki, Ellen Damm, Brice Loose, Jun Inoue).
 - Aug, 2018 I/B Araon (Korean ice breaker) cruise, Chukchi and Beaufort Seas, Ocean warming and acidification: their impact on marine plankton (On board: Jonaotaro Onodera and other 3 Japanese and 10-20 Korean)
 - 27 Nov, 2018- 23 Mar, 2019 I/B Shirase (Japanese ice breaker), Southern Ocean, Nitrogen cycle in the Southern Ocean, the 60th Japanese Antarctic Research Expedition (On board: Naomi Harada (PI of summer party) and others)
 - 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)
 - June 2018: T/V Oshoro-maru Arctic expedition (T. Hirawake, A. Ooki, K. Sugie, S. Kameyama etc.)

2. Events like conferences, workshops, meetings, schools, capacity building etc. (incl. all information possible). Please indicate to which of the SOLAS Core Themes or Cross-Cutting Themes your information belongs to or specify an overlap between Themes.

Theme 1: Greenhouse gases and the oceans

- Workshop for air-sea interaction study (F. Taketani and Y. Iwamoto)
- 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 5: Ocean biogeochemical control on atmospheric chemistry

- Ocean and Atmosphere session at Japan Geoscience Union meeting, May 2018, Biogeochemical linkages between the ocean and the atmosphere during phytoplankton bloom (convenors: Y. Miyazaki, Y. Iwamoto, J. Nishioka, K. Suzuki).
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Cross-Cutting Theme: Upwelling systems, polar oceans, coastal waters

- Workshop with stakeholder (Government, Companies, Environmental NGOs) Resilience and Adaptive Capacity of Arctic marine systems under a changing climate (RACArctic) Stakeholder workshop "Responses of Arctic marine ecosystems to climate change: fish and fisheries in the Pacific Arctic, Tromso, Norway, Mar 6, 2018 (This is international collaboration work between Japan, Norway and USA sponsored by Belmont Forum)

3. Funded national and international projects / activities underway. Please indicate to which of the SOLAS Core Themes or Cross-Cutting Themes your information belongs to or specify an overlap between Themes.

Theme 1: Greenhouse gases and the oceans

- Deployment of drifting buoys with pCO₂ sensor in the Pacific Ocean founded by the Ministry of Environment of Japan (PI: A Murata; 2016-2021)
- Researches of greenhouse gases and their relevant pollutants in the atmosphere and in the ocean by NIES, supported by the fund of Global Environmental Research Coordination System from the Ministry of the Environment, Japan (H. Tanimoto, S. Nakaoka).
- NIES VOS Program planned until 2020 (Atmospheric/Oceanic Greenhouse Gas Observation: Japan-North America, Japan-Oceania; Atmospheric Greenhouse Gas Observation: Japan-Southeast Asia) (H. Tanimoto, S. Nakaoka).

Theme 3: Atmospheric deposition and ocean biogeochemistry

- 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).
- 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)

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

- 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)

Cross-Cutting Theme: Upwelling systems, polar oceans, coastal waters

- Resilience and Adaptive Capacity of Arctic marine systems under a changing climate (RACArctic) project. This is international collaboration project between Japan, Norway and USA sponsored by Belmont Forum from Jul 2015 to Jun 2018.
- Biogeochemical linkage between Polar and subarctic ocean, MEXT/JSPS Grant-in-Aid for Scientific Research (A) (PI: J. Nishioka, FY2017-2020).
- Arctic Challenge for Sustainability: Arctic region research project covering natural and social sciences. This is a national flagship project funded by the Ministry of Education, Culture, Sports, Science and Technology, Japan. The National Institute of Polar Research (NIPR), Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and Hokkaido University are playing the key roles in this project, and will continue to carry it out from Sep 2015 to Mar 2020.

4. Plans / ideas for future projects, programmes, proposals national or international etc. (please indicate the funding agencies and potential submission dates). Please indicate to which of the SOLAS Core Themes or Cross-Cutting Themes your information belongs to or specify an overlap between Themes.

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

- NIES supports international pCO₂ database of Surface Ocean CO₂ Atlas (SOCAT) by providing NIES VOS pCO₂ data as well as by executing quality control to the submitted data measured by other institutes mainly in the North Pacific as a responsible institute of the SOCAT.

Comments