

Report for the year 2015 and future activities

SOLAS Japan

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Please note that this report has two parts!

Part 1: reporting of activities in the period of January 2015 – December 2015

Part 2: reporting on planned activities for 2016 to 2018/19.

The information provided will be used for reporting, fundraising, networking and strategic development. In particular, **in 2016 SOLAS will develop its Implementation Plan, which will be largely based on the information from part 2 of the national reports, as well as input from international SOLAS initiatives and activities.** This info will be crucial in order to draft a realistic Implementation Plan representative of SOLAS, internationally.

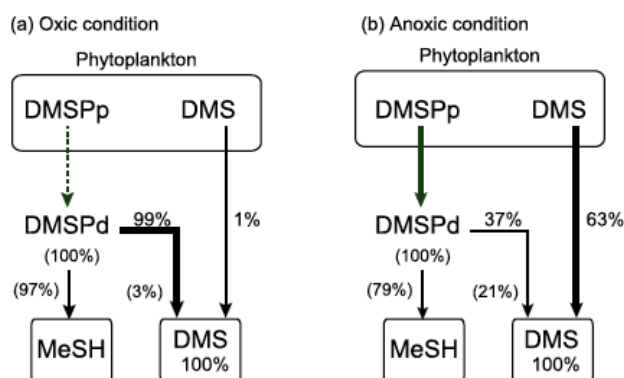
IMPORTANT: May we remind you that this report should reflect the efforts of the SOLAS community in the **entire country** you are representing (all universities, institutes, lab, units, groups)!

PART 1 - Activities from January 2015 to December 2015

1. Scientific highlight

Enhancement of dimethylsulfide production by anoxic stress

Dimethylsulfide (DMS) is produced by phytoplankton in the ocean and plays an important role in biogeochemical cycles and climate system of the Earth. Previous field studies reported a possible relationship between DMS enhancement and anoxic condition, although the governing processes are still to be identified. Here we show the first direct evidence for the enhancement of DMS production by natural planktonic assemblages caused by anoxic stress. Under the anoxic condition, DMS production was considerably enhanced and DMS bacterial consumption was inhibited, resulting in an eightfold higher rate of gross DMS production than that under the oxic condition. Our results demonstrated that anoxic stress is one of important “environmental factors” in the marine



DMS dynamics, suggesting the possible global importance due to ubiquity of anoxic conditions in the coastal oceans. This process would become more important in the future due to expansion of coastal hypoxic and anoxic zones by global warming.

Figure: Diagrams of the paths and fates of DMS production and DMSP degradation under (a) oxic and (b) anoxic conditions in the bay water.

Omori, Y., H. Tanimoto, S. Inomata, S. Wada, K. Thume, G. Pohnert, Enhancement of dimethylsulfide production by anoxic stress in natural seawater, *Geophys. Res. Lett.*, 42, 4047–4053, doi:10.1002/2015GL063546, 2015.

2. Activities/main accomplishments in 2015 (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.)

Events:

- Nov. 2015: SOLAS-Japan synthesis presentation as part of the IGBP-Japan 25th anniversary special symposium, "Biogeochemical cycles between surface ocean and lower atmosphere and its impacts on climate" (by Y. Nojiri)

Field campaign:

- March 2015: "Influence of Okhotsk sea-ice melt-water on productivity and biogeochemical processes", R/V Hakuho-Maru cruise made in the coastal Oyashio and Oyashio region of the western North Pacific Ocean (KH-15-1 led by J. Nishioka) - measurements of volatile organic compounds (VOCs) in air and seawater, chemical components in submicron aerosols, and CCN were made in order to assess the effect of the phytoplankton blooms on trace gases and submicron organic aerosols and the resulting climatic and environmental impacts
- July 2015: "Evaluation of sampling methods for DMS in seawater" at Akkeshi Bay (by S. Kameyama)
- August-October 2015: Arctic Ocean cruise by R/V Mirai (MR-15-03) as part of the ArCS project
- November 2015: Atmospheric gas and aerosol observation during R/V Hakuho-maru cruise (KH-15-4 led by H. Saito) which sailed Kuroshio region in the western North Pacific

Projects:

- The NIES (National Institute for Environmental Studies) VOS program using cargo ships for atmospheric/oceanic CO₂ observations in the North Pacific and the south-eastern Asia (atmospheric only), and frequent and accurate observations of marine phytoplankton pigments and light regimes (by S. Nakaoka, H. Tanimoto, Y. Tohjima, K. Suzuki, Y. Nojiri, et al)

Data analysis:

- SOLAS-relevant activities in the NEOPS (New Ocean Paradigm on its Biogeochemistry, Ecosystem and Sustainable Use) project - observations of sea-to-air flux of DMS and other VOCs, and of physical and chemical properties of marine aerosols at the north-south transect in the western Pacific (by Y. Miyazaki, M. Mochida, Y. Iwamoto, Y. Omori, H. Tanimoto, M. Uematsu)

International collaborations:

- Contribution to the review paper entitled "Methods for Biogeochemical Studies of Sea Ice: The State of the Art, Caveats, and Recommendation" by Miller et al. (with D. Nomura as a co-author), *Elementa*, 3, 000038, doi:10.12952/journal.elementa.000038, 2015.

3. Top 5 publications in 2015 (only PUBLISHED articles) and if any weblinks to models, datasets, products, etc.

Omori, Y., H. Tanimoto, S. Inomata, S. Wada, K. Thume, G. Pohnert, 2015, Enhancement of dimethylsulfide production by anoxic stress in natural seawater, *Geophys. Res. Lett.*, 42, 4047–4053, doi:10.1002/2015GL063546.

Tohjima, Y., Y. Terao, H. Mukai, T. Machida, Y. Nojiri, and S. Makyutov, 2015, ENSO-related variability in latitudinal distribution of annual mean atmospheric potential oxygen (APO) in the equatorial Western Pacific, *Tellus B*, 67, 25869, <http://dx.doi.org/10.3402/tellusb.v67.25869>.

Cui, Y., S. Suzuki, Y. Omori, S.-K. Wong, M. Ijichi, R. Kaneko, S. Kameyama, H. Tanimoto, and K. Hamasaki, 2015, Abundance and distribution of dimethylsulfoniopropionate degradation genes and the corresponding bacterial community structure at dimethyl sulfide hotspots in the tropical and subtropical Pacific Ocean, *Appl. Environ. Microbiol.*, 81(12), 4184–4194, doi: 10.1128/AEM.03873-14.

Ooki, A., D. Nomura, S. Nishino, T. Kikuchi, Y. Yokouchi, 2015, A global-scale map of isoprene and volatile organic iodine in surface seawater of the Arctic, Northwest Pacific, Indian, and Southern oceans, *J. Geophys. Res.-Oceans*, 120, doi:10.1002/2014JC010519.

Taketani, F., T. Miyakawa, H. Takashima, Y. Komazaki, X. Pan, Y. Kanaya, and J. Inoue, 2016, Shipborne observations of atmospheric black carbon aerosol particles over the Arctic Ocean, Bering Sea, and North Pacific Ocean during September 2014, *J. Geophys. Res.-Atmos.*, 121, doi:10.1002/2015JD023648.

Products: Uematsu, M., S. Takeda, Y. Nojiri, and H. Tanimoto, 2015, Biogeochemical cycles between surface ocean and lower atmosphere and its impacts on climate (in Japanese), *Global Environment*, 20(2), 195-202.

Weblinks: Monitoring of atmosphere-ocean carbon dioxide exchange by Ship-of-Opportunity (SOOP) website (<http://soop.jp>)

PART 2 - Planned activities from 2016 to 2018/19

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:

- 2016– NIES VOS program, and collaboration with international partners including IOS (Institute of Ocean Science, Canada), CSIRO (Commonwealth Scientific and Industrial Research Organisation, Australia), NIWA (National Institute for Water and Atmosphere, New Zealand) on data sharing and joint analysis
- Summer 2016: Australian cruise around the coastal Great Barrier Reef with Japanese contribution on seawater measurements of VOCs (contributors: H. Tanimoto, Y. Omori)
- Feb-Dec 2016, Hokkaido Bay study for dynamics of nutrient and VOCs in seawater (led by A. Ooki).
- Feb-Mar 2016, Okhotsk Sea study for sea ice observation (led by D. Nomura)
- Summer 2018, Arctic Ocean observations (as part of ArCS, NABOS-II projects)
- Research cruises in the Pacific Ocean by R/V Hakuho-Marui and Shinsei-Marui

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

Workshop:

- SOLAS-Japan National Committee annual meeting (led by Y. Yamanaka)
- March 2016: Joint NIES-KOPRI workshop on the Arctic observations (by H. Tanimoto)

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 the activity topics relate – including the themes on ‘SOLAS science and society’ and ‘Geoengineering’)

National projects:

- NIES VOS program funded by the Ministry of Environment of Japan,
- Studies of ocean surface CO₂ partial pressure and nutrients mappings using international integrated databases (PI: S. Nakaoka), FY2014-2016.
- Long-term, comprehensive observation of long-lived greenhouse gases and short-lived climate pollutants in the Asia-Oceania Regions (PI: H. Tanimoto), FY2012-2016.
- Integrative observational study of oxygen and isotopes of carbon dioxide in the atmosphere to investigate the climate responses of the global carbon cycle (PI: Y. Tohjima), FY2014-2018.
- JAXA GCOM RA6
- Highly frequent and accurate observations of marine phytoplankton pigments and light regimes for the validation of SGLI/GCOM-C data (PI: Koji Suzuki)
- ArCS project (<http://www.arcs-pro.jp/en/index.html>) jointly teamed by NIPR, JAMSTEC, and Hokkaido University
- MEXT/JSPS Grant-in-Aid for Scientific Research funded to several SOLAS-relevant projects, including "Determination on the triple oxygen isotopes of tropospheric ozone" (PI: U. Tsunogai, FY2014-2016), "Global observations of VOCs dissolved in the surface ocean using novel time-of-flight mass spectrometry" (PI: H. Tanimoto, FY2015-2018)

International projects:

- NABOSS-II (<http://research.iarc.uaf.edu/NABOS2/>) (contributor: D. Nomura)
- SCOR (http://www.scor-int.org/SCOR_WGs_WG140.htm) (contributor: D. Nomura)

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)

- "New earth and planetary science using a flying boat" (led by U. Tsunogai) to be submitted to the Science Council of Japan, asking for an endorsement.
- The SOLAS-Japan National Committee will discuss the transition to Future Earth in collaboration with other National Committees for IGAC, IMBER, LOICZ and GEOTRACES.

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

None

Comments

None