surface ocean solas lower atmosphere study

Report for the year 2022 and future activities

SOLAS *Canada*

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This report has two parts:

***- Part 1:** reporting of activities in the period of January 2022 - Jan/Feb 2023*
***- Part 2:** reporting on planned activities for 2023 and 2024.*

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 of high sensitivity systems;
Environmental impacts of geoengineering;
Science and society**.**

IMPORTANT*: This report should reflect the efforts of the SOLAS community in the* ***<u>entire country</u>*** *you are representing (all universities, institutes, lab, units, groups, cities).*

First things first…Please tell us what the IPO may do to help you in your current and future SOLAS activities. ?

The Canadian community thanks the members of the SOLAS IPO for their continued efforts in serving the SSC and the SOLAS community at large as well as in communicating SOLAS-related research.

PART 1 - Activities from January 2022 to Jan/Feb 2023

1. Scientific highlight

1. **Clean air policies are key for successfully mitigating Arctic warming**

A tighter integration of modeling frameworks for climate and air quality is urgently needed to assess the impacts of clean air policies on future Arctic and global climate. This paper combines a new model emulator and comprehensive emissions scenarios for air pollutants and greenhouse gases to assess climate and human health co-benefits of emissions reductions. Fossil fuel use is projected to rapidly decline in an increasingly sustainable world, resulting in farreaching air quality benefits. Despite human health benefits, reductions in sulfur emissions in a more sustainable world could enhance Arctic warming by 0.8 °C in 2050 relative to the 1995–2014, thereby offsetting climate benefits of greenhouse gas reductions. Targeted and technically feasible emissions reduction opportunities exist for achieving simultaneous climate and human health co-benefits. It would be particularly beneficial to unlock a newly identified mitigation potential for carbon particulate matter, yielding Arctic climate benefits equivalent to those from carbon dioxide reductions by 2050.

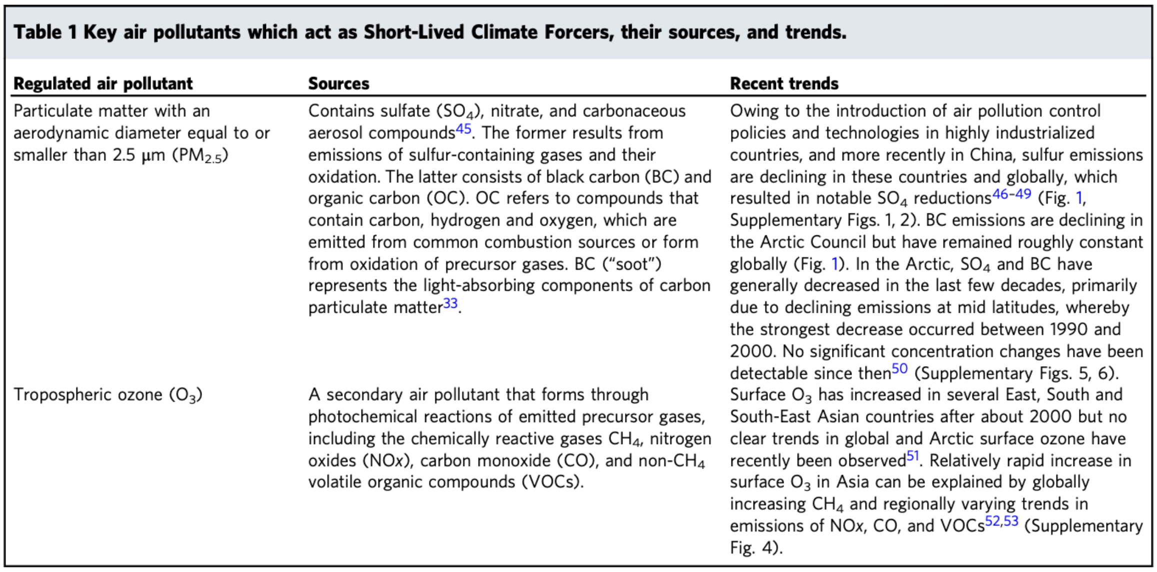

Table 1 Key air pollutants which act as Short-Lived Climate Forcers, their sources, and trends.

Regulated air pollutant	Sources	Recent trends
Particulate matter with an aerodynamic diameter equal to or smaller than 2.5 µm ($PM_{2.5}$)	Contains sulfate (SO_4), nitrate, and carbonaceous aerosol compounds[45]. The former results from emissions of sulfur-containing gases and their oxidation. The latter consists of black carbon (BC) and organic carbon (OC). OC refers to compounds that contain carbon, hydrogen and oxygen, which are emitted from common combustion sources or form from oxidation of precursor gases. BC ("soot") represents the light-absorbing components of carbon particulate matter[33].	Owing to the introduction of air pollution control policies and technologies in highly industrialized countries, and more recently in China, sulfur emissions are declining in these countries and globally, which resulted in notable SO_4 reductions[46–49] (Fig. 1, Supplementary Figs. 1, 2). BC emissions are declining in the Arctic Council but have remained roughly constant globally (Fig. 1). In the Arctic, SO_4 and BC have generally decreased in the last few decades, primarily due to declining emissions at mid latitudes, whereby the strongest decrease occurred between 1990 and 2000. No significant concentration changes have been detectable since then[50] (Supplementary Figs. 5, 6).
Tropospheric ozone (O_3)	A secondary air pollutant that forms through photochemical reactions of emitted precursor gases, including the chemically reactive gases CH_4, nitrogen oxides (NOx), carbon monoxide (CO), and non-CH_4 volatile organic compounds (VOCs).	Surface O_3 has increased in several East, South and South-East Asian countries after about 2000 but no clear trends in global and Arctic surface ozone have recently been observed[51]. Relatively rapid increase in surface O_3 in Asia can be explained by globally increasing CH_4 and regionally varying trends in emissions of NOx, CO, and VOCs[52,53] (Supplementary Fig. 4).

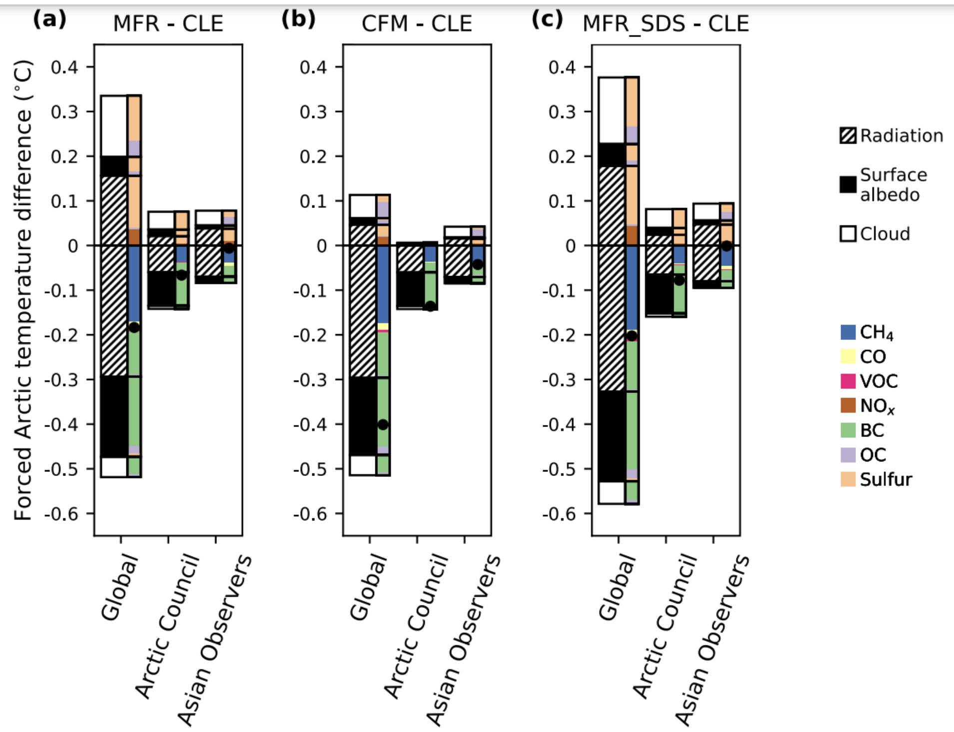

Fig. 3 Impacts of changes in air pollution on future Arctic climate. a Differences in forced Arctic temperatures in 2050 are shown between Maximum Feasible Reduction, **b** Climate Forcing Mitigation, Sustainable Development activity (**c**) scenarios and the Current LEgislation scenario. The differences are broken down into contributions of global and regional emissions of chemically reactive species and the radiative forcing processes that are associated with these emissions. 3 different radiative forcing processes are considered, indicated by wide bars (hatched, black, and white; for interactions of air pollutants and CH_4 with radiation, surface albedo, and clouds, respectively, see legend). Narrow colored bars refer to emissions of 7 reactive species (see legend) from global sources and two regions (Arctic Council, and Asian Arctic Council Observer countries: Japan, People's Republic of China, Republic of India, Republic of Korea, Republic of Singapore). Black bullets refer to the net temperature changes associated with global and regional emissions. Supplementary Fig. 10 provides the corresponding global temperature differences.

Citation: von Salzen, K., Whaley, C.H., Anenberg, S.C. *et al.* (2022). Clean air policies are key for successfully mitigating Arctic warming. *Commun Earth Environ* 3, 222, https://doi-org.acces.bibl.ulaval.ca/10.1038/s43247-022-00555-x

2. Iodine emission from the reactive uptake of ozone to simulated seawater

This paper studies the detailed chemistry that occurs between ozone and inorganic seawater components that lead to the release of molecular iodine to the gas phase. As well, it demonstrates that realistic marine organic material from phytoplankton cultures inhibits iodine release through an unknown mechanism.

The heterogeneous reaction of ozone and iodide is both an important source of atmospheric iodine and dry deposition pathway of ozone in marine environments. While the iodine generated from this reaction is primarily in the form of HOI and I2, there is also evidence of volatile organoiodide compound emissions in the presence of organics without biological activity occurring [M. Martino, G. P. Mills, J. Woeltjen and P. S. Liss, A new source of volatile organoiodine compounds in surface seawater, Geophys. Res. Lett., 2009, 36, L01609, L. Tinel, T. J. Adams, L. D. J. Hollis, A. J. M. Bridger, R. J. Chance, M. W. Ward, S. M. Ball, and L. J. Carpenter, Influence of the Sea Surface Microlayer on Oceanic Iodine Emissions, Environ. Sci. Technol., 2020, 54, 13228–13237]. In this study, we evaluate our fundamental understanding of the ozonolysis of iodide which leads to gas-phase iodine emissions. To do this, we compare experimental measurements of ozone-driven gas-phase I2 formation in a flow tube to predictions made with the kinetic multilayer model for surface and bulk chemistry (KM-SUB). The KM-SUB model uses literature rate coefficients used in current atmospheric chemistry models to predict I2(g) formation in pH-buffered solutions of marine composition containing chloride, bromide, and iodide compared to solutions containing only iodide. Experimentally, I2(g) formation was found to be suppressed in solutions containing seawater levels of chloride compared to solutions containing only iodide, but the model does not predict this effect using literature rate constants. However, the model is able to predict this trend upon adjustment of two specific reaction rate constants. To more closely represent true oceanic conditions, we add an organic component to the proxy seawater solutions using material generated from Thalassiosira pseudonana phytoplankton cultures. Whereas the rate of ozone deposition is unaffected, the formation rate of I2(g) is strongly suppressed in the presence of biological organic material, indicative of a sink or reduction of reactive iodine formed during the oxidation process.

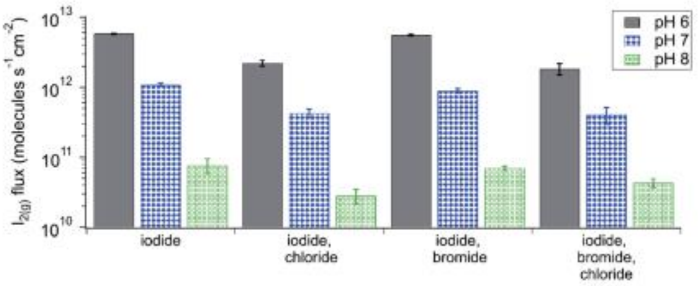

Fig. 2 $I_{2(g)}$ mixing ratio at the end of the flow tube measured after 25 minutes of ozone exposure from the different salt solutions. The different pHs are represented by the colour and shading of the bars, and the composition of the solution is described on the *x*-axis.

Citation. S.R. Schneider, P.S.J. Lakey, M. Shiraiwa, J.P.D. Abbatt (2023). Iodine emission from the reactive uptake of ozone to simulated seawater, *Environmental Science*: Processes and Impacts, doi.org/10.1039/D2EM00111J.

3. Sea-air transfer of a tracer dye observed during the Tracer Release Experiment with implications for airborne contaminant exposure

Rhodamine water tracer (RWT) released during the 2021 Tracer Release Experiment in the St. Lawrence Estuary provides a proxy for the water-soluble fractions of contaminant spills. Measurements of total and size-resolved aerosols were taken onboard a research vessel throughout the experiment. Size-resolved aerosol measurements show airborne transmission of water-soluble RWT in a bimodal distribution peaking at 5.2 µm and 0.9 µm. Highest aerosol RWT (30.5 pg m^{-3}) was observed in the 12-hour daytime period following the first dye release (Sept. 5), while the lowest (8.8 pg m^{-3}) was observed in the subsequent nighttime sample. Available wind and RWT patch information were used to identify factors contributing to the factor-of-three variation in aerosol RWT concentrations. Negligible correlations were found between aerosol RWT and wind speed and sample time-of-day. Wind direction is isolated as the key variable for consideration in identifying the impact of contaminant spills on coastal and inland communities.

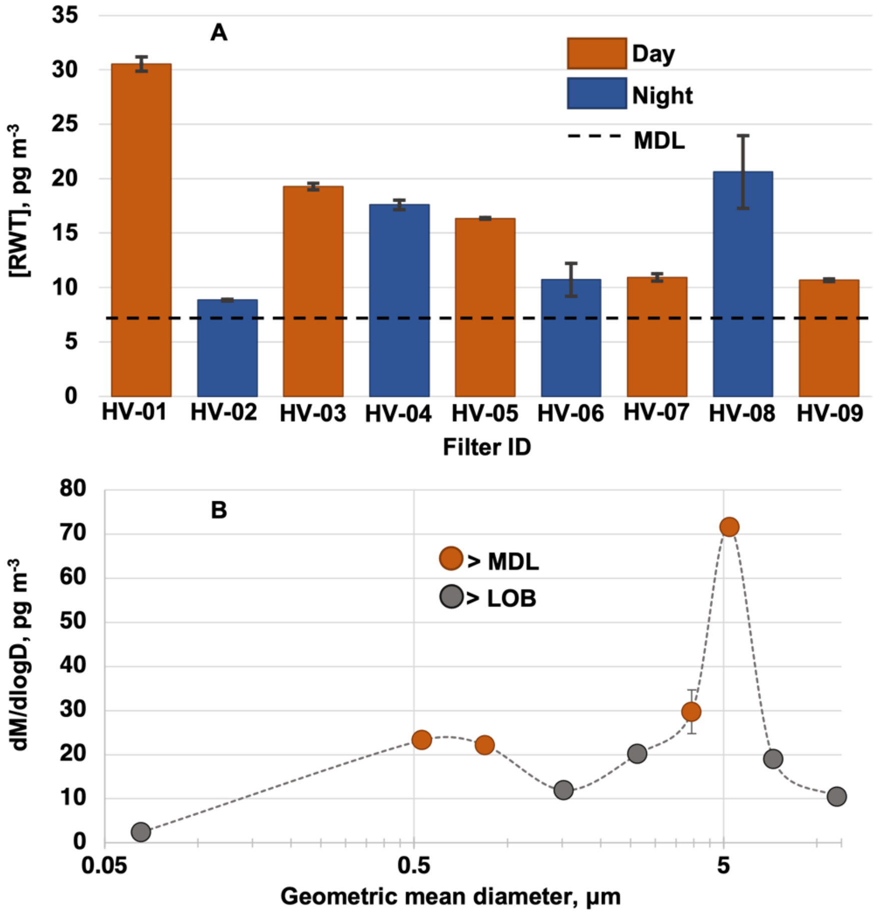

Fig 1. A) RWT concentrations (pg m^{-3}) determined from filter samples collected in the high-volume (HV) sampler. Orange and blue bars indicate daytime and nighttime samples, respectively. Error bars represent the 95% confidence interval as estimated from triplicate fluorescence measurements of the filter extract (Table 1, $[RWT]_{ext}$). All HV samples had RWT levels above the MDL, shown by the overlaid dashed black line. B) Normalized size distribution of collected aerosols (the measured mass concentration is divided by the bin width, giving a normalized concentration value that is independent of the bin width) as determined from RWT collected in the 9-stage Anderson impactor (AI), with aerodynamic size cut of each stage shown on the x-axis. Orange points indicate RWT concentrations above the method detection limit (MDL); grey points indicate those above the level of blank (LOB) but below the MDL.

Citation: Weagle, C. L., R. Saint-Louis, E. Dumas-Lefebvre, C. Chavanne, D. Dumont, R.Y.-W. Chang (2022). Sea-air transfer of a tracer dye observed during the Tracer Release Experiment with implications for airborne contaminant exposure, *Marine Pollution Bulletin*, 182, 113945, https://doi.org/10.1016/j.marpolbul.2022.113945

2. Activities/main accomplishments in 2022 (e.g., projects; field campaigns; workshops and conferences; model and data intercomparisons; capacity building; international collaborations; contributions to int. assessments such as IPCC; collaborations with social sciences, humanities, medicine, economics and/or arts; interactions with policy makers, companies, and/or journalists and media).

1. BEPSII winter school, Cambridge Bay, 14-23 May, 2022. An international intercomparison project for sea-ice biogeochemistry and an ECR fields school was performed at CHARS through BEPSII. https://sites.google.com/site/bepsiiwg140/blog/bepsii-sea-ice-school-2022 (B. Else)
2. Workshop on representing polar air-sea gas exchange in Earth system models. March 14 & 17, 2022. Co-convened by Canadians and Norwegians, hosted by the EU CRiceS project. (B. Else, L. Miller)

3. CIce2Clouds annual meeting, September 23-24, 2022. Cape Town, South Africa. SCOR working group co-chaired by Canadian, with additional Canadian senior and early-career membership. (N. Steiner, I. Deschepper, L. Miller, E. Wilcox)
4. FATIMA - Aerosol and fog droplet size distributions were measured in the North Atlantic as part of the Fog and Turbulence Interactions in the Marine Atmosphere (FATIMA) led by Joe Fernando at University of Notre Dame, July 1-31, 2022 (R. Y.-W Chang).
5. Fog (cloud) measurements on Mt. Soledad as part of the Eastern Pacific Cloud Aerosol Precipitation Experiment led by Lynn Russell at University of California San Diego started in February 2023 (R. Y.-W Chang).

3. Publications in 2022 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.

Note that this is a non-exhaustive list.

Papers:

1. Amiraux, R., C.J. Mundy, Marie Pierrejean, Andrea Niemi, Kevin J. Hedges, Thomas A. Brown, Jens K. Ehn, Kyle H. Elliott, Steven H. Ferguson, Aaron T. Fisk, Grant Gilchrist, Les N. Harris, Katrin Iken, Kevin B. Jacobs, Kelsey F. Johnson, Z.A. Kuzyk, Audrey Limoges, Tracey N. Loewen, Oliver P. Love, Cory J.D. Matthews, Wesley R. Ogloff, Bruno Rosenberg, Janne E. Søreide, Cortney A. Watt, David J. Yurkowski (2023). Tracing carbon flow and trophic structure of a coastal Arctic marine food web using highly branched isoprenoids and carbon, nitrogen and sulfur stable isotopes, *Ecological Indicators*, Volume 147, 109938, https://doi.org/10.1016/j.ecolind.2023.109938.
2. Behnke, J., Cai, Y., Gu, H., & LaRoche, J. (2023). Short-term response to iron resupply in an iron-limited open ocean diatom reveals rapid decay of iron-responsive transcripts. *PLOS ONE*, *18*(1), e0280827. https://doi.org/10.1371/journal.pone.0280827.
3. Bruyant, F., R. Amiraux, M.-P. Amyot, P. Archambault, L. Artigue, L. Barbedo de Freitas, G. Bécu, S. Bélanger, P. Bourgain, A. Bricaud, E. Brouard, C. Brunet, T. Burgers, D. Caleb, K. Chalut, H. Claustre, V. Cornet-Barthaux, P. Coupel, M. Cusa, F. Cusset, L. Dadaglio, M. Davelaar, G. Deslongchamps, C. Dimier, J. Dinasquet, D. Dumont, B. Else, I. Eulaers, J. Ferland, G. Filteau, M.-H. Forget, J. Fort, L. Fortier, M. Galí, M. Gallinari, S.-E. Garbus, N. Garcia, C. Gérikas Ribeiro, C. Gombault, P. Gourvil, C. Goyens, C. Grant, P.-L. Grondin, P. Guillot, S. Hillion, R. Hussher, F. Joux, H. Joy-Warren, G. Joyal, D. Kieber, A. Lafond, J. Lagunas, P. Lajeunesse, C. Lalande, J. Larivière, F. Le Gall, K. Leblanc, M. Leblanc, J. Legras, K. Lévesque, K.-M. Lewis, E. Leymarie, A. Leynaert, T. Linkowski, Martine Lizotte, A. Lopes dos Santos, C. Marec, D. Marie, G. Massé, P. Massicotte, A. Matsuoka, L.A. Miller, S. Mirshak, N. Morata, B. Moriceau, P.-I. Morin, S. Morisset, A. Mosbech, A. Mucci, G. Nadaï, C. Nozais, I. Obernosterer, T. Paire, C. Panagiotopoulos, M. Parenteau, N. Pelletier, M. Picheral, B. Quéguiner, P. Raimbault, J. Ras, E. Rehm, L. Ribot Lacosta, J.-F. Rontani, B. Saint-Béat, J. Sansoulet, N. Sardet, C. Schmechtig, A. Sciandra, R. Sempéré, C. Sévigny, J. Toullec, M. Tragin, J.-É. Tremblay, A.-P. Trottier, D. Vaulot, A. Vladoiu, L. Xue, G. Yunda-Guarin, and M. Babin (2022). he Green Edge cruise: investigating the marginal ice zone processes during late spring and early summer to understand the fate of the Arctic phytoplankton bloom. *Earth System Science Data* **14**:4607-42, doi: 10.5194/essd-14-4607-2022. TChang, R. Y.-W. , J.P.D. Abbatt, M. Boyer, J.P. Chaubey, D. Collins, “Characterizing the hygroscopicity of growing particles in the Canadian Arctic summer”, *Atmospheric Chemistry and Physics*, 22, 8059-8071, 2022, https://doi.org/10.5194/acp-22-8059-2022.
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6. Heerah, K.M., Reader, H.E. (2022). Towards the identification of humic ligands associated with iron transport through a salinity gradient. *Sci Rep* 12, 15545,. https://doi-org.acces.bibl.ulaval.ca/10.1038/s41598-022-19618-2
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droplet residuals and aerosol particles during the Arctic Ocean 2018 expedition, *Journal of Geophysical Research – Atmospheres*, 127(11), e2021JD036383.

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12. Siegel, S., A. Neuberger, L. Karlsson; P. Zieger, F. Mattsson, P. Duplessis,L. Dada, K. Daellenbach, J. Schmale, A. Baccarini, R. Krejci, B. Svenningsson, R. Chang, A. Ekman, I. Riipinen, C. Mohr, Claudia (2022). Using novel molecular-level chemical composition observations of High Arctic organic aerosol for predictions of cloud condensation nuclei", *Environmental Science & Technology*, 56(19), 13888-13899, https://doi.org/10.1021/acs.est.2c02162.
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15. von Salzen, K., Whaley, C.H., Anenberg, S.C. *et al.* (2022). Clean air policies are key for successfully mitigating Arctic warming. *Commun Earth Environ* 3, 222, https://doi-org.acces.bibl.ulaval.ca/10.1038/s43247-022-00555-x.
16. Wang, H., Peng, Y., von Salzen, K., Yang, Y., Zhou, W., and Zhao, D. (2022). Evaluation of a quasi-steady-state approximation of the cloud droplet growth equation (QDGE) scheme for aerosol activation in global models using multiple aircraft data over both continental and marine environments, *Geosci. Model Dev.*, 15, 2949–2971, https://doi.org/10.5194/gmd-15-2949-2022.
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19. Whaley, C. H., Law, K. S., Hjorth, J. L., Skov, H., Arnold, S. R., Langner, J., Pernov, J. B., Bergeron, G., Bourgeois, I., Christensen, J. H., Chien, R.-Y., Deushi, M., Dong, X., Effertz, P., Faluvegi, G., Flanner, M., Fu, J. S., Gauss, M., Huey, G., Im, U., Kivi, R., Marelle, L., Onishi, T., Oshima, N., Petropavlovskikh, I., Peischl, J., Plummer, D. A., Pozzoli, L., Raut, J.-C., Ryerson, T., Skeie, R., Solberg, S., Thomas, M. A., Thompson, C., Tsigaridis, K., Tsyro, S., Turnock, S. T., von Salzen, K., and Tarasick, D. W. (2023). Arctic tropospheric ozone: assessment of current knowledge and model performance, *Atmos. Chem. Phys*., 23, 637–661, https://doi.org/10.5194/acp-23-637-2023.
20. Whaley, C. H., Mahmood, R., von Salzen, K., Winter, B., Eckhardt, S., Arnold, S., Beagley, S., Becagli, S., Chien, R.-Y., Christensen, J., Damani, S. M., Dong, X., Eleftheriadis, K., Evangeliou, N., Faluvegi, G., Flanner, M., Fu, J. S., Gauss, M., Giardi, F., Gong, W., Hjorth, J. L., Huang, L., Im, U., Kanaya, Y., Krishnan, S., Klimont, Z., Kühn, T., Langner, J., Law, K. S., Marelle, L., Massling, A., Olivié, D., Onishi, T., Oshima, N., Peng, Y., Plummer, D. A., Popovicheva, O., Pozzoli, L., Raut, J.-C., Sand, M., Saunders, L. N., Schmale, J.,

Sharma, S., Skeie, R. B., Skov, H., Taketani, F., Thomas, M. A., Traversi, R., Tsigaridis, K., Tsyro, S., Turnock, S., Vitale, V., Walker, K. A., Wang, M., Watson-Parris, D., and Weiss-Gibbons, T. (2022). Model evaluation of short-lived climate forcers for the Arctic Monitoring and Assessment Programme: a multi-species, multi-model study, *Atmos. Chem. Phys.*, 22, 5775–5828, https://doi.org/10.5194/acp-22-5775-2022.

21. Williford, T., Amon, R. M. W., Kaiser, K., Benner, R., Stedmon, C., Bauch, D., et al. (2022). Spatial complexity in dissolved organic matter and trace elements driven by hydrography and freshwater input across the Arctic Ocean during 2015 Arctic GEOTRACES expeditions. *Journal of Geophysical Research: Oceans*, 127, e2022JC018917. https://doi.org/10.1029/2022JC018917.
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Data sets:

1. Bruyant, F., R. Amiraux, M.-P. Amyot, P. Archambault, L. Artigue, L. Barbedo De Freitas, G. Bécu, S. Bélanger, P. Bourgain, A. Bricaud, E. Brouard, C. Brunet, T. Burgers, D. Caleb, K. Chalut, H. Claustre, V. Cornet-Barthaux, P. Coupel, M. Cusa, F. Cusset, L. Dadaglio, M. Davelaar, G. Deslongchamps, C. Dimier, J. Dinasquet, D. Dumont, B. Else, I. Eulaers, J. Ferland, G. Filteau, M.-H. Forget, J. Fort, L. Fortier, M. Galí-Tapías, M. Gallinari, S.-E. Garbus, N. Garcia, C. Gérikas Ribeiro, C. Gombault, P. Gourvil, C. Goyens, C. Grant, P.-L. Grondin, P. Guillot, S. Hillion, R. Hussherr, F. Joux, H. Joy-Warren, G. Joyal, D. Kieber, A. Lafond, J. Lagunas, P. Lajeunesse, C. Lalande, J. Larivière, F. Le Gall, K. Leblanc, M. Leblanc, J. Legras, K. Levesque, K.-M. Lewis, E. Leymarie, A. Leynaert, T. Linkowski, M. Lizotte, A. Lopes Dos Santos, C. Marec, D. Marie, G. Massé, P. Massicotte, A. Matsuoka, L. Miller, S. Mirshak, N. Morata, B. Moriceau, P.-I. Morin, S. Morisset, A. Mosbech, A. Mucci, G. Nadaï, C. Nozais, I. Obernosterer, T. Paire, C. Panagiotopoulos, M. Parenteau, N. Pelletier, M. Picheral, B. Quéguiner, P. Raimbault, J. Ras, E. Rehm, L. Ribot Lacosta, J.-F. Rontani, B. Saint-Béat, J. Sansoulet, N. Sardet, C. Schmechtig, A. Sciandra, R. Sempéré, C. Sévigny, J. Toullec, M. Tragin, J.-E. Tremblay, A.-P. Trottier, D. Vaulot, A. Vladoiu, L. Xue, G. Yunda-Guarin, M. Babin (2022). The Green Edge cruise: following the evolution of the Arctic phytoplankton spring bloom, from ice-covered to open waters. SEANOE. https://doi.org/10.17882/86417.

4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2022? If yes, who? How did you engage?

1. Contributions to SOOS science plan: Newman, L., M. A. Hancock, E. Hofmann, M.J.M. Williams, S.F. Henley, S. Moreau, P. Bricher, S. Ackley, J. Beja, J.A. Caccavo, S. Diggs, S. Fawcett, P. Fretwell, S. Gille, P. Heil, L. Herraiz Borreguero, J. Höfer, P. ten Hoopen, S. Kern, J. Kool, D. Lannuzel, R. Massom, M. Mazloff, A. Meijers, B. Ozsoy, L. Ponzi Pezzi, B. Pfeil, M. du Plessis, M.N. Raphael, J.-B. Sallee2, O. Schofield, I. Schloss, E.H. Shadwick, S. Swart, E. van Wijk, K. Altieri, A. Barbosa, S. Barreira, G. Budillon, K. Casciotti, F. Colleoni, K. Currie, M. Frey, S. Halfter, K. Hendry, W. Hobbs, M. Janout, R. Kerr, P. Kukliński, M. LaRue, T. Martin, C.R. McMahon, C.R.B. Mendes, L. Miller, P. Miloslavich, E. Murphy, J. Nishioka, A. Novellino, B.Y. Queste, W. Rack, P. Rivaro, A. Schiller, W. Smith, C. Stevens, S. Tripathy, Z. Wang (2022). The Southern Ocean Observing System 2021-2025 Science and Implementation Plan. https://doi.org/10.5281/zenodo.6324359.
2. Air-sea ice-ocean interactions and feedbacks explicitly included in the developing Canadian Antarctic Research program.
3. Representation on the World Climate Research Programme's Safe Landing Pathways working group and Climate Intervention task team (L. Miller)
4. Lecture provided in SOLAS master's program at the University of Galway on Climate Intervention (L. Miller)

PART 2 - Planned activities for 2023 and 2024

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

1. FoxSIPP: the Foxe Basin Sea-Ice Pump Project. An intensive 2-year study of carbon sequestration with the deepwater formation in Foxe Basin, in the Canadian Arctic Archipelago. A year-long deployment of a bottom mooring instrumented for CO2 system measurements is planned for deployment in the deepwater formation plume exiting Foxe Basin in the summer of 2023 and will be bracketed with synoptic water-column surveys of the regions in the summers of both 2023 and 2024.
2. June - July 2023 – Participation in a research cruise in the Yellow Sea as part of the Fog and Turbulence Interactions in the Marine Atmosphere led by Joe Fernando at the University of Notre Dame (R. Y.-W Chang)
3. Continued participation on Mt. Soledad as part of the Eastern Pacific Cloud Aerosol Precipitation Experiment led by Lynn Russell at University of California San Diego (R. Y.-W Chang)
4. Canadian inputs into the Ice Algae Model Intercomparison Project (IAMIP2), with model evaluations, are underway (N. Steiner)
5. As part of the NSERC carbon sink project, a coupled ice-ocean-bgc model is being analyzed for the impacts on and changes of the carbon sink in the Canadian Arctic (a manuscript is in preparation, Laenger et al., in prep).

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

1. Tracer Release Experiment Meeting - April 2023 (R. Y.-W Chang)

3. Funded national and international projects/activities underway.

1. FoxSIPP: the Foxe Basin Sea-Ice Pump Project, 2022-2024. NSERC, Fisheries and Oceans Canada. Leads: B. Else, L. Miller. SOLAS Theme 1 & Polar Oceans
2. Climate Relevant interactions and feedbacks: the key role of sea ice and Snow in the polar and global climate system (CRiceS). A European Union Horizon 2020 Framework Programme (J. Thomas, R. Makkonen, leads) with funded Canadian participation by B. Else, N. Steiner, and L. Miller. International collaborative project to integrate observational insights into climate and Earth system models. SOLAS Themes 4, 5, and Integrated topic on Polar Oceans
3. Quantifying and Predicting Canada's Marine Carbon Sink, 2020-2022. Lead: R. Hamme. NSERC Advancing Climate Change Science in Canada Program. SOLAS Theme 1
4. A co-operative, multi-platform effort to observe marine biogeochemical processes and address Arctic community research priorities, 2019-2022. Lead: B. Else. ArcticNET. SOLAS Integrated topics on Polar Oceans and Science & Society
5. Fog and Turbulence Interactions in the Marine Atmosphere led by University of Notre Dame (May 2021 – April 2026) involves understanding fog in the North Atlantic and the Yellow Sea (R. Y.-W Chang)
6. Eastern Pacific Cloud Aerosol Precipitation Experiment led by University of California San Diego (Feb 2023 – Jan 2024) involves understanding aerosol-cloud-precipitation interactions via measurements using the Atmospheric Radiation Monitoring Mobile Laboratory facility on the Scripps Pier as well as complementary measurements on a nearby mountain to capture cloud formation and properties. Modeling and remote sensing activities will also take place. (R. Y.-W Chang)

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

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

Several members of the community are involved in international projects, organisations and programmes that are highlighted in the above sections, including BEPSII, World Climate Research Programme's Safe Landing Pathways working group and Climate Intervention task team, to name a few.

Comments