

Ian A. Raphael

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Education

Expected 2025 THAYER SCHOOL OF ENGINEERING AT DARTMOUTH COLLEGE

Ph.D. Sensor systems engineering

Thesis: Tools for observing snow and sea ice in a changing Arctic Ocean.

Advised by Professors Donald Perovich and Christopher Polashenski

2018 DARTMOUTH COLLEGE

B.A. with high honors, Earth and Computer Science

Honors thesis: Quantifying volumetric change of Athabasca Glacier in the 20th & 21st centuries.

Advised by Professor Robert Hawley

Research Experience

2019–present **Graduate research assistant**, Thayer School of Engineering, Hanover, NH

Led field component (11-months) of a multi-institute project participating on the central Arctic MOSAiC expedition. Analyzed sea ice mass balance data and conducted modeling experiments to determine that snow is the largest control on modern winter sea ice growth in the Arctic. Examined Arctic ice–ocean boundary layer, finding that stratified meltwater can significantly reduce basal ice melt. Designed ultra low-power embedded, autonomous network for measuring snow on sea ice.

2016–2019 **Research assistant**, Dept. of Earth Sciences, Dartmouth College, Hanover, NH

Led four field experiments using radio echo sounding (RES) to measure the volume of Athabasca Glacier, in AB, Canada. Built and repaired RES instrumentation. Compared contemporary glacier volume to historical volume estimates and used Monte-Carlo methods to determine the volume trend and estimate the disappearance date of the glacier.

2017–2018 **Volunteer research assistant**, Volunteers in Medicine of the Olympics, Port Angeles, WA

Assisted physicians and epidemiologists in determining the efficacy of local hepatitis treatment clinics through patient and stakeholder interviews and survey analysis.

Field Experience

- 2023 **Field scientist**, ArcWatch 1 Expedition, Central Arctic Ocean (60 days at sea)
Deployed autonomous ice mass balance buoys and snow observation network. Conducted snow and sea ice physical characterization surveys at 11 ice stations. Assisted with underwater remotely operated vehicle operations for collecting mass balance, optical, and upper ocean measurements.
- 2023 **Field scientist**, Deadhorse/Prudhoe Bay, AK, USA
On a team of three (two scientists + pilot), deployed four ice mass balance buoys in the Beaufort Gyre from a fixed-wing, single-engine airplane over two days in early March.
- 2022 **Field scientist**, Utqiagvik, AK, USA
Led a seven day field campaign in November 2022 studying thin sea ice thermomechanical processes in Elson Lagoon. Mentored a junior graduate student in preparing for and executing a field campaign in challenging early-season conditions.
- 2019–2020 **Field scientist**, MOSAiC Expedition, Central Arctic Ocean (305 days at sea)
Lead field scientist for our project on the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) for eleven months (Legs 1, 2, and 4). Responsible for designing and conducting ice mass balance, snow surface scanning, and upper ocean surveys. Installed and maintained a network of ice dynamics and mass balance instrumentation. Aided in installing, maintaining, and recovering expedition infrastructure and equipment.
- 2017–2019 **Volunteer field technician**, Olympic National Park, National Park Service, Port Angeles, WA
Seasonal field technician with the National Park Service. Helped plan and conduct multiple 3-7 day backcountry field surveys in the Olympic National Park wilderness, including alpine lake and snow surveys as well as intertidal ecology surveys.
- 2016–2019 **Senior thesis research**, Athabasca Glacier, Jasper NP, AB, Canada
Designed and conducted yearly radio echo sounding (RES) surveys of Athabasca Glacier to determine the volume and volume trends of the lower Athabasca Glacier.

Teaching Experience

- 2023 **FYREE mentor**
Mentored undergraduate engineering students in an independent research project through the FYREE (First Year Research Experience in Engineering) program.
- Summer 2022 **Graduate Teaching Fellow**, Joint Science Education Project (JSEP)
Designed and delivered a week-long Arctic science education curriculum to a cohort of Greenlandic, Faroese, Danish, and American high school students. Facilitated an independent research project conducted by a small group of students focused on understanding the physical processes influencing ice sheet surface melt.
- Winter 2020 **Private Tutor**, English as a Second Language (TutorOut Inc.)
Taught curriculum-based English as a Second Language (ESL) course to elementary-aged Chinese students.
- Fall 2019 **Teaching Assistant**, Glaciology field course (Dept. of Earth Sciences, Dartmouth College)
Assisted in teaching geophysical survey theory/techniques, glacier travel, geological mapping to undergraduate students.
- Fall 2018 **Undergraduate Teaching Assistant**, Glaciology field course (Dept. of Earth Sciences, Dartmouth College)

- Assisted in teaching geophysical survey theory/techniques, glacier travel to junior undergraduate students.
- 2016–2018 **Climbing Instructor**, Intermediate and Advanced Rock Climbing (Outdoor Programs Office, Dartmouth College)
Taught sport and traditional technical rock climbing and self rescue.
- Fall 2017 **Undergraduate Teaching Assistant**, Earth Sciences 1: How the Earth Works (Dept. of Earth Sciences, Dartmouth College)
Assisted in lab lectures, led field exercises covering the foundations of geology, hydrology, and environmental science for undergraduate students.

Community Engagement/Community Service

- 2024-present **Volunteer bike mechanic**, Bikes Not Bombs community bike shop (Boston, MA)
Processed donated bicycles for refurbishment and use in community bike school and international bike program to improve access to affordable, sustainable transportation for underprivileged community members.
- 2023 **Volunteer bike mechanic**, Portland Gear Hub community bike shop (Portland, ME)
Processed donated bicycles for refurbishment and use in community bike school to improve access to affordable, sustainable transportation for underprivileged community members.
- 2023 **Invited speaker**, School of Ice, US Ice Drilling Program
Delivered presentation on the fundamentals of sea ice mass balance measurements and a live demonstration of the Seasonal Ice Mass Balance (SIMB₃) buoy.
- 2022-present **Gleaning volunteer**, Cumberland County Food Security Council (Portland, ME)
Gleaned excess produce from local farms to distribute at no cost to community members experiencing food insecurity.
- 2021 **Invited panelist**, Florida National Ocean Science Bowl career panel
- 2019 Field demonstrations for APECS MOSAiC School
Demonstrated fundamentals of autonomous buoy deployment for graduate students in the APECS MOSAiC School.
- 2017–2018 **Patient care advocate**, Volunteers in Medicine of the Olympics (VIMO; Port Angeles, WA)
Maintained long-term relationships with hepatitis patients to ensure that they remained up-to-date and empowered on care appointments, treatments and medication, and insurance processing. Responded to patient inquiries and acted as a liaison between patients, medical facilities, and VIMO.
- 2004–2012 **Volunteer**, Shake-a-Leg Miami accessible watersports center (Miami, FL)
Volunteered with regatta race committee, marine science program, and vessel maintenance team at an accessible watersports center for BIPOC, intellectually, developmentally, and physically disabled, and other underrepresented community members.

Grants, Honours & Awards

- 2024 Most outstanding presentation, *Research in progress seminar, Thayer School of Engineering, Dartmouth College*.
- 2023 Most outstanding presentation, *Research in progress seminar, Thayer School of Engineering, Dart-*

	<i>mouth College.</i>
2023	MOSAiC Conference early career researcher award (\$1,400), <i>MOSAiC Consortium</i>
2022	National Defense Science and Engineering Graduate Fellowship (NDSEG) (\$306,000), <i>Office of Naval Research, Department of Defense</i>
2021–2022	Joint Science Education Project (JSEP) Graduate Fellowship (\$6,000), <i>NSF JSEP, Dickey Center for International Understanding, Dartmouth College</i>
2021	MOSAiC conference early career researcher award (\$500), <i>MOSAiC Consortium</i>
2019	George Austin Colligan Fellow, <i>Thayer School of Engineering, Dartmouth College</i>
2018	High Honors, <i>Department of Earth Science, Dartmouth College</i>
2018	Sigma Xi Nominee, <i>Sigma Xi Scientific Research Honor Society, Dartmouth College Chapter</i>
2017	Senior Honors Thesis Grant (\$2,500), <i>Department of Earth Sciences, Dartmouth College</i>
2016	Citation for Academic Excellence, <i>Professor Christina Seely, Department of Studio Arts, Dartmouth College</i>
2016	James O. Freedman Presidential Scholar research grant (\$2,000), <i>Dartmouth College Undergraduate Advising and Research</i>
2014, 2015	Academic honors, <i>Dartmouth College</i>
2014	Member of the E.E. Just Society for underrepresented minority students in STEM, <i>Dartmouth College</i>

Certifications, Trainings & Short Courses

2023	Polar Firearms Training and Polar Bear Safety (certification), <i>ICS of Colorado</i>
2020	Polar Field Science and Safety (workshop), Bremerhaven, Germany
2019	Helicopter Underwater Egress and STASS (certification)
2019	Polar Field Science and Safety (workshop), Tromsø, Norway
2019	Polar Firearms Training and Polar Bear Safety (certification), <i>ICS of Colorado</i>
2019	Fire Fighting and Fire Prevention at Sea (certification), <i>Connecticut Fire Academy</i>
2019	Standards of Training, Certification, and Watchkeeping for Seafarers (STCW; certification), <i>New England Maritime Institute</i>
2019	Polar Field Science and Safety (workshop), Utqiagvik, AK, USA
2017, 2019	Wilderness Emergency Medical Technician (W-EMT; certification), <i>NREMT</i>
2016	Wilderness First Responder (certification), <i>SOLO School of Wilderness Medicine</i>

Publications

JOURNAL ARTICLES

In preparation	I.A. Raphael et al. An affordable, distributed, autonomous network for measuring snow depth and associated environmental variables. <i>Patent in preparation.</i>
In preparation	I.A. Raphael et al. A low-cost, autonomous, distributed system for measuring snow on sea ice. <i>Manuscript in preparation, draft available upon request.</i>
In preparation	I.A. Raphael et al. Volume loss of Athabasca Glacier in the 20th and 21st centuries. <i>Manuscript in preparation; draft available upon request.</i>
In review	M.M. Smith et al., including I.A. Raphael , "Formation and fate of freshwater on an ice floe in the Central Arctic." <i>In review.</i>

- 2024 **Raphael, I.A.**, Perovich, DK, Polashenski, CM, Clemens-Sewall, D, Itkin, P, Lei, R, Nicolaus, M, Regnery, J, Smith, MM, Webster, M, Jaggi, M. 2024. "Sea ice mass balance during the MOSAiC drift experiment: Results from manual ice and snow thickness gauges." *Elementa: Science of the Anthropocene* 12(1). DOI: <https://doi.org/10.1525/elementa.2023.00040>
- 2024 D. Clemens-Sewall, et al., including **I.A. Raphael**. "High-resolution repeat topography of drifting ice floes in the Arctic Ocean from Terrestrial Laser Scanning." *Nature Scientific Data* 11.1 (2024): 70.
- 2023 D. Perovich, **I.A. Raphael**, et al. "Sea ice heat and mass balance measurements from four autonomous buoys during the MOSAiC drift campaign." *Elementa: Science of the Anthropocene* 11.1 (2023).
- 2023 A. Macfarlane, et al., including **I.A. Raphael**. "A Database of Snow on Sea Ice in the Central arctic Collected during the MOSAiC expedition." *Nature Scientific Data* 10.1 (2023): 398.
- 2023 V. Nandan, et al., including **I.A. Raphael**. "Wind Transport of Snow Impacts Ka-and Ku-band Radar Signatures on Arctic Sea Ice." *The Cryosphere* 17.6 (2023): 2211-2229.
- 2023 P. Itkin, et al., including **I.A. Raphael**. "Sea ice and snow characteristics from year-long transects at the MOSAiC Central Observatory." *Elementa: Science of the Anthropocene* 11.1 (2023).
- 2022 D. N. Wagner et al., including **I.A. Raphael**. "Snowfall and snow accumulation processes during the MOSAiC winter and spring season." *Cryosphere* 16. ARTICLE (2022): 2373-2402.
- 2022 O. Hames & M. Jafari et al., including **I.A. Raphael**. Modeling the small-scale deposition of snow onto structured Arctic sea ice during a MOSAiC storm using snowBedFoam 1.0., *Geoscientific Model Development* 15.16 (2002): 6429-6449.
- 2022 M.M. Smith, L. von Albedyll, **I.A. Raphael**, et al. "Quantifying false bottoms and under-ice meltwater layers beneath Arctic summer sea ice with fine-scale observations." *Elem Sci Anth* 10.1 (2022): 000116.
- 2022 D. Clemens-Sewall et al., including **I.A. Raphael**. FlakeOut: A Geometric Approach to Remove Wind-Blown Snow from Terrestrial Laser Scans. *Cold Regions Science and Technology* (2022): 103611.
- 2022 B. Light et al., including **I.A. Raphael**. Arctic sea ice albedo: spectral composition, spatial heterogeneity, and temporal evolution observed during the MOSAiC drift. *Elem Sci Anth* 10.1 (2022): 000103.
- 2022 M.A. Webster et al. including **I.A. Raphael**. Spatiotemporal evolution of melt ponds in the Arctic: MOSAiC observations and model results. *Elem Sci Anth* 10.1 (2022): 000072.
- 2022 M. Nicolaus et al., including **I.A. Raphael**. Overview of the MOSAiC expedition – Snow and Sea Ice. *Elementa: Science of the Anthropocene*.
- 2021 H.J. Belter et al., including **I.A. Raphael**. Interannual variability in Transpolar Drift ice thickness and potential impact of Atlantification. *The Cryosphere*. 15.6 (2021): 2575-2591.
- 2020 E. Welty et al., including **I.A. Raphael**. Worldwide version-controlled database of glacier thickness observations. *Earth System Science Data*. 12.4 (2020): 3039-3055.
- 2020 C. Katlein et al., including **I.A. Raphael**. Platelet ice under Arctic pack ice in winter. *Geophysical Research Letters*. 47.16 (2020): e2020GL088898.

SELECTED ABSTRACTS

[†]*Invited abstract*

- 2024[†] **I.A. Raphael** et al. A new autonomous system for distributed, floe-scale snow depth measurements. *AGU Fall Meeting*.

- 2023 **I.A. Raphael** et al. A simple method for estimating the effective thermal conductivity of snow on Arctic sea ice. *IGS Sea ice symposium*.
- 2023 **I.A. Raphael** et al. Estimates of the effective thermal conductivity of snow on MOSAiC. *Second MOSAiC International Workshop and Conference*.
- 2023 D. Perovich et al., including **I.A. Raphael**. Solar heat partitioning during the MOSAiC field experiment. *Second MOSAiC International Workshop and Conference*.
- 2023 D. Perovich et al., including **I.A. Raphael**. A different time. A different place. A different ice? Snow and sea ice at MOSAiC and SHEBA. *Second MOSAiC International Workshop and Conference*.
- 2022 **I.A. Raphael** et al. Point measurements of mass balance and heat fluxes on MOSAiC. *MOSAiC International Workshop and Conference*.
- 2021 **I.A. Raphael** et al. Snow, ice, and meltwater in a younger Arctic icepack: locally variable processes and the thermodynamic mass balance of first- and second-year ice. *AGU Fall Meeting*.
- 2021 D. Perovich, **I.A. Raphael** et al. Sea ice temperature and mass balance measurements during the MOSAiC drift campaign. *AGU Fall Meeting*.
- 2021 C. Polashenski et al., including **I.A. Raphael**. SIDEx Observations of Sea Ice Stress-Strain-Fracture Fields. *AGU Fall Meeting*.
- 2021 M. Webster et al., including **I.A. Raphael**. Spatiotemporal evolution of melt ponds in the Arctic: MOSAiC observations and model results. *AGU Fall Meeting*.
- 2021 D. Clemens-Sewall et al., including **I.A. Raphael**. The Impacts of Snow Redistribution on Wintertime Arctic Sea Ice Growth. *AGU Fall Meeting*.
- 2021 **I.A. Raphael** et al. Manual point-measurements of sea ice mass balance during the MOSAiC Expedition. *EGU Spring Meeting*.
- 2021 D.K. Perovich, **I.A. Raphael**, R. Moore, D. Clemens-Sewall. Autonomous observations of sea ice mass balance during MOSAiC. *EGU Spring Meeting*.
- 2021 M.M. Smith, L. Von-Albedyll, **I.A. Raphael**, I. Matero, B. Lange. Freshwater under the MOSAiC floe: implications of under-ice melt ponds for mass balance. *EGU Spring Meeting*.
- 2021 D. Wagner et al., including **I.A. Raphael**. Snowfall and snow accumulation processes during MOSAiC. *EGU Spring Meeting*.
- 2021 D. Clemens-Sewall et al., including **I.A. Raphael**. Improving Observations of Aggregate Snow Cover Properties on MOSAiC by Integrating Repeat Terrestrial Laser Scanning and In-Situ Data. *EGU Spring Meeting*.
- 2021 B. Light et al., including **I.A. Raphael**. The MOSAiC sea ice albedo record: its context and role for informing improved surface radiative budgets in a climate model. *EGU Spring Meeting*.
- 2021 B.A. Lange et al., including **I.A. Raphael**. An overview of the HAVOC project during MOSAiC: a multi-disciplinary glimpse at bio-physical sea ice ridge habitat properties from winter to summer. *Arctic Frontiers*.
- 2020 C.M. Polashenski et al., including **I.A. Raphael**. Observations of Stress and Strain at Floe Scale in Sea Ice. *AGU Fall Meeting*.
- 2020 D. Clemens-Sewall et al., including **I.A. Raphael**. Snow Accumulation and Redistribution Patterns in the Central Arctic. *AGU Fall Meeting*.
- 2020 T. Kanzow et al., including **I.A. Raphael**. Evolution of the winter mixed layer observed during MOSAiC. *AGU Fall Meeting*.
- 2020 B. Light et al., including **I.A. Raphael**. In situ observations of the seasonal evolution of Arctic sea ice albedo. *AGU Fall Meeting*.
- 2020 D. Wagner et al., including **I.A. Raphael**. Working towards a reliable snowfall estimate on Central Arctic sea ice. *AGU Fall Meeting*.

C. Katlein et al., including **I.A. Raphael**. Platelet Ice under Arctic Pack Ice in Winter. *AGU Fall Meeting*.

DATASETS

Donald Perovich, Ian Raphael, Ryleigh Moore, David Clemens-Sewall, Christopher Polashenski, & Cameron Planck. (2022). Measurements of ice mass balance and temperature from autonomous Seasonal Ice Mass Balance buoys in the Arctic Ocean, 2019-2020. Arctic Data Center. doi:10.18739/A2JH3D444.

Donald Perovich, Ian Raphael, Ryleigh Moore, David Clemens-Sewall, Christopher Polashenski, & Cameron Planck. (2022). Measurements of ice mass balance and temperature from autonomous Seasonal Ice Mass Balance buoys in the Arctic Ocean, 2019-2020. Arctic Data Center. doi:10.18739/A2JH3D444.

Ian Raphael, David Clemens-Sewall, Donald Perovich, & Christopher Polashenski. (2024). Snow–ice interface temperatures from the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) Expedition in the Central Arctic (2019-2020). Arctic Data Center. doi:10.18739/A2MP4VQoX.

Don Perovich. (2024). Sea ice mass balance (SIMB) data from The Sea Ice Dynamics Experiment (SIDEX); Beaufort Sea, March 2023. Arctic Data Center. doi:10.18739/A2KK94D93.

David Clemens-Sewall, Chris Polashenski, Ian Raphael, Don Perovich, Steven Fons, Polona Itkin, Matthias Jaggi, Arttu Jutila, Amy Macfarlane, Ilkka Matero, Marc Oggier, David Wagner, Ronald Visser, Thomas Olufson, Martin Radenz, Carl Schönning, Jesper Hansen, Monica Votvik, Eric Brossier, & Saga Svavarsdottir. (2022). High-Resolution Repeat Topography of Drifting Ice Floes in the Arctic Ocean from Terrestrial Laser Scanning Collected on the Multidisciplinary drifting Observatory for the Study of Arctic Climate Expedition. Arctic Data Center. doi:10.18739/A20863712.

Angela Bliss, Jennifer Hutchings, Philip Anderson, Philipp Anhaus, Hans Jakob Belter, Jørgen Berge, Vladimir Bessonov, Bin Cheng, Sylvia Cole, Dave Costa, Finlo Cottier, Christopher J Cox, Pedro R De La Torre, Dmitry V Divine, Gilbert Emzivat, Ying-Chih Fang, Steven Fons, Michael Gallagher, Maxime Geoffrey, Mats A Granskog, ... Guangyu Zuo. (2022). Sea ice drift tracks from the Distributed Network of autonomous buoys deployed during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition 2019 - 2021. Arctic Data Center. doi:10.18739/A2KP7TS83.

David Clemens-Sewall, Chris Polashenski, & Ian Raphael. (2021). Terrestrial Laser Scanning Data of the ROV (Remote Operated Vehicle) area on the MOSAiC (Multidisciplinary Drifting Observatory for the Study of Arctic Climate) Expedition on February 22, 2020. Arctic Data Center. doi:10.18739/A2901ZH4K.

David Clemens-Sewall. (2021). Terrestrial Laser Scans of the Central Observatory of the Multidisciplinary drifting Observatory for the Study of Arctic Climate. Arctic Data Center. doi:10.18739/A2DR2P98D.

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Berge, Vladimir Bessonov, Bin Cheng, Sylvia Cole, Dave Costa, Finlo Cottier, Christopher J Cox, Pedro R De La Torre, Dmitry V Divine, Gilbert Emzivat, Ying-Chih Fang, Steven Fons, Michael Gallagher, Maxime Geoffrey, Mats A Granskog, ... Guangyu Zuo. (2022). Raw files for sea ice drift tracks from the Distributed Network of autonomous buoys deployed during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition 2019 - 2021. Arctic Data Center. doi:10.18739/A2WW77163

Madison Smith, Bonnie Light, Don Perovich, Melinda Webster, Philipp Anhaus, David Clemens-Sewall, Felix Linhardt, Amy Macfarlane, Ian Raphael, Debbie Bozzato, Zoé Brasseur, Ruzica Dadic, Steven Fons, Antonia Immerz, Henna-Reetta Hannula, Jenny Hutchings, Falk Pätzold, Julia Regnery, Roberta Pirazzini, & Aikaterini Tavri. (2021). Broadband albedo measurements of the sea ice surface during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) campaign in the Central Arctic Ocean, April – September 2020. Arctic Data Center. doi:10.18739/A24I6T11W.

Madison Smith, Ian Raphael, Luisa von Albedyll, Benjamin Lange, & Evgenii Salganik. (2021). Sea ice thickness and false bottom measurements along drill lines during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) expedition, Leg 4. Arctic Data Center.

Madison Smith, Bonnie Light, Don Perovich, Melinda Webster, Philipp Anhaus, David Clemens-Sewall, Felix Linhardt, Amy Macfarlane, Ian Raphael, Debbie Bozzato, Zoé Brasseur, Ruzica Dadic, Steven Fons, Antonia Immerz, Henna-Reetta Hannula, Jenny Hutchings, Falk Pätzold, Julia Regnery, Roberta Pirazzini, & Aikaterini Tavri. (2021). Raw files for broadband and spectral albedo measurements of the sea ice surface during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) campaign in the Central Arctic Ocean, April – September 2020. Arctic Data Center. doi:10.18739/A2P843X2Z.

Ian Raphael, David Clemens-Sewall, Donald Perovich, Christopher Polashenski, Polona Itkin, Julia Regnery, Marcel Nicolaus, Matthias Jaggi, Madison Smith, Ilkka Matero, Amy Macfarlane, Jennifer Hutchings, Arttu Jutila, Steven Fons, Marc Oggier, David Wagner, & Oguz Demir. (2022). Measurements of sea ice point-mass-balance using hotwire thickness gauges and ablation stakes during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) Expedition in the Central Arctic (2019-2020). Arctic Data Center. doi:10.18739/A2NK36626.

Madison Smith, Deborah Bozzato, Emelia J Chamberlain, Ulrike Dietrich, Elise Droste, Allison A Fong, Bonnie Light, Felix Linhardt, Ilkka Matero, Don Perovich, Ian Raphael, Julia Regnery, Evgenii Salganik, Aikaterini Tavri, Luisa von Albedyll, & Melinda Webster. (2021). Near-surface ocean temperature & salinity measurements (using YSI and Castaway) during the summer component of the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) campaign in the Central Arctic Ocean, July – September 2020. Arctic Data Center. doi:10.18739/A2TT4FV1G.

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the sea ice surface during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) campaign in the Central Arctic Ocean, April – September 2020. Arctic Data Center. doi:10.18739/A2FT8DK8Z.

Madison Smith, Bonnie Light, Don Perovich, Melinda Webster, Philipp Anhaus, David Clemens-Sewall, Felix Linhardt, Amy Macfarlane, Ian Raphael, Debbie Bozzato, Zoé Brasseur, Ruzica Dadic, Steven Fons, Antonia Immerz, Henna-Reetta Hannula, Jenny Hutchings, Falk Pätzold, Julia Regnery, Roberta Pirazzini, & Aikaterini Tavri. (2021). Photos of the sea ice surface corresponding to surface albedo datasets collected during the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC) campaign in the Central Arctic Ocean, April – September 2020. Arctic Data Center. doi:10.18739/A2B27PS3N.

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