

BIOGRAPHICAL SKETCH

March 2024

Michael Steele

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Education

1987 PhD: Geophysical Fluid Dynamics, Princeton University, Princeton, NJ
1981 BA (Phi Beta Kappa): Physics, Reed College, Portland, OR

Experience

2011-present Senior principal oceanographer, Polar Science Center, Seattle, WA
1997-2010 Senior oceanographer, Polar Science Center, Seattle, WA
1996-1999 Chairman, Polar Science Center
1987-1997 Oceanographer, Polar Science Center
1982-1987 Assistant in Research, Geophysical Fluid Dynamics Lab, Princeton, NJ
1980 Research Assistant, Goddard Institute for Space Studies, New York, NY

Community Service

Committees, Panels, Chairs:

2023-ongoing Member, organizing committee for CAMAS: Consortium for the Advancement of Marine Arctic Science
2023-2024 Member, organizing committee for a CLIVAR workshop on the Representation of the State of the Arctic Ocean in Ocean Climatologies and Reanalysis Products
2023-2024 Lead organizer: AGU/Ocean Sciences session on sea ice prediction
2020-2023 Chair, Group for High Resol. Sea Surf. Temp., High Latitude Task Team
2019-2020 Lead organizer: AGU mtg. sessions on coupled sea ice - climate
2018-2019 Member, NSF/OPP Portfolio Review Committee
2009-2019 Lead organizer: FAMOS/AOMIP School for arctic marine modeling
2016-2019 Review board member: EU project "Blue Action"
2015-2018 co-Organizer: AGU mtg. sessions on coupled sea ice - climate
2013 Review board member: Multi-institutional Danish project "NAACOS"
2006-2012 Member, SEARCH Science Steering Committee
2002-2012 Member, Polar Advisory Group, PoDAG (NASA)
2002-2011 Member, ARCSS Hydrology Science Steering Comm., CHAMP (NSF)

2010	Member, SEARCH Understanding Change Task Force (NSF)
2007-2010	Ocean/Ice Section Leader, USARC Scaling Study
2006-2009	Member, ARCSS Committee (NSF)
2008	Co-organizer, Arctic Ocean Circulation Workshop, JPL, Oct'08
2007	Co-chair, Freshwater in the Arctic session (AGU mt., SF, CA)
2006	Member, SEARCH Data Management Working Group (NSF)
2005-2006	Member, SEARCH Observing Change panel (NSF)
2004-2007	Member, ARCUS Advisory Board
2006	Co-chair, Arctic shelf processes session (AGU Ocean Sci. mtg., Honolulu)
2004	Co-chair, Freshwater in the Arctic session (AGU mtg., S.F., CA)
2000-2004	Member, ARCSS OAI Science Steering Committee (NSF)
2002	Co-chair, Arctic model-data comparison workshop (ACSYS/IARC)
2002	Co-chair, High latitude ocean processes Chapman conference (AGU)
1999-2000	Member, Committee on NASA's Polar Geophysical Data Sets (NRC)
<u>Other:</u>	
1999-ongoing	Developer of the ocean database PHC (last major update spring, 2005): (http://psc.apl.washington.edu/Climatology.html)
ongoing	Reviewer for AGU (<i>cited for excellence in reviewing, 2012</i>) and AMS journals, Polar Research, DSR, ARCUS student research award; Proposal review panel member for NSF, NASA and other agencies; Tenure review panel member for various U.S. and international institutions.
ongoing	Lectures and demonstrations in K-12 schools, colleges, and museums.
2012-2013	Lead science consultant, Arctic buoy exhibit at Pacific Science Center
2007-2010	Leader, "Dylan the Arctic Diatom" educational cartoon development team
2004-2011	Quarterly lecture in General Environmental Science 215 at the Art Institute of Seattle; material provided for student term papers
2005-2006	Leader, Art Insitute of Seattle – Polar Science Center student internship program. Pilot project: "The Life of Sea Ice" video

Projects (active)

... as overall lead PI:

NSF ARCSS (OPP-2138316) 2022-2026 [UW\$2.7M]: “Collaborative Research: CAS-MNP: Sea ice-ocean exchange of Arctic microplastics: linking small scales to the large-scale system”

- Collaborators: B. Light, M. Orellana, M. Smith (PSC/APL/UW); A. Jahn (CU), D. Bailey (NCAR); C. Ludwig (ISB)

ONR Arctic (N00014-21-1-2868) 2021-2023 [UW\$1.3M]: “SIZRS Collaboration Team: Next-Generation UpTempO buoys for Persistent Sampling of the Arctic's Seasonal Ice Zone”

- Collaborators: Jim Thomson (APL)
- -> **Enhanced for “CAMAS”**

... as co-PI, UW lead:

NOPP (NASA 80NSSC18K0837) [UW\$432k]: “Multi-sensor Improved Sea Surface Temperature: continuing the GHRSSST partnership and improving Arctic data”

- Overall lead PI: Chelle Gentemann (ESR)
- Other collaborators: Peter Minnett (U of Miami), Sandra Castro (U of CO), Gary Wick (U of CO)

... as co-PI, non-UW lead:

NSF OPP/Arctic (PLR-1751363) 2018-2021 [UW\$ \$462k]: “NSFGEO-NERC Collaborative Research: Advancing Predictability of Sea Ice: Phase 2 of the Sea Ice Prediction Network (SIPN2)”

- Overall lead PI: Uma Bhatt (UAF)
- UW lead PI: Muyin Wang (JISAO)
- Other collaborators: Ed Blanchard-Wrigglesworth (UW), Peter Bieniek (UAF), Hajo Eicken (UAF), Joseph Little (UAF), John Walsh (UAF), Lawrence Hamilton (UNH), Helen Wiggins (ARCUS), Mark Serreze (NSIDC)

NOAA (NA15OAR4320063-AM170) 2018-2020 [APL/UW\$399k]: “Arctic freshwater pathways and their impact on North Atlantic deep water formation in a hierarchy of models”

- Overall lead PI: Wei Cheng (UW/JISAO)
- Other collaborators: Dongxiao Zhang (UW/JISAO), Wilbert Weijer (LANL), Jiaxu Zhang (LANL)

NASA (80NSSC21K0832) 2021-2024 [APL/UW\$4.9M]: “Salinity and Stratification at the Sea Ice Edge (SASSIE)”

- Overall lead PI: Kyla Drushka (APL/UW)
- Other collaborators: APL/UW: Eric D’Asaro, Peter Gaube, Andrey Shcherbina, Jim Thomson (APL/UW), ESR: Julian Schanze, JPL: Shannon Brown, Ian Fenty, Severine

Fournier, Sidharth Misra, UNC Wilmington: Frederick Bingham, WHOI: Ted Maksym, Viviane Menezes, Seth Zippel.

Schmidt Marine: NanoCTD 2022-2024 [about \$700k]

- Overall lead PI: Anuscheh Nawaz (APL/UW)
- Other collaborators: Jae-Hyun Chung (UW-ME)

Proposals (in review)

NASA MAP with Wei and Anastasia Romanou

Proposals (in prep)

NSF WARM next-gen

NASA ice edge

NSF MIZ cruise

ONR RIOT

ONR SIZRS renewal

NPRB N. Bering Sea

Old projects

NASA (80NSSC20K0134) 2020-2022 [UW\$92k]: “Advanced understanding and modeling of polar cloud and precipitation processes using CloudSat, CALIPSO, and complementary datasets”

- Overall lead PI: Jennifer Kay (CU)
- Other collaborators: Tristan L’Ecuyer (U of Wisconsin)

NSF DPP/Arctic (PLR-1603266) 2016-2019 [UW\$326k]: “FAMOS: Forum for Arctic Modeling and Observing Synthesis Phase 2”

- Overall lead PI: Andrey Proshutinsky (WHOI)
- Other collaborators: None.

NASA (JPL subcontract 1587724) 2018-2020 [UW\$146k]: “Evaluation of sea surface salinity retrievals for the Arctic Ocean from l-band satellites using in-situ observations and satellite altimetry and gravimetry”

- Overall lead PI: Tong Lee (JPL)
- Other collaborators: Severine Fournier (JPL)

NASA (NNX16AK43G) 2016-2020 [UW\$170k]: “Climate indicators to track the seasonal evolution of the Arctic sea ice cover to support stakeholders”

- Collaborators: Walter Meier (NSIDC); Peng Ge (NC State U); Angela Bliss (OSU)

Observational Program Experience

2023-ongoing	ONR/NOAA “Arctic AIR:” Aircraft-based hydrographic buoys, Beaufort Sea
2022	NASA “SASSIE:” Salinity And Stratification at the Sea Ice Edge, Beaufort Sea
2012-ongoing	ONR “SIZRS:” Seasonal Ice Zone Reconnaissance Surveys, Beaufort Sea
2010-ongoing	NSF/NOAA/ONR/NASA “UpTempO:” Upper Arctic Ocean hydrographic buoys
2010-2013	NASA: Arctic bio-optical ARGO floats

2012-2013 NASA "MIZOPEX:" Beaufort Sea buoys & UAVs
2007 Baffin Bay hydrographic sampling in collaboration with narwhal studies
2003-2013 NSF "Switchyard" Project: Lincoln Sea hydrographic profiles via aircraft
2000-2014 NSF "NPEO:" North Pole Environ Observatory hydrographic profiles via aircraft
1995 OR SCICEX'95: Scientific Ice Expeditions hydrography via submarines
1991 Lead Experiment (LEADDEX) Pilot Study
1988 Coordinated Eastern Arctic Experiment (CEAREX)

Mentoring

Undergraduate research assistants:

2010: C. Ozimek, Physics
2008-09: A. Czoski, Digital Arts
2004: W. Williams, Physics/Astronomy
1998-99: R. Morley, Physics
1998: S. Norman, Chemistry
1997-98: T. Saunders, Physics
1996-97: J. Annis, Oceanography
1997: N. Huang, Computer Science

Masters degree students:

2023-present: J. Oklu, Phys. Ocean.
2003-2005: W. Ermold, Appl. Physics

PhD students (all as secondary advisor):

2022-present: C. Borries-Strigle, Atmos. Sci.
2023-present: C. Schmidgall, Phys. Ocean.
2022-2023: S. Hall, Phys. Ocean.
2021-2022: Z. Li, Geography
2016-2017: I. Onarheim, Phys. Ocean.
2006-2010: M. Alkire, Chem. Ocean.
2005-2012: C. Peralta-Ferriz, Phys. Ocean.
2013-2017: S. Dewey, Phys. Ocean.

Thesis defense opponent for:

2018: N. Grivault (U of Alberta, Canada)
2011: J. Jackson (U of Br. Columbia, Canada)
2011: O. Segtnan (U of Bergen, Norway)

Postdoctoral students:

2023-present: R. Spratt (*secondary advisor*)
2023-present: O. J. Houndegnonto (*secondary advisor*)
2023-present: J. Perez-Valentin (*secondary advisor*)
2022-present: A. Pacini
2023-2024: G. Xu (*secondary advisor*)
2022-2023: A. Sledd (*secondary advisor*)
2019-2020: N. Mayot (*secondary advisor*)
2017-2018: M. Cape
2016-2018: W. Zhong
2013-2015: Y. Kawaguchi
2012-2014: T. Martin
2011-2012: C. Lique
2011-2012: J. Shi
2009: L. deSteur (*secondary advisor*)

Employees

S. Dickinson (*part-time*): scientific programmer

Peer-Reviewed Publications

(published as of April, 2023): 1st author: 26; 2nd author: 26; 3rd author: 21

In preparation

Steele, M., S. Dickinson, W. Cheng, J. Zhang, W. Weijer, “Freshwater content diagnostics for the Arctic Seas,” *J. Ocean. Atmos. Technol.*, *in preparation*, **2022**.

Steele, M., W. Ermold, L. Rainville, “SST across the Arctic summer MIZ,” *J. Geophys. Res.*, *in preparation*, **2022**.

Steele, M., W. Ermold, K. Colburn, and I. Rigor, The UpTempO buoy, *J. Ocean. Atmos. Technol.*, in preparation, **2022**.

(???,*,*,?) Carton, Chepurin, Steele, RARE, in preparation, **2023**.

(???,?,?,?) Polyakov and Steele, LHW, in preparation, **2023**.

(???,?,?,?) T. Eldevik, I. H. Onarheim, L. H. Smedsrud, M. Steele, P. A. Dodd, M. Muilwijk, and M. Årthun, How Atlantic heat makes Arctic sea ice retreat, in preparation, **2023**.

(???,?,?,?) Pacini, Steele, et al., First-year water, in preparation, **2023**.

Wenli's latest paper,

(?*,*,27,*) Pacini, A., M. Steele, and M.-B. Schreck, Gridding and validation of a sea ice cover data set from the National Weather Service's Alaska Sea Ice Program, *The Cryosphere*, in preparation, **2023**.

Borries-Strigle, C., U. Bhatt, D. Bailey, P. Bieniek, E. Blanchard-Wrigglesworth, I. Polyakov, and M. Steele, Impact of Bering Strait heat transport on regional Arctic sea ice predictability, *J of ??*, in prep., **2023**.

In review/press

(144) Ingrid Onarheim's sea ice paper...

(143) Drushka, K., Westbrook, E., Bingham, F., Gaube, P., Dickinson, S., Fournier, S., Menezes, V., Misra, S., Perez, J., Rainville, E. J., Schanze, J., Schmidgall, C., Shcherbina, A., Steele, M., Thomson, J., & Zippel, S.: Salinity and Stratification at the Sea Ice Edge (SASSIE): An oceanographic field campaign in the Beaufort Sea, *Earth Syst. Sci. Data Discuss.* <https://doi.org/10.5194/essd-2023-406>, in review, **2024**.

(142) Bushuk, M., S. Ali, D. A. Bailey, Q. Bao, L. Batt, U. S. Bhatt, E. Blanchard-Wrigglesworth, E. Blockley, G. Cawley, J. Chi, F. Counillonno, P. G. Coulombe, R. I. Cullather, F. X. Diebold, A. Dirkson, E. Exarchou, M. Gobel, W. Gregory, V. Guemas, L. Hamilton, B. He, S. Horvath, M. Ionita, J. E. Kay, E. Kim, N. Kimura, D. Kondrashov, Z. M. Labe, W. Lee, Y. J. Lee, C. Li, X. Li, Y. Lin, Y. Liu, W. Maslowski, F. Massonnet, W. N. Meier, W. J. Merryfield, H. Myint, J. C. Acosta Navarro, A. Petty, F. Qiao, D. Schroder, A. Schweiger, Q. Shu, M. Sigmoid, M. Steele, J. Stroeve, N. Sun, S. Tietsche, M. Tsamados, K. Wang, J. Wang, W. Wang, Y. Wang, Y. Wang, J. Williams, Q. Yang, X. Yuan, J. Zhang, & Y. Zhang, Predicting September Arctic sea ice: a multi-model seasonal skill comparison, *Bull. Amer. Meteorol. Soc.*, in review, **2024**.

(141) Xu, G., M. C. Rencurrel, P. Chang, X. Liu, G. Danabasoglu, S. G. Yeager, M. Steele, W. Weijer, Y. Li, N. Rosenbloom, F. Castruccio, Q. Zhang, The Bering Strait's Overlooked Role in Amplified Arctic Warming: Insights from High-Resolution Climate Simulations, *Nature*, in review, **2024**.

(140) Zhang, X. et al. including M. Steele, Weather and climate extremes in a changing Arctic, *Nature Revs. Earth and Environ.*, in review, **2024**.

Published

(139) Castro, S.L., G.A. Wick, S. Eastwood, M. Steele, and R.T. Tonboe, Examining the consistency of sea surface temperature and sea ice concentration in Arctic satellite products, *Remote Sensing*, *15*, <https://doi.org/10.3390/rs15112908>, **2023**.

- (138) Sledd, A., T.S. L'Ecuyer, J.E. Kay, & M. Steele, Clouds increasingly influence Arctic sea surface temperatures as CO₂ rises. *Geophys. Res. Lett.*, <https://doi.org/10.1029/2023GL102850>, **2023**.
- (137,*,*,21) Zhang, J., W. Cheng, M. Steele, M., & W. Weijer, Asymmetrically stratified Beaufort Gyre: Mean state and response to decadal forcing. *Geophys. Res. Lett.*, <https://doi.org/10.1029/2022GL100457>, **2023**.
- (136,*,*,20) Hall, S. B., B. Subrahmanyam, & M. Steele, The role of the Russian Shelf in seasonal and interannual variability of Arctic sea surface salinity and freshwater content. *J. Geophys. Res.*, <https://doi.org/10.1029/2022JC019247>, **2023**.

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- (135,*,26,*) Moore, G., Steele, M., Schweiger, A.J., Zhang, J., and Laidre, K.L., Thick and old sea ice in the Beaufort Sea during summer 2020/21 was associated with enhanced transport. *Commun Earth Environ* **3**, 198, <https://doi.org/10.1038/s43247-022-00530-6>, **2022**.
- (134, *,*,19) Hill, V., Light, B., Steele, M., & Sybrandy, A. L., Contrasting sea-ice algae blooms in a changing Arctic documented by autonomous drifting buoys. *J. Geophys. Res.*, 127, <https://doi.org/10.1029/2021JC017848>, **2022**.
- (133) Zhang, C., A. F. Levine, M. Wang, C. Gentemann, C. W. Mordy, E. D. Cokelet, P. A. Browne, Q. Yang, N. Lawrence-Slavas, C. Meinig, G. Smith, A. Chiodi, D. Zhang, P. Stabeno, W. Wang, H. Ren, K. A. Peterson, S. N. Figueroa, M. Steele, N. P. Barton, and A. Huang, Evaluation of operational forecasts at Alaskan arctic sea surface using in situ observations from saildrones, *Mon. Wea. Rev.*, <https://doi.org/10.1175/MWR-D-20-0379.1>, **2022**.
- (132,*,*,18) Vazquez-Cuervo, J., S. L. Castro, M. Steele, C. Gentemann, J. Gomez-Valdes, and W. Tang, Comparison of GHRSSST SST analysis in the Arctic Ocean and Alaskan coastal waters using saildrones, *Remote Sens.*, *14*, <https://doi.org/10.3390/rs14030692>, **2022**.
- (131) Zhong, W., S. T. Cole, J. Zhang, R. Lei, and M. Steele, Increasing winter ocean-to-ice heat flux in the Beaufort Gyre region, Arctic Ocean over 2006-2018, *Geophys. Res. Lett.*, 49, <https://doi.org/10.1029/2021GL096216>, **2022**.
- (130,*,*,17) Li, Z., Q. Ding, M. Steele, and A. Schweiger, Recent upper Arctic Ocean warming expedited by summertime atmospheric processes. *Nat Commun* **13**, 362, <https://doi.org/10.1038/s41467-022-28047-8>, **2022**.

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- (129) Tang, W., S. H. Yueh, A. G. Fore, A. Hayashi and M. Steele, An Empirical Algorithm for Mitigating the Sea Ice Effect in SMAP Radiometer for Sea Surface Salinity Retrieval in the Arctic Seas, *IEEE J. of Selected Topics in Appl. Earth Obs. Remote Sens.*, *14*, 11986-11997, doi:10.1109/JSTARS.2021.3127470, **2021**.
- (128, 26,*,*) Steele, M., H. Eicken, U. Bhatt, P. Bieniek, E. Blanchard-Wigglesworth, H. Wiggins, B. Turner-Bogren, L. Hamilton, J. Little, F. Massonnet, W. N. Meier, J. Overland, M. Serreze, J. Stroeve, J. Walsh, and M. Wang, Moving sea ice prediction forward via community intercomparison, *Bull. Amer. Meteorol. Soc.* <https://journals.ametsoc.org/view/journals/bams/aop/BAMS-D-21-0159.1/BAMS-D-21-0159.1.xml>, **2021**.
- (127, *,25,*) Schweiger, A., M. Steele, J. Zhang, G. W. K. Moore, and K. Laidre, Accelerated sea ice loss in the Wandel Sea points to a change in the Arctic's Last Ice Area, *Nature Commun. Earth Environ.*, *2*, 122, <https://doi.org/10.1038/s43247-021-00197-5>, **2021**.

- (126) Chiodi, A. M., C. Zhang, E. D. Cokelet, Q. Yang, C. W. Mordy, C. Gentemann, J. Cross, N. Lawrence-Slavas, C. Meinig, M. Steele, D. E. Harrison, P. Stabeno, H. Tabisola, D. Zhang, E. Burger, and K. O'Brien, Exploring the Alaskan Arctic Seasonal Ice Zone with Saildrones, *Frontiers in Marine Science*, <https://doi.org/10.3389/fmars.2021.640697>, **2021**.
- (125) Vazquez-Cuervo, J., C. Gentemann, W. Tang, D. Carroll, H. Zhang, D. Menemenlis, J. Gomez-Valdes, M. Bouali, and M. Steele, Using Saildrones to Validate Arctic Sea-Surface Salinity from the SMAP Satellite and from Ocean Models. *Remote Sens.*, **13**, <https://doi.org/10.3390/rs13050831>, **2021**.
- (124,*,*,16) Zhang, J., W. Weijer, M. Steele, W. Cheng, T. Verma & M. Veneziani, Labrador Sea freshening linked to Beaufort Gyre freshwater release., *Nat. Commun.*, **12**, <https://doi.org/10.1038/s41467-021-21470-3>, **2021**.
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- (123) DeGrandpre, M., W. Evans, M.-L. Timmermans, R. Krishfield, B. Williams, and M. Steele, Changes in the Arctic Ocean carbon cycle with diminishing ice cover, *Geophys. Res. Lett.*, **47**, <https://doi.org/10.1029/2020GL088051>, **2020**.
- (122) Mayot, N., P. A. Matrai, A. Arjona, S. Bélanger, C. Marchese, T. Jaegler, M. Ardyna, and M. Steele, Springtime export of Arctic sea ice influences phytoplankton production in the Greenland Sea, *J. Geophys. Res.*, **125**, <https://doi.org/10.1029/2019JC015799>, **2020**
- (121, *,*,15) Banzon, V., T.M. Smith, M. Steele, B. Huang, and H. Zhang, [Improved Estimation of Proxy Sea Surface Temperature in the Arctic](https://doi.org/10.1175/JTECH-D-19-0177.1). *J. Atmos. Oceanic Technol.*, **37**, 341–349, <https://doi.org/10.1175/JTECH-D-19-0177.1>, **2020**.
- (120,*,*,14) Zhang, J., Y. H. Spitz, M. Steele, C. Ashjian, R. Campbell, & A. Schweiger. Biophysical consequences of a relaxing Beaufort gyre. *Geophysical Research Letters*, **47**, e2019GL085990. <https://doi.org/10.1029/2019GL085990>, **2020**.
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- (119) Fournier, S., T. Lee, W. Tang, M. Steele, and E. Olmedo, Evaluation and Intercomparison of SMOS, Aquarius and SMAP Sea Surface Salinity Products in the Arctic Ocean, *Remote Sens.*, **11(24)**, 3043, <https://doi.org/10.3390/rs11243043>, **2019**.
- (118,*,*,13) Zhong, W., Zhang, J., Steele, M., Zhao, J., & Wang, T. Episodic extrema of surface stress energy input to the western Arctic Ocean contributed to step changes of freshwater content in the Beaufort Gyre. *Geophysical Research Letters*, **46**. <https://doi.org/10.1029/2019GL084652>, **2019**.
- (117) Moore, G. W. K., Schweiger, A., Zhang, J., & Steele, M. Spatiotemporal variability of sea ice in the arctic's last ice area. *Geophysical Research Letters*, **46**. <https://doi.org/10.1029/2019GL083722>, **2019**.
- (116) Minnett, P. J., A. Alvera-Azcárate, T. M. Chin, G. K. Corlett, C. L. Gentemann, I. Karagali, X. Li, A. Marsouin, S. Marullo, E. Maturi, R. Santoleri, S. Saux Picart, M. Steele, and J. Vazquez-Cuervo, Half a century of satellite remote sensing of sea-surface temperature, *Rem. Sens. Environ.*, **233**, <https://doi.org/10.1016/j.rse.2019.111366>, **2019**.
- (115,25,*,*) Steele, M., A. C. Bliss, G. Peng, W. N. Meier, and S. Dickinson, *Arctic Sea Ice Seasonal Change and Melt/Freeze Climate Indicators from Satellite Data, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: <https://doi.org/10.5067/KINANQKEZ14T>. **2019** [Date Accessed].

- (114) Peterson, P. K., M. Hartwig, N. W. May, E. Schwartz, I. Rigor, W. Ermold, M. Steele, J. H. Morison, S. V. Nghiem, and K. A. Pratt, Snowpack measurements suggest role for multi-year sea ice regions in Arctic bromine and chlorine chemistry, *Elem Sci Anth*, 7(1), p.14. DOI: <http://doi.org/10.1525/elementa.352>, 2019.
- (113,*24,*) Bliss, A.C., M. Steele, G. Peng, W.N. Meier, and S. Dickinson, Regional variability of Arctic sea ice seasonal change climate indicators from a passive microwave climate data record, *Environ. Res. Lett.*, 14, doi: <https://doi.org/10.1088/1748-9326/aaf84>, 2019.
- (112,*23,*) Zhong, W., Steele, M., Zhang, J., & Cole, S., Circulation of Pacific Winter Water in the western Arctic Ocean. *J. of Geophys. Res.*, 124. <https://doi.org/10.1029/2018JC014604>, 2019.
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- (111) Moore, G.W.K., A. Schweiger, J. Zhang, & M. Steele, What caused the remarkable February 2018 North Greenland polynya?, *Geophys. Res. Lett.*, 45, <https://doi.org/10.1029/2018GL080902>, 2018.
- (110) Zhang, J., A. Schweiger, M. Webster, B. Light, M. Steele, C. Ashjian, R. Campbell, & Y. Spitz, Melt pond conditions on declining Arctic sea ice over 1979-2016: Model development, validation, and results, *J. Geophys. Res.*, 123, <https://doi.org/10.1029/2018JC014298>, 2018.
- (109) Mayot, N., P. Matrai, I. H. Ellingsen, M. Steele, K. Johnson, S. C. Riser, & D. Swift, Assessing phytoplankton activities in the seasonal ice zone of the Greenland Sea over an annual cycle. *J. Geophys. Res.*, 123. <https://doi.org/10.1029/2018JC014271>, 2018.
- (108,*22,*) Peng, G., M. Steele, A. C. Bliss, W. N. Meier, & S. Dickinson, Temporal means and variability of arctic sea ice melt and freeze season climate indicators using a satellite climate data record. *Remote Sens.*, 10, 1328, 2018.
- (107) Stern H. L., A. J. Schweiger, J. Zhang, & M. Steele, On reconciling disparate studies of the sea-ice floe size distribution. *Elem Sci Anth*. 6(1):49. DOI: <http://doi.org/10.1525/elementa.304>, 2018.
- (106) Stern H. L., A. J. Schweiger, M. Stark, J. Zhang, M. Steele, & B. Hwang, Seasonal evolution of the sea-ice floe size distribution in the Beaufort and Chukchi seas. *Elem Sci Anth*. 6(1):48. DOI: <http://doi.org/10.1525/elementa.305>, 2018.
- (105,*12) Hill, V., B. Light, M. Steele, & R. Zimmerman, Light availability and phytoplankton growth beneath Arctic sea ice: Integrating observations and modeling. *J. Geophys. Res.*, 123, <https://doi.org/10.1029/2017JC013617>, 2018.
- (104) Moore, G.W.K., A. Schweiger, J. Zhang, & M. Steele, Collapse of the 2017 winter Beaufort High: A response to thinning sea ice?, *Geophys. Res. Lett.*, 45, 2860-2869, <https://doi.org/10.1002/2017GL076446>, 2018.
- (103,*21,*) Zhong, W., Steele, M., Zhang, J., & Zhao, J., Greater role of geostrophic currents in Ekman dynamics in the western Arctic Ocean as a mechanism for Beaufort Gyre stabilization. *J. Geophys. Res.*, 123, <https://doi.org/10.1002/2017JC013282>, 2018.
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- (102) Alkire, M. B., Morison, J., Schweiger, A., Zhang, J., Steele, M., Peralta-Ferriz, C., & Dickinson, S., A meteoric water budget for the Arctic Ocean. *J. Geophys. Res.*, 122, <https://doi.org/10.1002/2017JC012807>, 2017.
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