

Patricia DeRepentigny

ARCTIC SEA ICE · CLIMATE MODELING · POLAR CLIMATE VARIABILITY

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Research Objective

I'm interested in future projections of Arctic sea ice in earth system models, with the goal of improving our understanding of the multiple drivers of sea ice retreat on seasonal to century time scales in the context of forcing uncertainty and the internal variability of the climate system.

Education

PhD in Atmospheric & Oceanic Sciences

UNIVERSITY OF COLORADO BOULDER

2021

Boulder, CO USA

Advisor: Dr. Alexandra Jahn

PhD Thesis: Assessing the Future of the Arctic Sea Ice Cover: Processes, Variability and Implications

MSc in Atmospheric & Oceanic Sciences

MCGILL UNIVERSITY

2016

Montreal, Canada

Advisor: Dr. Bruno Tremblay

Master's Thesis: Patterns of Sea-Ice Retreat in the Transition to a Seasonally Ice-Free Arctic

BSc in Earth & Atmospheric Sciences with honorable mention

UNIVERSITÉ DU QUÉBEC À MONTRÉAL (UQAM)

2013

Montreal, Canada

Major: Meteorology

Research Experience

Graduate Research Assistant

INSTITUTE OF ARCTIC AND ALPINE RESEARCH – POLAR AND PALEOCLIMATE MODELING GROUP

2018 – Present

Boulder, CO USA

Advisor: Dr. Alexandra Jahn

Research projects: (1) Investigate how declining sea ice cover affects trans-border ice exchange between the different Arctic states; (2) Understand sea ice loss contributions from dynamic and thermodynamic sources in CMIP6 models.

Casual Research Assistant

MCGILL UNIVERSITY – SEA ICE RESEARCH GROUP

Summers 2016 & 2017

Montreal, Canada

Advisor: Dr. Bruno Tremblay

Research project: Use a Lagrangian ice tracking system to analyze increases in transnational ice exchange between the Arctic states over the recent years using satellite observations and until the end of the 21st century using climate models.

Graduate Research Assistant

MCGILL UNIVERSITY – SEA ICE RESEARCH GROUP

2013 – 2015

Montreal, Canada

Advisor: Dr. Bruno Tremblay

Research project: Development of a Lagrangian ice tracking system to assess the patterns of sea-ice retreat by analyzing wind-driven sea-ice divergence and its connection to the winter mean sea-level pressure field over the Arctic Ocean.

Intern in Meteorology

ENVIRONMENT CANADA – CANADIAN METEOROLOGICAL CENTER

Summers 2011 & 2012, Fall 2012

Dorval, Canada

Advisors: Drs. Jean-François Lemieux and André Plante

Research projects: (1) Optimization of an experimental sea ice model with a 5km resolution centered on the Arctic using buoy data; (2) Test the performance of the GEM Regional model with an increased 10km resolution for different projects.

Publications

PUBLISHED

9 total | 3 first-authored | 1 second-authored | h-index: 6 | ResearcherID: Q-2246-2017

DeRepentigny, P., Jahn, A., Holland, M. M., and Smith, A. (2020), Arctic sea ice in two configurations of the CESM2 during the 20th and 21st centuries, *Journal of Geophysical Research: Oceans*, 125(9), e2020JC016133, doi: 10.1029/2020JC016133

Meehl, G. A., Arblaster, J. M., Bates, S., Richter, J. H., Tebaldi, C., Gettelman, A., Medeiros, B., Bacmeister, J., **DeRepentigny, P.**, Rosenbloom, N., Shields, C., Hu, A., Teng, H., Mills, M. J., and Strand, G. (2020), Characteristics of future warmer base states in CESM2, *Earth and Space Science*, 7(9), e2020EA001296, doi: 10.1029/2020EA001296

Notz, D., and SIMIP Community, including **DeRepentigny, P.** (2020), Arctic sea ice in CMIP6, *Geophysical Research Letters*, 47(10), e2019GL086749, doi: 10.1029/2019GL086749

DuVivier, A. K., **DeRepentigny, P.**, Holland, M. M., Webster, M., Kay, J. E., and Perovich, D. (2020), Going with the floe: tracking CESM Large Ensemble sea ice in the Arctic provides context for ship-based observations, *The Cryosphere*, 14(4), 1259–1271, doi: 10.5194/tc-14-1259-2020

DeRepentigny, P., Jahn, A., Tremblay, L. B., Newton, R., and Pfirman, S. (2020), Increased transnational sea ice transport between neighboring Arctic states in the 21st century, *Earth's Future*, 8(3), e2019EF001284, doi: 10.1029/2019EF001284

Newton, R., Pfirman, S., Tremblay, L. B., and **DeRepentigny, P.** (2017), Increasing transnational sea-ice exchange in a changing Arctic Ocean, *Earth's Future*, 5(6), 633–647, doi: 10.1002/2016EF000500

DeRepentigny, P., Tremblay, L. B., Newton, R., and Pfirman, S. (2016), Patterns of sea ice retreat in the transition to a seasonally ice-free Arctic, *Journal of Climate*, 29(19), 6993–7008, doi: 10.1175/JCLI-D-15-0733.1

Tremblay, L. B., Schmidt, G. A., Pfirman, S., Newton, R., and **DeRepentigny, P.** (2015), Is ice-rafted sediment in a North Pole marine record evidence for perennial sea-ice cover?, *Phil. Trans. R. Soc. A*, 373(2052), doi: 10.1098/rsta.2014.0168

Lemieux, J. F., Beaudoin, C., Dupont, F., Roy, F., Smith, G. C., Shlyaeva, A., Buehner, M., Caya, A., Chen, J., Carrieres, T., Pogson, L., **DeRepentigny, P.**, Plante, A., Pestieau, P., Pellerin, P., Ritchie, H., Garric, G., and Ferry, N. (2015), The Regional Ice Prediction System (RIPS): verification of forecast sea ice concentration, *Quarterly Journal of the Royal Meteorological Society*, 142(695), 632–643, doi: 10.1002/qj.2526

SUBMITTED

Newton, R., Pfirman, S., Tremblay, L. B., and **DeRepentigny, P.**, Defining the ‘ice shed’ of the Arctic Ocean’s Last Ice Area and its future evolution, under review at *Earth's Future* (manuscript number: 2021EF001988).

DeRepentigny, P., Jahn, A., Holland, M. M., Fasullo, J. T., Lamarque, J. F., Hannay, C., Mills, M. J., Bailey, D. A., Tilmes, S., and Barrett, A., Enhanced early 21st century Arctic sea ice loss due to CMIP6 biomass burning emissions, under review at *Nature Climate Change* (reference number: NCLIM-21030586).

Fasullo, J. T., Lamarque, J. F., Hannay, C., Rosenbloom, N., Tilmes, S., **DeRepentigny, P.**, Jahn, A., and Deser, C., Spurious Late Historical-Era Warming in CESM2 and Other CMIP6 Climate Simulations Driven by Prescribed Biomass Burning Emissions, under review at *Nature Climate Change* (reference number: NCLIM-21030597).

IN PREPARATION

Kay, J. E., **DeRepentigny, P.**, Holland, M. M., Bailey, D. A., DuVivier, A. K., Blanchard-Wrigglesworth, E., Deser, C., Jahn, A., Singh, H., Smith, M., and Webster, M. A., The influence of sea ice mean state on climate change and variability in the Community Earth System Model version 2, to be submitted to *Journal of Advances in Modeling Earth Systems*.

Honors & Awards

NATIONAL

2021	Advanced Study Program (ASP) Postdoctoral Fellowship National Center for Atmospheric Research (NCAR)	\$69,000 USD /yr for 2 years
2021	Postdoctoral Fellowship (PDF) – declined Natural Sciences and Engineering Research Council of Canada (NSERC)	\$45,000 CAD /yr for 2 years
2018	Alexander Graham Bell Canada Graduate Scholarship - Doctoral Program (CGS D) Natural Sciences and Engineering Research Council of Canada (NSERC)	\$21,000 CAD /yr for 3 years
2018	The Weather Research House NSERC Scholarship Supplement Canadian Meteorological and Oceanographic Society (CMOS)	\$5,000 CAD /yr for 2 years

2018	Doctoral Research Scholarship (B2X) Fonds de recherche du Québec – Nature et technologies (FRQNT)	\$21,000 CAD /yr for 4 years
2014	Canada Graduate Scholarship – Master’s Program (CGS M) Natural Sciences and Engineering Research Council of Canada (NSERC)	\$17,500 CAD /yr for 2 years
2014	Master’s Research Scholarship (B1) – declined Fonds de recherche du Québec – Nature et technologies (FRQNT)	\$15,000 CAD /yr for 2 years

INSTITUTIONAL

2021	CESM Graduate Student Award – National Center for Atmospheric Research
2019	Outstanding Service Award – Department of Atmospheric & Oceanic Sciences, CU Boulder
2013	Canada Steamship Lines Award – McGill University
2012	Undergraduate Scholarship – Université du Québec à Montréal (UQAM)
2010	Entry Scholarship – Université du Québec à Montréal (UQAM) Foundation

MEETINGS

2021	1st Place Outstanding Student Oral Presentation Award – 16 th AMS Conference on Polar Meteorology & Oceanography
2019	Honorable Mention for Student Presentation – 2019 IGS Sea Ice Symposium
2019	Outstanding Student Presentation Award – 15 th AMS Conference on Polar Meteorology & Oceanography
2018	Best Overall Poster – 12 th Annual Earth System and Space Science Poster Conference

Conference Presentations

(O) oral presentation | (P) poster presentation | (v) virtual | * award winner

Enhanced Early 21st Century Arctic Sea Ice Loss due to CMIP6 Biomass Burning Emissions

• 26 th Annual Community Earth System Model (CESM) Workshop. (O(v))*	06/2021
• 16 th AMS Conference on Polar Meteorology and Oceanography. (O(v))*	06/2021
• Virtual EGU General Assembly 2021 (Gather Online). (O(v))	04/2021
• Winter Polar Climate Working Group (PCWG) Virtual Meeting. (O(v))	02/2021
• AGU Fall Meeting 2020 (Online Everywhere). (O(v))	12/2020

Arctic Sea Ice in Two Configurations of the CESM2 During the 20th and 21st Centuries

• Virtual EGU General Assembly 2020 (Sharing Geoscience Online). (P(v))	05/2020
• Winter Polar Climate Working Group (PCWG) Meeting in Boulder, CO USA. (O)	02/2020
• 13 th Annual Earth System and Space Science Poster Conference in Boulder, CO USA. (P)	12/2019
• ESM Summer School 2019 in Bad Aibling, Germany. (P)	09/2019
• 2019 IGS Sea Ice Symposium in Winnipeg, Canada. (P)	08/2019
• 2019 SIMIP Workshop at the IGS Sea Ice Symposium in Winnipeg, Canada. (O)	08/2019

No Scenario Impact on Arctic September Sea Ice in CESM2

• ESM Summer School 2019 in Bad Aibling, Germany. (P)	09/2019
• 2019 CESM Polar Modeling Workshop in Boulder, CO USA. (P)	08/2019

Increased Transnational Sea Ice Transport Between Neighboring Arctic States in the 21st Century

• 2019 IGS Sea Ice Symposium in Winnipeg, Canada. (O)*	08/2019
• 27 th IUGG General Assembly in Montreal, Canada. (O)	07/2019

Future Sea-Ice Decline Predicted to Bring the Arctic Nations Closer Together

• 15 th AMS Conference on Polar Meteorology and Oceanography in Boulder, CO USA. (O)*	05/2019
• Winter Polar Climate Working Group (PCWG) Meeting in Boulder, CO USA. (O)	02/2019
• 2018 AGU Fall Meeting in Washington, D.C. USA. (P)	12/2018
• 12 th Annual Earth System and Space Science Poster Conference in Boulder, CO USA. (P)*	11/2018

Will sea-ice decline bring the Arctic nations closer together?

• 23 rd Annual Community Earth System Model (CESM) Workshop in Boulder, CO USA. (P)	06/2018
• 11 th Annual Earth System and Space Science Poster Conference in Boulder, CO USA. (P)	12/2017

Patterns of sea-ice retreat in the transition to a seasonally ice-free Arctic

- 2015 AGU Fall Meeting in San Francisco, CA USA. (P)
- 49th CMOS Congress & 13th AMS Conference in Whistler, Canada. (O)

12/2015
06/2015

Finding the source regions of sea ice melting in the MIZ: a Lagrangian approach

- Arctic Change 2014 in Ottawa, Canada. (P)
- 3rd Forum for Arctic Modeling & Observational Synthesis in Woods Hole, MA USA. (P)
- ArcTrain Annual Meeting & Workshop in Bremen, Germany. (O)

12/2014
10/2014
05/2014

Teaching Experience

Teaching Assistant

Aug 2017 – May 2018

UNIVERSITY OF COLORADO BOULDER

Boulder, CO USA

Fall 2017 semester: ATOC1070 Weather and Atmosphere Laboratory. Delivered lectures and conducted experiments (4hrs per week), marked lab reports and held regular office hours.

Spring 2018 semester: ATOC3050 Principles of Weather. In charge of the weekly recitation sections (4hrs per week), reviewed important topics introduced during lecture and conducted further exploration of the material by various methods such as practice problems, graded weekly homework assignments and held regular office hours.

Workshops

2020 CICE & Icespack Community Workshop and Tutorial

Feb 2020

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Boulder, CO USA

Discussion of the current and future development of the community CICE and Icespack models. Lectures and practical sessions on using the CICE and Icespack models, both on their own as well as use within coupled modeling systems.

ESM Summer School 2019

Sep 2019

HELMHOLTZ ASSOCIATION OF GERMAN RESEARCH CENTERS

Bad Aibling, Germany

Combination of lectures and hands-on sessions on Earth system components, theoretical aspects, numerical modelling, data assimilation and coupling of numerical models for the Earth system.

2019 SIMIP Workshop

Aug 2019

CLIMATE AND CRYOSPHERE (CLIC) – WORLD CLIMATE RESEARCH PROGRAMME (WCRP)

Winnipeg, Canada

Half-day workshop to discuss ongoing SIMIP analysis in the target groups and possible collaborations on papers.

2019 CESM Polar Modeling Workshop

Aug 2019

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Boulder, CO USA

Week-long workshop for early-career polar scientists to learn specialized techniques for using the CESM and high performance computing in polar research.

2019 Arctic Data Center Data Science Training

Jan 2019

NATIONAL CENTER FOR ECOLOGICAL ANALYSIS AND SYNTHESIS

Santa Barbara, CA USA

Overview of best data management practices and data science tools, along with concrete steps and methods for more easily documenting and uploading data to the Arctic Data Center.

2018 NCL + Vapor Workshop

Jul 2018

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Boulder, CO USA

Introductory lectures and hands-on labs covering NetCDF and other data formats, NCL language basics, file input/output, data analysis and graphics.

2018 CSDMS Software Carpentry Workshop

May 2018

COMMUNITY SURFACE DYNAMICS MODELING SYSTEM

Boulder, CO USA

Lectures on programming skills useful for scientific computing and model development, including basic elements of the Unix bash shell, Python programming with Numpy and GitHub for version control.

2018 Python Workshop

UNIVERSITY OF COLORADO BOULDER RESEARCH COMPUTING

Spring 2018

Boulder, CO USA

Overview of how fundamental programming constructs are implemented within Python and some popular Python packages used in numeric calculations and data analysis.

2017 CESM Tutorial

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

Aug 2017

Boulder, CO USA

Lectures on simulating the climate system and practical sessions on running CESM, modifying components and analyzing data.

Skills

Operating Systems	macOS, Scientific Linux and Microsoft Windows
Programming Languages	NCL (<i>proficient</i>), MATLAB (<i>proficient</i>), Python (<i>intermediate</i>), shell scripting (<i>intermediate</i>)
Supercomputers	NCAR's Cheyenne
Data & Databases	Running ESM simulations, CMIP5/6, NetCDF, NCO, CDO
Numerical Modeling	Community Earth System Model (CESM)
Other Software	L ^A T _E X, Microsoft Office, G Suite, Adobe Reader, Inkscape
Human Languages	French (<i>native</i>) & English (<i>fluent</i>)

Grants

AMS Early Career Registration Grant

April 2021

Grant to cover the registration fees of the 16th AMS Conference on Polar Meteorology and Oceanography.

CU Boulder Graduate and Professional Student Government Travel Grant

December 2020

Travel grant of \$100 USD to cover the registration fees of the virtual AGU Fall Meeting 2020.

ATOC University Fellowship Award

May 2020

Travel grant of \$2620 USD to assist in participation in the EGU General Assembly 2020 in Vienna, Austria.

ESM Summer School 2019 Travel Grant

Sep 2019

Travel grant of 500€ to assist in participation in the ESM Summer School 2019 in Bad Aibling, Germany.

2019 IGS Student/ECR Travel Award

Aug 2019

Travel award of \$750 CAD to assist in participation in the 2019 IGS Sea Ice Symposium in Winnipeg, MB, Canada.

WCRP CliC Travel Grant

Aug 2019

Travel grant of \$490 USD to assist in participation in the 2019 SIMIP Workshop in Winnipeg, MB, Canada.

University of Colorado Boulder Graduate School Domestic Travel Grant

Jul 2019

Travel grant of \$300 USD to assist in participation in the 27th IUGG General Assembly in Montreal, QC, Canada.

Publication with archiving bonus from Québec-Océan

Oct 2016

Bonus of \$500 CAD for the publication of an article with data archiving as a Québec-Océan member.

Financial support for conference from Québec-Océan

May 2015

Travel grant of \$500 CAD to assist in participation in the CMOS conference in Whistler, BC, Canada.

ArcticNet training fund

Feb 2015

Travel grant of \$2,400 CAD to assist in participation in the field school *Field Topics in Arctic Systems: Snow Covered Sea Ice* in Nuuk, Greenland.

Québec-Océan training grant

Feb 2015

Travel grant of \$1,500 CAD to assist in participation in the field school *Field Topics in Arctic Systems: Snow Covered Sea Ice* in Nuuk, Greenland.

Service

Session Chair

2021 – Present

Serve as session chair for 4 different sessions at the 16th AMS Conference on Polar Meteorology and Oceanography in Boulder, CO USA.

Student Representative – AMS Committee on Polar Meteorology and Oceanography

2019 – Present

Organize the 16th Conference on Polar Meteorology and Oceanography (June 2021). Serve as a forum for the integration and dissemination of polar research through meetings, symposia, educational activities, and publications. [webpage]

Student Mentor to 1st-year graduate students – ATOC

2018 – Present

Assist incoming ATOC graduate student as they begin graduate school. Mentored three incoming students over four semesters.

Member – ATOC Awards Committee

2018 – Present

Improve opportunities for student recognition, including the creation of a new award to honor outstanding teaching assistants.

Member – CESM Polar Climate Working Group

2017 – Present

Consortium of scientists who are interested in modeling and understanding the climate in the Arctic and the Antarctic, and how polar climate processes interact with and influence climate at lower latitudes. [webpage]

Journal Reviewer

2016 – Present

Act as a reviewer for peer-reviewed publications for *Journal of Climate*, *Annals of Glaciology* and *Communications Earth & Environment*.

Student Lead & Co-founder – ATOC Colloquium Committee

2018 – 2020

Organize and host a bi-weekly seminar series featuring research done by ATOC graduate students and faculty members, as well as external speakers local to the Front Range. [webpage]

Student Lead – ATOC Curriculum Committee

2018 – 2020

Review and propose changes to the department curricula and core courses, minor, and major requirements.

Student Lead – ATOC COMPS I Committee

2018 – 2020

Review each COMPS I exam question, provide feedback to the writer and review COMPS exam procedures.

Student Council Member – ATOC

2018 – 2019

Facilitate communication and coordinate between department committees to enhance their connectedness and overall effectiveness.

Student Lead – ATOC Poster Conference Committee

2017 – 2020

Plan and run the annual Earth Systems & Space Science Poster Conference. [webpage]

Member – ATOC Student Concerns Committee

2017 – 2019

Work with the ATOC Graduate Advisor to address the needs and issues of students.

Outreach

Skype a Scientist

2018 – Present

Video calls with high school science classes.

La Pêche Coalition for a Green New Deal Webinar on Climate Feedback Loops

Feb 2021

Sit on a panel of experts to discuss the nature of climate feedback loops and the role of global forests and Arctic ice in sustaining life on Earth. [webpage]

Media Coverage

June 2020 **Publication Feature – Yale Climate Connections**

Featured in the news headline “Melting ice opens doors for wider spread of contaminants, diseases” published on June 2, 2020 in Yale Climate Connections. [\[webpage\]](#)

May 2020 **Publication Feature – ESM Project**

Featured in the news headline “Going with the floe: insights from the CESM Large Ensemble on the MOSAiC expedition” published on May 15, 2020 on the ESM Project News webpage. [\[webpage\]](#)

May 2020 **Publication Feature – Arctic Today**

Featured in the news headline “As Arctic ice thins and melts, more of it will travel between nations – bringing pollution with it” published on May 11, 2020 in Arctic Today. [\[webpage\]](#)

Apr 2020 **Publication Feature – NSIDC Arctic Sea Ice News & Analysis**

Featured in the news headline “The future of pollutant transport via sea ice drift” published on April 2, 2020 in NSIDC Arctic Sea Ice News & Analysis. [\[webpage\]](#)

Mar 2020 **Press Release – CU Boulder Today**

Featured in the news headline “Increasingly mobile sea ice risks polluting Arctic neighbors” published on March 18, 2020 in CU Boulder Today. [\[webpage\]](#)

Jan 2018 **Scientific contribution – National Geographic Magazine**

Provided data and scientific insight for the piece “Ice on the Edge” in the January 2018 issue of the National Geographic magazine.

Field Experience

Rosette Operator

CCGS AMUNDSEN SCIENTIFIC EXPEDITION 2015 (LEG 4)

Oct 2015

Baffin Bay, Canada

Operated the CTD/Rosette and the moving vessel profiler (MVP), collected water samples and analyzed salinity and oxygen concentration.

Field Topics in Arctic Systems: Snow Covered Sea Ice (GEOG7400)

ARCTIC SCIENCE PARTNERSHIP ANNUAL FIELD SCHOOL ORGANIZED BY THE UNIVERSITY OF MANITOBA

Feb 2015

Nuuk, Greenland

Learned about the Arctic physical, biological and social systems and engaged with the local communities.