Joanna D. Millstein

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EDUCATION

Massachusetts Institute of Technology, Cambridge, Massachusetts

PhD in Geophysics 2018 – 2023

Massachusetts Institute of Technology - Woods Hole Oceanographic Institution Joint Program
Advisor: Brent Minchew
Thesis: *The Flow and Fracture of Antarctic Ice Shelves*

Dartmouth College, Hanover, New Hampshire

Bachelor of Arts in Earth Sciences 2013 – 2017

Advisor: Bob Hawley
Honors Thesis: *Ice Thickness and Elevation Changes on the Ross Ice Shelf, Antarctica, from Airborne Radar and Satellite Altimetry*

PROFESSIONAL APPOINTMENTS

Colorado School of Mines, Golden, Colorado

Postdoctoral Fellow, Department of Geophysics Nov 2023 – Present

Massachusetts Institute of Technology, Cambridge, Massachusetts

Affiliate 2023 – Present

PUBLICATIONS

SUBMITTED & IN PREPARATION

[10] Millstein, J. D., E. J. Abrahams, J. C. Colliander, W. S. Sauthoff, J. Scheick, M. R. Siegfried, T. Snow. CryoCloud: A Community Driven Platform to Advance Scientific Cloud Computing *In preparation for Science Advances Research Resources*

[9] Millstein, J. D., J. P. Logan, M. R. Siegfried. Observational insight into stress drops during crevasse advection. *In prep.*

[8] Millstein, J. D., B. M. Minchew, C. C. Walker. The application of a fatigue-crack growth law for modeling ice shelf rifts. *In prep.*

[7] Millstein, J. D., B. M. Minchew, B. V. Riel. Time-dependent Strain-rate Fields Forecast Rift Propagation: Case Study on the Brunt Ice Shelf, Antarctica. *In prep. for Journal of Glaciology.*

[6] Henry A. C., C. Schannwell, V. Visnjevic, J. D. Millstein, P. D. Bons, Eisen, R. Drews. Predicting the three-dimensional age-depth field of an ice rise. ESS Open Archive . August 17, 2023. doi: 10.22541/essoar.169230234.44865946/v1 *Under review at Journal for Geophysical Research*.

PUBLISHED

[5] Walker, C, Millstein, J. D., B. Miles, S. Cook, A. Fraser, A. Colliander, S. Misra, L. Trusel, S. Adusumilli, C. Roberts, H. A. Fricker. Multi-decadal Collapse of East Antarctica's Conger-Glenzer Ice Shelf. Accepted at Nature Geoscience. 17, 1240–1248. 2024.

[4] MacKie*, E. J., Millstein*, J. D., K. A. Serafin. 47 Years of Large Antarctic Calving Events: Insights from Extreme Value Theory. Geophysical Research Letters 51.23. 2024. * = equal contribution

[3] Bassis, J. N., A. Crawford, S. B. Kachuck, D. Benn, C. C. Walker, J. D. Millstein, R. Duddu, J Astrom, H. Fricker, A. Luckman. Stability of Ice Shelves and Ice Cliffs in a Changing Climate. Annual Review of Earth and Planetary Sciences. Vol, 52. 2024.

[2] Millstein, J. D., B. M. Minchew, S. S. Pegler. Reassessing the Flow Law of Glacier Ice Using Satellite Observations. Nature Communications Earth & Environment, 3(1), *1-7*, 2022.

[1] Hawley, R. L. and J. D. Millstein, Quantifying snow drift on Arctic structures: A case study at Summit, Greenland, using UAV-based structure-from-motion photogrammetry. Cold Regions Science and Technology, 157, *163-170*, 2019.

WHITE PAPERS

[1] Millstein, J. D., T. Snow, W. Sauthoff, J. Scheick, & M. Siegfried. CryoCloud: Accelerating Discovery for NASA Cryosphere Communities with Open-Cloud Infrastructure, NASA RFI. https://doi.org/10.5281/zenodo.7662993. 2023

HONORS & AWARDS

GAGE/SAGE Student Travel Award — 2023

MIT Graduate Student Council Conference Grant Award — 2022

West Antarctic Ice Sheet Workshop Best Student Presentation Award — 2022

Student Research Fund — 2020
Massachusetts Institute of Technology departmental grant

M. Nafi Toksöz Fellow — 2019
Massachusetts Institute of Technology departmental fellowship

National Science Foundation Graduate Research Fellowship — 2018

Theodore R. Madden Fellow — 2018
Massachusetts Institute of Technology departmental fellowship

H. Allen Brooks Traveling Fellowship — 2017
Funding a year of travel and writing

Dr. Warren Upham Geology Prize, Dartmouth College — 2017
For best senior honors thesis in the Earth Sciences department.

John A. Ebers 1961 Memorial Award, Dartmouth College — 2017
Awarded to the outstanding Earth Sciences student in the senior class

Sigma Xi, Dartmouth College — 2017

Honors Thesis Grant, Dartmouth College — 2017

Estwing Award for Outstanding Geologist, Dartmouth College — 2016
Awarded to an Earth Sciences student for outstanding enthusiasm, cooperation, and support in the field.

EXTERNAL FUNDING

Accelerating ICESat-2 Science with Collaborative Cloud-computing — 2022
$363K. 22-NUP2022-0089. PIs: T. Snow (CSM), D. Felikson (NASA GSFC) M. Siegfried (CSM).
Served as a lead writer while PhD candidate

National Science Foundation Graduate Research Fellowship — 2018
$138,000

H. Allen Brooks Traveling Fellowship — 2017
$15,000

TEACHING EXPERIENCE

Arctic Seismology, University Center in Svalbard, Norway. *Instructor* — 2024

Radar Theory and Applications, Colorado School of Mines Field Course. *Instructor* — 2024

Remote Sensing, Colorado School of Mines. *Guest Lectures* — 2023, 2024

Physical Principles of Remote Sensing, MIT. *Guest Lectures* — 2018, 2019, 2021, 2022

Juneau Icefield Research Program

Geophysics Teaching Faculty — Summer 2021
Faculty field instructor for geophysics, remote sensing, and glacier hydrology in addition to designing and supervising student research projects. Responsible for safe field procedures and instruction in geodetic methods.

Teaching Assistant, MIT

Geophysics Field Camp — January 2020
Graduate-level field course instructor in drone operation and geologic mapping.

Physical Principles of Remote Sensing — Fall 2020
Teaching assistant for graduate and undergraduate course in physics of remote sensing.

Teaching Assistant, Dartmouth College

How the Earth Works — Spring 2016
Teaching assistant for introductory course in geology with laboratory component.

Computer Animation — Fall 2015
Teaching assistant for course on advanced digital modeling and animation.

INVITED TALKS

Observational constraints on the fracture of glacier ice. *Earth and Environmental Science Seminar, University of Pennsylvania*, Scheduled February 2025

Observational constraints on the fracture of glacier ice. *GeoColloquium, Geological Sciences at CU Boulder*, Scheduled January 2025

Observational constraints on the fracture of glacier ice. *Weeks Lecture, Department of Geoscience, University of Wisconsin–Madison*, November 2024

Advanced Computing for Surface Deformation and Topography. *NASA Solid Earth Team Meeting - CORE 2.0*, September 2024.

An extreme value theory perspective on large iceberg calving events. *CESM Workshop*, June 2024.

Collaborative Cloud Computing for Cryosphere Science. *ICESat-2 Applications Workshop*, June 2024.

Collaborative Cloud Computing for Cryosphere Science. *ICESat-2 Science Team Meeting*, October 2022.

Uncovering the Cryosphere with SAR. *NISAR Community Meeting*, August 2022.

From Flow to Fracture on Antarctic Ice Shelves. *Ice Sheets and Climate Group at University of Colorado, Boulder*, February 2022.

Investigating the Dynamics of Antarctic Ice Shelves. *Colorado School of Mines Glaciology Group*, October 2021.

n=4: Reassessing the Flow Law of Glacier Ice Using Satellite Observations. *Maths on Ice Seminar*, October 2021.

Validating and calibrating Glen's Flow Law for Antarctic glacier ice. *British Antarctic Survey*, May 2021.

Inferring ice rheology in Antarctic ice shelves using remotely-sensed surface velocity observations. *AGU Fall Meeting*, December 2021.

Delving into Glen's flow law and inferring characteristics from the flow law exponent. *Georgia Tech Ice & Climate Group*, June 2020.

Digital Elevation Model Creation Using SfM at Summit, Greenland. *EnviroDrones*, June 2017.

MENTORSHIP

Graduate

Elenda Savidge, *Colorado School of Mines* — 2023 – Present

Hannah Verbonceour, *Colorado School of Mines* — 2022 – Present

Undergraduate

Jack Logan, *Colorado School of Mines Class of 2026* — 2024 – Present

Cecilia Gichner, *Bates College Class of 2022* — 2021 – 2022

Ryan Conti, *MIT Class of 2023* — 2021 – 2022

Jon Rosario, *MIT Class of 2024* — Summer 2021

Neosha Narayanan, *MIT Class of 2022* — 2020 – 2022

Joyce Yoon, *MIT Class of 2023* — Summer 2020

FIELD EXPERIENCE

Colorado — 2024
Faculty for Colorado School of Mines Geophysics field course

Svalbard — 2024
Faculty for UNIS Course Arctic Seismic Exploration and Monitoring

Piute Wilderness, California — 2022
Teaching assistant and drone pilot for MIT geophysics field course

Juneau Icefield, Alaska — 2021
Faculty member and geophysics instructor for crevasse research for 30+ students.

Atlantic Ocean, R/V Corwith Cramer — 2018
Conducted hydrographic and biological surveys off the shelf break jet south of Cape Cod

Western United States and Rocky Mountains — 2015
Dartmouth Earth Sciences Off-Campus Field Program

Greenland — 2015
Based at Summit Station. Geophysical surveys and drone flights.

Greenland — 2014
Western margins of the Greenland Ice Sheet. CryoSat-2 ground truth campaign.

ACADEMIC SERVICE

Reviewer

Geophysical Research Letters, Journal of Glaciology, Nature Communications, Nature Geoscience

Session Convener, AGU Fall Meeting 2024 — 2024

Panelist for NSF Crevasse Webinar Series
Topic: Automated Detection of Crevasses from Remote Sensing — 2023

Session Convener, AGU Fall Meeting 2022 — 2022

WHOI search committee for Deep Submergence faculty position
Chair of Student Advisory Group — 2021

MIT EAPS Application Mentorship Program
Co-organizer — 2020, 2021

MIT EAPS Graduate Student Advisory Council
Co-President — 2020, 2021

Graduate Climate Conference
Planning Committee - Logistics Team Leader — 2019

OUTREACH & INVOLVEMENT

EOS Article
Author on piece "Democratizing Science in the Cloud" — 2024

MIT Abstracts, Nord Anglia Education
Keynote for international audience of primary school students — 2023

MIT Museum
Climate science expert for science movie night — 2020

Gardner Pilot Academy, Massachusetts
Introducing 8th grade math students to glaciers and glaciology — 2019

Skype a Scientist
Educational program instructor — 2018 – Present

International Arctic Science Committee
Volunteered in Akureyri, Iceland — 2017

PROFESSIONAL AFFILIATIONS

International Glaciological Society — 2018 – Present
American Geophysical Union — 2015 – Present
Sigma Xi — 2017 – 2023

SKILLS

Computing
Python, Unix/Linux, MATLAB, R, JavaScript, Fortran, LaTeX
GIS & Software
QGIS, ArcGIS, Gdal, ISCE, ImpDAR, FEniCS, ERDAS Imagine, ENVI, Agisoft Photoscan
Design
Adobe Photoshop, Adobe Illustrator, Inkscape, Gimp, Autodesk Maya
Machining
Competent operator of lathes, saws, and others shop equipment.

CERTIFICATIONS

Wilderness First Aid
AIARE I
FAA Remote Pilot (Commercial Drone license)

SELECTED CONFERENCE ABSTRACTS

[22] Savidge, E., Millstein, J. D., Snow, T., Siegfried, M. R., Bezu, C., Alley, K. E., Riel, B., 2024. Deteriorating Structural Integrity of Pine Island Glacier's South Shelf (2017-2023) identified with Satellite-Derived Surface Deformation, Ice Velocity, and Strain Rates. *AGU Fall Meeting*.

[21] Logan, J. P., Millstein, J. D., Siegfried, M. R., Surway-Stepney, T., 2024. Evaluating the Yield Stress of Glacial Ice over Antarctic Blue Ice Zones. *AGU Fall Meeting*.

[20] Mackie, E. J., Millstein, J. D., Serafin, K. A., 2024. Extreme value theory shows no increase in Antarctic calving size over the last half century. *AGU Fall Meeting*.

[19] Millstein, J. D., Lipscomb W., Leguy G., 2024. Evaluating Stress-based Calving Criteria in the Community Ice Sheet Model. *AGU Fall Meeting*.

[19] Millstein, J. D., 2024. How does ice break? *SatCamp Workshop*.

[18] Millstein, J. D., E. J. Mackie, K. A. Serafin, 2024. An extreme value theory perspective on large iceberg calving events. *Colorado Glaciology Workshop*.

[17] Millstein, J. D., B. M. Minchew, C. C. Walker, 2023. The application of a fatigue-crack growth law for modeling ice shelf rifts. *AGU Fall Meeting*.

[16] Millstein, J. D., B. V. Riel, B. M. Minchew, 2022. Time-dependent Strain-rate Fields Forecast Rift Propagation: Case Study on the Brunt Ice Shelf, Antarctica. *Colorado Glaciology Workshop*.

[15] T. Snow, Millstein, J. D., W. Sauthoff, J. Colliander, C. Holdgraf, F. Pérez, M. Siegfried, 2023. Accelerating Discovery for NASA Cryosphere Communities with JupyterHub. *JupyterCon*.

[14] T. Snow, Millstein, J. D., W. Sauthoff, J. Colliander, C. Holdgraf, F. Pérez, M. Siegfried, 2023. Time-dependent Accelerating Discovery for NASA Cryosphere Communities with Open-Cloud Infrastructure. *AMS 103rd Annual Meeting*.

[13] Millstein, J. D., B. V. Riel, B. M. Minchew, 2022. Time-dependent Strain-rate Fields Forecast Rift Propagation: Case Study on the Brunt Ice Shelf, Antarctica. *AGU Fall Meeting*.

[12] C. C. Walker, H. A. Fricker, Millstein, J. D., B. Miles, L. D. Trusel, 2022. Sustained long-term collapse of Conger-Glenzer ice shelf, East Antarctica. *AGU Fall Meeting*.

[11] N. Narayanan, Millstein, J. D., B. M. Minchew, 2022. Simulation and Analysis of Deformation and Stability in Antarctic Ice Shelves. *AGU Fall Meeting*.

[10] D. F. Martin, S. B. Kachuck, Millstein, J. D., B. M. Minchew, 2022. Examining the Sensitivity of Ice Sheet Models to Updates in Rheology (n= 4). *AGU Fall Meeting*.

[9] Millstein, J. D., B. V. Riel, B. M. Minchew, 2022. Time-dependent Strain-rate Fields Forecast Rift Propagation: Case Study on the Brunt Ice Shelf, Antarctica. *WAIS Workshop*.

[8] Millstein, J. D., B. V. Riel, B. M. Minchew, 2022. Time-dependent Strain-rate Fields Forecast Rift Propagation: Case Study on the Brunt Ice Shelf, Antarctica. *NISAR Community Meeting*.

[7] Millstein, J. D., B. M. Minchew, S.S. Pegler, 2021. n=4. *WAIS Workshop*.

[6] Millstein, J. D., B. M. Minchew, 2021. Validating and calibrating Glen's Flow Law for Antarctic glacier ice. *EGU 2021*.

[5] Millstein, J. D., B. M. Minchew, 2019. Inferring ice rheology in Antarctic ice shelves using remotely-sensed surface velocity observations. *AGU Fall Meeting*.

[4] Das, I., L. Padman, W. Chu, H. A. Fricker, M. K. Becker, R. E. Bell, K. J. Tinto, J. D. Millstein, 2017. Mass Balance and Structure of the Ross Ice Shelf, Antarctica. *International WCRP/IOC Conference on Regional Sea Level Changes and Coastal Impacts*.

[3] Das, I., L. Padman, W. Chu, H. A. Fricker, M. K. Becker, R. E. Bell, K. J. Tinto, J. D. Millstein, 2016. Mass Balance and Structure of the Ross Ice Shelf, Antarctica. *AGU Fall Meeting*.

[2] Millstein, J. D., W. Chu, I. Das, R.E. Bell, 2016. An Englacial Radar Attenuation Modeling Approach and Application to the Ross Ice Shelf. *AGU Fall Meeting*.

[1] Millstein, J. D., R.L. Hawley, 2015. Digital Elevation Model Creation Using SfM on High-Altitude Snow-Covered Surfaces at Summit, Greenland. *AGU Fall Meeting*.