Samuel B. Kachuck

Ice Dynamics Group
Climate and Space Sciences and Engineering
University of Michigan

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EDUCATION

Cornell University Aug 2018
Ph.D. in Physics
Committee: Lawrence M. Cathles, III, James P. Sethna, Carl Frank
Dissertation: Time-domain glacial isostatic adjustment: theory, computation, and statistical applications

Cornell University Aug 2014
M.S. in Physics

Cambridge University, St. Edmund's College May 2011
M.A.St., in Applied Mathematics and Theoretical Physics (with Merit)
Essay: The Interaction of a Buoyant Plume with a Grid

Wesleyan University June 2010
B.A. in Physics (with High Honors) and Mathematical Economics
Thesis: Granular Gravitational Collapse in Realistically Simulated Granular Gases

TEACHING EXPERIENCE

Instructional Support, University of Michigan
Ice and the Climate (UM CLaSP 474) Winter 2021
Earth Systems Modeling (UM CLaSP 410) Fall 2020

Produced videos and quizzes for hybrid learning within learning management system.

Lecturer, University of Michigan
Earth Systems Modeling (UM CLaSP 410) Fall 2019

Delivered twice weekly lectures and practical labs, updating material to use cooperative problems and active learning.

Guest Lecturer, University of Michigan
Ice sheets, Glaciers and Climate (UM CLaSP 474) Winter 2019

Developed and delivered 90-minute lecture introducing the concepts, methods, and historical context of glacial geomorphology, with cooperative assignment using high resolution LiDAR images to identify features and hypothesize ice flow patterns.

Guest Lecturer, Cornell University
Fluid Dynamics in the Earth Sciences Fall 2017

Developed and delivered two 50-minute lectures on the physics and observational basis of Glacial Isostatic Adjustment.

Private Tutor, Cornell University 2012 – 2018

Provided one-on-one tutoring for both calculus- and non-calculus-based mechanics, electromagnetism, and quantum intro courses by referral from the Cornell physics department. Several students subsequently hired/referred me to tutor for courses outside the physics department (e.g., Mechanical Engineering control theory and Civil Engineering fluid dynamics).

Graduate Teaching Assistant, Cornell University

Analytical Mechanics (PHYS 3318)	Spring 2017
Physics II: Electromagnetism (PHYS 2213)	Fall 2011, Spring 2012, Summer 2012
Physics I: Mechanics and Heat (PHYS 1112)	Fall 2012

Conducted two- or three-times weekly active learning sections practicing, clarifying, or expanding on material from main course lecture using cooperative problems.

Undergraduate Teaching Assistant, Wesleyan University

Quantum Mechanics I (PHYS 214)	Spring 2010
Mathematical Economics (ECON 380)	Fall 2009
General Physics II (PHYS 116)	Spring 2009
General Physics I (PHYS 113)	Fall 2008

Led weekly discussion sections for group problem solving and exam review.

RESEARCH EXPERIENCE

Postdoctoral Research Fellow, University of Michigan July 2018-Present

Advisor: Prof. Jeremy Bassis

Numerical modeling of largescale mechanical ice fracture and cryospheric interactions with the solid earth.

Graduate Research Fellow, Cornell University May 2012 – May 2018

Cornell University

Advisor: Prof. Lawrence M. Cathles, III

Studied the physics and uncertainties in global inversions glacial isostatic adjustment and Pleistocene relative sea levels.

Graduate Research Assistant, Cornell University Sep 2011 – May 2012

Advisor: Prof. Itai Cohen

Experimental study of the fluid dynamics and control mechanisms employed by Drosophilae to stabilize their flight against perturbations.

Research Assistant, GK Batchelor Fluids Lab, Cambridge University Oct 2010 – May 2011

Advisor: Dr. Stuart B. Dalziel

Experimental study of the various fluid dynamical regimes present when a buoyant plume flows past a permeable medium.

Undergraduate Research Assistant, Wesleyan University Aug 2008 – June 2010
Advisor: Prof. Greg A. Voth
Experimental and computational study of the dynamics of 2D granular gases in gravity, both in steady state (when energy is continuously added) and in decay (when it is not).

MENTORING EXPERIENCE

Paige Brady, University of California, Davis undergraduate Summer 2020-Present
Cameron Book, Los Alamos National Labs postgraduate intern Summer 2019
Daniel Postal, Cornell University undergraduate Summer 2015

PUBLICATIONS

1. **Kachuck, Samuel B.**, M. Whitcomb, J. Bassis, D. Martin, S. Price, "Simulating ice shelf extent using damage mechanics," *Journal of Glaciology* (in review).
2. **Kachuck, Samuel B.**, D. Martin, J. Bassis, and S. Price, "Rapid viscoelastic deformation slows marine ice sheet instability at pine island glacier," *Geophysical Research Letters*, vol. 47, no. 10, pp. 1–12, Jul. 2020. doi: 10.1029/2019GL086446.
3. **Kachuck, Samuel B.** and L. M. Cathles, "Benchmarked computation of time-domain viscoelastic love numbers for adiabatic mantles," Geophysical Journal International, vol. 218, no. 3, pp. 2136– 2149, Jun. 2019, issn: 0956-540X. doi: 10.1093/gji/ggz276.
4. W. Durkin, **Kachuck, Samuel B.**, and M. Pritchard, "The importance of the inelastic and elastic structures of the crust in constraining glacial density, mass change, and isostatic adjustment from geodetic observations in southeast Alaska," *Journal of Geophysical Research: Solid Earth*, vol. 124, no. 1, pp. 1106–1119, 2019.
5. Martinec, Z., V. Klemann, W. van der Wal, R. E. M. Riva, G. Spada, D. Melini, … **Kachuck, Samuel B.**, … A benchmark study of numerical implementations of the sea-level equation in GIA modelling. Geophys. J. Int., vol 215, pp. 389–414, 2018, doi: 10.109
6. **Kachuck, Samuel B.** and L. M. Cathles, "Constraining the geometry and volume of the Barents Sea Ice Sheet," *Journal of Quaternary Science*, 2018.
7. **Kachuck, Samuel B.** and G. A. Voth, "Simulations of granular gravitational collapse," *Physical Review E*, vol. 88, no. 6, p. 062 202, Dec. 2013, issn: 1539-3755. doi: 10.1103/PhysRevE.88. 062202.
8. J. A. Perez, **Kachuck, Samuel B.**, and G. A. Voth, "Visualization of collisional substructure in granular shock waves," *Physical Review E*, vol. 78, no. 4, pp. 1–6, Oct. 2008, issn: 1539-3755. doi: 10.1103/PhysRevE.78.041309.

PRESENTATIONS

Oral

1. ***Invited*** **Kachuck, Samuel B.**, "Implementing novel physics in ice sheet models for improved sea-level projections," *National Energy Research Scientific Computing Seminar Series*, 2021
2. **Kachuck, Samuel B.**, M. Whitcomb, J. Bassis, D.F. Martin, S. Price, "Damage Control: forming stable ice shelves in simulations with damage mechanics," *West Antarctic Ice Sheet Initiative*, 2021.
3. ***Invited*** **Kachuck, Samuel B.**, "The ice and earth physics of sea level change," *Wesleyan University Physics Colloquium*, 2021.

4. Brady, Paige and **Kachuck, Samuel B.**, "A Statistical Physics Description of Glacier Calving Behavior in Ice-Shelf Evolution," *Conference for Undergraduate Women in Physics*, 2021.
5. Brady, Paige and **Kachuck, Samuel B.**, "A Statistical Physics Description of Glacier Calving Behavior in Ice-Shelf Evolution," *UC Davis Annual Undergraduate Research Scholarship and Creative Activities Conference*, 2021.
6. **Kachuck, Samuel B.**, D. Martin, J. Bassis, S. Price, "Rapid viscoelastic deformation slows marine ice sheet instability in the Amundsen Sea Embayment," *AGU*, 2020.
7. Book, C., M Hoffman (presenter), and **Kachuck, Samuel B.**, "Sensitivity of Coupled Solid Earth – Ice Sheet Modeling of Thwaites Glacier to Coupling Timescale and Earth Rheology," *West Antartctic Ice Sheet Initiative*, 2020.
8. **Kachuck, Samuel B.**, D. Martin, J. Bassis, and S. Price, "Rapid viscous response slows pine island grounding-line retreat," *SERCE GIA Workshop*, 2019.
9. ***Invited* Kachuck, Samuel B.,** "Solid Earth Feedbacks," ITGC: The Next Generation, 2019.
10. Z. Martinec, V. Klemann, . .., and **Kachuck, Samuel B.**, "A benchmark study of numerical implementations of the sea-level equation in GIA modelling," *EGU*, 2018.
11. W. J. Durkin, **Kachuck, Samuel B.**, and M. E. Pritchard, "Impact of different crustal elastic models on interpreting regional GIA deformation in southeast Alaska," *EGU*, 2018.
12. **Kachuck, Samuel B.** and L. M. Cathles, "Nondimensionalized relaxation method for efficient computation of elastic love numbers," *Workshop on Glacial Isostatic Adjustment and Elastic Deformation*, 2017.
13. **Kachuck, Samuel B.**, L. M. Cathles, A. Amantov, A. Hormes, and W. Fjeldskaar, "Emergence constraints on Late Weichselian Barents Sea ice sheet history," *EGU*, 2014.
14. **Kachuck, Samuel B.**, "Velocity dependent energy loss in granular gravitational collapse," *New York Condensed Matter Workshop*, 2011.

Poster

1. **Kachuck, Samuel B.**, D. Martin, J. Bassis, and S. Price, "Rapid viscoelastic response to ice loss in the ASE slows grounding line retreat," *ITGC Science Meeting*, 2021.
2. **Kachuck, Samuel B.**, D. Martin (presenter), J. Bassis, and S. Price, "Rapid viscoelastic deformation slows marine ice sheet instability at Pine Island Glacier," *AGU*, 2019.
3. Price, S. (presenter) et. al, **Kachuck, Samuel B.**, et al., "Probabilistic Sea Level Projections from Ice Sheet and Earth System Models (ProSPect)," *AGU, 2019*.
4. **Kachuck, Samuel B.** and L. M. Cathles, "Giapy: glacial isostatic adjustment in python: nondimensionalized relaxation method for computation of time-domain viscoelastic love numbers," *AGU*, 2018.
5. **Kachuck, Samuel B.** and J. Bassis, "Low visocosity mantle feedback in Amundsen Sea Embayment dynamics," *West Antarctic Ice Sheet Initiative*, 2018.
6. ***Invited* Kachuck, Samuel B.** and L. M. Cathles, "Using geometry to improve model fitting and experiment design for glacial isostasy *(invited)*," *AGU*, 2017.
7. **Kachuck, Samuel B.** and L. M. Cathles, "Sloppy inversion and optimal experiment design for last glacial maximum Barents Sea ice sheet configuration," in *AGU*, 2016.
8. **Kachuck, Samuel B.** and L. M. Cathles, "GIA response suggests thick lithosphere under the Appalachians," in *Institute for the Study of the Continents*, 2014.

9. **Kachuck, Samuel B.**, L. M. Cathles, A. Amantov, and W. Fjeldskaar, "North american peripheral bulge constraints on mantle rheology," in *EGU*, 2014.
10. L. M. Cathles, A. Amantov, **Kachuck, Samuel B.**, and W. Fjeldskaar, "The seamod methodology of GIA interpretation," *EGU*, 2014.
11. **Kachuck, Samuel B.** and L. M. Cathles, "Lithosphere, ice history, local emergence," *EGU*, 2013.

Science, Technology, and Society

1. ***Invited* Kachuck, Samuel B.**, "Data and simulacra, toward a framework for inclusive coproduction." *AGU*, 2020.
2. ***Invited* Kachuck, Samuel B.**, "Politics of modeling," *University of Michigan Science, Technology, and Society Workshop*, 2019.

Sessions Convened

1. Antarctica. *SERCE GIA Workshop*, 2019.
2. Looking forward beyond ITGC. *ITGC: The Next Generation*, 2019.
3. Mantle structure. *Institute for the Study of the Continents Symposium*. 2019.

SERVICE

Peer Reviewer JGR: Solid Earth, Solid Earth, The Cryosphere 2018-Present

Member URGE (Unlearning Racism in Geosciences) Pod 2021
Drafted policy to advance Diversity, Equity, and Inclusion in CLaSP, UM

Internal Grant Reviewer Los Alamos National Lab 2020
Performed internal review of Matthew Hoffman's proposal for a Department of Energy Early Career Grant

Judge AGU Fall Meeting OSPA 2018-2019

Scientific Steering Committee: ITGC: The Next Generation 2019
Organized the program, including sessions, talk invitations, and discussions for Early Career Researchers associated with the International Thwaites Glacier Collaboration.

Judge Michigan Geophysical Union Symposium 2019

Judge Engineering Graduate Symposium, University of Michigan 2018

Member Discipline Based Education Research Journal Club 2017-2018
Led discussions on recent pedagogical research.

Member Cornell Graduate Student Union Communications Committee 2016-2017
Coordinated communications to general membership during recognition campaign.

Lead Graduate Teaching Assistant Review, Cornell University Physics 2013
Organized recording of one section from each first-year graduate teaching assistant, and reviewed the recording with them to form strategies to improve

Trainer Graduate Teaching Assistant Training, Cornell University Physics 2012-2013
Coordinated the pedagogical training of incoming first-year graduate students, led sessions on active learning,

OUTREACH

Pen Pal Letters to a Pre-Scientist 2016-Present
Correspond with a student in an under-resourced elementary school through the year to "humanize STEM professionals, demystify STEM career pathways, and inspire all students to explore a future in STEM."

Guest Lecturer Antarctic Week 2018, 2020
Virtually visit elementary school classrooms across US to discuss climate change and Antarctic science.

Guest Lecturer Waterford-Kettering High School 2020
Developed and delivered lecture on sea level change science to combined classes over three periods.

Leader of Local Geology Walk 2016-2018
Developed and led walks to variety of student, class, prospective student, and alumni groups describing the geological history of Ithaca, NY through observation of features.

Assistant Alumni Day Physics Demonstrations 2012

Assistant Retrospective Degree Day Fluids Demonstrations 2011

HONORS & AWARDS

NERSC High Performance Computing Achievement Award 2021

Douglas A Fitchen Scholar, $1500 2017
for international travel to present physics

AGU Outstanding Student Paper Award 2016

NSF GRFP Honorable Mention 2012

Phi Beta Kappa 2010

Graham Prize 2010
for excellence in natural science

Karl van Dyke Prize 2010
for outstanding achievement in physical science

Plukas Teaching Apprentice Award 2010
for excellent service to the Economics Department as a TA

White Prize 2010
for advanced undergraduate study in economics

Dean's List, Wesleyan University 2006-2010

Squire Fund Fellow, $1200 2007
for research into Classical Civilizations

Chadbourne Prize 2007
for the freshman student displaying outstanding character, conduct, and leadership

PROFESSIONAL MEMBERSHIP

American Geosciences Union 2016-Present

Lecturers Employee Organization 2019

Cornell Graduate Student Union 2015-2018

European Geosciences Union 2013-2016