Katarzyna (Kasia) Warburton

Department of Applied Mathematics and Theoretical Physics, University of Cambridge
klpw3@cam.ac.uk

Experience

2024 - present: **Junior Research Fellow**, Trinity College, University of Cambridge

2022 - 2024: **Postdoctoral Fellow and Lecturer**, Thayer School of Engineering, Dartmouth

Education

2018 - 2022: **PhD in Applied Mathematics**, DAMTP, University of Cambridge
"The Response of Antarctic Ice Streams to Tidal Forcing"
(supervised by Prof. Jerome Neufeld and Dr Duncan Hewitt)

2017 - 2018: **M.Math.** (Distinction) University of Cambridge, Trinity College

2014 - 2017: **B.A. Mathematics** (First class honours), University of Cambridge, Trinity College

Funding

2022: **Junior Research Fellowship**, Trinity College Cambridge (deferred to 2024)

2022: **Society of Fellows Postdoctoral Fellowship**, Dartmouth College

2022: **Houghton Distinguished Postdoctoral Fellowship**, MIT EAPS (declined)

2018 - 2022: **Fully-funded NERC PhD Studentship**, Earth Systems Sciences DTP

2018: **Rouse-Ball Travelling Studentship in Mathematics**, for a visit to Cornell University to study bacterial motility, supervised by Prof. Mingming Wu

2016: **LMS Undergraduate Research Bursary**, for "Silo honking: experimental investigation into the origins and characteristics of sound emission from granular flow in a vertical tube", supervised by Dr Nathalie Vriend

Awards

2024: **Thomas Hughes Travel Fellowship**, to attend ICTAM 2024

2022: **Institute of Physics Early Career Lecturer Award**, Edwards Symposium

2022: **Outstanding Reviewer**, JGR: Earth Surface

2020: **John Glen Prize** for best student talk, IGS British Branch

2020: **Smith-Knight Rayleigh-Knight Prize** (1st Class): awarded by the University of Cambridge for an extended essay on "any subject in Mathematics and its applications"

2018: **Vice-Chancellor's Award**, for the 250 highest-ranked students across all disciplines starting research at the University of Cambridge (PhD funding offered, not required)

2018 - 2021: **Research Scholarship**, Trinity College Cambridge, for performance in M.Math.

2015 - 2017: **Junior Scholarship** (2015) and **Senior Scholarship** (2016-17), Trinity College Cambridge, for performance in undergraduate degree

Publications

In prep: Mann, L.E., Warburton, K.L.P., and Meyer, C.R. "Nonlinear longitudinal stress coupling in glaciers and ice sheets" (student paper - submission anticipated Oct. 2024)

In prep: Warburton, K.L.P., Del Vecchio, J., Meyer, C.R., and Palucis, M.C. "Thermodynamic channelization of suprapermafrost flows" (submission anticipated Nov. 2024)

Submitted: Warburton, K.L.P, Meyer, C.R., Sommers, A.N. "Physical and numerical instability of subglacial water flow" (JGR: Earth Surface - EarthArxiv link)

Submitted: Stubblefield, A.G., Meyer, C.R., Rempel, A.W., Warburton, K.L.P., Hansen, D.D., and Zoet L.K. "Modeling sediment compaction beneath ice lenses during frost heave" (PRSA - EarthArxiv link)

7. Sommers, A.N., Meyer, C.R., Poinar K., Mejia J., Morlighem M., Rajaram H., Warburton K.L.P., and Chu W. "Velocity of Greenland's Helheim Glacier controlled both by terminus effects and subglacial hydrology with distinct realms of influence", Geophysical Research Letters, 2024

6. Hansen, D.D., Warburton, K.L.P, Zoet, L.K., Meyer, C.R., Rempel, A.W., and Stubblefield, A.G. "Frozen fringe impacts basal friction for soft-bedded glaciers and ice streams", Geophysical Research Letters, 2024

5. Warburton, K.L.P., Hewitt, D.R., Meyer, C.R., and Neufeld, J.A. "A shallow approximation for ice streams sliding over strong beds", Journal of Glaciology, 2023 10.1017/jog.2023.47

4. Hogan, K.A., Warburton, K.L.P., Graham, A.G.C., Neufeld, J.A, Hewitt, D.R, and Larter, R.D. "Towards modelling of corrugation ridges at ice-sheet grounding lines" The Cryosphere, 2023 10.5194/tc-17-2645-2023

3. Warburton, K.L.P., Hewitt, D.R. and Neufeld, J.A. "Shear dilation of subglacial till results in time-dependent sliding laws", Proceedings of the Royal Society A, 2023 10.1098/rspa.2022.0536

2. Warburton, K.L.P., Hewitt, D.R. and Neufeld, J.A. "Tidal grounding-line migration modulated by subglacial hydrology", Geophysical Research Letters, 2020 e2020GL089088

1. Warburton, K.L.P., Hewitt, D.R. and Neufeld, J.A. "The elastic Landau-Levich problem on a slope", Journal of Fluid Mechanics, 2020 883 (A40)

Teaching and Outreach

Winter 2024: Lecturer, ENGS 150 Intermediate Fluid Mechanics, Dartmouth. Graduate level course for Engineering and Earth Sciences students covering ocean, river, and ice sheet flows

2018 - 2022: Supervisor for undergraduate Mathematics students, University of Cambridge - Dynamical Systems, Mathematical Biology, Vectors and Matrices

2018 - 2022: Supervisor, Masters drop-in sessions for Slow Viscous Flow, Fluid Dynamics of the Environment, and Fluid Dynamics of the Solid Earth

2019 - present: Leader of the UK's European Girls Mathematical Olympiad program. Other UKMT outreach since 2014 includes: mentoring, running residential camps, marking, lecturing

2022 - present: Talks for Christ's College 'Women in Maths' residential, Cambridge departmental 'Girls in Maths' open day, Dartmouth departmental 'Sonia Kovalevsky' middle school visit, 'She Talks Science' summer school

2021: Workshop leader, Murray Edwards College STEP summer school

Students Supervised

Logan Mann (PhD expected 2026, Dartmouth Engineering, primary supervisor Colin Meyer)
Main supervisor on project "Extensional stresses in ice stream flow" (since 2022)

Christian Erikson (PhD expected 2025, Dartmouth EARS, primary supervisor Carl Renshaw)
Main supervisor on project "Formation of step pools in shallow streams" (since 2024)

Isaac Brown (PhD expected 2027, Cambridge Mathematics, primary supervisor Jerome Neufeld)
Secondary supervisor, PhD topic "Reduced models of subglacial hydrology" (since 2024)

Anthony Cheng (Masters 2024-25, Dartmouth Engineering, co-supervised with Colin Meyer)
Main supervisor, "Evolving permeability in flow through snow"

Sebastiaan Hoek, (NERC Research Experience Placement 2021, co-supervised with Jerome Neufeld)
"Transient moulin morphology as a window on glacial rheology"

Invited Talks

Geology Seminar, College of William & Mary, Dec. 2024 (forthcoming)

Applied and Interdisciplinary Mathematics Seminar, University of Bath, Nov. 2024 (forthcoming)

Physical and Applied Mathematics Seminar, University of Manchester, Oct. 2024 (forthcoming)

Geophysical Fluid Dynamics Program, WHOI, July 2024 *Preferential melt-flow patterning in the Cryosphere*

Geology and Geophysics Seminar, MIT, Apr. 2024 *Tide-sediment interactions beneath Antarctica* (postponed to Dec. 2024)

Earth Sciences Geolunch, Dartmouth College, Oct. 2023 *Patterning everywhere: three projects in cryo-inspired stability analysis*

Geophysical Fluid Dynamics Program, WHOI, Aug. 2023 *Channelization of subglacial water flow*

Balmforth Group, UBC, Mar. 2023 *Subglacial till as dilatant viscoplastic granular flow*

Earth Sciences Seminar, University of Oregon, Mar. 2023 *Water flow through subglacial sediments*

Weeks Seminar, University of Wisconsin-Madison, Dec. 2022 *Modelling water in subglacial sediments*

Ice + Climate Seminar, Dartmouth College, Sept. 2022 *Shear dilation of subglacial till*

SIAM-IMA Seminar, University of Sheffield, July 2022 *Squeegees, glaciers, and mud: how fluid dynamics can help to model Antarctic ice flow*

FoaLab Group, University of Oxford, May 2022 *The response of ice streams to tidal forcing*

Maths on Ice Forum, online, Feb. 2021 *Tides below glaciers*

Ice Dynamics and Paleoclimate Seminar, British Antarctic Survey, Nov. 2020 *Linking surface velocity and subglacial hydrology*

Geophysical and Environmental Processes Seminar, University of Cambridge, Oct. 2020 *From top to bottom: using surface velocity variations to look below glaciers*

Conference Presentations

IGS British Branch, Sept. 2024 *Predicting the channelization of subglacial hydrology*

ICTAM, Aug. 2024 *Evolving permeability of sub- and supra-glacial flow* **(invited)**

North-East Glaciology Meeting, Apr. 2024 *Predicting the channelization of subglacial hydrology*

AGU Fall Meeting, Dec. 2023 *Dynamic evolution of frozen fringe as a mechanism for bedform generation*

APS DFD, Nov. 2023 *Channelization of subglacial water flow: stability and channel distribution*

WAIS Workshop, Sept. 2023 *The formation of tidally-modulated landforms at rapidly retreating grounding lines*

AGU Fall Meeting, Dec. 2022 *The formation of tidally-modulated landforms at rapidly retreating grounding lines* **(invited)**

Edwards Symposium, Sept. 2022 *Subglacial Soft Matter* **(invited)**

EGU General Assembly, May 2022 *A time-dependent sliding law for granular till* **(invited)**

AGU Fall Meeting, Dec. 2021 *Shear dilation in granular till modifies subglacial sliding rates*

IGS British Branch, Sept. 2021 *Time-dependent soft-bedded sliding laws*

APS DFD, Nov. 2020 *A two-phase model for the transient response of subglacial till*

IGS British Branch, Sept. 2020 *Constraining till permeability via tidal velocity variations*

AGU Fall Meeting, Dec. 2019 *Tidal grounding line migration modulated by subglacial hydrology*

APS DFD Nov. 2019 *Glacial Squeegee: elastic Landau-Levich and the tidal modulation of ice streams*

Service

Reviewer for *Journal of Glaciology*, *The Cryosphere*, *Journal of Fluid Dynamics*, *Geophysical Research Letters*, *Proceedings of the Royal Society A*, *Journal of Geophysical Research: Earth Surface*, *Nature Geoscience*, *Communications Earth and Environment*

Organiser, "Maths on Ice" online seminar series (since 2023)

Chair, "Cryosphere" session, APS DFD 2023, "Modelling Approaches" session, IGS British Branch 2021

Member, British Mathematical Olympiad Executive Committee (since 2024)

Interviewer, undergraduate Mathematics applicants at Trinity College and Churchill College, Cambridge (since 2021)