

## Ian Joseph Hewitt – CV & publications

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### Academic Positions

- 2022 - Professor, Mathematical Institute, University of Oxford
- 2013 - 2022 Associate Professor, Mathematical Institute, University of Oxford
- 2013 - Fellow & Mathematics Tutor, Trinity College, University of Oxford
- 2010 - 2012 Killam Post-doctoral Research Fellowship, University of British Columbia
- 2008 - 2009 College lecturer, Trinity College, University of Oxford

### Education

- 2006 – 2009 University of Oxford  
*DPhil in Mathematics* – ‘Mathematical modelling of geophysical melt drainage’, supervised by Dr Andrew Fowler.
- 2002 – 2006 University of Oxford  
*MMath - Mathematics* (First Class Honours)
- 1997 – 2002 Queen Elizabeth High School, Hexham, Northumberland

### Awards

- 2016 *Distinguished Scholar, Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institute*
- 2014 *Cryosphere Early Career Award, American Geophysical Union*
- 2011 *Postdoctoral Teaching Award, University of British Columbia*
- 2010 *Postdoctoral Fellowship, Killam Trusts*
- 2006 *Gibbs Prize, University of Oxford*

### Teaching

*Oxford*

- A6 Differential Equations II (2023- )
- Prelims Introduction to University Mathematics (2021- )
- C5.6 Applied Complex Variables (2018-2021)
- C5.11 Mathematical Geoscience (2016-2020)

B5.4 Waves and Compressible Flow (2014-2017)

MSc Mathematical Modelling (2013-2016)

College tutorials in most areas of Applied Mathematics (2013- )

*University of British Columbia*

Math 253: Multivariable Calculus (Fall 2012)

Math 307: Applied Linear Algebra (Spring 2012)

Math 257: Partial Differential Equations (Spring 2010)

## **Supervision**

*Postdoctoral Research Assistants*

Michael Dallaston (2013-2015), Marianne Haseloff (2017-2019), Michael McPhail (2019-2021), Hamish Hay (2022- )

*DPhil (PhD) students*

Graham Benham (2018), Rachel Philip (2018), Alex Bradley (2020), Daniel Spencer (2021), Alissa Kamilova (2021), Michael Coughlan (2021), Gonzalo Gonzalez de Diego (2023), Natalie Woods (current), Deborah Cotton (current), Gabriel Cairns (current), Harry Stuart (current)

*Numerous MSc and undergraduate research students*

## **Funded Research Projects**

2023 - 2026 'Understanding surface-to-bed meltwater pathways across the Greenland Ice Sheet using machine-learning and physics-based models', NSF-GEO/NERC (Co-I), £300,000

2021 - 2024 'What makes Io so hot? Tidal dissipation in partially molten planets', Leverhulme Trust, (Co-PI), £224,000

2019 - 2022 'Meltwater Ice-sheet Interactions and the changing climate of Greenland', NERC Standard Grant, (Co-I), £650,000

2017 - 2020 'Two-phase dynamics of temperate ice, NSF-GEO/NERC, (Co-PI) £300,000

2013 - 2017 'Improving the Physics in Ice Sheet Models', Marie Curie Career Integration Grant, EC, €100,000

2013 - 2014 'Exploring the role of subglacial melt water on ice-ocean interactions', John Fell Fund, University of Oxford, £42,116.00

## **Community Activities & Responsibilities**

Organiser of 'Mathematics on Ice' – a monthly virtual workshop bringing together the global community of researchers studying and modelling ice sheets (February 2021- )

Organiser of workshop 'Mathematical Modelling in Glaciology'

(<https://www.birs.ca/events/2020/5-day-workshops/20w5198>) at the Banff International Research Station, Canada, January 2020

Regular staff member at the Woods Hole GFD summer program (2010,2016,2017,2018)

Lecturer and co-organiser of Karthaus summer schools on Ice-Sheets and Glaciers in the Climate System (2014, 2016, 2017, 2018, 2019, 2022, 2023)

Scientific Editor, Journal of Glaciology (2017- )

co-Chief Editor, Annals of Glaciology No.72 (2016)

Regular reviewer for: NERC, NSF, ANR, NWO, ISF, The Royal Society, *Nature*, *Nature Geoscience*, *PNAS*, *Science*, *J. Fluid Mech.*, *GRL*, *JGR*, *The Cryosphere*, *J. Glaciol.*, *Ann. Glaciol.*, *EPSL*, *Phys. Earth Plan. Int.*, *J. Petrol.*, *Physica D*, *Quat. Sci. Rev.*, *SIAM J. Applied Math.*

Regular session convenor at AGU Fall Meeting (2011- ) and EGU General Assembly (2019- )

Regular attendee at European Study Groups with Industry (ESGI)

Steering Committee of the Oxford Climate Research Network (2015- )

Steering Committee of the Oxford NERC Doctoral Training Partnership (2017- )

Associate Head of Department (People), Mathematical Institute (2022- )

### **Selected Recent Invitations**

September 2023	Physics and Climate Seminar, Universität Bern, Switzerland
August 2023	International Congress on Industrial and Applied Mathematics, Japan
December 2022	Applied & Interdisciplinary Mathematics Seminar, University of Bath, UK
November 2022	AMSI-AustMS Workshop on Mathematics of Sea Ice and Ice Sheets, University of Adelaide, Australia
January 2022	'Physics in the Ground Beneath our Feet' workshop, Princeton, USA
October 2021	Fluid Dynamics Seminar, DAMTP, University of Cambridge
March 2021	SIAM Conference on Computational Science and Engineering, mini-symposium, Virtual
January 2020	Mathematical Modelling in Glaciology, Banff International Research Station, Canada
December 2019	American Geophysical Union, Fall Meeting, San Francisco, USA
August 2019	UK Fluid Mechanics Conference, Keynote Speaker, Cambridge, UK
May 2019	Modelling of Thin Liquid Films, Banff International Research Station, Canada

### **Publications**

(Google Scholar <https://scholar.google.com/citations?hl=en&user=pH7KHXYAAAAJ>)

D. I. Benn, I. J. Hewitt & A. Luckman 2023 Enthalpy balance theory unifies diverse glacier surge behaviour. *Ann. Glaciol.*, doi:10.1017/aog.2023.23

T. Woods & I. J. Hewitt 2023 A model of the weathering crust and microbial activity on an ice-sheet surface. *The Cryosphere*. **17**, 1967--1987 doi:10.5194/tc-17-1967-2023

- G. Gonzalez de Diego, P. E. Farrell & I. J. Hewitt 2023 On the finite element approximation of a semicoercive Stokes variational inequality arising in glaciology. *SIAM J. Numerical Analysis* **61**, 1-25 doi:10.1137/21M1437640
- A. T. Bradley, I. J. Hewitt & D. Vella 2023 Bendocapillary instability of liquid in a flexible-walled channel. *J. Fluid Mech.* **955**, A26, doi:10.1017/jfm.2022.1025
- L. A. Stevens, M. Nettles, J. L. Davis, T. T. Creyts, J. Kingslake, I. J. Hewitt & A. Stubblefield 2022 Tidewater-glacier response to supraglacial lake drainage. *Nature Communications* **13**, 6065 doi:10.1038/s41467-022-33763-2
- D. Stevens, J. C. Ely, S. J. Livingstone, C. D. Clark, F. E. G. Butcher, I. J. Hewitt 2022 Effects of basal topography and ice-sheet surface slope in a subglacial glaciofluvial deposition model. *J. Glaciology* doi:10.1017/jog.2022.71
- G. Gonzalez de Diego, P. E. Farrell & I. J. Hewitt 2022 Numerical approximation of viscous contact problems applied to glacial sliding, *J. Fluid Mech.* **938**, A21, doi:10.1017/jfm.2022.178
- A. T. Bradley, F. Box, I. J. Hewitt & D. Vella 2021 Droplet trapping in bendotaxis caused by contact angle hysteresis. *Phys. Rev. Fluids* **6**, 114003 doi:10.1103/PhysRevFluids.6.114003
- N. Karlsson, A. Solgaard, K. Mankoff, F. Gillet-Chaulet, J. MacGregor, J. Box, M. Citterio, W. Colgan, S. Larsen, K. Kjeldsen, N. Korsgaard, D. Benn, I. J. Hewitt & R. Fausto 2021 A First Constraint on Basal Melt-water Production of the Greenland Ice Sheet. *Nature Communications* doi:10.1038/s41467-021-23739-z
- D. C. Spencer, R. F. Katz & I. J. Hewitt 2021 Tidal controls on the lithospheric thickness and topography of Io from magmatic segregation and volcanism modelling. *Icarus* **359** doi:10.1016/j.icarus.2021.114352
- I. J. Hewitt 2021 Slow viscous flow. In 'Glaciers and Ice Sheets in the Climate System', ed. A. C. Fowler & F. Ng, *Springer*.
- R. Philip, I. J. Hewitt & P. D. Howell 2021 Modelling the effect of surfactant on droplet breakup in a turbulent flow. *SIAM J. Appl. Math.* **81** doi:10.1137/20M1321851
- I. J. Hewitt & N. J. Balmforth 2020 Viscoelastic ribbons. *J. Fluid Mech.* **908**, doi:10.1017/jfm.2020.870
- D. C. Spencer, R. F. Katz, I. J. Hewitt, D. A. May & L. P. Keszthelyi 2020 Compositional layering in Io driven by magmatic segregation and volcanism. *J. Geophys. Res.* doi:10.1029/2020JE006604
- D. C. Spencer, R. F. Katz & I. J. Hewitt 2020 Magmatic intrusions control Io's crustal thickness. *J. Geophys. Res.* doi:10.1029/2020JE006443
- B. Hankin, I. J. Hewitt, G. Sander, F. Danieli, G. Formetta, A. Kamilova, A. Kretzschmar, K. Kiradjiev, C. Wong, S. Pegler & R. Lamb 2020 A risk-based network analysis of distributed in-stream leaky barriers for flood risk management. *Nat. Hazards Earth Syst. Sci.* **20**, 2567-2584, doi:10.5194/nhess-20-2567-2020
- E. A. Wilson, A. J. Wells, I. J. Hewitt & C. Cenedese 2020 The dynamics of a subglacial salt wedge. *Journal of Fluid Mechanics* **895** doi:10.1017/jfm.2020.308
- M. O. Dalwadi, S. L. Water, H. M. Byrne & I. J. Hewitt 2020 A mathematical framework for developing freezing protocols in the cryopreservation of cells. *SIAM J. Appl. Math.*
- I. J. Hewitt 2020 Subglacial Plumes. *Ann. Rev. Fluid Mech.* **52**, 145-169 doi:10.1146/annurev-fluid-010719-060252

- M. Haseloff, I. J. Hewitt & R. F. Katz 2019 Englacial Pore Water Localises Shear in Temperate Ice Stream Margins. *J. Geophys. Res.* **124**, doi:10.1029/2019JF005399
- D. I. Benn, R. L. Jones, A. Luckman, J. J. Furst, I. J. Hewitt & C. Sommer 2019 Mass and enthalpy budget evolution during the surge of a polythermal glacier: a test of theory. *J. Glaciol.*, doi:10.1017/jog.2019.63
- D. I. Benn, A. C. Fowler, I. J. Hewitt & H. Sevestre 2019 A general theory of glacier surges. *J. Glaciol.*, doi:10.1017/jog.2019.62
- I. J. Hewitt & T. T. Creyts 2019 A model for the formation of eskers. *Geophys. Res. Lett.* **46**, doi:10.1029/2019GL082304
- T. V. Ball, N. J. Balmforth & I. J. Hewitt 2019 Indentation into a plastic fluid layer. *Proc. Roy. Soc. A* **475**, doi:10.1098/rspa.2018.0747
- A. T. Bradley, F. Box, I. J. Hewitt & D. Vella 2019 Wettability-Independent Droplet Transport by Bendotaxis. *Phys. Rev. Lett.* **122**, 074503 doi:10.1103/PhysRevLett.122.074503
- G. P. Benham, I. J. Hewitt, C. P. Please & P. A. D. Bird 2018 Optimal control of diffuser shapes for non-uniform flow. *J. Eng. Math.* doi:10.1007/s10665-018-9974-6
- L. A. Stevens, I. J. Hewitt, S. B. Das & M. D. Behn 2018 Relationship between Greenland Ice Sheet surface speed and modeled effective pressure. *J. Geophys. Res.*, **123**, 2258-2278 doi:10.1029/2017JF004581
- G. P. Benham, A. A. Castrejon-Pita, I. J. Hewitt, C. P. Please, R. W. Style & P. A. D. Bird 2018 Turbulent shear layers in confining channels. *J. Turbulence.*, **11**, 22799-2813 doi:10.1080/14685248.2018.1459630
- C. Meyer & I. J. Hewitt 2017 A continuum model for meltwater flow through compacting snow. *The Cryosphere*, **11**, 2799-2813 doi:10.5194/tc-11-2799-2017
- K. J. Burns, N. J. Balmforth & I. J. Hewitt 2017 Granular Rolling resistance of shallow granular deformation. *Proc. Roy. Soc. A*, **473**, doi:10.1098/rspa.2017.0375
- R. Drews, F. Pattyn, I. J. Hewitt, F. S. L. Ng, S. Berger, K. Matsuoka, V. Helm, N. Bergeot, L. Favier & N. Neckel 2017 Actively evolving subglacial conduits and eskers initiate ice shelf channels at an Antarctic grounding line. *Nature Communications* **121**, doi:10.1038/ncomms15228
- I. J. Hewitt & C. Schoof 2017 Models for polythermal ice sheets and glaciers. *The Cryosphere*, **11**, 541-551 doi:10.5194/tc-11-541-2017
- A. Banwell, I. J. Hewitt, I. Willis & N. Arnold 2016 Moulin density controls drainage development beneath the Greenland ice sheet. *J. Geophys. Res. Earth Surf.* **121**, doi:10.1002/2015JF003801
- D. P. Hewitt & I. J. Hewitt 2016 Homogenized boundary conditions and resonance effects in Faraday cages. *Proc. R. Soc. Lond. A* doi: 10.1098/rspa.2016.0062
- C. Schoof & I. J. Hewitt 2016 A model for polythermal ice incorporating gravity-driven moisture transport. *J. Fluid Mech.* **797**, 504-535, doi: 10.1017/jfm.2016.251
- J-B. Gorce, I. J. Hewitt & D. Vella 2016 Capillary Imbibition into Converging Tubes: Beating Washburn's Law and the Optimal Imbibition of Liquids. *Langmuir*, **32**, 1560-1567 doi: 10.1021/acs.langmuir.5b04495
- M. C. Dallaston, I. J. Hewitt & A. J. Wells 2015 Channelization of plumes beneath ice shelves. *J. Fluid. Mech.* **785**, 109-134, doi: 10.1017/jfm.2015.609

- I. J. Hewitt, A. A. Lacey & R. I. Todd 2015 A Mathematical Model for Flash Sintering. *Mathematical Modelling of Natural Phenomena* **10**(6),77-89 doi: 10.1051/mmnp/201510607
- I. J. Hewitt, N. J. Balmforth & J. R. de Bruyn 2015 Elastic-plated gravity currents. *Euro. J. Appl. Math.* **26**,1-31, doi:10.1098/rspa.2014.0740
- M. C. Dallaston & I. J. Hewitt 2014 Free-boundary models of a meltwater conduit. *Phys. Fluids.* **26**,083101, doi:10.1063/1.4892389
- N. S. Hall Taylor, I. J. Hewitt, J. R. Ockendon & T. P. Witelski 2014 A new model for disturbance waves. *Int. J. Multiphase Flow.* **66**,38-45, doi:10.1016/j.ijmultiphaseflow.2014.06.004
- N. J. Balmforth, R. V. Craster & I. J. Hewitt 2014 The speed of an inclined ruck. *Proc R. Soc. A* **471**, 20140740, doi:10.1098/rspa.2014.0740
- I. J. Hewitt 2013 Seasonal Changes in Ice Sheet Motion due to Meltwater Lubrication. *Earth. Plan. Sci. Lett.* **371-372** 16-25 doi:10.1016/j.epsl.2013.04.022
- M. A. Werder, I. J. Hewitt, C. Schoof & G. E. Flowers 2013 Modeling channelized and distributed subglacial drainage in two dimensions. *J. Geophys. Res.* **118** 1-19, doi:10.1002/jgrf.20146
- C. Schoof & I. J. Hewitt 2013 Ice-Sheet Dynamics. *Ann. Rev. Fluid Mech.* **45** 217-239 doi: 10.1146/annurev-fluid-011212-140632
- N. J. Balmforth & I. J. Hewitt 2013 Viscoplastic sheets and threads. *J. Non-Newt. Fluid Mech.* doi:10.1016/j.jnnfm.2012.05.007
- I. J. Hewitt, C. Schoof & M. A. Werder 2012 Flotation and open water flow in a model for subglacial drainage. Part II: Channel flow. *J. Fluid Mech.* **702** 157-187 doi:10.1017/jfm.2012.166
- C. Schoof, I. J. Hewitt & M. A. Werder 2012 Flotation and open water flow in a model for subglacial drainage. Part I: Linked cavities. *J. Fluid Mech.* **702** 126-156 doi:10.1017/jfm.2012.165
- I. J. Hewitt & N. J. Balmforth 2012 Viscoplastic lubrication theory with application to bearings and the washboard instability of a planning plate. *J. non-Newt. Fluid Mech.* **169-170** 74-90 doi:10.1016/j.jnnfm.2011.11.008
- I. J. Hewitt, N. J. Balmforth & J. N. McElwaine 2012 Granular and Fluid Washboards. *J. Fluid Mech.* **692** 446-463 doi:10.1017/jfm.2011.523
- I. J. Hewitt, H. Scolan & N. J. Balmforth 2011 Flow-destabilized seiches in a reservoir with a movable dam. *J. Fluid. Mech.* **678** 294-316 doi:10.1017/jfm.2011.113
- I. J. Hewitt, N. J. Balmforth & J. N. McElwaine 2011 Continual skipping on water. *J. Fluid. Mech.* **669** 328-353 doi:10.1017/S0022112010005057
- I. J. Hewitt 2011 Modelling distributed and channelized subglacial drainage: the spacing of channels. *J. Glaciol.* **57** 302-314 doi:10.3189/002214311796405951
- I. J. Hewitt 2010 Modelling melting rates in upwelling mantle. *Earth Plan. Sci. Lett.* **300** 264-274 doi:10.1016/j.epsl.2010.10.010
- I. J. Hewitt & A. C. Fowler 2009 Melt channelization in ascending mantle. *J. Geophys. Res.* **114** B06210, doi:10.1029/2008JB006185
- I. J. Hewitt & A. C. Fowler 2008 Partial melting in an upwelling mantle column. *Proc. R. Soc. A*, **464** (2097), 2467-2491 doi:10.1098/rspa.2008.0045

I. J. Hewitt & A. C. Fowler 2008 Seasonal waves on glaciers. *Hydrol. Process.* **22**, 3919-3930 doi:10.1002/hyp.7029