Andrew Tedstone

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Research interests

Ice sheet and glacier mass balance, albedo, hydrology and dynamics, in connection to responses to climate change.

Employment

School of Geographical Sciences, University of Bristol, UK.
2016–. Research Associate.
BLACK and BLOOM - controls on the albedo of the Greenland Ice Sheet.
Remote sensing of albedo; modelling the effects of albedo upon surface mass balance.

Education

School of GeoSciences, University of Edinburgh, UK.
2011–2015. Ph.D. *Hydrological controls on Greenland Ice Sheet motion.*
Funded by the Natural Environment Research Council (NERC), UK.

Scott Polar Research Institute, University of Cambridge, UK.
2010–2011. M.Phil. Polar Studies (with Distinction).
Funded by the Fitzwilliam Graduate Scholarship.
Thesis: *Sediment plumes as indicators of Greenland Ice Sheet runoff.*

Fitzwilliam College, University of Cambridge, UK.
2007–2010. B.A. Hons. Geography (1^{st} Class).
Dissertation: *The subglacial drainage system of Hagafellsjökull-Eystri, Iceland.*

First Author Publications

Tedstone, A., J. Bamber, J. Cook, C. Williamson, X. Fettweis, A. Hodson & M. Tranter (2017). Dark ice dynamics of the south-west Greenland Ice Sheet. *The Cryosphere*. DOI: 10.5194/tc-11-2491-2017.

Tedstone, A., P. Nienow, A. Dehecq, N. Gourmelen, D. Goldberg & E. Hanna. Decadal slowdown of a land-terminating sector of the Greenland Ice Sheet despite warming (2015). *Nature*, 526, 692–695. DOI: 10.1038/nature15722.

Tedstone, A., P. Nienow, N. Gourmelen & A. Sole (2014). Greenland Ice Sheet motion insensitive to spatial variations in subglacial hydraulic structure. *Geophys. Res. Lett.*, 41(24), 8910–8917. DOI: 10.1002/2014GL062386.

Tedstone, A., P. Nienow, A. Sole, D. Mair, T. Cowton, I. Bartholomew & M. A. King (2013). Greenland Ice Sheet motion insensitive to exceptional meltwater forcing. *Proc. Nat. Acad. Sci.*, 110 (49), 19719–19724. DOI: 10.1073/pnas.1315843110.

Tedstone, A. & N. Arnold (2012). Automated remote sensing of sediment plumes for identification of runoff from the Greenland Ice Sheet. *Journal of Glaciology*, 58 (210), 699-712. DOI: 10.3189/2012JoG11J204.

Co-authored Publications

Bamber, J., **A. Tedstone**, A. Proshutinsky, D. Dukhovsky, E. Enderlin, I. Howat, M. King, B. Noel and M. van den Broeke (2018). Land ice budget of the Arctic and North Atlantic Oceans. Part I: Data, methods and results. *JGR: Oceans*. DOI: 10.1002/2017JC013605.

Williamson, C., A. Anesio, J. Cook, **A. Tedstone**, E. Sypianska, A. Holland, D. Fagan, M. Tranter, X. Fettweis and M. Yallop (2018). A time-for-space assessment of an ice algal bloom on the Greenland Ice Sheet. *FEMS Microbiology Ecology*. DOI: 10.1093/femsec/fiy025.

Cook, J., A. Hodson, A. Gardner, M. Flanner, **A. Tedstone**, C. Williamson, T. Irvine-Fynn, J. Nilsson, R. Bryant & M. Tranter (2017). Quantifying bioalbedo: A new physically-based model and critique of empirical methods for characterizing biological influence on ice and snow albedo. *The Cryosphere*. DOI: 10.5194/tc-11-2611-2017.

Hofer, S., **A. Tedstone**, X. Fettweis & J. Bamber (2017). Decreasing cloud cover drives the recent mass loss on the Greenland ice sheet. *Science Advances*. DOI: 10.1126/sciadv.17005844.

Kohler, T., J. Žárský, J. Yde, G. Lamarche-Gagnon, J. Hawkings, **A. Tedstone**, J. Wadham, J. Box, A. Beaton & M. Stibal (2017). Carbon dating reveals a seasonal progression in the source of particulate organic carbon exported from the Greenland Ice Sheet. *Geophysical Research Letters*. DOI: 10.1002/2017GL073219.

Musilova, M., M. Tranter, J. Wadham, J. Telling, **A. Tedstone** & A.M. Anesio (2017). Microbially driven export of labile organic carbon from the Greenland ice sheet. *Nature Geoscience*. DOI: 10.1038/ngeo2920.

Linhoff, B., M. Charette, P. Nienow, J. Wadham, **A. Tedstone** & T. Cowton (2017). Utility of ^{222}Rn as a passive tracer of subglacial distributed system drainage. *Earth and Planetary Science Letters*. DOI: 10.1016/j.epsl.2016.12.039.

Hawkings, J., J Wadham, L. Benning, K. Hendry, M. Tranter, **A. Tedstone**, P. Nienow & R. Raiswell (2017). Ice sheets as a missing source of silica to the polar oceans. *Nature Communications*. DOI:10.1038/ncomms14198.

Wadham, J., J. Hawkings, J. Telling, D. Chandler, J. Alcock, E. O'Donnell, P. Kaur, E. Bagshaw, M. Tranter, **A. Tedstone** & P. Nienow (2016). Sources, cycling and export of nitrogen on the Greenland Ice Sheet. *Biogeosciences*. DOI: 10.5194/bg-13-6339-2016.

de Fleurian, B., M. Morlighem, H. Seroussi, E. Rignot, M. R. van den Broeke, P. K. Munneke, J. Mouginot, P. C. J. P. Smeets & **A. Tedstone** (2016). A modeling study of the effect of runoff variability on the effective pressure beneath Russell Glacier, West Greenland. *Journal of Geophysical Research: Earth Surface*. DOI: 10.1002/2016JF003842.

Hawkings, J., J. Wadham, M. Tranter, J. Telling, E. Bagshaw, A. Beaton, S-L. Simmons, D. Chandler, **A. Tedstone** and P. Nienow (2016). The Greenland Ice Sheet as a hotspot of phosphorus weathering and export in the Arctic. *Global Biogeochemical Cycles*. DOI: 10.1002/2015GB005237.

Hawkings, J., J. Wadham, M. Tranter, E. Lawson, A. Sole, T. Cowton, **A. Tedstone**, I. Bartholomew, P. Nienow and D. Chandler (2015). The effect of a warming climate on nutrient and solute export from the Greenland Ice Sheet. *Geochemical Perspectives Letters*, 1, 94-104. DOI: 10.7185/geochemlet.1510.

Hawkings, J., J. Wadham, M. Tranter, R. Raiswell, L. Benning, P. Statham, **A. Tedstone**, P. Nienow, K. Lee & J. Telling (2014). Ice sheets as a significant source of highly reactive nanoparticulate iron to the oceans. *Nat. Comm.*, 5, 3929. DOI: 10.1038.ncomms4929.

Sole, A., P. Nienow, I. Bartholomew, D. Mair, T. Cowton, **A. Tedstone**, & M. King (2013). Winter motion mediates dynamic response of the Greenland Ice Sheet to warmer summers. *Geophys. Res. Lett.*, 40, 3940–3944. DOI: 10.1002/grl.50764.

Skills

Geospatial data analysis: Remotely sensed data (MODIS, Landsat, MISR, SAR interpretation, feature tracking), GDAL, QGIS, ArcGIS, ESA SNAP, ENVI, Kinematic GPS processing (TEQC/TRACK), AgiSoft PhotoScan, automated processing chains, lab-based sensor calibrations, climate simulations using the Modèle Atmosphérique Régionale (MAR).

Scientific Programming: Python (advanced), FORTRAN, MATLAB, bash (intermediate). Git version-control. Super-computer deployments. My GeoRaster Python package is available on conda-forge and PyPI.

IT: Unix, Windows, Microsoft Office, LaTeX, vector and raster image editing, VirtualBox, Vagrant.

Web development: xHTML, CSS, PHP, MySQL, Javascript, jQuery, Apache, Zope, Wordpress.

Fieldwork

Upernavik, north-west Greenland July 2018. Surface sampling and reflectance measurements, UAV surface imaging.

Himachal Pradesh, Indian Himalayas September 2017. Bio-climatic characterisation of Chotta Shigri, as part of a Bristol collaboration with Jawaharlal Nehru University (JNU).

South-west Greenland ablation zone July 2017. Surface reflectance measurements using ASD FieldSpec and unmanned aerial system with RedEdge camera.

Svalbard March 2017. Unmanned aerial system tests for BLACK & BLOOM, and pingo hydrochemistry sampling for A. Hodson. Undertook UNIS Rifle Training (pass) and UNIS Snowmobile training (pass).

South-west Greenland ablation zone August 2016. Albedo measurements of the ice sheet surface. Led organisation of field logistics for the 15-person, 6-week campaign consisting of three work packages spread across five institutions. Coordination of several tonnes of outbound freight and multiple helicopter flights.

Leverett Glacier, south-west Greenland May 2015: hydrological gauging for the University of Bristol.

Leverett Glacier, south-west Greenland May–August 2012 & May 2013: Dye dilution river discharge gauging, ablation measurements and SF_6 gas tracer sampling at a remote ice-marginal field camp. Deployment of differential GPS units, meteorological sensors and time lapse cameras along a 115 km transect.

Hagafellsjökull-Eystri, Iceland July–August 2009 (2 weeks). Hydrological measurements (stage, salt dilution gauging and hydrochemistry).

Recent Presentations

European Geophysical Union General Assembly, April 2018, Vienna. *Talk: Assessing the impact of bio-albedo upon Greenland Ice Sheet melting.*

European Geophysical Union General Assembly, April 2018, Vienna. *Talk: Land Ice Contribution to the Fresh Water Budget of the Arctic and North Atlantic Oceans.*

Swansea University of the 3rd Age, November 2017. *Talk: Measuring and modelling bio-albedo.*

Natural Environment Research Council, Swindon, November 2017. *Talk: How do we measure bio-albedo?*

Indo-UK workshop on Bio-climatic Feedbacks of Melting Himalayan Ice, JNU, New Delhi, September 2017. *Talk: Bio-albedo of Ice: Earth Observation and Modelling.*

Data Intensive Research in Environment: Challenges and Opportunities for the GW4 Alliance, University of Exeter, May 2017. *Talk: Challenges in projecting the sea level rise contribution of the Greenland Ice Sheet.*

University of Aberystwyth Physical Geography Seminar Series, February 2017. *Talk: What controls dark ice on the Greenland Ice Sheet?*

AGU Fall Meeting, San Francisco, December 2016. *Talk: Physical controls on dark ice presence in south-west Greenland.*

1st MAR User Workshop, June 2016. *Presentation: Microbial and particulate controls on the albedo of the Greenland Ice Sheet.*

Bristol Geography Python Group. March 2016: *Raster Processing*, May 2016: *The xarray package - faster access to netCDF files*.

Chartered Institution of Water and Environmental Management (CIWEM), South-West Branch. April 2016. *Presentation: The Greenland Ice Sheet hydrological system and potential impacts upon sea level rise.*

Service

Reviewer for Nature Scientific Reports, Journal of Glaciology, Annals of Glaciology, The Cryosphere, Journal of Geophysical Research: Earth Surface.

Convenor of the Edinburgh GeoSciences Hutton Club seminar series for 2013–14.

Vice-President of the Edinburgh GeoSciences GradSchool (2012–2013)
Co-organiser for the School's annual 3-day conference for 120 delegates.

Research Group Website design and development of the Edinburgh Cryosphere website, 2012–2015.

Vice-President of Cambridge University Geographical Society (2009–2010).

Impact

Media outreach: creation of short films for social media networks. Film segments featured in NERC-produced films. Filmed with BBC News on the Greenland Ice Sheet during July 2017. Contributor to 'Ice Alive' short film, 2018.

Lothians Equal Access Programme 2013: Developed and delivered lectures and practical workshops for students with no family university background.

On Thin Ice? Public outreach exhibition at Dynamic Earth, Edinburgh, 2011.

Geography Ambassador with the Royal Geographical Society, 2010-2011.

Teaching

Ice Sheet Hydrology and Dynamics Lecture for 2nd year undergraduates at the University of Bristol, October 2017.

Python for Environmental Sciences 3-day practical course (October 2016) for new PhD students at the University of Bristol. Created and led data analysis tutorials.

Student co-supervision: S. Hofer (*M.Res.*, then *Ph.D.*, 2016–); T. Gribbin (undergraduate dissertation 2018, 40 credits); F. Baldacchino (*MSc* dissertation 2018); R. Pappas (undergraduate from Montana State University, USA - term project in remote sensing).

Field: Iceland Undergraduate Elective, 2013, 2014 and 2015 — *10-day intensive field course in south Iceland. Supervision of student projects, equipment and food logistics; co-leadership of the 2014 Elective.* Cairngorms, Scotland, short courses 2011, 2013, 2014, 2015 — *glacial geomorphology*.

Tutoring and Demonstrating: Geomorphology, 2012–15; Environment Sensitivity and Change, 2011–2012; Plotting in Python, 2012; Quantitative Methods in Geography, 2011.

Feedback Award nominee, Edinburgh University Student Association, 2013.

Selected Funding

Scottish Alliance for Geoscience, Environment and Society (SAGES). Postdoctoral and Early Career Researcher Exchange program. £2375. 2014.

University of Edinburgh Mackay Greenland Fund. £600. 2013.

University of Edinburgh Moss Scholarship. £5000. 2012.

Natural Environment Research Council PhD studentship. £68k. 2011.

Courses attended

Lecturing for Research Staff, UoB, April 2018

Programming with OpenMP, UoB, April 2018

Beginning Fortran, UoB, Nov 2017

Publishing Research Software, UoB, Nov 2016

Developing your research career strategy, UoB, June 2016

Statistics: a refresher course for Science researchers, UoB, May 2016

How to peer-review research manuscripts for journals, UoB, Feb 2016

Karthaus Course on Glaciers and Ice sheets in the Climate System, September 2014 (Institute for Marine and Atmospheric Research, Utrecht)

Science communication, 2 days, October 2012 (SAGES/Glasgow University)

Fieldwork First Aid, passed 2016, 2014, 2011 (Marlin)

Presentation Skills (Island 41)

Python and Subversion, 5 hours Jan 2012 (Edinburgh University)

MATLAB, 10 hours Dec 2010 (Cambridge University)

Awards

Best 3rd year presentation, Edinburgh GeoSciences GradSchool Conference, 2014.

Nominated for Best Feedback award, Edinburgh University Student Association Teaching Awards, 2013.

Runner-up in British Hydrological Society Student Dissertation Awards, 2010.

1912 Senior Scholar, Fitzwilliam College, 2010–2011.

Cockle Prize, Fitzwilliam College, 2010–2011.

Other Experience

Web Developer, NERC E^3 Doctoral Training Partnership. July–September 2015.

Scout Leader at Avon District Explorers (2016–), 1st Histon Scout Group, Cambridge (2010–2011) and 1st Purton & Lydiard Scout Group, Wiltshire (2004–, including web and advertising).

Activities Instructor at Bonaly Scout Activity Centre, Edinburgh (2013–2015)

Technical Director for student theatre productions in Cambridge (2007–2010)

Sales Assistant, Millets (outdoor equipment retailer) (2006–2010)
Advising customers; covering supervisory duties; occasional store management.