

CURRICULUM VITAE

Christopher James Keylock



Nationality: British

Place of Birth: Exeter, Devon, UK

Date of Birth: 5th November, 1972

Department of Civil and Structural Engineering
Sir Frederick Mappin Building,
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Education

- 1997 - 2002 Ph.D. Trinity College, University of Cambridge. Thesis title - *The interaction between flow structures and bedload sediment at parallel channel confluences*.
Funded by NERC studentship GT04/97/55/FS
Supervisors: Professor Stuart Lane (now Université de Lausanne) and Professor Keith Richards (now retired).
- 2004 M. A. University of Oxford.
- 1994 - 1996 M.Sc. University of British Columbia. Thesis title - *Avalanche Risk in Iceland*.
Funded by a Teaching Assistantship. Supervisor: Professor David McClung (now retired).
- 1991 - 1994 B.A. (hons). Brasenose College, University of Oxford.
Awarded College Exhibition in 1992 and 1993 by Brasenose College.

Employment

- 2010 – present Prize Senior Lecturer, Department of Civil and Structural Engineering, University of Sheffield.
- 2007 – 2010 Part-Time Lecturer (60%), School of Geography, University of Leeds,
- 2000 - 2006 Lecturer, School of Geography, University of Leeds
- 1998 - 2000 Supervisor of Studies, Fitzwilliam College, Cambridge.
- 1996 - 1997 Snow avalanche division, Icelandic Meteorological Office.

Awards and Fellowship

- 2016 – 2017 Royal Academy of Engineering and Leverhulme Trust Senior Research Fellowship LTSRF1516-12-89.
Based in:
Turbulence and Mixing Group, Department of Aeronautics, Imperial College London;
Fluid Mechanics and Heat Transfer Group, Department of Mechanical Engineering, Johns Hopkins University.
- 2014 20th Anniversary UK/RoI-JSPS Alumni Association Award.

Journal Editorial Responsibilities

- 2013 – Associate Editor, *Water Resources Research*
- 2010 – 2012 Editorial Board for *Transactions of the Institute of British Geographers*, the highest impact factor journal in Geography according to ISI 2008.

Research

Primary Innovations and Discoveries:

- 1) Current work is proposing a new approach to the analysis of the turbulent velocity gradient tensor.
- 2) I developed a method for studying the dependence of turbulent intermittency upon the velocity itself. Given a key assumption in all classical turbulence work is that these things are independent, and given that they may not be in non-idealised flows, particularly if there is not a clear scale separation, this suggests a new means for developing enhanced turbulence closures for modelling geophysical and environmental turbulence processes. It also provides a new means to classify environmental turbulence. (*J. Geophys. Res.*, 2012). Results have been particularly interesting for flow over bedforms (*Geophys. Res. Lett.*, 2013; *J. Fluid Mech.*, 2016), with new work comparing flow through vegetation in the atmosphere and hydrosphere.
- 3) I conceived of, and helped work on the development of a new radar system for imaging the dynamics of geophysical mass flows to unprecedented resolution, which is now installed in Switzerland. (*Geophys. Res. Lett.*, 2013).
- 4) I developed a new, generic technique for analysing nonlinear systems called Gradual Wavelet Reconstruction (*Nonlin. Proc. Geophys.*, 2010). This extended pre-existing methods that test the null hypothesis that there is no significant between a time series and linear (phase-randomised) synthetic data. Given a rejection of that hypothesis, the question of how non-linear the original data are can now be answered. Applications of this method so far are published in hydrology (*Water Resour. Res.*, 2012), turbulence physics (*Phys. Fluids*, 2015) and modelling (*J. Turbulence*, 2011), and geomorphology (*J. Geophys. Res.*, 2014).
- 5) I developed the first formal, risk-based approach for snow avalanche zoning during my M.Sc. (*J. Glaciol.*, 1999).

Edited Collections:

Keylock, C.J., Kida, S. and Peters, N. 2016. *Interscale Transfers and Flow Topology in Equilibrium and Non-Equilibrium Turbulence*, Special issue of *Fluid Dynamics Research*, volume 48, number 2.

Keylock, C. J. (ed.) 2010. *The Future of Geomorphology*, Special issue of *Progress in Physical Geography*, volume 34, number 3.

Invited Paper for the 50th anniversary special issue of *Water Resources Research*:

Keylock, C.J. 2015. Flow resistance in natural, turbulent channel flows: The need for a fluvial fluid mechanics, *Water Resources Research* 51, doi: 10.1002/2015WR016989.

Papers (published, ISI-rated journals with an estimate of my contribution or a label to indicate a PhD or PDRA's work):

Fluid Mechanics

- (70%) **Keylock, C.J.**, Chang, K.S., Constantinescu, G.S. 2016. Large eddy simulation of the velocity-intermittency structure for flow over a field of symmetric dunes, *Journal of Fluid Mechanics* 805, 656-685.
- (PhD) Higham, J., Brevis, W., **Keylock, C.J.** 2016. A rapid non-iterative proper orthogonal decomposition based outlier detection and correction for PIV data, *Measurement Science and Technology* 27, no. 125303, doi: 10.1088/0957-0233/27/12/125303.
- (80%) **Keylock, C.J.**, Ganapathasubramani, B., Monty, J., Hutchins, N. and Marusic, I. 2016. The coupling between inner and outer scales in a zero pressure boundary layer evaluated using a Hölder exponent framework, *Fluid Dynamics Research* 48, 2, 021405.

- (90%) **Keylock, C.J.** and Nishimura, K. 2016. Wavelet phase analysis of two velocity components to infer the structure of interscale transfers in a turbulent boundary-layer, *Fluid Dynamics Research* 48, 2, 021406.
- (80%) **Keylock, C.J.**, Stresing, R. and Peinke, J. 2015. Gradual wavelet reconstruction of the velocity increments for turbulent wakes, *Physics of Fluids* 27, 025104.
- (80%) **Keylock, C.J.**, Singh, A., Venditti, J., Fofoula-Georgiou, E. 2014. Robust classification for the joint velocity-intermittency structure of turbulent flow over fixed and mobile bedforms, *Earth Surface Processes and Landforms* 39, 1717-1728.
- (80%) **Keylock, C.J.**, Singh, A., Fofoula-Georgiou, E. 2013. The influence of bedforms on the velocity-intermittency structure of turbulent flow over a gravel bed, *Geophysical Research Letters* 40, 1-5, doi:10.1002/grl.50337.
- (80%) **Keylock, C.J.**, Nishimura, K., Peinke, J. 2012. A classification scheme for turbulence based on the velocity-intermittency structure with an application to near-wall flow and with implications for bedload transport, *Journal of Geophysical Research* 117, F01037, doi:10.1029/2011JF002127.
- (70%) **Keylock, C.J.**, Nishimura, K., Nemoto, M., Ito, Y. 2012. The flow structure in the wake of a fractal fence and the absence of an "inertial regime", *Environmental Fluid Mechanics* 12, 227-250 doi: 10.1007/s10652-011-9233-0.
- (70%) **Keylock, C.J.**, Tokyay, T.E., Constantinescu, G. 2011. A method for characterising the sensitivity of turbulent flow fields to the structure of inlet turbulence, *Journal of Turbulence* 12, N45, doi: 10.1080/14685248.2011.636047.
- (100%) **Keylock, C.J.** 2009. Evaluating the dimensionality and significance of "active periods" in turbulent environmental flows defined using Lipschitz/Hölder regularity, *Environmental Fluid Mechanics* 9, 509-523.
- (100%) **Keylock, C.J.** 2008. A criterion for delimiting active periods within turbulent flows, *Geophysical Research Letters* 35, L11804, doi:10.1029/2008GL033858.

Methods for Nonlinear Systems

- (100%) **Keylock, C.J.** 2014. Discussion of "Testing stationarity with wavelet-based surrogates" by Megan McCullough and Ahsan Kareem, vol. 139, no. 2, p.200-209", *ASCE J. Eng. Mech.* 140, 4, 07014001, [http://dx.doi.org/10.1061/\(ASCE\)EM.1943-7889.0000698](http://dx.doi.org/10.1061/(ASCE)EM.1943-7889.0000698).
- (100%) **Keylock, C.J.** 2010. Characterizing the structure of nonlinear systems using gradual wavelet reconstruction, *Nonlinear Processes in Geophysics* 17, 615-632.
- (100%) **Keylock, C.J.** 2008. Improved preservation of autocorrelative structure in surrogate data using an initial wavelet step, *Nonlinear Processes in Geophysics* 15, 435-444.
- (100%) **Keylock, C.J.** 2007. Pseudo-periodic surrogate data generation using wavelet-based methods, *Physica D* 225, 219-228.
- (100%) **Keylock, C.J.** 2006. Constrained surrogate time series with preservation of the mean and variance structure, *Physical Review E* 73, 036707.

Mass Movement Processes

- (PDRA) Ash, M., Brennan, P.V., Lok, L.B., McElwaine, J.N., Vriend, N.M., **Keylock, C.J.**, Sovilla, B. 2014. Two-dimensional radar imaging of flowing avalanches, *Cold Regions Science and Technology* 102, 41-51.
- (50%) **Keylock, C.J.**, Ash, M., Vriend, N., Brennan, P.V., McElwaine, J.N., Sovilla, B. 2014. Looking inside an avalanche using a novel radar system, *Geology Today* 30, 21-25.
- (PDRA) Vriend, N.M., McElwaine, J.N., Sovilla, B., **Keylock, C.J.**, Ash, M., Brennan, P.V. 2013. High resolution radar measurements of snow avalanches, *Geophysical Research Letters* 40, 1-5, doi:10.1002/grl.50134.

- (15%) Eckert, N., **Keylock, C.J.**, Castebrunet, H., Lavigne, A., Naaim, M. 2013. Temporal trends in avalanche activity in the French Alps and subregions: from occurrences and runout altitudes to unsteady return periods, *Journal of Glaciology* 59(213), 93-113, doi: 10.3189/2013JoG12J091.
- (15%) Eckert, N., **Keylock, C.J.**, Bertrand, D., Parent, E., Faug, T., Favier, P., Naaim, M. 2012. Quantitative risk and optimal design approaches in the snow avalanche field: review and extensions, *Cold Regions Science and Technology* 79, 1-19.
- (100%) **Keylock, C.J.** 2005. An alternative form for the statistical distribution of extreme avalanche runout distances, *Cold Regions Science and Technology* 42, 185-193.
- (100%) **Keylock, C.J.** 2003. The North Atlantic Oscillation and Snow Avalanching in Iceland, *Geophysical Research Letters* 30, 5, 1254 doi:10.1029/2002GL016272
- (50%) Barbolini, M. and **Keylock, C.J.** 2002. A new method for avalanche hazard mapping using a combination of statistical and deterministic models, *Natural Hazards and Earth Systems Sciences* 2, 3/4, 239-245
- (80%) **Keylock, C.J.** and Barbolini, M. 2001. Snow avalanche impact pressure - vulnerability relations for use in risk assessment, *Canadian Geotechnical Journal* 37, 227-238.
- (25%) Barbolini M., Gruber U., **Keylock C.J.**, Naaim M. and Savi F. 2000. Application of statistical and hydraulic-continuum dense-snow avalanche models to 5 real European sites, *Cold Regions Science and Technology* 31, 133-149.
- (85%) **Keylock C.J.**, McClung D.M. and Magnusson M.M. 1999. Avalanche risk by simulation, *Journal of Glaciology* 45, 303-314.
- (90%) **Keylock C.J.** and Domaas U. 1999. Evaluation of topographic models of rockfall travel distance for use in hazard applications, *Arctic, Antarctic and Alpine Research* 31, 312-320.
- (100%) **Keylock, C.J.** 1997. Snow Avalanches, *Progress in Physical Geography*, 21, 481-500

Geomorphology/Hydrology

- (70%) **Keylock, C.J.**, Singh, A., Foufoula-Georgiou, E. 2014. The complexity of gravel-bed river topography examined with gradual wavelet reconstruction, *Journal of Geophysical Research* 119, 682-700, doi: 10.1002/2013JF002999.
- (80%) **Keylock, C.J.**, Lane, S.N., Richards, K.S. 2014. Quadrant/octant sequencing and the role of coherent structures in bed load sediment entrainment, *Journal of Geophysical Research* 119, 264-286, doi: 10.1002/2012JF002698.
- (50%) **Keylock, C.J.**, Constantinescu, G., Hardy, R.J. 2012. The application of computational fluid dynamics to natural river channels: Eddy resolving versus mean approaches, *Geomorphology* 179, 1-20.
- (100%) **Keylock, C.J.** 2012. A resampling method for generating synthetic hydrological time series with preservation of cross-correlative structure and higher order properties, *Water Resources Research* 48, W12521, doi:10.1029/2012WR011923.
- (100%) **Keylock, C.J.** 2010. Introduction to special issue: The future of geomorphology, *Progress in Physical Geography* 34, 261-264.
- (100%) **Keylock, C.J.** 2007. The visualisation of turbulence data using a wavelet-based method, *Earth Surface Processes and Landforms* 32, 637-647.
- (100%) **Keylock, C.J.** 2007. Identifying linear and non-linear behaviour in reduced complexity modelling output using surrogate data methods, *Geomorphology* 90, 356-366.
- (80%) **Keylock, C.J.**, Hardy, R.J., Parsons, D.R., Ferguson, R.I., Lane, S.N., Richards, K.S. 2005. The theoretical foundations and potential for large-eddy simulation (LES) in fluvial geomorphic and sedimentological research, *Earth-Science Reviews* 71, 271-304.
- (100%) **Keylock, C.J.** 2005. Describing the recurrence interval of extreme floods using nonextensive thermodynamics and Tsallis statistics, *Advances in Water Resources* 28, 773-778.
- (100%) **Keylock, C.J.** 2003. Mark Melton's geomorphology and Geography's quantitative revolution, *Transactions, Institute of British Geographers* 28, 142-157.

Ecology

(100%) **Keylock, C.J.** 2005. Simpson diversity and the Shannon-Wiener index as special cases of a generalized entropy, *Oikos* 109, 203-207.

Book contributions and refereed conference proceedings:

- Ash, M., Brennan, P.V., Vriend, N.M., McElwaine, J.N. **Keylock, C.J.** 2011. FMCW Phased Array Radar for Automatically Triggered Measurements of Snow Avalanches, *Proceedings of the 8th European Radar Conference 2011*, EuMA, 166-169.
- Ash, M.J., Brennan, P.V., Vriend, N.M., McElwaine, J.N., **Keylock, C.J.** 2011. Two-Dimensional FMCW Radar Imaging of Entire Avalanche Events, *5th IASME / WSEAS International Conference on GEOLOGY and SEISMOLOGY (GES '11)*, Cambridge, U.K., 153-157.
- Keylock, C.J.** 2011. Chaos and Complexity, in Livingstone, D.N. and Agnew, J.A. (eds), *The SAGE Handbook of Geographical Knowledge*, SAGE, London, chapter 29.
- Ash, M., Chetty, K., Brennan, P., McElwaine, J., **Keylock, C.** 2010. FMCW radar imaging of avalanche-like snow movements, *IEEE Radar Conference 2010*, p.102-107, doi: 10.1109/RADAR.2010.5494643
- Brennan, P.V., Ash, M., Isa, F.M., **Keylock, C.**, McElwaine, J. 2009. Advanced radar imaging of geophysical flows, *GES'09: Proc. of the 3rd IASME/WSEAS Int. Conf. on Recent Adv. In Geol. And Seismol.* 144-147.
- Lane, S.N., Hardy, R.J., **Keylock, C.J.**, Ferguson, R.I. & Parsons, D.R. 2004. Coherent flow structures in shallow gravel-bed rivers: an experimental and numerical study, in Jirka, G.H & Uijttewaal, W.S.J. (eds), *Proceedings of the International Symposium on Shallow Flows*, Balkema
- Schindler, R.J., Lane, S.N., **Keylock, C.J.** & Naden, P.S. 2004. Characterisation of Stem Wake Effects Using PIV Imagery, in Jirka, G.H & Uijttewaal, W.S.J. (eds), *Proceedings of the International Symposium on Shallow Flows*, Balkema.
- Keylock, C.** 2003. The natural science of Geomorphology? in Trudgill S. and Roy, A. (eds) *Contemporary Meanings in Physical Geography*. Arnold.
- Keylock, C.J.** 2000. Avalanches, in Hancock P.L. and Skinner B.J. (eds) *The Oxford Companion to The Earth*, Oxford University Press.
- Harbitz, C., Issler, D. & **Keylock, C.J.** 1998. Conclusions from a recent survey of avalanche computational models, in Hestnes, E. (ed) *Norwegian Geotechnical Institute Publication 203*, 128-139.

According to Scopus, my H-index is 15. Scopus citations are stated first, with *Google-Scholar* in brackets:

Keylock (2005) <i>Oikos</i>	114 (186)	Ecology
Keylock et al. (1999) <i>J. Glaciol.</i>	55 (86)	Avalanches
Barbolini et al. (2000) <i>Cold Reg. Sci. Tech.</i>	54 (79)	Avalanches
Keylock et al. (2005) <i>Earth Sci. Rev.</i>	47 (73)	Hydrodynamics
Keylock and Barbolini (2001) <i>Can. Geotech. J.</i>	35 (54)	Avalanches
Keylock (2006) <i>Phys. Rev. E</i>	27 (39)	Signal analysis
Keylock et al. (2012) <i>Geomorphology</i>	24 (33)	Hydrodynamics
Keylock (2005) <i>Cold Reg. Sci. Tech.</i>	24 (35)	Avalanches
Keylock (2010) <i>Nonlinear Proc. Geophys.</i>	23 (22)	Signal analysis
Keylock (2007) <i>Physica D</i>	22 (30)	Signal analysis
Keylock (2003) <i>Geophys. Res. Lett.</i>	20 (26)	Avalanches
Barbolini and Keylock (2002) <i>Nat. Haz. Earth Sys. Sci.</i>	18 (30)	Avalanches
Vriend et al. (2013) <i>Geophys. Res. Lett.</i>	17 (20)	Avalanches
Eckert et al. (2013) <i>J. Glaciology</i>	15 (23)	Avalanches

International Committees:

In April 2016 I joined the AGU Joint Technical Committee on Hydroclimatic Hazards with colleagues from MIT, Cornell, Columbia, UC Irvine, Rutgers, Uppsala, Cal. State, and City University of New York.

Teaching

I have always delivered modules at the core of the curricula of the Engineering and Geography departments in which I have worked. I am currently on sabbatical from my role as the department's Director of Learning and Teaching.

At Sheffield I have taught a fourth year Civil Engineering undergraduate/MSc course on risk and extreme events, a MSc course on sampling and data analysis, a fourth year course on flow, turbulence and sediment transport and have delivered first and second year computer programming teaching as part of the mathematics stream that our students follow. I have also introduced and delivered a research methods and data analysis course for our third year students.

Lectures and classes at the University of Leeds included the following topics and courses: fluvial hydraulics; the history and philosophy of geomorphology; the science of snow and ice; first and second year statistics; MSc in computational fluid dynamics; Faculty PhD training programme on research methods for physical scientists. As Supervisor of Studies at Cambridge I gave supervisions across physical geography to first and second year undergraduates.

I have also given guest lectures for undergraduate and postgraduate courses at the Dept. of Civil Engineering, University of Minnesota (wavelet analyses), Dept. of Geography, University of Cambridge, Dept. of Geography, University of Manchester, and the Dept. of Hydraulic and Environmental Engineering, University of Pavia, Italy.

I have published the following material relevant to education and pedagogy. The report associated with the paper by Harris *et al.* fed into the design of the new Geography A-level:

Harris, R., Tate, N., Souch, C., Singleton, A., Orford, S., **Keylock, C.**, Jarvis, C., Fitzpatrick, K., Brunsdon, C. 2014. Geographers count: a report on quantitative methods in geography, *Enhancing Learning in the Social Sciences* 6, 43-58.

Keylock, C. and Ash, M. 2014. Measuring avalanches to manage risk, *Geography Review* 28, 1, 10-13.

Keylock, C.J. 2007. Withering geomorphology, *Earth Surface Processes and Landforms* 32, 5, 803-804.

Keylock, C.J. 2006. Reforming AS/A2 Physical Geography to Enhance Geographic Scholarship, *Geography* 91, 272-279

Keylock, C.J., Hirashima H., and Nishimura, K. 2006. Hazards resulting from earthquakes: A case study. *Geography Review* 19, 5, 10-14.

Keylock, C.J. and Dorling, D. 2004. What kind of quantitative methods for what kind of Geography? *Area*, 36, 358-366.

Keylock, C.J. 2004. Reviewing The Hjulström curve. *Geography Review* 17, 4, 16-20.

Holden, J., **Keylock, C.J.**, Howard, A.J. 2003. *Geomorphology Resource Pack: Upper Wharfedale*. School of Geography, University of Leeds.

Keylock, C., Lawless, M., Schindler R. 2003. Studying in Canada, in Rogers A. and Viles H. (eds) *The Student's Companion to Geography*, Blackwell.

I have been awarded a certificate for excellence in academic and personal tutoring from the University of Leeds Student Union.

PhD Supervision:

Dr Robert Schindler (Defended successfully in February 2006);
Dr Sara Alexander (Defended successfully in April 2010)
Mr Manar Al-Saffar, (Defended successfully in May 2016)
Mr Jonathan Highan (commenced 2013/14)
Mr Hoan Truong (commenced 2013)

PhD External examination:

Dr Aurore Lavigne (AgroParisTech and ETNA/CEMAGREF, Paris, December 2013)
Dr Nicolas Eckert (AgroParisTech and ETNA/CEMAGREF, Grenoble, December 2007)

Journal Refereeing

Avalanches: *Annals of Glaciology; Cold Regions Science & Technology; Journal of Glaciology.*
Climate: *Climate of the Past, Discussions; Climatic Change; International Journal of Climatology.*
Ecology: *Ecography; Ecological Modelling; Oikos.*
Fluids: *Environmental Fluid Mechanics; Fluid Dynamics Research; International Journal of Computational Fluid Dynamics; Journal of Fluid Mechanics;*
Geography: *Journal of Spatial Science; Progress in Physical Geography; Transactions, Institute of British Geographers.*
Geoscience: *Computers & Geosciences; Earth Surface Processes and Landforms; Earth Science Reviews, Geodinamica Acta; Geomorphology; Geophysical Research Letters; Journal of Geophysical Research – Atmospheres; Journal of Geophysical Research –Earth Surface; Journal of Mountain Science; Journal of Sedimentary Research; Natural Hazards; Sedimentology;*
Hydraulics: *Advances in Water Resources, Journal of Hydraulics Research, Water Science & Engineering, Water Resources Research.*
Physics: *Measurement Science & Technology; Physica A; Physical Review E; Physical Review Letters, Scientific Reports.*
Signal Analysis: *Simulation Modelling: Practice and Theory*

Research Projects and Grants Awarded

2016-2017 Royal Academy of Engineering/Leverhulme Trust Senior Research Fellowship.
2014 JSPS award for scientific symposium on Interscale Transfers and Flow Topology in Equilibrium and Non-Equilibrium Turbulence.
2012-2013 ESRC award on Quantitative Methods in Geography Teaching
2012 EPSRC small equipment grant to develop laboratory facilities
2012-2015 EPSRC grant to develop MIMO capability for avalanche radar.
2012 Santander funded International Visit to Chile
2012 Royal Summer Science Exhibition
2009-2011 British Council Alliance programme UK-France 'Risk zoning for snow avalanches in a changing climate' with CEMAGREF, Grenoble.
2008 - 2011 NERC 'Geophysical flow dynamics using pulsed Doppler radar' with Mathematics, University of Cambridge, and Electrical Engineering, UCL.
2005 RGS-IBG, BGRG & QMRG 'Wavelet Workshop'
2004 British Council PPS programme UK-Netherlands 'Measuring and modelling flow through flexible fractal objects' with Prof. Bernard Geurts, University of Twente, Netherlands.
2004 Japanese Society for the Promotion of Science Postdoctoral Fellowship (Short Term) 'Snow saltation as a function of temperature and the role of coherent vortices'

- 2003 Scientific committee for a NERC-EPSC, NSF, Office of Naval Research, London Mathematical Society and Isaac Newton Institute funded meeting on Geophysical Granular and Particle Laden Flows formed as a satellite meeting to the Isaac Newton Institute programme on *Granular and Particle Laden Flows*.
- 2002 - 2005 Member of the EU 5th Framework research programme "Avalanche Studies and Model Validation in Europe" SATSIE. (see <http://www.leeds.ac.uk/satsie>)
- 2002 - 2004 Nuffield Foundation award to New Lecturers NAL/00495/G for Large-Eddy Simulation study of flow and sediment movement at confluences
- 1994 - 1996 Member of the European Union 4th Framework research programme "Snow Avalanche Mapping and Warning in Europe" (SAME.).

Research grant reviewing:

I have reviewed research grant proposals for the U.K. research councils and the national research councils in Canada, Chile, France and Switzerland.

Other research activities:

In October 2016 I was one of two international members of *un Jury de Concours* for a Chargé de Recherche position at Irstea, the French national institute for research into environmental and agricultural science and technology. The post was for a statistician to work on natural hazards analysis.

In 2016-17 I have visiting positions at the Department of Mechanical Engineering, Johns Hopkins University, and the Department of Aeronautics, Imperial College, London.

I was invited to write a paper for the 50th anniversary special issue of *Water Resources Research*, which was published in 2015. In this work I established a future agenda for the understanding of fluid flow in natural channels, focusing on an improved understanding of vortex topology and mechanisms for dissipation.



JSPS Supported Symposium on Interscale Transfers and Flow Topology in Equilibrium and Non-equilibrium Turbulence (Sheffield, UK, September 2014)

In September 2014, I organized an International Research Meeting on *Interscale Transfers and Flow Topology in Equilibrium and Non-Equilibrium Turbulence*. This was supported by the Japan Society for the Promotion of Science and selected papers were published in *Fluid Dynamics Research* in 2016.

I have been an invited speaker at the Institute of Mathematical Sciences and Dept. of Aeronautics, Imperial College and Lorentz Center, University of Leiden for work on fractal-forced flows between 2005 and the present. Most recently, this has been as part of the 3rd Workshop on Fractal Forced Flow at Imperial (supported by EPSRC and ERCOFTAC) in March 2014 and September 2016, and a SiG42/44 meeting in Sheffield in September 2015.

In July 2012, with colleagues from Cambridge and UCL, I organised a stand at the Royal Society Summer Science Exhibition. This is one of the UK's largest public science festivals and was attended by 11120 people. The event received press coverage in most of the national press and a video clip from our stand, "Setting a Speed Trap for an Avalanche", was used by ITV News at Ten to inform the public following nine fatalities in an avalanche in the Alps in July 2012. See the on-line exhibit at: <http://sse.royalsociety.org/2012/exhibits/avalanche-radar/>



I was the script editor for BBC programme *10 Things you didn't know about avalanches* (2.2 million viewers when first screened in March 2008):
<http://www.bbc.co.uk/programmes/b008vrwk>.



In 2003 I was on the scientific committee for a Newton Institute-sponsored meeting on Geophysical Granular and Particle Laden Flows, held in Bristol, U.K.

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Geophysical Granular and Particle-Laden Flows

> Overview

Satellite
 27th October 2003 to 31st October 2003
Organisers: JMNT Gray (Manchester), AJ Hogg (Bristol) & K Hutter (Darmstadt)
Scientific Committee: JT Jenkins (Cornell), C Keylock (Leeds), T Mullin (Manchester) & A Woods (Cambridge)

Workshop held at "@-Bristol", Harbourside, Bristol, UK

Many large-scale natural hazards and geomorphic processes involve granular or particle-laden flows. Examples abound in our natural environment, ranging from avalanches, debris flows, rock-falls, pyroclastic flows and lahars, to turbidity currents, sediment transport in rivers and dune formation. This meeting will bring together environmental scientists, geographers, geologists and geophysicists, who observe these phenomena in the field, with mathematicians, physicists and engineers who are developing sophisticated mathematical models and laboratory based experiments to understand these complex and challenging flows. A group of leading mathematicians and scientists will be gathered at the Isaac Newton Institute for a 4 month programme on *Granular and Particle-Laden Flow* at this time, and this Satellite workshop provides an unparalleled opportunity for environmental scientists, theoreticians and experimentalists to meet, discuss and exchange ideas.

Administrative Responsibilities

In 2016-17 I am on sabbatical from my role as the Director for Learning and Teaching in the department of Civil and Structural Engineering, University of Sheffield. In essence, I am responsible for the departmental learning environment, the content of all our degree programmes and the student experience associated with these. In the 18 months since I took over I have led the implementation of two new MSc courses, completely restructured our fourth year and MSc provision, and introduced new research skills teaching at level 3. I am currently looking at a reorganisation of our first year mechanics teaching to place Fluid, Geotechnical and Structural Mechanics on a similar footing. In conjunction with this appointment, in 2015 I completed the Sheffield Leader Training for those in managerial positions.

In addition to serving on various departmental committees, I was the departmental Examinations Officer for undergraduate programmes in Leeds Geography in 2009/10.