Thomas Kent

Curriculum Vitae

Personal Details

Preferred name:	Tom	email:	tkent198@gmail.com
Date of Birth:	17 July 1989	Website:	tkent198.github.io/
Nationality:	British	LinkedIn:	tom-kent-5101

Research Expertise and Interests

Mathematical and statistical modelling of atmospheric and environmental phenomena: geophysical fluid dynamics; data assimilation; hydraulic and shallow water-type modelling; numerical methods for hyperbolic problems; numerical weather prediction (meteorology); flood modelling and mitigation; statistical downscaling and bias correction; scientific code development; science outreach, education, and communication.

Professional Employment

Aug. 2018 - Dec. 2020	Research fellow (0.5FTE) **School of Mathematics, University of Leeds, UK**
Jan. 2018 - Aug. 2020	Teaching Assistant (0.5FTE) **School of Mathematics, University of Leeds, UK**
Jan. - May 2017	Postdoctoral Research Associate **School of Mathematics, University of Leeds, UK**
Sept. 2016 - May 2017	Maths Support Tutor **Leeds University Library, UK**
May 2013- Dec. 2016	Postgraduate Research & Teaching Assistant **School of Mathematics, University of Leeds, and the Met Office, UK**
Jan. - April 2013	Freelance content writer **Research Media (Applied health and environmental research)**
Sept. - Dec. 2012	Visiting Research Scientist **GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany**

Education

May 2013 - Dec. 2016	PhD Applied Mathematics **University of Leeds, UK**
Sept. 2011 - Sept. 2012	MSc Meteorology and Climatology (Distinction) **University of Birmingham, UK**
Aug. 2009 - Aug. 2010	Exchange Year (Erasmus Program) **Technical University of Dresden, Germany**
Sept. 2007 - July 2011	BSc Mathematics (First Class (Hons)) **University of Bristol, UK**
2000 - 2007	Secondary School in Dover: 4 A levels, 11 GCSEs

Publications

Journals: arxived/to be submitted

2 **Kent, T.**, Cantarello, L., Inverarity, G., Tobias, S., Bokhove, O. (2020): Idealised forecast-assimilation experiments for convective-scale Numerical Weather Prediction. EArXiv.

1 **Kent, T.**, Bokhove, O. (2020): Ensuring 'well-balanced' shallow water flows via a discontinuous Galerkin finite element method: issues at lowest order. *arXiv:2006.03370*

Journals: published

5 Bokhove, O., Hicks, T., Zweers, W. and **Kent, T.** (2020): Wetropolis extreme rainfall and flood demonstrator: from mathematical design to outreach. *Hydrol. Earth Syst. Sci.*, **24**, 2483–2503. **[Selected as a journal highlight - May 2020.]**

4 Bokhove, O., Kelmanson, M.A., **Kent. T.**, Piton, G. and Tacnet, J.-M. (2020): A cost-effectiveness protocol for flood-mitigation plans based on Leeds' Boxing Day 2015 floods. *Water*, **12**, 652.

3 Bokhove, O., Kelmanson, M.A., **Kent, T.**, Piton, G. and Tacnet, J.-M. (2019): Communicating (nature-based) flood-mitigation schemes using flood-excess volume. *River Res. Applic.* **35** 1402-1414.

2 **Kent, T.**, Bokhove, O., Tobias, S.M. (2017): Dynamics of an idealized fluid model for investigating convective-scale data assimilation. *Tellus A: Dynamic Meteorology and Oceanography*, **69(1)**, 1369332.

1 Wong, G., Maraun, D., Vrac, M., Widmann, M., Eden, J.M, and **Kent, T.** (2014): Stochastic model output statistics for bias correcting and downscaling precipitation including extremes. *J. Climate.* **27**, 6940–6959.

Theses

2 **Kent, T.** (2017): An idealised fluid model of convective-scale NWP: dynamics and data assimilation. *PhD Thesis, University of Leeds.*

1 **Kent, T.** (2012): Stochastic correction and downscaling of daily precipitation via a probability mixture model. *MSc Thesis, University of Birmingham.*

Other (all available online)

3 **Kent, T.** (2020): DARE contributes evidence to national flooding inquiry. *Data Assimilation for the Resilient City blog.*

2 Bokhove, O., Kelmanson M.A., **Kent, T.** (2020): A new tool for communicating cost-effectiveness of flood-mitigation schemes. *Written evidence, DEFRA UKGov flood inquiry.*

1 **Kent, T.** (2018): Using flood-excess volume to assess and communicate flood-mitigation schemes. *Data Assimilation for the Resilient City blog.*

Open-source code and documentation

5 Flood-Excess-Volume: Using 'flood-excess volume' to assess and communicate flood-mitigation schemes: case studies incl. source code and output.

4 hydraulic_wetro: Wetropolis rainfall and flood demonstrator: developments in hydraulic modelling and visualisation.

3 wellbalanced_SW_DGFEM: Ensuring 'well-balanced' shallow water flows via a discontinuous Galerkin finite element method: issues at lowest order.

2 SW_riemann_problem: Exact solutions of the Riemann problem for the shallow water equations: rarefaction waves, shocks, and contact discontinuities.

1 modRSW_EnKF: An idealised convective-scale forecast-assimilation framework.

Seminars and Conferences

Overview: 5 invited seminars (Uni. Reading, Met Office, FU Berlin, Uni. Potsdam, LIFD); 10 conference talks (in the UK, Europe, and USA); 3 internal seminars (Schools of Mathematics & Earth and Environment, Leeds); 6 posters.

Summary of conference talks and invited seminars:

Sept. 2021	Flood demonstrator 'Wetropolis': from design to research in flood modelling and mitigation, **Invited***: Flood modelling and forecasting challenges in industry workshop, University of Sheffield. [Online; rescheduled from June 2020.]*
Oct. 2020	Mathematical and numerical modelling of the Wetropolis flood and rainfall demonstrator, **Invited***: Leeds Institute for Fluid Dynamics ECR forum webinar.*
May 2019	The modRSW model – physical basis, numerics, and dynamics, *DA workshop, University of Leeds.*
April 2019	Idealised forecast-assimilation experiments and their relevance for convective-scale Numerical Weather Prediction, *EGU General Assembly, Vienna.*
Sept. 2018	Flood-excess volume (or how Wetropolis inspired a new tool for flood-mitigation assessment), Water@Leeds annual Confluence 2018, Leeds.
Sept. 2018	Using flood-excess volume to assess and communicate flood-mitigation schemes, *Leeds-Kyoto International Symposium: Advanced Engineering for Natural Disaster Identification, Mitigation, Prevention, and Response. Leeds.*
Mar. 2017	An idealised fluid model of convective-scale NWP: dynamics and data assimilation. **Invited***: Universität Potsdam and Freie Universität Berlin.*
Jan. 2017	Dynamics of an idealised fluid model of convective-scale NWP. *Dynamics of Rotating Fluids meeting, University College London.*
Nov. 2016	An idealised fluid model of convective-scale NWP: dynamics and data assimilation. **Invited***: Weather Science seminar, Met Office, Exeter.*
Nov. 2016	An idealised fluid model of convective-scale NWP: dynamics and data assimilation. **Invited***: Data Assimilation Research Centre seminar, University of Reading.*
June 2015	An idealised fluid model for inexpensive DA and its relevance for NWP. *Workshop on Sensitivity Analysis and Data Assimilation in Meteorology, WV, USA.*
April 2015	A modified shallow water model for investigating convective-scale data assimilation. *EGU General Assembly, Vienna.*
July 2014	A modified shallow water model of convective-scale NWP. *CliMathNet conference 2014, University of Leeds.*
May 2014	A modified shallow water model for investigating convective-scale data assimilation. *Reading-Warwick Data Assimilation Meeting, University of Warwick.*

A full list, including co-authors, slides, and posters can be found at: tkent198.github.io/talks.html

Awards and Funding

2020	EPSRC's Data Assimilation for the Resilient City (DARE) Pilot Project award (£24,216.50), August - December 2020.
2020	Nominated for the Leeds Partnership awards for teaching/mentoring.
2019	Research workshop grant: London Mathematical Society (£2500) and Leeds' School of Maths (£2500) for hosting DA workshop, 16-17 May 2019, Leeds.
2017	(i) EPSRC Impact Accelerator Award (Met Office) and (ii) 'Maths foresees' outreach project funding award (3+2 months postdoc funding), University of Leeds.
2014	Young Scientist travel award (€500), International Symposium for Data Assimilation, LMU Munich.
2013	EPSRC CASE (Cooperative Awards in Science & Technology) scholarship (University of Leeds and Met Office; 3.5 years salary and expenses for PhD degree).
2012	EU COST Action VALUE grant (€2500) for research visit to GEOMAR, Germany.

Teaching

Positions held and Experience

› Teaching assistant, School of Mathematics, Leeds (2013-20)

Overview: running tutorials and workshops for undergraduate (primarily applied) mathematics courses, and providing support for the lectures and weekly assignments including assessment. Where noted below, also delivering lectures* and module manager** (class size ca. 200).

List of courses: Mathematics 1 & 2 (calculus, linear algebra, and mechanics), Calculus and Mathematical Analysis*, Modelling with Differential Equations**, Vector Calculus, Nonlinear Differential Equations, Optimisation, Financial Mathematics, BSc project supervision.

› Maths support tutor, Leeds University Library (2016/17)

Overview: providing one-to-one and small-group assistance at the Skills@Library drop-in service, primarily for level 0 and 1 undergraduates from mathematics, engineering, and business/finance, but open to all students from disciplines with a numerate aspect.

Highlights

› Module Manager for Modelling with differential equations

I led the content, delivery and assessment for ca. 200 students on this core first-year course for students on multidisciplinary mathematics degrees. Notable additions to the course: (i) more emphasis on the importance of formulating the problem from, e.g., a completely verbal description of a physical situation, and (ii) established a new section of atmospheric applications and problems, reflecting my own research expertise.

› Supervising research-based BSc projects

I jointly planned and led the final-year BSc project "Flood analysis: assessing and communicating of river floods to policy makers and the general public", based on actual and ongoing interdisciplinary research. In total, co-supervision of 5 students.

› Nomination for Leeds partnership award

In March 2020, I was nominated by a mathematics student for a Leeds Partnership award for excellence in mentoring/teaching.

Public Engagement and Outreach

2018-20	Contributor to the Data Assimilation for the Resilient City blog.
2018	Yorkshire iCASP confluence 2018, Brewery Wharf, Leeds, 15 June 2018: showcasing flood demonstrator Wetropolis to stakeholders.
2017	'Armley Mills Science Fair' at Leeds Industrial Museum, 26 March 2017. 'Be Curious', the research open day of the University of Leeds, showcasing our research with free, interactive and fun activities. 25 March 2017. 'Flood recovery and resilience' conference, Bilsborrow (near Preston; organised by the public Churchtown Flood Action Group), 29 Jan. 2017.
2016	'The Science of Floods', Hebden Bridge. Public event organised by Pennine Prospects and contribution from our network *Maths Foresees*, 8 May 2016.
2015-17	Wave tank demonstration at numerous undergraduate open days in the School of Mathematics, showcasing the maths of waves and fluid dynamics.

Computing and Programming proficiency

High:	Python, Matlab, LaTeX, Linux/Unix OS, GitHub, Microsoft Office
Intermediate:	R, html
Basic:	Fortran

See public GitHub *page for some projects with open-source code:* github.com/tkent198

Languages

English:	Native speaker
German:	Highly proficient (CEFR: C1, A Level: A)
French:	Intermediate (GCSE: A*)
Spanish:	Intermediate
Danish:	Elementary

Referees

1. Prof. Onno Bokhove – Chair in Geophysical Fluid Dynamics
   School of Mathematics, University of Leeds
   Email: o.bokhove@leeds.ac.uk
2. Prof. Steven Tobias – Director of Leeds Institute for Fluid Dynamics
   School of Mathematics, University of Leeds
   Email: s.m.tobias@leeds.ac.uk
3. Dr. Philip Walker – Director of Student Education
   School of Mathematics, University of Leeds
   Email: p.walker@leeds.ac.uk