Jemima M. Tabeart

CONTACT INFORMATION

Department of Mathematics and Statistics
Whiteknights
Reading
RG6 6AX

(+44) 07789 452744
jemima.tabeart@pgr.reading.ac.uk

BRIEF NARRATIVE SUMMARY

I am a PhD candidate in Mathematics with a focus on data assimilation, expecting to submit my thesis in September 2019. Data assimilation combines the output from a numerical model of a dynamical system with observations of the system to yield an accurate description of the current dynamical state. To date my work has focused on the impact of introducing correlated observation errors, which are used to weight the contribution of observations, on the convergence of the minimisation of variational objective functions. The project is wide reaching, incorporating theoretical linear algebra, the design and coding of small scale numerical testbeds, and complex experiments using 1D-Var, 4D-Var and NEMOVAR schemes at the UK Met Office. I have one published paper, one paper in review and one paper to be submitted imminently related to my PhD research. I have undertaken my PhD research in a cross-institution, interdisciplinary programme, where I have collaborated with external organisations such as the Met Office. Prior to my doctoral studies I have had experience carrying out research in fields including materials science (which resulted in the publication of a peer reviewed paper) and mathematical modelling for fluid mechanics.

EDUCATION

Ph.D. Candidate, "On the treatment of correlated observation errors in data assimilation", **Expected submission:** September 2019
EPSRC Mathematics of Planet Earth Centre for Doctoral Training, **University of Reading**,

- Supervised by Dr Sarah L. Dance, Dr Amos S. Lawless, Professor Nancy K. Nichols, Dr Joanne A. Waller, and Dr David Simonin
- In collaboration with NCEO and the Met Office, my research investigates how correlated observation error can be incorporated into a data assimilation framework whilst reducing the negative impact on convergence that has been observed theoretically and in practice.

M.Res. (Distinction), 2015 – 2016
EPSRC Mathematics of Planet Earth Centre for Doctoral Training
University of Reading & **Imperial College London**,

- Taught Courses: *Partial Differential Equations, Data & Uncertainty, Dynamical Systems, Numerical Analysis & Data Assimilation*
- Project Title: *On the variational data assimilation problem with non-diagonal observation weighting matrices*
- Supervisors: Dr Amos S. Lawless, Dr Sarah L. Dance, Professor Nancy K. Nichols and Dr Joanne A. Waller

MMath (Hons) 1st, Mathematics with Study Year Abroad, 2011 – 2015
University of Bath,

- Undertook assessed third year at Université Joseph Fourier (now part of Université Grenoble Alpes) where I completed the Parcours A stream for students preparingto study graduate mathematics.
- MMath Project Title: *Models for Walking Droplets and Their Confined States*
  Supervisor: Dr Paul Milewski

RESEARCH EXPERIENCE

Visiting researcher, UK Met Office (July/August 2018)
8 week research project based in Ocean Forecasting and Research Development group to investigate importance of error covariances for sea surface temperature observations. Compared diagnosed errors obtained using method of Desroziers et al. (2005) with estimates produced by ESA CCI SST project, finding significant

differences between the two estimate types.

Researcher, University of Bath (July/August 2014)
8 week research placement based at the Universities of Bath and Cambridge. The bouncing droplet phenomenon, a fluid dynamics problem with parallels in quantum physics, was modelled in 1D using MATLAB. The programs, graphs and final report produced provided a starting point for my undergraduate research project.

Research Assistant, University of Bath (July/August 2011)
Awarded a 5 week Bursary placement in June 2010 - subsequently returned to work on a European-wide project studying Gallium Nitride (GaN). Created a new tool to aid the 3D visualisation of GaN's physical properties, which involved learning to program in Visual Basic, communicating with other scientists on the same project and presenting my work to non-experts. The placement culminated in the publication of a joint paper in Integrated Ferroelectrics (Vol 133 Issue I).

PUBLICATIONS

Published

Jemima M. Tabeart, S. L. Dance, S. A. Haben, A. S. Lawless, N. K. Nichols and J. A. Waller "The conditioning of least squares problems in variational data assimilation" *Numerical Linear Algebra with Applications*, 2018, https://doi.org/10.1002/nla.2165

M.-L. Hicks, **Jemima Tabeart**, M. J. Edwards, E. D. Le Boulbar, D. W. E. Allsopp, C. R. Bowen and A. C. E. Dent "High Temperature Measurement of Elastic Moduli of (0001) Gallium Nitride" *Integrated Ferroelectrics*, 133(1) 17-24, 2012 https://doi.org/10.1080/10584587.2012.663309

Under review

Jemima M. Tabeart, S. L. Dance, A. S. Lawless, N. K. Nichols and J. A. Waller 'Improving the condition number of estimated covariance matrices' *Submitted Tellus A* https://arxiv.org/abs/1810.10984

In Preparation

Jemima M. Tabeart, S. L. Dance, F. Hilton, A. S. Lawless, S. Migliorini, N. K. Nichols and J. A. Waller "The impact of reconditioning of the correlated observation error covariance matrix on the Met Office system" *In preparation*

Jemima M. Tabeart, S. L. Dance, A. S. Lawless, N. K. Nichols and J. A. Waller "Introducing correlated observation errors in a preconditioned variational data assimilation framework" *In preparation*

TRAVEL GRANTS

Workshop on Sensitivity Analysis and Data Assimilation: 820 euros +£200 from DARE training fund.

PRIZES AND AWARDS

Best group project: MPE CDT Industrial Study Group, March 2018.

Best group project: presenting NCEO science to an industrial audience, NCEO Researchers' Forum, February 2018.

Best poster presentation: NCEO Researchers' Forum, February 2018.

Best MRes project: MPE CDT March 2017.

Chancellor's Prize for best final year undergraduate student: University of Bath, June 2015.

COMPUTING

Confident with Unix, MATLAB, Python, LaTeX
Significant experience with high performance computing, using the Met Office Rose/Cylc system, netCDF
Some experience with IDL

LANGUAGES Native English speaker, fluent in French

CONFERENCES

Invited Speaker

- Environmental Research DTP Student Seminar Series *How to use observation error information to improve weather forecasts*
  University of Oxford 2nd November, 2018
- Ocean Group Seminar Series: *Estimating correlated observation errors for SST*
  UK Met Office, Exeter, UK 28th August, 2018.
- Imperial College SIAM student conference *How to use correlated covariance information without breaking the bank*
  Imperial College London, UK 11th June 2018.
- Imperial College Junior Applied Mathematics Seminar *How to use correlated covariance information without breaking the bank*
  Imperial College London, UK 7th February 2018.

Invited Participant

- NCEO Researchers' Forum, February 2018, *Accounting for correlated observation errors in variational data assimilation*
  University of Leicester, UK (Poster) 5th – 6th February 2018
- International Workshop on Climate Change and Natural Disasters,
  Cemaden/INPE, São Jose dos Campos, Brazil (Oral) 29th August – 2nd September 2017
- MPECDT Industrial Study Group
  Imperial College London, London, UK 20th – 21st March 2017
  University of Reading, UK 19th – 20th March 2018

Selected contributed presentations

International conferences

Oral presentations

- 7th International Symposium on Data Assimilation: *Improving the conditioning of estimated observation error covariance matrices*
  RIKEN Centre for Computational Science, Kobe, Japan 21st-24 January 2019
- Workshop on Sensitivity Analysis and Data Assimilation in Meteorology and Oceanography: *Improving the condition number of estimated covariance matrices*
  Meli Ria Hotel, Aveiro, Portugal 1st-6th July 2018

Poster presentations

- 7th International Symposium on Data Assimilation *The impact of using reconditioned correlated observation error covariance matrices in the Met Office 1D-Var system*
  RIKEN Centre for Computational Science, Kobe, Japan 21st-24 January 2019

National conferences

Oral presentations

- CliMathNet Conference *Improving the condition number of estimated covariance matrices*
  University of Reading, UK 19th-21st September 2018
- NCEO CEOI annual conference *Accounting for correlated observation errors in variational data assimilation*
  University of Bath, UK 27th-30th June 2017.

Poster presentations

- National Earth Observation Conference *Improving the condition number of estimated covariance matrices*
  University of Birmingham, UK 4th-7th September 2018
- LMS Women in Maths Days *Improving the condition number of estimated covariance matrices*
  Isaac Newton Institute, Cambridge 30th April - 1st May 2018

Student and internal conferences

Oral presentations

- Imperial College SIAM student conference *Accounting for correlated observation errors in variational data assimilation*
  Imperial College, London, UK 19th June 2017.

Poster presentations

- MPECDT Jamboree *Improving the condition number of estimated covariance matrices*
  University of Reading UK 21st March 2018
- MPECDT Jamboree *Accounting for correlated observation errors in variational data assimilation*
  Imperial College, London, UK 22nd March 2017

Training courses

- NERC training course Oceans in Weather and Climate 12-16th March 2018
- EUMETSAT/ECMWF NWP-SAF Satellite Data Assimilation 3rd - 7th April 2017
- ECMWF Data Assimilation Course 27th-21st March 2017
- Met Office internal training: Using Rose and Cylc 9th-10th May 2016

Research Leadership

Communications Office/Secretary *University of Reading SIAM-IMA Student Chapter* October 2016 – September 2018

- Co-organised annual conference for over 50 PhD students from across the South West (June 2017 and May 2018).
  Invited and liaised with keynote speakers, organised travel, booked rooms.
  Awarded £100 additional funding to enable gender diversity of keynote speakers.
- Organising welcome week activities for new PhD students in the department.

Student representative *Mathematics of Planet Earth* October 2015 –

- Responsible for communicating student concerns and comments to the CDT staff.
- Inviting speakers and organising mini-symposium at annual Jamboree.
- Student representative on committees including the Stakeholder and Steering Committees
- Preparing student reports for EPSRC and internal reviews.

Teaching Experience

Teaching Assistant

- January – March 2017-9: Numerical Methods for Financial Engineering (MSc Finance)
  Co-leading computer practicals for 16 students assisting with Visual Basic activities
- September – March 2016-2018: Linear Algebra (1st year BSc)
  Co-leading weekly workshops for 30 students, assisting with problem sheets and concepts from lectures.
- October – December 2016: Data & Uncertainty (MPECDT MRes)
  Leading and preparing occasional tutorials for 16 students going through problems together at the board
- October – March 2014/15: Algebra (1st year BSc)
  Leading and preparing weekly tutorials for 16 students, going through lecture content and problem sheet solutions at the board.

Marking

- March 2017-18: Linear Algebra/Calculus - *summative assignments for 210 students.*
- October - March 2014-15: Algebra - *weekly formative problem sets for 30 students.*

Other professional activities

Outreach activities January 2018 – 2019

- School visits to promote STEM careers with 14-18 year old students.

- Blogs about conference attendance and summarising research including: lay summary of recent paper NCEO website, article in Mathematics Today (August 2017) about student SIAM conference.

Trustee Reading University Students' Union 2016 – 2018

- Served as Deputy Chair 2017 – 2018
- Represented the views of post-graduate students.
- Ensured the organisation continued to act in the best interest of its members.