

Matthew Griffith



Contact

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Languages

English: Mother tongue
French: Proficient
Portuguese: Independent

Programming Skills

Linux Shell Script
Python, MATLAB, \LaTeX
Git, Fortran90



Personal Profile

I am a final year PhD student in applied mathematics/NWP at the University of Bath, working in collaboration with the Space Weather Group at the Met Office. I obtained a first class MMath(Hons) in Mathematics in 2016. I have strong experience in mathematical modelling, in particular working on the Met Office's climate and weather model - the Unified Model - as the focus of my PhD. As well as this, I have also used my mathematical modelling skills to initiate collaborations with research groups in both Portugal and France, where I modelled both hydrogen peroxide signalling and water waves under the influence of an electric field. Here, I was able to fit into and work well with small research teams. Throughout this work I have also accumulated skills in a wide range of programming languages including Python, MATLAB and Fortran90. I have good communication skills, having presented my work at academic conferences as well as having been a tutor for an undergraduate course for several years. I also ran an introduction to Python course for a group of around 50 new NERC PhD students. I am also a proficient speaker of French, having studied in French for a year on a Study Year Abroad scheme, as well as having been in Paris for my collaborative work.

Academic Qualifications and Achievements

2016 –
Oct 2020

PhD in Applied Mathematics/NWP

University of Bath, U.K.

Raising the Roof: Extending the UK Met Office's Unified Model to the Mesosphere and Lower Thermosphere.

Funded by the Natural Environmental Research Council's GW4+ Doctoral Training Programme, my PhD in collaboration with the Space Weather group at the Met Office is focused on extending their weather and climate model - the Unified Model (UM) - into the mesosphere and lower thermosphere.

In my PhD, I used model diagnostics to investigate the initial problems seen when the model upper boundary was raised. Following the diagnosis of the problem, I implemented a stopgap solution of relaxation to climatology whilst the model radiation scheme was rewritten. This allowed the model to successfully run into the lower thermosphere [1]. Now that development of the improved radiation scheme is complete, I will now verify the model output against satellite data from the group of Prof. Nick Mitchell at the University of Bath. All model code is written in Fortran90, and I perform diagnostic analysis on output in Python.

This project is multidisciplinary in nature, including both mathematical and physical components. Since my background is in mathematics, the PhD required me to quickly become well acquainted with general circulation modelling, as well as applying my previous knowledge and expertise to the complexities of working with an operational model such as the Unified Model.

Publications:

1. **M.J. Griffith**, D.R. Jackson, D.J. Griffin and C.J. Budd. "Stable Extension of the Unified Model into the Mesosphere and Lower Thermosphere", *Space Weather*, (Accepted - under revision 2020)
2. D.R. Jackson, S. Bruinsma, S. Negrin, C. Stolle, C.J. Budd, R. Dominguez Gonzalez, E. Down, D.J. Griffin, **M.J. Griffith**, G. Kervalishvili, D. Lubián Arenillas, J. Manners, J. Matzka, Y.Y. Shprits, R. Vasile and I. S. Zhelavskaya. "The Space Weather Atmosphere Models and Indices (SWAMI) Project: Overview and First Results", *Space Weather*, (Accepted - under revision 2020)
3. D.R. Jackson, T.J. Fuller-Rowell, D.J. Griffin, **M.J. Griffith**, C.W. Kelly, D.R. Marsh and M.-T. Walach. "Future Directions for Whole Atmosphere Modelling: Developments in the context of space weather", *Space Weather*, 17(9), pp.1342-1350, (2019).

Research visits:

1. NOAA, Boulder, CO, USA for 1 week. Discussed physical parameterisations necessary for upper atmosphere modelling.
2. Met Office, Exeter, U.K. for several week to month long periods over the course of my PhD. Worked closely with the space weather and model development teams to aid rapid progression with my research.

Conferences:

1. SAMBA Summer Conference 2019, University of Bath, U.K. **Achieved best poster prize.**
2. SIAM Mathematics of Planet Earth 2018, Philadelphia, USA. Presented poster "Using the UK Met Office's Unified Model to simulate the lower thermosphere - results and validation."
3. Whole Atmosphere Modelling Workshop 2018, Deimos, Tres Cantos, Spain. Gave presentation on PhD work.

4. SAMBA Summer Conference 2018, University of Bath, U.K. Presented talk "Using the Unified Model to simulate the lower thermosphere."

Workshops, Training & Study Groups:

1. Montreal Industrial Problem Solving Workshop 2019, Université de Montréal, Canada.
2. European Study Group with Industry 128 2017, Limerick, Ireland.
3. Physics Dynamics Coupling Workshop 2018, ECMWF.
4. SAMBa Integrative Think Tank 2017, Bath, U.K.
5. Advanced Numerical Methods for Earth System Modelling 2017, ECMWF.
6. NERC GW4+ DTP Autumn School 2018 Introduction to Python Course. Ran this course for new cohort of PhD students.

2012 – 2016 **MMath(Hons) Mathematics with Study Year Abroad** University of Bath, U.K.

First-Class Honours : 82%

Thesis in applied mathematics, "Planetary motion in Einstein's theory of general relativity" (80%).

Modules taken include: Scientific computing (Fortran90); Numerical solution of PDEs (MATLAB); Viscous fluid mechanics; Mathematical methods.

Study Year Abroad at Université Joseph Fourier, Grenoble, France.

Taught and examined in French.

2010 – 2012 **A-Levels** Prestatyn High School, U.K.

A-Levels: Maths **A***, Chemistry **A**, French **A**; AS-Levels: Further Maths **A**, ICT **A**

2008 – 2010 **GCSEs** Prestatyn High School, U.K.

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Achievements and Awards

Jul. 2019 Winner of the SAMBa Summer Conference Best Poster Prize University of Bath, U.K.

Feb. 2019 Awarded Royal Society Funding of £3900 to collaborate with Prof. Emmanuel Fort's research group at Institut Langevin, ESPCI in Paris, France for 3 months Paris, France

Oct 2016 Awarded NERC GW4+ DTP competitive funding for PhD project in collaboration with the Met Office University of Bath, U.K.

Work Experience

2015 – 2020 **Tutor and Marker - Mathematical Methods & Applications** University of Bath, U.K.

Produce and present a weekly tutorial to 15 first year maths students based on lecture material and feedback on marked work. Mark problem sheets, mid-term assessments and first year exams.

Sep 2019 –

Dec 2019 **University of Coimbra (UC) Biotech Placement** Coimbra, Portugal

Funded by NERC GW4+ DTP Placement scheme, my work here centred around modelling the reaction-diffusion system governing hydrogen peroxide signalling. Produced git-versioned Python code to solve this system which will be used at UC Biotech for future parameter analysis.

Apr 2019 –

Jul 2019 **Institut Langevin Placement** Paris, France

Funded by a Royal Society Grant, my work here was primarily experimental. In particular, we performed experiments to induce a Faraday instability in a bath of water using an electric field. The subsequent post-processing of captured images was performed using the Schlieren imaging method in MATLAB.

2017 - 2018 **NERC GW4+ DTP Bath Representative** University of Bath, U.K.

Point of contact for NERC GW4+ DTP Students at the University of Bath. Presented to upcoming cohort of around 100 students. Organised quarterly student feedback meetings.

Dec 2016 **One to one tuition for Masters student** University of Bath, U.K.

Tutoring of student in numerical analysis (MATLAB) and mathematical methods modules.

Extra Curricular Activities

I enjoy climbing, skiing and hiking. I also attend a weekly duplicate bridge club, and enjoy playing board games. Aside from this I am a sociable person, and am really interested in languages. I therefore like to travel and experience different cultures whenever I can.