

Declan A. Valters

Scientific Software Engineer – Met Office

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Personal Statement

I am a scientific software engineer interested in atmospheric, hydrological, and geomorphological modelling, as well as topographic data analysis. I am interested particularly in the links between weather and land surface processes and the development of numerical models that underpin research in land surface dynamics using high-performance computing.

Education

- **PhD in Earth, Atmospheric, and Environmental Science** **University of Manchester**
Thesis: Modelling catchment sensitivity to rainfall resolution and erosional parameterisation in simulations of flash floods in the UK
Supervisors: Prof David Schultz, Dr Simon Brocklehurst
September 2013 – March 2017
 - **Master in Earth Science (Hons., 1st Class)** **University of Edinburgh**
Thesis: Extracting tectonic information using statistical methods of river profile analysis
Supervisor: Prof Simon Mudd
2009 – 2013
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Experience and Software Projects

- **Met Office – Weather Science IT** **metoffice.gov.uk**
Scientific Software Engineer *March 2017 – Present*
 - Development of the Cylc software package, a scientific workflow manager and scheduler.
 - Development of the Rose software framework for configuration of meteorological applications.
 - **HAIL-CAESAR: A numerical landscape evolution model for HPC** **dvalts.io/HAIL-CAESAR**
PhD software project *September 2013 – 2017*
 - A C++ cellular automaton model ported to HPC (High performance computing) facilities through a shared-memory parallelism model (OpenMP).
 - I translated and developed the CAESAR-Lisflood numerical model from a C#/.NET application into a platform-independent code suitable for high-performance computer use such as ensemble simulations and sensitivity analyses.
 - **Land Surface Dynamics Topographic Toolbox** **lsdtopotools.github.io**
Open source developer/contributor *2012 – Present*
 - Object-oriented C++ topographic analysis and modelling package developed with the Land Surface Dynamics research group at Edinburgh. The continuing aim of the project is to implement state-of-the-art algorithms as they are published in academic literature. A key aim of LSDTopoTools is to facilitate reproducible scientific data analysis for large topographic datasets.
 - My specific role was to develop the statistical analysis tools (C++), visualisation (Python), and automation scripts (Python) for task-farming sensitivity analyses.
 - **Met Office – Satellite Applications** **nwpsaf.eu**
Full-stack web developer *July - October, 2015*
 - Redevelopment of the Met Office/European Meteorological Satellite facility website. A public website used for the retrieval of post-processed satellite data and imagery.
 - Designed and implemented a MySQL database for satellite image metadata, integrated with a Javascript front-end for retrieval and rendering of data and imagery.
 - I wrote several tools for keeping the database maintained automatically (Shell scripts/Python/PHP) as new data were added.
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Publications

- **In preparation**
 - **Valters, D.A.**, et al. (in prep.) *HAIL-CAESAR: A cellular automaton hydrodynamic landscape evolution model parallelised for shared-memory computing architectures*. Geoscientific Model Development
 - **Valters, D.A.**, et al. (in prep.) *Sensitivity of a flood-inundation model to rainfall distribution and erosional parameterisation*. Hydrology and Earth System Sciences.
 - **2017**
 - Clubb, F.J. , Mudd, S.M., Milodowski, D.T., **Valters, D.A.**, Slater, L.J., Hurst, M.D., and Limaye, A.B (2017) Geomorphometric delineation of floodplains and terraces from objectively defined topographic thresholds, *Earth Surf. Dynam.*
 - **2016**
 - **Valters, D.A.** (2016). *Modelling Geomorphic Systems: Landscape Evolution*. In: Cook, S.J., Clarke, L.E. & Nield, J.M. (Eds.) *Geomorphological Techniques* (Online Edition). British Society for Geomorphology; London, UK. ISSN: 2047-0371.
 - **2014**
 - Mudd, S.M., Attal, M., Milodowski, D.T., Grieve, S.W.D. and **Valters, D.A.** (2014). *A statistical framework to quantify spatial variation in channel gradients using the integral method of channel profile analysis*, *Journal of Geophysical Research: Earth Surface*
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Conference Presentations and Abstracts

- **2016**
 - **Valters, D.A.** (2016) *Frontiers in geomorphological computing*. 1st annual Research Software Engineers conference, Manchester, UK.
 - **Valters, D.A.**, & Brocklehurst, S. H. (2016) *Topographic signatures of spatially-limited storm morphologies revealed from numerical landscape evolution modelling*. *Geophysical Research Abstracts*, EGU General Assembly, Abstract 18-14328.
 - Clubb, F.J., Mudd, S.M., Milodowski, D.T., and **Valters, D.A.** (2016) Geomorphometric delineation of floodplains and terraces from slope and channel relief thresholds, AGU Fall Meeting, Poster.
 - **2015**
 - **Valters, D.A.**, Brocklehurst, S. and Schultz, D., (2015). Sensitivity of hydro-geomorphic processes to catchment-scale variations in rainfall distribution. In EGU General Assembly Conference Abstracts (Vol. 17).
 - Mudd, S.M., Grieve, S.W.D., Milodowski, D.T., Hurst, M.D., Clubb, F.J., **Valters, D.A.**, (2015) *LSDTopo-ToolBox: Open source geomorphology*. Presented at the BSG Annual General Meeting, Southampton.
 - **2014**
 - **Valters, D.A.** (2014). *Modelling landscape sensitivity to stormier climates*, British Society for Geomorphology Annual Conference, BSG Annual General Meeting, Manchester
 - **Valters, D.A.** and Mudd, S.M. (2014). *Extracting tectonic information using the integral method of river profile analysis: applications along the Wasatch fault, Utah*, *Geophysical Research Abstracts*, EGU General Assembly, Abstract EGU2014-16074-1.
 - Mudd, S.M., Attal, M., Milodowski, D.T., Grieve, S.W.D. and **Valters, D.A.** (2014). *A statistical technique for identifying channels of different steepness in transient landscapes*, *Geophysical Research Abstracts*, EGU General Assembly, Abstract EGU2014-15780.
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Technical Skills

Programming Languages & Software

- My current working languages are **C++** and **Python** (including NumPy, Matplotlib). I've experience in writing object-oriented and procedural style code.
 - Experience in HPC applications including implementing **OpenMP**-style parallelism, as well as **MPI** approaches to parallelisation.
 - Experience in using **subversion** and **git** version control systems.
 - Previously I've worked on projects using **Javascript** and **PHP** for web development.
 - Basic knowledge of **Fortran**, **Matlab**, **C**, and shell scripting in Linux.
 - **ArcGIS 9 & 10**, **GRASS-GIS** and **QGIS**.
 - Experience in using and modifying the **WRF** numerical weather prediction model and familiarity with the Met Office **Unified Model** (UM).
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Professional Development

- **Programming/Technical courses**
Fortran Modernisation
Writing scalable parallel applications with MPI
Advanced MPI
Advanced OpenMP
Message-passing programming with MPI
Single-node performance optimisation
Shared Memory programming with OpenMP
Extended introduction to CUDA
2-3 day courses, provided by ARCHER/EPCC
February 2017
December 2016
September 2016
August 2016
July 2016
December 2015
December 2015
November 2015
 - **Numerical Weather Prediction Model training**
The Weather Research and Forecasting Model (WRF)
Met Office Unified Model (UM)
NCAS/NCAR – October 2013
NCAS/University of Reading – December 2014
 - **Scientific training**
NERC/JBA Extreme Flood Forecasting and Management
NCAS Atmospheric Science Summer School
5 days – January 2015
2 weeks – September 2013
 - **Professional memberships**
British Society for Geomorphology
UK Research Software Engineers Network
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Other Roles and Service

- Journal of Open Source Software – reviewer
2016 – Present
 - British Society for Geomorphology – Web Officer
2015 – 2017
 - Teaching Assistant – University of Manchester
2013 – 2016
Courses taught:
 - Fortran and Matlab for engineers
 - Earth Surface Processes (Geomorphology)
 - Engineering Geology
 - Earth Resources
 - Our Earth (Open Online Course Moderation)
 - Global tectonics
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Grants and Awards

- 5th Intel Xeon Phi Access Programme
STFC, Hartree Centre – 4 months trial
- Mackay Greenland Scholarship
UoE Award for Greenland-based research project – £1000
- Undergraduate Class Medal