

Dr Declan Valters

Research Software Engineer

Global Change Research Institute – University of Edinburgh

GitHub: <https://github.com/dvalters>

Website: <http://dvalts.io>

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Employment

- **Research Software Engineer** **University of Edinburgh**
School of Geosciences 11/2017 – present
 - **Scientific Software Engineer** **Met Office**
Modelling Infrastructure Support Systems 03/2017 – 11/2017
 - **Software Developer (PhD work placement)** **Met Office**
Satellite Applications 06/2015 – 10/2015
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Education

- **PhD in Earth, Atmospheric, and Environmental Science** **University of Manchester**
Thesis: Numerical modelling of catchment sensitivity to rainfall resolution and erosional parameterisation in simulations of flash floods in the UK 2013 – 2017
 - **Master in Earth Science (Hons., 1st Class)** **University of Edinburgh**
Thesis: Extracting tectonic information using statistical methods of river profile analysis 2009 – 2013
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Software Projects

- **LISFLOOD model HPC parallelisation project** <https://github.com/dvalters/hail-caesar>
C++, OpenMP, MPI: Co-Investigator on going project funded from two grants from UK National Super-computer (ARCHER) budget to port and parallelise a coupled flood-inundation and sedimentation model to massively parallel systems. Extends model parallel capability to multi-node compute architecture using the LibGeoDecomp library.
- **FUSE-NetCDF** <https://github.com/dvalters/fuse-netcdf>
Python: ECMWF small grant awarded from the *European Summer Of Weather Code* project to design and implement a FUSE-based filesystem for mounting, viewing, and editing NetCDF files as user-space file system on Linux operating systems.
- **Global Change Ecology Lab Software** <https://github.com/GCEL>
Python: Further development of the International Land Model Benchmarking system (ILAMB).
Fortran: Extended functionality of the Land Surface Verification Toolkit (LVT).
Python, MySQL, PostGreSQL, PostGIS: Development of a Python interface to the SPECCHIO spectral information system.
Git: Implementation of Git version control and support of best practices in software engineering for scientists in the research group.
- **Cylc and Rose** <https://cylc.github.io/cylc>
Met Office applications for numerical modelling infrastructure support.
Python: Development of the Cylc software package, a scientific workflow manager and scheduler.
Python: Development of the Rose software framework for configuration of meteorological applications.

- **HAIL-CAESAR: A numerical landscape evolution model for HPC** <http://dvalts.io/HAIL-CAESAR>

C++, OpenMP: cellular automaton model ported to HPC (High performance computing) facilities through a shared-memory parallelism model.

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** <http://lsdtopotools.github.io>

C++, Python: Object-oriented 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 contributions have been to improve parallelisation (**OpenMP**) within the code. develop the statistical analysis tools (C++), visualisation and automation scripts (**Python**) for task-farming sensitivity analyses.

- **Numerical Weather Prediction – Satellite Application Facility website** <https://nwpsaf.eu>

Python, PHP, Javascript: 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 as new data were added.

Grants and Awards

- ARCHER eCSE13-21 Co-Investigator and funded Technical Staff Member (PI - Simon Mudd) Implementing parallel I/O within LISFLOOD to enable high-resolution massively parallel hydrogeomorphic simulations (6 months)
- ECMWF Summer of Weather Code ECMWF grant to develop Python software for enabling a NetCDF as filesystem in user space (FUSE)
- ARCHER eCSE12-17 Co-Investigator (PI - Simon Mudd) Enabling multi-node MPI parallelisation of the LISFLOOD flood-inundation model within the LSDTopoTools modelling framework (3 months)
- 5th Intel Xeon Phi Access Programme STFC, Hartree Centre – (Porting the LISFLOOD/HAIL-CAESAR model to the Xeon Phi architecture (4 months trial)

Teaching roles and mentoring experience

- Conference workshops written and delivered
 - EuroScipy 2018 – Introduction to Parallelism in Python
 - Research Software Engineering 2018 Conference - Introduction to Parallelism in Python
- Workshops - University of Edinburgh *2018 – present*
 - Introduction to Fortran
 - Introduction to Python
 - Pandas for Data Analysis
- Teaching Assistant – University of Manchester *2013 – 2016*
 - Fortran and Matlab for engineers - MSc course

Technical Skills

Programming Languages & Software

- My current working languages are **Python** (including NumPy, Matplotlib), **C++** and **Fortran**.
- 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 **Matlab** and **C**.
 - 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**

C++17 new features workshop	<i>December 2018</i>
Fortran Modernisation	<i>February 2017</i>
Writing scalable parallel applications with MPI	<i>December 2016</i>
Advanced MPI	<i>September 2016</i>
Advanced OpenMP	<i>August 2016</i>
Message-passing programming with MPI	<i>July 2016</i>
Single-node performance optimisation	<i>December 2015</i>
Shared Memory programming with OpenMP	<i>December 2015</i>
Extended introduction to CUDA	<i>November 2015</i>

- **Numerical Weather Prediction Model training**

The Weather Research and Forecasting Model (WRF)	<i>NCAS/NCAR – October 2013</i>
Met Office Unified Model (UM)	<i>NCAS/University of Reading – December 2014</i>

- **Professional memberships**

Royal Meteorological Society
UK Research Software Engineers Network

Relevant community service and voluntary roles

- Journal of Open Source Software – Reviewer *2017 – present*
- EuroPython 2018 *Session chair and Conference volunteer*
- Conference volunteer – PyCon Ireland *2016*
- Research Software Engineering conference volunteer – RSE16 *2016*
- British Society for Geomorphology – Web Officer *2015 – 2017*
- Founder of the Python users Group in the Centre for Atmospheric Science (University of Manchester)