

# DOUGLAS KELLEY

VEGETATION MODELLER

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## SUMMARY

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### Academic qualification

2014 PhD Ecology

Macquarie University,  
Department of  
Biological Sciences,  
Ryde, NSW, Australia  
Thesis:  
Modelling  
Australian fire  
regimes

2008 MSc Earth  
System Science

University of Bristol,  
Department of Earth  
Sciences, UK  
Dissertation:  
Statistical  
modelling of  
global fire  
regimes.

2007 BSc (Hons.)  
Physics

University of  
Warwick, Department  
of Physics, UK  
Dissertation:  
Modelling  
atmospheric  
effects on  
starlight.

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### Employment History

Apr 2015-  
present

Postdoctoral  
Research  
Assistant

Department of  
Geography &  
Environmental  
Science,  
University of  
Reading, UK.

Jun 2014-Mar  
2015

Postdoctoral  
Research  
Assistant

Department of  
Biological  
Sciences,  
Macquarie  
University, Ryde,  
NSW, Australia.

Sep 2008-Sep  
2010

Research  
Assistant

Department of  
Geographical  
Sciences,  
University of  
Bristol, UK.

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### Publication Statistics

Total Citations: 190

H index: 6

i10 index: 3

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### Awards

2010-2014

Macquarie  
University  
Research  
Excellence  
Scholarship

Macquarie  
University, Ryde,  
NSW, Australia

2013

Post  
Graduate  
Research  
Fund (PGRF)

Macquarie  
University, Ryde,  
NSW, Australia

2011

Biology  
postgrad  
conference  
best  
presentation

Biological  
Sciences,  
Macquarie  
University, Ryde,  
NSW, Australia

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### Current Research Interests

Vegetation-climate dynamics and ecosystem modelling, including:

- Fire dynamics and fire—climate—vegetation interactions.
- Wildfire impacts (on e.g vegetation, carbon-cycle, hydrology)
- Vegetation disturbance resistance and recovery
- Vegetation model benchmarking and diagnosis

- Plant resource allocation strategies.
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## Personal Details

Name: Dr Douglas I Kelley Date of Birth: 06/08/1984 Nationality: British

### Work Address

Department of  
Geography &  
Environmental  
Science  
University of Reading  
Whiteknights  
Reading  
RG6 6AB  
UK

### Home Address

Flat 40  
18 Oxford Road  
Reading  
Berkshire  
RG1 7LB  
UK

### Email:

douglas.i.kelley@gmail.com

### Phone:

+44 (0) 7936 726 819

### Web:

<http://douglask3.github.io/>

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## Higher Education

### PhD Ecology

Macquarie University, Department of Biological Sciences, Ryde, NSW,  
Australia Modelling Australian fire regimes **2010-2014**

Benchmarking and developing the LPX Dynamic Global Vegetation Model (DGVM) to improve the simulation of fire and fire-vegetation interacting. Using this new version of LPX to simulate fire, vegetation and carbon dynamics in Australia over the 21st century. Thesis can be downloaded from [goo.gl/9YjwKw](http://goo.gl/9YjwKw)

### MSc Earth System Science

University of Bristol, Department of Earth Sciences, UK **2007-2008**

Main dissertation: Wildfires as part of the global carbon cycle: Quantitative analysis using data assimilation

Other subjects covered: Earth system modelling; Natural hazards; Remote sensing & GIS; Isotopes and other Earth System tracers; Climate change science and policy

### BSc (Hons.) Physics

University of Bristol, Department of Earth Sciences, UK **2002-2007**

Main dissertation: Modelling atmospheric effects on starlight

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## Employment History

### Postdoctoral Research Assistant

Department of Geography & Environmental Science, University of Reading, UK. **April 2015-present**

Simulating present and future fire regimes using coupled dynamic global vegetation model (DGVM) and process based fire model.

### Postdoctoral Research Assistant

Cafe M Research Group, Department of Biological Sciences, Macquarie University, Ryde, NSW, Australia **Oct 2014-Apr 2015**

Testing conceptual phenology and plant carbon allocation models under changing climate and elevated CO2 fertilization.

### Research Assistant

Department of Biological Sciences, Macquarie University, Ryde, NSW, Australia **Jun 2014-Sep 2014**

Modelling changes on past and future vegetation-fire dynamics and its feedback on terrestrial and atmospheric carbon.

### Research Assistant

Department of Geographical Sciences, University of Bristol, UK **May 2008-Sep 2010**

DGVM-fire model development. Applying developed model to: test to effectiveness of different fire management techniques in current and future climates; simulate paleo vegetation and carbon stocks.

Department of Earth Sciences, University of Bristol, UK **Apr 2008-Sep 2008**

Publicity; lecture and seminar timetabling; finding and organising guest lectures; general admin.

### Widening Participation

Widening Participation Office, University of Bristol **Sep 2007-Sep 2008**

Working with students in primary and secondary education to encourage university attendance from low socio-economic backgrounds: helping organize & run University open days and campus tours; in-school presentations and career evenings.

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## Current Research Interests

My research focuses on improving our understanding of the interactions between fire, vegetation and climate, and exploring how these interactions feed impact terrestrial ecosystem properties such as carbon and hydrological cycles. I'm also involved in the continued development of a vegetation model benchmarking system; and collaborate on research exploring resource allocation and phenology strategies, and strategies for avoiding drought mortality. Much of this involves utilising experimental and satellite data to drive more observation-driven vegetation model development.

### Current Research:

- Development and application of LPX -a coupled Dynamic Vegetation-fire model.
- Vegetation disturbance resistance and recovery
- Statistics and observational data for benchmarking and comparing vegetation models.
- Plant resource allocation strategies.

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## Publications

Total Citations: 190

H index: 6

i10 index: 3

### Reviewed

IC Prentice, DI Kelley, PN Foster, P Friedlingstein, SP Harrison, ...: Modeling fire and the terrestrial carbon balance, Global Biogeochemical Cycles 25 (3) (2011)

. citations:86

P Ciais, A Tagliabue, M Cuntz, L Bopp, M Scholze, G Hoffmann, ...: Large inert carbon pool in the terrestrial biosphere during the Last Glacial Maximum, Nature Geoscience 5 (1), 74-79 (2012)

. citations:42

DI Kelley, IC Prentice, SP Harrison, H Wang, M Simard, JB Fisher, ...: A comprehensive benchmarking system for evaluating global vegetation models, *Biogeosciences* 10, 3313-3340 (2013)

. citations:37

DI Kelley, SP Harrison, IC Prentice: Improved simulation of fire-vegetation interactions in the Land surface Processes and eXchanges dynamic global vegetation model (LPX-Mv1), Copernicus Publications (2014)

. citations:8

T Kaminski, W Knorr, G Schürmann, M Scholze, PJ Rayner, S Zaehle, ...: The BETHY/JSBACH carbon cycle data assimilation system: experiences and challenges, *Journal of Geophysical Research: Biogeosciences* 118 (4), 1414-1426 (2013)

. citations:8

MJB Zeppel, SP Harrison, HD Adams, DI Kelley, G Li, DT Tissue, ...: Drought and resprouting plants, *New Phytologist* 206 (2), 583-589 (2015)

. citations:6

DI Kelley, SP Harrison: Enhanced Australian carbon sink despite increased wildfire during the 21st century, *Environmental Research Letters* 9 (10), 104015 (2014)

. citations:2

D Kelley, SP Harrison, IC Prentice: Implications of introducing realistic fire response traits in a Dynamic Global Vegetation Model, *AGU Fall Meeting Abstracts* 1, 06 (2013)

. citations:0

S Harrison, J Midgley, B Hoffmann, I Radford, C Nano, B Murphy<sup>10</sup>, ...: Using plant functional traits to predict ecosystem vulnerability to changing fire regimes, (NA)

. citations:0

Generated using scholar packages:

Keirstead, James (2015), scholar: analyse citation data from Google Scholar, R package version 0.1.4, <http://github.com/jkeirstead/scholar> and

googleScholarGrab version no. 50de78f extracted from Douglas Kelley's google scholar on Thu 21 Jan 2016 21:21:27

## Submitted

Harrison, S. P. and Kelley, D. I.: Projected changes in Australian fire regimes during the 21st century and consequences for ecosystem, *International Journal of Wildland Fire*

Hantson, S., Arneth, A., Harrison, S. P., Kelley, D. I., Prentice, I. C., Rabin, S. S., Archibald, S. ...: Projected changes in Australian fire regimes during the 21st century and consequences for ecosystem, *Biogeosciences*, bg-2016-17

Ukkola, A., Keenan, T., Kelley, D. I., Prentice, I. C., Vegetation buffers the water-resource impacts of environmental change in regions with declining precipitation, *Environmental Research Letters*, ERL-102203

## In Prep

Kelley D. I., de Kauwe, M., Medlyn, B. Testing Allocation model assumptions in a simple ecosystem model

Harrison, S. P., Kelley, D. I., Wang, H., Herbert, A., Li, G., Bradstock, R., Fontaine, J., Enright, N., Murphy, B. P., Pekin, B. K., Penman, T., Russell-Smith, J., Wittkuhn, R. S: Patterns in the abundance of post-fire resprouting in Australia based on plot-level measurements.

Whitley, R., Kelley, D. I., de Kauwe, M., Keenan, T. F., Phendulum - A first principles model of describing savanna phenology

## International Conference Presentations

Kelley, D. I., Harrison, S. P. and Prentice, I. C.: Implications of introducing realistic fire response traits in a Dynamic Global Vegetation Model, AGU Fall Meeting Abstracts, 1, p.6. Dec 2013.

## Visits and Internal Presentations

Kelley, D. I., Harrison, S. P., Prentice, I. C. and Medlyn, B. E.: Modelling Australian Fire Regimes, Thesis completion seminar, Macquarie University, Ryde, Australia. Mar 2015

Kelley, D. I., Harrison, S. P. and Prentice, I. C.: The LPX fire-enabled Vegetation Model, visit to Centre for Environmental Risk Management of Bushfires, University of Wollongong, NSW, Australia. May 2013.

Kelley, D. I., Harrison, S. P., Prentice, I. C. and Medlyn B. : The effects of climate change on Australian fire regimes, Postgraduate supplementary conference, Macquarie University, Ryde, Australia. Nov 2012.

Kelley, D. I.: Development of lightning ignitions scheme in LPX-DGVM, Biosphere and Climate Dynamics brown bag seminars, Macquarie University, Ryde, Australia. Sep 2012.

Kelley, D. I.: Benchmarking vegetation and fire in LPX-DGVM, Biosphere and Climate Dynamics brown bag seminars, Macquarie University, Ryde, Australia. Mar 2012.

Kelley, D. I., Prentice, I. C., Wang, H., Wills, K. and Harrison, S. P.: A comprehensive benchmarking system for evaluating global vegetation models, Postgraduate supplementary conference, Macquarie University, Ryde, Australia. Nov 2011.

Kelley, D. I., Prentice, I. C., Wang, H., Wills, K. and Harrison, S. P.: A comprehensive benchmarking system for evaluating global vegetation models, Climate Futures Postgraduate Forum, Macquarie University, Ryde, Australia. Nov 2011.

Kelley, D. I.: Benchmark data-sets for assessing DGVM performance, Biosphere and Climate Dynamics brown bag seminars, Macquarie University, Ryde, Australia. Sep 2011.

Kelley, D. I., Harrison, S. P. and Prentice, I. C.: The effects of climate change on Australian fire regimes, Postgraduate supplementary conference, Macquarie University, Ryde, Australia. 17th Nov 2010.

Kelley, D. I.: Transient Biomization Scheme, course seminar for Msc Earth Systems Science, Department of Earth Sciences, University of Bristol, UK. 2 July 2008.

Kelley, D. I., Elena Counce: Forest Fire simulator, course seminar for Msc Earth Systems Science, Department of Earth Sciences, University of Bristol, UK. 19 Nov 2007.

Kelley, D. I., Harrison, S. P.: Comparison of simulated fire regimes at the Last Glacial Maximum and for the Mid-Holocene with charcoal data, QUEST: Quantifying and Understanding the Earth System Open Science Conference and Annual Science Meeting, Mar 2008

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## Workshops and Consultancy Visits

University of Queensland, Brisbane, QL, Australia

**Oct 2013**

Data Synthesis workshop for fire resilience and response traits} {Australian Centre for Ecological Analysis and Synthesis ACEAS

Fire response traits database  
Macquarie University, Ryde, Australia

**May 2013**

Workshop on construction of database on distribution of different resprouting traits in climate space, as part of the Australian Centre for Ecological Analysis and Synthesis (ACEAS) Working group “.

Technical Assistance for Climate Change  
Royal Society for the Conservation of Nature, Jordan

**Oct 2009**

Report on Impacts of Future Climate Change on Vegetation, Fire, and Runoff in Jordan

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## Training

## Courses

### Software Carpentry

Programming philosophy, code structure and version control

**Feb 2013**

### Genses2Geoscience: Writing for journals

Drafting and writing journal articles and research proposals

**Aug 2012**

### Genses2Geoscience: sql

Database Construction using sql

**Sep 2011**

### Genses2Geoscience: Teaching in small groups

Effective questioning, encouraging equal participation, and managing student behaviour.

**Aug 2011**

### Planning and writing journal articles

Planning articles to fit journals

**Nov 2009**

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## Awards

### International Macquarie University Research Excellence Scholarship (iMQRES)

Macquarie University, Ryde, Australia

**2010-2014**

Postgraduate award for completion of PhD

### Post Graduate Research Fund (PGRF)

Macquarie University, Ryde, Australia

**2013**

Competitive award to enhance postgraduate research experience. Funded attendance at the 2013 AGU fall conference in order to present DGVM development and future projection of fire regimes and terrestrial carbon stocks under climate change

### Postgraduate conference - best presentation

Biological Sciences, Macquarie University, Ryde, Australia

**2011**

Best presentation out of the departments 78 postgraduate students at the annual post-graduate conference. Awarded for presentation on a vegetation model benchmarking system}

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## Skills

## Modelling

I have been lead developer on LPX - a high-complexity coupled Dynamic Vegetation-Fire Model - since 2009. LPX has both Fortran and C++ components for fast (relative to its complexity) computational times. I have recently also added a shell and R interface to facilitate parallelization and to allow results to be easily plotted and analysed. See [douglass3.github.io/LPX.html](http://douglass3.github.io/LPX.html) for more information.

## Statistical Programming

Most of my research involves statistical analysis of large datasets and model outputs. Collaboration on many of my projects means I am fluent in most widely used statistical programming languages. Most of my work is in either R, python and matlab, but I have also performed graphical and statistical analysis using Fortran and C amongst others.

See <a href="http://douglass3.github.io/my_best_plots.html">douglass3.github.io/my_best_plots.html</a> for examples of R and matlab plots from my PhD.	See <a href="http://bitbucket.org/douglass3/lpxbenchmarking">bitbucket.org/douglass3/lpxbenchmarking</a> for an example of statistical benchmarking of extensive model outputs against global raster and site-based datasets.
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## Web Design

In my spare time, I have developed dynamic websites using open source content management system. My personal site is on a static host, but is maintained using a python based dynamic-site emulator. Developing and maintaining these sites have allowed me to become familiar with many content management systems (i.e. wordpress, concrete5 etc) and fluent in HTML/CSS, PHP and Markdown. I have linked Markdown with R and python when sharing and presenting results from model development and analysis. \* See [eppingdac.com.au](http://eppingdac.com.au), an example of a website I have developed using Concrete5 Content Management System \* See [douglass3.github.io](http://douglass3.github.io), and example of a website produced using a simple dynamic-site emulator.

## Publishing

As well as publishing papers, I have also written manuals, reports and newsletters using a variety of languages and software products, including (aside from standard office/open office): \* Latex - this includes my thesis (available <<>>) \* Scribus - for example, my running clubs newsletter ([eppingdac.com.au/news-and-views/newsletter](http://eppingdac.com.au/news-and-views/newsletter)) \* Photoshop/Illustrator and GIMP (the open source equivalent). See [flickr.com/doug\\_from\\_the\\_uk](http://flickr.com/doug_from_the_uk) for examples of graphical art and photo 'touch ups', manipulation.

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## Software Tool

Collaborations on various projects has lead me to develop software packages to share across projects teams. Some these perform statistical model-comparisons; others run vegetation models themselves, and some help keep track for workflows and provenance when using a version control system model. Below are some of the most used software packages. More detail can be found at [douglass3.github.io/tools](http://douglass3.github.io/tools), while an exhaustive list can be found on my bitbucket and github repository pages detailed in the contact section.

## Software Carpentry

Programming philosophy, code structure and version control

Feb 2013 Other  
stuff :  
OS X :  
Windows  
XP/Vista  
: Linux  
: CVS /  
Subversion  
: git

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## Relevant Extra- Circular activity



## Committee member responsible for Web-design, Communications, and social runners

Epping and District Athletics Clubs North Epping, Hornsby, NSW Australia 2015

Website development [www.eppingdac.com.au](http://www.eppingdac.com.au); designing, producing and distributing newsletter and e-publicity for local community running and athletics club

## Student Union involvement Web-design, Communications, and social runners

University and Warwick and Bristol University

**2002-2008**

Sabbatical year sitting on board of directors of Warwick Students Union responsible for the Student Advice and Welfare department; 3 years as charity trustee and 6 years on student council responsible for Science Faculty representation; committee posts on various student run sports clubs and societies including People and Planet, Student TV station, Student Support Groups, and running clubs

## Digital Photography and Art

Open Univesity, UK

**2002-2008**

Open University undergrad course in digital photography and image manipulation.  
See [www.flickr.com/photos/doug\\_from\\_the\\_uk](http://www.flickr.com/photos/doug_from_the_uk)

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### Referees

**Prof. Sandy  
Harrison**

Professor in  
Global  
Palaeoclimates  
and  
Biogeochemical  
Cycles

Department of  
Geography and  
Environmental  
Science, School of  
Archaeology,  
Geography and  
Environmental  
Science, The  
University of Reading,  
Whiteknights,  
Reading RG6 6AB U  
Email:  
[s.p.harrison@reading.ac.uk](mailto:s.p.harrison@reading.ac.uk)

**Prof. Colin  
Prentice**

Chair of  
Biosphere and  
Climate Impacts

Grantham Institute  
for Climate Change  
and Department of  
Life Sciences,  
Imperial College,  
Silwood Park  
Campus, Ascot SL5  
7PY UK  
Email:  
[c.prentice@imperial.ac.uk](mailto:c.prentice@imperial.ac.uk)

**Prof. Belinda  
Medlyn**

Chair of  
Biosphere and  
Climate Impacts

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for the Environment,  
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