Robin Wilson

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Education and Qualifications

2015	PhD Complex Systems Simulation	University of Southampton, Institute for Complex Systems Simulation **Title:** Developing a novel method to retrieve high spatial resolution AOT from satellite data **Supervisors:** Prof E. J. Milton, Dr J. M. Nield and Dr J. Noble Awarded 19th February 2015
2013	Postgraduate Introduction to Learning and Teaching	University of Southampton, Professional Development Unit *MSc-level Higher Education Teaching Course* (Equivalent to half of PGCAP)
2010	BSc (Hons) Geography *First Class* *Highest overall mark in year*	University of Southampton **Dissertation:** Automated Selection of Suitable Atmospheric Calibration Sites for Satellite Imagery (supervised by Prof E. J. Milton)
2007	CMI Certificate in Management (Level 3)	City of Bristol College (through the Year in Industry scheme)

Awards

2015	RSPSoc PhD thesis prize for *Developing a novel method to retrieve high spatial resolution AOT from satellite data*
2015	First Prize in the Collaborations Workshop 2015 'Hack Day', Oxford, UK
2014	First Prize in the Computational Modelling Group Iridis Student Project Contest, University of Southampton, UK
2014	First Prize in the Collaborations Workshop 2014 'Hack Day', Oxford, UK
2013	Best Oral Presentation Prize at the Student Conference on Complexity Science, Oxford, UK
2012	RSPSoc MSc thesis prize for *"Can a single cloud spoil the view?" Modelling the effect of an isolated cumulus cloud on surface solar irradiance*
2010	Highly Commended in RGS-IBG Quantitative Methods Research Group Undergraduate Dissertation Prize

Publications

Peer-reviewed research papers

1. Wilson, R. T., Milton, E. J., and Nield, J. M. (2015). Are visibility-derived AOT estimates suitable for parameterising satellite data atmospheric correction algorithms? *International Journal of Remote Sensing* **36** (6).

2. Wilson, R. T., Milton, E. J., and Nield, J. M. (2014). Spatial variability of the atmosphere over southern England, and its effect on scene-based atmospheric corrections. *International Journal of Remote Sensing* **35** (13).

3. Wilson, R. T. (2012). Py6S: A Python interface to the 6S Radiative Transfer Model. *Computers and Geosciences* **51**, 166–171.

Papers in conference proceedings

1. Wilson, R. T., Milton, E. J., and Nield, J. M. (2012). Spatial variability of the atmosphere across southern England and the resulting error in assuming a uniform atmospheric correction. In: *Annual Conference of the Remote Sensing and Photogrammetry Society. (RSPSoc 2012)*.
2. Wilson, R. T., Milton, E. J., and Mackin, S. (2011). Automated identification of invariant ground targets: towards a UK environmental change space observatory (UK-ECSO). In: *Annual Conference of the Remote Sensing and Photogrammetry Society. (RSPSoc 2011)*.
3. Wilson, R. T. and Milton, E. J. (2010). Automated Selection of Suitable Atmospheric Correction Sites. In: *Annual Conference of the Remote Sensing and Photogrammetry Society. (RSPSoc 2010)*.

Conference posters

1. Wilson, R. T., Milton, E. J., and Nield, J. M. (2012). "Spatial variability of the atmosphere over southern England under clear skies: magnitude and impact". In: *ESA Earth Observation Summer School*, *Frascati*, *Rome*.
2. Wilson, R. T. and Milton, E. J. (2010). "Automated Selection of Suitable Atmospheric Correction Sites". In: *Annual Conference of the Remote Sensing and Photogrammetry Society. (RSPSoc 2010)*.
3. Wilson, R. T. and Nield, J. M. (2010). "The application of automated pattern metrics to surface moisture influences on modelled dune field development". In: *Global Sand Seas*, *October 2010*, *RGS*, *London*.

Book reviews

1. Wilson, R. T. (2013). Advanced remote sensing: terrestrial information extraction and applications, by Shunlin Liang, Xiaowen Li and Jindi Wang. *International Journal of Remote Sensing* **34** (14), 5262–5263.

Research Projects and Collaborations

- During my PhD I have developed HOTBAR: a novel method for measuring Aerosol Optical Thickness (AOT) from satellite images at 100,000 times more detail than previous methods. This method is based upon a 'reimagining' of haze detection methods originally developed in the 1970s, and produces data at 30m resolution with a comparable accuracy to the 10km data currently available from MODIS. The resulting AOT data have a range of applications including monitoring of air quality, and atmospheric correction of satellite images I am collaborating with researchers including **Sarah Norgate** (Salford), **Aaron van Donkelaar** and **Randall Martin** (Dalhousie), **Cathryn Tonne** (LSHTM), **Rashmi Pant** (Indian Institute of Public Health) and **John Gulliver** (Imperial) to exploit this revolutionary new data source for health research.

- In collaboration with **Peter Wilson** (Southampton), and with funding from the **IT as a Utility Network+** (through EPSRC), I am developing a smartphone-based instrument to measure AOT which can be made for less than a hundredth of the cost of comparable commercial instruments. This will allow accurate measurement of AOT on spatial scales which were previously impossible due to cost. Follow-up funding from EPSRC will be sought to develop a 'Citizen Science' project using this instrument.

- Atmospheric conditions affect the accuracy of GPS measurements, but this can also be used to measure the atmospheric water vapour content. Meteorological organisations are starting to use these data, as they are far cheaper than radiosonde measurements. Together with **Richard Bingley** (Nottingham) and the **British Isles Continuous GNSS Facility**, I have produced the most detailed global analysis of the accuracy of these data, and this is currently being written up for publication in *Atmospheric Measurement Techniques*.

- **Pete Bunting** (Aberystwyth) has developed free software for performing a full spatially-variable atmospheric correction of satellite images, built upon Py6S. Early versions of the software are in use by the Norwegian Space Agency, and the UN FAO. I am currently working with him to develop this further, with funding from the Welsh Assembly Government.

- The state-of-the-art Discrete Anisotropic Radiative Transfer model (DART) allows full 3D simulations of synthetic satellite scenes. A rudimentary method to allow simulation of a spatially-variable atmosphere has been implemented, and I will work with **Jean-Philippe Gastellu-Etchegorry** (Toulouse) and his team to extend this to allow detailed simulation of the effect of the atmosphere on a range of remote sensing activities, including satellite and airborne imaging, LiDAR and field spectroscopy, and to assist with future development of atmospheric monitoring techniques.

- Abundances of specific rock types can be identified from remotely-sensed spectra by specific absorption features, but many of these absorption features are close to those caused by the atmosphere (by water vapour, for example). In collaboration with **Richard Murphy** (Sydney), I will use Py6S to examine the impact that atmospheric conditions have on our ability to estimate abundances accurately, and to test new methods for retrieving more accurate abundance estimates - work of great relevance to mining and prospecting companies.

Funding obtained

2013 – 2014	£50,000	**IT as a Utility Network+ Pilot Project Grant (EPSRC)** *A Sky Clarity Instrument for Citizen Science - 'Sky-Sci'* Grant to develop, calibrate and test a novel smartphone-based instrument to measure atmospheric clarity, with the aim of developing a Citizen Science network to vastly increase the number of measurements collected worldwide. I developed the idea for this project, and have driven it from the idea, through application for funding, to completion.
2012 – 2013	£3,000	**Software Sustainability Institute Fellowship** To spend on travel to conferences and running events to promote both software sustainability in my field, and my own research.
2012	£250	**RSPSoc Travel Bursary** Provided, after a competitive application, for travel to Frascati, Italy for the two-week ESA Earth Observation Summer School.
2012	£26,595	**British Isles Continuous GNSS Facility** Data provided as a grant 'in kind' for work on the spatial variability atmospheric water vapour contents over the UK and its effect on atmospheric correction of satellite images.

Teaching experience

Undergraduate and Master's

2010 – 2013	Taught on a range of undergraduate and MSc courses including *Remote Sensing of the Terrestrial Environment*, *Practical Skills in Remote Sensing*, *Programming Skills in Remote Sensing*, *Calibration and Validation of EO Data* and *Advanced Geographical Information Systems* providing teaching, advice and one-to-one assistance during computer-based practical sessions. A teaching observation stated that I provided *"excellent one-to-one support in the practical class"*, and I received an average student feedback score of 4.25/5.
2011 – 2013	Taught on the first and second year undergraduate field courses. In 2013, took charge of the field-based part of the 'Integrated Day' of the first year field course.

2013	Designed and delivered two sessions for *Programming Skills in Remote Sensing* and *Practical Skills in Remote Sensing*. These sessions combined lectures and computer-based practicals, and an observation report stated *"Robin is already a confident and effective lecturer ... an excellent session in every respect with very high quality teaching and learning."*

Training courses

2013	Planned and ran a one-hour *Introduction to Iridis for Geographers* session to give postgraduate students within the department an introduction to the use of the university High Performance Cluster (Iridis) for their research work.
2013	Delivered a one-hour training session on *Software Sustainability and Reproducible Research in Remote Sensing* at the RSPSoc Annual Student Meeting in Glasgow. I was invited to deliver this in place of a keynote talk at the conference.
2009	Provided paid tutoring in Visual Basic programming to a MBA student at the University of Southampton who had no previous programming experience. I planned and delivered a course of ten sessions, as well as producing reference guides for her use and setting assignments for her to complete.

Supervision

2014	Provided the majority of science-focused supervision to the post-doc working on the SkySci project, involving regular meetings, collaborative lab work and providing training on the scientific basis of the instrument.
2013	Contributed to the supervision of Jo Nield's undergraduate dissertation students while she was on sick leave.
2012 – 2013	Part of the supervisory team for two MSc students and one undergraduate student from Electronics and Computer Science. Their task was to develop a measuring instrument for use within Geography, so I acted as the 'customer' for the project, as well as providing training on the scientific background to the instrument, use of laboratory equipment and similar instruments within Geography.
2012	Hosted an A-Level student for a week's 'research experience'.

Technical skills

- **Programming:** Python, IDL, R, Java, C/C++, HTML/CSS, Javascript, Bash
  GUI development, High Performance Programming including parallelisation
  'Big Data' processing, Open-source project management

- **Specalist software:** ENVI, ArcGIS, QGIS, eCognition, PostGIS, GRASS GIS, Unix/Linux
  6S, MODTRAN, ATCOR, FLAASH, DART, SAMS, Specchio, GDAL/OGR

- **Instrumentation:** Field spectrometers (ASD FieldSpec, USB2000); Optical instruments (Microtops, BF3, SunScan); Geomatics equipment (GPS, dGPS, TLS, UAVs)
  Field spectroscopy, automated measurement systems, laboratory calibration and testing of optical instruments

Professional association memberships

Date	Assocation
2013 –	Higher Education Academy (Associate Fellowship)
2013 –	Association for Geographic Information
2012 –	Software Sustainability Institute (Fellowship)
2009 –	Remote Sensing and Photogrammetry Society

Media and outreach experience

Date	Experience
2012 –	Since March 2012 I have been the Editor of *SENSED*, RSPSoc's quarterly newsletter. The newsletter has an international circulation of over 1,000 specialists in the field, and I am responsible for the content and design of the newsletter, including soliciting articles, writing editorials, copy editing and page design. Since taking over the Editorship two years ago, I have significantly improved the content and design of the newsletter, and feedback from the RSPSoc Council recently stated, *"Your enthusiasm and various initiatives for enhancing SENSED are fantastic and this is just what we need to keep it developing… you have a publication that you can be very proud of!"*.
2013–15	My work on digitising the data from John Snow's map of the Soho Cholera outbreak in 1854 was featured in the Guardian Online, and in an interview on BBC Radio Solent. I later presented this work at the London Geomob.
2012	I presented at two secondary schools on GIS, remote sensing and 'Geography at University'.

Work experience and consulting

2015	Biological Sciences, University of Southampton	I worked as a short-term post-doctoral research assistant working on the translation of the LPJ-GUESS dynamic vegetation model into the Thinklab semantic modelling environment.
2013	London School of Hygiene and Tropical Medicine	**Remote Sensing Consultant** One month's consulting work during my PhD, in which I used MODIS Aerosol Optical Thickness data to estimate particulate matter concentrations over a number of villages near Hyderabad, India. This has led to ongoing collaborations with the LSHTM using AOT data to assess the health risks from air pollution.
2010 – 2012	Year in Industry	**Year in Industry Ambassador** Worked part-time for the Year in Industry (YINI) organising events and promoting YINI at universities and schools. As part of this I have presented alongside the Director of Admissions at the University of Cambridge and also at the Lloyd's Register Educational Trust.
2006 – 2007	British Energy	**High Integrity Software Engineering** *Year in Industry placement* Between my A-Levels and university, I worked as part of the software control and protection team for Sizewell B Nuclear Power Station and was the primary software engineer for two major safety-related projects. My software has now been approved by the Nuclear Installations Inspectorate and is in full use at Sizewell B, controlling neutron detectors inside the reactors and monitoring the data for safety purposes.

Training attended

2015	**Promoting your research**, Southampton
2014	**Engaging external stakeholders**, Southampton
2013	**DART Training**, Toulouse, France DART is a state-of-the-art three dimensional Radiative Transfer Model which can be used for simulations and sensitivity analyses of data and models within optical, thermal and LiDAR remote sensing.
2013	**Introduction to Field Spectroscopy**, Edinburgh Although I was attending as a student, I was invited to deliver a session on the final day of the course on analysing field spectra using Python and Py6S.
2012	**Media Skills**, Southampton This included practical training in radio and TV interviews.
2012	**European Space Agency Earth Observation Summer School**, Frascati, Italy I gained a place on this course against stiff competition from across Europe.
2012	**Teamworking & Networking Key Skills for Research Students**, Warwick
2012	**Fire Warden Training**, Southampton
2011	**Health and Safety Risk Assessment Training**, Southampton
2011	**Communication & Cultural Awareness for the Global Researcher**, Southampton

Other activities

- Fellow of the Software Sustainability Institute (SSI), which I won against stiff competition in 2013 from academics at all career stages. I have received funding for specific activities during the last year, but will retain the title of Fellow for life, along with the possibility of bidding for further fellowship funds.

- Member of the selection panel for the SSI Fellowships 2014, and reviewed grant proposals submitted to the SSI Open Call

- Co-organiser of the UK Windy Day 2014 conference and sole organiser of the Software Carpentry 'Boot Camp' at Southampton

- Referee for the *International Journal of Remote Sensing*, *Remote Sensing Letters* and *Advances in Space Research*

- Significant experience of university administration, having been a student representative on the Faculty Graduate School Advisory Group and the Geography Graduate School Staff-Student Liaison Committe for two years during my PhD

- 'Trusted Tester' of a new Google product to allow easy analysis of satellite data in the 'cloud'

- I have developed a range of remote sensing software, including:

  - Py6S: a Python interface to the 6S Radiative Transfer Model, which receives over 200 downloads per month – see `www.py6s.rtwilson.com`
  - PyProSAIL: a similar interface for the ProSAIL model
  - RTWTools: a set of GUI-based extensions for ENVI – see `www.rtwtools.rtwilson.com`

- I developed – and continue to update – a popular online list of freely-available GIS datasets (`www.freegisdata.rtwilson.com`), which receives over 15,000 visits per month