Robert George Green

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Date of Birth: 5th March 1990
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Research Interests – Areas of expertise

Seismic velocity structure of volcanic regions. Ambient noise interferometry and surface wave tomography. Volcano-monitoring with micro-earthquakes and seismic noise using relative velocity variations. Crustal structure and rift tectonics of extensional regions. Micro-seismic analysis; earthquake location and source determination with both double-couple and full moment tensor inversion. Earthquake triggering and induced seismicity with Coulomb stress analysis.

Current Appointment

Humboldt Research Fellow – Deutsches GeoForschungsZentrum – GFZ Potsdam – Sektion 2.4 Seismologie

- Investigating the seismic structure and volcanic processes of the Klyuchevskoy Volcanic group, Kamchatka, Russia.

Previous Appointments

Research Associate in Seismology – University of Cambridge

- Investigating the seismic structure and volcanic rifts systems of Iceland, using ambient noise tomography, receiver functions, and earthquake constraints from both regional events and array based methods.
- Investigating relative velocity changes at Kilauea and volcanoes in Iceland.
- Public outreach project, designing, producing and presenting a public science exhibition at the prestigious Royal Society Summer Science Exhibition in London.

Education

PhD in Seismology – University of Cambridge (October 2012 – March 2016)

- The structure and seismicity of Icelandic rifts (2nd place RAS Keith Runcorn thesis Prize for UK based Geophysics PhDs)

MSci Natural Sciences – University of Cambridge (July 2012) : **First Class**

- Geological Sciences. Seismology thesis**:** Microseismicity and faulting between volcanic systems in Iceland

BA Natural Sciences – University of Cambridge (July 2011) : **First Class**

- Geological Sciences with a geological mapping project
- Geoscience Intern (06/2011 – 09/2011) at BP.Plc. International Centre for Business and Technology, Sunbury, UK

Awards

Best Presentation – British Geophysical Association PGRiP meeting – September 2015
Nature Communications Early Career Scientist prize for best presentation – January 2017
RAS Keith Runcorn thesis prize for 2016 runner up – May 2017

Grants/Funding Awards

2017 – Humboldt Research Fellowship
2016 – Geological Society of London Research Grant - £1500
2016 – European Geophysical Union travel grant award - €400
2015 – School of Physical Sciences Fieldwork Award - £1500
2013 – Co-author on SEISUK Seismometer Loan for 8 broadband seismometers
2012 – NERC funded PhD studentship with BP CASE award
2012–2015 – St John's College - College Prize (Scholarship for 1st Class degree) - £1200
2012 – Scholarship from BP.plc - £1000

2011 – St John's College - The Wright Prize (Scholarship for 1st Class degree with special merit) - £500
2011–2016 – St Johns College travel grants for expeditions and geological fieldwork > £1500
2010 – Centre for Latin American Studies award (Grant for geological mapping research in Chile) - £6000
2010 – St John's College Undergraduate Research Grant - £1000

Research Skills

Seismic data acquisition and processing, Earthquake location and source inversion, Ambient noise analysis, Surface wave Tomography and two-plane wave surface wave methods, Stress triggered earthquake analysis. Velocity variation analysis using the MSNoise package.
Computing: Proficient in Linux based shell scripting, python, MSOffice suite. Working knowledge of Matlab, fortran and familiar with C++, QGIS.

Field Experience

- Experienced in all elements of seismic network operation including fieldwork planning and logistics, network configuration design, instrument deployment and servicing as well as complete seismic station installation and vault construction. I have spent over 14 weeks on seismic fieldwork in Iceland, and have had responsibility for planning and leading trips for a number of years.
- I am experienced with the operation of broadband and short period seismometers, geophones and accelerometers, in particular Guralp and Nanometrics systems. I also have extensive knowledge of field QC procedures which are required in remote deployments.
- I have experience in off-road driving and working in a harsh environment (ice caps, volcanic interior of Iceland). Wilderness experience: expeditions in Bolivia, Chile and Patagonia.

Training/Certification

Fellow of the Geological Society of London and the Royal Astronomical Society
NERC Advanced Training Course - COMET InSAR training – Leeds University
NERC – SEISUK – Training for seismometer deployment and servicing
NERC Advanced Training Course – Applied Geophysics (GPR, Gravity, E-M and Magnetic surveys).
Outdoor Fieldwork First Aid Training. Two-day course, Marlin Training.
British Off-Road Driving Association standard level training course.

Teaching Experience

- 2013-2017 – Supervisor for 4 Masters research theses at the University of Cambridge and in collaboration with the Hawaii Volcano Observatory.
- 2015 – Lectured to 3rd year undergraduates.
- 2012-2016 – Practical class teaching assistant (20+ students) and small group (2-3 students) tutorials for Geophysics, Seismology and Structural Geology courses for 2nd, 3rd and 4th year undergraduate students at University of Cambridge.
- 2013-2014 – Teaching assistant on undergraduate fieldtrips to the Isle of Arran, Scotland.

Publications (peer reviewed)

Crustal formation on a spreading ridge above a mantle plume: receiver function imaging of the Icelandic crust. Jenkins, J., Maclennan, Green, R.G., Cottaar, S., Deuss, A.F., White, R.S. ***Journal of Geophysical Research,*** *submitted* (2017).

Seismic Amplitude Ratio Analysis of the Bárðarbunga-Holuhraun dike propagation and eruption. Caudron. C., White. R. S., Green. R. G., Woods. J., Ágústsdóttir. Th., Donaldson. C., Greenfield. T., Rivalta. E., Brandsdóttir. B. ***Journal of Geophysical Research,*** *in review* (2017).

Deep crustal melt plumbing of Bárðarbunga volcano, Iceland. Hudson. T. S., White. R. S., Greenfield. T., Ágústsdóttir. Th., Brisbourne. A., Green. R. G. ***Geophysical Research Letters,*** (2017).

Relative seismic velocity variations correlate with deformation at Kilauea volcano. Donaldson. C., Caudron. C., Green. R. G., Thelen. W. A., White. R. S. ***Science Advances, 3,*** e1700219 (2017).

Ambient noise tomography reveals upper crustal structure of Icelandic rifts. Green. R. G., Priestley. K. P., White. R. S. ***Earth and Planetary Science Letters,*** **466,** *20*–31 (2017).

Strike-slip Faulting during the 2014 Bárðarbunga-Holuhraun Dike Intrusion, Central Iceland. Ágústsdóttir. Th., Woods. J., Greenfield. T., Green. R. G., White. R. S., Winder. T., Brandsdóttir. B., Steinthórsson. S., Soosalu. H. ***Geophysical Research Letters***, **43** (2016).

Triggered earthquakes suppressed by an evolving stress shadow from a propagating dyke. Green. R. G., Greenfield. T., White. R. S. ***Nature Geoscience, 8***, 629–633 (2015).

Segmented lateral dyke growth in a rifting event at Bárðarbunga volcanic system, Iceland. Sigmundsson, F., Hooper, A., Hreinsdóttir, S., Vogfjörd, K.S., Ófeigsson, B.G., Heimisson, E.R., Dumont, S., Parks, M., Spaans, K., Gudmundsson, G.B., Drouin, V., Árnadóttir, T., Jónsdóttir, K., Gudmundsson, M.T., Högnadóttir, T., Fridriksdóttir, H.M., Hensch, M., Einarsson, P., Magnússon, E., Samsonov, S., Brandsdóttir, B., White, R.S., Ágústsdóttir, T., Greenfield, T., Green, R.G., Hjartardóttir, Á.R., Pedersen, R., Bennett, R.A., Geirsson, H., La Femina, P.C., Björnsson, H., Pálsson, F., Sturkell, E., Bean, C.J., Möllhoff, M., Braiden, A.K., Eibl, E.P.S. ***Nature,*** **517,** 191–195 (2015).

Motion in the north Iceland volcanic rift zone accommodated by bookshelf faulting. Green. R. G., White. R. S. & Greenfield. T. ***Nature Geoscience***, **7,** 29–33 (2014).

Publications (un-reviewed)

Explosive Earth – Communicating geophysics research to the public, in **British Geophysical Association Newsletter**. R. G. Green, J. Woods (2016).

Velocity model and seismicity associated with melt movement. Robert S. White & Robert G. Green. **EU deliverable report for FUTUREVOLC project** (2016).

Invited Presentations

2017 – Seismology Section Special Seminar, GFZ Potsdam – Triggered earthquakes and seismic structure in the volcanic rift zones in Iceland. Robert G. Green, Tim Greenfield, Keith F. Priestley, Robert S. White

2017 – Geophysics Colloquium, Bullard Labs, Cambridge – Seismic velocity structure of volcanic rifts in Iceland. Robert G. Green, Keith F. Priestley, Robert S. White

2016 – Geophysics Colloquium, ETH Zurich – Triggered earthquakes and seismic structure in the volcanic rift zones of central Iceland. Robert G. Green, Tim Greenfield, Keith F. Priestley, Robert S. White

2015 – Geophysics Seminar, University of Cambridge – Microearthquakes and Magma: The seismicity of rifting in central Iceland. Robert G. Green, Tim Greenfield, Robert S. White

2015 – IMAGE conference, Pisa - Seismic imaging of volcanic systems of the Northern Volcanic Zone, Iceland. (poster) Robert G Green, Tim Greenfield, Juerg Schuler, Robert S. White, Keith Priestley, Zoe Watson, David J Pugh, Jon Tarasewicz, Bryndis Brandsdottir.

2015 – IMAGE conference, Pisa - Triggered earthquakes suppressed by an evolving stress shadow from a propagating dyke; Bárðarbunga volcano, Iceland. Robert G Green, Tim Greenfield, Robert S White

2015 – Seminar on Frontiers in Earth Sciences, University of Cambridge - Triggered earthquakes suppressed by an evolving stress shadow from a propagating dyke. Robert G. Green, Tim Greenfield, Robert S. White

2014 – Seminar on Frontiers in Earth Sciences, University of Cambridge - Bookshelf faulting and rotations in the north Iceland volcanic rift zone. Robert G. Green, Robert S. White, & Tim Greenfield.

2014 – Day of geophysics and Melt, University of Bristol – Bookshelf faulting and rotations between the north Iceland volcanic rift segments. Robert G. Green, Robert S. White, & Tim Greenfield.

2013 – Hawaii Volcano Observatory – Bookshelf faulting and rotations in the north Iceland volcanic rift segments. Robert G. Green, Robert S. White, & Tim Greenfield.

Contributed Presentations

2017 – AGU, New Orleans. – Precursory tremor of the Askja Caldera landslide, July 2014 – seismic signal analysis and numerical modelling. Anne Schöpa, Wei-An Chao, Bradley Lipovsky, Niels Hovius, Robert S. White, Robert G. Green.

2017 – Geological Society of London, 50 years of Plate Tectonics meeting. – The Spreading Plate Boundary across Iceland: Rifting and Volcanism. Robert S White, Thorbjörg Ágústsdóttir, Bryndís Brandsdóttir, Clare Donaldson, Robert G. Green, Tim Greenfield, Tom Hudson, Jennifer Jenkins, Heidi Soosalu, Tom Winder, Jennifer Woods.

2017 – IAVCEI, Portland. – Volcano monitoring with noise-based methods: insights from the Northern Volcanic Zone of Iceland and Kīlauea, Hawaii. Clare Donaldson, Corentin Caudron, Robert Green, Bryndís Brandsdóttir, Þorbjörg Ágústsdóttir, Jenny Woods, Robert White.

2017 – German Geophysical Society (DGG), Potsdam. – The seismic records of the 21 July 2014 Askja landslide. Anne Schöpa, Wei-An Chao, Niels Hovius, Robert G. Green, Robert S. White, Arnaud Burtin

2017 – BGA/VMSG/TSG joint assembly, Liverpool. – Seismic velocity structure of volcanic rift zones in Iceland. Robert G. Green, Keith F. Priestley, Robert S. White - **Winner of Nature Communications Early Career Scientist Award**

2017 – BGA/VMSG/TSG joint assembly, Liverpool. – Small-scale en-echelon dyke segmentation beneath the 2014-15 Holuhraun eruption fissure recorded by microseismicity. – Tom Winder, Jennifer Woods, Robert S. White, Thorbjörg Ágústdóttir, Robert G Green, Bryndís Brandsdóttir, Sveinbjörn Steinþórsson.

2017 – BGA/VMSG/TSG joint assembly, Liverpool. – The 2014-2015 caldera collapse, lateral dike formation, and major effusive eruption in the Bárðarbunga volcanic system, Iceland. - Freystein Sigmundsson and coauthors on Bárðarbunga papers.

2016 – AGU fall meeting – Triggered earthquakes suppressed by an evolving stress shadow from a propagating dyke; Bárðarbunga volcano, Iceland. - Robert G. Green, Tim Greenfield, Robert S. White

2016 – AGU fall meeting – Magma transport from deep to shallow crust and eruption. – Robert S. White, Tim Greenfield, Robert G. Green, Bryndís Brandsdóttir, Tom Hudson, Jennifer Woods, Clare Donaldson, Thorbjörg Ágústdóttir.

2016 – AGU fall meeting – Relative Seismic Velocity Variations Correlate with Deformation at Kīlauea Volcano – Clare Donaldson, Corentin Caudron, Robert G. Green, Weston Thelon, Robert S. White

2016 – European Seismological Commission Volcano Seismology workshop – The seismic signature of rift systems in Iceland – Robert G. Green, Keith F. Priestley, Robert S. White

2016 – European Seismological Commission Volcano Seismology workshop – Long-period earthquakes during the Bárðarbunga rifting event – Bryndís Brandsdóttir[1], Thorbjörg Ágústdóttir, Jennifer Woods, Robert S. White, Tim Greenfield, Robert G. Green, Jonathan Smith, Clare Donaldson and Corentin Caudron

2016 – COB Volc Meeting Cambridge – The seismic signature of rift systems in Iceland – Robert G. Green, Keith F. Priestley, Robert S. White

2016 – Seismix International Symposium – Velocity variations at Kīlauea and Bárðarbunga volcanoes measured using ambient seismic noise – C. Donaldson, C. Caudron, R.G. Green, W.A. Thelen, R.S. White

2016 – Seismix International Symposium – Magma migration revealed by seismic amplitude ratio analyses: examples at Tolbachik and Bárðarbunga volcanoes – C. Caudron, B. Taisne, C. Donaldson, R.G. Green, R. S. White

2016 – Seismix International Symposium – Seismic velocity structure of active rifts and a mid crustal low velocity zone in the Icelandic crust. – Robert G. Green, Keith F. Priestley, Robert S. White

2016 – EGU annual meeting – Constraining the dynamics of the 2014-2015 Bárðarbunga-Holuhraun intrusion and eruption use seismic noise – C. Caudron, C. Donaldson, R. G. Green, R. S. White.

2016 – EGU annual meeting – Dynamics of the Askja caldera landslide, July 2014, from seismic signal analysis. – A Schöpa, A Burtin, N Hovius, R G. Green.

2015 – AGU fall meeting - Ambient Noise Surface Wave Tomography of the volcanic systems of eastern Iceland. (poster) - Robert G. Green, Keith F. Priestley, Robert S. White

2015 – AGU fall meeting - Detailed Segmentation and Episodic Propagation of the 2014 Bárðarbunga Dike Intrusion and Seismicity Accompanying the sustained Holuhraun Eruption, Central Iceland. (poster) - Thorbjörg Ágústsdóttir, Jennifer Woods, Tim Greenfield, Robert G. Green, Robert S. White, Bryndís Brandsdóttir, Sveinbjörn Steinþórsson.

2015 –AGU fall meeting - Dike propagation mechanisms from seismicity accompanying the 2014 Bárðarbunga-Holuhraun fissure eruption, Iceland. (poster) - Jennifer Woods, Thorbjörg Ágústsdóttir, Robert S. White, Robert G. Green, Tim Greenfield, Bryndís Brandsdóttir, Sveinbjörn Steinthórsson, Simon Redfern.

2015 – AGU fall meeting - Why is extension in the eastern rift zone of Iceland accompanied predominantly by strike-slip seismicity? Robert S. White, Jennifer Woods, Thorbjörg Ágústsdóttir, Robert G. Green, Tim Greenfield, Bryndís Brandsdóttir, Simon Redfern.

2015 – British Geophysical Association PGRiP Meeting - Triggered earthquakes suppressed by an evolving stress shadow from a propagating dyke. Robert G. Green, Tim Greenfield, Robert S. White - **Winner of Best Presentation Award**

2015 – Science dissemination at Vatnajökull National Park (poster). Eruption at Bardabunga. Robert G Green

2015 – COMET Volcanology Meeting - Triggered earthquakes suppressed by an evolving stress shadow from a propagating dyke. Robert G. Green, Tim Greenfield, Robert S. White

2015 – EGU annual meeting - Failure mechanisms during melt injection along dykes in Iceland. Robert S. White, Thorbjörg Ágústsdóttir, Tim Greenfield, Robert G. Green, Bryndís Brandsdóttir, Jennifer Woods, David Pugh.

2015 – EGU annual meeting - Triggered seismicity induced by stresses from the Bardabunga 2014 rifting event. Robert G. Green, Tim Greenfield, Robert S. White

2015 – EGU annual meeting - Dyke propagation mechanisms and the immediate pre- and syn-eruptive seismicity of the 2014 Holuhraun fissure eruption, Iceland. (Poster). Jennifer Woods, Thorbjörg Ágústsdóttir, Tim Greenfield, Robert G. Green, Robert S. White, Bryndís Brandsdóttir, Sveinbjörn Steinthórsson, and Simon Redfern.

2015 – EGU annual meeting - Segmented lateral dyke growth in a rifting event at Bárðarbunga volcanic system, Iceland. Freysteinn Sigmundsson et al.

2015 – EGU annual meeting - Seismicity caused by dyke propagation in the Bárðarbunga volcanic system, NE Iceland. (poster) Thorbjörg Ágústsdóttir, Tim Greenfield, Robert G. Green, Robert S. White, Bryndís Brandsdóttir, Sveinbjörn Steinthórsson, and Jennifer Woods.

2015 – Bullard Laboratories Tea-time talk series - Earthquake triggering and stress shadows during the Bárðarbunga-Holuhraun dyke intrusion. Robert G Green, Tim Greenfield, Robert S. White

2015 – VMSG - Pre and syn–eruptive seismicity of the 2014 Holuhraun Fissure eruption, Iceland. Jennifer Woods, Thorbjörg Ágústsdóttir, Robert G Green, Tim Greenfield, Robert S White,Bryndís Brandsdóttir, Simon Redfern.

2015 – VMSG – Seismicity caused by the dyke propagation in the Bárðarbunga volcanic system, NE Iceland. Thorbjörg Ágústsdóttir, Tim Greenfield, Robert G. Green, Robert. S. White, Bryndís Brandsdóttir, Sveinbjörn Steinþórsson, Jennifer Woods.

2014 – FUTUREVOLC annual meeting – Seismicity of the Bárðarbunga unrest – dyke propagation 16th – 29th August (poster). Þorbjörg Ágústsdóttir, Tim Greenfield, Robert G. Green, Robert S. White, Bryndís Brandsdóttir[2], Sveinbjörn Steinþórsson[2], Jenny Jenkins

2014 – FUTUREVOLC annual meeting – Crustal Velocity Structure beneath Vatnajökull (poster). Robert G. Green, Tim Greenfield, Þorbjörg Ágústsdóttir, Robert S. White, Keith Priestley, Bryndís Brandsdóttir, Sveinbjörn Steinþórsson, Kristín Vogfjörð.

2014 – Seminar on Frontiers in Earth Sciences, University of Cambridge - Bookshelf faulting and rotations in the north Iceland volcanic rift zone (poster). Robert G. Green, Robert S. White, & Tim Greenfield.

2014 – Earth Sciences Department Graduate talks - Bookshelf faulting and rotations between the north Iceland volcanic rift segments. Robert G. Green, Robert S. White, & Tim Greenfield.

2013 – Bullard Laboratories Tea-time talk series - Bookshelf faulting and rotations between the north Iceland volcanic rift segments. Robert G. Green, Robert S. White, & Tim Greenfield.

2013 – AGU – Magma plumbing beneath Askja volcano, Iceland. (poster) Tim Greenfield, Robert S. White, & Robert G. Green.

2013 – AGU - Bookshelf faulting and transform motion between rift segments of the Northern Volcanic Zone, Iceland (poster) Robert G. Green, Robert S. White, & Tim Greenfield.

2013 – Volcano-Seismology Workshop, Sulawesi – Seismicity around Askja, Tectonic faulting and magmatism. Robert G Green, Tim Greenfield, Janet Key, Michael Mitchell, Heidi Soosalu, Robert S. White.

2013 – British Geophysical Association PGRiP meeting. Cambridge - Micro-seismicity and spatial mapping of the b value around Askja, Iceland (poster). Tim Greenfield, Robert S. White & Robert G. Green

2013- British Geophysical Association PGRiP meeting. Cambridge - Bookshelf faulting and rotations in the north Iceland volcanic rift zone (poster). Robert G. Green[1], Robert S. White, & Tim Greenfield

2013 – Science dissemination at Vatnajökull National Park. Monitoring small earthquakes around Askja. (poster). Robert G Green.

2013 - Seminar on Frontiers in Earth Sciences, University of Cambridge. Bookshelf faulting and rotations in the north Iceland volcanic rift zone. (poster) Robert G Green.

2013 – Volcanic Magmatic Studies Group (VMSG) - Crustal deformation between volcanic segments of the Askja and Kverkfjöll central volcanoes, Northern Iceland (poster) Robert G Green, Robert S White, Tim Greenfield, Jon Tarasewicz, Heidi Soosalu, Janet Key.

2012 – Volcano-Seismology Workshop, El Hierro - Insights into the Askja volcano, Iceland, with seismic

measurements. Tim Greenfield, Robert G Green, Steinunn S. Jakobsdóttir, Janet Key, Michael Mitchell, Heidi Soosalu, Sveinbjörn Steinthórsson, Robert S. White.