Curriculum Vitæ – Richard Foa Katz

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Academic positions

2015– **Professor of Geodynamics**, Department of Earth Sciences, Univ. Oxford, UK.

2011–15 **Associate Professor**, Department of Earth Sciences, University of Oxford, UK.

2012 **Visiting Researcher**, Earthquake Research Institute, Univ. Tokyo, Japan.

2007–12 **Research Councils UK Academic Fellow**, Department of Earth Science, University of Oxford, UK.

2006–08 **Senior Research Fellow**, Institute of Theoretical Geophysics, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, UK.

2006 **Postdoctoral Researcher**, Lamont-Doherty Earth Observatory, Columbia University, NY.

Education

2006 **Ph.D. with distinction**, Columbia University, NYC, NY, USA. Dissertation: *The Deep Roots of Volcanoes: Models of Magma Dynamics with Applications to Subduction Zones*, supervisor: Marc Spiegelman.

2000 **B.A. Cum Laude**, Cornell University, Ithaca, NY, USA.

Awards

2015 Editors' Citation for Excellence in Refereeing from *G-Cubed*.

2013 Outstanding Reviewer award from *Geophysical Journal International*.

2012 **The Philip Leverhulme Prize**.

2012 The European Geosciences Union's **Division Outstanding Young Scientist Award for the Division on Geodynamics**.

2008 ***New Journal of Physics* 10th Anniversary Highlights** included my 2005 paper on wax tectonics.

Selected grants and fellowships

01/05/17 **NERC/NSF Collaborative Grant**. [*awarded*] £240k over three years to develop two-phase models of temperate ice at ice-stream margins. Co-PIs Hewitt (Oxford), Iverson (Iowa State) and Zoet (Wisconsin). Ref. NE/R000026/1.

01/11/15 **Deep Carbon Observatory of the Sloan Foundation grant.** [*awarded*] $700k over 2 years to develop two-phase simulations of carbon transport and a modelling forum for carbon circulation. With PI Prof. L. Kellogg and Co-I Prof. S. Mukhopadhyay (UC Davis).

01/03/15 **Royal Society International Exchanges Grant**. [*awarded*] £12k over 2 years to develop 3D simulations of sea-ice formation and brine circulation with adaptive mesh refinement. With Prof. Andrew Wells, AOPP/Oxford.

01/09/14 **NERC Consortium Grant**. [*awarded*] £2.25M over five years. ∼20 Co-Is; To investigate terrestrial volatile cycles through the solid Earth. NERC ref. NE/M000427/1.

01/12/10 **NERC Standard Grant**. [*expired*] £338k over three years. Four PIs; collaborative between Cambridge and Oxford. To develop finite element models of magma dynamics. NERC ref. NE/I026995/1.

14/10/10 **European Research Council Starter Grant**. [*awarded*] €1.4M over five years to hire two PDRAs and one student to study coupling of climate with magmatism at mid-ocean ridges. ISMAGiC, ERC ref. 279925.

04/09/10 **Royal Society Travel Grant**. [*expired*] £4000 to support a 1-month Oxford visit by Prof. Y. Takei of ERI, Tokyo in 2011.

01/08/09 **Natural Environmental Research Council New Investigator Grant**. [*expired*] "Coupled models of magma/mantle dynamics: melt transport at mid-ocean ridges and subduction zones." £55k over two years for personal salary support, overhead, travel, consumables. NERC ref. NE/H00081X/1.

01/09/06 **US National Science Foundation International Research Fellowship Program**. [*expired*] $163,057 over two years covering salary, travel, research expenses. NSF award #0602101.

Manuscripts in prep/review/press

- Rees Jones D. **R.F. Katz**, J.F. Rudge and M. Tian, Thermal impact of magmatism in subduction zones. In review.
- Turner A.J., **R.F. Katz**, M.D. Behn and T. Keller, Magmatic focusing to mid-ocean ridges: the role of grain size variability and non-Newtonian viscosity. In review.

Publications

2017 Keller T., **R.F. Katz** and M.M. Hirschmann; Volatiles beneath mid-ocean ridges: Deep melting, channelised transport, focusing, and metasomatism. *EPSL*. 10.1016/j.epsl.2017.02.006.

2016 Keller, T., and **R.F. Katz**; The Role of Volatiles in Reactive Melt Transport in the Asthenosphere. *J. Petrology* 10.1093/petrology/egw030.

- Turner S., C. Langmuir, **R.F. Katz**, M.A. Dungan and S. Escrig; Parental arc magma compositions dominantly controlled by mantle-wedge thermal structure. *Nature Geosci.* 10.1038/ngeo2788.
- Huybers, P., C. Langmuir, **R.F. Katz**, D. Ferguson, C. Proistosescu and S. Carbotte. Comment on "Sensitivity of seafloor bathymetry to climate-driven fluctuations in mid-ocean ridge magma supply." Technical comment, *Science*. 10.1126/science.aae0451.
- Alisic L., S. Rhebergen, J.F. Rudge, **R.F. Katz**, and G.N. Wells, Torsion of a cylinder of partially molten rock with a spherical inclusion: theory and simulation. *Geochem. Geophys. Geosys.* 10.1002/2015GC006061.
- S. Weatherley and **R.F. Katz**. Melt transport rates in heterogeneous mantle beneath mid-ocean ridges. *Geochim. Cosmochim. Acta*. 10.1016/j.gca.2015.09.029.

2015 Crowley, J., **R.F. Katz**, P. Huybers, C. Langmuir, and S.-H. Park; Glacial cycles drive variations in the production of oceanic crust. *Science*. 10.1126/science.1261508.

- Qi, C., D. Kohlstedt, **R.F. Katz**, and Y. Takei; An experimental test of the viscous anisotropy hypothesis for partially molten rocks. *Proc. Nat. Acad. Sci.* 0.1073/pnas.1513790112.
- Y. Takei and **R.F. Katz**. Consequences of viscous anisotropy in a deforming, two-phase aggregate. Why is porosity-band angle lowered by viscous anisotropy? *J. Fluid Mech.* 10.1017/jfm.2015.592.

- Taylor-West, J. and **R.F. Katz**; Melt-preferred orientation, anisotropic permeability, and melt-band formation in a deforming, partially molten aggregate. *Geophys. J. Int.* 10.1093/gji/ggv372.
- Rhebergen, S., G.N. Wells, A.J. Wathen, and **R.F. Katz**. Optimal three-field block-preconditioners for models of coupled magma/mantle dynamics. *SIAM J. Sci. Comput.* 10.1137/14099718X.
- Kyrke-Smith, T., **R.F. Katz**, and A. Fowler. Subglacial hydrology as a control on emergence, scale, and spacing of ice streams. *J. Geophys. Res. Earth Sfc.* 10.1002/2015JF003505.
- Burley, J. and **R.F. Katz**. Variations in mid-ocean ridge CO_2 emissions driven by glacial cycles. *EPSL*. 10.1016/j.epsl.2015.06.031.
- Turner, A., **R.F. Katz** and M.D. Behn. Grain-size dynamics beneath mid-ocean ridges: Implications for permeability and melt extraction. *Geochem. Geophys. Geosys.* 10.1002/2014GC005692.
- Hooker J.N. and **R.F. Katz**; Vein spacing in extending, layered rock: the effect of synkinematic cementation. *Am. J. Sci.*. 10.2475/06.2015.03.
- A.A. Lacey, M.G. Hennessy, P. Harvey and **R.F. Katz**; Mathematical Modelling of Tyndall Star Initiation. *Eur. J. App. Math.* 10.1017/S095679251500042X.

2014 Rhebergen, S., G. Wells, **R.F. Katz**, and A. Wathen; Analysis of block preconditioners for models of coupled magma/mantle dynamics. *SIAM Journal on Scientific Computing*. 10.1137/130946678.

- Allwright, J. and **R.F. Katz**; Pipe Poiseuille flow of viscously anisotropic, partially molten rock. *GJI*. 10.1093/gji/ggu345.
- Rivalta, E., B. Taisne, A. Bunger, and **R.F. Katz**; A review of mechanical models of dike propagation: schools of thought, results and future directions. *Tectonophysics*. 10.1016/j.tecto.2014.10.003.
- Alisic, L., J.F. Rudge, **R.F. Katz**, G. Wells and S. Rhebergen; Compaction around a rigid, circular inclusion in partially molten rock. *JGR—Solid Earth*. 10.1002/2013JB010906.
- Kyrke-Smith, T., **R.F. Katz** and A. Fowler, Subglacial hydrology and the formation of ice streams. *Proc. Roy. Soc. A*. 10.1098/rspa.2013.0494.

2013 Kyrke-Smith, T., **R.F. Katz** and A. Fowler, Stress balances of ice streams in a vertically integrated, higher-order formulation. *J. Glaciology*, doi: 10.3189/2013JoG12J140.

- Takei, Y. and **R.F. Katz**, Consequences of viscous anisotropy in a deforming, two-phase aggregate: 1. Governing equations and linearised analysis. *J. Fluid Mech.*, doi: 10.1017/jfm.2013.482.
- **Katz, R.F.** and Y. Takei, Consequences of viscous anisotropy in a deforming, two-phase aggregate: 2. Numerical solutions of the full equations. *J. Fluid Mech.*, doi: 10.1017/jfm.2013.483.

2012 Weatherley, S. and **R.F. Katz**, Melting and channelized magmatic flow in chemically heterogeneous, upwelling mantle. *Geochem. Geophys. Geosys.*, doi: 10.1029/2011GC003989.

- **Katz, R.F.** and S. Weatherley, Consequences of mantle heterogeneity for melt extraction at mid-ocean ridges. *EPSL*. doi: 10.1016/j.epsl.2012.04.042.
- Gregg, P.M., L.B. Hebert, L.G.J. Montési, and **Katz, R.F.**, Geodynamic models of melt generation and extraction at mid-ocean ridges. *Oceanography*. doi: 10.5670/oceanog.2012.05.

2011 **Katz, R.F.** and J. Rudge, The energetics of melting fertile heterogeneities within the depleted mantle. *Geochem. Geophys. Geosys.*, doi: 10.1029/2011GC003834.

2010 England, P.C. and **R.F. Katz**, Dry melting and thermal advection in the mantle wedge control the location of volcanic arcs. *Nature*, doi: 10.1038/nature09417.

- England, P.C. and **R.F. Katz**, (Brief Communication Arising) Global systematics of arc volcano position. *Nature*, doi: 10.1038/nature09154.

- **Katz, R.F.** Porosity-driven convection and asymmetry beneath mid-ocean ridges. *Geochem. Geophys. Geosys.*, doi: 10.1029/2010GC003282.

- Weatherley, S. and **R.F. Katz** Plate-driven dynamics and global patterns of mid-ocean ridge bathymetry. *Geochem. Geophys. Geosys.*, doi: 10.1029/2010GC003192.

- **Katz, R.F.** and M.G. Worster. Stability of ice-sheet grounding lines. *Proc. Roy. Soc. A*, doi: 10.1098/rspa.2009.0434.

2008 **Katz, R.F.** Magma dynamics with the Enthalpy Method: benchmark solutions and magmatic focusing at mid-ocean ridges. *J. Petrology*, doi: 10.1093/petrology/egn058.

- **Katz, R.F.** and M.G. Worster. Simulation of directional solidification, thermochemical convection and chimney formation in a Hele-Shaw cell. *J. Comp. Phys.*, doi: 10.1016/j.jcp.2008.06.039.

- van Keken, P., C. Currie, S.D. King, M.D. Behn, A. Cagnioncle, J. He, **R.F. Katz**, S. Lin, E.M. Parmentier, M. Spiegelman, K. Wang, A community benchmark for subduction zone modelling. *Phys. of the Earth and Planetary Interiors*, doi: 10.1016/j.pepi.2008.04.015.

2007 **Katz, R.F.**, M. Knepley, B. Smith, M. Spiegelman, E. Coon. Numerical simulation of geodynamic processes with the Portable Extensible Toolkit for Scientific Computation, *Phys. of the Earth and Planetary Interiors*, doi: 10.1016/j.pepi.2007.04.016.

2006 **Katz, R.F.**, M. Spiegelman, and B. Holtzman, The dynamics of melt and shear localisation in partially molten aggregates. *Nature*, doi:10.1038/nature05039.

- Knepley, M.G., **R.F. Katz**, and B.F. Smith. Developing a geodynamics simulator with PETSc. In Numerical Solution of Partial Differential Equations on Parallel Computers, Series: Lecture Notes in Computational Science and Engineering, Vol. 51, A.M. Bruaset and A. Tveito, editors. Springer-Verlag.

- Spiegelman, M. and **R.F. Katz**. A semi-Lagrangian Crank-Nicolson algorithm for the numerical solution of advection-diffusion problems, *Geochem. Geophys. Geosys.*, doi: 10.1029/2005GC001073.

2005 **Katz, R.F.**, R. Ragnarsson, and E. Bodenschatz. Tectonic microplates in a wax model of sea-floor spreading, *New J. Phys.*, doi: 10.1088/1367-2630/7/1/037

- **Katz, R.F.** and E. Bodenschatz, Taking wax for a spin: tectonic microplates in an analog model of plate tectonics. *Europhys. News*, Vol. 5. (unrefereed)

2004 **Katz, R.F.**, M. Spiegelman and S. Carbotte. Ridge migration, asthenospheric flow and the origin of magmatic segmentation in the global mid-ocean ridge system. *Geophys. Res. Lttrs.*, doi: 10.1029/2004GL020388

2003 **Katz, R.F.**, M. Spiegelman and C.H. Langmuir. A new parameterisation of hydrous mantle melting. *Geochem. Geophys. Geosys.*, doi: 10.1029/2002GC000433

Citation metrics

- Google Scholar h-index: 18 (accessed 5 Oct 2016).
- Scopus h-index: 15 (accessed 5 Oct 2016).
- ResearcherID h-index: 14 (accessed 5 Oct 2016).

Invited conference lectures

2015 AGU Fall Meeting, San Francisco, USA. DCO Modeling and Visualization Workshop, Washington DC, USA.

2013 Two invited talks at Fall AGU, SF, USA. Invited talk at SIAM Geosciences conference, Padova, Italy.

2012 Keynote talk at the Gordon Research Conference on Rock Deformation, Andover, New Hampshire, USA. Award lecture at EGU conference in Vienna.

2011 AGU Fall Meeting, San Francisco, USA. Two invited talks. VMSG Conference, Cambridge, UK. Keynote address (program substitution).

2010 American Geophysical Union, San Francisco, USA. European Geosciences Union conference in Vienna, Austria. Session GMPV16/GD5.9

2009 (Keynote) 11th International Workshop on Modelling of Mantle Convection and Lithospheric Dynamics, Braunwald, CH; Water on Earth and Beyond conference, Durham, UK; In-situ Geophysical Studies of Planetary Surfaces: Past, Present, and Future, Roy. Astro. Soc. meeting, London.

2008 Computational Infrastructure for Geodynamics (CIG) Workshop on Mathematical and Computational Issues in the Solid Earth Geosciences, Santa Fe, USA.

2006 (Keynote) Penrose Conference on Arc Crustal Genesis and Evolution, Valdez, Alaska; Western Pacific Geophysics Conference, Beijing, China.

2005 Fall AGU meeting, San Francisco, USA.

2004 Fall AGU meeting, San Francisco, USA.

PhD student supervision

2013– **Jonathan Burley**. Project: Ice ages, sea level, and magmatism: coupled oscillations.

2010–'13 **Teresa Kyrke-Smith**. Project: Ice stream emergence in coupled models of ice sheets and subglacial hydrology. On to a postdoc at the British Antarctic Survey.

2009–'13 **Samuel Weatherley**. Project: Reactive magmatic flow in a deforming mantle. On to a postdoc at the Danish Geological Survey.

Postdoctoral research supervision

2016– **Dr. Meng Tian**. Ongoing.

2016– **Dr. David Rees Jones**. Ongoing.

2012–'14 **Dr. Sander Rhebergen**. Now a Professor at the University of Waterloo, Canada.

2012–'13 **Dr. John Crowley**. Now employed at Engineering Seismology Group Canada.

2013–'16 **Dr. Tobias Keller**. Now postdoc at Stanford.

2013–'16 **Dr. Andrew Turner**. Now employed in UK government scientific research.

Departmental teaching

2015– **Mantle dynamics seminar** for fourth-year students in Earth science at Oxford.

2012– **Geodynamics** for third-year students in Earth science at Oxford.

2011– **Mathematical Problem-Solving in Earth Science** for second-year students in Earth Science at Oxford.

2010– **Introduction to Physical Thermodynamics** for first-year students in Earth Science at Oxford.

2008–2010 **Mathematics for Materials and Earth Sciences** at Oxford. Tutor conducting weekly problem classes.

2008– Demonstrator for the **Oxford volcanology field trip** to Santorini, Greece.

Outreach

2017 Co-lecturer, Introduction to Fluid Dynamics, African Institute for Mathematical Sciences, Cape Town, South Africa. (Student feedback)

2012– Outreach lectures to A-level students taking Further Maths.

2011 Invited lecturer, Abdus Salam Internation Centre for Theoretical Physics Advanced School on Mechanical and Thermal Processes in Geodynamics.

2009 Public lecture at Science Oxford on the L'Aquila earthquake.

Service, training, and qualifications

- Committee service in Department: Organiser of departmental seminars (2010–), IT committee (2014–, chair); management committee (2014–); examiner (2014–), research committee (2013).

2016 Invited lecturer at the EMS School in Applied Mathematics Mathematical Modelling, Numerical Analysis and Scientific Computing.

2014–16 Co-organiser of the Newton Institute for Mathematical Sciences programme Melt in the Mantle.

2015 Co-organiser of the Deep Carbon Observatory meeting Modelling and Vizualization Workshop.

2014– Research IT board member (University-level committee).

2011– Oxford Supercomputing Centre Executive Committee (committee chair since Jan 2013).

2013 Session convener for the 2013 European Geosciences Union General Assembly, Vienna, Austria.

2012 Session convener for the 2012 European Geosciences Union General Assembly, Vienna, Austria, and the 2012 Goldschmidt Conference, Montreal, Canada.

2010 Session convener for the 2010 European Geosciences Union General Assembly, Vienna, Austria. Session GD1.4.

2012– Member of NERC Peer Review College.

- Reviewer for journals including *Nature*, *J. Petrology*, *J. Fluid Mechanics* and for the UK NERC and the US NSF.

2008 Session convener at Goldschmidt geochemistry conference, Vancouver, Canada.

2007 Two-month training in peer-support counselling of graduate students, University of Cambridge.