

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

- 01/03/19 **European Research Council Consolidator Grant**. [awarded] €2M over five years to hire two PDRAs and one student to study magma-assisted tectonics of mid-ocean ridges and continental rifts. RIFT-O-MAT, ERC ref. 772255.
- 01/04/18 **Deep Carbon Observatory of the Sloan Foundation grant**. [awarded] \$750k over 18 months to continue development of two-phase simulations of carbon transport and a modelling forum for carbon circulation. With PI Prof. L. Kellogg (UC Davis).
- 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

- Huybers, P., P. Liautaud, C. Proistosescu, B. Boulahanis, S. Carbotte, **R.F. Katz** and C. Langmuir. Sea level faulted for abyssal hill spacing. In review.
- Lichtenberg T., T. Keller, **R.F. Katz**, G. Golabek and T. Gerya, Magma ascent in planetesimals: control by grain size. In press, *EPSL*.

PUBLICATIONS

- 2018 Rees Jones D.W., **R.F. Katz**, J.F. Rudge and M. Tian, Thermal impact of magmatism in subduction zones. *EPSL*. [10.1016/j.epsl.2017.10.015](https://doi.org/10.1016/j.epsl.2017.10.015)
- Bo, T., **R.F. Katz**, O. Shorttle and J.F. Rudge. The melting column as a filter of mantle trace-element heterogeneity. *G-cubed*. [10.1029/2018GC007880](https://doi.org/10.1029/2018GC007880)
 - Rees Jones D.W. and **R.F. Katz**, Reaction-infiltration instability in a compacting porous medium. *J. Fluid Mech.* [10.1017/jfm.2018.524](https://doi.org/10.1017/jfm.2018.524)
- 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](https://doi.org/10.1016/j.epsl.2017.02.006).
- 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. *G-cubed*. [10.1002/2017GC007048](https://doi.org/10.1002/2017GC007048)
- 2016 Keller, T., and **R.F. Katz**; The Role of Volatiles in Reactive Melt Transport in the Asthenosphere. *J. Petrology* [10.1093/petrology/egw030](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1073/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1002/2015JF003505).
- Burley, J. and **R.F. Katz**. Variations in mid-ocean ridge CO₂ emissions driven by glacial cycles. *EPSL.* [10.1016/j.epsl.2015.06.031](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1137/130946678).
- Allwright, J. and **R.F. Katz**; Pipe Poiseuille flow of viscously anisotropic, partially molten rock. *GJI.* [10.1093/gji/ggu345](https://doi.org/10.1093/gji/ggu345).
- Rivalta, E., B. Taisne, A. Bungler, 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1038/nature09417).
- England, P.C. and **R.F. Katz**, (Brief Communication Arising) Global systematics of arc volcano position. *Nature*, doi: [10.1038/nature09154](https://doi.org/10.1038/nature09154).
- **Katz, R.F.** Porosity-driven convection and asymmetry beneath mid-ocean ridges. *Geochem. Geophys. Geosys.*, doi: [10.1029/2010GC003282](https://doi.org/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](https://doi.org/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](https://doi.org/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/ptrology/egn058](https://doi.org/10.1093/ptrology/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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. Ltr.*, doi: [10.1029/2004GL020388](https://doi.org/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](https://doi.org/10.1029/2002GC000433)

CITATION METRICS

- [Google Scholar](#) h-index: 20 (accessed 17 Aug 2018).
- [Scopus](#) h-index: 19 (accessed 17 Aug 2018).

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

- 2017– **Dan Spencer**. Project: Tidal dissipation and volcanism on Io.
- 2017– **Tom Breithaupt**. Project: Olivine alignment, anisotropic viscosity, and two-phase geodynamics.
- 2013–17 **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

2017– **Marianne Haseloff**. Ongoing.

2016– **Meng Tian**. Ongoing.

2016– **David Rees Jones**. Ongoing.

2016–’18 **Nestor Cerpa Gilvonio**. Now postdoc at Montpellier.

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

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

2013–’16 **Tobias Keller**. Now postdoc at Stanford.

2013–’16 **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– **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.

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

2011 Invited lecturer, Abdus Salam International 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 (2014,2018), research committee (2013).

2016 Invited lecturer at the EMS School in Applied Mathematics [Mathematical Modelling, Numerical Analysis and Scientific Computing](#).

2014– Divisional representative on Research IT board (University-level committee).

2011–16 Oxford Supercomputing Centre Executive Committee (Chair, 2013–2016).

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 Visualization Workshop](#).

2008– Session convener at the Goldschmidt Conference (2008, 2012, 2018), the European Geosciences Union conference (2010, 2012, 2013).

2012– Member of NERC Peer Review College.

- Reviewer for journals including *Nature*, *J. Petrology*, *J. Fluid Mechanics*, *EPSL* and for the European Research Council, UK Natural Environment Research Council and the US National Science Foundation.
- 2007 Two-month training in peer-support counselling of graduate students, University of Cambridge.