

Curriculum Vitae

Cian Wilson

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Education & Academic Experience

2016-present Computational Scientist

Department of Terrestrial Magnetism, Carnegie Institution for Science, Washington, DC

Responsible for managing the department's scientific computing laboratory, maintaining and developing software for high performance computing with a focus on fluid dynamics.

2014-2016 Associate Research Scientist

2011-2013 Post-doctoral Research Scientist

Fluid Migration in Deformable Porous Media

Lamont-Doherty Earth Observatory, Columbia University, New York

- Numerics:
 - Principal developer TerraFERMA:
 - a Transparent Finite Element Rapid Model Assembler for solid Earth problems
 - based on open-source numerical libraries FEniCS, PETSc and SPuD
 - provides framework for composing and exploring nonlinear multi-physics problems
- Applications:
 - Fluid migration at plate boundaries
 - Mantle dynamics
 - Reactive cracking

2009-2010 Post-doctoral Research Associate

Modeling Multi-Material Compressible Flows on Unstructured Adaptive Meshes

Institute of Shock Physics, Imperial College London

- Numerics:
 - Semi-implicit compressible pressure projection using linearized equations of state
- Applications:
 - Landslide generation of tsunamis
 - Mantle convection modeling with adaptive meshes

2005-2009 PhD Computational Physics

Modeling Multiple-Material Flows on Adaptive Unstructured Meshes

Department of Earth Science & Engineering, Imperial College London

- Principal supervisors: Dr Gareth Collins, Professor Chris Pain, Dr Matthew Piggott
- Numerics:
 - Developed coupled & minimally dissipative flux-limiters for material advection
- Applications:
 - Validation of a landslide-generated tsunami model
- Awards:
 - EPSRC Departmental Scholarship and CASE Award (AWE)

2004-2005 MSc Mathematical Modeling & Scientific Computing

Computing Laboratory & Mathematical Institute, University of Oxford

- Dissertation: Elliptic Structured Grid Generators Using Unstructured Triangulations
Supervised by Dr Chris Farmer
 - Demonstrated elliptic finite element mesh generator suitable for concave domains
- Awards:
 - EPSRC Scholarship

2000-2004 MSc Earth Sciences (first class)

Department of Earth Sciences, University of Oxford

- Dissertation: Long Wavelength Gravity & Topography Anomalies in the Central Pacific
Supervised by Professor Tony Watts
 - Periodogram and multi-taper analysis of gravity coherence and admittance
- Awards:
 - University Scholarship
 - Gibb's Prize, Best Independent Mapping Project

Relevant Activities & Experience

- Principal developer TerraFERMA, <http://terraferma.github.io>
- Core developer Fluidity, <http://fluidityproject.github.io>
- Developer SPuD, <http://tinyurl.com/hhlgylg>

Publications

- Wilson, C. R., Spiegelman, M., van Keken, P. E. (in preparation) TerraFERMA: Transparent Finite Element Rapid Model Assembler for non-linear multi-physics problems in Earth science. *Geochemistry, Geophysics, Geosystems*.
- Spiegelman, M., May, D. A., Wilson, C. R. (in press) On the solvability of viscoplastic rheologies in geodynamics. *Geochemistry, Geophysics, Geosystems*.
- Smith, R. C., Hill, J., Collins, G. S., Piggott, M. D., Kramer, S. C., Parkinson, S. D., Wilson, C. R. (2016) Comparing approaches for numerical modelling of tsunami generation by deformable submarine slides. *Ocean Modelling*.
- Jones, T. D., Davies, D. R., Campbell, I. H., Wilson, C. R., Kramer, S. C. (2016) From Plume Source to Hotspot: Do Mantle Plumes Preserve the Heterogeneous Structure of their Deep-Mantle Source? *Earth and Planetary Science Letters*.
- Davies, D. R., Le Voci, G., Goes, S., Kramer, S. C., Wilson, C. R. (2016) The mantle wedge's transient 3-D flow regime and thermal structure. *Geochemistry, Geophysics, Geosystems*.
- Tosi, N., Stein, C., Noack, L., Hüttig, C., Maierová, H., Davies, D. R., Wilson, C. R., Kramer, S. C., Thieulot, C., Glerum, A., Fraters, M., Spakman, W., Rozel, A., Tackley, P. J. (2015) A community benchmark for viscoplastic thermal convection in a 2-D square box. *Geochemistry, Geophysics, Geosystems*.
- Jacobs, C. R., Goldin, T. J., Collins, G. S., Piggott, M. D., Kramer, S. C., Melosh, H. J., Wilson, C. R., Allison, P. A. (2015) An improved quantitative measure of the tendency for volcanic ash plumes to form in water: implications for the deposition of marine ash beds. *Journal of Volcanology and Geothermal Research*.
- Wilson, C. R., Spiegelman, M., van Keken, P. E. (2014). Fluid flow in subduction zones: the role of solid rheology and compaction pressure. *Earth and Planetary Science Letters*.
- Garel, F., Goes, S., Davies, D. R., Davies, J. H., Kramer, S. C., Wilson C. R. (2014) Interaction of subducted slabs with the mantle transition-zone: A regime diagram from 2-D thermo-mechanical models with a mobile trench and an overriding plate. *Geochemistry, Geophysics, Geosystems*.
- Le Voci, G., Davies, D. R., Goes, S., Kramer, S. C., Wilson, C. R. (2013) A systematic 2-D investigation into the mantle wedge's transient flow regime and thermal structure: complexities arising from a hydrated rheology and thermal buoyancy. *Geochemistry, Geophysics, Geosystems*.
- Jacobs, C., Collins, G. S., Piggott, M. D., Kramer, S. C., Wilson, C. R. (2013). Multiphase flow modelling of volcanic ash particle settling in water using adaptive unstructured meshes. *Geophysical Journal International*.
- Kramer, S. C., Wilson, C. R., Davies, D. R. (2012). An implicit free surface algorithm for geodynamical simulations. *Physics of Earth and Planetary Interiors*.
- Davies, D. R., Wilson, C. R., Kramer, S. C. (2011). Fluidity: a fully-unstructured anisotropic adaptive mesh computational modeling framework for geodynamics. *Geochemistry, Geophysics, Geosystems*.
- Farrell P. E., Piggott, M. D., Gorman, G. J., Ham, D. A., Wilson, C. R. (2010). Automated continuous verification and validation for numerical simulation. *Geoscientific Model Development Discussions*.
- Farrell, P. E., Piggott, M. D., Pain, C. C., Gorman, G. J., Wilson, C. R. (2009). Conservative interpolation between unstructured meshes via supermesh construction. *Computer Methods in Applied Mechanics and Engineering*.
- Ham, D. A., Farrell, P. E., Gorman, G. J., Maddison, J. R., Wilson, C. R., Kramer, S. C., Shipton, J., Collins, G. S., Cotter, C. J., Piggott, M. D. (2009). Spud 1.0: generalizing and automating the user interfaces of scientific computer models. *Geoscientific Model Development*.

Grants Awarded

- Wilson, C. R. (2015-2016). Understanding how the mantle transition-zone 'valve' controls slab fate. Cardiff University 10470-1162.
- Wilson, C. R., Spiegelman, M., Kelemen, P., van Keken, P. E. (2014-2017). Collaborative research: advanced modeling for understanding fluid magma migration in subduction zones. NSF OCE 13-58091.
- Spiegelman, M., Wilson, C. R. (2013-2015). Physics and chemistry of carbon at extreme conditions. UCLA 0995 G RA 452.
- Spiegelman, M., Wilson, C. R. (2014-2014). Modeling of Reactive Fluid-Solid Systems for H₂O and Carbon Transport in Subduction Zones. Carnegie CIW10470-1162.
- Holtzman, B., Spiegelman, M., Wilson, C. R. (2012-2015). Dynamical coupling of deformation and melt transport in the earth: a combined theoretical and experimental study. NSF EAR 11-41976.