

DANIEL ANDREW FROST

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Education

- Ph.D. The University of Leeds 2010-2014
Thesis: "Seismic observation of the Earth's small-scale structure"
Structure of lower mantle using scattered seismic waves and relation to large-scale features
Detecting the edge of the Pacific Large Low Shear Velocity Province using P-waves
- MEarthSci The University of Oxford 2006-2010
Earth Sciences 2.1 Classification
Masters thesis: "A marine geophysical study of the Tonga Trench-Louisville ridge collisional system in the South-West Pacific Ocean"

Employment

- Postdoctoral Scholar University of California, Berkeley 2016-present
Funded by NSF grant 1829283 : Resolving the influence of mantle heterogeneity on estimates of inner core anisotropy
Inner core structure using exotic seismic phases and seismic arrays
Tomographic mapping of the Alaskan slab
Resolving the influence of mantle structure on core waves
Distribution of small-scale heterogeneities throughout the mantle and their relation to mantle dynamics and subduction
Supporting the research output and organisation of the Cooperative Institute for Dynamic Earth Research (CIDER) program
Preparing educational reports on multidisciplinary topics for CIDER
PDRA: Barbara Romanowicz
- Postdoctoral Scholar Arizona State University 2014-2016
Funded by NSF grant PVS0695: Deep mantle cycling of oceanic crust
Distribution of small-scale heterogeneities throughout both the upper and lower mantle and their relation to mantle dynamics and subduction
The influence of broad lower mantle heterogeneities on deep-travelling S-waves and the effect on analysis of outer core structure
PDRA: Edward Garnero

Research Interests

Whole Earth structure, earth evolution, cross-disciplinary studies, influence of convection on mantle structure, seismic scattering, core structure, anisotropy, chemical heterogeneity, D'' complexity, array seismology, tomographic inversion, developing seismic methodologies

Publications

Frost, Daniel A.; Romanowicz, Barbara: On the orientation of the fast and slow directions of anisotropy, *Phys. Earth Planet. Int.*, 2019, 286, p. 101-110

Frost, Daniel A.; Garnero, Edward J.; Rost, Sebastian, Dynamical links between small- and large-scale mantle heterogeneity: seismological evidence, *Earth Planet. Sci. Lett.*, 2018, 482, p. 135-146

Frost, Daniel A.; Romanowicz, Barbara, Constraints on Inner Core anisotropy using array observations of $P'P'$, *Geophys. Res. Lett.*, 2017, 44, p. 10,878-10,886

Frost, Daniel A.; Rost, Sebastian; Garnero, Edward J.; Li, Mingming; Seismic evidence for Earths crusty deep mantle, *Earth Planet. Sci. Lett.*, 2017, 470, p. 54-63

Rader, Erika; Emry, Erica; Schmerr, Nicholas; **Frost, Daniel A.**; Cheng, Cheng; Menard, Julie; Yu, Chunquan; Geist, Dennis, Characterization and Petrological Constraints of the Midlithospheric Discontinuity, *G-Cubed*, 2015, p. 3484-3504

Rost, Sebastian; Earle, Paul S.; Shearer, Peter M.; **Frost, Daniel A.**; Selby, Neil D; Seismic Detections of small-scale heterogeneities in the deep Earth, Springer Monograph, 2015, in *The Earths Heterogeneous Mantle*, c. 12, p. 367-390

Frost, Daniel A.; Rost, Sebastian; The P-wave Boundary of the Large-Low Shear Velocity Province beneath the Pacific, *Earth Planet. Sci. Lett.*, 2014, 403, p. 380-392

Frost, Daniel A.; Rost, Sebastian; Selby, Neil D.; Stuart, Graham W., Detection of a tall ridge at the core-mantle boundary from scattered PKP energy, *Geophys. J. Int*, 2013, 195, p. 558-574

Publications - in preparation

Frost, Daniel A.; Romanowicz, Barbara; Lasbleis, Marine; Chandler, Brian: Inner core dynamics from patterns of seismic anisotropy

Frost, Daniel A.; Romanowicz, Barbara: The influence of the upper mantle on estimates of inner core structure

Frost, Daniel A.; Garnero, Edward J.: The influence of lower mantle structure on resolution of the Earths core

Frost, Daniel A.; Rost, Sebastian: Physical properties of scattering heterogeneities throughout the mantle

Non-peer reviewed work

Frost, Daniel A.; Romanowicz, Barbara: On the different flavours of seismic reference models, <https://escholarship.org/uc/item/7wb6377n>

Invited Presentations

2017 European Geophysical Association General Assembly Vienna

Frost, Daniel A.*; Rost, Sebastian; Garnero, Edward J.; Romanowicz, Barbara; The dynamic connection between small and large-scale mantle heterogeneity

2015 American Geophysical Union Fall Meeting San Francisco

Frost, Daniel A.*; Rost, Sebastian; Garnero, Edward J.; Seismic detection of oceanic crust in Earth's lower mantle and its relation to large-scale mantle structure

2013 European Geophysical Association General Assembly Vienna

Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; A global study of the lowermost mantle using scattered PKKP waves (PK●KP)

2012 Faculty of Environment Conference Leeds

Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; Stewart, Graham W.; The Earth in detail: Seismology as a tool for studying the Earth's fine-scale structure

2012 Congres de Doctorants IGP, Paris

Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; Stuart; PKP Scattering: Detecting a Heterogeneous Ridge Above the Core-Mantle Boundary

Campus Presentations

2019 Origins Seminar UC Davis

Frost, Daniel A.*; Seismological evidence of the dynamical links between small- and large-scale mantle structure

2019 Seismology and Tectonics Seminar UCLA

Frost, Daniel A.*; Inner core dynamics from patterns of seismic anisotropy

2018 Seismological Laboratory Seminar California Institute of Technology

Frost, Daniel A.*; Seismological evidence of the dynamical links between small- and large-scale mantle structure

2018 Department of Physics Colloquium New Mexico State University

Frost, Daniel A.*; The dynamical links between small- and large-scale mantle structures: seismological evidence

2016 Deep Thoughts Earth and Life Science Institute, Tokyo

Frost, Daniel A.*; Seismically mapping kilometre-scale structures throughout the mantle

2016 Berkeley Seismological Lab Seminar University of California, Berkeley

Frost, Daniel A.*; Seismically mapping kilometre-scale structures throughout the mantle

Proposals - funded

2018 National Science Foundation Geophysics program

Value: \$152,142 *Resolving the influence of mantle heterogeneity on estimates of inner core anisotropy*

Co-authored with Barbara Romanowicz. Named researcher.

2014 National Science Foundation Cooperative Studies Of The Earth's Deep Interior program

Value: \$550,121 *Deep Mantle Cycling of Oceanic Crust*

This proposal was authored by PIs at ASU, but the seismological investigations (one third of the proposed activities) were built around my skill base, to specifically fund my involvement in the multidisciplinary research

2014 Preparatory Commission for the Comprehensive Nuclear Test-ban Treaty Organization (CTBTO) Young Scientist Research Award

Value: 9 months *Characterisation of small-scale heterogeneities beneath IMS arrays for improved source location and magnitude estimation*

Authored proposal and the project was awarded, but I turned this down to accept a postdoctoral position at Arizona State University

Proposals - in preparation

2018 National Science Foundation Geophysics program

Combining global tomographic inversions with geodynamical growth models to constrain the origins of Earth's inner core features

Co-authored with PIs at New Mexico State University and Wayne State University. Named researcher supporting seismic analysis.

2018 National Science Foundation Geophysics program

Regional tomographic inversion of the Alaskan subduction zone

Co-authored with PIs at Rensselaer Polytechnic Institute and UC Berkeley. Named researcher supporting seismic analysis.

Teaching Experience

University of California, Berkeley

Guest instructor: Earthquake of the week EPS256 (2018, 2019) - Graduate level

Guest lectures: Physics of the Earth's Interior EPS122 (2017)

Arizona State University

Undergraduate student pitching workshop (2015)

The University of Leeds

Teaching assistant: Global Seismology (2011, 2012, 2013)

Guest lecture on graduate research: Global Seismology (2013)

Teaching assistant: Computing (2011, 2012, 2013)

Teaching assistant: Geological fieldwork courses (2011, 2012, 2013)

Teaching assistant: Petrology (2013)

Teaching assistant: Inverse theory (2012)

Teaching assistant: Geological map skills (2012)

Teaching assistant: Applied geophysics (2011)

Teaching assistant: Geophysical data acquisition field course (2011)

Multidisciplinary Research Experience

2018 CIDER Summer School UC Santa Barbara, California

"Relating geophysical and geochemical heterogeneity in the deep Earth" (attendant)

Worked to constrain the nature of the thermal boundary layer at the core-mantle boundary from a multidisciplinary approach

2017 MEXT Shin-Gakujutsu Winter school Kusatsu, Japan

"Origin and Evolution of Deep Primordial Reservoirs" (attendant)

2016 CIDER Summer School UC Santa Barbara, California

"Flow in the Deep Earth" (attendant)

Worked on integrating multidisciplinary observations and experiments of the lower mantle to understand its chemical and thermal structure

2014 ELSI Summer School Earth and Life Sciences Institute, Tokyo

“Computational Tools for Planetary Formation and Earth Evolution” (attendant)

2013 Seismic network deployment
Assisted in decommissioning Faultlab Dense Array in Northern Anatolia in Turkey

2013 CIDER Summer School UC Berkeley, California
“From mantle to crust: continental formation and destruction” (attendant)
Worked on the nature, prevalence, and possible explanations for observations of the Mid-Lithospheric Discontinuity

2010, 2012 Research Scientist AWE Blacknest, UK
Analysed seismic scattering using CTBTO data

2009 Volunteer Research Scientist Centre of Exchange and Research in Volcanology, Colima University, Mexico
Volunteered as a research assistant for 2 months working with seismic data and thermal camera images to analyse volcanic activity at Volcan de Colima. Took part in several field trips to observe and sample Volcan de Colima

Scientific Service

Reviewer: Earth and Planetary Science Letters, Journal of Geophysical Research, Geophysical Journal International, Geophysical Research Letters

2016-2019 Maintaining CIDER’s online presence

2015-2018 American Geophysical Union Fall Meeting OSPA Judge

2018 Volunteered as an undergraduate mentor at the American Geophysical Union Fall Meeting

2018 Organised CIDER pre-AGU workshop

2018 Supported the running and organisation of CIDER summer program

2017 Volunteered as an undergraduate mentor at the American Geophysical Union Fall Meeting

2017 Co-organised CIDER pre-AGU workshop

2017 Assisted with running CIDER summer program

2016 Organised student pitching competition at Arizona State University

2012 Assisted with delegate services for the SEDI 2012 meeting held in Leeds

2012 Co-organised the British Geophysical Association Postgraduate Research in Progress Meeting held in Leeds

Service to University

2019 Co-organised Berkeley Seismological Lab seminar series

2018 Organised lab-wide discussion meetings on recent seismicity and professional development

2017 Postdoc representative on UC Berkeley Seismological Lab web design committee

2016 Co-organised Berkeley Seismological Lab seminar series

2015 Organised research group-wide social meetings at Arizona State University

2013 Postgraduate student representative at both the research institute and school level at University of Leeds

Outreach

- 2019 Presented at UC Berkeley CalDay on Earth's core to advertise geophysics research to prospective students
- 2019 Support Berkeley Seismological Laboratory at UC Berkeley CalDay
- 2019 Taught tectonics to 6th grade students with Bay Area Science in Schools
- 2019 Remotely engaged with third grade students at a rural school to discuss earthquake hazards and research
- 2018 Engaged with the public at a question and answer session at The Bay Area Science Festival
- 2018 Presented on behalf of UC Berkeley Seismological Lab at the City of Berkeley ShakeOut
- 2018 Presented at UC Berkeley Compass to advertise geophysics research across campus
- 2018 Presented at UC Berkeley CalDay on Earth's core to advertise geophysics research to public
- 2018 Supported Berkeley Seismological Laboratory at UC Berkeley CalDay
- 2018 Taught statistical analysis to students for science fair projects in a Bay Area middle school
- 2018 STEM mentor for Be A Scientist program in a Bay Area middle school
- 2017 Taught seismology to 6th grade students with Bay Area Science in Schools
- 2017 Presented on behalf of UC Berkeley Seismological Lab at the Bay Area Science Festival

Professional Development

- 2018 University of California, Beyond Diversity lectures
Discussion of inclusion in STEM education
- 2016 University of California, Berkeley Postdoctoral Development Courses
Management and Python programming
- 2015 Arizona State University Postdoctoral Development Course
Pitching and application writing
- 2015 IRIS Webinars
Programming skills and career development

Presentations

- 2018 American Geophysical Union Fall Meeting Washington D.C.
Frost, Daniel A.*; Romanowicz, Barbara; Lasbleis, Marine; Chandler, Brian; Inner Core Dynamics From Patterns of Seismic Anisotropy
- 2018 American Geophysical Union Fall Meeting Washington D.C.
Roecker, Steven; **Frost, Daniel A.***; Romanowicz, Barbara; Structure of the Crust and Upper Mantle beneath Alaska Determined from the Joint Inversion of Arrival Times and Waveforms of Regional and Teleseismic Body Waves
- 2018 American Geophysical Union Fall Meeting Washington D.C.
Mingda Lv, Margaret S Avery, Xiaoran Chen, Bethany Chidester, Jie Deng, Benjamin J Farcy, **Frost, Daniel A.***, Zhi Li, Joshua F Martin, Bruce A Buffett, Susannah Dorfman, and Lijun Liu: ; A multidisciplinary assessment of heat flux at the core mantle boundary
- 2018 American Geophysical Union Fall Meeting Washington D.C.

Waszek, Lauren; Burdick, Scott; Lasbleis, Marine; **Frost, Daniel A.***; Anandawansa, Rashni; Combining global tomographic inversions with geodynamical growth models to constrain the origins of Earth's inner core features

2018 Study of Earths Deep Interior Edmonton
Frost, Daniel A.*; Romanowicz, Barbara; Axially dependent Inner Core anisotropy from low order inner core convection

2018 Dynamics and evolution of Earths coupled core-mantle system Royal Astronomical Society
Frost, Daniel A.*; Romanowicz, Barbara; Axially dependent Inner Core anisotropy from low order inner core convection

2017 American Geophysical Union Fall Meeting New Orleans
Frost, Daniel A.*; Romanowicz, Barbara; Investigating the source of anomalous PKP travel times on South-Sandwich to Alaska paths

2017 Gordon Research Conference: Interior of the Earth Mount Holyoke
Frost, Daniel A.*; Romanowicz, Barbara; Constraints on Inner Core structure from P'P' array-based observations

2017 Gordon Research Seminar: Interior of the Earth Mount Holyoke
Frost, Daniel A.*; Romanowicz, Barbara; Constraints on Inner Core structure from P'P' array-based observations

2017 European Geophysical Association General Assembly Vienna
Frost, Daniel A.*; Romanowicz, Barbara; Constraints on Inner Core structure from P'P' array-based observations

2016 American Geophysical Union Fall Meeting San Francisco
Frost, Daniel A.*; Romanowicz, Barbara; Constraints on Inner Core structure from P'P' array-based observations

2016 American Geophysical Union Fall Meeting San Francisco
 Ko, Byeongkwon; Holt, Adam; Gao, Chao; **Frost, Daniel A.***; Karaoglu, Haydar; Lai, Hongyu; Yuan, Kaiqing; Li, Mingming; Campbell, Siobhan M.; Shim, Sang-Heon; Irving, Jessica C. E.; Kellogg, Louise H.; Miller, Samantha M.; Probing the lower mantle composition and thermal structure: Insights from D'

2016 Study of Earths Deep Interior Nantes
Frost, Daniel A.*; Garnero, Edward J.; Rost, Sebastian; Connection across scales of seismic heterogeneity throughout the mantle

2015 American Geophysical Union Fall Meeting San Francisco
Frost, Daniel A.*; Garnero, Edward J.; TA sub-array measurements of SmKS ray parameters to determine lower mantle influence

2014 American Geophysical Union Fall Meeting San Francisco
Frost, Daniel A.*; Rost, Sebastian; Garnero, Edward J.; A dynamical context for small-scale heterogeneity throughout the mantle beneath subduction

2014 Study of Earth's Deep Interior Kanagawa, Japan
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; A global study of the lowermost mantle using short and long period scattered PKKP waves (PK●KP)

2013 American Geophysical Union Fall Meeting San Francisco

Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; A global study of the lowermost mantle using short and long period scattered PKKP waves (PK●KP)

2013 American Geophysical Union Fall Meeting San Francisco
Frost, Daniel A.*; Rost, Sebastian; Constraining lower mantle anomalies using USArray

2013 American Geophysical Union Fall Meeting San Francisco
 Rost, Sebastian; **Frost, Daniel A.***; The distribution of small-scale heterogeneity at the core-mantle boundary

2013 BGA Postgraduate Research in Progress Meeting Cambridge
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; A global study of the lowermost mantle using scattered PKKP waves (PK●KP)

2013 Gordon Research Conference: Interior of the Earth Mount Holyoke
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; A global study of the lowermost mantle using scattered PKKP waves (PK●KP)

2013 Gordon Research Seminar: Interior of the Earth Mount Holyoke
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; Stewart, Graham W.; PKP Scattering: Detecting a Heterogeneous Ridge Above the Core-Mantle Boundary

2012 Structure and Dynamics of Earth's Deep Mantle College de France
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; PKKP Scattering: A tool for the global study of the Core-Mantle Boundary

2012 BGA Postgraduate Research in Progress Meeting Leeds
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; PKKP Scattering: A tool for the global study of the Core-Mantle Boundary

2012 Study of Earth's Deep Interior Leeds
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; PKKP Scattering: Towards a global study of the Core-Mantle boundary

2011 American Geophysical Union Fall Meeting San Francisco
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; Stuart, Graham W., PKP Scattering: Detecting a heterogeneous ridge about the Core-Mantle boundary

2011 BGA Postgraduate Research in Progress Meeting Oxford
Frost, Daniel A.*; Rost, Sebastian; Selby, Neil D.; Stuart, Graham W., PKP Scattering: Detecting a heterogeneous ridge about the Core-Mantle boundary