

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

- Assistant Project Scientist University of California, Berkeley commencing Fall 2019
Funded by NSF grant 1829283: Resolving the influence of mantle heterogeneity on estimates of inner core anisotropy
Understanding structure and tectonics of mantle beneath Alaska
Implementing regional box tomography
Improving resolution of deep Earth by understanding shallow mantle influence
- Postdoctoral Scholar University of California, Berkeley 2016-present
Funded by NSF grants 1135452 and 1829283: Resolving the influence of mantle heterogeneity on estimates of inner core anisotropy
Inner core anisotropy using exotic seismic phases and seismic arrays and mineral physics
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; Lasbleis, Marine; Chandler, Brian: Seismic evidence of slow translation and preferential equatorial growth of the inner core, *A, submitted to Science*

Frost, Daniel A.; Romanowicz, Barbara; Roecker, Steve: Upper mantle slab under Alaska: contribution to anomalous core-phase observations on south-Sandwich to Alaska paths, *B, in review at Phys. Earth. Planet. Int.*

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 Earth's 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.; Avery, Margaret S.; Buffett, Bruce A.; Chidester, Bethany A.; Deng, Jie; Dorfman, Susannah M.; Li, Zhi; Liu, Lijun; Lv, Mingda; Martin, Joshua F: Multidisciplinary constraints on the thermal-chemical boundary between Earth's core and mantle

Frost, Daniel A.; Garnero, Edward J.: The influence of lower mantle structure on resolution of the Earth's 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 - submitted

2018 National Science Foundation Geophysics program

Requested: *Collaborative Research: Investigating the Crust and Upper Mantle Structure of Alaska and the Yakutat terrain by full waveform inversion*

Myself as PI, with Barbara Romanowicz (UC Berkeley), Steve Roecker (Rensselaer Polytechnic Institute), and Josh Stachnik (Lehigh University) as co-PIs.

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

CoI with PIs at New Mexico State University and Wayne State University.

2018 National Science Foundation Geophysics program

Improved imaging of the outermost core through determination of the effects of lowermost mantle heterogeneity and anisotropy

CoI with PI Edward Garnero (Arizona State University), and CoIs Ebru Bozdog (Colorado School of Mines) and Maureen Long (Yale University).

Teaching Experience

University of California, Berkeley

Guest instructor: Earthquake of the week EPS 256 (2018, 2019) - Graduate level

Guest lecturer: 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 (Editor's Citation for Excellence in Refereeing, 2018)

2019 Facilitator at "How to Be an Effective Mentor and Mentee" Workshop at the AGU Fall Meeting Student and Early Career Scientist Conference

2016-2019 Maintaining CIDER's online presence

2019 Supported the organisation of CIDER summer program

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

- Winter 2019 Will organise visit and teach lesson on geophysics to Gifted and Talented Education program from Bay Area school
- 2019 Popping the Science Bubble - public research talk at Berkeley Public Library
- 2019 Remotely taught seismology to 3rd and 4th grade students at school in central Kansas
- 2019 Presented research and basic seismology lesson to 7th grade students visiting from local school
- 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

- 2019 IUGG General Assembly Montreal
Frost, Daniel A.*; Romanowicz, Barbara; Chandler, Brian; Lasbleis, Marine; Seismic evidence of slow translation of the inner core
- 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 Earth's Deep Interior Edmonton
Frost, Daniel A.*; Romanowicz, Barbara; Axially dependent Inner Core anisotropy from low order inner core convection
- 2018 Dynamics and evolution of Earth's 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, Byeongkwan; 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