

Curriculum Vitae
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A. Research

A.1 Research statement

I am primarily an earthquake seismologist with a structural focus; that is, I use data from earthquakes and other passive sources to obtain information about the Earth's internal structure, from which I attempt to draw conclusions about the history and dynamics of large-scale Earth processes. Earthquake data have a greater ability to illuminate the Earth's interior than any artificial source, and so are the main information source used to develop models of the Earth below the crust. However, the earthquake seismogram is a highly complex encoding of the interaction between seismic waves and earth structure; as a consequence, there is a need for innovation in the modelling, inversion, and interpretation of earthquake records, as well as in interpreting the resulting constraints on the Earth's physical properties in terms of geology and mineral physics. Thus, the three major goals of my research to date have been: (i) the development and application of techniques for obtaining information on Earth structure from earthquake recordings, (ii) understanding the origin, history and dynamics of the lithosphere, and the relationship between crust and mantle evolution, and (iii) understanding the specific history of the assembly and modification of the North American continent, as experienced by the lithosphere as well as the crust.

A.2 Publications in refereed journals

[Names of students under my supervision are bolded. Order is reverse chronological.]

26. Ola, O., Frederiksen, A.W., Bollmann, T., Darbyshire, F., Jurdy, D., Revenaugh, J., Stein, C., Stein, S., Van der Lee, S., Wiens, D., and Wysession, M. (2015) Anisotropic Zonation in the Lithosphere of Central North America: Influence of the Mid-Continent Rift, in preparation for *Tectonophysics*.

25. Wolin, E., Van der Lee, S., Bollmann, T.A., Wysession, M.E., Stein, S., Wiens, D.A., Darbyshire, F.A., Frederiksen, A.W., and Revenaugh, J. (2015) Seasonal and diurnal variations in long-period noise at SPREE stations: the influence of soil characteristics on shallow stations' performance, submitted to *Bulletin of the Seismological Society of America*.
24. Frederiksen, A.W. and Delaney, C. (2015) Deriving crustal properties from the P coda without deconvolution: the southwestern Superior Province, North America, *Geophysical Journal International*, in press.
23. Frederiksen, A.W., Thompson, D., Rost, S., Cornwell, D.G., Gülen, L., Houseman, G.A., Kahraman, M., Poyraz, S.A., Teoman, U.M., Türkelli, N., and Utukcu, M. (2015) Crustal thickness variations and isostatic disequilibrium across the North Anatolian Fault, western Turkey, *Geophysical Research Letters* **42**, 751–757, doi:10.1002/2014GL062401.
22. Frederiksen, A.W., Deniset, I., Ola, O., and Toni, D. (2013) Lithospheric fabric variations in central North America: influence of rifting and Archean tectonic styles, *Geophysical Research Letters* **40**, 1–5, doi:10.1002/grl.50879.
21. Zhang, J. and Frederiksen, A.W. (2013) 3-D crust and mantle structure in southern Ontario, Canada via receiver function imaging, *Tectonophysics* **608**, 700–712, doi:10.1016/j.tecto.2013.08.011.
20. Frederiksen, A.W., Bollmann, T., Darbyshire, F., and Van der Lee, S. (2013) Modification of continental lithosphere by tectonic processes: a tomographic image of central North America, *Journal of Geophysical Research* **112**, B07318, doi:10.1029/2006JB004861.
19. Frederiksen, A.W. (2011) Panel deconvolution of receiver-function gathers: improved images via cross-trace constraints, *Geophysical Journal International* **184**, 1275–1288, doi:10.1111/j.1365-246X.2010.04904.x.
18. Idowu, O., Frederiksen, A.W., and Cassidy, J.F. (2011) Imaging the Nechako Basin, British Columbia, using ambient seismic noise, *Canadian Journal of Earth Sciences* **48**, 1038–1049, doi:10.1139/E11-007.
17. Stein, S., Van der Lee, S., Jurdy, D., Stein, C., Wiens, D., Wysession, M., Revenaugh, J., Frederiksen, A., Darbyshire, F., Bollmann, T., Lodewyk, J., Wollin, E., Merino, M., and Tekverk, K. (2011) Learning from failure: the SPREE Mid-Continent Rift Experiment, *GSA Today* **21**, 5–7, doi:10.1130/G120A.1.
16. Camacho, A., Yang, P., and Frederiksen, A. (2009) Constraints from diffusion profiles on the duration of high-strain deformation in thickened crust, *Geology* **37**, 755–758, doi:10.1130/G25753A.1.
15. Hyndman, R.D., Currie, C.A., Mazzotti, S., and Frederiksen, A. (2009) Temperature control of continental lithosphere elastic thickness: Effective elastic thickness T_e vs upper mantle velocity V_s , *Earth and Planetary Science Letters* **277**, 539–548, doi:10.1016/j.epsl.2008.11.023.

14. Plomerova, J., Frederiksen, A.W., and Park, J. (2008) Seismic anisotropy and geodynamics of the lithosphere-asthenosphere system, *Tectonophysics* **462**, 1–6, doi:10.1016/j.tecto.2008.08.007.
13. Darbyshire, F.A., Eaton, D.W., Frederiksen, A.W., and Ertolahti, L. (2007) New insights into the lithosphere beneath the Superior Province from Rayleigh wave dispersion and receiver function analysis, *Geophysical Journal International* **169**, 1043–1068, doi:10.1111/j.1365-246X.2006.03259.x.
12. Eaton, D.W. and Frederiksen, A.W. (2007) Seismic evidence for convection-driven motion of the North American plate, *Nature* **446**, 428–431, doi:10.1038/nature05675.
11. Frederiksen, A.W., **Miong, S.K.**, Darbyshire, F.A., Eaton, D.W., Rondenay, S., and Sol, S. (2007) Lithospheric variations across the Superior Province, Ontario, Canada: evidence from tomography and shear-wave splitting, *Journal of Geophysical Research* **112**, B07318, doi:10.1029/2006JB004861.
10. Frederiksen, A.W., Ferguson, I.J., Eaton, D., **Miong, S.-K.**, and Gowan, E. (2006) Mantle Fabric at Multiple Scales Across an Archean-Proterozoic Boundary, Eastern Ontario, Canada, *Physics of the Earth and Planetary Interiors* **158**, 240–263, doi:10.1016/j.pepi.2006.03.025
9. Van der Lee, S. and Frederiksen, A.W. (2005) Surface-wave tomography applied to the North American upper mantle, in *Seismic Earth: Array Analysis of Broadband Seismograms*, American Geophysical Union Geophysical Monograph **157**, 67-80.
8. Eaton D., Frederiksen, A. and **Miong, S.K.** (2004) Shear-wave splitting observations in the lower Great Lakes region: Evidence for regional anisotropic domains and keel-modified asthenospheric flow, *Geophysical Research Letters* **31**, L07610.
7. Frederiksen, A.W. and Revenaugh, J. (2004) Lithospheric imaging via teleseismic scattering tomography, *Geophysical Journal International* **159**, 978-990.
6. Sherrington, H., Zandt, G., and Frederiksen, A.W. (2004) Crustal Fabric in the Tibetan Plateau Based on Waveform Inversions for Seismic Anisotropy Parameters, *Journal of Geophysical Research* **109** B02312, doi:10.1029/2002jb002345.
5. Frederiksen, A.W., Folsom, H., and Zandt G. (2003) Neighbourhood inversion of teleseismic Ps conversions for anisotropy and layer dip, *Geophysical Journal International* **155**, 200-212
4. Frederiksen, A.W., Bostock, M.G., and Cassidy, J.F. (2001) S-wave velocity structure of the Canadian upper mantle, *Physics of the Earth and Planetary Interiors* **124**, 175-191.
3. Frederiksen, A.W., and Bostock, M.G. (2000) Modelling teleseismic waves in dipping anisotropic structures. *Geophysical Journal International* **141**: 401-412.

2. Frederiksen, A.W., Bostock, M.G., VanDecar, J.C., and Cassidy, J.F. (1998) Seismic structure of the upper mantle beneath the northern Canadian Cordillera from teleseismic travel-time inversion, *Tectonophysics* **294**, 43-55.

1. Shi, L., Francis, D., Ludden, J., Frederiksen, A., and Bostock, M. (1998) Xenolith evidence for lithospheric melting above anomalously hot mantle under the northern Canadian Cordillera, *Contributions to Mineralogy and Petrology* **131**, 39-53.

A.4 Presentations

[Only invited presentations listed; too many conference abstracts (ca. 4-5 per year since 2001) to list here.]

- Frederiksen, A.W., Bollmann, T.A., Darbyshire, F.A., Jurdy, D.M., Revenaugh, J., Stein, S.A., Van der Lee, S., Wiens, D.A., and Wysession, M.E., Traces of extension in continental lithosphere: Towards a seismic image of the Mid-Continent Rift, invited talk, 2012 Fall Meeting of the American Geophysical Union, Abstract T41G-01, December, 2012.
- Frederiksen, A.W., Defining Mantle Anomalies in Time and Space: Seismic Images of the Superior Province and Mid-Continent Rift, invited talk, presented at Northwestern University, University of Alberta and University of Calgary in early 2012.
- Frederiksen, A.W., Olaleye, M., Toni, D.A., Darbyshire, F.A., and Eaton, D.W. (2010) Accretion, modification and erosion of Archean lithosphere: evidence from the Superior Province and adjacent region, abstract T31F-01 (invited) presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.
- Frederiksen, A.W. (2007). Deep beneath Ontario: Seismic observations and lithospheric tectonics, invited keynote, Congrès annuel du GEOTOP, Lac MacDonald, Québec.

A.5 Software packages

- RAYSUM: Modelling and inversion of teleseismic waveforms in anisotropic, dipping layers. Developed 1999-present.
- SCATTER: Waveform tomography of teleseismic scattered wavefields. Developed 2001-present.
- Panel Deconvolution: Improved deconvolution of receiver functions with inter-trace constraints, developed 2008-present.

B. Teaching

B.1 Graduate supervision

[All sole-supervised]

- Zaporozan, T. (M.Sc., in progress, began Sept. 2012)
- Ola, O. (M.Sc., Jan. 2012 Aug. 2014) *Lithospheric Fabric in Central North America: the Superior Province and the Mid-Continent Rift*
- Bryksin, A. (M.Sc., in progress, began Sept. 2011)
- Olaleye, M. (M.Sc., Sept. 2008 May 2011) *Receiver Function Analysis of Crustal and Upper Mantle Stratigraphy Across the Western Superior Province*
- Idowu, O. (M.Sc., Sept. 2007 Aug. 2009) *Surface Wave Tomography of the Nechako Basin, British Columbia, Using Ambient Seismic Noise*
- Zhang, J. (M.Sc., Sept. 2003 Dec. 2005) *3-D Structure in Southern Ontario via Receiver Function Imaging*

B.2 Undergraduate supervision

[All sole-supervised except where noted]

- Campbell, R. (B.Sc. Hons., in progress)
- Ramlakhan, K. (B.Sc. Hons., in progress)
- Sheng, A. (B.Sc. Hons., May 2014, co-supervised with Dr. Anton Chakhmouradian) *Structure and Origin of the Shoulderblade Breccia Dome, Central Manitoba*
- Delaney, C. (B.Sc. Hons., began 2013, did not complete)
- Deniset, I. (B.Sc. Hons., May 2012) *Investigating upper-mantle and lithospheric fabric across the south-west edge of the Superior Province by shear-wave splitting*
- Toni, D. (B.Sc. Hons., May 2009) *Investigating Anisotropy in the Upper Mantle using Shear-Wave Splitting from the Manitoba Teleseismic Array*
- Olaleye, M. (B.Sc. Hons., May 2008) *Mapping Lateral Crustal Thickness and Poisson's Ratio Variations in the Southern Cordillera, British Columbia Using the Zhu and Kanamori Stacking Algorithm for Receiver Functions.*
- Bucher, P. (B.Sc. Hons., May 2007) *Delineation of the Upper Mantle at the St. Lawrence Rift Valley Using Teleseismic P-Wave Tomography:*
- McPherson, J. (B.Sc. Hons., May 2005) *Channel Boundary Delineation and Reservoir Prediction in Two Stacked Glauconitic Channel Reservoirs Using Forward Seismic Modelling, Spectral Decomposition and Event Similarity Prediction, Glauconitic Formation, Southeastern Alberta.*

- Miong, S-K. (B.Sc. Hons., May 2005) *Application of Shear-Wave Splitting Analysis in Imaging Asthenospheric and Lithospheric Anisotropy Beneath the Superior Province, Canadian Shield.*
- Letkeman, A. (B.Sc. Hons., Dec. 2002) *Imaging the Deep Structures of the Grenville Province, Ontario Using Teleseismic Receiver Functions.*

B.3 Courses taught

- Winter 2009, Fall 2011, Winter 2013, Fall 2013: GEOL 7720 Geophysical Imaging and Data Processing, University of Manitoba
- Fall 2002 through 2013: GEOL 2060 Introductory Geophysics, University of Manitoba
- Fall 2012: GEOL 4270 Advanced Studies in Earth Sciences (Observational Seismology), University of Manitoba
- Fall 2008, Winter 2011, Fall 2012: GEOL 4320 Physics of the Earth: Seismology and Heat Flow, University of Manitoba
- Fall 2012: GEOL 7490 Advanced Seismology 2 (Observational Seismology), University of Manitoba
- Winter 2005, 2007, 2010, 2012: GEOL 3740 Exploration Seismology, University of Manitoba
- Fall 2004, 2007, 2008, Winter 2012: GEOL 7480 Advanced Seismology 1 (Theoretical Seismology), University of Manitoba
- Summer 2004, 2007, 2009, 2011: GEOL 4260/4740 Geophysics Field Course (co-taught 2004, 2007 and 2011, solo 2009), University of Manitoba
- Winter 2005, 2007: GEOL 7230 Geophysics of the Earth's Crust and Mantle (co-taught), University of Manitoba
- Winter 2004, 2007: GEOL 7260 Geophysical Information, University of Manitoba
- Winter 2004, 2006: GEOL 4810 Geophysical Data Analysis, University of Manitoba
- Winter 2002: EART113 Physics in the Earth Sciences, University of California Santa Cruz

C. Professional activity

C.1 Relevant work history

07/2013-12/2013	Acting associate dean (academic), University of Manitoba
05/2008-present	Associate professor, University of Manitoba
07/2002-04/2008	Assistant professor, University of Manitoba
01/2001-06/2002	Post-doctoral researcher, earthquake seismology Supervisor: Dr. J. Revenaugh, UCSC
01/1999-05/2000	Teaching Assistant, various earth science courses Various supervisors, UBC
07/1994-12/2000	Research assistant, earthquake seismology Supervisors: Drs. M. Bostock & R. Ellis, UBC
05/1993-08/1993	Geophysics summer student, geophysical data processing Supervisor: Dr. D. Poley, Shell Canada

C.2 Educational history

1997-2000	Ph.D., Geophysics (Seismology), University of British Columbia Title of thesis: <i>Seismic Imaging of the Canadian Upper Mantle</i> Supervisor: Dr. M.G. Bostock
1994-1996	M.Sc., Geophysics (Seismology), University of British Columbia Title of thesis: <i>A Teleseismic Study of the Northern Cordilleran Upper Mantle Beneath the SNORCLE Transect</i> Supervisor: Dr. M.G. Bostock
1991-1994	B.Sc. (1st Class Hons.), Solid Earth Geophysics, McGill University

C.3 Awards and grants

04/2011-04/2014	National Science and Engineering Research Council of Canada (NSERC)/Earth Sciences Sector (Natural Resources Canada) CRD grant, joint with UBC, \$100,000
04/2010-03/2013	Natural Resources Canada GEMS grant, \$30,000
09/2008-08/2015	National Science and Engineering Research Council of Canada (NSERC) Discovery Grant, \$140,000.
09/2003-08/2008	National Science and Engineering Research Council of Canada (NSERC) Discovery Grant, \$122,250.
09/2006-09/2010	Canada Foundation for Innovation Institutional Operating Fund, \$21,763.
09/2003	Canada Foundation for Innovation New Opportunities Grant, \$181,360.
09/2002	University of Manitoba startup grant, \$50,000.
01/2001-06/2002	NSERC Post-Doctoral Fellowship.
01/1997-12/1998	NSERC Post-Graduate Scholarship (PGS) B.
01/1994-08/1996	NSERC PGS A.
05/1994	Logan Medal, Department of Earth and Planetary Sciences (EPS), McGill University.
09/1992-05/1994	R.P.D. Graham Scholarship, EPS, McGill University.
09/1991-05/1992	Entrance Scholarship, EPS, McGill University.

C.4 Administrative activity

Departmental committees:

- Department awards committee, 2013-present
- Graduate admissions and graduate affairs committees, 2006-2013, chaired 2008-2013.
- Honours thesis evaluation committee, 2002-2007, 2009-2012
- Search committee for watershed systems junior chair position, 2011.
- Department centenary committee, 2006-2010
- Endowment fund committee, 2005-2010 (chaired committee 2006-2010)
- Geophysics program review committee, 2005-2006
- Geological Sciences seminar coordinator, 2003-2007
- Tectonics position search committee, 2003-2005
- Geophysics technician search committee, 2003-2004

Faculty committees:

- Faculty computing committee, 2005-present
- One tenure and two promotion committees, 2012
- Faculty representative to University Senate, 2007-2010
- Faculty seminar committee, 2003-2005
- Faculty research synergy committee, 2003-2004

Other university service:

- Served as acting Associate Dean, Academic July-December, 2013.
- Served as acting Department Head at various times, for periods up to one month (most recently in July, 2014).
- Handled media requests and radio/TV interviews regarding major newsworthy earthquakes

C.5 Service to profession and professional recognition

- Treasurer, Solid Earth Section, Canadian Geophysical Union, 2013-present
- Associate Editor, Journal of Geophysical Research, American Geophysical Union, 2009-present
- Chair of Publications Subcommittee, 2013 GAC-MAC conference, Winnipeg, 2012-2013.
- Member-at-large of Executive, Solid Earth Section, Canadian Geophysical Union, 2011-2013
- One of three guest editors, special issue of Tectonophysics, Elsevier, 2006-2007.
- Extensive peer review history; journals include:
 - Computers and Geosciences
 - Canadian Journal of Earth sciences
 - Earth and Planetary Science Letters
 - Geology
 - Geophysical Journal International
 - Journal of Geophysical Research
 - Journal of Paleolimnology
 - Lithos
 - Physics of the Earth and Planetary Interiors
 - Tectonophysics
- Reviewed grant proposals for:
 - Alberta Ingenuity Fund
 - NSERC
 - NSF
 - POLARIS project