

Dr. J. Kim Welford

Department of Earth Sciences
Memorial University of Newfoundland
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CITIZENSHIP: Canadian

CURRENT EMPLOYMENT:

Research Associate, RA-III March 2010 - present
Memorial University of Newfoundland, St. John's, NL, Canada

- Reprocessing land 2-D seismic reflection lines from the Nechako region, British Columbia with constraints from magnetotelluric studies
- Resolving the deep structure of the Irish, Labrador and Scotian margins using constrained 3-D gravity inversion

PAST PROFESSIONAL RESEARCH EMPLOYMENT:

Senior Geophysicist, Research and Development (part-time) March 2010 - May 2011
PanGeo Subsea Inc., St. John's, NL, Canada

- Developed novel techniques for high resolution 3-D and 4-D acoustic imaging of the sub-surface for the offshore renewable energy and oil and gas industries.

Post-Doctoral Fellow June 2005 - March 2010
Memorial University of Newfoundland, St. John's, NL, Canada

- Imaging the rifted continental margin offshore Newfoundland using 2-D marine seismic reflection data and constrained 3-D gravity inversion
- Resolving the deep structure of the Irish and Scotian margins using constrained 3-D gravity inversion

Post-Doctoral Fellow November 2004 - May 2005
University of British Columbia, Vancouver, BC, Canada

- Near-surface and upper crustal imaging in Nevada and Alberta using industry 2-D and 3-D land seismic reflection data
- Finite-element numerical modelling of tectonic plate deformation

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EDUCATION:

Degrees earned:

Ph.D. in Geophysics, awarded November 2004
University of British Columbia, Vancouver, BC, Canada
Department of Earth and Ocean Sciences
Thesis title: *Deep 3-D seismic reflection imaging of Precambrian sills in the crystalline crust of Alberta, Canada*

M.Sc. in Geophysics, awarded May 2000
University of British Columbia, Vancouver, BC, Canada
Department of Earth and Ocean Sciences
Thesis title: *Lithospheric structure across the Canadian Cordillera of northeastern British Columbia from seismic refraction and potential field data*

B.Sc. Honours in Planetary Sciences, awarded May 1997
McGill University, Montreal, Quebec, Canada
Department of Earth and Planetary Sciences
Thesis title: *Crustal magnetic anomalies of the North Polar region derived from Magsat data*

HONOURS AND AWARDS:

- Natural Sciences and Engineering Research Council of Canada (NSERC)
Post-Doctoral Fellowship (PDF) 2006-2008
- Thomas and Marguerite MacKay Memorial Scholarships, UBC 2002-2004
- Faculty of Science Achievement Award for Service, UBC 2003
- Chevron Canada Outstanding Student Paper in Seismology,
Canadian Geophysical Union Annual Meeting 2002
- Natural Sciences and Engineering Research Council of Canada
Industrial Postgraduate Scholarship (IPS-2) 2000-2002
- Lorntzen Scholarship, UBC 2000-2001
- Earth and Ocean Sciences Outstanding Teaching Assistant Award, UBC 2000
- Thomas and Marguerite MacKay Memorial Scholarship, UBC 1999-2000
- Canadian Society of Exploration Geophysicists Scholarship 1998-2000
- Earth and Planetary Sciences Entrance Scholarship, McGill University 1994
- Governor General's Medal for highest average in a graduating year,
Queen of Angels Academy 1992

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OTHER EARTH SCIENCE RELATED WORK EXPERIENCE:

Co-op student January - May 2002

EnCana Corporation, Calgary, Alberta, Canada

- Pursued thesis-related research at EnCana as part of NSERC industrial post-graduate scholarship

Webpage translator 2001-2002

Geological Survey of Canada, Pacific Division, Vancouver, BC, Canada

- Translated portions of the Geological Survey of Canada's Volcano website from English to French and performed all the French proofreading of the site (http://gsc.nrcan.gc.ca/volcanoes/index_f.php)

Seismic Observer (Bird-dog) November 1999

LITHOPROBE, Vancouver, BC, Canada

- Acted as a field observer for the SNoCLE seismic reflection survey, Corridor 2 in northern British Columbia

Seismic Field Work Assistant July - September 1997

LITHOPROBE, Vancouver, BC, Canada

- Deployed seismometers for the SNoRE 97 experiment in northern British Columbia, central Yukon Territory and the Northwest Territories, Canada

Research Assistant Summer 1996

Prof. Jafar Arkani-Hamed, McGill University, Montreal, Quebec, Canada

- Generated formal lecture notes for the undergraduate course, Terrestrial Planets

TEACHING AND OUTREACH:

Co-Instructor for EASC 4105: High Resolution Geophysics Fall 2008

Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NL, Canada

Senior level primarily field-based course in high resolution geophysics focusing on engineering and environmental applications.

- Lectured on seismic refraction methods
- Guided students in their overall field survey design
- Assisted students with their seismic data acquisition, processing and interpretation

Teaching Assistant 1997-2003

Department of Earth and Ocean Sciences, UBC, Vancouver, BC, Canada

- EOSC 100: Introduction to Planet Earth
- EOSC 114: Natural Disasters

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- EOSC 120: Introduction to Geology
- EOSC 310: The Earth and the Solar System
- EOSC 350: Environmental, Geotechnical, and Exploration Geophysics I
- EOSC 351: Environmental, Geotechnical, and Exploration Geophysics II
- EOSC 353: Seismology
- Operated and maintained both the Geophysics and Astronomy Reading Room and the Earth and Ocean Sciences Reading Room

Scientists and Innovators in the Schools

1999-2005

Science World, Vancouver, BC, Canada

- Visited schools and conducted workshops about plate tectonics and earthquakes for elementary and high school students
- Participated in networking seminars for high school students at Vancouver's Science World
- Designed and conducted workshops on earthquake science at Vancouver's Science World
- Prepared and conducted workshops on earthquake science for Loon Lake, Science World's annual summer camp for elementary school teachers

Earthquake speaker

2000-2005

Department of Earth and Ocean Sciences, UBC, Vancouver, BC, Canada

- Conducted demonstrations on earthquake science for school groups visiting the department

Science 101 instructor

Summer 2003

University of British Columbia, Vancouver, BC, Canada

- Taught a course on earthquakes and plate tectonics to residents of Vancouver's Downtown Eastside and other inner-city communities

Physics summer camp organizer

Summer 2002

Department of Physics and Astronomy, UBC, Vancouver, BC, Canada

- Helped organize the first physics summer camp focusing on geophysics
- Designed and conducted camp activities involving earthquakes and plate tectonics

Let's Talk Science Volunteer

1998-1999

Let's Talk Science, Vancouver, BC, Canada

- Collaborated with elementary school teachers to develop fun and interesting ways of introducing science to elementary school children

RESEARCH:

Refereed publications:

- Welford, J.K.**, Shannon, P.M., O'Reilly, B.M., and Hall, J., (2012). Comparison of lithosphere structure across the Orphan Basin/Flemish Cap and Irish Atlantic conjugate continental margins from constrained 3-D gravity inversions, *Journal of the Geological Society of London*, accepted for publication (53 submitted pages plus 9 figures).
- Dehler, S.A. and **Welford, J.K.**, (2012). Variations in rifting style and structure of the Scotian margin, Atlantic Canada, from 3-D gravity inversion, *Geological Society of London, Special Publications*, in press (19 submitted pages plus 7 figures).
- Welford, J.K.**, Hall, J., Sibuet, J.-C., and Srivastava, S., (2010). Structure across the north-eastern margin of Flemish Cap, offshore Newfoundland from Erable multichannel seismic reflection profiles: evidence for a transtensional rifting environment, *Geophysical Journal International*, **183**, 572-586.
- Welford, J.K.**, Shannon, P.M., O'Reilly, B.M., and Hall, J., (2010). Lithospheric density variations and Moho structure of the Irish Atlantic continental margin from constrained 3-D gravity inversion, *Geophysical Journal International*, **183**, 79-95.
- Welford, J.K.**, Smith, J., Hall, J., Deemer, S., Srivastava, S., and Sibuet, J.-C., (2010). Structure and rifting evolution of the northern Newfoundland Basin from Erable multichannel seismic reflection profiles across the southeastern margin of Flemish Cap, *Geophysical Journal International*, **180**, 976-998.
- Welford, J.K.**, and Hall, J., (2007). Crustal structure of the Newfoundland rifted continental margin from constrained 3-D gravity inversion, *Geophysical Journal International*, **171**, 890-908.
- Welford, J.K.**, Hearn, E.H., and Clowes, R.M., (2007). The possible role of mid-crustal igneous sheet intrusions in cratonic arch formation, *Tectonics*, **26**, TC5012, doi:10.1029/2006TC002023.
- Welford, J.K.** and Clowes, R.M., (2006). 3-D seismic reflection investigation of the upper crustal Winagami sill complex of northwestern Alberta, Canada, *Geophysical Journal International*, **166**, 155-169.
- Fernandez Viejo, G., Clowes, R.M. and **Welford, J.K.** (2005). Constraints on the composition of the crust and uppermost mantle in northwestern Canada: Vp/Vs variations along Litho-probe's SNorCLE Transect, *Canadian Journal of Earth Sciences*, **42**, 1205-1222.

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Clowes, R.M., Hammer, P.T.C., Fernandez Viejo, G., and **Welford, J.K.** (2005). Lithospheric structure in northwestern Canada from Lithoprobe seismic refraction and related studies: A synthesis, *Canadian Journal of Earth Sciences*, **42**, 1277-1293.

Welford, J.K., and Clowes, R.M. (2004). Deep 3-D seismic reflection imaging of Precambrian sills in southwestern Alberta, Canada, *Tectonophysics*, **388**, 161-172.

Welford, J.K., and Zhang, R. (2004). Ground roll suppression from deep crustal seismic reflection data using a wavelet-based approach: a case study from western Canada, *Geophysics*, **69**, 877-884.

Welford, J.K., Clowes, R.M., Ellis, R.M., Spence, G.D., Asudeh, I., and Hajnal, Z. (2001). Lithospheric structure across the craton-Cordilleran transition of northeastern British Columbia, *Canadian Journal of Earth Sciences*, **38**, 1169-1189. (cited 25 times on Scopus as of May 2011)

Invited talks:

Welford, J.K. Lithospheric density variations and Moho structure of the Irish Atlantic continental margin from constrained 3-D gravity inversion, Geophysics section, School of Cosmic Physics, Dublin Institute for Advanced Studies, Dublin, Ireland, July 8th, 2009.

Welford, J.K. Investigating Precambrian sills in the crystalline crust of Alberta, Canada, using industry-acquired deep 3-D seismic reflection data, Heiland Lecture Series, Colorado School of Mines, Golden, Colorado, USA, January 13th, 2005.

Extended abstracts for conference presentations:

* indicates speaker

Guigné, J., **Welford, J.K.**, and McDermott, I.* (2010). Volumetric, multi-fold acoustic interrogations of complex sub-seabeds, *European Association of Geoscientists and Engineers, Near Surface 2010*, Zurich, Switzerland, September 6-8, Abstract B39.

Welford, J.K.*, Hall, J., and O'Reilly, B.M. (2008). Lithospheric density variations and Moho structure of the Irish rifted continental margin from constrained 3D gravity inversion, *Central Atlantic Conjugate Margins Conference - Halifax 2008, Program and extended abstracts*, 323-334.

Welford, J.K.*, Smith, J., Hall, J., Deemer, S., Srivastava, S., and Sibuet, J.-C. (2008). Structure and rifting evolution on the northern Newfoundland Basin from Erable multichannel seismic reflection profiles across the southern margin of Flemish Cap, *Central Atlantic Conjugate Margins Conference - Halifax 2008, Program and extended abstracts*, 335-348.

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Dehler, S.A.*, and **Welford, J.K.** (2008). Variations in crustal thickness and extensional style along the Scotian margin, Atlantic Canada: constraints from seismic data and 3D gravity inversion, *Central Atlantic Conjugate Margins Conference - Halifax 2008, Program and extended abstracts*, 26-30.

Welford, J.K.*, Zhang, R., and Clowes, R.M. (2002). Ground roll removal from a deep 3-D reflection dataset using Physical Wavelet Frame Denoising, *Society of Exploration Geophysicists Expanded Abstracts*, **21**, 2162-2165.

Welford, J.K.*, and Clowes, R.M. (2000). Lithospheric structure across the Canadian Cordillera of northeastern British Columbia. GeoCanada2000 Meeting, Calgary, Alberta, Canada, May 28 - June 2.

Conference presentations:

* indicates speaker

Dehler, S.A.*, and **Welford, J.K.** (2010). Variations in rifting style and structure of the Scotian margin, Atlantic Canada, from 3-D gravity inversion. American Association of Petroleum Geologists (AAPG) 2010 Annual Convention and Exhibition, New Orleans, USA, April 11-14.

Welford, J.K.*, Smith, J., Hall, J., Deemer, S., Srivastava, S., and Sibuet, J.-C. (2009). Investigating Variations in Rifting Style Along the Southern Margin of Flemish Cap, Offshore Newfoundland: Results from the Erable Multichannel Seismic Reflection Experiment. AGU 2009 Joint Assembly, Toronto, Ontario, Canada, May 23-27.

Welford, J.K.*, Hall, J. (2007). Crustal structure of the Newfoundland rifted continental margin from constrained 3-D gravity inversion. Joint CMOS-CGU-AMS meeting, St. John's, NL, Canada, May 28 - June 1.

Welford, J.K.*, Hearn, E.H., and Clowes, R.M. (2006). The possible role of mid-crustal igneous sheet intrusions in cratonic arch formation. Canadian Geophysical Union Meeting, Banff, Alberta, Canada, May 13-16.

Welford, J.K.*, and Clowes, R.M. (2004). 3-D Imaging and modelling of the Precambrian Winagami Sill Complex in northwestern Alberta, Canada. Seismix2004, 11th International Symposium on deep seismic profiling of the continents and their margins, Mont Tremblant, Quebec, Canada, Sept. 26-Oct. 1.

Hammer, P.T.C.*, Clowes, R.M., **Welford, J.K.**, and Fernandez Viejo, G. (2004). Lithospheric structure in northwestern Canada: A synthesis of LITHOPROBE seismic refraction, wide-angle reflection and related studies. Seismix2004, 11th International Symposium on deep

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seismic profiling of the continents and their margins, Mont Tremblant, Quebec, Canada, Sept. 26-Oct. 1.

Welford, J.K.*, and Clowes, R.M. (2004). 3-D Imaging of the Precambrian Winagami Sill Complex in Northwestern Alberta, Canada: Continental Rebar Revealed? Joint Assembly of the American and Canadian Geophysical Unions, Montreal, Quebec, Canada, May 17-21.

Welford, J.K.*, and Clowes, R.M. (2003). Deep 3-D imaging of Precambrian sills in Alberta, Canada. Seismix2003, 10th International Symposium on deep seismic profiling of the continents and their margins, Taupo, New Zealand, January 6-11.

Clowes, R.M.* , Hammer, P.T.C., **Welford, J.K.**, and Fernandez-Viejo, G. (2003). Lithoprobe near-vertical to wide-angle seismic profiles across northwestern Canada: Comparison and interpretation. Seismix2003, 10th International Symposium on deep seismic profiling of the continents and their margins, Taupo, New Zealand, January 6-11.

Clowes, R.M.* , Hammer, P.T.C., **Welford, J.K.**, and Fernandez-Viejo, G. (2002) Lithoprobe near-vertical to wide-angle seismic profiles across the northern Canadian Cordillera: Comparison and interpretation. Geological Society of America Annual Meeting, Denver, Colorado, USA, October 27-30.

Welford, J.K.*, and Clowes, R.M. (2002). Imaging Precambrian reflectors in southwestern Alberta using an industry-acquired deep 3-D seismic reflection dataset. Scientific meeting of the Canadian Geophysical Union, Banff, Alberta, Canada, May 18-21.

Welford, J.K.*, and Clowes, R.M. (2001). Preliminary results of 3-D seismic reflection imaging of the crystalline crust of southwestern Alberta: The search for the southern extent of the Head-Smashed-In Reflector. Scientific meeting of the Canadian Geophysical Union, Ottawa, Ontario, Canada, May 14-17.

Welford, J.K.*, and Clowes, R.M. (1999). The Lithoprobe SNoRE '97 Experiment - Line 21: Velocity structure across the Cordillera of northeastern British Columbia from refraction and potential field data. Scientific meeting of the Canadian Geophysical Union, Banff, Alberta, May 9-13.

Welford, J.K.*, and Clowes, R.M. (1998). Velocity structure across the Canadian Cordillera of northeastern British Columbia - Preliminary results from Lithoprobe SNoRE '97 Experiment - Line 21. EOS, Transactions, American Geophysical Union, 1998 Fall Meeting, Vol. 79, No. 45, November 10, 1998/Supplement, p.F654.

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MISCELLANEOUS:

Contributions to the geophysical community:

- Reviewer for the *Canadian Journal of Earth Sciences, Geology, Geophysics* and *Geophysical Journal International*.
- Co-convener for the session “Seismic Studies of the Earth’s Crust: Current Work and the Future of Controlled-source Deep Crustal Studies?” at the AGU 2009 Joint Assembly, held in Toronto, Ontario from May 23rd to 27th.
- Member of the local organizing committee (in charge of French translation) for the 2007 Canadian Geophysical Union Annual Meeting (joint with CMOS and AMS), held in St. John’s, NL from May 28th to June 1st.
- Co-convener for the session “The North Atlantic rifted margin: geophysical processes and constraints” at the 2007 Canadian Geophysical Union Annual Meeting (joint with CMOS and AMS).

University departmental contributions:

- Grad representative to the Safety and Security Committee (EOS-UBC) 1999-2004
- Grad representative to the Public Relations Committee (EOS-UBC) 2002-2003
- Christmas party organizer (EOS-UBC) 2001
- Undergraduate Society President (EPS-McGill) 1996-1997

Extracurricular activities:

- Eastern Edge 19+ Women’s Ice Hockey League, St. John’s, NL 2008-2009
- Pottery, Devon House Clay Studio, St. John’s, NL 2006-2007
- Female Intramural Ice Hockey Team, UBC (Captain/Player) 1997-2005
- Female Intramural Ice Hockey Team, McGill University 1996-1997
- Model United Nations Club President/Member, John Abbott College 1992-1994

Computing skills:

- Experience with Unix (Linux, Ubuntu, Mac OSX, FreeBSD and Solaris), Windows and DOS operating systems
- Seismic processing experience with Globe Claritas (2-D and 3-D), the Colorado School of Mines’ Center for Wave Phenomena’s Seismic Unix (SU), Landmark’s PROMAX, Landmark/ITA’s INSIGHT, GEDCO’s Vista and BP-Amoco’s FreeUSP

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- Seismic/geophysical interpretation, 3-D visualization and earth model building experience with Gocad, the Kingdom Suite software from Seismic Micro, CGGVeritas' AVO and GLI3D software and Landmark's Seisworks and Geoprobe software
- Programming experience in Fortran, Matlab, C and Turbo-Pascal
- Graphical skills in GMT, Canvas, Islanddraw, CorelDraw, Xfig and Arcview

Languages:

- Fluently bilingual in French and English (speaking, reading, writing)