Will Fortin

UNIVERSITY OF WYOMING

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Prof. Dr. Heiner Igel and the Department of Earth and Environmental Sciences,

Please accept my application for the postdoctoral position in geophysics/seismology. Below you will find my Curriculum Vitae and references.

As a researcher, I enjoy tackling difficult and fundamentally important problems of high scientific and societal importance. My focus is always contained in two questions: *What is the major question being answered with this work?* and *Why is it important that we answer this major question?* My Ph.D. dissertation is concerned with the extraction of as much detailed information as possible, in a quantitative manner, from seismic data. I have applied these issues to both marine geology in the Cascadia Subduction Zone and the oceanic water column at various global locations.

I am a strong candidate for this position due to my previous experience in seismic data collection, processing, and interpretation. Specifically, my research is currently focused on full waveform seismic velocity inversion, yielding highly detailed velocity models of the Cascadia Subduction Zone. The resultant velocity model, inverted at subsurface sampling of 6.25m laterally and ~0.2 dominant frequency vertically, produces a high quality pre-stack depth migrated seismic image for use in interpreting structure. The final velocity model will also be used to help determine the role of fluids in the geographic setting.

My work related to velocity modeling and seismic imaging is distinguished among my peers. At the 2012 AGU meeting, I won an Outstanding Student Paper Award for my work in seismic imaging of the Cascadia Subduction Zone. I also took the lead role in writing a collaborative, three-institution National Science Foundation grant for continued work characterizing the CSZ funded for USD $373,880. As a student, the grant was awarded to my advisor; however, it represents my passion and dedication to understanding critical crustal geology and its impact on both science and society.

Looking ahead to the near future, I anticipate continuing my research in seismology by mastering new skills to supplement the ones I have developed in graduate school. Specifically, I intend to adapt my work in velocity inversion to include more terrestrial data to investigate new and larger scale problems. On a longer timescale, I see my career trajectory trending toward interdisciplinary study and the big questions only combined efforts can address. I have preferred interdisciplinary work since my undergraduate research in physics and philosophy, and continued the trend in graduate school by using seismology for both geology and oceanography.

My research skills, interests, and goals are well matched to members of the Geophysics Section of the Department of Earth and Environmental Sciences. Scientists working with velocity inversion and tomography, such as Karin Sigloch and Briant Kennett, would make natural collaborators. Additionally, the computing facilities and interaction with experts in advanced computing at LMU could drive my work in new, exciting directions.

My doctoral graduation is anticipated in May 2014 and will yield an additional 3 first-author and 2 co-authored publications.

Thank you for your consideration,

Will Fortin February 2014

Will Fortin - *Curriculum Vitae*

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Academic Credentials

University of Wyoming, Laramie, WY
Ph.D. Candidate, Anticipated 2014 — Advisor: W. Steve Holbrook

Woods Hole Oceanographic Institution
Visiting Graduate Student, Fall 2009 — Advisor: Ray Schmitt

Denison University, Granville, OH
B.S. – Physics, May 2007
B.A. – Philosophy, May 2007

Refereed Publications

Fortin, W.F.J. and Holbrook, W. S.: Sound speed requirements for optimal imaging of seismic oceanography data, Geophys. Res. Lett., 36, L00D01, doi:10.1029/2009GL038991, 2009.

Other Publications

Padhi, A., Mukhopadhyay, P., Blacic, T., **Fortin, W.,** Holbrook, S. and Mallick, S.: Prestack waveform inversion for the water column velocity structure: The present state and the road ahead, Soc. Expl. Geophys, 29, pp2845-2849, 2010.

Fortin, W.F.J., Holbrook, W.S., Schmitt, R., Smith, S.: Mapping Non-Local Turbulent Breakdown of Oceanic Lee Waves Offshore Costa Rica Through Seismic Oceanography, Proceedings of Meeting on Acoustics, 2013.

Prepared: **Fortin, W.F.J.,** Holbrook, W. S., Schmitt, R., and St.Laurent, L.: Mapping turbulent diffusivity associated with oceanic internal waves offshore Costa Rica. For: Oceanography

Prepared: Beeson, J.W., Goldfinger, C., **Fortin, W.F.J.**: Submarine Erosional Features on the Cascadia Frontal Thrust: Insights into New Erosional Processes on the Cascadia Margin. For: Nature Geosciences

Prepared: Padhi, A., **Fortin, W.F.J.,** Mallick, S., Holbrook, W.S.: Two dimensional temperature and salinity images from prestack waveform inversion methods: an example from the South China Sea. For: JASA

Academic Presentations

American Geophysical Union: *Poster* December 2013 San Francisco, CA, USA. *Detailed Seismic Velocity Structure of the Cascadia Subduction Zone from Prestack Waveform Inversion.*

Mini-Workshop on Seismic Oceanography: *Section Leader.* June 2013 Montreal, QC, Canada.

International Congress on Acoustics: *Talk.* June 2013 Montreal, QC, Canada. *Mapping Non-Local Turbulent Breakdown of Oceanic Lee Waves Offshore Costa Rica.*

Wyoming Geological Association: *Invited Talk.* March 2013 Casper, WY, USA. *Strategies in marine reflection seismic imaging of the unusual Cascaida Subduction Zone.*

Marcus Langseth Science Oversight Committee: *Invited Student Talk.* December 2012 San Francisco, CA, USA. *MGL 12-12 Cascadia Open-Access Seismic Transects (COAST).*

American Geophysical Union: *Poster* December 2012 San Francisco, CA, USA. *Seismic Imaging of the Cascadia Subduction Zone with Four Source Array Configurations.*

AGU Ocean Sciences: *Poster* February 2012 UT, USA. *Internal wave energy and turbulent breakdown of lee waves generated offshore Costa Rica through seismic oceanography.*

ESF Exploratory Workshop: *Poster* November 2008 Girona, Spain. *To Pick or not to Pick: Accuracy and Utility of Sound Speed Models in Processing Seismic Oceanography Data.*

Industry Experience

Chevron Corporation, *Professional Intern,* July-September 2010. Energy Technology Company, Rock Properties from Seismic Team. I developed a workflow for building detailed Earth models used in forward seismic modeling.

Chevron Corporation, *Professional Intern,* May-July 2009. Energy Technology Company, Velocity Modeling Services. I examined the uncertainty in seismic images as a result of the tradeoff between seismic velocity and anisotropic parameters.

Grants Won

UNOLS Chief Scientist Training Program: *$1,500.* Fall 2013.

*Student-Lead Participation in Writing**:*** **National Science Foundation:** ***Collaborative Research: Imaging plate boundary processes within the Cascadia subduction zone offshore central Washington with open-access marine seismic data*** *$373,880 ($133,973 to W.S. Holbrook at U. Wyoming).* 2013-2015.

Young Scholar Summer Research Program: *$3,000.* Summer 2006.

Denison University Research Foundation: *$3,000.* Summer 2005.

Anderson Scholarship for Research: *$3,000.* Summer 2004.

Honors

Outstanding Student Paper Award – American Geophysical Union 2012

Advisory board to the Dean of the College of Arts and Sciences, University of Wyoming Central Committee 2012-2013

Sigma Pi Sigma, National Physics Honor Society

Service Award, University of Wyoming, Geology and Geophysics, 2013

Senior Fellow, Denison University Philosophy department 2007

Junior Fellow, Denison University Physics department 2006

University of Wyoming Spotlight, *UW Graduate Student Participates in Chief Scientist Training Program.* 2013

University of Wyoming Student Profile, *Will Fortin (Ph.D.): An Adriatic Cruise.* 2009

Heritage Scholarship Recipient 2003-2007

Major Field and Sea-Going Experience

R/V Endeavor, October 2013. UNOLS Chief Scientist Training Program. Oceanographic research and training cruise where I examined the flow interaction with bathymetry in the Middle Atlantic Bight. I was responsible for all onboard acoustic instruments and data.

R/V Marcus Langseth, July 2012. Two-week open access, open participation, seismic cruise investigating the features of the Cascadia Margin, specifically the subducting plate location and shape. I was responsible for managing and instructing the science party in seismic data processing as well as all planning and execution of seismic oceanography research on board. I attended all P.I. meetings.

R/V Atlantis, August 2011. Three-week research cruise: I was primarily responsible for the data collection and processing of the EM122 multibeam echosounder. I also had watchstanding responsibilities for the *ROV Jason* and helped in data management and processing for thermal blankets.

R/V Urania, March 2009. Three weeks aboard an Italian research vessel participating in traditional oceanographic data collection as well as seismic data collection. Responsible for monitoring seismic data collection and assisting with turbulence and microstructure data collection

R/V Marcus Langseth, March – April 2008. One-month Pacific cruise offshore Costa Rica and Nicaragua. I planned three seismic lines for my graduate research project and managed all expendable instrument data collection

R/V Marcus Langseth, February – March 2008. One-month cruise off the Atlantic coast of Costa Rica and Nicaragua. In addition to watchstanding, I developed, managed, and implemented methods for launching expendable instruments for the first time on this vessel

Research Experience

Graduate Research: University of Wyoming, geophysics, 2007-current:

Using Reflection Seismology to Investigate the Structure of the Water Column. I am examining mesoscale oceanic features through seismic oceanography. In particular, I am quantifying oceanic turbulence through spectral methods and full-waveform inversion techniques to study temperature and salinity structures.

Detailed Seismic Velocity Structure of the Plate Boundary, Cascadia Subduction Zone, from Prestack Waveform Inversion. I am investigating seismic survey parameters to best image the subducting oceanic plate interface at the Cascadia Subduction Zone and performing prestack full-waveform inversions to create highly detailed velocity maps for use in studying the role of fluids in subduction systems.

For more information please see my webpage: www.willfortin.com

Undergraduate: Denison University, computational astrophysics, philosophy, 2004-2007

Young Scholar, philosophy, 2006: **Quantum Mechanics: Physical Interpretations and Philosophical Consequences**. I examined different interpretations of quantum mechanics to make a philosophical argument for a Bohmian interpretation of causality.

Denison University Research Foundation Scholar, computational astrophysics, 2005: **Modeling Star Formation: 3-D Visualizations of Gaseous and Dusty Clouds**. I generated temperature and density models of gaseous, dusty, star-forming clouds then created realistic 3-D images and movies useful for seeing changes around structures in the model.

Anderson Scholar, computational astrophysics, 2004: **Effect of Gas on Temperature and Density in 3-D Star-Forming Clouds**. I wrote computer programs that calculated how the gaseous components of star-forming clouds affect the temperature and density structures both locally and globally in 3 dimensions.

International Experience

Six years living in Singapore 1992-1994, 1999-2001
Acquainted with French and Mandarin Chinese languages

Leadership Experience

Central Committee: Dean's advisory board, U. of Wyoming 2012-2013
Secretary, Society of Exploration Geophysicists, U. of Wyoming Chapter 2011-2012
Vice President, Sigma Pi Sigma/Society of Physics Students, Denison Chapter 2005-2006
Vice President, Delta Chi Fraternity, Denison Chapter 2006
Editor-in-Chief, Episteme International Journal of Undergraduate Philosophy, 2007

Professional Affiliations

American Geophysical Union
Society of Exploration Geophysicists

Research Skills

Programming Languages: MATLAB, Fortran
Software Packages: MB, Paradigm Suite, Promax, GOCAD, GMT, SIOSEIS, Microsoft Office
Operating Systems: UNIX, Linux Red Hat, OS X, Windows

Teaching Experience

Substitute Lecturer University of Wyoming for three courses: Oceanography, Reflection Seismology, and Remote Sensing, 2007-2013
Undergraduate Teaching Assistant for nine courses including: Introductory Astronomy, Introductory Physics for majors, Introductory Physics for non-majors, Honors Physics and the Sound of Music, Denison University 2004-2007
Undergraduate Tutor for Introductory Physics, Denison University 2006

Academic Workshops

UNOLS Chief Scientist Training Program: October 2013 University of Rhode Island
Mini-Workshop on Seismic Oceanography: June 2013 Montreal, QC, Canada
GeoPRISMS Cascadia Mini-Workshop: December 2012 San Francisco, CA, USA
Future of Marine Seismology: March 2010 Lake Tahoe, NV, USA
1st ESF Exploratory Workshop on Seismic Oceanography: Nov. 2008 Girona, Spain.

Professional Courses Taken

"Launching an Academic Career" taught by Jeff McDonnell, U. of Saskatchewan, December, 2012
Ancient Carbonates Field Trip. Lead by Steve Bachtel, ConocoPhillips. May 19-23, 2008.
"Seismic Interpretation" taught by Peter Henning, ConocoPhillips. September 2007

Extra-Curricular

Society of Exploration Geophysicists, UW chapter 2010-2012
Geology Club & AAPG, UW Chapter 2007-2010
D-III Varsity Cross Country, Indoor & Outdoor Track 2003-2005

References

Dr. W. Steve Holbrook – *Graduate Advisor*
University of Wyoming
1-307-766-2427
steveh@uwyo.edu

Dr. Raymond Schmitt – *Graduate Committee Member in Seismic Oceanography*
Woods Hole Oceanographic Institution
rschmitt@whoi.edu

Dr. Harold Tobin – *Collaborator in Subduction Science and Velocity Modeling*
University of Wisconsin
htobin@geolog.wisc.edu