

# Allen K. McNamara

## Curriculum Vitae

School of Earth and Space Exploration  
Arizona State University  
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### Education

- Ph.D., Geophysics**, Department of Geological Sciences, **University of Michigan**, 2002.  
Dissertation Title: *Geodynamical Modeling of Mantle Convection to Investigate Mantle Layering and the Cause of Lower Mantle Anisotropy.*  
Advisor: Peter E. van Keken  
Committee Members: Rob Van der Voo, Carolina Lithgow-Bertelloni, Lars Stixrude, and Charlie Doering.
- M.S., Geology**, Department of Geological Sciences, **University of Michigan**, 1998.  
Thesis Title: *West African Proximity of Avalon in the Latest Precambrian.*  
Advisors: Rob Van der Voo and Ben van der Pluijm.
- B.S., Physics**, Department of Physics, **Michigan State University**, 1996.
- B.S., Geology**, Department of Geology, **Michigan State University**, 1996.

### Professional Employment

School of Earth and Space Exploration, Arizona State University  
Associate Professor, 2010 - present  
Assistant Professor, 2004 – 2010

Department of Physics, University of Colorado  
Postdoctoral Research Associate, 2002 - 2004  
Research Mentor: Shijie Zhong

Department of Geological Sciences, University of Michigan  
Graduate Research Assistant, 1996-2002  
Graduate Student Instructor, 1996-2002

**Publications** (Graduate students are shown in green font)

Williams, C.D., M. Li, A.K. McNamara, E.J. Garnero, and M.C. van Soest, Episodic entrainment of deep primordial mantle material into ocean island basalts, *Nature Communications*, in revision.

Allu Peddinti, D., and A.K. McNamara, Material transport across Europa's Ice Shell, *Geophysical Research Letters*, in revision.

Zhao, C., E.J. Garnero, A.K. McNamara, N. Schmerr, and R. W. Carlson, Chemically distinct, stable and long-lived thermochemical reservoirs in Earth's deep mantle, *Earth and Planetary Science Letters*, in revision.

Hernlund, J.W., and A.K. McNamara, The Core-Mantle Boundary Region, in *Treatise on Geophysics Volume 8: Mantle Dynamics*, editors: D. Bercovici and G. Schubert, in press.

Li, M., A.K. McNamara, and E.J. Garnero, Chemical complexity of hotspots caused by cycling oceanic crust through mantle reservoirs, *Nature Geoscience*, 7, 336-370, doi:10.1038/ngeo2120, 2014.

Cottaar, S., M. Li, A.K. McNamara, H.-R. Wenk, and B. Romanowicz, Synthetic seismic anisotropy models within a slab impinging on the core-mantle boundary, *Geophysical Journal International*, 199, 164-177, 2014.

Li, M., and A.K. McNamara, The difficulty for subducted oceanic crust to accumulate in upwelling mantle plume regions, *Journal of Geophysical Research*, 118, 1-10, doi:10.1002/jgrb.50156, 2013.

Thorne, M.S., E.G. Garnero, G. Jahnke, H. Igel, and A.K. McNamara, Mega Ultra Low Velocity Zone and mantle flow, *Earth and Planetary Science Letters*, 364, 59-67, 2013.

Wenk, H.-R., S. Cottaar, C.N. Tome, B. Romanowicz, and A.K. McNamara, Deformation in the lowermost mantle: from polycrystal plasticity to seismic anisotropy, *Earth and Planetary Science Letters*, 306, 33-45, 2011.

Garnero, E.J., A.K. McNamara, J.A. Tyburczy, Structure of Earth's lower mantle, in H.K. Gupta, editor, *Encyclopedia of Solid Earth Geophysics*, Springer Science+Business B.V., 154-159, 2011.

McNamara, A.K., E.J. Garnero, and S. Rost, Tracking deep mantle reservoirs with ultra low velocity zones, *Earth and Planetary Science Letters*, 299, 1-9, 2010.

Bull, A.L., A.K. McNamara, T.W. Becker, and J. Ritsema, Global scale models of the mantle flow field predicted by synthetic tomography models, *Physics of the Earth and Planetary Interiors*, 182, 129-138, 2010.

Schmerr, N., E.J. Garnero, and **A.K. McNamara**, Deep mantle plumes and convective upwelling beneath The Pacific Ocean, *Earth and Planetary Science Letters*, 1-2, 143-151, 2010.

Lassak, T.M., **A.K. McNamara**, E.J. Garnero, and S. Zhong, Core-mantle boundary topography and mantle dynamics, *Earth and Planetary Science Letters*, 289, 232-241, 2010.

Zhang, N., S. Zhong, and **A.K. McNamara**, Supercontinent formation from stochastic collision and mantle convection models, *Gondwana Research*, 15, 267-275, 2009.

Bull, A.L., **A.K. McNamara**, and J. Ritsema, Synthetic tomography of plume clusters and thermochemical piles, *Earth and Planetary Science Letters*, 278, 152-162, 2009.

Garnero, E. J., **A.K. McNamara**, Structure and dynamics of Earth's lower mantle, *Science*, 320, 626-628, 2008.

Zhong, S., **A.K. McNamara**, E. Tan, L. Moresi, and M. Gurnis, A benchmark study on mantle convection in a 3-D spherical shell using CitcomS, *Geochemistry, Geophysics, Geosystems*, 9, Q10017, doi:10.1029/2008GC002048, 2008 .

Merkel, S., **A.K. McNamara**, S. Speziale, L. Miyagil, A. Kubo, Y. Meng, T.S. Duffy, and H.-R. Wenk, Deformation of (Mg,Fe)SiO<sub>3</sub> post-perovskite and modeling of D" anisotropy, *Science*, 316, 1729-1732, 2007.

Lassak, T.M., **A.K. McNamara**, and S. Zhong, Influence of thermochemical piles on topography at the Earth's core-mantle boundary, *Earth and Planetary Science Letters*, 261, 443-455, 2007.

Ritsema, J., **A.K. McNamara**, and A.L. Bull, Tomographic filtering of geodynamical models, *Journal of Geophysical Research*, 112, B01303, doi: 10.1029/2006JB004566, 2007.

Garnero, E. J., T. Lay, and **A.K. McNamara**, Implications of lower mantle structural heterogeneity for existence and nature of whole mantle plumes, in **Plates, Plumes, and Planetary Processes**, editors: G.R. Foulger and D.M. Jurdy, GSA Special Paper 430, 2007.

Garnero, E.J., M.S. Thorne, **A.K. McNamara**, and S. Rost, Fine-scale ultra-low velocity zone layering at the core-mantle boundary and superplume, in **Superplumes: Beyond Plate Tectonics** , editors: Yuen, D.A., S. Maruyama, S.-I. Karato, B.F. Windley, XIV, 569 p., Springer, 2007.

Wenk, H.R., S. Speziale, **A.K. McNamara**, and E.J. Garnero, Modeling anisotropy development in the lower mantle, *Earth and Planetary Science Letters*, 245, 302-314, 2006.

Ford, S.R., E.J. Garnero, and A.K. McNamara, A strong lateral shear velocity gradient and anisotropy heterogeneity in the lowermost mantle beneath the southern Pacific, *Journal of Geophysical Research*, 111, B3, B03306, doi:10.1029/2004JB003574, 2006.

McNamara, A.K., and S. Zhong, Thermochemical Structures Beneath Africa and the Pacific, *Nature*, 437, p1136-1139, 2005.

McNamara, A.K., and S. Zhong, Degree-One Mantle Convection: Dependence on internal heating and temperature-dependent rheology, *Geophysical Research Letters*, 32, L01301, doi:10.1029/2004GL021082, 2005.

McNamara, A.K., and S. Zhong, Thermochemical structures within a spherical mantle: Superplumes or Piles?, *Journal of Geophysical Research*, 109, B07402, doi:10.1029/2003JB002847, 2004.

McNamara, A.K., and S. Zhong, The influence of thermochemical convection on the fixity of mantle plumes, *Earth and Planetary Science Letters*, 222, 485-500, 2004.

Podolefsky, N.S., S. Zhong, and A.K. McNamara, The anisotropic and rheological structure of the oceanic upper mantle from a simple model of plate shear, *Geophysical Journal International*, 158, 287-296, 2004.

McNamara, A.K., P.E. van Keken, and S. Karato, Lattice-Preferred Orientation near the core-mantle boundary; a likely mechanism to produce seismic anisotropy, *Journal of Geophysical Research*, 108, B5, 2230, doi:1029/2002JB0011970, 2003.

McNamara, A.K., Geodynamical Modeling of Mantle Convection to Investigate Mantle Layering and the Cause of Lower Mantle Anisotropy, *Ph.D. Dissertation, University of Michigan*, 2002.

McNamara, A.K., P.E. van Keken, and S. Karato, Development of anisotropic structure by solid-state convection in the Earth's lower mantle, *Nature*, v 416, 310-314, 2002.

Mac Niocail, C., van der Pluijm, B.A., Van der Voo, R., and McNamara, A.K., West African proximity of Avalon in the latest Precambrian; Reply to Discussion by Murphy et al., *Geological Society of America Bulletin*, v 114, 1051-1052, 2002.

McNamara, A.K., S. Karato, and P.E. van Keken, Localization of dislocation creep in the lower mantle: Implications for the origin of seismic anisotropy, *Earth and Planetary Science Letters*, 191, 85-99, 2001.

McNamara, A.K., C. Mac Niocail, B.A. van der Pluijm, and R. Van der Voo, West African proximity of Avalon in the Latest Precambrian, *Geological Society of America Bulletin*, 113, 1161-1170, 2001.

**McNamara, A.K.** and P.E. van Keken, Cooling of the Earth: A parameterized convection study of whole vs. layered models, *Geochemistry, geophysics, geosystems*, 1, Paper number 2000GC000045, 2000.

Ruff, L.J. and **A.K. McNamara**, Rupture process of the August 17,1999 Izmit, Turkey Earthquake: Comparison with other large strike-slip earthquakes, *in The 1999 Izmit and Duzce Earthquakes: preliminary results*, edited by Aykut Barka, 2000.

## **Research Funding**

### **Funded Proposals**

*Currently Active:*

NASA **\$6,097,437**. Nexus for Exoplanet System Science: Exoplanetary Ecosystems: Exploring Life's Detectability on Chemically Diverse Exoplanets, 2015-2019, PI: Desch, multiple CoIs, including **McNamara (4%)**.

NSF-EAR **\$95,653**. CSEDI Collaborative Research: A multidisciplinary approach to investigate the origin of anisotropy at the base of the mantle, 2015-2018, **ASU PI: McNamara (100%)**, Berkeley PIs (separate budget): Romanowicz, Wenk, Militzer.

NSF-EAR **\$550,121**. CSEDI: Collaborative Research: Deep Mantle Cycling of Oceanic Crust, 2014-2016, PI: Garnero (34%), CoPIs: **McNamara (33%)**, Shim (33%).

NSF-EAR **\$220,326**. CSEDI: Structure and dynamics of Large-Scale Lower Mantle Compositional Heterogeneity, 2012-2015, PI: Garnero (60%), **CoPI: McNamara (40%)**.

NSF-EAR, **\$112,532**. CSEDI collaborative research: a multidisciplinary approach to investigate the origin of seismic anisotropy at the base of the mantle, 2011-2015, **ASU PI: McNamara (100%)**, Berkeley PIs (separate budget): Romanowicz, Wenk, Militzer.

NSF-EAR, **\$303,148**. Investigating the cause and significance of Ultra Low Velocity Zones, 2011-2014, **PI: McNamara (100%)**.

NASA, **\$580,576**. Modeling Thermochemical Convection of Europa's Icy Shell, 2010-2014, **PI: McNamara (75%)**, CoIs: Zolotov, Greeley (25%).

*Completed:*

NSF-EAR, **\$247,645**. An investigation into the compositionally heterogeneous plume clusters in 3D spherical geometry, 2009-2013, **PI: McNamara (100%)**.

NSF-EAR, **\$20,000**. 11<sup>th</sup> International Workshop on the Modeling of Mantle Convection, 2009, **PI: McNamara (100%)**.

NSF-EAR/IF, **\$75,000**. Acquisition of Linux PC cluster for joint geodynamical and seismological research at Arizona State University, 2008-2011, **PI: McNamara (50%)**, coPIs: Fouch (25%), Garnero (25%).

NSF-EAR, **\$200,000**. An investigation into thermochemical piles beneath Africa and the Pacific, 2005-2009, **PI: McNamara (100%)**.

NSF-EAR, **\$178,946**. CSEDI collaborative research: Investigating the relationship between plume dynamics and ULVZ geometry, 2005-2008, **PI: McNamara (50%)**, coPI: Garnero (50%).

### **Other Funded Proposals**

NSF, **\$5.0M**, FESD Type I: The Dynamics of Earth System Oxygenation, 2013-2018, PI: Ariel Anbar, [I am an official “**collaborator**” on the project].

NASA, **\$5.9M**, Follow the Elements, 2009-2014, PI: Ariel Anbar, [I am an official “**collaborator**” on the project].

### **Invited Presentations**

- Seismological Laboratory, California Institute of Technology, February 2015, *Seismolab Seminar*.
- Department of Geological Sciences, Michigan State University, January, 2015.
- Department of Earth and Planetary Science, UC Berkeley, January 2015, *Department Colloquium*.
- Department of Earth Sciences, ETH Zurich, November, 2014.
- Department of Geological Sciences, Michigan State University, November, 2014.
- Goldschmidt Conference, Sacramento, CA, June, 2014, *Invited, but moved to contributed upon session merge*.
- CIDER Workshop, Santa Barbara, CA, *Invited Lecture*, July, 2014.
- AGU, Fall Meeting, San Francisco, December 2013. *Invited Presentation*.
- Department of Physics, University of Toronto, September 2013, Department Colloquium.

- Numerical Modeling of Mantle and Lithospheric Dynamics Workshop, Davis, CA, *Invited Speaker*, July 2012.
- PGP, University of Oslo, May 2012, *Kongsberg Seminar*.
- Department of Geoscience, University of Nevada Las Vegas, April 2012, *Department Colloquium*.
- School of Earth and Environmental Sciences, Washington State University, March 2012, *Department Colloquium*.
- AGU, Fall Meeting, San Francisco, December 2011, *Invited Presentation*.
- Department of Geology and Geophysics, University of Utah, November 2011.
- European Geosciences Union 2011 General Assembly, Vienna, Austria, April 2011, *Invited Presentation*.
- Seismological Laboratory, California Institute of Technology, February 2011, *Dix Seminar*.
- Department of Earth and Planetary Sciences, UC Santa Cruz, December 2010. *CODEP Colloquium*.
- School of Earth and Space Exploration, Arizona State University, October 2010, *Department Colloquium*.
- GLADE Meeting, La Jolla, CA, July 2010, *Invited Speaker*.
- SEDI Meeting, Santa Barbara, CA, July 2010, *Invited Speaker*
- AGU, Fall Meeting, San Francisco, December 2009. *Invited Presentation*.
- Gordon Research Conference, Interior of the Earth, June 2009, *Invited Speaker*.
- Department of Earth and Ocean Sciences, University of British Columbia, March 2009. *Department Colloquium*.
- AGU, Fall Meeting, San Francisco, December 2008. *Invited Presentation*.
- Department of Earth and Space Sciences, UCLA, December 2008. *Department Colloquium*.
- Department of Earth and Planetary Science, UC Berkeley, November 2008. *Department Colloquium*.
- Department of Geosciences, Stony Brook, October 2008. *Department Colloquium*.
- Goldschmidt Conference, Vancouver, BC., *Keynote Speaker*, July, 2008.
- Numerical Modeling of Mantle and Lithospheric Dynamics Workshop, Davis, CA, *Invited Speaker*, July, 2008.
- AGU, Fall Meeting, San Francisco, December 2007. *Invited Presentation*.
- Department of Geological Sciences, University of North Carolina, Chapel Hill, March 2007. *Department Colloquium*.
- COMPRES Meeting, Snowbird, UT, *Keynote Speaker*, June 2006.
- CIG numerical modeling workshop, Boulder, CO, June 2005. *Invited Speaker*.
- AGU, Spring Joint Session, New Orleans, May 2005. *Invited Presentation*.
- Department of Geological Sciences, University of California, Davis, May 2005. *Department Colloquium*.
- Department of Physics, New Mexico State University, October 2004. *Department Colloquium*.

- Seismological Laboratory, California Institute of Technology, April 2004. *Department Colloquium.*
- Department of Geological Sciences, Arizona State University, February 2004.
- Department of Geophysical Sciences, University of Chicago, February 2004.
- Department of Earth and Planetary Sciences, Washington University, November 2003.

## **Graduate Student Committees**

### **My graduate students:**

#### **Primary**

Abigail Bull PhD. (2004-2009) *Defended on May 21, 2009*

*Abigail was awarded an AGU Outstanding Student Paper Award for her Fall AGU 2007 oral presentation on her PhD research.*

Teresa Lassak PhD. (2004-2009) *Defended on June 1, 2009*

Mingming Li, PhD. (2010-2014) *Defended on Dec 4, 2014.*

*Mingming was awarded an AGU Outstanding Student Paper Award for her Fall AGU 2013 poster presentation on his PhD research.*

Divya Allupeddinti, PhD (Spring 2011 - present)

*Divya was awarded an AGU Outstanding Student Paper Award for her Fall AGU 2012 poster presentation on her PhD research.*

Nicole Marin, MS (Fall 2014 – present)

#### **Co-advised, Second Projects**

Curtis Williams, PhD [with *Mini Wadhwa*](defended 2014)

Hongyu Lai, PhD [with *Ed Garnero*]

## **Service**

### **Community**

2015- American Geophysical Union Council, President-elect (elected) of *Studies of Earth's Deep Interior Focus Group.*

2014, Computational Infrastructure for Geodynamics (CIG), Organizing committee for the CIG Mantle and Lithospheric Dynamics Workshop, held in Banff, Alberta, Canada.

2014, 2013, 2012, American Geophysical Union, Secretary (elected) of *Studies of Earth's Deep Interior Focus Group.*



2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, American Geophysical Union, Executive Committee member of *Studies of Earth's Deep Interior Focus Group*.

2012, 2011, External Mentoring Program, Washington State University.

2009, National Science Foundation, *Geophysics Panel*.

2009, 2008, American Geophysical Union, Fall Meeting Planning Committee, chair of *Studies of Earth's Deep Interior Focus Group*.

2009, American Liaison and NSF proposal writer, for the 11<sup>th</sup> *International Workshop on modeling of mantle convection and lithosphere dynamics*

### **Session Organizer**

2015, IUGG, IASPI session: *Mantle and Core Structure and Dynamics*.

2014, Goldschmidt, *Chemical Composition of Earth's Mantle*.

2013, Fall AGU, DI session: *New Constraints on the Structure and Dynamics of the Lower Mantle*.

2013, Fall AGU, V session: *Earth System Oxygenation: An Inside Job?*.

2010, Fall AGU, DI session: *Earth's Lower Mantle: New Insights from Geophysics, Mineral Physics, Geodynamics, and Geochemistry*.

2008, Goldschmidt, *New Frontiers for geochemical reservoirs*.

2007 Fall AGU, Union session: *Structure and processes in the lower mantle and at the core-mantle boundary*.

2006, Fall AGU, Union session: *New Views of the Core Mantle Boundary Region*.

2004 Fall AGU, Tectonophysics session: *Anisotropy, Heterogeneity, and Flow: Geodynamics, Seismology, and Mineral Physics in the Lowermost Mantle*.

### **Department/University Service**

2014, 2013, 2012, School of Earth and Space Exploration, Graduate Student Oversight committee (chair in 2014-2015).

2013, 2012, 2011, School of Earth and Space Exploration, Graduate Student Recruiting committee (chair in 2012-2013).

2013, 2012, School of Earth and Space Exploration, faculty search committee (seismology position).

2012, 2011, School of Earth and Space Exploration, faculty search committee (geodesy position).

2012, 2011, 2010, 2009, School of Earth and Space Exploration, Undergraduate Student Oversight committee

2011, School of Earth and Space Exploration, IT staff search committee.

2011, 2010, 2009, 2008, 2007, School of Earth and Space Exploration, Computing Committee.

2008, School of Earth and Space Exploration, IT manager search committee.

2007, School of Earth and Space Exploration, IT manager search committee.

## **Teaching**

**GLG 101 Introduction to Physical Geology** Spring 2005, Spring 2006, Summer 2009, Fall 2009.

**GLG 410 Computers in Geology** Fall 2005.

**GLG 598 Understanding the Earth's Interior Seminar** Spring 2006.

**GLG 419 Geodynamics** Fall 2007, Spring 2009, Spring 2013, Spring 2015.

**GLG 598 Numerical Methods in Geophysics** Spring 2007, Spring 2010, Spring 2014.

**GLG 418 Geophysics** Fall 2007, Fall 2008, Fall 2011, Fall 2012, Fall 2013, Fall 2014.

**GLG 494/598 Dynamics: Elastic and Ductile Deformation**, Spring 2011.

## **Meeting Abstracts**

McNamara, A., M. Li, and E. Garnero, ULVZ locations can provide insight into their cause, 2015 IUGG General Assembly, Prague, Czech Republic, June 22-July 2, 2015 [invited].

McNamara, A., M., Li, Investigating potential causes for an abrupt change of thermal state in the Earth's upper mantle during the great oxygenation event, 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec., 2014.

Li, M., A. McNamara, E. Garnero, Interaction between LLSVPs and ULVZs and its implications for the origin of ULVZs, 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec., 2014 [invited].

Allu Peddinti, D., A. McNamara, Reaching Europa's surface: erosion of the viscous lid by compositional plumes with implications for ocean-surface material exchange, 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec., 2014.

Li, M., A. McNamara, E. Garnero, Interaction between mantle plumes, subducted oceanic crust, and primordial reservoirs at Earth's lowermost mantle, 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec., 2014 [invited].

Garnero, E., A. McNamara, D. Shim, LLSVP, 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec., 2014.

Cottaar, S., M. Li, A. McNamara, B. Romanowicz, H.-R. Wenk, The role of post-perovskite in explaining observations of seismic anisotropy, 2014 Fall Meeting, AGU, San Francisco, Calif., 15-19 Dec., 2014.

Li, M., A. McNamara, and E. Garnero, Investigating the origin of ultra-low velocity zones, Goldschmidt, Sacramento, CA, May, 2014.

McNamara, A., M. Li, C. Williams, E. Garnero, and M. Van Soest, The interaction of subducted oceanic crust with long-lived compositional reservoirs in the deep mantle, Goldschmidt, Sacramento, CA, May, 2014.

Cottaar, S., M. Li, A.K. McNamara, B.A. Romanowicz, and H.-R. Wenk, Splitting predictions for synthetic anisotropy models in the lowermost mantle beneath a slab, 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec., 2013.

McNamara, A.K., M. Li, C. Williams, and E.J. Garnero, Investigating the Interaction Between Long-lived Compositional Reservoirs and Subducted Oceanic Crust, 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec., 2013 [invited].

Li, M., A.K. McNamara, and E.J. Garnero, Three dimensional morphology and dynamics of ultra-low velocity zones, 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec., 2013.

Allu Peddinti, D., and A.K. McNamara, Deep ice formation in convecting ice-ocean systems: implications for trace element transport from Europa's Ocean to its surface, 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec., 2013

Allu Peddinti, D., and A.K. McNamara, Convection models for Ice-Water System: Dynamical Investigation of Phase Transition, 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec., 2012.

Williams, C.D., A.K., McNamara, E.J., Garnero, and M.C. Van Soest, Episodic entrainment of primordial material in plumes from isolated lower mantle reservoirs, 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec., 2012.

Cottaar, S., M. Li, L.M. Miyagi, A.K. McNamara, B.A. Romanowicz, and H.-R. Wenk, Forward modeling the perovskite-postperovskite transition in seismically anisotropic models beneath a slab, 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec., 2012.

Li, M., A.K. McNamara, E.J. Garnero, Episodic entrainment of subducted oceanic crust into primordial reservoirs of the lower mantle, 2012 Fall Meeting, AGU, San Francisco, Calif., 3-7 Dec., 2012.

McNamara, A.K., Mantle cooling promotes the stability of compositional reservoirs, 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec., 2011 [invited].

Li, Mingming, and A.K. McNamara, The difficulty for subducted oceanic crust to accumulate at the core-mantle boundary, 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec., 2011.

Zhao, C., E.J. Garnero, N.C. Schmerr, and A.K. McNamara, Hawaii: A plume rising vertically from the top of a lowermost mantle compositional reservoir, 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec., 2011.

Thorne, M.S., S. Rost, A.K. McNamara, J. Hernlund, Chunpeng Zhao, and E.J. Garnero, What do we really know about ultra-low velocity zones?, 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec., 2011.

McNamara, A.K., E.J. Garnero, and S. Rost, Long-lived compositional reservoirs: Their evolution in a cooling Earth and hypothesis tests for their existence, presented at 2011 European Geosciences Union General Assembly [invited].

Garnero, E.J., A.K. McNamara, C. Zhao, and M.S. Thorne, Multi-scale lower mantle structure and dynamics, Abstract DI12B-01, presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec., 2010 [invited].

Thorne, M.S., E.J. Garnero, A.K. McNamara, and H. Igel, Detection of present-day slab-driven mantle flow, Abstract MR32A-04, presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec., 2010 [invited].

Cottar, S., A.K. McNamara, B.A. Romanowicz, and H. Wenk, On the origin of seismic anisotropy at the base of the mantle, Abstract DI33C-08 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec, 2010.

Zhao, C., E.J. Garnero, M.S. Thorne, and A.K. McNamara, Fine scale deep mantle structure beneath central Pacific: LLSVP heterogeneity and edge, ULVZ, and CMB topography, Abstract DI21B-1962 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec, 2010.

Bunte, M.K., A.K. McNamara, and R. Greeley, Investigating Ice Shell Convection with a Lower Boundary Defined by Changes in Phase and Composition: Implications for Europa, #2523, Lunar and Planetary Science Conference, 2010.

McNamara, A.K., E.J. Garnero, S. Rost, T.M. Lassak, and S. Zhong, Dynamic Constraints on the Presence of Primordial Mantle Reservoirs, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract DI21B-02, 2009 [invited].

Bunte, M.K., A.K. McNamara, R. Greeley, Investigating ice shell convection with a lower boundary defined by changes in phase and composition: Implications for Europa, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract P51E-1168, 2009

Wenk., H., C.N. Tome, A.K., McNamara, and S. Cottarr, Modeling preferred orientation and seismic anisotropy in the lowermost mantle, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract MR14A-08, 2009 [invited].

Rost, S., E.J. Garnero, C. Thomas, A.K. McNamara, S. Pathirana, W. Stefan, Detection and Absence of Ultra Low Velocity Zones, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract MR22C-02, 2009 [invited].

Garnero, E.J., S. Rost, A.K. McNamara, M.S. Thorne, Tracking Lowermost Mantle Chemistry with Ultra-Low Velocity Zones, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract U42A-04, 2009

Cottarr, S., P. Cupillard, A.K. McNamara, B.A. Romanowicz, and H. Wenk, Forward modeling the origin of seismic anisotropy at the base of the mantle, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract DI41B-1800, 2009.

McNamara, A.K., T.M. Lassak, E.J. Garnero, and Zhong, S., Core Mantle Boundary Topography as a Constraint on Large Scale Mantle Models, *11<sup>th</sup> International Workshop on Modeling of Mantle Convection and Lithospheric Dynamics*, 2009.

Garnero, E., N. Schmerr, T. Lay, C. Zhao, A. McNamara, M. Thorne, A. Hutko, USArray Data Support Whole Mantle Convection, *Earthscope Meeting*, 2009.

McNamara, A.K., E.J. Garnero, S. Rost, and M.S. Thorne, Dynamics of the Ultra Low Velocity Zone, *Eos, Transactions, American Geophysical Union*, Fall, 2008 [invited].

Lassak, T.M., A.K. McNamara, Earth's CMB topography and mantle convection, *Eos, Transactions, American Geophysical Union*, Fall, 2008.

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