GREG HIRTH

Department of Earth, Environmental and Planetary Sciences
Brown University
Providence, RI 02912
Greg_Hirth@Brown.edu

Experience:

Brown University, Department of Earth, Environmental and Planetary Sciences
2010-present Professor
2015-2020 Chair
9/2007-2009 Associate Professor
2002-9/2007 Adjunct Associate Professor

Woods Hole Oceanographic Institution, Department of Geology and Geophysics
2009-present Adjunct Scientist
1998-2007 Associate Scientist (Tenured in 2001)
1994-1998 Assistant Scientist
1993 Postdoctoral Scholar

Massachusetts Institute of Technology, Earth, Atmospheric, and Planetary Sciences
1993-2007 Research Affiliate

Rice University, Department of Earth Sciences
Spring 2011 Weiss Visiting Professor

University of Montpellier, Geosciences
Spring 2007 Visiting Scientist

California Institute of Technology, Division of Geological and Planetary Sciences
Fall 1999 Visiting Professor of Geophysics

University of Minnesota, Department of Geology and Geophysics
1991-1992 Postdoctoral Research Associate

Brown University, Department of Geological Sciences
1985-1990 Graduate Research Assistant

Education:

Ph.D. Geological Sciences, Brown University, 1991
Sc., M. Geological Sciences, Brown University, 1987
B.S. Geological Sciences, Indiana University, 1985

Service:

Brown University and Brown Department of Earth, Environmental and Planetary Sciences

OVPR Research Advisory Board, 2021-present

OVPR Research Continuity Committee, 2020-2021
University Chairs and Directors Agenda Committee, 2016-2018
Department Chair for DEEPS, July 2015-2020
Search Committee for Planetary Faculty position, 2014
Chair, Department Postdoc Committee, 2014
DEEPS Chair's Advisory Committee, 2014-2015
Chair, Search Committee for Solid Earth Dynamics position (2013)
Office of Sponsored Programs Faculty Advisory Committee (2011-2012)
First Year Advisor (2008, 2010, 2012); Sophomore Advisor (2009, 2011)
Graduate School Committee, 2009
Review Panel, Salomon Faculty Research Awards, 2009, 2013
Department Curriculum Committee 2008-2010
Leader, Department Field Trip, fall 2008

WHOI and WHOI Department of Geology and Geophysics

WHOI/MIT Joint Program Graduate Admissions Committee, 1995-1996
WHOI Postdoctoral Fellowship Committee, 2002-2003
WHOI Gender Equity Program Advisory Committee, 2005-2007
Chair, Joint Committee, Marine Geology and Geophysics, WHOI/MIT Joint Program, 2004-2007
Leader, Joint-Program Geodynamics field trip to Basin and Range, 1994.
Leader, Joint-Program Field Trip (with Brian Tucholke and Kip Hodges) to Death Valley, 1994.
Leader, Joint-Program Geodynamics field trip to Yellowstone and Snake River Plane, 2001.
Leader, Joint-Program Geodynamics field trip to Mount St. Helens and Puget Sound, 2003.

Community

AGU:
Convener, AGU special sessions, 1993, 1999, 2004, 2005, 2008, 2009, 2011, 2013, 2016
Steering Committee, Physical Properties of Earth Materials, AGU, 1995-1997.
AGU meeting program committee, Tectonophysics, 1996-1997
AGU Mineral and Rock Physics Focus Group, 2000-2002
Vice Chair, AGU Mineral and Rock Physics Focus Group, 2002-2003
Secretary, Tectonophysics Section, AGU, 2004-2006; an elected position
AGU Mineral and Rock Physics executive committee, 2008-2009
President-elect, Tectonophysics Section, AGU, 2010-2012; an elected position
President, Tectonophysics Section, AGU, 2013-2015

NSF:
Panelist, NSF MARGINS (OCE), 2000
Panelist, NSF Tectonics (EAR), 2001-2004
NSF-MARGINS steering committee, 2000-2004
CIDER Advisory Committee, 2012-2014

SCEC: Southern California Earthquake Center
Member, Planning Committee, 2013-2016

Editorial:
Geology Editorial Board, 1997-1999
J. Geophys. Res. Associate Editor, 1999-2002
G-cubed, Associate Editor, 2006-2010

Meetings and Workshops:
Co-convener, Workshop on Seafloor Geodesy, WHOI, Fall 2002
Program Advisory Committee and Editor, Dahlem Conference: *The Dynamics of Fault Zones*, 2004
Co-convener, MARGINS Workshop: *Interpreting Mantle Images*, 2006
Chair, 2008 Gordon Research Conference: *Rock Deformation*; an elected position
Co-convener, CIDER Summer Program "Dynamics of Mountain Building", 2011
Co-convener, Earthscope Institute on the Lithosphere-Asthenosphere Boundary, 2011

Awards and Fellowships:

NAGT-USGS Coop Summer Field Training Internship, 1985

Corinna Borden Deen Fellowship, Brown University, 1989

GSA Best Paper Award in Structural Geology and Tectonics (*Dunlap et al.*, 1997), 2001

Fellow of the Deep Ocean Exploration Institute, WHOI, 2003

Fellow of Mineralogical Society of America, 2006

Fellow of American Geophysical Union, 2008

NSF-MARGINS *Distinguished Lecturer*, 2009-2010

Weiss Visiting Professor, Rice University, 2011

Francis Birch Lecture, American Geophysical Union, 2017

George P. Woollard Award, Geological Society of America, 2018

Graduate Advisor: Jan Tullis, Brown University

Postdoctoral Advisor: David Kohlstedt, University of Minnesota

Teaching:

Brown University

GEOL 1960A *Rheology of the Crust and Mantle* (Spring 2008; Fall 2009, Fall 2011, Fall 2013, Fall 2016, Fall 2018)
GEOL 0160G *Energy Resources* (Fall 2008, Fall 2010, Fall 2012, Fall 2014, Summer 2021)
GEOL 1560 *Tectonics* (with Don Forsyth, Spring 2010, Spring 2012, Spring 2014, Fall 2015); with A. Saal (Spring 2018); with A Saal and C. Dalton (Spring 2020, Spring 2022)
GEOL 1450 *Structural Geology* ((with J. Tullis: Spring 2016, Spring, 2017), Spring 2019, Spring 2021)
GEOL 2910G *Dynamics of Ice Sheets and Glaciers* (with D. Goldsby & M. Parmentier, Fall 2009, Spring 2013)
GEOL 2920Q *Rheological Boundaries in the Earth* (with M. Parmentier & A. Saal, Spring 2009)
GEOL 2920 *Deformation Mechanisms: From Crystal Defects to Seismic Structure* (with K. Fischer & R. Cooper, 2005)
GEOL 1950M Geoengineering: The Unnatural World

WHOI/MIT

12.525 *Mechanisms of Faulting and Earthquakes* (with J. Lin & J. McGuire, 2002, 2005)
12.718 *Kinetics and Mass Transport* (with Stan Hart, '96; '98;'00; '02, '04, '06)
12.701 *Igneous Processes at Oceanic Plate Margins* (with P. Kelemen, 2004)
12.753 *Geodynamics Seminar* (with J. McGuire, 2003)
12.456 *Rock Mechanics Seminar* (with B. Evans, 1995; 1998)

Caltech

GE150 *Rheology and Deformation Mechanisms* (1999)

Students and Post-docs:

PhD Thesis advisor (and co-Thesis advisor)

Javier Escartin (MIT/WHOI 1996, now Ecole Normale Superieure, Paris), Mike Braun (MIT/WHOI 2004, now at ExxonMobil), Margaret Boettcher (MIT/WHOI 2005, now Assoc. Prof., UNH), Brian deMartin (MIT/WHOI 2007, now at ExxonMobil), Jessica Warren (MIT/WHOI 2007, now Assoc. Prof. U. Deleware), Luc Mehl (MS, MIT/WHOI 2007, now adventure guide and author, Alaska), Linda Chernak (Brown, 2011, now Admissions Officer, University of Rochester), Amanda Getsinger (Brown 2014, now at Shell), Chris Havlin (Brown 2014, now at Univ. Illinois), Brooks Proctor (Brown, 2016, postdoc at USGS, now US Military), Taka Kanaya (Brown, 2018, now postdoc, McGill), Nick Dygert (Brown, 2016, now Asst. Prof., Univ. Tennessee), Noah Hammond (Brown, 2017, now lecturer, Holy Cross), Leif Tokle (Brown, now ETH Zurich), Nir Badt (Brown, now U. Penn.), Eric Burdette (Brown, now Brown Postdoc), Ningli Zhao (Brown, now postdoc at Earth and Planets Laboratory, Carnegie), Thomas Czernik (present), Hannah Shabtian (present), Keren Levine (present).

Thesis project advisor

Dan Lizarralde (MIT/WHOI 1997), Gary Jaroslow (MIT/WHOI 1997), Elena Miranda (U. Wyoming, 2006), Marshall Sundberg (Brown University, 2009), Janelle Homburg (Columbia, 2012), Jill Van Tongeren (Columbia, 2011), Jessica Stanley (MIT MS, 2009-2010), Steve Kidder (Caltech, 2011), Emily Roland (MIT/WHOI, 2011), Cristiane DeCastro Goncalves (University of Ouro Preto, Brazil, 2011), Leonardo Goncalves (University of Ouro Preto, 2011), Will Nachlas (University of Minnesota, 2015), Andrew Cross (University of Otago, 2015), Pamala Speciale (UT Austin, current), Katrina Sauer, Otago Univ.); Hamid Soleymani (CCNY, 2020)

Brown Undergraduate Thesis advisor

Arjun Kohli (2010, graduate school at Stanford), Helen Doyle (2011, graduate school at Dartmouth), Hang Nguyen (2011), Cameron Meyers (2012, graduate school at Minnesota), Caroline Webb (2012, graduate school at UC Davis), Julia Carr (2013, graduate school at Penn State), Caroline Seyler (2015, graduate school at McGill), William Shinevar (2015, graduate school at MIT/WHOI), Rachel Gotlieb (2015), Edgar Villegas (2021, graduate school at Rice).

MIT/WHOI General Exam project advisor

Laurent Montesi, Karen Viskupic, Jenny Matzel, Steven Singletary, Ryan Clark, Andrea Llenos, Chris Waters and Emily Roland.

Thesis Committees (MIT/ WHOI)

Dan Lizarralde (Chair), Laura Magde (Chair), Gretchen Eckhart, Glenn Gaetani, Anke Friedrich, Laurent Montesi, Eliza Richardson, Karen Viskupic, Jenny Matzel (Chair), Clare Williams (Chair), Einat Lev, Nick Austin, Lili Xu

Thesis Committees (Brown)

Bethany Ehlmann, Marshall Sundberg, Christine McCarthy, Heather Ford, Angela Stickle, McCall Burau, Tina Rau, Alex Kasprak, Kei Shimizu, Jaime Beaulieu, Hillary O'Brien, Stephanie Spera, Colin Jackson, Ben Parks, Tess Caswell, Chris Kelley, Sean Wiggins, Erica Nathan, Darien Florez, Danny Anderson

Postdocs

Wenlu Zhu (WHOI, now Assoc. Prof, U. Maryland), Laurent Montesi (WHOI, now Assoc. Prof. U. Maryland), Magali Billen (WHOI, now Prof. U.C. Davis), Phil Skemer (Brown, now Assoc. Prof. Wash. U. St. Louis), Elisabeth Nadin (Brown, now Asst. Prof. Univ. Alaska Fairbanks), Eric Goergen (Brown, now Senior Application Scientist, FEI), Jacques Precigout (Brown, now Univ. Orleans), Justin Hustoft (Brown, now Asst. Prof. Simpson University), Whitney Behr (now Professor, ETH), Keishi Okazaki (now Hiroshima University), Emily Chin (now Associate Prof., UCSD), Yuval Boneh (now Lecturer, Ben-Gurion University, Israel), Hannah Rabinowitz (now Pacif NW National Lab).

Postdoc project co-advisor

Carlos Garrido (WHOI, now Univ. Grenada), Joerg Renner (MIT, now Bochum Univ.), Kiyoshi Baba (WHOI, now at ERI, U. Tokyo), Jun Muto (Brown, now Tohoku University)

Field Work and Research Cruises:

- I've participated on three research cruises to the Southwest Indian Ridge, including ODP Leg 176, Return to Hole 735b and IODP Leg 204 to the Mid-Atlantic Ridge.

- Field work: Central Australia (1993), Oman ophiolite (1995, 1996, 2000, 2008), Josephine ophiolite (1995, 2003, 2006), Trinity ophiolite (2003, 2005, 2006), Talkeetna Arc (2000-2002), Ingalls ophiolite (1996; 2004), Big Jim ophiolite (2004, 2005), Norway (2009). Oman Drilling (2018), Mecca Hills, CA (2021).

Funding Record:

NSF EAR-2217836, Collaborative Research: Experimental deformation of monazite and titanite: Implications for interpretation of petrochronologic data, 9/1/2022-8/31/2024, $386,315.

NSF EAR-2146640, Collaborative Proposal: Testing Collision Versus Frictional Stress-Drop Models of High-Frequency Earthquake Ground Motions, 6/1/2022-5/31/2025, $324,729.

NSF EAR- Experimental constraints on the rheology of the mantle lithosphere at the base of the seismogenic zone, 5/2021-4/2024, $422,171.

NSF EAR- Collaborative Research: Community Facility Support: Facilitating Access and Innovation through a Collaborative Organization for Rock Deformation (CORD, 4/2021-3/2023, $175,627.

NSF EAR- Collaborative Research: Identifying shallow slow slip using hematite textures and (U-Th)/He thermochronometry of exhumed and experimental faults, 6/2021-5/2024, $142,125.

NSF EAR-1833496, Collaborative Research: Community Facility Support: Facilitating Access and Innovation through a Collaborative Organization for Rock Deformation (CORD), 9/1/2018-8/31/2020, $271,164.

NASA Rheology of an evolving lunar mantle: New experimental constraints and generalized mantle viscosity models, 11/30/17-11/29/20, $440,217.

SCEC, Incorporating the effects of hydrous phases and strain localization into seismic-velocity-based models for the Community Rheology Model, $15,000, 02/01/18-01/31/19.

NSF EAR-1606528, Collaborative Research: Rheology of the Earth's Transition Zone - An Integrated Approach, 05/06/2016 – 05/31/2019, $118851.

SCEC, Integrating Seismic Velocity Data and Experimental Flow Laws into the Community Rheology Model, $14,500, 05/01/17-04/30/18.

NSF EAR-1624178, Collaborative Research: The role of rock composition and microstructural evolution on strain localization and the effective viscosity of the crust, 08/01/2016-07/31/2018, $135807.

SCEC, Rheological Mixing Laws for Application to the Community Rheology Model, 02/01/2016-01/31/2017, $8156.

NSF EAR-1513714, Collaborative Research: Alteration of mantle peridotite: Geochemical fluxes and dynamics of far from equilibrium transport, 06/15/2015-06/30/2018, $121439.

NSF EAR, Layering within cratonic lithosphere: Integrated constraints from xenoliths, seismic structure and geodynamical modeling, 6/14-5/16, $ 501,915.

NSF EAR-1315784, The role of pore-fluid pressure on fault behavior at the base of the seismogenic zone, 07/01/13 - 06/30/16, $367,585.

NSF/SCEC, The role of pore-fluid pressure on fault behavior at the base of the seismogenic zone, 02//01/13 - 01/31/14, $24,000.

SCEC, The role of pore-fluid pressure on fault behavior near the base of the seismogenic zone, 02/01/12 - 01/31/13, $27,564.

NSF EAR-1220075, Experimental constraints on crustal rheology, 07/15/12 - 06/30/15, $291,853.

NSF EAR-1049582, Experimental Constraints on the Rheology and Seismicity of Subducting Lithosphere and the Slab-Wedge Interface, $363,600.

EAR- CSEDI-1067689, Collaborative Research: Integrating Seismological, Rheological and Petrological Studies of Melt Production in Subduction Zones, 9/11-8/13, $40,117.

OCE-0927172, Collaborative Research: Structure and Composition of Oceanic Lithosphere and the Lithosphere/Asthenosphere Boundary, $27,358

EAR-0911536 Collaborative Research: Titanium in Deforming Quartz and the Thermo-mechanics of Detachment and Thrust Systems, 7/1/09-6/30/12, $35,540.

EAR 0810188 Experimental Constraints on the Rheology of the Lower Continental Crust, 6/1/08-5/31/11, $272,255.

EAR 0738880 Collaborative Research: Microstructural and Modeling Constraints on Strain Localization, LPO Development and Rheology of the Upper Mantle, 3/1/08-2/28/11, $198,276.

EAR 0652707 Collaborative Research: The Dynamics of Plume-Trench Interaction: Samoa-Tonga, 6/1/07-5/31/09, $365,800 (with S. Hart, M. Behn, and J. Collins).

OCE 0623188 Thermal-Mechanical Behavior of Oceanic Transform Faults, 8/1/06-7/31/08, $150,310 (w/ Mark Behn).

OCE 0452401 Collaborative Research: Melt Transport and Mechanical Properties in Partially Molten Peridotites, Awarded 02/17/2005, $71,819 (with Brian Evans).

JOI PO#T304A26:LEG 304 EBSD Analysis of Mafic and Ultramafic Rocks from Expedition 304/305: Implications for the Onset of Serpentinization and Melt Migration, 11/17/2004-11/14/2006, $24,866.

EAR 0409609 Continental Dynamics Program, Constraining mantle rheology, mantle flow, and crust/mantle coupling beneath New Zealand, Awarded 07/01/2005, $480,936 (with John Collins, Brad Hager, Anne Sheehan and Peter Molnar).

Mellon Independent Study Award (WHOI), Crystallographic Constraints on the Nucleation and Growth of Coral Skeleton: A Test of Biological versus Physicochemical Control of Biogenic Mineralization, 06/15/2004-05/14/2006, $49,395 (with Anne Cohen).

EAR 0405709 Collaborative Research: Rheology of Altered Oceanic Lithosphere, Awarded 05/27/2004, $291,583 (with Brian Evans).

EAR 0230267 Textural Analyses of Naturally Deformed Peridotite and Gabbro: Implications for the Interpretation of Geophysical Data and the Rheology of the Lithosphere, Awarded 11/22/2002, $309,037.

EAR 0125919 Convection of the Mantle Wedge Above Subduction Zones, Awarded 05/24/2002, $112,195 (with Peter Kelemen).

OCE 0118572 Detailed Study Of Focused Melt Transport In The Upper Mantle Section Of The Oman Ophiolite, Awarded 11/05/2001, $134,265 (with Peter Kelemen).

EAR 0112266 Acquisition of EBSD Detector and Software for Microstructural Analyses, Awarded 09/10/2001, $60,000.

OCE 0118254 Modeling the MELT Electromagnetic Data: Topography and Anisotropy, 8/15/01 to 8/15/03, $60,000 (with Alan Chave [PI] and Rob Evans).

OCE 0002674 Collaborative Research: Oceanic Upper Mantle Structure from Very Large Offset Seismic Refraction Measurements, 07/01/2001 to 12/31/2004, $68,364 (with John Collins, Dan Lizarralde and Jim Gaherty).

OCE 0099316 Collaborative Research: Laboratory Constraints on the Relations Among Deformation, Permeability, and Melt Migration, Awarded 06/15/2001, $46,659 (with Brian Evans).

EAR 9910899, Continental Dynamics Program, Constraints on the Genesis of Continental Crust Via Arc Magmatism: Geology, Geochemistry, Structure and Physical Properties of the Talkeetna Arc Section, South Central Alaska, 8/1/00 to 7/31/05, $1,780,627 (with Peter Kelemen [primary PI], Peter Clift, Stan Hart, Brad Hacker, Nik Christensen, Terry Pavlis, Jim Matinson, Sue DeBari)

OCE 9907244 Experimental Constraints on Serpentinization at Mid-Ocean Ridges and its Role in Lithospheric Deformation, 10/01/1999 to 03/31/2003, $266,070.

JOI Task No. F000770 Microstructural Constraints on the Rheology of the Lower Ocean Crust – Leg 176 Post Cruise Science Support, 8/1/98 to 7/31/99, $20,850.

OCE 9819666 Melt Extraction and Crustal Accretion at Mid-Ocean Ridges: Continued Study of the Mantle and Lower Crust in the Oman Ophiolite, 5/1/99-4/30/02, $350,000 (with Peter Kelemen [PI]).

EAR 9814796 Effects of Stress and Fluid Composition on Pore Structure and Permeability During Hydrothermal Compaction, 01/01/1999 to 12/31/2002, (with Wenlu Zhu).

EAR 9726125 Collaborative Research: Dynamic Recrystallization: Microstructural Constraints on the Dynamics and Kinematics of Tectonic Processes, 02/15/1998 to 01/31/1999, $29,883 (with Jan Tullis).

OCE 9711170 Constraints on the Accretion of the Lower Oceanic Crust: A Quantitative Textural and Geochemical Study of Gabbros from the Oman Ophiolite and the Mid-Ocean Ridges, 09/01/1997 to 02/29/2000, $200,000 (with Peter Kelemen).

EAR 9706681 Very Deep Electrical Soundings Beneath Oceans and Cratons, 09/01/1997 08/31/2000, $42,000 (with Alan Chave).

Mellon Independent Study Award (WHOI), Development of low-altitude, aerial photo mosaic technique and measurement of size-frequency distribution of melt flow channels in the upper mantle, 1996-1997 (with Peter Kelemen).

OCE 9626930 Collaborative Research: Physical Properties of Partially Molten Feldspathic Rocks in the Ocean Crust, 10/15/1996 to 09/30/1999, $85,000 (with Brian Evans).

OCE 9618442 The Plutonic Foundation of a Very Slow-Spreading Ridge, 09/01/97 to 09/31/00, $651,310 (with Henry Dick [PI] and Maurice Tivey).

EAR 9405845 Collaborative Research: Experimental Constraints on the Water Content of the Upper Mantle and Its Role in Geodynamical Processes, 07/01/1994 to 06/30/1997, $76,925 (with David Kohlstedt).

EAR 9418228 Mapping of Textural, Modal and Compositional Variations in the Shallow Mantle: Implications for

the Dynamics of Melt Flow and Segregation, 1/1/95 to 12/31/97, $238,100 (with Peter Kelemen).

OCE 9313812 Experimental Constraints on the Strength of the Lithosphere at Slow Spreading Ridges, 04/01/1994 to 09/30/1997, $164,000 (with Brian Evans).

Publications (students** and postdocs* denoted by asterisks)

* Boneh, Y., M. Pec, and G.Hirth, High-pressure mechanical properties of talc – Implications for fault strength and slip processes, Journal of Geophysical Research, revision submitted.

**Tokle, L., G., Hirth, and H. Stunitz, The effect of muscovite on the microstructural evolution and rheology of quartzite in general shear, *J. Struct. Geol.,* revision submitted.

Hirth, J.P., Xie, D., Hirth, G. and Wang, J., Recovery and facets for deformation twins in minerals and metals**,** *Proceedings of the National Academy of Sciences,* in press.

**Hua, J., K.M. Fischer, T.W. Becker, E. Gazel, and G. Hirth, Seismic detection and dynamic implications of prevalent asthenospheric partial melt, *Nature Geosciences*, in press.

**Hua, J., K.M. Fischer, E. Gazel, E.M. Parmentier, and G. Hirth, Long-distance asthenospheric transport of plume-influenced mantle, *G-cubed*, in press.

**DiMonte, A.A., Ault, A.K., Hirth, G. and Bradbury, K.K., 2022. Hematite accommodated shallow, transient Pleistocene slow slip in the exhumed southern San Andreas fault system, California, USA. *Geology*, *50*(12), pp.1443-1447.

**Burdette, E. and Hirth, G., 2022. Creep rheology of antigorite: Experiments at subduction zone conditions. *Journal of Geophysical Research: Solid Earth*, *127*(7), p.e2022JB024260.

Menzel, M.D., Urai, J.L., Ukar, E., Hirth, G., Schwedt, A., Kovács, A., Kibkalo, L. and Kelemen, P.B., 2022. Ductile deformation during carbonation of serpentinized peridotite. *Nature communications*, *13*(1), pp.1-13.

*J.B. Russell, J.B. Gaherty, H.F. Mark, G. Hirth, L.N. Hansen, D. Lizarralde, J.A. Collins, and R.L. Evans, 2022, Seismological evidence for grain-size sensitive olivine deformation during mid-ocean ridge spreading, G-cubed, *23(10), p.e2022GC010542.*

Kelemen, P.B., Carlos de Obeso, J., Leong, J.A., Godard, M., Okazaki, K., Kotowski, A.J., Manning, C.E., Ellison, E.T., Menzel, M.D., Urai, J.L. and Hirth, G., 2022. Listvenite formation during mass transfer into the leading edge of the mantle wedge: Initial results from Oman Drilling Project Hole BT1B. *Journal of Geophysical Research: Solid Earth*, *127*(2), p.e2021JB022352.

Hirth, J.P., Hirth, G. and Wang, J., 2022. Type III and IV deformation twins in minerals and metals. *Proceedings of the National Academy of Sciences*, *119*(13), p.e2118253119.

Behn, M.D., Goldsby, D.L. and Hirth, G., The role of grain size evolution in the rheology of ice: implications for reconciling laboratory creep data and the Glen flow law. *The Cryosphere*, *15*(9), 4589-4605, 2021.

*Boneh, Y., Chin, E.J. and Hirth, G., 2021. Microstructural Analysis of a Mylonitic Mantle Xenolith Sheared at Laboratory-like Strain Rates from the Edge of the Wyoming Craton. *Minerals*, *11*(9), p.995.

*Chu, S.X., Tsai, V.C., Trugman, D.T. and Hirth, G., Fault Interactions Enhance High-Frequency Earthquake Radiation. *Geophysical Research Letters*, *48*(20), p.e2021GL095271, 2021.

Chin, E.J., **Chilson-Parks, B., *Boneh, Y., Hirth, G., Saal, A.E., Hearn, B.C. and Hauri, E.H., The peridotite deformation cycle in cratons and the deep impact of subduction. *Tectonophysics*, *817*, p.229029, 2021.

Tsai, V.C., Hirth, G., Trugman, D.T. and *Chu, S.X., Impact versus frictional earthquake models for high-frequency radiation in complex fault zones. *Journal of Geophysical Research: Solid Earth*, *126*(8), p.e2021JB022313, 2021.

**Zhang, H., **Zhao, N., Qi, C., Huang, X. and Hirth, G., Influences of CO2 on the Microstructure in Sheared Olivine Aggregates. *Minerals*, *11*(5), p.493, 2021.

**Mark, H.F., Collins, J.A., Lizarralde, D., Hirth, G., Gaherty, J.B., Evans, R.L. and Behn, M.D., Constraints on the depth, thickness, and strength of the G discontinuity in the central Pacific from S receiver functions. *Journal of Geophysical Research: Solid Earth*, *126*(4), p.e2019JB019256, 2021.

**Tokle, L. and Hirth, G., Assessment of quartz grain growth and the application of the wattmeter to predict quartz recrystallized grain sizes. *Journal of Geophysical Research: Solid Earth*, p.e2020JB021475, 2021.

*Boneh, Y., Chin, E.J., **Chilson-Parks, B.H., Saal, A.E., Hauri, E.H., Hearn Jr, C.B. and Hirth, G., Microstructural shift due to post-deformation annealing in the upper mantle. *Geochemistry, Geophysics, Geosystems*, p.e2020GC009377, 2021.

*Okazaki, K., **Burdette, E. and Hirth, G., Rheology of the fluid oversaturated fault zones at the brittle-plastic transition. *Journal of Geophysical Research: Solid Earth*, p.e2020JB020804, 2021.

**Tokle L., Hirth G., Liang Y., Raterron P., and Dygert N., The effect of pressure and Mg-content on ilmenite rheology: Implications for lunar mantle overturn, *J. Geophys. Res.: Planets* doi: 10.1029/2020JE006494, 2021.

**Burdette, E., and G. Hirth, Enhanced dehydration weakening of antigorite driven by slow shear heating: Insights from high-pressure experiments with a modified apparatus stiffness. *J. Geophys. Res., Solid Earth*, 125, e2020JB020064. https://doi.org/10.1029/2020JB020064, 2020.

Lawn, B., D. Marshall, R. Raj, G. Hirth, T. Page, and J. Yeomans, Precipitous weakening of quartz at the α–β phase inversion. *Journal of the American Ceramic Society*, *104*(1), pp.23-26, 2021.

**Soleymani, H., Kidder, S., Hirth, G. and Garapić, G., 2020. The effect of cooling during deformation on recrystallized grain-size piezometry. *Geology*, *48*(6), pp.531-535.

Tsai, V.C. and Hirth, G., 2020. Elastic impact consequences for high-frequency earthquake ground motion. *Geophysical Research Letters*, *47*(5), p.e2019GL086302.

*Ma, Z., Dalton, C.A., **Russell, J.B., Gaherty, J.B., Hirth, G. and Forsyth, D.W., 2020. Shear attenuation and anelastic mechanisms in the central Pacific upper mantle. *Earth and Planetary Science Letters*, *536*, p.116148.

**Badt, N.Z., Tullis, T.E., Hirth, G. and Goldsby, D.L., 2020. Thermal pressurization weakening in laboratory experiments. *Journal of Geophysical Research: Solid Earth*, *125*(5), p.e2019JB018872.

*Calzolari, G., Ault, A.K., Hirth, G. and **McDermott, R.G., 2020. Hematite (U-Th)/He thermochronometry detects asperity flash heating during laboratory earthquakes. *Geology*, *48*(5), pp.514-518.

*Okazaki, K. and Hirth, G., 2020. Deformation of mafic schists from subducted oceanic crust at high pressure and temperature conditions. *Tectonophysics*, *774*, p.228217.

Hirth, J.P., Hirth, G. and Wang, J., 2020. Disclinations and disconnections in minerals and metals. *Proceedings of the National Academy of Sciences*, *117*(1), pp.196-204.

*David, E.C., Brantut, N. and Hirth, G., 2020. Sliding Crack Model for Nonlinearity and Hysteresis in the Triaxial Stress-Strain Curve of Rock, and Application to Antigorite Deformation. *Journal of Geophysical Research: Solid Earth*, *125*(10), p.e2019JB018970.

**Speciale, P.A., Behr, W.M., Hirth, G. and **Tokle, L., 2020. Rates of olivine grain growth during dynamic recrystallization and post-deformation annealing. *Journal of Geophysical Research: Solid Earth*, *125*(11), p.e2020JB020415.

**Xie, D., Hirth, G., Hirth, J.P. and Wang, J., 2019. Defects in deformation twins in plagioclase. *Physics and Chemistry of Minerals*, *46*(10), pp.959-975.

Hirth, J.P., Wang, J. and Hirth, G., 2019. A topological model for defects and interfaces in complex crystal structures. *American Mineralogist: Journal of Earth and Planetary Materials*, *104*(7), pp.966-972.

*French, M.E., Hirth, G. and *Okazaki, K., 2019. Fracture-induced pore fluid pressure weakening and dehydration of serpentinite. *Tectonophysics*, *767*, p.228168.

**Zhao, N., Hirth, G., Cooper, R.F., Kruckenberg, S.C. and **Cukjati, J., 2019. Low viscosity of mantle rocks linked to phase boundary sliding. *Earth and Planetary Science Letters*, *517*, pp.83-94.

**Mark, H.F., D. Lizarralde, J.A. Collins, J. A., N.C. Miller, G Hirth, J.B. Gaherty, and R.L. Evans, Azimuthal seismic anisotropy of 70 Ma Pacific-plate upper mantle. *Journal of Geophysical Research: Solid Earth,* 10.1029/2018JB016451, 124, 2019.

**Tokle, L., G. Hirth, and W.M. Behr, Flow laws and fabric transitions in wet quartzite, *Earth and Planetary Science Letters* 505, 152-161, https://doi.org/10.1016/j.epsl.2018.10.017, 2019.

**Russell J.B., J. Gaherty, P.Y. Lin, D. Lizarralde D, J.A. Collins, G. Hirth, and R.L. Evans RL, High-resolution constraints on Pacific upper mantle petrofabric inferred from surface-wave anisotropy, *J. Geophys. Res.: Solid Earth*, https://doi.org/10.1029/2018JB016598, 2019.

**Shinevar, W.J., M.D. Behn, G. Hirth, and O. Jagoutz, Inferring Crustal Viscosity from Seismic Velocity: Application to the Lower Crust of Southern California, *Earth, Planet. Sci. Lett*, 494,83-91, https://doi.org/10.1016/j.epsl.2018.04.055, 2018.

**Clerc, F., M.D. Behn, E.M. Parmentier, and G. Hirth, Predicting rates and distribution of carbonate melting in oceanic upper mantle: Implications for seismic structure and global carbon cycling. *Geophysical Research Letters*, *45*(14), 6944-6953, 2018.

**Nachlas, W.O., C. Teyssier, D.L. Whitney, and G. Hirth, Deformation geospeedometry in experimental and natural shear zones, *Earth Planet. Sci. Lett.*, 498, 129-139, https://doi.org/10.1016/j.epsl.2018.06.025, 2018.

**Hammond, N.P., A.C. Barr, R.F. Cooper, T.E. Caswell, and G. Hirth, Experimental Constraints On The Fatigue of Icy Satellite Lithospheres by Tidal Forces, *J. Geophys. Res. Planets*, 10.1002/2017JE005464, 123, 390–404, 2018.

Beeler, N.M., G. Hirth, T.E. Tullis, and C.H. Webb, On the depth extent of co-seismic rupture, *Bull. Seis. Soc. Am.*, doi: 10.1785/0120160295, 2018.

Nachlas, W.O., J. Thomas, and G. Hirth, TitaniQ deformed: Experimental deformation of out-of-equilibrium quartz porphyroclasts, *Journal of Structural Geololgy*, 116, 207-222, https: //doi.org/10.1016/j.jsg.2018.07.012, 2018.

**Kanaya, T., and G. Hirth, Brittle to semibrittle transition in quartz sandstone, *J. Geophys. Res.*, 123, 10.1002/2017JB014682, 2018.

**Proctor, B. and G. Hirth, Talc-induced pressure solution in olivine, *G-cubed,* in revision.

**Cross, A.J., G. Hirth, D.J. Prior, Significant effects of secondary phases and grain boundary sliding on CPO evolution, *Geology*, 45, 955–958, doi:10.1130/G38936.1, 2017.

*Chin, E.J., *V. Soustelle, G. Hirth, A.E. Saal, S.C. Kruckenberg, J.M. Eiler, Microstructural and geochemical constraints on the evolution of deep arc lithosphere, Geochemistry, Geophysics, Geosystems, 17(7), 2497-2521, 2016.

**Proctor, B. and G. Hirth, 'Ductile to brittle' transition in thermally stable antigorite gouge at mantle pressures, *J. Geophys. Res., Solid Earth*, DOI: 10.1002/2015JB012710, 2016.

**Lin, P.-Y., J.B. Gaherty, G. Jin, J.A. Collins, D. Lizarralde, R.L. Evans, and G. Hirth, Constraints on flow dynamics within the oceanic asthenosphere from a high-resolution analysis of seismic anisotropy, *Nature*, 535(7613), 538-541, 2016.

Miranda, E., G. Hirth, and B.E. John, Microstructural evidence for the transition from dislocation creep to dislocation-accommodated grain boundary sliding in naturally deformed plagioclase, *J. Struct. Geol.*, 92, 30-45, 2016

*Okazaki, K., and G. Hirth, Dehydration of lawsonite could directly trigger earthquakes in subducting oceanic crust, *Nature*, 530.7588, 81-84, 2016.

Beeler, N. M., Hirth, G., Thomas, A., and Bürgmann, R., Effective stress, friction and deep crustal faulting, *J. Geophys. Res., Solid Earth,* DOI: 10.1002/2015JB012115, 2016.

Dygert, N., G. Hirth, and Y. Liang, A flow law for ilmenite in dislocation creep: Implications for lunar cumulate mantle overturn, *Geophys. Res. Lett.*, **DOI: 10.1002/2015GL066546, 2016.

**Kidder, S., Hirth, G., Avouac, J. P., & *Behr, W., The influence of stress history on the grain size and microstructure of experimentally deformed quartzite, *J. Struct. Geol*., 83, 194–206, doi:10.1016/j.jsg.2015.12.004, 2016.

**Nachlas, W. O., and G. Hirth, Experimental constraints on the role of dynamic recrystallization on resetting the Ti-in-quartz thermobarometer, *J. Geophys. Res.: Solid Earth* 120, 8120-8137, 2015.

**Shinevar, W. J., M.D., Behn, and G. Hirth, Compositional dependence of lower crustal viscosity, *Geophys. Res. Lett.*, *42*(20), 8333-8340, 2015.

**VanTongeren, J.A., G. Hirth, and P.B. Kelemen, Constraints on the accretion of the gabbroic lower oceanic crust from plagioclase lattice preferred orientation in the Samail ophiolite, *Earth Planet. Sci. Lett.,* 427, 249-261, 2015.

**Sarafian, E., R.L. Evans, J. Collins, J. Elsenbeck, G. Gaetani, J.B. Gaherty, G. Hirth, and D. Lizarralde, The electrical structure of the Central Pacific upper mantle constrained by the NoMelt Experiment, *G-cubed*, submitted.

Hirth, G., and D.L. Kohlstedt, The stress dependence of olivine creep rate: Implications for extrapolation of lab data and interpretation of recrystallized grain size, *Earth and Planet. Sci. Lett.*, 418, 20-26, doi:10.1016/j.epsl.2015.02.013, 2015.

**Proctor, B., and G. Hirth, Role of pore fluid pressure on transient strength changes and fabric development during serpentine dehydration at mantle wedge conditions, *Earth and Planet. Sci. Lett.*, 421, 1-12, 2015.

Hirth, G., and N.M. Beeler, The role of fluid pressure on frictional behavior at the base of the seismogenic zone, *Geology*, 43, 223-226, doi: 10.1130/G36361.1, 2015.

**Goncalves, C.C., L. Goncalves, G. Hirth, The effects of quartz recrystallization and reaction on weak phase interconnection, strain localization and evolution of microstructure, *J. Struct. Geol.*, 71, 24-40, http://dx.doi.org/10.1016/j.jsg.2014.11.010, 2015.

**Auzende, A.-E., J. Escartin, N.P. Walte, S. Guillot, G. Hirth and D.J. Frost, Deformation mechanisms of antigorite serpentinite at subduction zone conditions determined from experimentally and naturally deformed rocks, *Earth and Planet. Sci. Lett.*, 411, 229-240, doi:10.1016/j.epsl.2014.11.053, 2015.

**Proctor, B., T.M. Mitchell, G. Hirth, D. Goldsby, F. Zorzi, and G. Di Toro, Dynamic weakening of serpentinite gouges and bare-surfaces at seismic slip rates, *J. Geophys. Res.*, 119, 8107-8131, DOI: 10.1002/2014JB011057, 2014.

Abers, G.A., K.M. Fischer, G. Hirth, D.A. Wiens, T.Plank, B.K. Holtzman, C. McCarthy and E. Gazel, Reconciling mantle attenuation-temperature relationships from seismology, petrology, and laboratory measurements, *Geochemistry, Geophysics, Geosystems*, 15, 3521-3542, DOI: 10.1002/2014GC005444, 2014.

**Getsinger, A., and G. Hirth, Amphibole fabric formation during diffusion creep and the rheology of shear zones, *Geology*, 42, 535-538, doi:10.1130/G35327.1, 2014.

*Precigout, J., and G. Hirth, B-type Olivine Fabric induced by Grain Boundary Sliding, *Earth Planet. Sci. Lett.,* 395, 231-240, http://dx.doi.org/10.1016/j.epsl.2014.03.052, 2014.

Hirth, G., Earth Science: Missing link in mantle dynamics, *Nature (News & Views)*, 507, 42-43, doi: 10.1038/nature13064, 2014.

*Behr, W.M. and G. Hirth, Rheological properties of the mantle lid beneath the Mojave region in southern California, *Earth and Planet. Sci. Lett.*, 393, 60-72, http://dx.doi.org/10.1016/j.epsl.2014.02.039, 2014.

**Zietlow, D.W., A.F. Sheehan, P.H. Molnar, M.K. Savage, G. Hirth, J.A. Collins, and B.H. Hager, Upper mantle seismic anisotropy at a strike-slip boundary: South island, New Zealand, *J. Geophys. Res.*, 119, 1020-1040, DOI: 10.1002/2013JB010676, 2014.

**Getsinger, A.J., G. Hirth, H. Stunitz, and E.T. Goergen, The influence of water on rheology and strain localization in the lower continental crust, *G-cubed*, 14, 2247-2264, DOI: 10.1002/ggge.20148, 2013.

Skemer, P., J.M. Warren, L.N. Hansen, G. Hirth and P.B. Kelemen, The influence of water and LPO on the initiation and evolution of mantle shear zones, *Earth Planet. Sci. Lett.*, 375, 222-233, 2013.

**Havlin, C. E.M. Parmentier, G. Hirth, Lithosphere thinning due to dike propagation driven by melt accumulation at the lithosphere-asthenosphere boundary, *Earth Planet. Sci. Lett.*, 376, 20-28, 2013.

Hirth, G., and Guillot, S., Rheology and tectonic significance of serpentinite, *Elements*, 9, 107-113, DOI: 10.2113/gselements.9.2.107, 2013.

Dasgupta, R., A. Mallik, K. Tsuno, A.C. Withers, G. Hirth and M.M. Hirschmann, Carbon-dioxide-rich silicate melt in the Earth's upper mantle, *Nature*, 493, 211-215, doi:10.1038/nature11731, 2013.

**Goncalves, C.C., G. Hirth, and L. Lagoeiro, The rheology of banded iron formation: constraints from axial compression experiments, *Rem: Revista Escola de Minas*, 65, http://dx.doi.org/10.1590/S0370-44672012000400010, 2012.

Kelemen, P.B., and G. Hirth, Reaction-driven cracking during retrograde metamorphism: Olivine hydration and carbonation, *Earth Planet. Sci. Lett.*, vol 345-348, 81-89, http://dx.doi.org/10.1016/j.epsl.2012.06.018, 2012.

Skemer, P., J. Warren, G. Hirth, Interpreting mantle seismic anisotropy in complex kinematic settings, *G-cubed*, 13, Q03006, doi:10.1029/2011GC003988, 2012.

Freed, A.M, G. Hirth, and M.D. Behn, Using short-term postseismic displacements to infer the ambient deformation conditions of the upper mantle, *J. Geophys. Res.*, 117, B01409, doi:10.1029/2011JB008562, 2012.

**Pikser, J.E., D.W. Forsyth, and G. Hirth, Along-strike translation of a fossil slab, *Earth Planet Sci. Lett.*, 331-332, 315-321, doi:10.1016/j.epsl.2012.03.027, 2012.

Behn M.D., P.B. Kelemen, G. Hirth, B.R. Hacker, and H.-J. Massonne, Diapirs as the source of sediment signature in arc lavas, *Nature Geoscience*, 4, 641–646, doi:10.1038/ngeo1214, 2011.

**Chernak, L., and G. Hirth, Syn-deformational antigorite dehydration produces stable fault slip, *Geology*, 39, 847-850, doi: 10.1130/G31919.1, 2011.

**Kohli, A. H., D. L. Goldsby, G. Hirth, and T. E. Tullis, Flash weakening of serpentinite at near-seismic slip rates, *J. Geophys. Res.*, doi:10.1029/2010JB007833, 116, B03202, 2011.

*Skemer, P., M. Sundberg, G. Hirth, and R. Cooper, Experimental deformation of a natural peridotite: Bridging the gap between the laboratory and nature, *Geological Society of London, Special Publication (The DRT volume)*, ed: Prior, D.J., E.H. Rutter, and D.J. Tatham, 360, 211-223, DOI: 10.1144/SP360.12, 2011.

*Muto, J., G. Hirth, R. Heilbronner, and J. Tullis, Plastic anisotropy and fabric evolution in sheared and recrystallized quartz single crystals, *J. Geophys. Res.*, 116, B02206, doi:10.1029/2010JB007891, 2011.

Blackman, D.K. et al., Drilling constraints on lithospheric accretion and evolution at Atlantis Massif, Mid-Atlantic Ridge 30ºN, *J. Geophys. Res.*, Vol 116, doi:10.1029/2010JB007931, 2011.

**Roland, E., M. Behn and G. Hirth, Thermal-mechanical behavior of oceanic transform faults-Implications for the spatial distribution of seismicity, *Geochemistry, Geophysics, and Geosystems (G-cubed),* 11, Q07001, DOI: 10.1029/2010GC003034, 2010.

**Homburg, J.M., G. Hirth and P.B. Kelemen, Investigation of the strength contrast at the Moho: A case study from the Oman Ophiolite, *Geology*, 38, DOI:10.1130/G30880.1, 679-682, 2010.

**Chernak, L.J., and G. Hirth, Deformation of antigorite serpentinite at high temperature and pressure, Earth Planet. Sci. Lett., 296, 23–33, doi:10.1016/j.epsl.2010.04.035, 2010.

**Sundberg*, M.*, G. Hirth, and P.B. Kelemen, Trapped Melt in the Josephine Peridotite: Implications for Permeability and Melt-Extraction in the Upper Mantle, *J. Petrology*, 51, 185-200, doi:10.1093/petrology/egp089, 2010.

*Skemer, P., **J. Warren, P.B. Kelemen, and G. Hirth, Microstructural and rheological evolution of a mantle shear, *J. Petrology*, 51, 43-53, doi:10.1093/petrology/egp057, 2010.

Barber, D., H.-R. Wenk, G. Hirth and D.L. Kohlstedt, Dislocations in Minerals, in *Dislocations in Solids*, volume 16, edited by J.P. Hirth and L. Kubin, Elsevier, 171-232, 2010.

Behn, M.D., G. Hirth and **J.R. Elsenbeck II, Implications of grain-size evolution on the seismic structure of the oceanic upper mantle, *Earth Planet. Sci. Lett.*, 282, 178-189, doi:10.1016/j.epsl.2009.03.014, 2009.

**Chernak, L., G. Hirth, J. Selverstone, and J. Tullis, The effect of aqueous and carbonic fluids on the dislocation creep strength of quartz, *J. Geophys. Res.*, 114, B04201, doi:10.1029/2008JB005884, 2009.

**Warren, J., G. Hirth, P. Kelemen, Evolution of olivine lattice preferred orientation during simple shear in the mantle, *Earth Planet Sci. Lett.*, 272, 501-512, 2008.

Escartin, J., *M. Andreani, G. Hirth, and B. Evans, Relationships between the microstructural evolution and the rheology of talc at elevated pressures and temperatures, *Earth Planet. Sci. Lett.,* 268*,* 463–475, 2008.

**Mehl, L., and G. Hirth, Plagioclase recrystallization and preferred orientation in layered mylonites: Evaluation of flow laws for the lower crust, *J. Geophys. Res.*, 113, B05202, doi:10.1029/2007JB005075, 2008.

Behn, M.D., G. Hirth and P. Kelemen, Lower crustal foundering as a mechanism for trench parallel seismic anisotropy below volcanic arcs, *Science*, 317, 108-111, 2007.

*Billen, M., and G. Hirth, Rheologic controls on slab dynamics, *Geochemistry, Geophysics, and Geosystems (G-cubed)*, 8, doi:10.1029/2007GC001597, ISSN: 1525-2027, 2007.

Behn, M.D., **Boettcher, M., G. Hirth, On the thermal structure of oceanic transform faults, *Geology*, 35, 307-310, 2007.

Kelemen, P., and G. Hirth, A periodic shear-heating mechanism for intermediate depth earthquakes in the mantle, *Nature*, 446, 787-790, doi:10.1038/nature05717, 2007.

Handy, M.R., G. Hirth, and R. Burgmann, Continental fault structure and rheology from the frictional-to-viscous transition downwards, in *Tectonic Faults, Agents of Change on a Dynamic Earth*, edited by M. Handy, G. Hirth, and N. Hovius, 139-182, MIT Press, Cambridge MA, 2007.

**Boettcher, M., G. Hirth, and B. Evans, Olivine friction at the base of oceanic seismogenic zones, *J. Geophys. Res.*, 112, B01205, doi:10.1029/2006JB004301, 2007.

Ildefonse, B., Blackman, D.K., B., John, B.E., Ohara, Y., Miller, D.J., MacLeod, C.J., and the Expedition 304/305 Scientists, Oceanic Core Complexes and Crustal Accretion at Slow-Spreading Ridges: *Geology*, 35, 623-626; DOI: 10.1130/G23531A.1, 2007.

*Baba K., P. Tarits, A. D. Chave, R. L. Evans, G. Hirth, R. L. Mackie, Electrical structure beneath the northern MELT line on the East Pacific Rise at 15°45′S, Geophys. Res. Lett., 33, L22301, doi:10.1029/2006GL027528, 2006.

Hirth, G., Protons lead the charge, *Nature* 443, 927 – 928, News and Views, 2006.

**Warren, J.M., and G. Hirth, Grain size sensitive deformation mechanisms in naturally deformed peridotites, *Earth Planet Sci. Lett.*, 248, 438-450, 2006.

Baba, K., A.D. Chave, R.L. Evans, G. Hirth, and R.L. Mackie, Mantle dynamics beneath the East Pacific Rise at 17ºS: Insights from the MELT EM data, J. Geophys. Res.*, 111, B02101, doi:10.1029/2004JB003598, 2006.

Blackman, D., Ildefonse, B, John, B.E., Ohara, Y, Miller, D.J., and Expedition Science Party, IODP Expeditions 304 and 305: Oceanic Core Complex Formation, Atlantis Massif: Scientific Drilling, v. 1, p. 27-31(doi:10.0 /iodp.sd.1.0.00), 2005

*Billen, M., and G. Hirth, Newtonian versus non-Newtonian upper mantle viscosity: Implications for subduction initiation, *Geophys. Res. Lett.*, 32, L19304, doi:10.1029/2005GL023457, 2005.

Evans, R.L., G. Hirth, *K. Baba, D. Forsyth, A. Chave and R. Mackie, Compositional controls on oceanic plates: geophysical evidence from the MELT Area, *Nature*, 437, 249-252, 2005.

Gaherty, J.B., D. Lizarralde, J.A. Collins, G. Hirth, and **S. Kim, Mantle deformation during slow seafloor spreading constrained by observations of seismic anisotropy in the western Atlantic, *Earth Planet. Sci.*, 228, 255-265, 2004.

Lizarralde, D., JB. Gaherty, J.A. Collins, G. Hirth, and **S.D. Kim, Spreading-rate dependence of melt extraction at mid-ocean ridges from far-offset seismic data, *Nature*, 432, 744-747, 2004.

**deMartin, B., G. Hirth, B. Evans, Experimental Constraints on Thermal Cracking of Peridotite at Oceanic Spreading Centers, in J. Lin, ed., *The Thermal Structure of the Oceanic Crust and Dynamics of Hydrothermal Circulation*, Geophysical Monograph 148, American Geophysical Union, Washington, D.C., 148, 167-185, 2004.

Evans, B., Y. Bernabe and G. Hirth, Relations among porosity, permeability, and deformation in rocks at high temperatures, MARGINS Theoretical and Experimental Earth Science Series. 1: Rheology and Deformation of the Lithosphere at Continental Margins, eds. G.D. Karner, N.W. Driscoll, B. Taylor and D.L. Kohlstedt, Columbia University Press, 311-339, 2004.

Hirth, G., and D. Kohlstedt, Rheology of the Upper Mantle and the Mantle Wedge: A View From the Experimentalists, in Inside the Subduction Factory, edited by John Eiler, Geophysical Monograph 138, 83-105, American Geophysical Union, Washington, D.C., 2003.

**Mehl, L., B.R. Hacker, G. Hirth, and P. Kelemen, Arc-parallel flow within the mantle wedge: Evidence from the accreted Talkeetna arc, South Central Alaska, *J. Geophys. Res.*, 108, B8, 2375, doi:10.1029/2002JB002233, 2003.

*Zhu, W., and G. Hirth, A network model for permeability in partially molten rocks, *Earth Planet. Sci. Lett.*, 212 (2003) 407-416, 2003.

*Renner, J., **K. Viskupic, G. Hirth, and B. Evans, Melt extraction from partially molten peridotite, *Geochemistry, Geophysics, and Geosystems*, DOI number 10.1029/2002GC000369, 2003.

*Montesi, L.G.J., and G. Hirth, Grain size evolution and the rheology of ductile shear zones: from laboratory experiments to postseismic creep, *Earth Plant. Sci. Lett.*, 211, 97-110, 2003.

Hirth, G, Laboratory constraints on the rheology of the upper mantle, in *Plastic Deformation of Minerals and Rocks,* edited by S. Karato and H.R. Wenk, Reviews in Mineralogy and Geochemistry, 51, 97-120, 2002.

**Yoshinobu, A., and G. Hirth, Microstructural and experimental constraints on the rheology of partially molten gabbro beneath oceanic spreading centers, *J. Struct. Geol.*, 24, 1101-1107 2002.

*Renner, J., B. Evans, and G. Hirth, Grain growth and inclusion formation in partially molten carbonate rocks, *Cont. Min. Pet.*, 142, 501-514, 2002.

Dick, H.J.B., K. Ozawa, P.T. Robinson, P.S. Meyer, Y. Niu, M. Constantin, G. Hirth, J. Natland, and R. Hebert, Primary silicate mineral chemistry of a 1.5 km section of ultra-slow spread lower ocean crust: ODP Hole 735B, Southwest Indian Ridge, *Leg 176 ODP Scientific Results Volume*, 2002.

Hirth, G., C. Teyssier, and W.J. Dunlap, An evaluation of quartzite flow laws based on comparisons between experimentally and naturally deformed rocks, *Int. J. Earth Sci.*, (*Geologishe Rundschau)*, 90, 77-87, 2001.

Evans, B., *J. Renner, and G. Hirth, A few remarks on the kinetics of grain growth in rocks, *Int. J. Earth Sci.,* (*Geologishe Rundschau)*, 90, 88-103, 2001.

Escartin, J., G. Hirth, and B. Evans, Strength of slightly serpentinized peridotites: Implications for the tectonics of oceanic lithosphere, *Geology*, 29, 1023-1026, 2001.

*Garrido, C.J., P. Kelemen, and G. Hirth, Variation of cooling rate with depth in lower crust formed at an oceanic spreading ridge; Plagioclase crystal size distributions in gabbros from the Oman Ophiolite, *Geochemistry, Geophysics, and Geosystems (G^3),* 2, Paper number 2000GC000136, 2001.

Tucholke, B.E., Fujioka, K., Ishihara, T., G. Hirth, and M. Kinoshita, Submersible study of an oceanic megamullion in the central North Atlantic, *J. Geophys. Res.*, 106, 16145-16161, 2001.

Hirth, G., Evans, R.L., and A.D. Chave, Comparison of continental and oceanic mantle electrical conductivity: Is the Archean lithosphere dry?, *Geochemistry, Geophysics, and Geosystems (G^3)*, 1, Paper Number 2000CG000048, 2000.

**Braun, M., G. Hirth, and E.M. Parmentier, The effects of deep, damp melting on mantle flow and melt generation beneath mid-ocean ridges, *Earth Planet. Sci. Lett*., 176, 339-356, 2000.

Kelemen, P. B., **M. Braun and G. Hirth, Spatial distribution of melt conduits in the mantle beneath oceanic spreading ridges, *Geochemistry, Geophysics, and Geosystems (G^3)*, 1, Paper Number 1999GC000012, 2000.

*Renner, J., B. Evans, and G. Hirth, On the rheologically critical melt percentage, *Earth Planet. Sci. Lett.*, 181, 585-594, 2000.

Dick, H.J.B., J.H. Natland, J.C. Alt, W.Bach, D. Bideau, J.S. Gee, S. Haggas, J.G.H. Hertogen, G. Hirth, P.M. Holm, B. Ildefonse, G.J. Iturrino, B.E.John, D.S.Kelley, E. Kikawa, A. Kingdon, P.J. LeRoux, J. Maeda, P.S. Meyer, D.J. Miller, H.R. Naslund, Y. Niu, P.T. Robinson, J. Snow, R.A. Stephen, P.W.Trimby, H.-U. Worm, and A. Yoshinobu, A long in-situ section of the lower ocean crust: results of ODP Leg 176 drilling at the Southwest Indian Ridge, *Earth Planet. Sci. Lett.*, 179, 31-51, 2000.

*Ito, G., Y. Shen, G. Hirth and C.J. Wolfe, Mantle flow, melting, and dehydration of the Iceland mantle plume, *Earth and Planet. Sci. Lett*, 165, 81-96, 1999.

Hirth, G., **J. Escartín, and J. Lin, The rheology of the lower oceanic crust: Implications for lithospheric deformation at mid-ocean ridges, in *"Faulting and Magmatism at Mid-Ocean Ridges"*, Geophys. Monogr. Ser., vol. 106, edited by W.R. Buck, P.T. Delaney, J.A. Karson and Y. Lagabrielle, pp. 291-304, 1998.

Hirth, G., and J. Tullis, Dislocation creep regimes in experimentally deformed quartz aggregates, in *Atlas of mylonitic and fault-related rocks*, Edited by A.W. Snoke, J.A. Tullis, V.R. Todd, Princeton Univ. Press, 496-499, 1998.

Hirth, G., **J.W. Dunlap, C. Teyssier, Dislocation creep regimes in naturally deformed quartz aggregates, in *Atlas of mylonitic and fault-related rocks*, Edited by A.W. Snoke, J.A. Tullis, V.R. Todd, Princeton Univ. Press, 500-501, 1998.

**Escartín, J., G. Hirth, and B. Evans, Non-dilatant brittle deformation of serpentinites: Implications for mohr-coulomb theory and the strength of faults, *J. Geophys. Res*., 102, 2897-2913, 1997.

Kelemen, P.B., G. Hirth, N. Shimizu, M. Spiegelman, and H.J.B. Dick, A review of melt migration processes in the adiabatically upwelling mantle beneath oceanic spreading ridges, *Philos. Trans. R. Soc. London* A355, 283-318, 1997.

**Escartín, J., G. Hirth, and B. Evans, Effects of serpentinization on lithospheric strength and the style of normal faulting at slow spreading ridges, *Earth and Planet. Sci. Lett*, 151, 181-189, 1997.

**Dunlap, W.J., G. Hirth, and C. Teyssier, Thermomechanical evolution of a midcrustal duplex and implications for midcrustal rheology, *Tectonics*, 16, 983-1000, 1997.

Hirth, G., and D.L. Kohlstedt, Water in the oceanic mantle: Implications for rheology, melt extraction and the evolution of the lithosphere, *Earth Planet. Sci. Lett*., 144, 93-108, 1996.

**Jaroslow, G.E., G. Hirth, and H.J.B. Dick, Abyssal peridotite mylonites: implications for grain-size sensitive flow and strain localization in the oceanic lithosphere, *Tectonophysics*, 256, 17-37, 1996.

Hirth, G., and D.L. Kohlstedt, Experimental constraints on the dynamics of the partially molten upper mantle: Deformation in the diffusion creep regime, *J. Geophys. Res.,* 100, 1981-2001, 1995a.

Hirth, G., and D.L. Kohlstedt, Experimental constraints on the dynamics of the partially molten upper mantle: 2. Deformation in the dislocation creep regime, *J. Geophys. Res.,* 100, 15,441-15,449, 1995b.

**Lizarralde*, D.*, A. Chave, G. Hirth, and A. Schultz, Northeastern Pacific mantle conductivity profile from long-period magnetotelluric sounding using Hawaii-to-California submarine cable data, *J. Geophys. Res*., 100, 17,837-17,854, 1995.

Hirth, G., and J. Tullis, The brittle-plastic transition in experimentally deformed quartz aggregates, *J. Geophys. Res.,* 99, 11731-11747, 1994.

Hirth, G., and J. Tullis, Dislocation creep regimes in quartz aggregates, *J. Struct. Geol., 14*, 145-159, 1992.

Hirth, G., and J. Tullis, The effect of porosity on the strength of quartz aggregates deformed in the dislocation creep regime, *Tectonophysics, 200*, 97-110, 1991.

Hirth, G., and J. Tullis, Reply to comment on "The effects of pressure and porosity on the micromechanics of the brittle-ductile transition in quartzite", *J. Geophys. Res., 96*, 11,881-11,882, 1991.

Hirth, G., and J. Tullis, The effects of pressure and porosity on the micromechanics of the brittle-ductile transition in quartzite, *J. Geophys. Res., 94*, 17,825-17,838, 1989.

Books

Tectonic Faults: Agents of Change on a Dynamic Earth, Edited by Mark R. Handy, Greg Hirth and Niels Hovius, MIT Press, June 2007.