Rob M. Skarbek

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Lamont-Doherty Earth Observatory
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Education

Ph.D. Geological Sciences, University of Oregon, June, 2015
Advised by Alan Rempel, and David Schmidt
Dissertation: *Modeling the Effects of Geologic Heterogeneity and Metamorphic Dehydration on Slow Slip and Shallow Deformation in Subduction Zones*

M.S. Geosciences, Penn State, 2008
Advised by Demian Saffer
Thesis: *Pore Pressure Development Within Underthrust Sediments at the Nankai Subduction Zone: Implications for Décollement Mechanics and Sediments Dewatering*

B.A. Physics, Penn State, 2006

Employment

June, 2019 - Present Associate Research Scientist, Lamont-Doherty Earth Observatory

June, 2016 - May, 2019 Postdoctoral Research Scientist, Lamont-Doherty Earth Observatory

June, 2015 - April, 2016 Postdoctoral Research Scholar, University of Oregon

March, 2010 - June, 2015 Graduate Teaching Fellow, University of Oregon

Summer 2009 Geophysical Research Intern, Newfield Exploration Company

2006 - 2008 Graduate Research Assistant, Penn State University

Research Interests

Rock and ice friction; Earthquake source mechanics; Firn/snow and sediment consolidation; Structure and mechanics of submarine accretionary wedges; Mechanics of ice streams

Marine Experience

2012 - 2013 Shipboard scientist (logging and physical properties specialist), IODP Expedition 338, NanTroSEIZE Stage 3: Plate Boundary Deep Riser 2, Nov. 2012 - Jan. 2013

Funding

Awarded

2020-2022 NSF-OPP, Understanding Firn Rheology Through Laboratory Compaction Experiments and Radar Data, $737,532, Lead PI.

2019-2022 NASA-SSA, Laboratory Study of Frictional Stability and Tidal Triggering in Ice Mixtures, $500,639, Co-PI.

2014 Consortium for Ocean Leadership: Improved Mechanical Models of Accretionary Prisms with Application to the Kumano Transect, IODP Expedition 338 post-cruise research, $15,000.

2012-2013 Consortium for Ocean Leadership: Expedition 338 Shipboard Scientist Support, $20,707.

Pending

2020-2025 NSF-FRES, Collaborative Research: The Roles of Fault Zone Structure, Rheology, and Kinetics in Dictating Fault Slip Behavior Along the Subduction Interface, $174,908, Lead PI at LDEO.

2020-2023 NSF-EAR, The Influence of Fault Geometry on Shallow Frictional Sliding in Subduction Zones, $188,197, Sole PI.

Publications

In Review and In Preparation

McCarthy, C., P. B. Kelemen, R. M. Skarbek, and D. Goldsby (2020a), A viscous mechanism for periodic strain rate variations in glaciers, *J. Geophys. Res*, in Review.

Skarbek, R. M., C. McCarthy, and H. M. Savage (2020), A new method for determining rate-and-state frictional properties from induced shear stress oscillations, Application to ice-on-rock sliding, *Geochem. Geophys. Geosys.*, in Prep.

McCarthy, C., R. M. Skarbek, and H. M. Savage (2020b), Effect of periodic sliding velocity on ice friction and healing, *Geophys. Res. Lett.*, in Prep.

Peer-Reviewed

Skarbek, R. M., and H. M. Savage (2019), RSFit3000: A MATLAB GUI-based program for determining rate and state frictional parameters from experimental data, *Geosphere*, *15*(5), 1665–1676, doi: 10.1130/GES02122.1.

Skarbek, R. M., H. M. Savage, P. B. Kelemen, and D. Yancopoulos (2018a), Competition between crystallization-induced expansion and creep compaction during gypsum formation, and implications for serpentinization, *J. Geophys. Res.*, *123*(7), 5372–5393, doi: 10.1029/2017JB015369.

Rabinowitz, H. S., H. M. Savage, R. M. Skarbek, M. J. Ikari, B. M. Carpenter, and C. Collettini (2018), Frictional behavior of input sediments to the Hikurangi Trench, New Zealand, *Geochem, Geophys, Geosys*, *19*(9), 2973–2990, doi: 10.1029/2018GC007633.

Skarbek, R. M., and A. W. Rempel (2017), Heterogeneous Coulomb wedges: Influence of fluid pressure, porosity, and application to the Hikurangi subduction margin, New Zealand, *J. Geophys. Res.*, *122*(3), 1585–1613, doi: 10.1002/2016JB013497, 2016JB013497.

Bletery, Q., A. M. Thomas, J. C. Hawthorne, R. M. Skarbek, A. W. Rempel, and R. D. Krogstad (2017), Characteristics of secondary slip fronts associated with slow earthquakes in Cascadia, *Earth Planet. Sci. Lett.*, *463*, 212 – 220, doi: http://dx.doi.org/10.1016/j.epsl.2017.01.046.

Handwerger, A. L., A. W. Rempel, and R. M. Skarbek (2017), Submarine landslides triggered by destabilization of high-saturation hydrate anomalies, *Geochem, Geophys, Geosys*, *18*(7), 2429–2445, doi: 10.1002/2016GC006706.

Skarbek, R. M., and A. W. Rempel (2016), Dehydration-induced porosity waves and episodic tremor and slip, *Geochem. Geophys. Geosys.*, *17*(2), 442–469, doi: 10.1002/2015GC006155.

Handwerger, A. L., A. W. Rempel, R. M. Skarbek, J. J. Roering, and G. Hilley (2016), Rate-weakening friction characterizes both slow sliding and catastrophic failure of landslides, *Proc. Natl. Acad. Sci. U.S.A.*, *113*(37), 10,281–10,286, doi: 10.1073/pnas.1607009113.

Moore, G. F., K. Kanagawa, M. Strasser, B. Dugan, L. Maeda, S. Toczko, and the IODP Expedition 338 Scientific Party (2014), IODP Expedition 338: NanTroSEIZE Stage 3: NanTroSEIZE plate boundary deep riser 2, *Sci. Dril.*, *17*, 1–12, doi: 10.5194/sd-17-1-2014.

Skarbek, R. M., A. W. Rempel, and D. A. Schmidt (2012), Geologic heterogeneity can produce aseismic slip transients, *Geophys. Res. Lett.*, *39*(21), doi: 10.1029/2012GL053762.

Skarbek, R. M., and D. M. Saffer (2009), Pore pressure development beneath the décollement at the Nankai subduction zone: Implications for plate boundary fault strength and sediment dewatering, *J. Geophys. Res.*, *114*(B7), doi: 10.1029/2008JB006205.

Data Reports, and Conference Publications

Kelemen, P., R. Aines, E. Bennett, S. Benson, E. Carter, J. Coggon, J. de Obeso, O. Evans, G. Gadikota, G. Dipple, M. Godard, M. Harris, J. Higgins, K. Johnson, F. Kourim, R. Lafay, S. Lambart, C. Manning, J. Matter, K. Michibayashi, T. Morishita, J. Nol, K. Okazaki, P. Renforth, B. Robinson, H. Savage, R. Skarbek, M. Spiegelman, E. Takazawa, D. Teagle, J. Urai, and J. Wilcox (2018), In situ carbon mineralization in ultramafic rocks: Natural processes and possible engineered methods, *Energy Procedia*, *146*, 92 – 102, doi: https://doi.org/10.1016/j.egypro.2018.07.013, Carbon in natural and engineered processes: Selected contributions from the 2018 International Carbon Conference.

Skarbek, R. M., and A. W. Rempel (2013a), Thermal consolidation with chemical dehydration reactions: Pore pressure generation in the slow slip region of subduction zones, in *Poromechanics V: Proceedings of the Fifth Biot Conference on Poromechanics*, edited by C. Hellmich, B. Pichler, and D. Adam, pp. 499–506, American Society of Civil Engineers, Reston, VA, doi: 10.1061/9780784412992.059.

Gou, J., W. Likos, M. B. Underwood, R. M. Skarbek, and D. Saffer (2011), Data report: consolidation chararcteristics of sediments from Sites C0002, C0006, and C0007, IODP Expeditions 315 and 316, NanTroSEIZE Stage 1, in *Proceedings of the Integrated Ocean Drilling Program*, vol. 314/315/316, edited by M. Kinoshita, H. Tobin, J. Ashi, G. Kimura, S. Lallement, E. J. Screaton, D. Curewitz, H. Masago, K. T. Moe, and the Expedition 314/315/316 Scientists, Integrated Ocean Drilling Program Management International, Inc., Washington D. C.

Saffer, D., J. Gou, M. B. U. W. Likos, R. M. Skarbek, I. Song, and M. Gildow (2011), Data report: consolidation, permeability, and fabric of sediments from the Nankai continental slope, IODP Sites C0001, C0008, and C0004, in *Proceedings of the Integrated Ocean Drilling Program*, vol. 314/315/316, edited by M. Kinoshita, H. Tobin, J. Ashi, G. Kimura, S. Lallement, E. J. Screaton, D. Curewitz, H. Masago, K. T. Moe, and the Expedition 314/315/316 Scientists, Integrated Ocean Drilling Program Management International, Inc., Washington D. C.

Conference Presentations

McCarthy, C., P. Kelemen, R. M. Skarbek, and D. L. Goldsby (2019a), An intraglacial viscous mechanism for periodic glacial earthquakes, Abstract C51C-1295, AGU 2019 Fall Meeting, San Francisco, CA, 9-13 Dec.

McCarthy, C., H. M. Savage, R. M. Skarbek, E. Aharonov, C. H. Scholz, S. Saltiel, and M. Zaman (2019b), Dramatic healing under static and oscillating loads in an ice on rock system, Abstract T22B-02, AGU 2019 Fall Meeting, San Francisco, CA, 9-13 Dec.

Savage, H. M., R. M. Skarbek, P. J. Polissar, and C. D. Rowe (2019), How coseismic temperature rise affects postseismic healing, Abstract T22B-08, AGU 2019 Fall Meeting, San Francisco, CA, 9-13 Dec.

Skarbek, R. M., H. M. Savage, and P. B. Kelemen (2018b), Experimental investigation of reaction-driven deformation, cracking and permeability during serpentinization, Abstract V13E-0171, AGU 2018 Fall Meeting, Washington D.C., 10-14 Dec.

Skarbek, R. M., H. M. Savage, M. Spiegelman, P. B. Kelemen, and D. Yancopoulos (2017), Competition between reaction-induced expansion and creep compaction during gypsum formation: Experimental and numerical investigation, Abstract H41P-08, AGU 2017 Fall Meeting, New Orleans, LA, 11-15 Dec.

McCarthy, C., H. M. Savage, R. M. Skarbek, and M. Nettles (2017), The effect of periodic forcing on the stability transition of ice friction, Abstract C33E-01, AGU 2017 Fall Meeting, New Orleans, LA, 11-15 Dec.

Skarbek, R. M., H. M. Savage, P. B. Kelemen, S. Lambart, and B. Robinson (2016), Experiments on the effects of confining pressure during reaction-driven cracking, Abstract MR41A-2680, AGU 2016 Fall Meeting, San Francisco, CA, 12-16 Dec.

Bletery, Q., A. Thomas, R. D. Krogstad, J. C. Hawthorne, R. M. Skarbek, A. W. Rempel, and M. G. Bostock (2016), Automated detection of secondary slip fronts in Cascadia, Absract S42A-02, AGU 2016 Fall Meeting, San Francisco, CA, 12-16 Dec.

Skarbek, R. M., and A. W. Rempel (2015), Tidally influenced stick-slip in 1D models of ice stream flow with rate-and-state friction, Abstract C11A-0733, AGU 2015 Fall Meeting, San Francisco, CA, 14-18 Dec.

Handwerger, A. L., A. W. Rempel, and R. M. Skarbek (2015), Submarine landslides and gas hydrates: Using a rate and state friction model to describe incipient motion triggered by the dissociation of high saturation hydrate anomalies, Abstract EP14B-08, AGU 2015 Fall Meeting, San Francisco, CA, 14-18 Dec.

Skarbek, R. M., A. W. Rempel, and A. Thomas (2014a), Effects of tidal modulation in heterogeneous models of slow slip, Abstract S53C-4541, AGU 2014 Fall Meeting, San Francisco, CA, 15-19 Dec.

Skarbek, R. M., M. Ikari, A. Hupers, A. W. Rempel, D. Wilson, and H. Kitajima (2014b), Approximate general Coulomb model for accretionary prisms: An integrated study of the Kumano Transect, Nankai Subduction Zone, Southwest Japan, Abstract EGU2014-9819, EGU General Assembly.

Handwerger, A. L., A. W. Rempel, J. J. Roering, G. Hilley, and R. M. Skarbek (2014), A rate- and state-dependent friction model to describe the seasonal motion of slow-moving earthflows and quantify their potential for catastrophic failure, Abstract NH42A-04, AGU 2014 Fall Meeting, San Francisco, CA, 15-19 Dec.

Skarbek, R. M., and A. W. Rempel (2013b), Modelling the controls on excess pore pressure by dehydration reaction in the slow-slip region of subduction zones, Abstract T41A-252, AGU 2013 Fall Meeting, San Francisco, CA, 9-13 Dec.

Skarbek, R. M., A. W. Rempel, and D. A. Schmidt (2011), Slow slip events in a 1-D model of a compliant subduction channel shear zone, Abstract S23B-2243, AGU 2011 Fall Meeting, San Francisco, CA, 5-9 Dec.

Skarbek, R. M., A. W. Rempel, and D. A. Schmidt (2010), Pore pressure evolution at the plate interface along the Cascadia subduction zone from the trench to the ETS transition zone, Abstract T13A-2158, AGU 2010 Fall Meeting, San Francisco, CA, 13-17 Dec.

Saffer, D. M., A. McKiernan, and R. M. Skarbek (2008), Permeability anisotropy in marine mudstones in the Nankai Trough, SW Japan: Implications for hypothesized lateral fluid flow and chemical transport outbouard of the trench, Abstract U53A-0047, AGU 2008 Fall Meeting, San Francisco, CA, 15-19 Dec.

Song, I., R. M. Skarbek, D. M. Saffer, and P. B. Flemings (2008), A comparison of compression behavior of mudrock core samples from the Nankai Margin, SW Japan and the Ursa Basin, Gulf of Mexico, Abstract T31A-1985, AGU 2008 Fall Meeting, San Francisco, CA, 15-19 Dec.

Skarbek, R. M., and D. M. Saffer (2007), Pore pressure development in sub-décollement sediments in subduction zones: Insights from laboratory data and numerical modeling, Abstract T33C-1478, AGU 2014 Fall Meeting, San Francisco, CA, 10-14 Dec.