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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; Deformation and fluid flow in multi-phase porous media; Mechanics of ice streams; Structure and mechanics of submarine accretionary wedges.

Marine Experience

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

Funding

2021-2024 NSF-EAR, *The Influence of Fault Geometry on Shallow Frictional Sliding in Subduction Zones*, \$188,197, **Sole PI**.

2020-2023 NSF-OPP, *Understanding Firn Rheology Through Laboratory Compaction Experiments and Radar Data*, \$737,532. **Lead PI**, co-PIs: J. Kingslake, C. McCarthy.

2019-2022 NASA-SSA, *Laboratory Study of Frictional Stability and Tidal Triggering in Ice Mixtures*, \$500,639. **Co-PI** with H. Savage. Lead PI: C. McCarthy.

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.

Publications

In Review

McCarthy, C., R. M. Skarbek, and H. M. Savage (2022), Effect of periodic sliding velocity on ice friction and healing, *Frontiers in Earth Science*, doi: 10.1002/essoar.10509831.1.

Kingslake, J., R. Skarbek, E. Case, and C. McCarthy (2022), Grain-size evolution controls the accumulation dependence of modeled firn thickness, *The Cryosphere Discussions, 2022*, 1–30, doi: 10.5194/tc-2022-13.

Peer-Reviewed

Skarbek, R. M., C. McCarthy, and H. M. Savage (2022), Oscillatory loading can alter the velocity dependence of ice-on-rock friction, *Geochem., Geophys., Geosys*, *23*(2), doi: <https://doi.org/10.1029/2021GC009954>.

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. Colletini (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

- 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 characteristics 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

- Skarbek, R. (2021), Shallow slow slip events can nucleate on velocity-strengthening thrust faults, Abstract MR35A-0095, AGU 2021 Fall Meeting, 13 - 14 Dec., doi: 10.1002/essoar.10509521.1.
- Holtzman, B. K., N. Groebner, T. Sawi, T. Xing, M. Pec, H. O. Ghaffari, U. Mok, R. M. Skarbek, J. Paisley, T. Mittal, F. Waldhauser, E. Beauce, and A. Barth (2021), Unsupervised spectral feature extraction applied to acoustic emissions during brittle creep of basalt under dry and wet conditions, Abstract H12E-04, AGU Fall Meeting, 13 - 17 Dec.

- Kingslake, J., R. M. Skarbek, E. Case, and C. McCarthy (2021), Grain-size evolution controls the accumulation dependence of modeled isothermal firn thickness, Abstract C44C-01, AGU Fall Meeting, 13 -17 Dec.
- Zaman, M., C. McCarthy, H. M. Savage, and R. M. Skarbek (2021), Laboratory experiments to better constrain frictional heating and seismicity on icy satellite faults, Abstract P31A-06, AGU 2021 Fall Meeting, 13 -17 Dec.
- Skarbek, R. M., C. McCarthy, and H. M. Savage (2020), A new method for determining rate-and-state frictional properties from experimental shear stress oscillations, application to ice-on-rock sliding, Abstract MR015-0002, AGU 2020 Fall Meeting, 1-17 Dec.
- 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.
- Blettery, 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, Abstract 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.
- Handwerker, 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.
- Handwerker, A. L., A. W. Rempel, J. J. Roering, G. Hillel, 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 outboard 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.