

Dougal D. Hansen – Curriculum Vitae

University of Wisconsin-Madison
Department of Geoscience
Postdoctoral research associate

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Education

- 2022 PhD from University of Wisconsin-Madison, Department of Geosciences
Advisor: Lucas K. Zoet (focus: Glaciology/Geophysics)
Dissertation: *Experimental insights into subglacial mechanics*
- 2017 B.S. with Honors in Geology and Mathematics from Portland State
University (Cum laude).
Advisor: Maxwell Rudolph
Honors thesis: *Formation of Double Ridges on Europa due to
Viscoelastoplastic Deformation above Crystallizing Cryovolcanic
Intrusion*

Appointments

- Sept 2022 – Postdoctoral Research Associate, UW-Madison
- 2017 – 2022 Research and Teaching Assistant, UW-Madison
- 2015 – 2016 Undergraduate Research Assistant, Portland State University

Teaching Experience

- Fall 2023 Co-instructor for Glacial and Pleistocene Geology (GEOSCI-920)
- June 2023 Teaching faculty for the Juneau Icefield Research Program
- Spring 2020 Teaching Assistant for Structure (GEOSCI-455)
- Fall 2019 Teaching Assistant for Applied Geophysics (GEOSCI-594)

Refereed Publications († denotes undergraduate mentee)

- Fahrner, D., Catania, G., Shahin, M., **Hansen, D. D.**, Loffler, K., Abermann, J., Advances in monitoring glaciological processes in Greenland over the past decades (accepted to *PLOS Climate*, Feb. 2024)
- Zoet, L. K., Smith, L. †, Mixtli, A. †, Brooks, **Hansen, D. D.**, (2024) Link between glacial striation morphology and induced drag. *GSA Bulletin*. <https://doi.org/10.1130/B37351.1>
- Stevens, N. T., Zoet, L. K., **Hansen, D.D.**, Alley, R. B., Roland, C. J., Schwans, E., Shepherd, C. S., (2023) Icequake insights on transient glacier slip mechanics near channelized subglacial drainage, *Earth and Planetary Science Letters*. <https://doi.org/10.1016/j.epsl.2023.118513>.
- Rempel, A.W., **Hansen, D.D.**, Zoet, L.K., Meyer, C. R., (2023) Diffuse debris entrainment in glacier, lab, and model environments. *Annals of Glaciology*. <https://doi:10.1017/aog.2023.31>
- Zoet, L. K., Sobol, P., Lord, N, **Hansen, D.D.**, (2023) A device to simulate cryosphere processes *Review of Scientific Instruments*. <https://doi.org/10.1063/5.0142933>

- Hansen, D. D.**, Brooks, J.P., Zoet, L. K., Stevens, N.T., Smith, L[†], Bates, C.E., Janke, B.J., (2023) A power-based abrasion law for use in landscape evolution models. *Geology*. <https://doi.org/10.1130/G50673.1>
- Zoet, L. K., **Hansen, D. D.**, Morgan-Witts, N, Menzies, J, Sobol, P, Lord, N., (2022) Experimental baseline for ice-till strain indicators. *Canadian Journal of Geoscience*. <https://doi.org/10.1139/cjes-2022-0074>
- Dodge, S., Zoet, L.K., Rawling, E., Theuerkauf, E., **Hansen, D. D.**, (2022). Transport properties of fast ice within the nearshore. *Coastal Engineering*, 177. <https://doi.org/10.1016/j.coastaleng.2022.104176>
- Stevens, N.T., Roland, C.J., Zoet, L. K, Alley, R.B., **Hansen, D.D.**, Schwans, E. (2022). Multi-decadal basal slip enhancement at Saskatchewan Glacier, Canadian Rocky Mountains. *Journal of Glaciology*, 1-16. <https://doi.org/10.1017/jog.2022.45>
- Hansen, D.D.** and Zoet, L.K., Characterizing sediment flux of deforming glacier beds. (2022) *Journal of Geophysical Research: Earth Surface*, p.e2021JF006544. <https://doi.org/10.1029/2021JF006544>
- Bershaw, J., **Hansen, D.D.**, and Schauer, A.J., (2020). Deuterium excess and ¹⁷O-excess variability in meteoric water across the Pacific Northwest, USA. *Tellus B: Chemical and Physical Meteorology*, 72(1), 1-17. <https://doi.org/10.1080/16000889.2020.1773722>
- Hansen, D. D.** and Zoet, L. K. (2019). Experimental constraints on subglacial rock friction. *Annals of Glaciology*, 60(80), 37-48. <https://doi.org/10.1017/aog.2019.47>
- Lipovsky, B. P., Meyer, C. R., Zoet, L. K., McCarthy, C., **Hansen, D. D.**, Rempel, A. W., and Gimbert, F. (2019). Glacier sliding, seismicity and sediment entrainment. *Annals of Glaciology*, 60(79), 182-192. <https://doi.org/10.1017/aog.2019.24>

Manuscripts in Review

- Hansen, D. D.**, Warburton, K.L.P., Zoet, L.K., Meyer, C. R., Rempel, A.W., Stubblefield, A., Frozen fringe controls basal friction for soft-bedded glaciers and ice streams (in review *Geophysical Research Letters*)
- Madden, I., Damsgaard, A., **Hansen, D. D.**, Zoet, L. K., Suckale, Predicting maximal shear-layer thickness in subglacial till with adapted friction laws, (in review *Physical Review Letters*)
- Crompton, J. W., Wagner, K., **Hansen, D.D.**, Image processing for micro-sediments (submitted in Oct 2023 as a chapter for the book “Sediments close-up, the micromorphology and micro-sedimentology of non-lithified sediments,” editors: Jaap JM van der Meer, John Menzies, Emrys Phillips)

Manuscripts in prep

- Stevens, N. T, **Hansen, D. D.**, Zoet, L. K., Sobel, P, Lord, N., Experimental investigation of cavity dynamics under cyclic effective stresses (for submission to *Journal of Glaciology*)
- Hansen, D. D.**, Warburton, K.L.P., Stubblefield, A., Tovar, A. [†], Zoet, L.K., Meyer, C. R., Rempel, A.W., Contribution of entrained basal sediment to subglacial sediment flux (for submission to *Geology*)
- Hansen, D. D.**, Zoet, L.K., Sobol, P., Lord, N, A cryogenic uniaxial compression device with ERT capabilities (for submission to *Review of Scientific Instruments*)

Fieldwork Experience

Sept-Oct 2023

Sedimentological study of paleo-glacial deposits, Northern Wisconsin

Nov. 2022	Alaska Broadband Accessory Deployment for Geophysical Research (BADGER) seismic experiment, Kenai Peninsula, AK
July-Aug 2022	Exposure dating and seismic/hydrologic survey at Denver Glacier, Coastal Range, AK
June, Aug. 2021	Seismic and Hydrologic Survey at Bench Glacier, Chugach Range, AK
Aug. 2019	Saskatchewan Glacier Geophysical Survey, Banff National Park, Canada
July 2015- Nov 2016	Pacific Northwest water isotope survey spanning OR, WA, northern ID.
June-Aug 2014	Juneau Icefield Research Project (student participant)
March 2013	Characterization of Mickey Hot Springs, Alvord Desert, Or (field assistant for L.A. Mobray and M.L. Cummings)

Journal Reviewer

Geophysical Research Letters (3)

Journal of Geophysical Research: Earth Surface (3)

Earth Surface Processes and Landforms (5)

Hydrologic Processes (2)

Conference/Symposia Presentations (* denotes talk, otherwise poster)

***Hansen, D. D.**, Zoet, L.K., Muto, A., Lord, N., Sobol, P. (2023) Can we estimate subglacial effective stress with active source seismic data? AGU Fall Meeting 2023.

Hansen, D. D., Stubblefield, A.G., Warburton, K.L.P., Zoet, L.K., Stubblefield, A.G., Meyer, C. R., Rempel, A.W. (2023) The impact of frozen sediments on basal friction for soft-bedded glaciers and ice streams. AGU Fall Meeting 2023.

***Hansen, D. D.**, Prescott, J, Morgan-Witts, N, Zoet, L.K., Rawling JE, (2023), Determining glacial sediment depositional mechanisms through anisotropy of magnetic susceptibility. Geological Society of America Annual Meeting 2023, Pittsburgh, PA.

Hansen, D. D., Zoet, L.K., Muto, Atsu., Lord, N, Sobel, P. (2023), Constraining subglacial till properties from acoustic techniques. WAIS Workshop, Cloquette, Mn

Hansen, D. D., Zoet, L.K., Stubblefield, A., Meyer, C. R., Rempel, A.W (2023). The impact of frozen sediments on basal frictions during glacier sliding. International Glaciology Society Edges of Glaciology Symposium, Limerick, Ireland

***Hansen, D. D.**, Zoet, L. K., Morgan-Witts, N, Menzies, J, Sobol, P, Lord, N., (2023) Experimental baseline for ice-till strain indicators. North Central - Geological Society of America Meeting, Grand Rapid, MI.

***Hansen, D. D.**, Brooks, J.P, Zoet, L.K, Stevens, N.T., Smith, L (2022). Linking subglacial abrasion rates to rock frictional energy during slip, American Geophysical Union Fall Meeting 2022, Chicago, IL.

Hansen, D. D., Zoet, L.K, Meyer, C., and Rempel, A. (2021). Insight into frozen fringe and its effect on slip mechanics, American Geophysical Union Fall Meeting 2021, New Orleans, LA.

***Hansen, D. D.**, Zoet, L.K, Meyer, C., and Rempel, (2021) Frozen fringe growth and its effect on basal slip, West Antarctic Ice Sheet Workshop 2021, Richmond, VA.

***Hansen, D.D.**, and Zoet, L. K., (2021) Experimental insight into the entrainment and transport of subglacial debris. Weeks Research Symposium 2021, Madison, WI.

Hansen, D. D., Zoet, L.K., Damsgaard, A. (2020). The influence of sliding velocity and effective stress on the distribution of strain in subglacial till. European Geophysical Union 2020. (*did not present because of COVID-19*).

- *Hansen, D. D.,** and Zoet, L.K. (2020). Sediment flux of deformable glacier beds. American Geophysical Union Fall Meeting 2020. Virtual.
- *Hansen, D. D.,** and Zoet, L.K. (2019). Experimental constraints on debris-bed contact forces during subglacial abrasion. International Glaciology Society Symposium, Madison, WI.
- Hansen, D. D.,** and Zoet, L.K. (2018). Experimental Constraints on Subglacial Abrasion, American Geophysical Union Fall Meeting 2018, Washington DC.
- *Hansen, D. D.,** and Zoet, L.K. (2018). Experimental methods to constrain energy dissipation during subglacial abrasion, North Central - Geological Society of America Meeting, Aimes, IA.
- Hansen, D. D.,** and Bershaw, J., (2017), Spatial Variability of $\Delta^{17}\text{O}$ in the Pacific Northwest, Goldschmidt 2017, Paris, France.
- Hansen, D. D.,** and Bershaw, J., (2016), Spatial variation of ^{17}O -excess water across Oregon. American Geophysical Union Fall Meeting 2016, San Francisco, CA.
- Hansen, D. D.,** and Rudolph, M.L., (2015), Formation of double ridge features on Europa due to the plastic deformation of an icy shell above a crystallizing water intrusion, American Geophysical Union Fall Meeting 2015, San Francisco, CA.
- Hansen D. D.,** Sanders, M., Yang, J, Thiessen, D., Nichols, A., Sales, H., Burns, S., (2014) The effects of fire on the physical structure of soils: Mt. Adams, WA. Sigma Xi Columbia-Willamette chapter Student Research Symposium

Honors/Awards/Funding

2022	James J. & Dorothy T. Hanks Award in Geophysics, UW-Madison
2022	C.F. Schiesser Outstanding Student Research Paper Award
2021	Berg TA award, UW-Madison
2019	C.F. Schiesser Outstanding Student Research Paper Award
2019	Geological Society of America Student Research Grant
2019	Sigma Xi Grant in Aid of Student Research
2019	UW-Madison Geoscience Departmental Grant
2019	Student Research Travel Grant, UW-Madison
2017	PSU Geology Outstanding Student Award
2016	Scott Burns Scholarship, PSU

Service

2023	Chair and OSPA liaison for AGU Session EP12B & EP12E (Landscape evolution beneath and beyond the ice)
2022-2024	UW-Madison Dept. of Geoscience DEI Steering Committee

2021-2022 President of American Association of Petroleum Geologists UW-Madison Student Chapter
2015-2016 President of Association of Engineering Geologists, PSU Student Chapter

Undergraduate Mentees

Lillian Smith. Project: “Classifying glacial abrasion morphology”

Rylee Maulson (CMN SDI intern). Project: “Linking clast shape to the transport history of Glacial tills”

Mataya Escalante (CMN SDI intern). Project: “Linking clast shape to the transport history of Glacial tills”

Kyle Smith. Project: “Permeability-porosity relationship for a WAIS basal till” (ongoing)

Jillian Prescott. Project: “The influence of ice burial depth on kettle geometry” (ongoing)

Alex Tovar: “Frozen fringe growth during basal slip” (ongoing)

Presentation collaborations

*Madden, I., Damsgaard, A., **Hansen, D. D.**, Zoet, L. K., Suckale (2023). Predicting maximal shear-layer thickness in subglacial till with adapted friction laws, American Geophysical Union Fall Meeting 2023. San Francisco

*Damsgaard, A., **Hansen, D. D.**, Zoet, L. K., (2022). Subglacial landforms from variations in modeled sediment flux, American Geophysical Union Fall Meeting 2022, Chicago, IL.

*Morgan-Witts, N., **Hansen, D. D.**, Zoet, L.K. (2022). Impacts of cyclic effective stress loading on basal slip, American Geophysical Union Fall Meeting 2022, Chicago, IL.

Summers, L., Stevens, N. T., **Hansen, D. D.**, Zoet, L. K., (2022) Sticky-spot migration observed at Bench Glacier from seismic data spanning 14 years, American Geophysical Union Fall Meeting 2022, Chicago, IL.

Meyer, C., Rempel, A, **Hansen, D. D.**, Stubblefield, A. G., Zoet, L. K., Cataloging effective pressure and frozen fringe under glaciers, American Geophysical Union Fall Meeting 2022, Chicago, IL.

Brooks, J.P., **Hansen, D. D.**, Stevens, N. T., Marcott, S. A., Zoet, L. K. (2022). Subglacial chemical weathering of two Alaskan glaciers: Insights from diurnal variations in water chemistry, American Geophysical Union Fall Meeting 2022, Chicago, IL.

*Rempel, A.W., **Hansen, D. D.**, Zoet, L. K., Meyer, C. (2022), Diffuse Debris Entrainment in Glacier, Lab, and Model Environments, International Glaciology Society Symposium, Juneau, Ak.

Smith, L., **Hansen, D. D.**, Zoet, L. K. (2022), Classifying Glacial Abrasion Morphology, UW-Madison Undergraduate Research Symposium 2022.

Summers, L. L., Stevens, N. T., **Hansen, D. D.**, Zoet, L. K. (2022), Testing the “sticky spot migration hypothesis” at Bench Glacier with seismic data from 2007 and 2021. Weeks Research Symposium 2021, Madison Wi.

Brooks, J.P., **Hansen, D.D.**, Zoet, L.K. (2021), Subglacial abrasion energy expenditure during basal slip. West Antarctic Ice Sheet Workshop 2021.

Stevens, N.T., Zoet, L.K., Roland, C.R., Alley, R.B., Schwans, E., **Hansen, D.D.**, Shepherd, C.S., (2021), Seismic insights on transient glacier sliding processes at Saskatchewan Glacier, Alberta, Canada. American Geophysical Union Fall Meeting 2021.

*Stevens, N.T., **Hansen, D.D.**, Zoet, L.K., Sobol., P.E., Lord, N.E., (2021). Experimental study of cyclic effective stress on glacier sliding with cavitation. American Geophysical Union Fall Meeting 2021.

- *Stevens, N.T., Alley, R.B., Roland, C.J., Zoet, L.K., **Hansen, D.D.**, Schwans, E., (2021). Reconsidering multi-decadal ice-margin sliding deceleration associated with rising meltwater supply: Insights from alpine glacier analogues. West Antarctic Ice Sheet Workshop 2020.
- *Stevens, N.T., Roland, C.J., Zoet, L.K., Alley, R.B., **Hansen, D.D.**, Schwans, E., Shepherd, C.S., (2021), Picoseismic insights onto transient processes at the bed of Saskatchewan Glacier. University of Washington Seismology Lunch Seminar.
- *Stevens, N.T., Roland, C.J., **Hansen, DD.**, Schwans, E., and Zoet, L.K. (2020). Basal Seismicity Forced by Surface Water Supply on a Stepped-Bed Glacier: Saskatchewan Glacier, Alberta, Canada. European Geophysical Union Annual Meeting 2020. Virtual.
- *Stevens, N.T., Roland, C.J., **Hansen, DD.**, Schwans, E., and Zoet, L.K. (2020). Student Seismology Workshop 2020. Dense Array Characterization of Glacier Stick-Slip Forced by Surface-Water Supply. cancelled (did not present because of COVID-19).
- *Stevens, N.T., Zoet, L.K., Roland, C.J., **Hansen, D.D.**, Alley, R.B., Schwans, E., and Shepherd, C.S. (2020). Imaging transient stick-slip processes near a subglacial conduit using a nodal seismic array. American Geophysical Union Fall Meeting 2020.
- *Zoet, L.K., **Hansen, D.D.**, and Rawling, E., (2020). A mechanistic understanding of Green Bay Lobe till deformation through experimental analysis. Geological Society of America North-Central Section Annual Meeting 2020.
- *Bershaw, J., and **Hansen, D.D.**, (2019), Variability of deuterium excess (d-excess) and ¹⁷O-excess (D¹⁷O) in meteoric water throughout the Pacific Northwest. Geological Society of America Cordilleran Section Annual Meeting 2019.