



Stanley Mordensky, PhD

Natural Scientist | stan.mordensky@gmail.com | (+1) 301 639 8619

Professional Summary

Scientist who investigates natural resources using data science, machine learning, laboratory experiments, and field research. Equally comfortable developing robust machine learning pipelines and making careful field observations. A demonstrated ability to analyze data, author reports, communicate advanced topics to all audiences.

An appetite for cross-disciplinary projects: regional geothermal assessments; annual available water from meteorological and geological data; geothermal reservoir rock mass characterization for development; volcanology.

Professional Experience

US Geological Survey | Geothermal Machine Learning Task

Portland, OR, USA

Research Geologist (Mendenhall Research Fellow)

February 2021 – Present

- Develop machine learning and physics-driven models for geothermal resources and water resources
- Build machine learning pipelines to train and evaluate models
- Conduct exploratory data analysis with geological and meteorological data
- Engineer new features (*i.e.*, create new input datasets for models)
- Participate as a part of an interdisciplinary research team
- Present research methods, results, and implications to technical and non-technical audiences

Yellowstone National Park | Geology Program

Yellowstone National Park, WY, USA

Visiting Scientist

May 2017 – September 2017; May 2020 – October 2020

- Mapped thermal features using GNSS transceivers for Hydrothermal Inventory Program
- Installed and maintained thermal data loggers and geodetic stations for thermal activity monitoring
- Synthesized workflow using Python scripts, ArcGIS, and structure-from-motion software to create and analyze maps for hazard characterization using thermal imagery
- Published print and web-based science content to educate visitors
- Accompanied visiting scientists to backcountry field locations
- Lab Manager for the YNP Physical Science Laboratory

University of Canterbury | Department of Geological Sciences

Christchurch, New Zealand

Doctoral Research Fellow

November 2015 – April 2019

- Completed geomechanical characterization of altered and unaltered andesite lavas in an alpine setting
- Designed experiments modeling physical processes in magmatic systems and eruption dynamics
- Characterized volcanic hazards (*e.g.* landslide, sector collapse) with numerical modeling
- Coordinated and collaborated with government and academic science teams

US Department of Energy | National Energy and Technology Laboratory

Albany, OR, USA

Research Fellow

March 2014 – March 2015

- Completed SEM, EDS, and XRD analyses for the Marcellus Shale Natural Attenuation
- Managed the personnel developing the Energy Data Exchange
- Installed magnetotelluric stations on Newberry Volcano

University of Oregon | Department of Geological Sciences

Eugene, OR, USA

Graduate Research Fellow

September 2010 – September 2012

- Designed and executed research plan to model magma transport with numerical modeling (VolatileCalc, MELTs)

US Geological Survey | Appalachian Blue Ridge Project

Reston, VA

Geologist

April 2010 – August 2010, June 2009

- Mapped meta-volcanic rocks in bimodal Paleo-Proterozoic complex in SW Virginia backcountry

Volunteer Experience

Yellowstone National Park | Climate Program

Yellowstone National Park, WY, USA

Volunteer

October 2020 – March 2021

- Scripted Python for processing of time-series image data to automate snowfall and thaw assessments
- Serviced backcountry climate stations for thermal, humidity, precipitation, and image data
- Aquarius database management

US Geological Survey | Hawaiian Volcano Observatory

Hawaii Volcanoes National Park, HI, USA

Volunteer

October 2012 – February 2013

- Conducted detailed flow-by-flow mapping and geochronology (^{14}C sampling)
- Managed hazard map production
- Completed a topographical analysis to install seismic stations on the island of Pagan

Reviewer for *The Geological Society Special Publications & Geofluids*

Instruction, Teaching, & Advising Experience

University of Canterbury | Department of Geology

Christchurch, New Zealand

Teaching Fellow

November 2015 – March 2019

- Taught labs for Volcanology, Petrology, Field Methods, Engineering Geology, and Geothermal/Ore Exploration
- Supervised emergency volcanic drills for analyses of volcanic activity and characterizing evolving hazards
- Advised 3 masters research projects on remote sensing, alteration, and geomechanical characterization
- Advised 2 undergrad research projects on alteration and geomechanical characterization

University of Oregon | Department of Geology

Eugene, OR, USA

Teaching Fellow

September 2010 – September 2012

- Taught Field Methods and labs for Mineralogy, Petrology, Volcanology, Earth Resources, and Earth Materials

George Washington University | Geology Program

Washington, DC, USA

Teaching Assistant

September 2008 – September 2009

- Taught Physical Geology and Environmental Geology (*i.e.* Introductory Geology) labs

Education

PhD Engineering Geology | 2019 | University of Canterbury: Christchurch, New Zealand

Dissertation: Effects of Magmatic Intrusions on Mechanical and Physical Properties of Volcanic Host Rock

MS Geological Sciences | 2012 | University of Oregon: Eugene, Oregon, USA | *summa cum laude*

Thesis: Magmas and Plumbing Systems of Oregon Cascade Volcanoes from Melt Inclusions

BA Geological Sciences | 2009 | George Washington University: Washington, DC, USA | *summa cum laude*

BSc Economics | 2009 | George Washington University: Washington, DC, USA | *summa cum laude*

Skill Sets

Software

- Python 3.X (*e.g.*, numpy, scipy, sklearn, keras, dask, netcdf4, gdal, rasterio, xarray)
- High performance computing
- Adobe Creative Suite
- ESRI: ArcGIS 9.X, 10.X, ArcGIS Pro, ArcGIS Online, ArcScene, ArcSurvey123, ArcCollector
- Agisoft Metashape (*i.e.* Agisoft Photoscan Pro)

Geomechanical

- Uniaxial compressive strength, Triaxial compressive deformation & Tensile strength testing
- Pulse decay & Steady-state permeametry
- Porosity & Density analysis (Archimedes triple weight & gas pycnometry)
- Elastic wave analysis (P-wave & S-wave velocity)

Petrological & Geochemical

Scanning electron microscope (SEM) | Electron probe analysis (EPMA) | X-Ray Diffraction (XRD)

Petrographic (thin-section) microscopy | Fourier transform infrared spectroscopy (FTIR)

Certifications

Wilderness First Responder | Eagle Scout | US & NZ Drivers License | US & NZ Paragliding License

Publications

13. Tollo, R. P., **Mordensky, S. P.** *Field Volcanology of the Oregon Cascades*. [Book in preparation]
12. **Mordensky, S. P.**, Lipor, J. J., DeAngelo, J., Burns, E. R., Lindsey, C. R., Evaluating Geothermal Resources with Classic Machine Learning Approaches. [Manuscript in preparation with intended submission to *Geothermics*]
11. **Mordensky, S. P.**, Lipor, J.J., Burns, E.R., Lindsey, C.R., (*In Press*) What Did They Just Say? Building a Rosetta Stone for Geoscience and Machine Learning. Conference Proceedings Paper for the Geothermal Rising Conference, August 28th - 31st, 2022.
10. **Mordensky, S. P.**, Villeneuve, M. C., Kennedy, B. M., Struthers, J., Gravley, D. M. (2022) Mechanical rock mass behaviour surrounding a shallow intrusion in andesitic lavas at Pinnacle Ridge, Mt. Ruapehu (New Zealand): pore-pressure induced edifice destabilization. *Engineering Geology* 305 - 106696. <https://doi.org/10.1016/j.enggeo.2022.106696>
9. **Mordensky, S. P.**, Lipor, J. J., DeAngelo, J., Burns, E. R., Lindsey, C. R., (2022) Predicting Geothermal Favorability in the Western United States by Using Machine Learning: Addressing Challenges and Developing Solutions, Proceedings 47th Stanford Geothermal Workshop, Stanford, California, February 7-9, 2022.
8. Kennedy, B. M., Farquhar, A., Hilderman, R., Villeneuve, M. C., Heap, M. J., **Mordensky, S. P.**, Kilgour, G., Jolly, A., Christenson, B. (2020) A conduit filled with hydrothermal breccia and self-closing cracks reconstructed from ballistics from Whakaari (White Island), New Zealand. *Geosciences* 10(4), 138. <https://doi.org/10.3390/geosciences10040138>
7. **Mordensky, S. P.**, Kennedy, B. M., Villeneuve, M. C., Lavallée, Y., Reichow, M. K., Wallace, P. A., Siratovich P. A., Gravley, D. M. (2019) Increasing the permeability of hydrothermally altered andesite by transitory thermal stressing. *Geochemistry, Geophysics, Geosystems (G-Cubed)* 20(11), 5251-5269. <https://doi.org/10.1029/2019GC008409>
6. Villeneuve, M. C., Kennedy, B. M., Gravley, D. M., **Mordensky, S. P.**, Heap, M. J., Siratovich, P. A., Wyring, L., Cant, J. (2019) Characteristics of altered volcanic rocks in geothermal reservoirs. ISRM International Congress on Rock Mechanics and Rock Engineering, 3120-3127. 13-18 September, 2019. Foz do Iguassu, Brazil.
5. **Mordensky, S. P.**, Heap, M. J., Kennedy, B. M., Gilg, H. A., Villeneuve, M. C., Farquharson, J. I., Gravley, D. M. (2019) Influence of Alteration on the Mechanical Behavior and Failure Mode of Andesitic Lavas: Implications for Shallow Seismicity and Volcano Monitoring. *Bulletin of Volcanology* 88(44), 1-12. <https://doi.org/10.1007/s00445-019-1306-9>
4. **Mordensky, S. P.**, Wallace, P. J. (2018) Magma storage below Cascades shield volcanoes as inferred from melt inclusion data: A comparison of long-lived and short-lived magma plumbing systems. *Journal of Volcanology and Geothermal Research* 368, 1-12. <https://doi.org/10.1016/j.jvolgeores.2018.10.011>
3. **Mordensky, S. P.**, Villeneuve, M. C., Farquharson, J. I., Kennedy, B. M., Heap, M. J., Gravley, D. M. (2018) Rock Mass Properties and Edifice Strength Data from Pinnacle Ridge, Mt. Ruapehu, New Zealand. *Journal of Volcanology and Geothermal Research* 367, 42-62. <https://doi.org/10.1016/j.jvolgeores.2018.09.012>
2. **Mordensky, S. P.**, Villeneuve, M. C., Kennedy, B. M., Heap, M. J., Gravley, D. M., Farquharson, J. I., Reuschlé, T. (2018) Physical and Mechanical Rock Property Relationships of a Shallow Intrusion and Volcanic Host Rock, Pinnacle Ridge, Mt. Ruapehu, New Zealand. *Journal of Volcanology and Geothermal Research* 359, 1-20. <https://doi.org/10.1016/j.jvolgeores.2018.05.020>
1. Siratovich, P. A., Villeneuve, M. C., **Mordensky, S. P.**, Richardson, I. (2017) Acid Solubility Testing of Greywacke Core and Implications for Well Permeability Enhancement. 22-24 November 2017. New Zealand Geothermal Workshop, Rotorua, New Zealand.

Non-Technical Articles / Outreach

3. **Mordensky, S. P.** (2021) The other volcanic range in the Yellowstone region: The Absarokas! *Caldera Chronicles*. U.S. Geological Survey. [Link]
2. **Mordensky, S. P.**, Hungerford, J., Flynn, B., Hosseini, B. (2017) Ecosystem Drivers: Geomorphology. *The State of Yellowstone Vital Signs and Select Park Resources Report*. Pg 15. U. S. National Park Service. [Link]
1. **Mordensky, S. P.** (2013) How can melt inclusions help us understand Kilauea's plumbing system? *Volcano Watch Bulletin*. Hawaiian Volcano Observatory, U. S. Geological Survey. [Link]

Technical Reports

4. **Mordensky, S. P.**, Rabjohns, K., Lieuallen, A. E., Harris, A., Verba, C. (2016) Characterization of the Oriskany and Berea sandstones: evaluating biogeochemical reactions of potential sandstone–hydraulic fracturing fluid interaction. Department of Energy, National Energy and Technology Technical Report Series.
3. **Mordensky, S. P.**, Lieuallen, A. E., Verba, C., Hakala, A. (2016) 87Sr/86Sr concentrations in the Appalachian Basin: A review. Department of Energy, National Energy and Technology Technical Report Series.
2. Wilson, B., **Mordensky, S. P.**, Verba, C., Rabjohns, K., Colwell, F. (2015) An evaluation of subsurface microbial activity conditional to subsurface temperature, porosity, and permeability at North American carbon sequestration sites. Department of Energy, National Energy and Technology Technical Report Series.
1. **Mordensky, S. P.**, Schubert, B., Verba, C., Hakala, A. (2015) 2H, 13C, 18O, 226Ra, and 228Ra Isotope Concentrations in the Appalachian Basin: A review. Department of Energy, National Energy and Technology Technical Report Series.

Selected Presentations

- Mordensky, S. P.**, Lipor, J.J., DeAngelo, J., Burns, E.R., Lindsey, C.R. (2022) Predicting Geothermal Favorability in the Western United States by Using Machine Learning: Addressing Challenges and Developing Solutions, EMMA Funded Mendenhall Speaker Series. [Oral/Virtual/**Invited**]
- Mordensky, S. P.**, Lipor, J.J., DeAngelo, J., Burns, E.R., Lindsey, C.R. (2022) Predicting Geothermal Favorability in the Western United States by Using Machine Learning: Addressing Challenges and Developing Solutions, 47th Stanford Geothermal Workshop, Stanford, California, February 7-9, 2022 [Oral/Virtual] [[Link to Recording](#)]
- Mordensky, S. P.** (2021) Hydrothermally Induced Edifice Destabilization, Ruapehu, New Zealand, Seminar for the USGS Geology, Minerals, Energy, and Geophysics Science Center. [Oral/Virtual/**Invited**]
- Mordensky, S. P.**, Lipor, J. J., DeAngelo, J., Burns, E. R., and Lindsey, C.R. (2021) Applying Data-Driven Machine Learning to Geothermal Favorability, Western United States, USA: Geological Society of America Abstracts with Programs. Vol 53, No. 6, [Oral/Virtual] <https://doi.org/10.1130/abs/2021AM-365177> [[Link to Abstract](#)] [[Link to Recording](#)]
- Mordensky, S.P.** (2021) The influence of shallow magma on volcanic outgassing and deformation. Montana State University. Bozeman, MT [Oral/Virtual/**Invited**].
- Mordensky, S. P.** (2020) Shallow Magma and Volcanic Processes. Invited Research Seminar. US Geological Survey - Hawaiian Volcano Observatory. Hilo, HI. [Oral/**Invited**].
- Mordensky, S. P.** (2020) Shallow Magma Emplacement and Related Volcanic Processes. George Washington University. Washington, DC. [Oral/**Invited**]
- Mordensky, S. P.**, Wallace, P. J. (2018) Magma storage below Cascades shield volcanoes (USA) as inferred from melt inclusion data: A comparison of long-lived and short-lived magma plumbing systems. University of Canterbury. Christchurch, New Zealand. [Oral/**Invited**]
- Mordensky, S. P.**, Kennedy, B. M., Villeneuve, M. C., Farquharson, J. I., Heap, M. J., Gravley, D. M. (2018) Considering scale (spatial and temporal) – the effect of intrusions on geomechanical properties of a volcanic host. Energy Straight from Magma Workshop on Krafla (Iceland) Magma Drilling. Wairakei, New Zealand. [**Invited**/Poster]
- Mordensky, S. P.**, Kennedy, B. M., Villeneuve, M. C., Gravley, D. M., Heap, M. J., Farquharson, J. I., Leonard, G. (2016) Rock Strength, Permeability, and Jointing Around Shallow Intrusions, Mt. Ruapehu. Talk at the Geological Society of New Zealand Annual National Meeting. Wanaka, New Zealand. [Oral]
- Mordensky, S. P.** (2013) The Plumbing Systems and Parental Magma Compositions of Shield Volcanoes in the Central Oregon High Cascades. Invited Research Seminar. Hawaiian Volcano Observatory. [Oral/**Invited**]

Web Presence

- ORCID: orcid.org/0000-0001-8607-303X
- Research Gate: www.researchgate.net/profile/Stanley_Mordensky2
- Google Scholar: scholar.google.com/citations?hl=en&user=S9OfqRYAAAAJ
- LinkedIn: www.linkedin.com/in/stanleymordensky/
- Online CV: www.stanmordensky.wixsite.com/cv02

Fellowships and Awards

- Mendenhall Fellowship (2021-2023)
- University of Canterbury Doctoral Scholarship (2015 - 2019)
- Mason Trust Award (2015 - 2018)
- American Geophysical Union Travel Grant (2016)
- NETL Research Fellowship (2014 – 2015)
- USGS/NAGT Internship Nomination (2009)
- Foshag-Hronik-Dhyse Award, The Mineralogical Society of Washington, DC (2009)
- George Washington Presidential Scholarship (2005)
- Harriet Irsay Scholarship Grant (2006)
- Georgie and William B. Snyder Scholarship (2006)

Field Campaigns Organized and Executed

Field expeditions required planning initiated with literature review. Schedules were drafted and field team personnel were briefed in advance. Field observations were digitized nightly. Sample-label redundancy prevented misidentification. Progress was continually checked against overall schedule.

- Mapping (Geologic, Geotechnical, & Hazard)
 - Sample collection (Geotechnical, Petrological, & Radiometric)
 - Unmanned aerial vehicle (UAV) piloting and remote sensing data collection
- 16,000+ km hiked across alpine, rainforest, temperate forest, and desert terrain between field expeditions and personal long-distance hiking trips (*e.g.* Appalachian Trail 2013; Pacific Crest Trail 2015; Continental Divide Trail 2019; South Island Te Araroa 2019)

May 2020 – October 2020 & June 2017 – September 2017

Geothermal Inventory & Thermal Hazard Mapping (Yellowstone Volcano, Wyoming).

January 2018 – February 2018, January 2017 – February 2017, & December 2015 – March 2016

Geotechnical and lithological characterization, mapping, and sample collection of altered and unaltered andesite. UAV-augmented Structure-from-Motion imagery collected (Ruapehu Volcano, New Zealand).

November 2012 – February 2013

Geochronology sampling and mapping of Mauna Loa lava (Hawaii Volcanoes National Park, Hawaii).

June 2011 – August 2011

Geochemical sampling of North Sister, Belknap, and Mt. Washington volcanoes (Several Wildernesses, Oregon)

April 2010 – August 2010

Lithological sampling and mapping of meta-volcanics in bimodal Proterozoic complex in SW Virginia.

Additional Projects

Stanley Mordensky Backcountry Photography

Owner & Lead Photographer

Portland, OR, USA

April 2015 – Present

- Provide official images of geological activity to U.S. Geological Survey (*e.g.* [2020 Giantess Eruption](#))
- Practice Leave-No-Trace (*i.e.* LNT) principles
- Respond to changing photoshoot parameters (*e.g.* season, time of day, weather)
- Plan backcountry routes
- Economize field gear and photography equipment for conditions

Trailside Tales Productions

Creator & Executive Producer

Gardiner, MT, USA

November 2019 – July 2020

- Find, develop, organize, write, record, edit, and finalize narrative podcast material
- Design, build, and maintain website (theTrailSideTales.com)

Geotechnical Consulting

Operator & Principal Technician

Christchurch, New Zealand

February 2017 – March 2019

- Examined drill cores for sub-sampling
- Developed novel approaches to maximize geomechanical analyses from limited sample material
- Prepared samples (*e.g.* sedimentary, metamorphic materials) for physical and mechanical property testing
- Conducted physical and mechanical rock property testing (*e.g.* porosity, permeability, strength, deformation)