

Phone: (+1) 701.678.5626

jmwrage@umich.edu

Website: www.jackiewrage.com

ORCID ID: 0000-0002-4581-1478

Linked in: www.linkedin.com/in/jackie-wrage/

Jackie M Kleinsasser

Education

- 2018–current PhD Candidate | Dept. of Earth and Environmental Sciences, University of Michigan, Ann Arbor
Research: Experimental Petrology, Economic Geology, Geochemistry
- 2012–2015 Bachelor of Science, Geosciences | North Dakota State University, Fargo
GPA - 3.95/4.0 (Summa Cum Laude); chemistry minor

Honors

- April 2019 Awarded the National Science Foundation Graduate Research Fellowship (NSF-GRF)
- Mar 2019 Awarded a Society of Economic Geologists Graduate Student Fellowship
- Aug 2018 Awarded the Rackham Merit Fellowship at the University of Michigan
- Mar–Dec 2016 Student Fulbright Research Grant: Universidad de Chile, Santiago, Chile
- Dec 2015 NDSU Winter Commencement Speaker
- Fall 2015 NDSU Dept. of Geosciences Allan C. Ashworth Scholarship
- 2014–2015 NDSU College of Science & Math Ambassador
- 2012–2015 NDSU College of Science and Math Dean's List

Travel, field experience

- Sept 2020 Field work in the Duluth Complex and related footwall rocks, northeastern MN
- Mar 2020 Geology and cultural history of the Dead Sea Rift Region, Israel & Jordan
- Feb 2020 S-XANES analyses, Advanced Photon Source, Argonne National Lab, IL
- Jan-Feb 2020 S-XANES analyses, Swiss Light Source, Villigen Switzerland + LA-ICP-MS analyses at Universität Bern in Bern, Switzerland
- Nov 2019 U-M Society of Economic Geologists field trip to the Eagle Cu-Ni Mine, Upper Peninsula, MI
- Summer 2019 Conducted high T/high P experiments at Leibniz Universität in Hannover, Germany
- May 2019 Nipigon area & Coldwell Alkalic Complex geology field trips, ON. Toured the Eagle Cu-Ni Mine in northern MI and the NorthMet Cu-Ni Deposit in northeastern MN
- June & Oct 2018 S-XANES analyses, Advanced Photon Source, Argonne National Lab, IL
- Summer 2017 Field work for the Fort Steele 1:24,000-scale quadrangle, south-central WY
- Nov 2016 Field work in the El Tatio geyser field, Atacama Desert, northern Chile
- Nov 2016 Toured four ore deposits in north-central Chile on the University of Chile Economic Geology field trip
- Sept 2015 Eastern North Dakota geology field course
- Sept 2014 Field Geology geological mapping course, southwest of Dickinson, ND
- Oct 2013 Southeast Minnesota/Iowa Paleontology field course
- Sept 2013 North Shore Lake Superior field course, northeast MN and Ontario, Canada

Conferences

- May 2020 Geological Society of America, North-Central Regional conference, *virtual*
Ore Deposits Hub Early Career Session presenter, *virtual*
- Oct 2019 Society of Economic Geologists conference, Santiago, Chile
- May 2019 Institute on Lake Superior Geology conference, Terrace Bay, ON
- Mar 2019 Prospectors & Developers Association of Canada annual meeting, Toronto, ON
- Aug 2018 Gordon Research Conference – Mineral Deposits conference, Waterville Valley, NH
- Nov 2015 Oral presentation at GSA conference, Baltimore, MD
- Mar 2015 American Chemical Society conference, Denver, CO
- Oct 2014 Geological Society of America conference, Denver, CO

Professional memberships

- * Geochemical Society
- * American Association of Petroleum Geologists (AAPG)
- * Society of Economic Geologists (SEG)
- * Geological Society of America (GSA)
- * Association of Women in Science (AWIS)

Coursework

- * Mineralogy & petrology
- * Sedimentology/stratigraphy
- * GIS
- * Organic chemistry
- * Inorganic chemistry
- * Physical chemistry
- * Invertebrate paleontology
- * Geochemistry
- * Soil genesis
- * Calculus (I, II, III), Physics
- * Isotope geochemistry
- * Analytical methods
- * Renewable energy policy
- * Advanced mineral deposits

Outreach/service

- Aug 2020 Communicating Science Conference – Michigan Workshop: breakout session panelist for “*Creating Modules for K-12 Outreach*” & expert reviewer for participants’ writing samples
- 2020/2021 Director of Grants – Association for Women in Science (AWIS) UM: manage funding and grants for AWIS programs, oversee Mentoring, Outreach, and Events program directors, manage organization membership, curate and send out bi-monthly newsletter
- 2019/2020 Director of Outreach – AWIS UM: lead the outreach team in organizing science outreach for local middle and high schools in Ann Arbor
- Spring 2019 U-M Michigan Geophysical Union (MGU) annual symposium organizing committee
- 2018/2019 Lead mentor for AWIS: Organize volunteers & demos, plan event, co-lead after school program for the Young Scientists Expo held March 2019
- June 2018 Organized and led a two-day geology field trip for middle school kids, southeast ND

Skills

Languages: English, advanced Spanish

Analytical/experimental equipment

- * Electron probe microanalysis (EPMA)
- * Scanning electron microscopy (SEM)
- * Internally heated pressure vessels (IHPVs)
- * X-ray absorption near edge structure spectroscopy (XANES)
- * X-ray fluorescence spectroscopy (XRF)
- * Fourier-transform infrared spectroscopy (FTIR)
- * Laser ablation ICP mass spectrometry (LA-ICP-MS)

Software/Programming

- * ArcGIS
- * Neuralog, Petra – well log visualization & management software
- * Adobe Illustrator
- * Geochemists Workbench
- * PHREEQC – aqueous geochemical modelling
- * R Studio – statistical programming

Relevant Research/Lab Experience

PhD research

Aug 2018 – current | Advisor: Dr. Adam Simon – University of Michigan, Ann Arbor, MI

Project I: The behavior of sulfur and rare earth element partitioning between apatite and dacitic melt as a function of oxygen fugacity.

- Conducted apatite crystallization experiments in internally heated pressure vessels (IHPVs) at controlled redox (fO_2) conditions to study the behavior and partitioning of sulfur between dacite melt, apatite, and fluid

Project II: Redox conditions of Paleoproterozoic & Archean arc-magmatic systems: constraints from sulfur-in-apatite oxybarometry | *Collaboration with Dr. Pedro Jugo and PhD student Xuyang Meng at Laurentian University, Sudbury, ON*

- Measuring sulfur content and $S^{6+}/\Sigma S$ ratios in apatite inclusions hosted in zircon to understand ancient magmatic systems

Project III: Unravelling the genesis of Fe-Ti oxide-bearing ultramafic intrusions along the Western Margin of the Duluth Complex, NE Minnesota | *Collaboration with Drs. Dean Peterson & George Hudak at U-Minnesota-Duluth's Natural Resources Research Institute, Duluth, MN*

- Performing detailed geochemical analyses and isotopic measurements on minerals from a number of oxide-bearing ultramafic intrusions (OUI's) to constrain how these Ti-prospects formed

Wyoming State Geological Survey

Oct 2017 – Jun 2018 | Supervisors: Dr. Ranie Lynds, PG, & Rachel Toner, PG – Laramie, WY

Contractor: Upper Cretaceous unconventional reservoir project

- Created the base map of the subsurface in the Powder River Basin for use in future WSGS unconventional oil and gas surveys and studies

May – Sep 2017 | Supervisor: Dr. Ranie Lynds, PG

Contractor: StateMap program – mapping the Fort Steele 7.5' quadrangle

- Conducted field work and assisted in publishing a 1:24,000-scale map

Student Fulbright Research Grant

Mar – Dec 2016 | Advisor: Dr. Martin Reich, Professor of Geology, Universidad de Chile, Santiago, Chile

- Implemented geochemical tools to investigate structural controls on thermal fluid evolution, Southern Volcanic Zone of Chile
- Published results as first author in the journal *Chemical Geology*

Selected Publications

- Wrage, J., Simon, A.C., Konecke, B.A., Linsler, S., Behrens, H., Holtz, F. Sulfide and sulfate saturation in dacitic melts as a function of oxygen fugacity. *In review – Geochimica et Cosmochim Acta.*
- Perez-Moreno, R., Reich, M., Daniele, L., Morata, D., Held, S., Wrage, J. Stable isotope and anthropogenic tracer signature of waters in an Andean geothermal system. *In review – Chemical Geology.*
- Lichtner, D.T., Toner, R.N., Wrage, J.M., and Lynds, R.M., **2020**. Upper Cretaceous strata in the Powder River Basin—Formation tops database, structure and thickness contour maps, and associated well data. Wyoming State Geological Survey Open File Report 2020-9, 50 p.
- Lynds, R.M., and Wrage, J.M., **2017**. Preliminary geologic map of the Fort Steele quadrangle, Carbon County, Wyoming. Wyoming State Geological Survey Open File Report 2017-5, 1:24,000-scale.
- Wrage, J., Tardani, D., Reich, M., Daniele, L., Arancibia, G., Cembrano, J., Sanchez-Alfaro, P., Morata, D., Perez-Moreno, R., **2017**. Geochemistry of thermal waters in the Southern Volcanic Zone, Chile—Implications for structural controls on geothermal fluid composition. *Chemical Geology* 466, 545–561.
- Tardani, D., Reich, M., Deditius, A., Chryssoulis, S., Sánchez-Alfaro, P., Wrage, J., **2017**. Cu-As decoupling in an active geothermal system: a link between pyrite and fluid composition. *Geochim et Cosmochim Acta* 204, 179–204.