Anna Ruefer

Ph.D. Candidate
Stanford University
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Education

Ph.D. in Geological Sciences, expected 2026
Stanford University, CA
Advisor: Dr. Ayla Pamukçu
Dissertation Title: Reconstructing the complex and dynamic magmatic plumbing system fueling a supereruption: the Tuff of Elevenmile Canyon, NV

M.S. in Geosciences, August 2021
Baylor University, TX
Advisor: Dr. Kenneth S. Befus
Thesis Title: Embayments in explosive, silicic eruptions: a textural, numerical, and experimental assessment

B.S. in Geology with Astronomy minor, May 2019
James Madison University, VA
Advisor: Dr. Elizabeth A. Johnson
Thesis Title: Determining a partition coefficient for water in plagioclase for rhyolitic eruptions

Other Research Experience

SHRIMP-RG Research Assistant **Sep. 2025 – Present**
Stanford University in partnership with the USGS
Assist users with sample preparation, imaging, and instrument tuning prior to analyses, monitor lab supplies, perform lab safety checks, process data, attend lab staff meetings; 10 hours per week.

USGS Intern **Jun. 2016 – Aug. 2019**
Florence Bascom Geoscience Center, Reston, VA
Processed Arctic Sea sediments cores, picked, counted, and identified microfossils, maintained and generated large datasets, and contributed to the preparation of research papers; 40 hours per week during school breaks.

Publications

Leung, D.D.V., **Ruefer, A.C.**, McDonald, A.M., Pamukçu, A.S., *Under review at the Canadian Journal of Mineralogy and Petrology*, “Picture-perfect petrography II: affordable, automated thin-section scanning.”

Ruefer, A.C., Pamukçu, A.S., Chiaro, G.R., Lewis, M.J., Eddy, M.P., Weaver, K.L., DesOrmeau, J.W., John, D.A., *In prep. for Journal of Petrology*. “Flaring up: discrete magma bodies within a deep, vertically extensive transcrustal magmatic system fueled the Tuff of Elevenmile Canyon supereruption.”

Ruefer, A.C., Kelly, L. J., Gualda, G. A., Carrillo, E. L., Hickernell, S., Ward, S., Winslow, H., & Ruprecht, P., 2025. “In one step: Insights into shallow differentiation from basalt to rhyolite at Cordón Caulle from rhyolite-MELTS simulations.” *Journal of Volcanology and Geothermal Research*, 108305.

Wei, Z., **Ruefer, A.C.**, Pamukçu, A.S., Suckale, J., 2024. “Deciphering clues regarding magma composition encoded in quartz-hosted embayments and melt inclusions through direct numerical simulations.” *JGR: Solid Earth,* v. 129, no. 4.

Befus, K.S., Thompson, J.O., Allison, C.M., **Ruefer, A.C.**, Manga, M., 2023. “Hydrated glass embayments constrain the cooling timescale of a Yellowstone ignimbrite.” *Geology.*

Befus, K.S., **Ruefer, A.C.**, Allison, C.M., and Thompson, J.O., 2023. “Quartz-hosted inclusions and embayments reveal storage, fluxing, and ascent of the Mesa Falls Tuff, Yellowstone.” *Earth and Planetary Science Letters*, 601, 117909.

Ruefer, A.C., Befus, K.S., Thompson, J.O., and Andrews, B.J., 2021. "Implications of Multiple Disequilibrium Textures in Quartz-Hosted Embayments. Front." *Earth Sci* 9: 742895.

Cronin, T.M., Seidenstein, J., Keller, K., McDougall, K., **Ruefer, A.** and Gemery, L., 2019. “The Benthic Foraminifera Cassidulina from The Arctic Ocean.” *Micropaleontology*, *65*(2), pp.105-125.

Cronin, T.M., Clevenger, M.K., Tibert, N.E., Prescott, T., Toomey, M., Hubeny, J.B., Abbott, M.B., Seidenstein, J., Whitworth, H., Fisher, S. Wondolowski, N., and **Ruefer, A.**, 2019. “Holocene sea-level variability from Chesapeake Bay tidal marshes, USA.” *The Holocene*, *29*(11), pp.1679-1693.

Conference Abstracts (talk*****, invited talk******)

Ruefer, A.C., Bryan, R.P., Pamukçu, A.S., Lewis, M.J., Eddy, M.P., Linking a transcrustal volcanic system to its plutonic roots with geochronology and geochemical modeling: *VOLCALI 2026, submitted.*

***Ruefer, A.C.,** Pamukçu, A.S., Chiaro, G.R., Price, M., Lewis, M.J., Eddy, M.P., DesOrmeau, J.W., Snapshots of a supereruption: multiphase insights into the Tuff of Elevenmile Canyon from glass, feldspar, biotite, and zircon: *EGU 2026*.

****Ruefer, A. C.**, Kelly, L. J., Gualda, G. A., Carrillo, E. L., Hickernell, S., Ward, S., Winslow, H., & Ruprecht, P., In one step: Insights into shallow differentiation from basalt to rhyolite at Cordón Caulle from rhyolite-MELTS simulations: *AGU 2025, invited.*

Bryan, R.P., Lewis, M.J., Eddy, M.P., Pamukçu, A.S., DesOrmeau, J.W., **Ruefer, A.C.,** The Freeman Creek Pluton as a Window into Pre-eruptive Magma Storage and Eruptibility in the Elevenmile Canyon Caldera Complex, Nevada: *GSA 2025.*

***Ruefer, A.C.,** Pamukçu, A.S., Chiaro, G.R., Lewis, M.J. Eddy, M.P., Weaver, K.L., and DesOrmeau, J.W., Flaring up: discrete magma bodies within a deep, vertically extensive transcrustal magmatic system fueled the Tuff of Elevenmile Canyon supereruption: *AGU 2025*.

Kelly, L.J., **Ruefer, A.C.**, Carillo, E.L., Hickernell, S., Ward, S., Gualda, G.A.R., Winslow, H., Ruprecht, P., One small step in the crust, one giant leap for magma: Insights into magma differentiation from basalt to rhyolite at Cordón Caulle derived from rhyolite-MELTS simulations: *IAVCEI 2025*.

Ruefer, A.C., Pamukçu, A.S., Chiaro, G.R., Lewis, M.J. Eddy, M.P., Weaver, K.L., and DesOrmeau, J.W., Amalgamation of multiple discrete magma bodies fueled the tuff of Elevenmile Canyon: *IAVCEI 2025*.

*Allison, C.M., Dufek, J., Befus, K.S., Thompson, J.O., Bachmann, O., **Ruefer, A.C.**, Rapid magma ascent for the Kos Plateau Tuff caldera-forming eruption recorded in quartz-hosted embayments: *IAVCEI 2023*.

Ruefer, A.C., Pamukçu, A.S., Eddy, M.P., DesOrmeau, J.W., and Lewis, M.J., Complex open-system processes recorded in a dissected Great Basin super-eruption*: AGU 2023.*

***Ruefer, A.C.,** Befus, K.S., and Allison, C.M., 2021, Decompression and rehydration of the Mesa Falls Tuff embayments: *AGU 2021*.

Ruefer, A.C., and Befus, K.S., 2020, Anthology of quartz-hosted embayment textures: *AGU 2020 (virtual).*

***Ruefer, A.C.,** and Befus, K.S., 2020, Experimentally testing embayments as record keepers of magmatic ascent: *GSA SC 2020.*

Ruefer, A.C., and James, P.B., 2020, Zeeman Crater's Anomalous Massif: *LPSC 2020*.

Ruefer, A.C., Johnson, E.A., McTaggart, E., Myers, M.L., Wilson, C.J.N., Wallace, P.J., 2018, Determining a partition coefficient for water in plagioclase for rhyolitic eruptions: *AGU 2018.*

Colip, G., Gosselin, G., Hojnacki, V., Richardson, L., **Ruefer, A.C.**, Whiteman, J., Matthews, D., St. John, K., 2018, A multi-proxy analysis of Northern Pacific STEMSEAS sediment core lithology and permeability: *GSA 2018.*

Richardson, L., Whiteman, J., **Ruefer, A.C.**, Hojnacki, V., Gosselin, G., Colip, G., St. John, K., 2018, A multi-proxy interpretation of marine sediment lithology on the Texas-Louisiana slope in the Gulf of Mexico as evidence for the deglaciation of the Laurentide ice sheet: *GSA 2018.*

Seminar talks

U.S. Geological Survey, Moffett Field **April 9, 2026**

"Reconstructing the complex and dynamic magmatic plumbing system fueling a supereruption: the Tuff of Elevenmile Canyon, NV."

Teaching Experience

SESUR Program Mentor (*Stanford*) **2026**

Mentored a Stanford undergraduate project focused on preparing and analyzing Al-in-amphibole for geobarometry; this has included writing a project proposal and securing funding in the Stanford SESUR program for summer of 2026 which will culminate in a research abstract, presentation, and poster.

SURGE Program Mentor (*Stanford*) **2025**

Designed an 8-week summer REU research proposal and mentored a senior undergraduate research project focused on preparation, characterization, and analysis of feldspar from the Tuff of Elevenmile Canyon. Culminated in a final abstract, poster, presentation, and EGU abstract.

Wrigley Field Program in Hawaii – *Volcanology Module Co-Instructor* (*Stanford*) **2023**

Organized logistics and materials, led field exercises, and delivered classroom lectures for a week-long volcanology module in Hawaii. Coordinated with group leaders, local scientists, and co-instructors.

Chemistry of the Earth and Planets – *Teaching Assistant* (*Stanford*) **2022**

Mineralogy – *Teaching Assistant* (*Baylor, Stanford*) **2020,2023**
Petrology – *Teaching Assistant* (*Baylor*) **2021**
Prepared, modified, and designed lab materials, led lab exercises and lectures, held office hours, and graded materials.

Evolution of the Laurentian Margin – *Field Trip (Stanford)* **2021**
Designed and led volcanology and petrology field exercises and lectures in the Bishop Tuff, CA and in Yosemite National Park.

Undergraduate Research Mentor (*Baylor)* **2021**
Mentored undergraduate student in petrologic methodology and sample preparation, including thin-section petrography, sample crushing, sieving, picking mineral separates, and doubly polishing melt inclusions and embayments for FTIR analyses.

Field Experience

Nevada
Stillwater Caldera Complex **Oct. 2021, May 2023, Sept. 2024**
Searchlight **Oct. 2021, Nov. 2022**
California
Bishop Tuff **May 2021, Sep. 2021, Mar. 2022**
Mono-Inyo Craters **May 2021, Mar. 2022**
Yosemite National Park **May 2021, Mar. 2022**
Lassen Volcanic National Park **Oct. 2022**
Sonoma Volcanics **Oct. 2022**
Hawai'i
Volcanoes National Park **Oct. 2022**
Montana, Wyoming
Yellowstone National Park **June 2019, Sep. 2020**
Glacier National Park **June 2019**
Texas
Big Bend National Park **Oct. 2019**
Enchanted Rock **Mar. 2021**
Arkansas
Crater of Diamonds State Park **Mar. 2021**
Mount Ida Quarry **Mar. 2021**
Ireland **May – June 2019**
6-week geology field camp in Western and Northern Ireland; included group and individual mapping projects and exercises in geomorphology, hydrology, geophysics, stratigraphy, and structure.

Selected Grants, Scholarships, and Awards

2025 Stanford-USGS Fellowship Awardee **May 2025**
Stanford Travel Grant **Oct. 2023**
GSA Graduate Research Grant: *Lipman Award* **May 2023**
GSA Student Travel Grant **Apr. 2023**
GSA Graduate Research Grant **May 2020**
Baylor Geosciences Research Grant **May 2020**
Baylor Three Minute Thesis Competition (3rd place) **Apr. 2020**
JMU Geology Field Course Scholarship **May 2018**
USGS STAR Award **July 2019**
VA Council on Women STEM Essay Scholarship Award (2nd place) **Apr. 2015**

Analytical Experience

Experimental experience (*Baylor*)
Independent user of vertical and horizontal cold-seal pressure vessels. Developed a procedure for controlled decompression experiments. Performed both decompression and equilibration experiments.

SEM-EDS (*Stanford*)
Developed a procedure for high-precision glass analyses and currently working to develop this system for mineral compositional analyses.

FTIR (*Smithsonian, JMU, Baylor, Berkley ALS*)
Experience determining H_2O, OH, and CO_2 contents in glasses and OH in feldspar and quartz with both conventional and high-resolution synchrotron FTIR analyses.

EPMA (*Oregon, Stanford*)
Collected major and trace element data from multiple mineral phases (zircon, feldspar, quartz, biotite), melt inclusion, and matrix glass.

LA-ICP-MS (*Stanford*)
Worked alongside lab personnel to optimize the Stanford laser for trace element analyses in feldspar and matrix glasses.

SHRIMP-RG (*Stanford*)
Lab research assistant with experience in sample preparation, instrument tuning, data collection, and data processing of zircon trace element data.

Raman (*JMU, Baylor, Stanford*)
Performed mineral identification and characterization using Raman spectroscopy.

TEM (*Baylor*)
Undertook a semester-long course on TEM spectroscopy, including training and independent use of the TEM.

Computational Experience

Rhyolite-MELTS thermodynamic modeling
Expertise in applying rhyolite-MELTS to various thermodynamic questions including equilibrium and fractional crystallization modeling, heat loss, storage pressure determination, phase saturation, mineral chemistry modeling

Fractionation, Assimilation, Partial Melting, and Mixing modeling
Tracking melt composition during fractional crystallization from input melt compositions; determined melt compositions produced via assimilation of crustal contaminants and magma mixing; applied a forward model to determine best-fit mineral assemblages (Python, Excel)

Diffusion modeling
Reconstructing decompression rates for explosive, rhyolitic eruptions using finite-difference numerical modeling to determine best-fit to diffusion profiles recorded within quartz-hosted melt embayments (MATLAB)

Determining density from gravity data
Applying Nettleton's method to calculate bulk density of a feature on the Moon's South Pole using GRAIL gravity data and LOLA topography data (MATLAB)

Engagement and Service

Elementary education outreach (*Bay Area, CA*) **Present**
Prepared geology and volcanology lessons for 4^{th} and 5^{th} graders; developed and led hands-on exercises, gave lectures, and curated samples to donate to local school collections in collaboration with the Stanford Mineral Collections

“Brown Bag” coordinator (*Stanford*) **2023 – 2024**
Coordinated bi-weekly research presentations by Stanford graduate students to foster collaboration, develop presentation skills, and create a sense of community

Association for Women Geoscientists Club Vice President (*JMU, Baylor*) **2019, 2021**
Organized, coordinated, and participated in informational panels and social events focused on women in STEM