The Outcrop

DEPARTMENT OF GEOSCIENCE UNIVERSITY OF WISCONSIN–MADISON 2024

When Ice Sheets and Active Volcanoes Collide

Faculty
Annie Bauer
Chloë Bonamici
Michael Cardiff
Andrea Dutton
Kurt Feigl
Ken Ferrier
Eva Golos
Laurel Goodwin
Marianne Haseloff
D. Clay Kelly
Shaun Marcott
Selva Marroquín
Stephen Meyers
Athena Nghiem
Shanan Peters
Eric Roden
Bradley Singer
Basil Tikoff
Huifang Xu
Christopher Zahasky
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Dougal Hansen
Kai Hu
Margriet Lantink
Aidan Lewandowski
Alexander Lusk
David Miller
Sarah Trevino

Professor Brad Singer teaches Portland Community College students about caldera formation at Crater Lake, Oregon.

Graduate Students
Ridwan Ajibade
Matthew Aleksey
Thaïs Altenberg
Juyong Bak
Jennifer Breiling
Rachel Breunig
Jeremy Brooks
Noah Brown
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Tianyu Zhou

Alumni and Friends: Please notify the Department if you have a mailing address or email address change. The Wisconsin Alumni Association or U.S. Postal service may not share new information with us.

Also, we'd like to hear from you! Send professional and personal updates, feedback, news, and photos for next year's *Outcrop* (will be published in the fall) to: **alumni-update@geology.wisc.edu**

To be added to the department alumni news email list, please subscribe by sending an email to: **join-geoscience-announcements@lists.wisc.edu.**

Check out *The Outcrop* on the web: geoscience.wisc.edu/geoscience/alumni-friends/outcrop

Ken Ferrier—Faculty liaison and editor (kferrier@wisc.edu)
Michelle Szabo—Graphics, editor, production (mszabo@wisc.edu)
Alexander Kiner —Graphic design, production (akiner@wisc.edu)

Department of Geoscience, University of Wisconsin–Madison, Lewis G. Weeks Hall for Geological Sciences
1215 West Dayton Street Madison, Wisconsin 53706-1692
Phone: 608-262-8960 | geodept@geology.wisc.edu | geoscience.wisc.edu

Greetings from Madison and the Department of Geoscience!

As always, we're delighted to be able to update our alumni and friends on all the latest from the past year via this 2024 edition of the Outcrop. I'm honored to help lead such a talented and active department. Our faculty, staff, graduates and undergraduates have been engaging in some truly impressive work over the past year, and I hope you enjoy catching up on all their accomplishments.

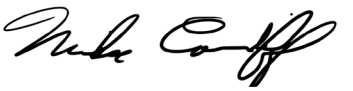
Our cover story this year highlights work from Prof. Brad Singer and the multi-university IF-AMPS team. Combining observations from geochronology, geomorphology and glaciology with coupled models of the earth's stress distribution, they are investigating the fundamental mechanisms by which ice sheet and landscape evolution contribute to magma chamber loading and eruptive processes. I hope you'll enjoy learning about this highly integrative work, as well as the many updates from our faculty about new and continuing research projects.

Weeks Hall, as ever, is a flurry of activity. By the time you're reading this, the department will have just hosted our "All Alumni and Friends Reunion" in celebration of the 50th Anniversary of Weeks Hall. We've been delighted to be able to welcome alumni back to campus, to show them all the latest departmental labs, and to spend some time talking about the great past, present, and future of Geoscience at UW-Madison. If you couldn't attend, we hope to see you next time!

Weeks is now also home to our two newest faculty, Selva Marroquín and Athena Nghiem, who joined the department this year and brought our Assistant Professor count to a new high of seven. This rapid transformation and growth continue to bring new energy and ideas into the Department, along with new construction, of course. Thanks to the generous support of our alumni and the college, we are completing renovations for both of our new professors, while also starting on a remodel of teaching room A320 to support technology-enabled coursework. This classroom will feature tools for collaborative programming, screen sharing, and sensor development and testing to support computationally and quantitatively intensive courses.

Last spring, as is tradition, we hosted our 2024 Spring Banquet at the UW Pyle Center, where I officially took the reins from our outgoing chair Brad Singer. Thanks to generous support from our alumni, we were able to deliver over 40 awards—including fellowships, teaching awards, and scholarships—to our most deserving graduate and undergraduate students. This is always a highlight of the year, but it was truly an honor—in one of my first roles as chair—to be the one delivering this generous support to our students. We thank all of Geoscience's engaged alumni and friends who help make events like this possible, and who continue to make our Department one of the best places in the world to study our world!

Best wishes, and On Wisconsin!



Michael Cardiff
Professor and Department Chair

Planning a Weeks Hall 50th Anniversary Celebration and Alumni Reunion

The Geoscience Board of Visitors (BoV) convened in early April with members attending both in person and via Zoom. Prof. Mike Cardiff shared a 'State of the Department' update with the attending members, followed by discussion of several key topics, summarized below. Mike is the new department chair replacing Prof. Brad Singer. The BoV wishes to recognize Brad's leadership contributions in his tenure (second time!) as department chair.

SPRING RESEARCH SYMPOSIUM:
Several BoV members attended the half-day Spring 2024 research symposium held at Weeks Hall. The session began with a keynote talk on seismic imaging of the Alaska subduction zone by Prof. Eva Golos, followed by 10 talks and 18 posters by our current roster of graduate students. Topics included a diverse suite of current student research in geochemistry, glaciology, structure, volcanology, hydrogeology, paleobiology and geoinformatics. All of the presentations were impressive in their scientific rigor, relevance to real-world problems/issues, and a focus on the fundamentals of geoscience research. The diverse research portfolio presented is a reflection of our student diversity and the academic advisors tasked with shaping their scientific futures.

REUNION COMMITTEE UPDATE:
BoV Co-Chair Mike Ursin is the lead on coordinating the various Reunion subcommittees and much progress has been made via in-person and monthly virtual planning sessions. The two-day event in the Fall of 2024 will include Weeks Hall lab and Museum tours, reminiscences on departmental history, graduate student posters and Happy Hour networking. A field trip to some of the area's geologic wonders will be headed by Dave Hart and colleagues. The event will conclude with featured speakers at an evening banquet at the Pyle Center. Steve Walter is stewarding the production of a high quality program guide and event publication. The Reunion registration website is live, and all BoV members are encouraged to register early.

DEVELOPMENT COMMITTEE UPDATE:
Mae Saul and Kyle Lewallen summarized the 2023 funding results, and the 2024 Day of the Badger outlook. This year's focus targets the Katherine Fowler-Billings Fund. The fund earmarks support for community-based, grass roots activities. In the next year or so, Mae suggested the University will enter a new funding campaign with key funding areas including artificial intelligence, sustainability, campus climate/community/belonging and democracy.

Board of Visitors: (Back row from left to right) Dave Hart, Mike Cardiff, Mike Ursin, Mike Porter, Erik Webb, and Bill Morgan; (Front row from left to right) Steve Walter, Carrie Eaton, Rich Slaughter, Liz Dennett, Brooke Norsted. Also featured onscreen and in Dennett's hands is the Vienna Meteorite.

BOV MEMBERSHIP:
Bill Morgan stewarded a much-needed refresh of the BoV/Senior Advisor membership list. Several alumni were identified as potential BoV candidates. Individual BoV members will contact these possible recruits, determine their interest in serving on the Board, and obtain a current CV for department consideration. In addition, several Distinguished Alumni Award winners, selected during the Covid pandemic, were formally acknowledged and recognized by the BoV and department for their contributions in geoscience.

On Wisconsin!

Mike Porter, BoV Chair
(mporterrcole@gmail.com)

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Kyle Lewallen kyle.t.lewallen@exxonmobil.com
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Steve Walter swalter0224@gmail.com
Erik Webb ekwebb@sandia.gov

SENIOR ADVISORS:
Charles Andrews candrews@sspa.com
Kirt Campion campion.geoscience@gmail.com
Timothy Carr timcarr51@gmail.com
Elizabeth Clechenko eclechenko@gmail.com
Doug Connell dconnell@barr.com
David Divine dld1761@aol.com
Tom Doe tdoe@golder.com
Steve Driese Steven_Driese@baylor.edu
Mark Emerson emerson.mark3@gmail.com
Maitri Erwin maitri.vr@gmail.com
Evan Franseen evanf@kgs.ku.edu
Carl Fricke carl.fricke@gmail.com
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jdrobertson@rannochpetroleum.com
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David Stephenson
davestephenson44@gmail.com
Timothy (Berge) Swearingen
tbberge@hotmail.com
Sally Zinke sallyzinke@yahoo.com

Meet our new faculty & staff

My name is Athena Nghiem, and I have just started as an assistant professor in Fall 2024 in the Department of Geoscience as part of the Freshwater Sustainability Cluster Hire through Water@UW-Madison! I am a biogeochemist and hydrologist originally from California, where I completed my BA at the University of California - Berkeley. I completed my Masters and PhD in New York at Columbia University's Lamont-Doherty Earth Observatory and I have just moved to Madison from Zurich, Switzerland where I held an ETH Postdoctoral Fellowship at ETH Zurich. I am excited to start my group in hydrogeochemistry here in the Department of Geoscience! My group broadly investigates water quality, aqueous and solid-phase biogeochemistry, coupled elemental and redox cycling, and contaminant transport. Specifically, my research explores environmental variability in hydrological and redox processes affecting critical water resources such as groundwater, and the drivers for the release, fate, and transport of trace elements and contaminants across different reservoirs in the environment. My research focuses on combining traditional laboratory and field approaches with data science and process-based modeling, incorporating techniques that range from X-ray absorption spectroscopy to reactive transport modeling. My aim is to quantify hydrological and biogeochemical cycling impacts on groundwater and other water resources under local to global scenarios of change and to address community-motivated questions related to the sustainability of water resources. I am very much looking forward to connecting with the department and the larger UW-Madison community to investigate relevant water quality issues locally and beyond!

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DAY OF THE BADGER

The 2024 Day of the Badger took place April 16-17 and we are grateful to all our alumni who made 120 gifts to the Department. The more than $24,000 raised supports the Kay Fowler-Billings Fund, which has enabled us to take steps toward improving department climate, diversity, and inclusiveness. The word is out on campus about the loyalty and generosity of Geobadgers across the country. I ask you to join us this coming spring semester to move Geobadgers back to the pinnacle of giving on campus. Thank you one and all for participating!

DAY OF THE BADGER 2025

Katharine (Kay) Fowler-Billings (1902 – December 17, 1997) was an American naturalist and geologist. Katharine was born and raised in Boston, completed a BA at Bryn Mawr College (1925), MA at the University of Wisconsin (1926), and PhD at Columbia University (1930). When she began her career, the field of geology was predominantly comprised of men, and the sexism she faced often prevented her from conducting research. Due to this, she would occasionally disguise herself as a man to access geological sites and continue her research. ("Fowler-Billings, Katharine, 1902-. Katharine Fowler-Billings lantern slide collection, 1937: an inventory". oasis.lib.harvard.edu.). The Department established the Kay Fowler-Billings funding exercise in 2020 to provide an opportunity for any member of the department to propose an activity, event, or other purchase that improves department climate, diversity, and inclusiveness. To date the deparment has:

- purchased picnic tables and benches for the courtyard
- provided seed funding to purchase new camping equipment for students to check out, enhancing equipment previously donated by alumni
- outfitted our lactation space with a mini-fridge and microwave (the department has newly dedicated a space specifically for new parents, an improvement from the shared space of years past)
- provided funding for academic advisors to travel to HBCUs to build connections in the advising community
- purchased graduate student application fee waivers for prospective students
- provided funding to establish a course to look at the ways in which student research can contribute to society and the achievement of desired societal outcomes
- held a Bystander Intervention Training that over 50 department citizens attended
- created an impactful, hands-on experience for middle school and high school students, with time split between the Geology Museum and SEM lab
- provided funding for a field experience for the Museum and the Eastern Shoshone Tribal Historical Preservation Office (ESTHPO), tribal Elders, and teachers along with their classes of middle and high school students from the Fort Washakie school system (Wind River Reservation, WY) to determine scientific names in the Shoshone language for two new Late Triassic genera that were recently discovered.

Our 2025 Day of the Badger Goal is to raise $50,000 to endow a fund in Kay Fowler-Billings' honor to continue to provide funding for these kinds of community-based, grass-roots activities for years to come.

All Units | Letters and Science | Chapters | Engineering | Class Years | Affiliation

CAMPAIGN	AMOUNT	GIFTS
La Follette School of Public Affairs	$60,460	202
Communication Arts	$34,006	207
Journalism & Mass Communication	$31,632	196
Political Science	$31,210	51
College of Letters & Science Annual Fund	$27,245	194
Geoscience	$24,028	120
Computer Sciences	$15,359	188
Computer, Data, & Information Sciences	$15,118	108
History	$13,361	97

Weeks Seminar Speakers 2023–2024

Fall 2023

September 8, 2023
Dept. of Geoscience, UW-Madison
Chair's Welcome & Research Group Lightning Talks

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September 15, 2023
Alicia Wilson,
University of South Carolina
Subseafloor Hydrogeology: Moving Beyond Watersheds

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September 22, 2023
Jeff Post,
Smithsonian Institution
Unraveling Manganese Oxides—Tales from the Dark Side of Mineralogy

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September 29, 2023
Paul Bierman,
University of Vermont
An old ice core provides new insights about the fragility of Greenland's ice sheet

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October 6, 2023
Ivo Fustos, Universidad de la Frontera, Chile
Rainfall-Induced Landslides in Volcanic Soils of Southern Andes: Present and Future, New Opportunities for Hazards Delimitation

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October 13, 2023
Shujuan Mao, Stanford
Understanding Subsurface Water, Energy, and Geohazards with Seismology

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October 20, 2023
Madison Douglas, MIT
River meandering drives biogeochemical cycling in discontinuous permafrost

October 27, 2023
Harriet Lau,
Brown University
Evolving Solid Earth Dynamics as a Trigger for the Mid Pleistocene Transition

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November 3, 2023
Marjorie Cantine,
University of Washington
Prospects and progress for telling time in carbonate sediments

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November 10, 2023
Allie Macho, Rio Tinto
Exploring for Copper: Applying Ideal Deposit Models to the Real World

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November 17, 2023
Ethan Theuerkauf,
Michigan State
Drivers and impacts of geomorphic change along Great Lakes coastlines

• • •

December 1, 2023
Maya Gomes,
Johns Hopkins
As the worm turned: Pyrite burial under low bioturbation intensity and implications for Paleozoic oxygenation

• • •

December 8, 2023
Meghana Ranganathan,
Georgia Tech
Modeling microphysics in ice sheet models

Spring 2024

January 26, 2024
Susan Kidwell,
University of Chicago
In search of condensed time: Time averaging of skeletal debris and its uses

• • •

February 2, 2024
Bo Guo,
University of Arizona
Fate and transport of PFAS in the vadose zone: controlling processes, mathematical formulation, and practical modeling approaches

• • •

February 9, 2024
Basil Tikoff, UW-Madison
Places that have influenced the geological mind

• • •

February 16, 2024
Becky Lange,
University of Michigan
Erupted basalts are storytellers across diverse tectonic settings: surprising new insights on their temperatures, water contents, timescales of phenocryst growth, and mechanisms of differentiation

• • •

February 23, 2024
Brett Carpenter, Oklahoma
The Susceptibility of Oklahoma's Basement to Seismic Reactivation : Constraining the Necessary Ingredients for Induced EQ

• • •

March 1, 2024
Andrew Cross, MIT-WHOI
Phase Transformations as a Source of Transient Weakening in Earth's Crust and Mantle

March 8, 2024
Neal Iverson, Iowa State
A linearly viscous flow law for temperate glacier ice?

• • •

March 15, 2024
Benjamin Edwards,
Dickinson College
Does your volcano record the cryosphere?

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March 22, 2024
Mike Eddy,
Purdue University
Hunting for Fossil Silicic Magma Reservoirs in the Rock Record

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April 5, 2024
Matt Ginder-Vogel,
UW - Madison
Radium in the Midwestern Cambrian Ordovician Aquifer System

• • •

April 19, 2024
Ellen Syracuse, LANL
The Rock Valley Direct Comparison: understanding the differences between shallow earthquakes and explosions

• • •

April 26, 2024
Nicola LaDue,
Northern Illinois University
Spatial skills and sense of belonging: Research-informed Geoscience Training

• • •

May 3, 2024
Edward Brook,
Oregon State
Preservation of very old climate records in ice cores from Allan Hills, Antarctica

DISCOVERY

Transport-reaction dynamics of organic matter and oxygen in sandy riverbed sediments

Eric Roden, Professor of Geoscience

Infiltration and degradation of particulate organic matter (POM) in permeable bottom sediments is an important aspect of biogeochemical cycling in river and stream ecosystems. Geoscience graduate student Thais Altenberg (M.S. December 2023) examined this phenomenon in the uppermost layers (0-10 cm) of sediment of the Wisconsin River near Spring Green, WI (Figure 1). Thais was assisted in this work by Manasi Passi-Simhan, a participant in the first annual (2022) Wisconsin SeaGrant-sponsored Freshwater@UW Summer Research Opportunities Program. Analysis of sediment cores collected from the field site showed maximum POM concentrations at the sediment surface, and a decrease in POM concentration with depth. These results indicated a source of fresh POM (e.g., photosynthetic biomass from the water column) input at the sediment surface, and progressive degradation of POM with depth. Thais conducted column experiments with surface sediment, in which the advective fluid flow rate was varied while monitoring dissolved oxygen (DO) concentration along the length of the column using optical DO sensor spots. Depletion of DO occurred at flow rates less than a few cm/hr, indicating high rates of microbial respiration linked to POM degradation in the sediment. The development of anoxic conditions in the columns motivated field and laboratory measurements to assess in situ DO concentrations, and to examine the influence of downward oxygenated fluid flow on DO concentration under conditions that approximated the in situ riverbed environment. Field deployments of optical DO sensors (Figure 1) revealed that surface sediments are oxygenated (≥ 70% air saturation) despite the presence of high rates of DO consumption. A laboratory experiment was conducted in a 5-gallon bucket containing riverbed sediment with optical DO probes inserted to a depth of ca. 2 cm in the sediment (Figure 2). The water layer overlying the sediment was stirred with a propeller to produce a downward fluid flux intended to model potential ripple-induced fluid advection in the riverbed. Anoxic conditions arose quickly in the absence of stirring, whereas DO increased immediately in response to initiation of stirring. Small changes in fluid temperature took place in parallel with shifts in DO, consistent with advective fluid flux into the sediment. Transport-reaction modeling of the results suggested that rates of advective fluid flow on the order of 5 cm/hr were required to maintain the DO concentrations observed in the presence of stirring. Analogous modeling of the in situ DO data suggested that downward fluid flux rates of 10+ cm/hr were required to maintain aerobic conditions in surface sediments. The results of this study demonstrate that infiltration of fresh POM stimulates microbial metabolism of riverbed surface sediments, and that downward fluid advection is likely to play a key role in supplying DO for aerobic microbial metabolism and associated biogeochemical processes in permeable riverbed sediments.

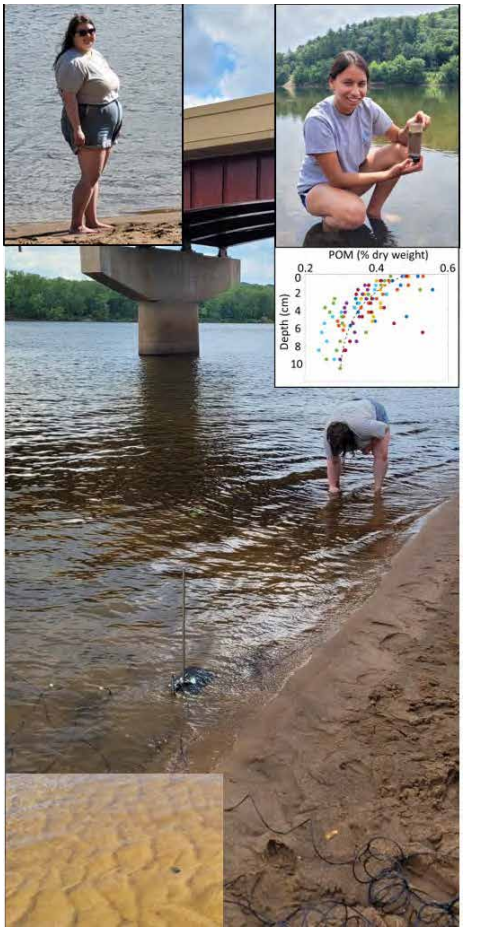

Figure 1. *Geoscience M.S. student Thais Altenberg and Freshwater@UW summer intern Manasi Passi-Simhan at Peck's Landing in Spring Green, WI. Main photo shows deployment of sediment dissolved oxygen sensors, with Thais collecting a sediment core. Upper insets show Thais 'on the beach', and Manasi holding one of multiple cores collected at the field site. Sectioning and analysis of the cores demonstrated a maximum in particulate organic matter (POM) content at the sediment surface. Lower left inset shows close-up of the rippled sediment surface.*

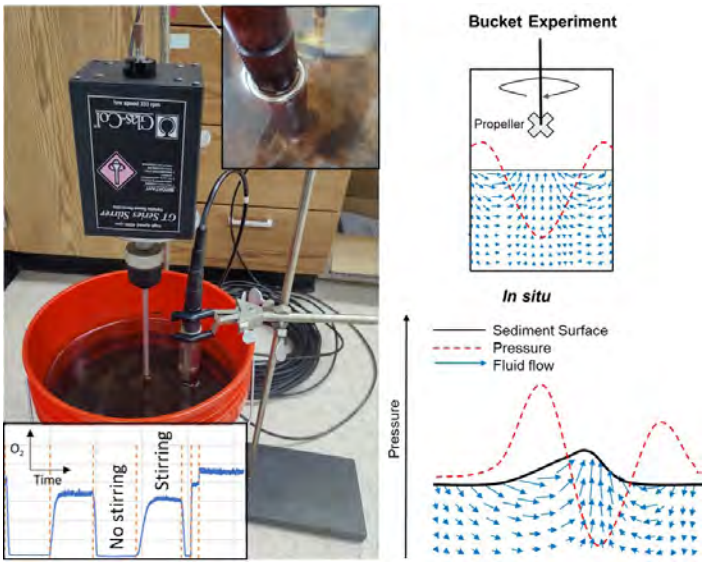

Figure 2. *Photo of laboratory "bucket experiment" where rotational flow of water over the sediment surface caused pressure-driven downward fluid flow (upper right), similar to how water flow over a rippled sediment surface (see lower left inset in Figure 1) can cause downward fluid flow in situ (lower right), thereby introducing oxygen into the sediment. Lower left inset shows influence of stirring-induced water flow on sediment oxygen concentration; upper inset shows close-up of an oxygen sensor embedded in surface sediment.*

AWARDS

Seth Sutton received the Johanna M. Resig Foraminiferal Research Fellowship from the Cushman Foundation for Foraminiferal Research for his proposal to identify the Mid-Paleocene Biotic Event and its impact on benthic foraminiferal communities from coastal plain sediments in the Western North Atlantic.

Mike Smith (PhD 2007) received the prestigious 2024 William R. Dickinson Medal from the Society for Sedimentary Geology (SEPM). The Dickinson Medal recognizes a mid-career scientist who is significantly influencing the sedimentary geology community with innovative work; with a track record of impactful publications, pioneering approaches and the establishment of an influential research program. Mike's contributions integrate sedimentology, tectonics, geochronology and paleoclimate, focusing on topics ranging from deep sea sedimentation to lake deposits. He is also a prodigious and well-liked teacher, and particularly enjoys leading students into the field to see rocks in their natural habitat.

HYDROBADGER AWARDS

Chunmiao Zheng (PhD 1988) has won the 2024 Prince Sultan Bin Abdulaziz International Prize for Water in its groundwater category "for developing powerful tools to understand groundwater processes in eco-hydraulic systems under diverse hydrological and climatic conditions, taking into account various environmental and socioeconomic factors, which can be employed by water managers locally and nationally". Dr Zheng will receive the award at a ceremony in Saudi Arabia; the award carries a prize of $133,000.

Kenneth R. Bradbury (PhD 1982) has been elected a 2024 Fellow of the Wisconsin Academy of Sciences, Arts & Letters joining an elite group of individuals who have exhibited exemplary dedication to civil discourse and public service benefitting the people of Wisconsin. Dr. Bradbury is recognized for his scientific contributions to hydrogeology as well as his mentoring of students and as a coordinating force for bringing together diverse communities to advance better management of Wisconsin's groundwater resources. He also was awarded the 2023 Schwartz Mentoring Award by the Hydrogeology Division of the Geological Society of America.

Randall J. Hunt (PhD 1993) received the US Department of Interior's Distinguished Service Award in May 2024. This is the highest honorary recognition presented by the DOI for outstanding contributions made during an eminent career with the DOI and for exceptional contributions to public service.

PhD student **Miles Reed** received a student modeler award from the Community Surface Dynamics Modeling System (CSDMS, the leading organization for topographic evolution modeling in the United States), for "Designing and applying a landscape evolution model infused with cosmogenic nuclides for geomorphic insights". He was also awarded an NSF postdoctoral fellowship for his proposal, "Erosion on the mountaintop removal coal mining landscapes of Central Appalachia", which he began after completing his PhD in Summer 2024.





DEPARTMENT OF GEOSCIENCE STUDENT AWARDS

UNDERGRADUATE STUDENTS

Mack C. Lake Outstanding Undergraduate Award
Kenz Carlton

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Distinguished Undergraduate Award
Grace Halstead

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Outstanding Sophomore Award
Alissa Choi

• • •

Field Camp Scholarship
Kate Akin
Alec Baudry
Katie Peters
William Runge

• • •

Eugene Cameron Scholarship
Emily Sautebin

• • •

The Laurence Dexter Environmental Scholarship
Jillian Prescott

Carl & Val Dutton Scholarship
Kate Akin

• • •

James J. and Dorothy T. Hanks Memorial Fund
Jillian Finucane

• • •

The Lowell R. Laudon Scholarship
Martin Heiser
Kyle Williams

• • •

The Paull Family Undergraduate Scholarship
Alec Baudry

• • •

T.C. Chamberlin Scholarship
Kate Akin
Kenz Carlton
Emma Zwirschitz

GRADUATE STUDENTS

Distinguished Graduate Student Award
Emily Mixon

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The James J. & Dorothy T. Hanks Graduate Student Award in Geophysics
Chelsea Volpano

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Dean Morgridge Distinguished Graduate Fellowship
Jeremy Brooks

• • •

Sturgess Bailey Distinguished Graduate Fellowship
Pablo Moreno-Yaeger

• • •

Kenneth and Linda Ciriacks Distinguished Graduate Fellowship
Emily Mixon

• • •

James D. and Stella M. Robertson Graduate Fellowship
Kyrsten Johnston

Jay C. Nania Graduate Research Assistantship
Rachel Breunig

• • •

Mark and Carol Ann Solien Fund
Matias Romero

• • •

William H. and Virgie Twenhofel Award
Rudy Molinek

• • •

C.F. Scheisser Outstanding Student Research Paper Award
Dougal Hansen, Andy Jones, Vy Le, Emily Mixon, Miles Reed, Nate Stevens, Ethan C. Parrish, Esther Stewart, Nicholas Sullivan

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George J. Verville Award
Aaron Kufner

• • •

Tyler and Berg Excellence in Teaching Awards
Thaïs Altenberg, Jen Breiling, Noah Brown, Kyrsten Johnston, Evgeny Mazko, Rudy Molinek, Claire Ruggles, Seth Sutton, Sally Stevens

KATE AKIN

Undergraduate student

I received the T.C. Chamberlin, Carl and Val Dutton and Geoscience Field Camp Fund Scholarships for the 2023-24 school year. These scholarships helped fund two great geoscience experiences for me that I would not have been able to attend previously! With these awards I was able to visit the Loch Borralan Pluton in the Northwest Highlands of Scotland which was the focus of my senior thesis. The last few years, I have also wanted to be able to have a field camp experience because I have heard from several people in our department that their favorite part of undergraduate studies was when they were able to attend. After hearing all the great memories and connections that everyone who went was able to make, I knew immediately that field camp would be something I would need to experience. Unfortunately, I have not been able to attend the last couple summers due to financial reasons. Because of the scholarships through the department and our donors I was able to attend the Wasatch-Uinta field camp this summer!

ALEC BAUDRY

Undergraduate student

Both the Paull Family Undergraduate Scholarship and Field Camp Scholarship enabled me to attend Wasatch Uinta field camp this summer. This was an amazing experience for me as a young geologist both academically and in making connections with other young scientists. It was my first time out in the field mapping as a geologist and it was a key learning experience for me. This experience helped me gain key insight into what real world geology looks like in a field setting. It was an impactful way to top off my undergraduate learning and career, and wouldn't have been possible from the support I received from the Paull Family Undergraduate Scholarship and Field Camp Scholarship.

ALISSA CHOI

Undergraduate student

I would like to express my sincere gratitude for receiving the Outstanding Sophomore Award. It is a great honor to have my work highlighted in this manner. Receiving this award has supported my paleoclimate and geochemistry research: I am currently working with Dr. Annie Bauer investigating strontium seawater variations during the Great Oxidation Event, and with the Center for Coldest Ice Exploration (COLDEX) to decipher dust and greenhouse gas paleoclimate signals in deformed blue ice areas. I am grateful to all my advisors and mentors at UW-Madison and beyond for all their support throughout my undergraduate journey!

KENZ CARLTON

Undergraduate student

This past academic year, I was awarded the Mack C. Lake Outstanding Undergraduate Award and the T.C. Chamberlin Scholarship. Scholarships such as these have been invaluable in my pursuit of my passion for geology, especially geologic mapping. Because I received enough funding, I was able to complete my senior thesis on the Honey Creek Structure with less stress about being able to support myself through my schooling. Furthermore, with such funding, I have been able to attend field trips, such as field camp in the Wasatch-Uinta region and a week-long trip to Death Valley. These trips have allowed me to expand my horizons beyond the Midwest and to gain first-hand experience that has proven indispensable in my studies. My gratitude to the generous donors who have helped to grant me such opportunities.

KATIE PETERS

Undergraduate student

I am honored to have received the Field Camp Scholarship this summer. With these funds, I had the extraordinary opportunity to attend a field camp through George Mason University in the beautiful Italian Dolomites. I was able to study carbonate platforms, fault zones, and large scale folding. I was also able to map Quaternary geology for the first time through the helpful guidance of my professors. During the summer, we completed breathtaking hikes through the Dolomites, including a hike to the carbonate platform Latemar. On this hike, it was exceptional seeing the distinct inner lagoon facies from the slope facies, all scarped out by an inner glacial cirque. It was deeply rewarding to practice field geology in an independent fashion and complete a large scale map. The Dolomites are made up of some of the most striking geology I've ever seen with distinct bedding and dramatic elevation.

JILLIAN PRESCOTT

Undergraduate student

I am honored to have received the Laurence Dexter Environmental Scholarship. This award has allowed me to devote extra time to my geoscience classes and immerse myself in my coursework. Being able to focus more on my geology classes has prepared me for my final year of undergraduate studies and the senior thesis I will begin in the fall. My thesis will continue the glacial geomorphology research I have been conducting in Professor Zoet's lab for the past year and a half. I have loved studying geology at the University of Wisconsin-Madison, and the opportunities from the department and this scholarship have been invaluable in helping me achieve my academic and career goals.

EMILY SAUTEBIN

Undergraduate student

I'm honored to have been awarded the Eugene N. Cameron Scholarship, which has empowered me to make the most of my time as a GeoBadger and prepare for a meaningful career in geoscience. Receiving these funds allows me to focus on my forthcoming senior thesis, which I'll be completing under the guidance of Clay Kelly. We're interested in interpreting the fossil record of planktic foraminifera in order to better understand the paleoenvironmental conditions of the Paleocene-Eocene Thermal Maximum (PETM). I'm deeply grateful for all of the fantastic opportunities this department has offered me—especially this once-in-a-lifetime chance to grow as a scientist.

KYLE WILLIAMS

Undergraduate student

I am honored to be one of two students to receive the Lowell R. Laudon Scholarship this year. I am humbled as awards like this make my time in university more financially sustainable and simultaneously provide encouragement that I am a student capable of such an award. The opportunities that scholarships like this one offers cannot be understated, like my recent time studying abroad in Iceland at the University of Reykjavik focusing on geothermal energy and continuum mechanics in geology. This generous scholarship has supported my continued desire for knowledge and allowed me to enhance my time as a geology student in ways I never could have imagined. I am continuously thankful for the generosity of the donors as I aim to further my education in graduate school in the near future.

THAIS ALTENBERG

Graduate student

My name is Thais Altenberg Vaz and I received the Tyler Teaching Assistant Fund in Geology and Geophysics Award this past spring. This award has helped me to cover living costs as well as travel costs to collect core samples from the South Dakota Geological Survey for my research on microfossil biostratigraphy in the Pierre Shale Formation. I have taught several introductory level geoscience courses here at UW Madison and through these experiences as well as receiving this award, I am inspired to continue working as an educator and pursue coursework in education as a part of my PhD minor.

RACHEL BREUNIG

Graduate student

I am honored to have been awarded the Jay C. Nania Graduate Research Assistantship for the 2024-2025 academic year. This award allows me to focus on a dissertation chapter exploring loess impacts on water quality, quantity, and landscape evolution through field observations at Wyalusing State Park, WI in fall 2024. This fall, I will install a new set of Hillslope Moisture Observation Stations to monitor and sample water across the stratigraphic column. Installations and water sampling from the stream and hills will require many trips, and I am supremely grateful to have been granted the support to make this possible. Engaging students in hands-on research has been a rewarding aspect of having frequent, local field work. Over the course of 3 years of work at Wyalusing, over 25 students (both graduates and undergraduates) have joined me as field assistants and received hands-on training on coring, environmental water sampling, and sensor management. My dissertation also involves modeling erosion and deposition in Chile's Southern Volcanic Zone to better understand how surface processes influence crustal stress conditions and thus volcanic eruptions. The contrast of these projects keeps me on my toes and is shaping me into a well-rounded geomorphologist and hydrologist!

JEREMY BROOKS

Graduate student

I am honored to receive the Dean L. Morgridge Wisconsin Distinguished Graduate Fellowship for spring 2025. Thanks to the generosity of the Morgridge family, I will continue working on my research projects studying how glaciers shape landscapes in Alaska and determining the history of the Laurentide Ice Sheet in Wisconsin during the late Quaternary. This award will allow me to focus on data analysis and preparing manuscripts during the end of my PhD. Thank you to the Morgridge family and the Weeks community for their support.

NOAH BROWN

Graduate student

I am very thankful for receiving the Stanley A. Tyler Award for Excellence in Teaching! This award has helped greatly by helping cover some monthly expenses which makes it easier to focus on research. My research aims to perfect methods for EBSD of ice in addition to in-situ flow through synthesis under X-ray diffraction as new mineral phases precipitate.

KYRSTEN JOHNSTON

Graduate student

I am very grateful to have received the Thomas E. Berg Award for Excellence in Teaching and the James D. and Stella M. Robertson Graduate Student Research Assistantship. Teaching at UW-Madison has been incredibly rewarding, and it is wonderful to have my efforts recognized with this award. Interacting with students has given me a better understanding of the material I teach, as well as a strong base in scientific communication that I hope to bring with me into an academic career. Although I love teaching, I am also excited for the opportunity to focus on my research in the Fall 2024 semester thanks to the graduate student research assistantship. I'm interested in strain partitioning at the grain to outcrop scale and I use a combination of microstructural techniques, finite strain analyses, and statistical analyses to gain insight into the differential behavior of minerals and units in layered sequences. This semester I plan to focus on completion of data collection and analyses for one of my projects looking at the effect of finite strain geometry on quartz microstructures. Thank you to the donors for supporting graduate student research and teaching!

AARON KUFNER

Graduate student

It is an honor to receive the George J. Verville Award in Geology and Geophysics! My graduate studies in paleontology have taken me to many places around the United States as I try to piece together the evolution of a group of long extinct amphibians from the Triassic Period. My research involves direct observation and measurement of specimens in museum collections, and due to the fragile nature of many of these specimens, it is essential that I can travel to the institutions where they are held. This award helped me travel to the last museum collection I needed to visit at UC Berkeley to complete my research. Awards like the Verville Award have helped ease the burden of travel costs during my time as a student, and I hope they will continue to help other students for years to come.

EVGENY MAZKO

Graduate student

I am incredibly honored to be the recipient of the Thomas E. Berg Award for excellence in teaching. This award has had a profound impact on my academic and professional journey. The generous funding has enabled me to invest in a personal laptop, a crucial tool for both teaching and conducting research. As a third-year PhD student in the Department of Geoscience, this support has provided me with the resources to enhance my teaching methods and improve the coursework for my students. Over the past four semesters, I have passionately served as a teaching assistant for courses such as Sedimentology and Stratigraphy, Introductory Geology, and Natural Disasters. The award has reaffirmed my dedication to teaching and motivated me to strive for excellence in my career. With the guidance of my advisor, Shanan Peters, and valuable student feedback, I have successfully redesigned the Sedimentology and Stratigraphy lab, leading to positive outcomes for my students. This recognition not only boosts my confidence but also inspires me to continue making meaningful contributions to the field of Geoscience. I sincerely appreciate your investment in awards like the Thomas E. Berg Award, which make a significant difference in the lives of students like me. Thank you for your support!

EMILY MIXON

Graduate student

I am honored to have been awarded the UW-Madison Geoscience Distinguished Graduate Student Award for 2023-2024. My decision to attend UW-Madison for graduate school was due in part to my impression of multi-discipline community in the department, so it is a true honor to be recognized for my academic and personal contributions to our shared goals in science and community-building. I am particularly grateful to my advisor Annie Bauer, my collaborators in the SIMS and ICP-MS labs, and my friends and mentors in the broader Weeks community for their support throughout my PhD.

PABLO MORENO-YAEGER

Graduate student

I am honored to have received the 2024 Sturges "Bull" W. Bailey Scholarship. Like Dr. Bailey, my interest in mineralogy and petrology fueled my initial career which eventually brought me to the University of Wisconsin-Madison. Thanks to these funds I have been able to focus on my research during the last year of my PhD, which involves $^{40}Ar/^{39}Ar$ dating and whole-rock and mineral compositions of lava flows and tephras from volcanoes located in southern Chile. My PhD dissertation is to investigate how glaciation affects the compositions and eruptive rates of volcanic arcs. Southern Chile is an excellent laboratory to explore this question as it holds >30 active volcanoes that were once covered by a 1-2 km-thick ice sheet ~18,000 years ago. My PhD projects are one part of a multi-collaborative NSF project to understand glacial and volcanic changes in the region. As part of this work, I have been able to show that indeed, some volcanoes are very sensitive to past glaciations and deglaciations, which act to change their magmatic compositions and their eruptive rates following large-scale ice retreat. I am very grateful to Dr. Bailey and his family for inspiring this scholarship, and to the donors for making the funds available. Also, I am thankful for having the opportunity to do fieldwork in my country and work with a great team of faculty, including my advisor, Brad Singer.

MATIAS ROMERO

Graduate student

I am incredibly grateful for the Mark and Carol Ann Solien Graduate Assistantship I received for the 2024-2025 academic year. Thanks to this support, I am able to focus on processing samples for cosmogenic nuclide surface exposure dating as part of my dissertation, which is focused on understanding ice sheet change. This research is conducted within the Paleoclimate and Geochronology Group, led by Prof. Shaun Marcott. The samples, collected from moraine boulders in northern Patagonia during the austral summers of 2023 and 2024, aim to document the rapid and widespread lateral retreat of the Patagonian Ice Sheet along its margins in response to the deglacial warming that followed the last ice age. I anticipate that the results will provide insights into the drivers and forcings behind ice sheet change, contributing to our understanding of one of the most understudied regions of the globe.

CLAIRE RUGGLES

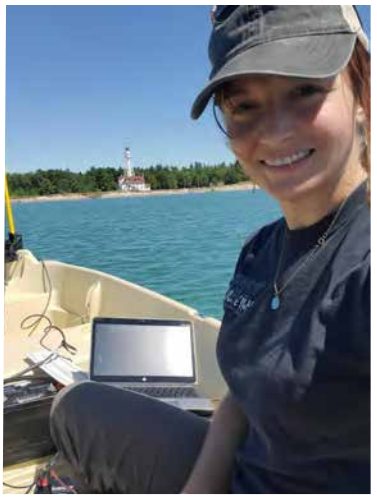
Graduate student

This past year, I was fortunate to receive the Thomas E. Berg Award for Excellence in Teaching. It has been a joy being able to work with the undergraduate students in this department. My time TAing Structural Geology and Introduction to Applied Geophysics during 2023 allowed me to get to know some of the late-stage undergraduates in our department, and to see how bright and enthusiastic they are. These courses allow for both a deeper dive into upper-level curricula, as well as get students out into the field to apply classroom concepts to field settings. It was wonderful seeing how engaged and motivated they were, and to be able to work closely with them to ensure that they are receiving the best experience possible. Helping to instruct these undergraduate students has inspired a love of teaching and undergraduate education, and I look forward to continuing TAing in the upcoming academic year as well!

CHELSEA VOLPANO

Graduate student

I had the honor of receiving both the Hanks Graduate Award in Geophysics and the Ciriacks Distinguished Graduate Fellowship at the Spring Banquet this year. I started at UW-Madison in 2019, earning my Masters with Dr. Luke Zoet in 2021 and advancing to the PhD program. My research uses field work and numerical modeling to answer questions about physical coastal processes along the Great Lakes. As someone who grew up near Wisconsin's Lake Michigan coast I have had the pleasure of working and connecting with many communities close to my hometown. This research was borne out of collaboration with the Wisconsin Geologic Survey with the participation of UW Geoscience alumni. During my graduate education I have seen how happy the alumni are to support students in the department at every step. The awards I received offer the privilege of working on my research full time in the last semesters of my PhD and I am so grateful for the opportunities made possible by the generosity and involvement of alumni in our department.



Cameron and Wilcox Electron Microbeam Labs Update

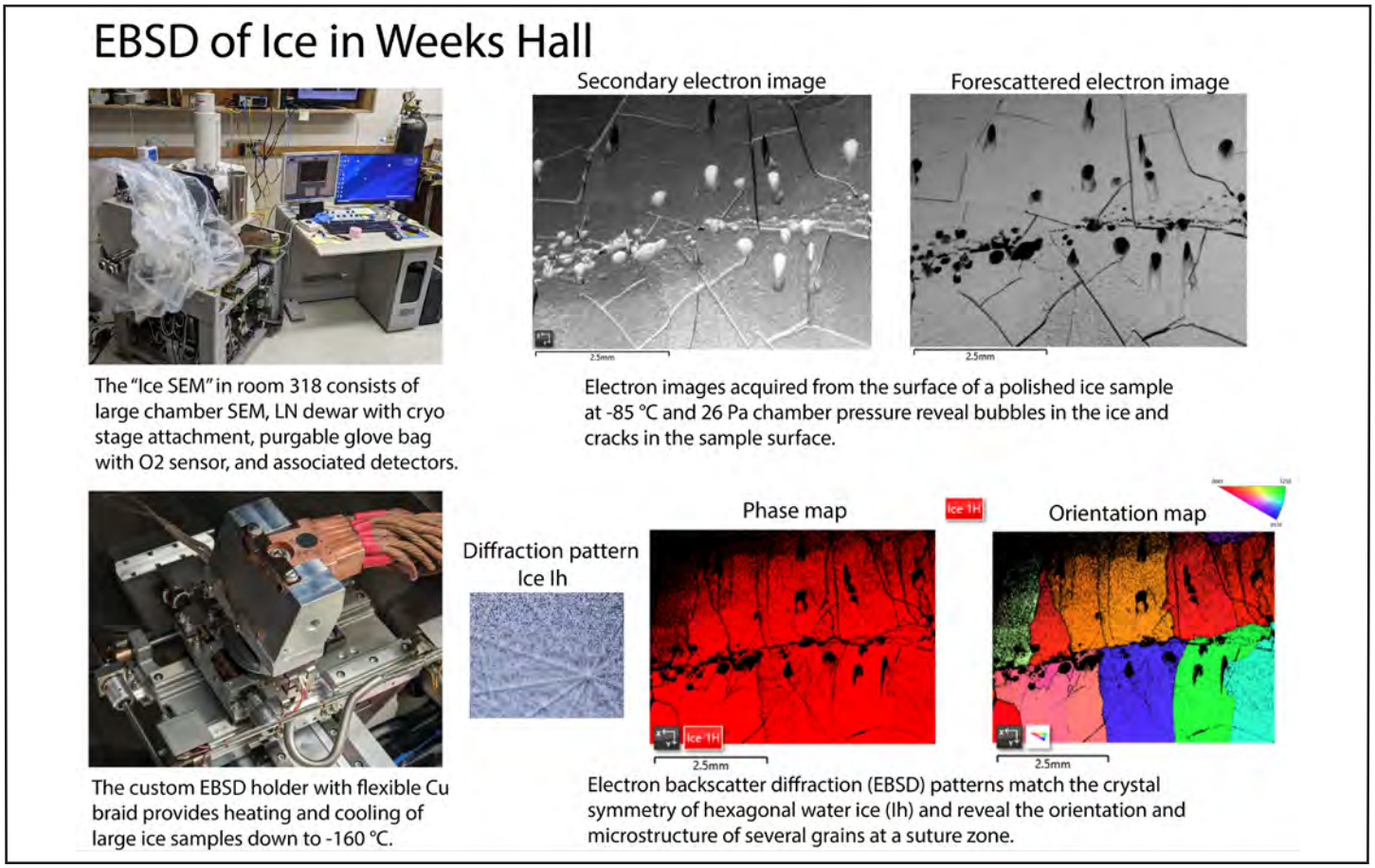
Will Nachlas

It has been a busy year working with new equipment and techniques in the Electron Microbeam Labs.

Last September saw the arrival of two additional Cameca SX-100 electron microprobes that were moved into room 306 with the surplus SX-100 received from LANL the previous spring. Throughout the fall semester, components from the three machines were combined into a fully functioning instrument with five wavelength dispersive X-ray spectrometers (WDS). The vacuum and electronics systems were first turned on in January 2024, and over the next few months testing of five spectrometers was performed with each of the diffraction crystals. By May 2024, the "new" SX-100 began producing research-quality WDS measurements.

The availability of the SX-100 will provide backup of the busy SX-Five and equipment components that can be used for long-term maintenance and continued operation of both microprobes. Some of the projects completed with the microprobe over the last year include measuring the composition of melt inclusions in pyroxene dated with Ar/Ar geochronology (Jicha et al., 2024, Geology), characterization of solar dust particles collected from the NASA Stardust mission (Zhang et al., 2024, Geochimica et Cosmochimica Acta), and analysis of erupted minerals and glasses to link volcanism with retreat of the Patagonian Ice Sheet (Moreno-Yaeger et al., 2024, GSA Bulletin). The EPMA instruments have also worked in collaboration with researchers in engineering, including analysis of O vacancy concentration in a novel oxygen-conducting phase used in solid oxide fuel cells (Meng et al., 2024, Nature Materials), chemistry of complex rare earth oxides used as environmental barrier coatings (Yu et al., 2024, Journal of the American Ceramic Society), and thickness of surface oxide layers on metallic glass thin films used in surgical devices (Muley et al., 2024, Applied Surface Science). We have also produced data for local Wisconsin start-up companies, including analytical results provided to Chocolate Rescue for Dogs that assisted with their canine rescue product reaching the commercial market.

In summer 2024 we made a breakthrough in developing capabilities for SEM-EBSD of ice as part of Prof. Chloe Bonamici's UW-2020 project. After nearly 3.5 years of equipment purchasing, installation, customization, and testing, with major efforts from Peter Sobol and Bil Schneider, our Hitachi S3700 large chamber electron microscope (SEM) performed the first electron backscatter diffraction (EBSD) analysis of water ice in early June 2024. The new "Ice SEM" in Weeks Hall 318 is now the only known electron microscope with a custom cryo stage dedicated to EBSD of ice and icy materials. We look forward to an upcoming year of cool research!



Antarctic Fieldwork: Looking for GHOSTs

Jaiden Zak

This year, I went to Antarctica with the GHOST project. We were 13 scientists and 10 support staff from institutions in the US, UK, and Germany, there to study the Geophysical Habitat of Subglacial Thwaites—in essence, the basal conditions of Thwaites Glacier. Thwaites is the size of Florida and contributes 4% of global sea-level rise; a total collapse of the glacier would increase global sea level by 65 cm. Understanding the physical processes that control the deformation and slip of Thwaites is crucial to predicting its future stability.

On November 7th, we took a 5 hour flight on a C-17 aircraft from Christchurch, New Zealand to McMurdo Station (population ~1000). Here we tested equipment, had trainings, learned an absurd amount of unnecessary acronyms, and sorted cargo. After much anticipation and over 2 weeks of delays, we made the 3.5 hour flight on an LC-130 to WAIS Divide. WAIS stands for West Antarctic Ice Sheet, and WAIS Divide camp is the site of an ice core that was completed in 2011. The camp currently serves as a hub in West Antarctica where large LC-130 planes bring people and cargo from McMurdo before smaller aircraft and vehicles transport to field sites. I spent 12 days in WAIS Divide (population < 60), once again waiting for a weather window and an operational aircraft. Here we slept in tents, rather than the dorm-style housing at McMurdo. After we organized our cargo for deployment to Thwaites, I passed time by playing cards and shoveling snow to melt for cooking, cleaning, and drinking. On Christmas Day, I took the 2 hour flight to Thwaites on a British Antarctic Survey (BAS) Twin Otter plane after one of the best Christmas dinners of my life. Thank you WAIS Divide cooks Lauren and Bev!

Jaiden with a Twin Otter airplane

Once on Thwaites, we carried out passive and active-source seismic experiments, operated multiple radar systems, collected drone images, and gathered gravity data. Our days off came during storms, which brought winds up to 50 knots and wind chills below -40°C. Snow drifts from these storms provided plenty of opportunities to shovel snow. We wrapped up our science on our deadline of January 16th and began the journey home. Taking the same flights in reverse, we eventually made it back to New Zealand 18 days later on February 3rd. Although we only had 3+ weeks at Thwaites due to delays, it was a very successful season and I am grateful to have been a part of such an excellent team.

Midnight over Thwaites

Training for Everest via Glacial Geology

Andy Jones

In July, our field team—composed of PhD students Andy Jones '26, Matias Romero '27 and Yasmeen Orellana Salazar '28, and recent PhD Ethan Parrish '24—completed a 2-week field campaign at Huayna Potosí, a towering peak 15 miles north of La Paz, Bolivia, nearly 20,000 feet above sea level. Our mission was to investigate the long-term fluctuations of the large glaciers cascading from the mountain's sides. The meltwater from these glaciers supplies drinking water to the millions of people living in La Paz, and the glaciers' precipitous retreat over the past 100 years has begun to jeopardize this important natural resource. The history of the glaciers' size viewed in a geologic context— over the past 11,700 years since the end of the last ice age—provides critical insight into the glaciers' predicted response to continued warming today. This research is part of a National Science Foundation grant to Shaun Marcott to study glacier change from Alaska to Patagonia along the spine of the American Cordilleras, and follows up on our recent publication in Science that also includes Luke Zoet.

Our daily routine consisted of collecting hand-sized pieces of glacially-polished bedrock near the present-day glacier fronts. The landscape, a mix of loosely-consolidated debris dropped by retreating ice and undulating knobs of bedrock, presented both breathtaking views and daunting challenges. Each morning, we loaded our packs with hammers, chisels, and a rock saw and set out from our 'refugio'—a modest mountain shelter—to the glacier front. On a map, the hikes looked reasonable: 1,000-ft of elevation gain over a couple miles. We were quickly acquainted with the oppressive effects of high altitude, however, working at 16,000 feet only days after coming from Madison. The samples have now made their way back to Weeks, and we begin the next task of reducing the rocks to their basic elemental constituents to measure their surface exposure ages and decipher the glacial history.

We extend our gratitude to our hosts, an Aymaran family—members of an indigenous Andean group—who live at this altitude year-round. They serve as local guides, often leading climbers training for Mt. Everest to the summit of Potosí. As part of this project, Ethan Parrish is producing a short film on 'glacier death,' featuring interviews with community members about the glaciers' role in their lives and how climate change is altering their world.

Above: Yasmeen Orellana-Salazar, Matias Romero, and Andy Jones in front of Huayna Potosí, Bolivia. Photo credit: Ethan Parrish

Below: Zongo Glacier and Huayna Potosí in Bolivia. Photo credit: Ethan Parrish

ECLIPSING AT THE EDGE OF THE OUACHITAS: A MULTI-DISCIPLINARY GEOLOGICAL EXCURSION

Shanan E. Peters and Basil Tikoff

"I have a crazy idea." That's how this began. Professor Tikoff sent Professor Peters a note at the start of the Spring '24 term suggesting that we organize a combined geology field trip and total solar eclipse viewing experience, which required a trek south, somewhere within a band between Missouri and Arkansas. Prof. Tikoff had a head start. He had already miraculously found an available, reservation-ready facility, the Oak Bower Group Use Area near Bismarck, Arkansas, right along the path of totality. We both agreed that it was a potentially once-in-a-lifetime event for us and our students, and that the geology was likely to be sufficiently interesting to make it worthwhile. So, we decided to go for it, with the generous support of the alumni-endowed Student Field Experiences Fund. Remarkably, we would soon realize that the Oak Bower group site, chosen because of its availability and location along the eclipse path, was on the banks of DeGray Reservoir, which is world-famous for having a spillway with a long continuous exposure of structurally tilted deep submarine fan deposits of the Jackfork Group. In other words, it was the perfect place to combine Structural Geology and Sedimentology and Stratigraphy, the two captive audiences that would form the nucleus of the trip.

All told, 26 Geobadgers, including most of the Sed-Strat and Structure classes and other interested grads and undergrads, would pile into several minivans and head south early on April 6th. It was a long drive, so the first day was dedicated to getting there. We spent the day Sunday driving around the local area, taking in geology highlights in the part of the Ouachitas that we were in. On the list of stops were new roadcuts outside of Hot Springs, where the Arkansas Novaculite and other adjacent units are very well exposed and tilted as part of the zigzag folds, and folded rocks in the Blakely Sandstone, near Blakely Mountain Dam. On Monday, the day of the eclipse, we spent the morning walking the famous spillway section, with Ellen Nelson and Tikoff leading the group through the process of logging a section in StraboSpot, the mobile field geology data collection app built by Tikoff and his collaborators. Of course, when it came to the eclipse, we were entirely at the mercy of the weather. Fortunately, we would totally luck out. As we rolled back into our beautiful and secluded lake-side camp, the scattered clouds parted and we had an essentially unobstructed view of the eclipse, from start to finish. It was truly amazing! After that, we snuck in one more outcrop, the type section of the Arkansas Novaculite. We then headed back to Madison the next day, geologically wiser and with an eclipse viewing experience for the ages.

Eclipse shadows on a sheet spread out near the excited students.

Professor Tikoff looking at a strata map with his students

The eclipse at totality.
Photo courtesy of Soren Goldsmith.

WHITE LAKE REBOOTS AFTER A COVID-19-INDUCED HIATUS

Shanan E. Peters, Annie Bauer, and Phil Brown

In 1941, then-professor Emmons led a group of 7 Geobadgers to map and explore the Huronian Supergroup and surrounds of southern Ontario. After a hiatus encompassing World War II, and with the blessing of the Dean, geology Professor Gates proposed to make the trip a regular affair and took up the mantle, returning to "White Lake" in 1952 with a bigger group of 11 students. Every year thereafter, for the next 67 years, Professor Gates, followed by a succession of faculty, notably Professor Bowser and Professor Brown, would do the same, returning to White Lake with another group of Geobadger students in tow. All told, 1,078 students would participate in the field course over those years, along with a few dozen other hangers-on. However, the 67-year Geobadger White Lake streak would come to an end in 2020, as the COVID-19 pandemic took hold and mandated the cancellation of the already-scheduled and planned trip. After an extended pause due to the pandemic and to changes in the status of our lodging facilities, it was with much excitement that Professors Bauer and Peters, along with Emeritus Professor Brown, rebooted the White Lake course and headed north once again.

Students map and discuss features of an outcrop.

As in the inaugural year of 1941, we set out in late April 2024 for the Elliot Lake region of Ontario with 7 students, **Simon Bushmaker, Molly Fox-Kincaid**, **Sierra Freiberg**, **Alyssa Hellrung**, **Katie Peters**, **Emily Sautebin**, and **Connor Seidel**. The objectives of the course are straightforward: learn about the Paleoproterozoic Huronian Supergroup and the fascinatingly remarkable changes in the Earth's surface environment that these world-class sedimentary rocks reveal, become familiar with rocks in the field and some of the major tectonic factors that have resulted in their modest deformation, and then dive into a field area to construct a geological map and cross section. This year's "White Lake rebooted" group of students was great, engaging productively in all three of these areas while dealing with sometimes challenging conditions in the field, all with can-do, positive attitudes. The trip was a success, but the rocks pretty much make that a guarantee. As one student put it in their final course review, "the White Lake trip has been one of the highlights of my geoscience degree; I learned so much within one short week in the field." It is indeed hard to replace this experience, and we look forward to continuing UW's long streak for many years to come, thanks in no small part to the generous support of our Alumni Student Field Experiences Fund.

Photo of the 2024 White Lake class at an overlook

Villarrica, the most active volcano in South America, rises to 2840 masl in the Andean Southern Volcanic Zone, Chile. Photo by Brad Singer from the south during the April 5, 2015 eruption. During this tiny eruption, dark basaltic ash flowed down, or was deposited on, the summit glaciers and surrounding areas, posing a hazard to several communities.

WHEN ICE SHE AND ACTIVE V COLLIDE

Written by Brad S. Singer

Determining how and why eruptive outputs are modulated by the loading and unloading of ice is key to understanding how ongoing and accelerating deglaciation across mid- to high-latitudes will impact future activity at many volcanoes. For example, there are more than 100 volcanoes buried under the West Antarctic Ice Sheet, which is thinning faster than other Antarctic ice sheets. Rapid thinning of the ice could enhance the rate of volcanic eruptions and possibly set up a positive feedback whereby additional heat is input to the base of the ice sheet, thereby increasing the rates of melting and in turn, sea level rise. Two fundamental questions are: Does decompression of the upper crust during rapid thinning of ice sheets propel increases in eruption rates? and, Does surface loading during ice sheet growth, followed by rapid unloading during deglaciation, promote changes in the storage conditions and compositions of magmas that reside within, and move through, the underlying subvolcanic plumbing systems? Gaining new insights toward answering these questions is the goal of an international team of geoscientists from UW-Madison, UCLA,

EETS VOLCANOES

Lehigh University, Brown University, Dickinson College, Purdue University, and in Chile the Universidad de la Frontera-Temuco, and the Servicio Nacional de Geologia y Mineria. Supported by a 5-year grant from the National Science Foundation's Frontier Research in Earth Sciences Program, this collaborative team of PIs and students (a list of contributors to this research follows this story) are addressing the mechanics and dynamics of ice sheet-arc magma plumbing system interactions at a regional-to-local scale within the Andean Southern Volcanic Zone (SVZ) of southern Chile. Here, piedmont glacier lobes, forming the northernmost extension of the Patagonian Ice Sheet, have enveloped dozens of large, active, composite volcanoes as they reached local thicknesses of nearly 2 km during the local Last Glacial Maximum (LGM) between ~35,000 and 18,000 years ago, then retreating rapidly between 18,000 and 15,000 years ago (**Figure 1**).

Working hypotheses include: (1) Over short timescales (less than 10,000 years), the composition, volume, and timing of eruptions are strongly influenced by climate-driven changes in surface

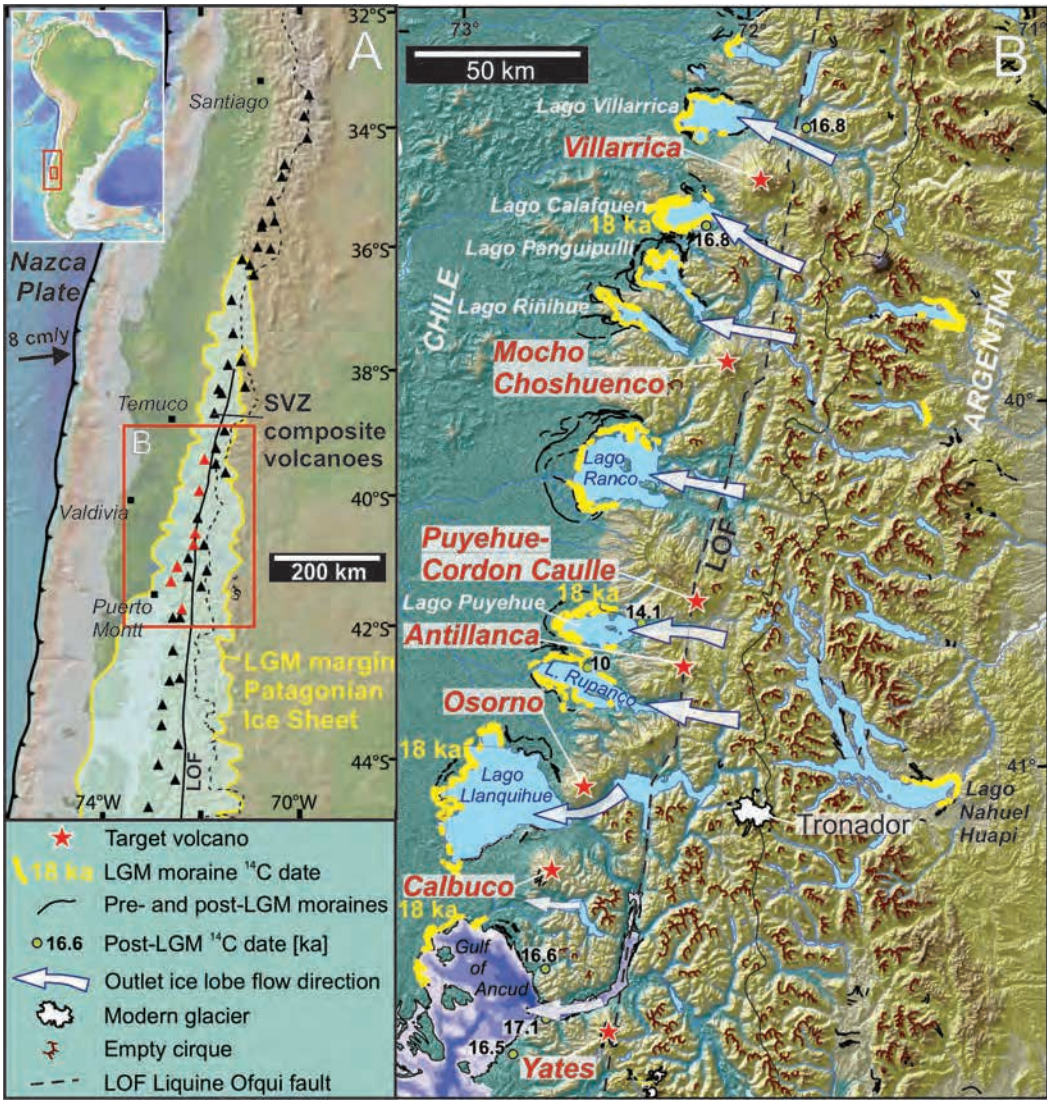


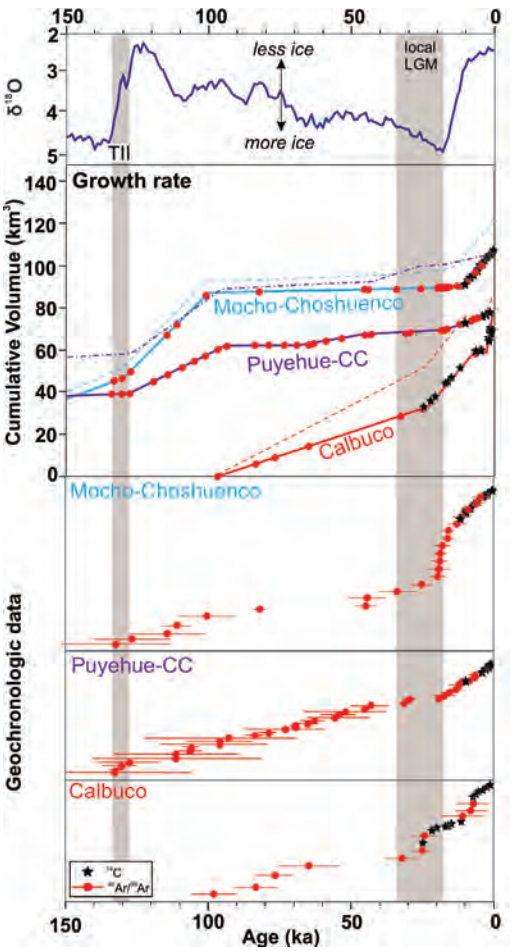
Figure 1. ***A.*** *Patagonian Ice Sheet extent during the local LGM; target volcanoes red triangles.* ***B.*** *Yellow lines: moraines deposited 23.0-17.8 ka which impound large proglacial lakes; those marked 18 ka are associated with many ^{14}C dates (modified from Davies et al., 2020). Red stars denote target volcanoes. The arrows indicate flow paths of throughgoing streams of the Patagonian ice sheet (PIS) during the LGM westward from the Andean range crest.*

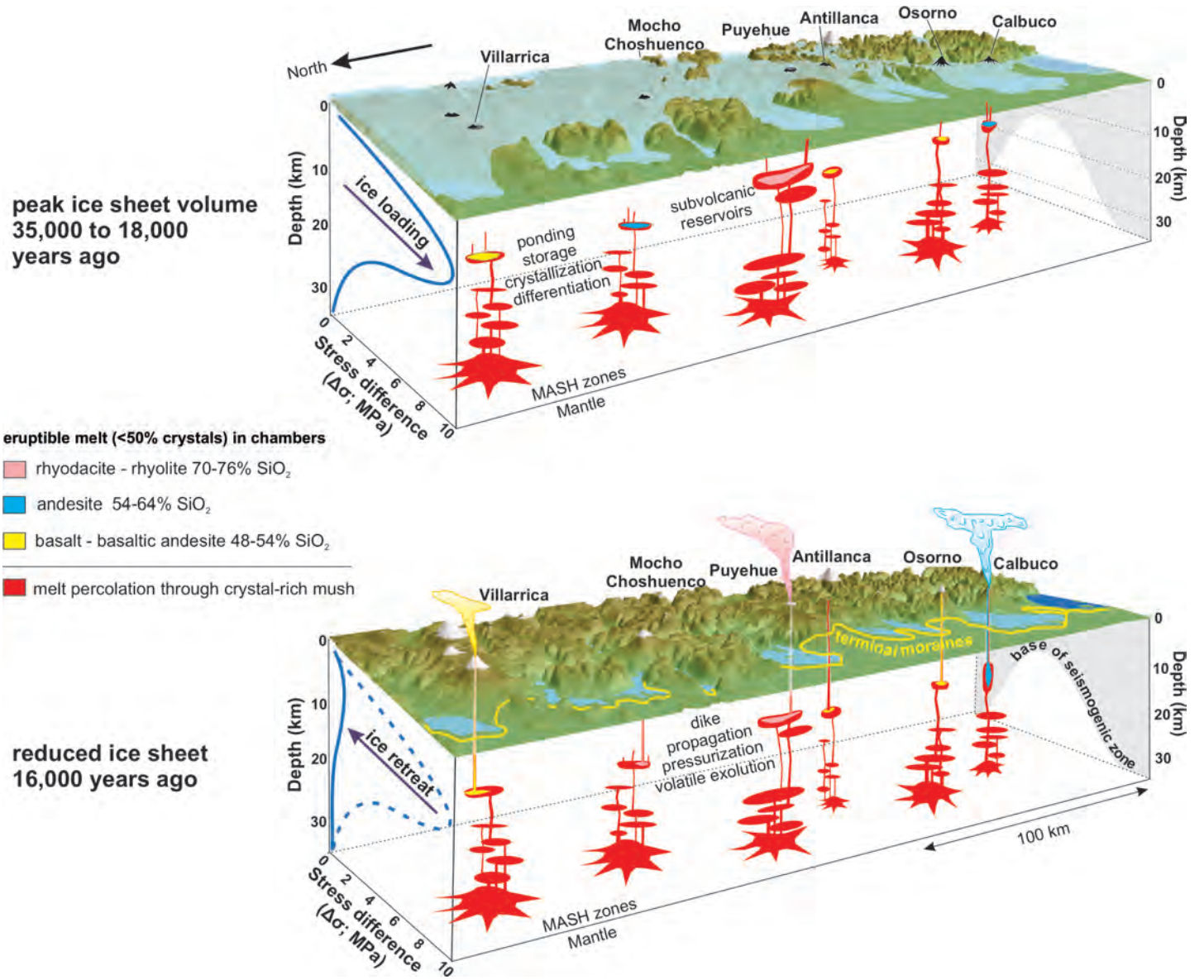
loading and vary among these volcanoes, (2) These short-term responses modulate long-term (greater than 10,000 year) eruptive characteristics governed by the flux of mantle-derived melt into the base of the crust, and (3) Crustal stress changes associated with rapid deglaciation that began 18,000 years ago promoted eruptions by enhancing volatile exsolution from melts (bubble formation) that pressurized stored magma and propelled dike propagation to the surface (**Figure 3**).

Our multi-faceted effort features a synthesis of existing and new field observations, laboratory measurements, and numerical simulations. Advances in $^{40}Ar/^{39}Ar$ radioisotopic and ^{3}He surface exposure geochronology, in conjunction with geologic mapping, facilitate reconstructions of volcanic eruptive histories spanning the last glacial-deglacial cycle that indicate significant increases in eruption rates immediately following retreat of the Patagonian Ice Sheet (**Figure 2**). On several volcanoes, where lavas have flowed into or against ice at high elevations, these dates also provide constraints on the thickness of ice at particular time slices (**Figure 4**). We have discovered granitic glacial erratic boulders at high altitudes on the slopes of several volcanoes that are interpreted as lodgment till deposited by the Patagonian Ice Sheet when it was at its greatest thickness (**Figure 5**).

The magnitude and geometry of the glacial loading and unloading is captured in a climate model-driven numerical simulation that reveals spatial and temporal heterogeneities in the configuration of the northernmost Patagonian Ice Sheet retreat (**Figure 6**; Cuzzone et al., 2024). The geological observations including dated moraine complexes, dated lava-ice contact features, surface exposure ages spanning the topography of granitic plutons east of the volcanoes, and the erratic boulders, are each consistent with this numerical model of ice sheet behavior. Deep valleys imply intense localized erosion on volcano flanks, and deposited sediment in nearby floodplains implies narrow regions of rapid sediment deposition. These observations,

Figure 2. *Records of cumulative volume erupted over time from three composite arc front volcanoes in the Andean Southern Volcanic Zone (**Figure 1**). $^{40}Ar/^{39}Ar$ ages from effusive lava flows and ^{14}C ages for tephra deposits have been used together with field relations to estimate eruptive volumes and growth rates. Solid curves are minimum growth rates, dashed curves account for erosion. Comparison with the marine proxy record for global ice volume indicates that following both Termination II (TII, 127 ka) and the local Last Glacial Maximum (LGM, 35-18 ka), volumetric rates of eruption of volcanic products, including lava flows, and regionally-dispersed tephra, increased significantly.*





in conjunction with dated lava flows, provide constraints on the rates and patterns of crustal loading and unloading by sediment redistribution.

The ice loading model (**Figure 6**), cone growth estimates (**Figure 2**), and a model of sediment redistribution history each inform numerical simulations of intra-crustal stress changes below the volcanic arc in response to the ice-driven and sediment-driven changes (**Figure 7**). An important feature of this modeling that distinguishes our approach from simple ice loading models (e.g., Wilson and Russell, 2020) is that surface loading and unloading, and therefore the evolution of intra-crustal stress below each volcano, are remarkably heterogeneous in space and time. This reflects the slow advance and rapid retreat of very thick glaciers through deep valleys that surround the volcanoes and produce maximum loads around the shoulders of the volcanoes. Moreover, the relative position of each volcano within the former Patagonian Ice Sheet plays an important role in modulating intra-crustal stress changes. For instance, Calbuco volcano is further west and was only partially surrounded by piedmont glaciers, implying stress changes were minimal, whereas Mocho Choshuenco volcano was completely surrounded by glaciers that were up to 1.6 km thick (**Figure 1B**) and stress changes were more substantial.

We have found that rates and patterns of crustal loading and unloading based on estimates of erosion and deposition on and around volcano surfaces, and due to volcanic cone growth, are overwhelmed by the unloading due to ice retreat. Thus, the loading/unloading history due to ice advance/retreat is central to the design of numerical simulations of magma reservoir responses to intracrustal stress changes

Figure 3. *Conceptual model for hypothesized volcanic responses along the Southern Volcanic Zone of the Andes to changes in ice loading from peak ice thickness during the local LGM between 35,000 and 18,000 years ago, to nearly complete retreat of ice by 16,000 years ago. During peak ice conditions, surface loading increases the lithostatic stress at depths where magma is stored within the upper portions of trans-crustal plumbing systems that perforate a 35 km thick crust. Upon rapid retreat of the Patagonian Ice Sheet, this stress drops by several MPa. Goals of our ongoing research are to determine: (1) How the composition, timing, and volume of eruptions vary from volcano to volcano during the last 50,000 years and whether ice loading and unloading modulates the longer term melt flux from the mantle, (2) Whether some magmas and reservoirs are more sensitive than others to changes in surface loading and unloading by virtue of contrasts in melt composition, volatile contents, storage depth, or recharge rate, and (3) Mechanically how the stress drop may promote volatile exsolution, pressurization of stored magma, and dike propagation to fuel an increase in the number and volume of post-LGM eruptions.*

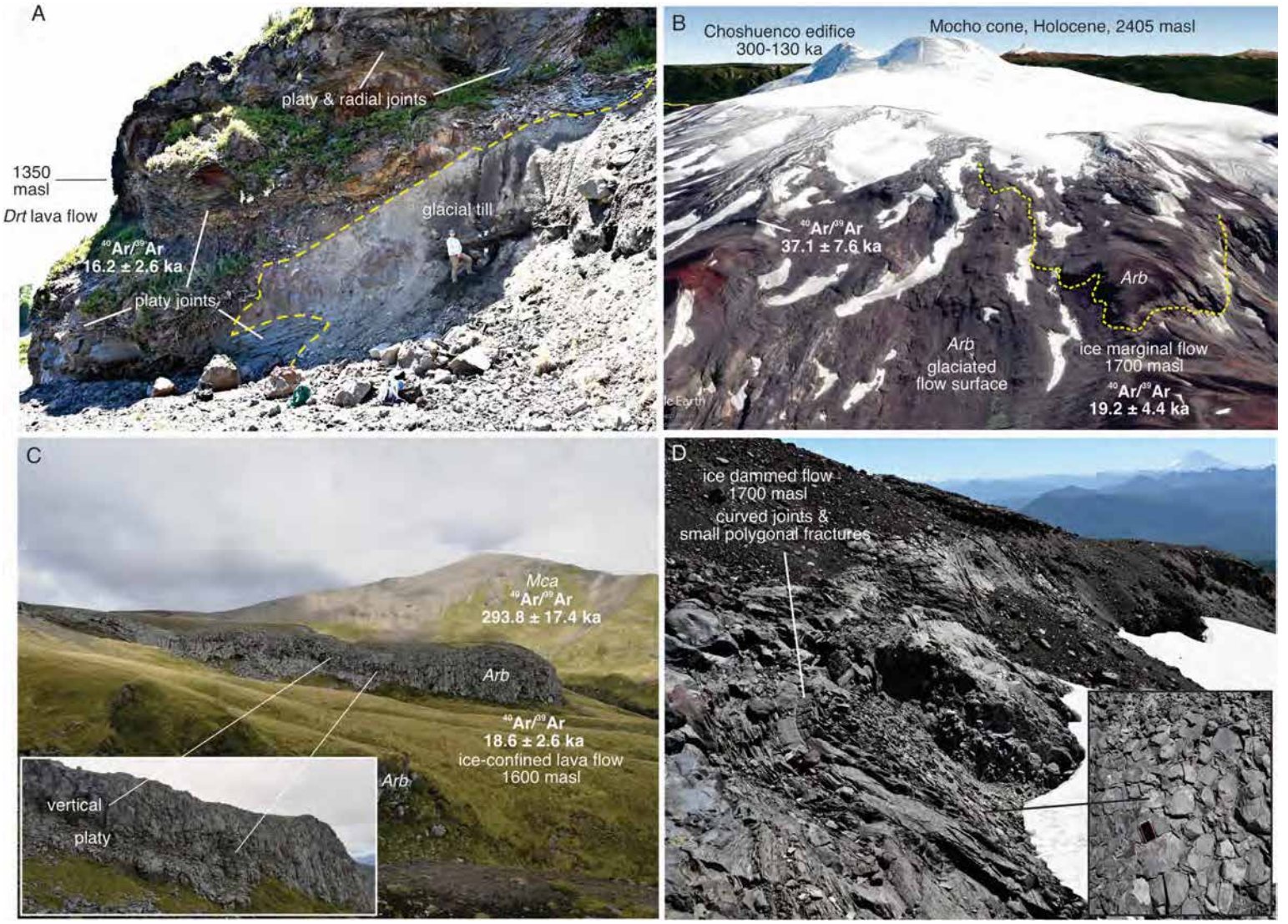


Figure 4. ***Examples of chronologic constraints on ice configuration at Mocho-Choshuenco volcano. A. On the east flank of the volcano at 1350 masl dacitic lava flows thicken downslope, comprise irregularly oriented platy and radial joints, and in this outcrop, the lava flowed onto several meters of glacial till. Note the 1.8 m tall person for scale. This lava flow is $^{40}Ar/^{39}Ar$ dated at 16.2 ± 2.6 ka (Moreno-Yaeger et al., 2024). We interpret these field relations to reflect lava flowing into and cooling against the margin of the Patagonian Ice Sheet as it has begun to shrink rapidly between 18 and 15 ka. B. Google Earth view northward onto the upper southern flank of the volcano highlighting a lava flow $^{40}Ar/^{39}Ar$ dated at 19.2 ± 4.4 ka inferred to have been impounded at an elevation of 1700 masl against the margin of the Patagonian ice sheet during the local LGM. C. On the west flank of the volcano, view to the south of a 30 m thick andesitic lava flow at 1600 masl that has been $^{40}Ar/^{39}Ar$ dated at 18.6 ± 2.6 ka (Moreno-Yaeger et al., 2024). This lava flow thickens downslope and comprises a platy-jointed base below subvertical joints. We infer that this flow was impounded against the margin of the Patagonian ice sheet during the local LGM (e.g., Smellie et al., 2011; see their figure 9). D. On the east flank of the volcano a dacitic lava mapped together with the lava in panel A exhibits curved jointing and small polygonal fractures (cell phone in the inset is 15 cm long) along its southern margin suggesting confinement by the Patagonian ice sheet at 1700 masl during the local LGM. The field observations and chronology highlighted here are consistent with modeling of the configuration of the Patagonian Ice Sheet during the last 25 ka (Cuzzone et al., 2024).***

beneath the volcanoes. Following periods of subdued volcanic output when glaciers were very thick, we have also found upticks in eruptive rates at three volcanoes during, or shortly after, the LGM (**Figure 2**). A numerical magma chamber model suggests that this behavior could be the result of a delicate balance between the timescales of magma cooling, the rate of mantle-derived magma recharge from depth (**Figure 3**), and viscous relaxation of surrounding crustal rocks. Depressurization of the crust increases eruptive mass flux to the surface only if: (1) the rate of mantle-derived magma recharging the chamber from below just outcompetes the rate of cooling, (2) the rate of recharge is barely large enough before loading to overcome viscous relaxation of overpressure by creep around the chamber, and (3) magmas are volatile undersaturated, and exsolve volatiles (form bubbles) via second boiling during the long repose associated with the high ice loads that precede rapid deglaciation.

Existing and newly developed thermobarometers that constrain magma crystallization and storage depths can be applied to eruptive products spanning a glacial-deglacial transition, such that not only secular changes in rates of volcanic eruption, but also changes in the depths of pre-eruptive magma storage and in magma composition can each be interpreted in the light of intra-crustal stress changes associated with glacial loading and unloading (**Figure 8**). Examining how the composition of magma, and the depths of pre-eruptive magma storage, changed at three volcanoes during the transition from thick ice loads during the LGM to ice-free, reveals contrasts and similarities between the underlying volcanic plumbing systems. For example, at Mocho-Choshuenco and Puyehue-Cordon

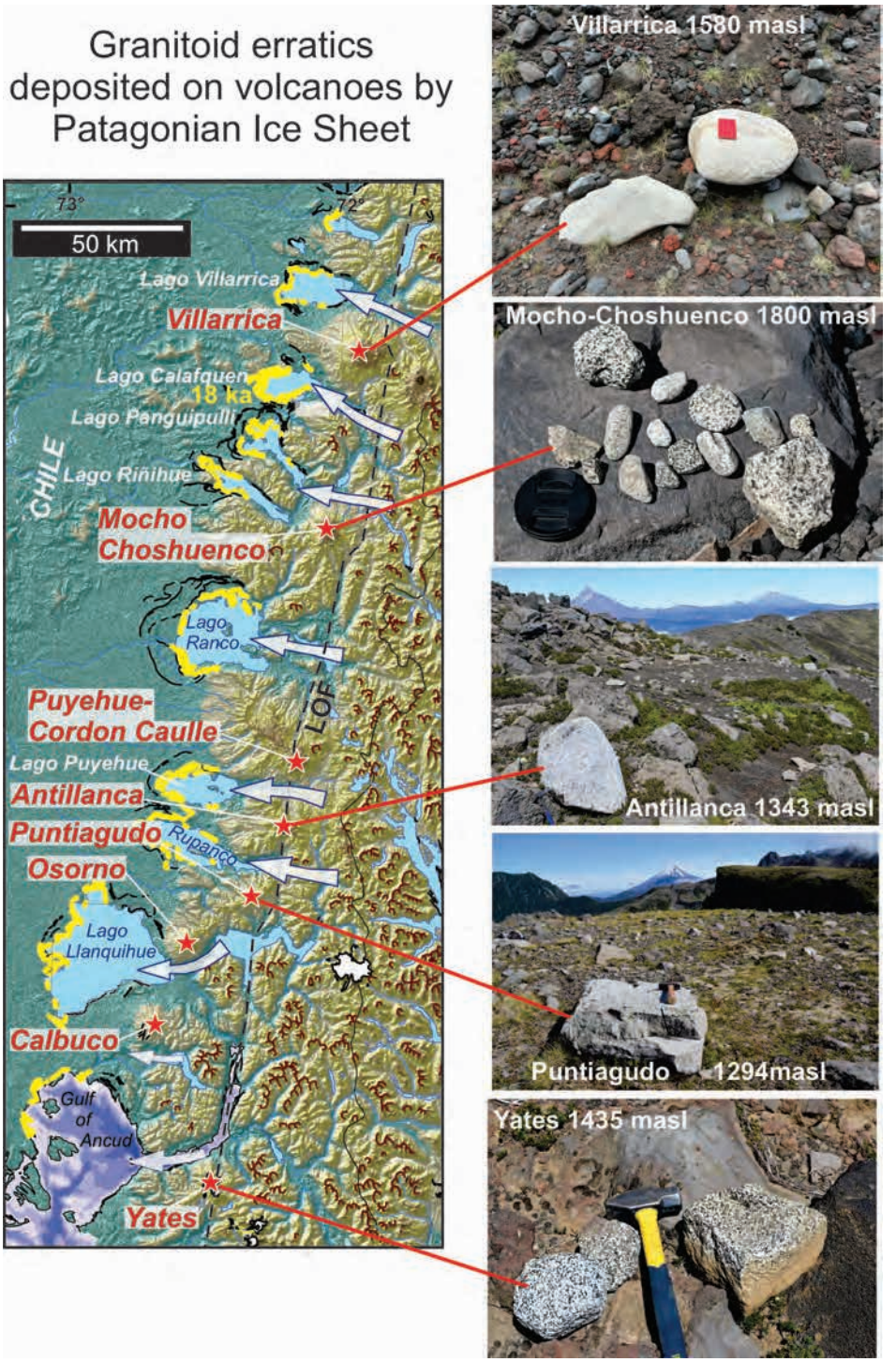


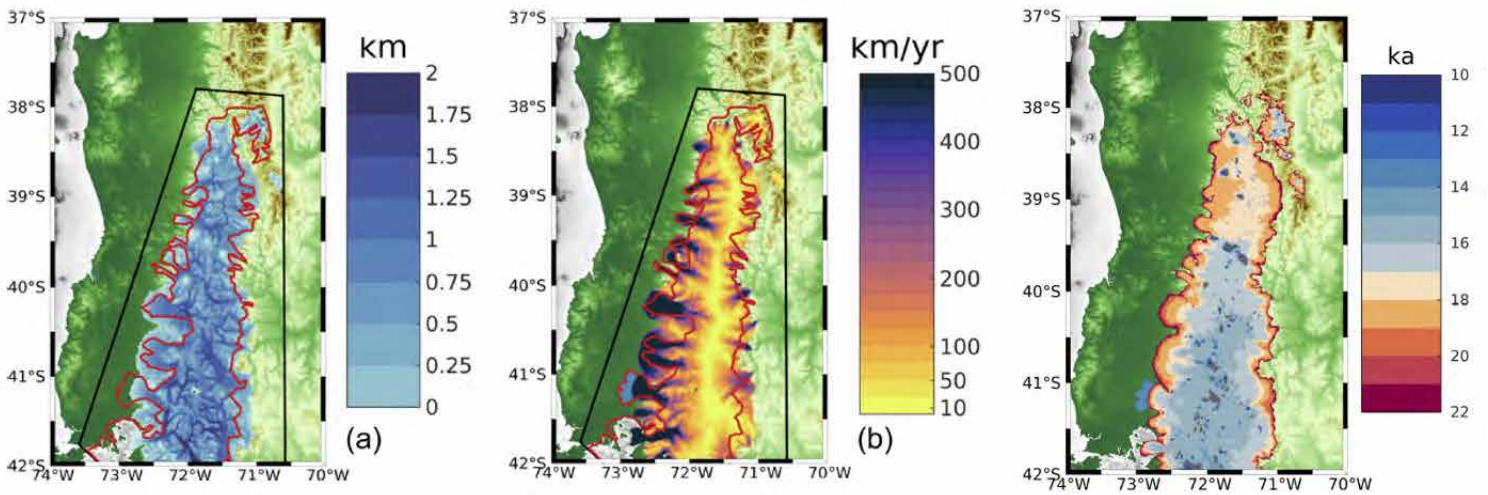
Figure 5. *Examples of erratic cobbles and boulders of various granitoid lithologies discovered on the eastern or southern flanks of several composite volcanoes. During the course of field campaigns from 2019 to 2024, erratics have been found in an altitudinal band that varies among volcanoes. Erratics have been found at Villarrica between 1550 and 1900 masl on the south flank, at Mocho-Choshuenco on the east flank between 1650 and 1800 masl, at Antillanca between 1300 and 1343 masl, on Puntiagudo at 1290 to 1310 masl, and on the east flank of Yates volcano at 1430-1500 masl.*

Caulle volcanoes, where the stress drops due to ice retreat were greatest at the depths of 5-17 km where magma was stored, more silica-rich and explosive dacitic or rhyolitic magma reservoirs developed immediately following deglaciation and have persisted to the present (**Figure 8**). This may reflect ponding, cooling, and volatile build-up during the LGM when ice loading limited the ability of dikes to ascend and partially empty the growing magma reservoirs. Alternatively, for the past 50,000 years Calbuco volcano has monotonously erupted basaltic andesite and andesite magma from a deep storage zone within a plumbing system much less impacted by intracrustal stress changes. Similar to the other volcanoes, however, a relatively shallow magma reservoir has also developed beneath Calbuco during the post-glacial period, indicating the complex, multi-level nature of reservoirs within the magma plumbing systems (**Figure 8**). For further information, our interdisciplinary research on volcano-ice interaction is detailed in an invited review paper (Singer et al., 2024) that is the basis for this story.

Implications for a habitable planet

Our findings thus far suggest that intracrustal stress relaxation associated with rapid deglaciation may propel a two- to fifty-fold increase in the eruptive fluxes at large composite continental arc front volcanoes. Although difficult to quantify, the CO_2 concentrations of arc magmas can be up to 1.0 wt.% at depths of crystallization and storage. The

Figure 6. *For the region in Figure 1B, simulated LGM ice thickness (a), simulated LGM ice velocity (b), and simulated deglaciation age from the LGM to 10 ka. Grey color indicates where ice persists after 10 ka (from climate-driven ice sheet model of Cuzzone et al., 2024). Note that the ice sheet reached thicknesses of nearly 2 km in deep valleys surrounding the volcanoes and that retreat of the ice sheet began earlier in the north than the south.*



amount of CO_2 flux emitted to the atmosphere from eruptions of subaerial volcanoes in magmatic arcs, hotspots, and rifts is estimated to be about 1.8 x 10^{12} mol/yr, or about 2 Tg of CO_2/yr, and is comparable to that of the output from the entire mid-ocean ridge system. Although this current rate of CO_2 contributed by subaerial eruptions is only ~5% of that emitted annually by the burning of fossil fuels at about 35 Tg of CO_2/yr, rapid deglaciation might be expected to increase atmospheric CO_2 concentrations over periods of several thousand years on top of the anthropogenic addition, and thus contribute in a non-trivial way to longer term global warming. We anticipate that the example we have illustrated from the Andean SVZ and northernmost Patagonian Ice Sheet retreat will stimulate further work to characterize more quantitatively the impacts of ice sheet loading and retreat on several other continental magmatic arcs, for example in Kamchatka, Hokkaido/Japan, the Alaskan Peninsula, and the Cascades, as well as within intraplate settings such as northern British Columbia.

The increase in eruption frequency and rates of cone growth following the LGM in the Andean SVZ has led to widespread distribution of unconsolidated tephra deposits and oversteepened cliffs of lava flows on volcano slopes throughout the landscape in Figure 1B. In the context of a warming climate associated with more frequent and intense rainfall events, many of these tephra deposits and escarpments are unstable and can fail, causing far-traveling landslides or debris flows. Thus, widespread retreat of edifice-buttressing ice masses, coupled with increased post-glacial volcanic output along the SVZ, may be a contributing factor in destabilizing volcano flanks and significantly increasing the risk of mass flow inundation around many of these volcanoes.

Research Credits

The team and institutions comprising the Ice Forcing in Arc Magma Plumbing Systems (IF-AMPS) project include: Brad S. Singer[1], Pablo Moreno-Yaeger[1], Meredith Townsend[2], Christian Huber[3], Joshua Cuzzone[4], Benjamin R. Edwards[5], Matias Romero[1], Yasmeen Orellana-Salazar[1], Shaun Marcott[1], Rachel E. Breunig[1], Ken L. Ferrier[1], Kathryn Scholz[6], Brent V. Alloway[7], Marissa M. Tremblay[8], Sally Stevens[1], Ivo Fustos-Toribio[9], Patricio I. Moreno[10], Franco Vera[11], Álvaro Amigo[11]

[1] Dept. of Geoscience, University of Wisconsin-Madison

[2] Dept. of Earth and Environmental Sciences, Lehigh University

[3] Dept. of Earth, Environmental, and Planetary Sciences, Brown University

[4] Joint Institute for Regional Earth System Science and Engineering, University of California, Los Angeles

[5] Dept. of Geosciences, Dickinson College

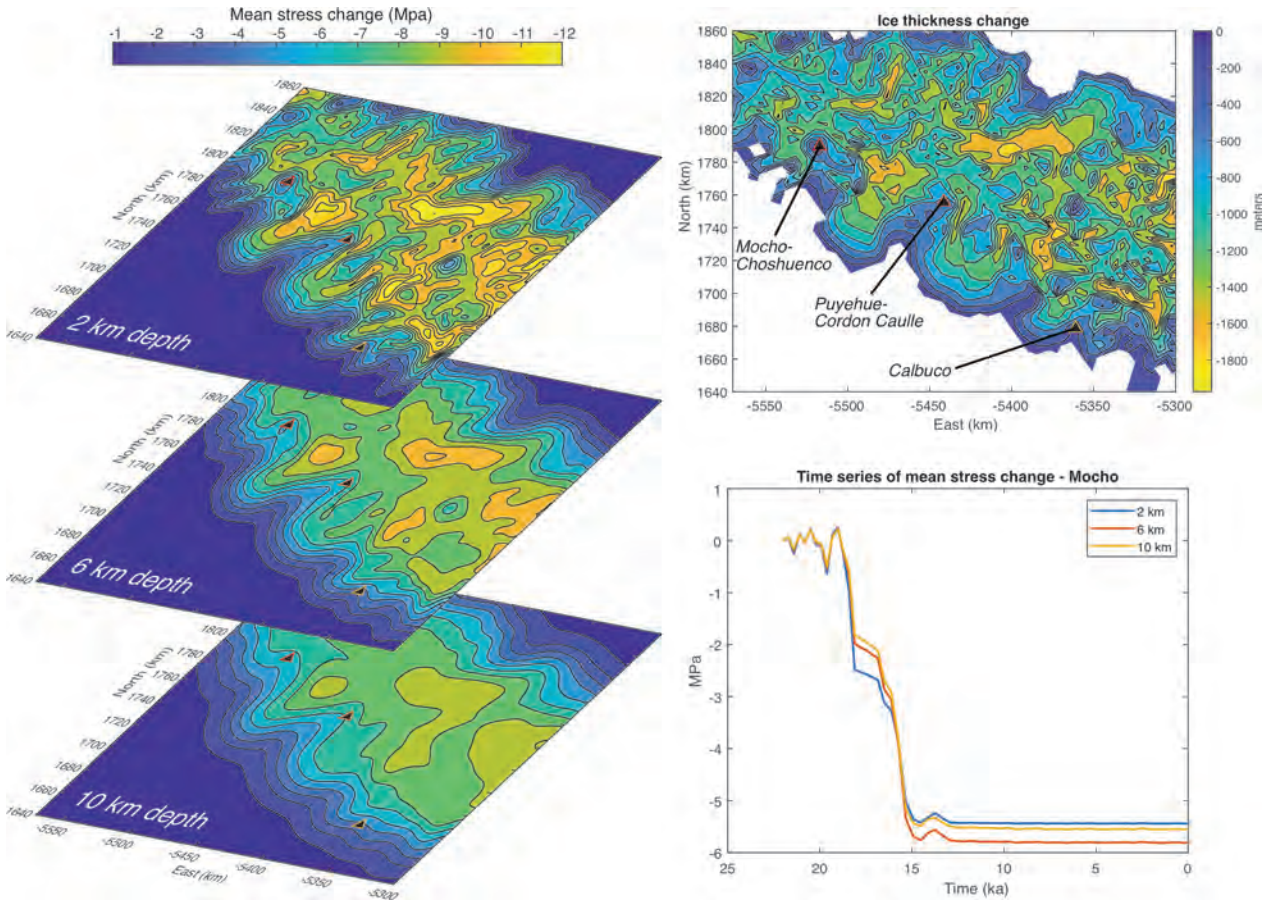


Figure 7. *Crustal stress model. Ice thickness change from the model of Cuzzone et al. (2024; **Figure 6**) over 22,000 years is illustrated in the upper right panel, with locations of three volcanoes, Mocho-Choshuenco, Puyehue-Cordon Caulle, and Calbuco. Lower right panel illustrates the mean stress change below Mocho-Choshuenco volcano at 2, 6, and 10 km depths shown in the stress maps in the left panels. Note that nearly all the stress change occurs during the rapid deglaciation between 18,000 and 15,000 years ago predicted in the ice sheet retreat model of Cuzzone et al. (2024) and supported by geologic and geochronologic data (e.g., **Figure 4**).*

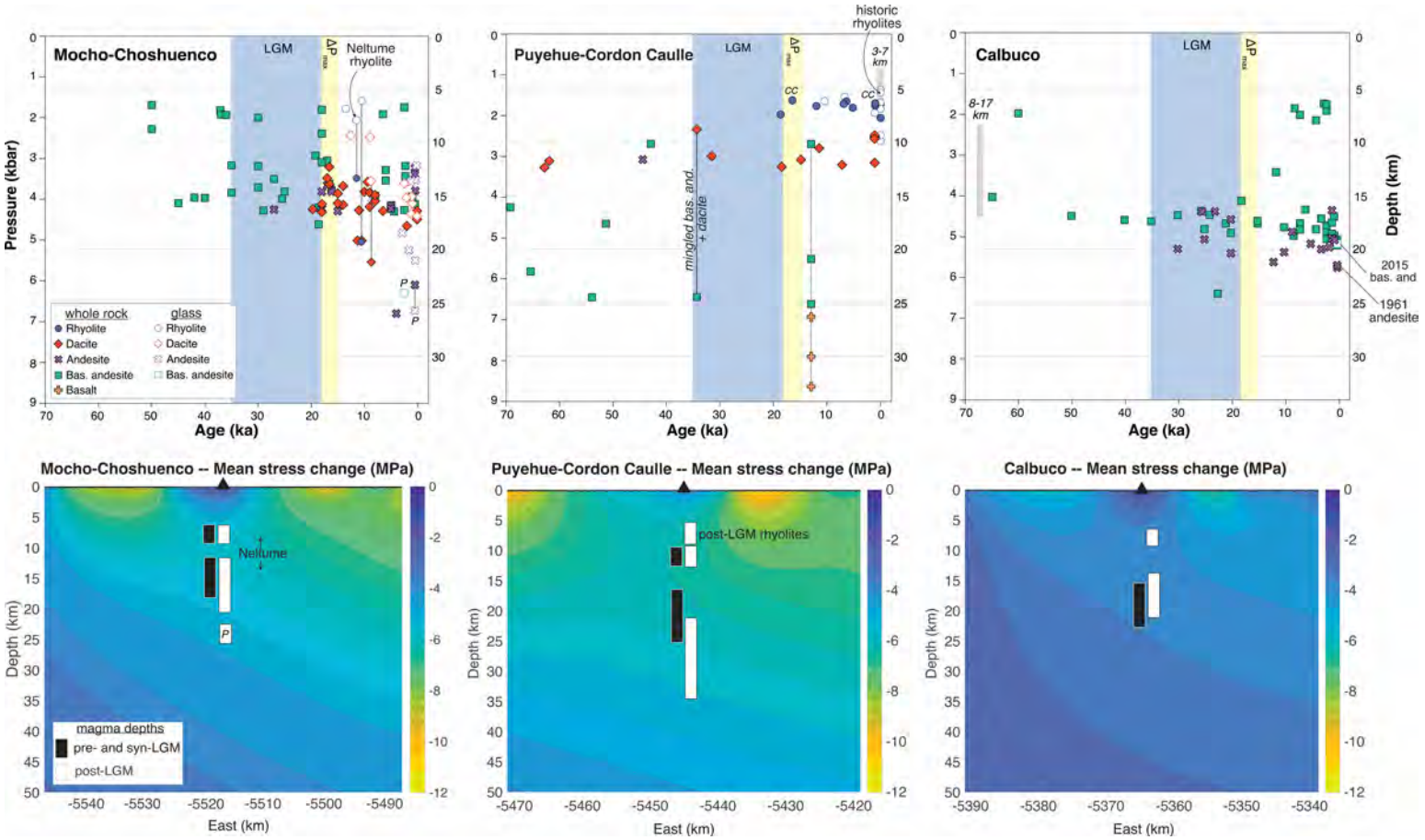


Figure 8. ***Upper panels:*** *Whole rock lava and tephra compositions and tephra glass compositions from Mocho-Choshuenco, Puyehue-Cordón Caulle, and Calbuco volcanoes are used in the Weber and Blundy (2024) machine-learning thermobarometer to estimate pressures (and depths assuming crustal density of 2.7 g/cm³) of magma extraction (whole rocks) or storage (glass). Vertical grey bars show range of pressures estimated in sources from the literature. The yellow vertical bands denoted Pmax reflect stress drops illustrated in* ***Figure 7.*** ***Lower panels:*** *Mean stress changes at depth from the ice sheet-surface loading model from 22,000 years ago to present day (****Figure 7****) for areas surrounding each of the three volcanoes. The black and white boxes schematically illustrate the positions of prominent magma reservoirs that fueled eruptions prior to, and following, the period of peak intracrustal stress change between 18,000 and 15,000 years ago.*

[6] Dept. of Earth Sciences, University of Oregon,
[7] Instituto de Geografía, Pontificia Universidad Católica de Chile, Santiago, Chile
[8] Dept. of Earth, Atmospheric, and Planetary Sciences, Purdue University,
[9] Dept. of Ingeniería Civil, Universidad de la Frontera, Temuco, Chile
[10] Dept. de Ciencias Ecológicas, Universidad de Chile, Santiago, Chile
[11] Servico Nacional de Geología y Mineria, Av. Santa Maria 0104, Providencia, Chile

References for further exploration

Cuzzone, J., Romero, M. and Marcott, S. (2024). Modeling the timing of Patagonian Ice Sheet retreat in the Chilean Lake District from 22–10 ka. The Cryosphere 18, 1381-1398.

Davies, B.J., Darvill, C.M., Lovell, H., Bendle, J.M., Dowdeswell, J.A., Fabel, D., García, J.L., Geiger, A., Glasser, N.F., Gheorghiu, D.M., Harrison, S. (2020). The evolution of the Patagonian Ice Sheet from 35 ka to the present day (PATICE). Earth-Science Reviews, p. 103152.

Moreno-Yaeger, P., Singer, B.S., Edwards, B.R., Jicha, B.R., Nachlas, W.O., Kurz, M.D., Breunig, R. Fustos-Toribio, I., Vasquez Antipan, D, Piergrossi, E. (2024). Pleistocene to recent evolution of Mocho-Choshuenco volcano during growth and retreat of the Patagonian Ice Sheet. Geological Society of America Bulletin, https://doi.org/10.1130/B37514.1.

Singer, B.S., Jicha, B.R., Harper, M.A., Naranjo, J.A., Lara, L.E., Moreno-Roa, H. (2008). Eruptive history, geochronology, and magmatic evolution of the Puyehue-Cordón Caulle volcanic complex, Chile. Geological Society of America Bulletin, 120, 599–618. https://doi.org:10.1130/B26276.1.

Singer, B.S., Moreno-Yaeger, P., Townsend, M., Huber, C., Cuzzone, J., Edwards, B.R., Romero, M., Orellana-Salazar, J., Marcott, S., Breunig, R.E., Ferrier, K.L., Scholz, K., Coonin, A.N., Alloway, B.V., Tremblay, M.M., Stevens, S., Fustos-Toribio, I., Moreno, P.I., Vera, F., Amigo, A. (2024) New perspectives on ice forcing in continental arc magma plumbing systems. Journal of Volcanology and Geothermal Research, https://doi.org/10.1016/j.jvolgeores.2024.108187.

Wilson, A.M., Russell, J.K. (2020). Glacial pumping of a magma-charged lithosphere: A model for glaciovolcanic causality in magmatic arcs. Earth and Planetary Science Letters, 548, p. 116500.

ANNIE BAUER

The ICP-TIMS lab has had a busy year! Researcher **Mike Tappa** continues to juggle a variety of method development and data interpretation responsibilities in support of internal and external students and is coordinating the renovation of the air handling system in our clean lab. Newly minted Dr. **Emily Mixon** defended her thesis, "Characteristics of Archean Crustal Reworking: Insights from in-situ Zircon ^{18}O and Trace Elements," this August, and has taken on a research position in the SLEUTh lab in our department. PhD student **Esther Stewart** published a sedimentologic and stratigraphic analysis in GSA Bulletin outlining evidence for marine influence on the Nonesuch Formation, Mid-Continent Rift, and is wrapping up a manuscript with a creative and exciting integration of the geochemistry of these sediments in support of the same interpretation. Along with researcher **Zach Adam** and collaborators at Dartmouth, we have a new NSF grant to study the geochemistry, provenance, and paleobiology of the Belt Supergroup, Montana, where PhD student **Hanna Konavaluk** just spent her first field season. We were delighted to welcome new PhD students this year: 1) **Emily Palmer**, a Department of Chemistry student who is applying the U-Th-Pb system to track oxidative weathering in the Proterozoic; and 2) **Rowan Gregoire**, who will be taking on a variety of Archean crustal evolution projects. **Annie Bauer** is the geochronology lead on a recently funded International Continental Drilling Program project to investigate Paleoproterozoic stratigraphy in the Francevilian Basins of Gabon. She is also busy as a co-chair of the 2025 Gordon Research Conference in Geochronology. Since 2023, our lab group has been excited to welcome four geobadger babies **Scotty**, **Alec**, **Emelia**, and **Adelaide**—welcome to our favorite planet!

CHLOE BONAMICI

It has been a dynamic and satisfying year for the Petro-Geochem Group, with several projects coming to completion and others gaining momentum. **Claudia Roig González** wrapped up her dissertation on stable isotope signatures of fluid-fault interactions and became the first fully fledged PhD of the Petro-Geochem Group. She now moves on to postdoctoral research at the University of Bologna – congratulations, Claudia! **Taryn Isenburg** successfully defended their MS thesis project utilizing zircon geochemistry to backtrack the tectonic setting of 1.4 billion-year-old volcanic tuffs of the Picuris Mountains of New Mexico. Former postdoctoral researcher **Suzanne Autrey-Mulligan** published her new pressure estimates for Proterozoic metamorphic rocks of the Grand Canyon in Geology. PhD student **Khalil Droubi** did field work in the deserts of California and Arizona with collaborators to launch a new project on intense fluid fluxing of the crust above the Farallon slab during the Laramide Orogeny. **Noah Brown** joined us this summer to start his PhD project on the quantitative crystallography of ice. NSF Postdoctoral Fellow **Amy Moser** completed eight lab experiments to deform our favorite geochronometry mineral titanite. Stay tuned for rainbow-colored maps of squished titanite next year!

This was also a year of progress and changes in the analytical labs that I oversee. The Ice Analysis Lab performed its first successful electron backscatter diffraction (EBSD) measurements on ice. **Will Nachlas**, **Bil Schneider**, and **Peter Sobol**, along with the help of PhD students **Natasha Morgan-Witts** and **Noah Brown**, worked tenaciously through the final technical challenges to push the ice EBSD capability over the finish line. Check out **Will Nachlas'** update for more details and exciting pictures. Several collaborations with **Luke Zoet** looking at the ice microstructure in natural glaciers, hailstones, experimentally deformed ices, and analogs of extraterrestrial ices are already on the docket.

The **WiscSIMS Lab** was renewed in its NSF funding and continues to operate as National Facility for stable isotope analysis. With this funding cycle, I take over as faculty PI and head of of the WiscSIMS Oversight Board from **John Valley**, who continues to advise the lab and manage his own research.

A subset of the ICP-TIMS lab celebrating awardees at the spring department banquet. L to R: Emily Mixon (2024 Distinguished Graduate Student Award), Hanna Konavaluk, Abby Santis, Emily Palmer, Alissa Choi (2024 Outstanding Sophomore Award).

KURT FEIGL

This year, I continued to work on geothermal energy. As described in the cover article of the Outcrop in 2022, the WHOLESCALE project is measuring and modeling the San Emidio geothermal field in the Basin and Range Province of northwestern Nevada. The project is named WHOLESCALE in (yet another forced) acronym that stands for "Water & Hole Observations Leverage Effective Stress

MS student Taryn Isenburg and Research Scientist Tyler Blum collect zircon U-Pb data on 1.4 Ga meta-tuffs of the Picuris Mountains in the WiscSIMS Lab.

Calculations and Lessen Expenses". It is supported by the Geothermal Technologies Office of the U.S. Department of Energy. The project includes data from seismology, drilling, geology, geodesy, and hydrology. To interpolate and interpret these rich data sets, the WHOLESCALE team is calculating the stress, strain, pressure, and temperature in the geothermal system using numerical simulation.

The team is strong because we combine expertise from universities and national labs with the real-world experience of Ormat Technologies. At the University of Wisconsin-Madison, the WHOLESCALE team includes faculty members **Kurt Feigl**, **Mike Cardiff**, **Cliff Thurber**, **Herb Wang**, as well as **Jesse Hampton** and **Hiroki Sone** in Civil and Environmental Engineering (all of whom are affiliated with the Geological Engineering – GLE – Program).

We rely on exceptionally competent staff members including Distinguished Instrumentation Engineer **Neal Lord** (B.S. Electrical and Computer Engineering & B.S. Computer Science 1987, **Michelle Szabo** (B.A. 1993), **Sabrina Bradshaw** (B.S. Geology & Geophysics 2005, M.S. GLE 2008), and Instrumentation Engineer **Peter Sobol**. Assistant Scientist **Hao Guo** contributes his expertise in seismology. Working with post-doc **Xi Luo**, I started learning two new languages: Python and rock mechanics. They have a different word for everything!

In February, I presented our results at the Stanford Geothermal Workshop. Although the project officially ends in October 2024, we still have several papers to write.

KEN FERRIER

Associate professor **Ken Ferrier**'s Earth Surface Evolution group had an eventful year! In fall 2023, PhD student **Miles Reed** published a paper on a novel numerical model for the coevolution of topography, soil composition, and cosmogenic nuclide concentrations (Reed et al., 2023, Journal of Geophysical Research-Earth Surface). In the fraction of the year since then, Miles defended his PhD, received a student modeler award at the CSDMS annual meeting, started an NSF postdoctoral fellowship at West Virginia University, and he and his wife welcomed the birth of their daughter. Congratulations, Miles!

Congratulations are also due to **Rachel Breunig**, who passed her preliminary exam in summer 2024 and is now officially a PhD candidate. She continues to make progress investigating the influence of bedrock erosion and sediment deposition on crustal stresses around volcanoes in Chile as part of the IF-AMPS project (see lead PI Brad Singer's cover article in the Outcrop). With Rachel's co-advisor Professor Mike Cardiff, she is also developing a project investigating the influence of atmospherically deposited sediments on Critical Zone hydrology, geochemistry, and topography at Wyalusing State Park.

Aidan Lewandowski joined our group as a research intern in fall 2023 after graduating with a major in Physics from McGill University. She has been making progress developing a model for the coupled evolution of topography and sea level, with the aim of improving interpretations of past and present sea-level changes. **Udita Mukherjee** wrapped up her postdoc in summer 2024 investigating sea-level responses to past ice sheet changes in East Antarctica. Finally, UW Geology Museum Associate Director **Brooke Norsted** has been doing an exceptional job leading an outreach program for students at Bayview Community Center supported by Ferrier's NSF CAREER grant (see the Museum's entry in the Outcrop).

EVA GOLOS

Being a seismologist in Wisconsin is a great situation: I don't get bothered too often by large earthquakes locally, and I get to travel to amazing places to collect data! In the past year, one amazing place my research group has focused on is the Cook Inlet region of Alaska. We have an ongoing experiment there, the Alaska Broadband Accessory Deployment for GEophysical Research (Alaska BADGER). We've deployed eleven broadband seismometers along the western Kenai Peninsula, and are combining this dataset with an exciting offshore fiber-optic Distributed Acoustic Sensing campaign, led by collab-

MARIANNE HASELOFF

The glaciology group made good progress in the last year. Postdoctoral researcher Dr **Kai Hu** is working on a multi-institutional collaborative project also involving Prof. Lucas Zoet studying the glacial history and dynamics of the Lake Superior Lobe of the Laurentide ice sheet. At the end of the last glacial period, this glacier repeatedly advanced and retreated over the deep basin that now forms Lake Superior (ca. 18,000 to 12,000 years ago). In the process it significantly shaped the landscape of northern Wisconsin. Using a numerical model, Kai illustrated that lake level fluctuations could trigger temporary ice sheet advance in a warming climate. This may provide a non-climatic explanation for irregular margin fluctuations of the Laurentide Ice Sheet, which were asynchronous with the climate during deglaciation.

MSc student **Campbell Dunn** is working on a novel model for subglacial conduits at the base of glaciers and ice sheets. The flow of water at the base of a glacier is a significant control on a glacier's flow speed, and Campbell is developing a numerical model to better understand how ice deformation and melting, sediment transport, erosion, and deposition interact at glacier beds.

Nicolas Sartore, graduate student in the AOS department with **Till Wagner** and me, has been working on melting at the base of ice shelves (the floating extensions of ice sheets) due to contact with warmer ocean waters. He has shown that some of the models used to determine melt rates fail in realistic parameter regimes and is now addressing the question of how to improve these models.

Participants of Glacial and Pleistocene Geology seminar field trip in front of Cable Esker. Photo credit: Lucas Zoet

This summer we were joined by undergraduate student Jaela Allen who studied the formation of "warm" regions in ice sheets (so-called temperate ice) due to thermo-mechanical feedbacks. She developed a new workflow that can be used to detect these regions in observed satellite data.

One of the highlights of my teaching year was the traditional field trip for the Glacial and Pleistocene Geology seminar, co-led with **Luke Zoet** and **Dougal Hansen**. We explored some of the interesting glacial geology shaped by the Lake Superior Lobe and subglacial hydrology with the students.

orators at the University of Washington. Our goal is to model the structure of the Aleutian-Alaska subduction zone in order to understand the processes that are responsible for a variety of seismic phenomena, ranging from the imperceptibly slow slipping of plates to extremely damaging earthquakes. We've recently been awarded a grant from NSF which will support this work. Master's student **Eryck Ochoa** has been exploring data from existing experiments near our region of study; his focus is using automated event detection to search for a mysterious signal known as tectonic tremor. Eryck presented his preliminary findings at the Seismological Society of America conference in May – impressive for a first-year Master's student! Undergraduate researcher **Mustafa Aleid** is continuing to investigate the structure below the subduction zone and Kenai peninsula using body wave arrival times. Mustafa had the distinction of being the very first researcher to present results from the BADGER experiment at the American Geophysical Union meeting last December. It's been a pleasure working with these two bright and dedicated students, and now that renovations on room 106 have been completed, we're excited to have a space for a computer lab and a home base for the group. I'm also indebted to **Neal Lord** and Peter Sobol for their hard work in servicing the seismographs, and helping us retrieve data. Without them the Alaska BADGER project (and much of the work in the Department) would not be possible. I'm also continuing a project centered around seismic imaging of the lithosphere and asthenosphere in the southwestern United States. This work is leading to interesting insights about temperature, mantle melting, and the connection between tectonic plate structure and volcanism. I'm looking forward to continuing these projects, teaching new classes, and starting more adventures in the upcoming year.

Marcott Lab group at INQUA 2022 Meeting in Roma, Italy.

LAUREL GOODWIN

Undergraduate **Elisabeth (Liz) Brown** finished an excellent senior research project and obtained degrees in Geoscience and Geological Engineering in December of 2023. Her research, a deep dive into the history of the iconic Baraboo breccia, demonstrates at least four episodes of brecciation. The oldest has a hematite-rich cement that contains minor anatase and kaolinite in addition to quartz. The second and third episodes are recorded by cross-cutting relationships as well as cements with the same mineral assemblage, but successively increasing quartz content. All three are included as clasts in the youngest, white quartz-cemented breccia we have all come to know and love.

M.S. student **Kate Tobin** successfully defended her thesis in Spring 2024. Her unusually broad and deep study of the San Andreas fault in the Mecca Hills incorporated field mapping and structural analysis (with former Research Scientist Randy Williams), meso- and microstructural investigation of gypsum veins (with me and Randy), and experimental study of clay-rich fault gouge (with GLE faculty member Hiroki Sone). The results upend the most recent structural analysis of this area, which suggested flower structures accommodate regional transpression, but are consistent with active tectonics research. Kate shows deformation is strongly partitioned. Strike-slip movement on the SAF is recorded by creep tracks and gypsum veins, in contrast to nearby thrust faults. Low dynamic coefficients of friction and rate-and-state behavior of representative gouge samples collected along an 8 km stretch of the SAF record velocity strengthening behavior, consistent with creep. Kate accepted a job offer from a consulting firm in which she was previously an intern, and now lives and works in the shadow of the Rockies.

PhD students **Matt Aleksey** and **Kaitlyn Crouch** divide their time between research in Arizona and Wisconsin. In Arizona, Matt is focused on an older (Laramide-age) and deeper (greenschist to amphibolite facies) rock record of crustal shortening associated with magmatism. Electron Back-Scattered Diffraction (EBSD) analysis of quartz in samples collected from the Quitobaquito and Puerto Blanco mountains shows that deformation included not only simple shear along a major thrust system, but also flattening consistent with substantial crustal thickening. Katilyn is studying the Patagonia fault, which records Basin and Range extension and preserves a record of fluid-fault interaction in damage-zone mineralization. Mineralization varies along strike, as does ephemeral stream chemistry. Katilyn is exploring links between fault-zone mineralogy and stream chemistry. In Wisconsin, they are both working with WGHNS geologist Eric Stewart to explore fault records at the surface (Matt) and in drill core (Kaitlyn) in the Baraboo HIlls. Their research has revealed evidence of multiple episodes of faulting and fluid-fault interactions, including precipitation of quartz and hematite in veins and breccia.

PhD student **Kyrsten Johnston** is also thinking about spatial variations in strain. She has made great strides in developing novel approaches to quantifying the impact of layer silicates on ductile deformation, and is currently writing up results for publication. I am pleased to co-advise this piece of her dissertation with her primary advisor Basil Tikoff.

SHAUN MARCOTT

The Paleoclimate and Glacial Geochronology group continues to expand our research into all things glaciers and climate. Over the past year we have continued our research on alpine glaciation from Alaska to southern Patagonia. PhD students **Andrew Jones** and **Jeremy Brooks** (co-advised with **Lucas Zoet**) are developing new glacial chronologies from

the Juneau Icefield to better understand past glacial changes and developing new methods and models for elucidating glacial erosion from the landform to valley scale. PhD student **Matias Romero** and M.S./PhD student **Yasmeen Orellana Salazar** are developing new glacial chronologies from northern and southern Patagonia to better understand the timing of glacial retreat and are relating their findings to changes in volcanism in collaboration with **Brad Singer** and PhD student **Pablo Moreno-Yaeger** in the WiscAr Lab. PhD student **Melissa (Mel) Reusche** (co-advised with **Andrea Dutton**) has been developing a new, high-resolution oxygen isotope dataset with the WiscSIMS group from speleothems from Cave of the Mounds. Mel is also developing new outreach materials in collaboration with Ian Orland (alum) at the Wisconsin Geologic and Natural History Survey and collecting survey data on how Cave of the Mounds visitors interact with the cave exhibits in order to improve visitor experience. Many other highlights over the last year, including: PhD research papers being published recently in Science (A. Jones), The Cryosphere (A. Jones), and Climates of the Past (M. Romero); lots of field work from Alaska, Canada, Chile, Argentina, and Bolivia; and members attending lots of meetings from Chicago to San Francisco to Rome. The students have been very busy and the group is very communal with lots of support in the field, the lab, and in publications. We seem to be thriving, as evidenced by me always being tired and late on many things.

STEPHEN MEYERS

The Heising-Simons Foundation-funded CycloAstro Project has been a focus of much of the recent work in the Astrochron Lab. My involvement in this initiative includes: (1) research on the history of the Earth-Moon system, Solar System chaos, and astronomical cycles using Bayesian inversion (see Meyers & Malinverno, 2018, PNAS; Ma et al., 2017, Nature), and (2) co-direction of The CycloCohort Program – "An Early-Career Springboard for Inclusion, Diversity, Equity and Justice (IDEJ) Focused Leadership in Geoscience & Astronomy" (lead director Rocío Caballero-Gill, George Mason University). The UW-Madison-based cohort includes graduate student **Ridwan Ajibade** (MS/PhD), graduate student **Alex Villa** (PhD), and postdoc **Margriet Lantink**.

Postdoc **Margriet Lantink** has been developing an exciting new cyclostratigraphic record from the 1.2-billion-year-old Hakatai Shale in the Grand Canyon, demonstrating that these iconic rocks hold answers to ancient astronomically-forced climate change and the history of the Solar System. She has also recently published two illuminating theoretical studies on the reliability of astronomical solutions in deep time, with CycloAstro PI Richard Zeebe (Univ. of Hawaii).

In August 2024, graduate student **Alex Villa** successfully defended her PhD, which includes a study that reveals (1) a dramatic increase in subtropical bioproductivity coincident with the growth of the Antarctic Ice Sheet (AIS) through the Eocene-Oligocene Transition (~34 Ma), and (2) the establishment of astronomically-forced teleconnections between the AIS evolution and subtropical bioproductivity. This excit-

A group photo of some of the participants in Stephen Meyers' astrochronology short course, taught at the Institute of Sedimentary Geology, Chengdu University of Technology in July 2024. Directly to the right of Meyers is Professor Chao Ma (UW-Geoscience MS/PhD, 2016).

ing work leverages her past involvement as a Shipboard Scientist on IODP Expedition 390/393 (Summer 2022) to the subtropical South Atlantic. Alex will be heading to MARUM in Bremen, Germany for her postdoc. Congrats Alex!

Graduate Student **Ridwan Ajibade** will be completing his MS this fall semester, an investigation of Earth-Moon history using Bayesian analysis of cyclostratigraphic records from the Permian (269 Ma) and Proterozoic (2.5 Ga). His results are providing powerful new constraints on our understanding of the Earth-Moon System.

Honorary Fellow **Nick Sullivan** (UW Geoscience PhD, 2022) will start a new postdoc at Pennsylvania State University in September, and he is busy publishing his dissertation chapters on AIS history. Honorary Fellow Ethan Parrish (UW-Geoscience MS/PhD, 2024) is a professional documentary filmmaker (Whispering River Media) and is working on publishing his dissertation chapter on the effectiveness of an arts-based Earth Science curriculum, in collaboration with the tadada Scientific Lab project (www.tadada.net).

Finally, over the past year I have been on a Guggenheim Fellowship/sabbatical traveling the world – Ecuador, Japan, New Zealand, China. It's been an incredible year exploring and working with colleagues across the planet! One of the highlights was a visit to China to see past graduate advisee, **Chao Ma** (UW-Geoscience MS/PhD, 2016), now a professor at Chengdu University of Technology. While in China I delivered an astrochronology short course (see photo) and gave a lecture tour at various academic institutions.

SHANAN PETERS

Once again, the Macrostrat lab had an eventful and productive year. Research Scientist **Daven Quinn** assumed the lead P.I. role on three new projects submitted to the NSF and USGS-DARPA, and all three proposals were funded, leading to a big new push to improve Macrostrat and set the stage for the future. As part of that effort, we are pleased to welcome Programmer Analyst **Amy Fromandi** to the Macrostrat development team. We look forward to next year's update, when a whole-new Macrostrat platform should be released. Our group also still maintains and runs the high-impact Paleobiology Database, and **Michael McClennen** remains at the helm on that front. Rockd, our mobile app (check it out on the app stores!), continues to grow at a rapid pace too, with over 138,000 registered accounts created as of July 2024! In addition to building leading-edge data infrastructure and apps for geoscience, the Macrostrat group continues to do diverse research. Current student **Aaron Kufner** is deep into his Ph.D. dissertation on metoposaurid taphonomy and systematics and Ph.D. student **Evgeny Mazko** passed his prelims and is rapidly compiling macrostratigraphic data for eastern Europe and western Siberia. Former Macrostrat students also continue their work, and the journal Paleobiology recently published two papers from the group: one by former Ph.D. student **Daniel Segessenman**, now a postdoctoral scholar at George Mason University, on transgression-regression cycles, sedimentation, and biodiversity in the Cambrian-Ediacaran of North America, and one by former Ph.D. student **Shan Ye**, now a scholar at China University of Geosciences (Beijing), on global bedrock geologic map predictions for Phanerozoic fossil diversity. Shanan continues to be involved with multiple projects, including pilot work for a possible new field-oriented project in western Utah, which alumnus **Bill Morgan** will likely help with. If you want to hear more about Macrostrat and some of the things that motivate us on that front, you can also tune into the recently released Geology Bites podcast featuring him. Finally, the entire group would like to thank our alumni, whose generous support helps to enable some of what we do. Thank you!

BASIL TIKOFF

It was a pretty good year for me from an academic standpoint. **Deanna Flores** and **Ellen Nelson** both successfully completed their respective Masters theses – congratulations are due to both of them. They are also both staying on for a PhD. Deanna also was able to somehow have a child in the same academic year. **Eneas Torres-Andrade** and I finished writing up his Masters work for publication. And, Eneas just started a new job at the U.S. Geological Survey in California. **Claire Ruggles** keeps plugging along on the geology/geophysics combination that she does. Claire also did a summer internship at Chevron. She met up with many Badger geologists in Houston, including her ex-Geo 202 TA Lindsay Shanks. **Kyrsten Johnston** continues to work on too many field areas (her advisor's fault) that all record some aspect of strain partitioning.

Among other highlights of the year, Laurel Goodwin and I led a long-put-off geological fieldtrip to Scotland. Most of the structure group went along. Shanan Peters and I also led a trip to Arkansas—a convenient excuse to see a solar eclipse—for a long weekend, but the geology was also spectacular. There is also a separate article about that. In addition, I attended the biannual Structural Geology and Tectonics Forum in Bellingham, Washington (the original Forum was held in Madison). It was nice to see past graduate students **Sarah Titus** and **Nick Roberts** there, both of whom are doing well. It was pleasant to see several things that I had been working on for a long time come to fruition at that meeting. My colleague **Julie Newman** (Texas A&M University) and I led a fieldtrip, a pre-meeting short course, and a post-meeting workshop for the Bellingham meeting; this level of activity was not very well thought out prior to getting there. I also got to do some fieldwork in coastal Alaska and achieve a life-long goal of working on the Coast shear zone. It didn't rain. At all. In the field. I am told that is atypical.

The development of the StraboSpot data system continues well, and keeps me pretty occupied. Finally, I co-taught a summer school on quantitative methods in Structural Geology in eastern California. Really, **Rick Allmendinger** (Cornell University) did the teaching and I was the local geology guide. Rick deserves a lot of thanks for leading the way on quantitative teaching and the development of very helpful software packages.

In terms of career-scale projects, cognitive science collaborator **Tim Shipley** (Temple University) and I are set to publish 12 monthly articles in GSA Today on "Places that influenced the Geological Mind". We have been working on these for years, but they will start appearing in in September—keep your eyes out for them!

HUIFANG XU

Graduate student **Tianyu Zhou** has been studying the effects of oxygen and carbon dioxide levels in the Precambrian atmosphere on the formation process of banding in banded iron formations. Her geochemical modeling results based on decomposition and oxidation rates of aqueous Fe-silicate metal complex indicate that high oxygen level (O_2-sufficient: $pO_2 > 10^{-4}$) resulted in formation of alternating bands of ferrihydrite and silica (see figure below). Low oxygen levels will result in jaspilite (co-precipitation of ferrihydrite and silica).

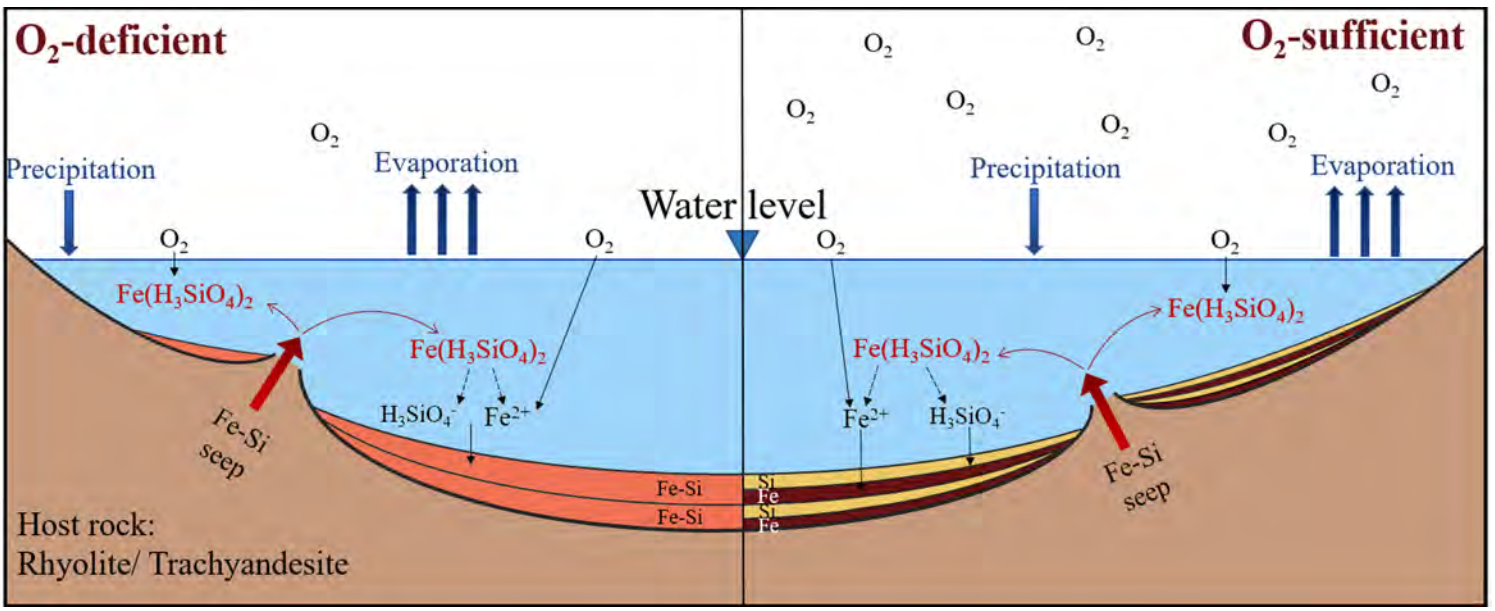
Graduate student **Noah Brown** finished his Master's thesis on investigation of lacustrine dolomite and magnesite in Lake Beeac, Victoria, Australia. His findings of Mg-rich clays associated with dolomite and magnesite support the argument that the presence of dissolved silica can be a crucial factor in addressing the 'dolomite problem.' This connection between dissolved silica and dolomite could shed light on the co-occurrence of dolomite with Mg-rich clays in evaporitic settings. Visiting graduate student **Jianru Cheng** worked on a new proxy based on carbonate minerals (calcite, dolomite and magnesite) for characterizing hydroclimate changes recorded in Deep Springs Lake, California. She discovered 500-year cycles and an extreme hydroclimate change around 900 year ago. The magnesite-rich layer (formed during extreme dry time period) is consistent with the anomaly low water level of nearby Owens Lake (65 km south) between early-1100s and mid-1100s, which is about the time of the late Northern Song Dynasty in Chinese history.

I worked on crystal structures and chemistry of opal-CT and greenalite nano-minerals. Greenalite was first discovered and described by **C. K. Leith** in early 1900s when he studied the Biwabik Iron Formation in the Mesabi Range, Northeastern Minnesota. Greenalite with incommensurately modulated structure is chemically non-stoichiometric. It contains a significant number of vacancies in the octahedral sites and additional oxygen (~9.5 oxygen per 2 Si) compared to serpentine (9 oxygen per 2 Si). Rapid precipitation of greenalite gel and quick capsulation or sealing by silica gel were responsible for preserving greenalite gel. Greenalite occurrences in iron formations can be linked to the large-scale komatiite-seawater interactions under low atmospheric oxygen level in earth history.

CHRIS ZAHASKY

It has been an exciting year for the Subsurface Hydrophysics Lab. Graduate students **Eleanor McFarlan** (MS) and **Adam Ornelles** (PhD) joined the group in Fall 2024. **Lizzi Runge** completed her M.S. degree titled 'Understanding PFAA Transport in Unsaturated Porous Media: Insights from Meter-Scale Column Experiments' in August 2024. **Paul Summers** was awarded an NSF Graduate Research Fellowship in Spring 2024 and is working to finish up a set of flow and transport models for the Town of Campbell on French Island as a part of the project titled 'Investigation of long-term drinking water security for the Town of Campbell and La Crosse County, WI' that is being led by Michael Cardiff.

Collin Sutton is spending the fall at Los Alamos National Laboratory as a part of a Department of Energy Office of Science Graduate Student Research Award. Collin is using this experience to learn advanced methods for modeling fracture network systems and compare these models with his recently collected experimental data collected in collaboration with students in **Jesse Hampton**'s Geomechanics and Rock Damage group in the Geologic



Schematic depositional model of BIF-like iron formation under different surface oxygen levels in a shallow hot spring lake (O_2-deficient: $pO_2 < 10^{-4}$; O_2-sufficient: $pO_2 \geq 10^{-4}$). When the O_2 level is high, the mix of aerobic lake water and $Fe(H_3SiO_4)_2$-bearing spring fluid leads to the ferrihydrite-rich layer and amorphous silica-rich layer precipitating successively. But ferrihydrite and silica coprecipitate when O_2 is deficient and there is no layering. The ferrihydrite-rich layer would convert to hematite-rich layer and amorphous silica-rich layer transforms into Si-rich layer. The surface water level is regulated by precipitation, evaporation and seepage from surrounding rock without visible inflow or outflow.

Engineering Department at UW-Madison.

PhD student **Vy Le** has been busy mentoring undergraduate students including a UW-Madison undergraduate student **Callie Karsten** and Henry Barron, a Water@UW Summer Research Opportunities Program (SROP) Fellow. Vy is working on a project titled 'Quantifying the Impact of Spatial and Temporal Variation in Hyporheic Zone Fluxes on Phosphorus Transport and Release in Wisconsin Streams and Rivers' funded by the Freshwater Collaborative of Wisconsin, a new state program leveraging the 13 Universities of Wisconsin institutions and the Wisconsin Idea to lead the global community in addressing freshwater challenges. This project, in collaboration with Erin Berns-Herrbolt from UW-Green Bay, **Dave Hart** from the Wisconsin Geologic and Natural History Survey, and Amy Workman at the UW-Extension Upham Woods Outdoor Learning Center, is focused on understanding the extent of phosphorus transport and storage into groundwater systems from surface water bodies with excessive phosphorus concentrations.

Graduate student Collin Sutton performing imaging studies of transport in fractured cores at the Wisconsin Institute for Medical Research.

LUKE ZOET

The UW-Madison Surface Processes group has been working hard over the past year and making interesting advances. The Coastal members of the group (**Chelsea Volpano** and **Collin Roland**) have been busy measuring coastal retreat in the Great Lakes using drones and an autonomous boat. The boat took a temporary unexpected trip across Lake Michigan, but has since been recovered and all is well. Great strides have also been made by the coastal members in examining the effects of nearshore ice on coastal change using a combination of modeling, field observations, and laboratory tests. Glacial erosion has also been a topic of interest lately within the group with **Jeremy Brooks**, **Dougal Hansen** and **Sam Marcus** all working on different aspects of glacial abrasion and quarrying. Sam has been working on an NSF FRES project led by Marianne Haseloff to understand the glacial evolution of the Lake Superior Basin. In this same region, **Fransisca Nunez** defended her MS in 2024 examining esker formation processes, and undergrad **Jillian Prescott** has just wrapped up her work on kettle formation. Both Fran and Jillian generated great papers that are under review. Fran is moving on to work as a Research Technician at Michigan State University. **Jaiden Zak** returned from a successful field experience at Thwaites Glacier, Antarctica where he deployed hundreds of seismometers and has already identified millions of basal icequakes. This work follows up on former PhD student **Nate Stevens**' work, who published a fantastic paper in EPSL in 2024 where he used seismic data to understand how glaciers transiently respond to diurnal changing conditions at their bed. **Jeremy Brooks** is working on a wide array of projects, one of which will take him to Los Alamos National Lab for about 5 months in 2024 to improve the glacier physics in the National Lab's Earth System Model, based upon experiments he's conducted at UW. Postdoc **Dougal Hansen** is using a new laboratory device to explore how the stress state at the bottom of glaciers affects seismic reflections in hopes of developing a technique to estimate stress state without requiring the drilling of boreholes to the bases of glaciers. Dougal has accepted an offer to start as an Assistant Professor in the Department of Earth, Environmental, and Planetary Sciences at Washington University in St. Louis in the Fall of 2025. PhD student **Natasha Morgan-Witts** has been working on a project that is out of this world, literally. She has spent the last year working on a project between our group and GLE's **Hiroki Sone**'s group to build a new device capable of deforming and fracturing ice at planetary conditions as part of a UW Research Forward project. After many hard years of work, we now have a functioning cryosphere triaxial deformation apparatus within our laboratories, and following its experiments the deformed ice will be imaged in **Chloë Bonamici's** new cryo EBSD. **Anya Wolterman** has been slamming waves into ice in the new cryo wave tank and watching how they melt. They've identified the first order controls on how icebergs melt away. As always, **Neal Lord** and **Peter Sobol** keep the machines going and are always willing to try to build the next strange device Luke proposes.

In Fall 2024, we will be joined by new PhD student **Kayla Hubbard** by way of the Colorado School of Mines and NSF. Kayla will work on hydrology projects in the Dry Valleys of Antarctica for part of her PhD project. **Luke Zoet** tags along with **J. Elmo Rawling** from the WGNHS looking at dirt throughout WI, the thing he feels most contented doing.

EMERITUS FACULTY AND STAFF

JEAN BAHR

2024 has been a relatively uneventful year of retirement. Tom and I have been splitting our time between our primary home in California, our condo in downtown Madison, and our "casita" in Santa Fe. Our big trip was 3 weeks in Spain in the spring, coinciding with the Fallas de San Jose in Valencia (the original Burning Man) and Semana Santa in Seville and Granada (lots of strangely enchanting processions). A fun discovery for us was the Paleontological Museum of Castilla-La Mancha in the medieval town of Cuenca. This was the result of the construction of the high speed rail line from Madrid to Valencia in the early 2000s, which crossed significant Cretaceous beds that were filled with fossils. Definitely worth a side trip if you are in that part of the country. We are looking forward to seeing Geobadgers at the GSA Connects meeting in September and at the 50th anniversary of Weeks Hall in October.

Jean with the dinosaurs at the Museo De Paleontología in Cuenca, Spain.

GORDON MEDARIS JR.

Recently, **Steve Driese** (UW-Madison, Ph.D., 1982) and I have been investigating paleosols. We found greater removal of SiO_2, CaO, Na_2O, and K_2O from Phanerozoic paleosols compared to Precambrian paleosols in the southern Great Lakes region (Journal of Geology, 2022, v. 130); namely 37% from two Cretaceous, 28% from two Cambrian, and 18% from six Proterozoic paleosols. In view of this relatively small database, we expanded our investigation (Precambrian Research, 2024, v. 401) to include a total of 21 paleosols worldwide and confirmed a greater removal of labile oxides from Phanerozoic paleosols compared to Precambrian ones; namely 37% from four Cretaceous, 24% from four Cambrian, 18% from nine Proterozoic, and 17% from four Archean paleosols. We attribute the greater magnitude of Phanerozoic weathering compared to Precambrian weathering to the effects of elevated concentrations of organic acids in the Critical Zone, which were produced by land plants that evolved in Cambrian time and eventually colonized the continents.

DAVE MICKELSON

I continue some outreach after 19 years of retirement. Hikes and about a dozen talks over the past year have been a nice way to keep in touch with geoscience. I am fortunate to still have use of the same office I moved into soon after I retired! As many of you know, Vin had a stroke in April, 2022. Fortunately, her health has continued to improve, but for us, frustratingly slowly!

Elmo Rawling has led completion of a 1:500,000 map of Quaternary deposits in Wisconsin. The map has completed the review process and revisions. This map is co-authored by **Eric Carson**, **John Attig**, **Bill Mode**, **Kent Syverson**, **Mark Johnson**, and myself. Should be released soon! **Caroline Rose** at WGNHS did the terrific cartography. **Carol McCartney** and I did another in-person geology pontoon boat tour of Lake Mendota in August. Vin and I will drive to Two Creeks and Point Beach to again lead hikes for the Wisconsin Natural Resources Foundation.

Finally, I continue involvement with coastal erosion issues by coordinating oblique photography of our WI Great Lakes shorelines. All are posted online at the Flood Science Center of the Association of State Floodplain Managers. All of the WI shoreline was completed again in 2024 thanks to the folks at the Wisconsin Wing of the Civil Air Patrol.

REQUESTS

From John Fournelle - Emeritus Senior Scientist and Geoscience Department Archivist:

I am looking for alumni who would be willing to be interviewed via Zoom about their experiences here at UW-Madison, from the Science Hall days onward to Weeks Hall, and if you have photos to share. Email me at johnf@geology.wisc.edu. I am also looking for Dott students in the Madison area who could help identify people in Bob's old slides.

DEMISEMISEPTCENTENNIAL – A MARVELOUS ANNIVERSARY

Since last October we have been commemorating the museum's 175th anniversary. Our collection was founded at the first UW Board of Regents meeting in the fall of 1848, when the University was also born. Since then, the museum has lived in a total of six campus buildings, and for the last 44 years has called Weeks Hall home.

To celebrate this landmark year, we have been adding a new specimen to our exhibits each month. These geological treasures come from around the globe and across the expanse of geologic time. Ranging from a colorful cluster of Indonesian grape agate and a tiny starfish from Wisconsin to a 1.85-billion-year-old shatter cone from the Sudbury Impact and a pair of Pleistocene stag moose antlers, we've loved sharing these new wonders with our visitors.

The most noteworthy (and heaviest!) addition, however, is Dane County's first meteorite, the Vienna Meteorite. Originally found in 2009, this newly classified meteorite weighs a whopping 109.5 pounds and was discovered by farmers a mere 13 miles away from the museum. Particularly stunning details are flow lines and splatter marks from when the surface melted during entry into Earth's atmosphere. The classification as an IVA ("four A") iron meteorite was performed by **Philipp Heck** (Postdoc 2008) at the Field Museum in Chicago with help from **Jim Holstein**, **Noriko Kita**, **Carrie Eaton**, and **Richard Slaughter**.

We are extremely grateful to the donors who made it possible for the museum to become the forever home for the Vienna. The farmers, Jim Koch and Jan Shepel, were so dedicated to it being available for Wisconsin school kids to visit that they donated more than half its value. UW geoscience alumna **Liz Dennett** (MS 2010, PhD 2014) enthusiastically and generously stepped up to push us over the finish line to land this phenomenal specimen. Vital funds were provided by the Robinson Family, the Franke and Zaveri Family, an anonymous donor as well as the Sherry Lesar Fund for Geological Wonder and the Friends of the Geology Museum. We are proud and honored to have such engaged museum champions!

COLLECTIONS

We are excited to announce that Dr. **Thomas J. Hudak**, PhD, a UW alumni and emeritus Anthropology and Linguistics professor at Arizona State University, has generously donated over 850 specimens to the museum. He assembled his collection from multiple continents over many decades and its highlights include sulfur stalagmites, football-sized doubly terminated calcites, sand spikes from the San Andreas Fault, and fluorites with petroleum inclusions from southern Illinois. From this rich bench we curated and unveiled a new exhibit featuring dozens of Dr. Hudak's specimens this fall. We are grateful and proud to showcase this particularly colorful and intriguing collection.

Museum student worker Grace Grahek holds one of the stunners from the Dr. Thomas J. Hudak collection - a doubly terminated calcite crystal from Elmwood, Tennessee.

Museum Curator **Carrie Eaton** was honored this year by colleague and honorary curator Kenneth (Chris) Gass of the Milwaukee Public Museum when he named a new trilobite species in her honor. Waukeshaaspis eatonae is a member of the Waukesha Lagerstätte, a world-class fossil locality in Milwaukee County. Our museum is home to over 1,500 specimens from this noteworthy site and Carrie has supported researchers from across the country in getting access to study them.

A lot of behind-the-scenes work is done by undergraduate students who put in hundreds of hours every year on projects that improve our collection and make it more accessible. This year Carrie supervised GLE major **Annemarie Goncalves** and four non-majors in this work. Their projects included improving the long-term storage for Triassic temnospondyl fossils, helping process and reintegrate a large number of invertebrate specimens after being out on loan, and assisting in curating the Hudak donation.

We are proud to be the home to Dane County's first meteorite, the Vienna Meteorite. Here it is in the kitchen of farmers Jim Koch and Jan Shepel before it went on display at the Geology Museum. Richard Slaughter, Noriko Kita, and Carrie Eaton were part of the team that classified it as an IVA ("four A") iron meteorite.

Museum Director **Rich Slaughter** and undergraduate **William Noguera** spent the better part of the year doing an inventory of an old department collection of economic ores that spans three centuries. They discovered many toxic minerals that required special care when handling, however among these dangers lurked treasures including several dozen specimens that were purchased at the 1893 World's Fair in Chicago. Collectively, this collection required moving and sorting through more than two and a half tons of material.

RESEARCH AND FIELD WORK

Our field crew, led by Museum Scientist **Dave Lovelace** and graduate student **Aaron Kufner** along with a cohort of undergraduate students, returned to the windswept vistas of Wyoming this summer. They continue to search for, and find, fossil clues that help us better understand the origin of dinosaurs in the northern hemisphere. A number of important specimens were found this summer that our crew is excited to get cleaned up and ready for study.

It's been a great year for boosting the museum's undergraduate research as well. Dave landed a generous grant from the David B. Jones Foundation to sponsor four years of student field work and research in vertebrate paleontology as well as conduct outreach with middle and high school students on the Wind River Reservation (WRR) in Wyoming. Additionally, we're proud of four undergraduates who work in the Fossil Preparation Lab who received a Wisconsin Idea Fellowship. Their project works in concert with the Jones grant, and provides resources for them to mentor WRR students in fossil preparation, identification, and curation.

OUTREACH

In 2023, the museum marked a significant milestone—it was the first year we welcomed more than 60,000 visitors! Apart from the tens of thousands of folks who come visit with friends or family, our guided tour program continues to rebound from the pandemic and our exhibits and collections are used for undergraduate and graduate classes across campus. From courses on introductory biology and geology to art history and museum studies, the museum is utilized by thousands of UW students every semester.

Museum Associate Director **Brooke Norsted** continued to support the outreach for a number of departmental grants. In the interest of helping folks better understand deep time, Brooke has been developing new ways for people to appreciate the age of Wisconsin fossils and rocks. With funding from one of **Brad Singer**'s NSF grants, help from a local builder, and a dash of creative influence from Wisconsin taverns, Brooke has created a Deep Time Shuffleboard where players learn about different chapters of Wisconsin's history based on where they land on the gameboard. This game can be taken out to events or used here at the museum along with a booklet that ties museum specimens to Wisconsin geological stories.

Ken Ferrier shows kids from the Bayview Community Center how the magnetic separator works to help him isolate quartz grains for research

Also in the theme of better teaching about deep time, Brooke is working on an NSF project with **Tyler Blum**, **Annie Bauer**, and **Emily Mixon**. This year we focused on deepening museum tour guides' ability to understand and explain radiometric dating and geologic time to visitors. Emily created a multi-part training and led lab tours for guides. Additionally, we've created a mini self-guided tour that highlights museum specimens that are older than T. rex.

As part of **Ken Ferrier**'s NSF CAREER grant, Brooke has been leading a biweekly "Geology Club" for kids aged 5-11 at Bayview Community Center, a local nonprofit organization that provides affordable housing and supportive services to 300 low-income residents, primarily immigrants and refugees. This year the club's activities included a hike to some springs at the UW Arboretum, experiments with flubber glaciers, and a chance to visit the Geology Museum and the department's rock crushing lab.

Our field crew hunkered down on the windy Wyoming slopes excavating Triassic fossils.

KATHERINE (KATE) GILES

For outstanding contributions to tectonics and sedimentation, and unwavering dedication to students (Marjorie Chan, citationist)

Kate is the Lloyd A. Nelson Professor in the Department of Earth, Environmental, and Resource Science, and Director of the Institute of Tectonic Studies at The University of Texas at El Paso. She received her B.S. (1981) from UW-Madison, M.S. from University of Iowa-Iowa City, and Ph.D. from University of Arizona-Tucson. She was Senior Carbonate Research Geologist at Exxon Production Company, followed by her academic position at New Mexico State University-Las Cruces (1998-2011).

Kate is belatedly recognized as the 2020 Distinguished Alumna awardee for outstanding contributions on tectonics and basin sedimentation, and salt-tectonic interactions, with applications to hydrocarbon traps, CO_2 sequestration, and emerging sources of hydrogen energy. Her excellence in research and scholarship is verified by keynote addresses at multiple conferences, her AAPG Distinguished Lectureship (2007-2008), the AAPG Shelton Search and Discovery Award (2011), and New Mexico State University Research Council Distinguished Career Award (2009). As a leader in her field, Kate is a GSA Fellow (2004) and has served as GSA Sedimentary Division chair (2016-2017).

It is important to recognize Kate's exceptional role as a mentor and educator, reflected in her 2024 AAPG Southwest section Distinguished Educator Award and 2022 AAPG Grover E. Murray Memorial Distinguished Educator Award. Her highly productive career is a positive reflection on her days at UW-Madison, sparked by the outstanding faculty and student camaraderie which she always emulates and encourages.

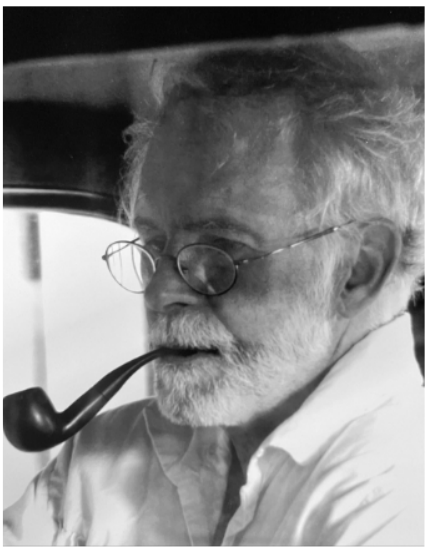
STEPHEN GUGGENHEIM

For distinguished research, teaching, and service in the field of clay mineralogy (Huifang Xu, citationist)

Stephen Guggenheim received his BS from Marietta College, MS from SUNY Stony Brook, and completed his PhD (1976) at UW-Madison with Prof. S. W. Bailey on "Cation Ordering in Subgroup Symmetry in the Micas." He joined the faculty at the University of Illinois at Chicago right after graduating and worked there for 40 years until retiring in 2016. His research focuses on the relationship of atomic structure and chemistry to layer silicate properties and capitalizes on diverse techniques including X-ray diffraction, high/low-temperature and elevated-pressure powder and single-crystal XRD, high-resolution transmission electron microscopy, high-pressure differential thermogravimetric analysis, and computer simulations of crystal structures. He described and reclassified several layer silicate species as "modulated" to emphasize that they did not conform to traditional structural groups, e.g., greenalite, a mineral discovered by **C. K. Leith** in the Biwabik Iron Formation, commonly referred to as a serpentine. This is useful for predicting topological limits and chemical variations of common layer silicates. He experimentally derived the metastable phase relations of nearly all the hydrous clay minerals. An interesting recent discovery is that methane hydrate may be present as a hydroxylate in the interlayer of clay minerals in seafloor sediments. Steve is a Foreign Fellow of the Accademia Nazionale dei Lincei, a Bailey Distinguished Member of the Clay Minerals Society (its highest honor), an AIPEA (International Association for the Study of Clays) Research Medalist, and a Hawley Medalist of the Mineralogical Association of Canada.

GARY A. KOCUREK

For exceptional contributions to eolian sedimentology from Earth to Mars (Marjorie Chan, citationist)



Gary Kocurek (UW PhD 1980), Professor Emeritus University of Texas-Austin, was a brilliant geologist renowned for his expertise in eolian systems. He is posthumously awarded the Distinguished Alumnus Award, as he sadly passed away in a tragic bicycle accident in 2024.

Gary received his B.S. and M.S. from the University of Houston. After his PhD, he accepted a position at UT-Austin. He served as department chair at a critical juncture when UT received the Jackson School endowment. When cross-bedded sandstones were recognized on Mars, the NASA team turned to Gary. He synthesized important concepts of eolian systems including fluid transport, bedform dynamics, dune evolution, and related stratigraphy to climate and sea level change. Gary wrote hundreds of seminal journal articles on eolian sedimentology and served on editorial boards of four major sedimentology journals.

Gary worked under tough field conditions requiring great physical endurance. Colleagues remember his supportive yet laid-back approach to mentoring, his blunt yet insightful opinions, his work ethic and conscientiousness, all interspersed with his signature dry humor and pipe smoking. Outside of geology, Gary's interests led him into native prairie restoration, leading to the Kocurek property in Central Texas receiving the 2023 TPWD Lone Star Land Steward Award for the Blackland Prairie ecoregion. Gary was an influential alumnus, leaving a legacy of impeccable geologic and eolian systems research.

GIFT GIVING GUIDE

The department's great need continues to be the ability to fill the gaps in funding between extramural research support ("grants") and University-supplied funds to support faculty, students, and staff in research, professional development, travel, and to remain on the cutting edge for research and teaching.

GIVING PRIORITIES

- **Terra Fund:** Our most flexible fund used for activities and items not covered by a specific fund
- **Robert and Nancy Dott Geoscience Fund:** Dedicated to funding student summer research activities
- **Sharon Meinholz Fund:** Helps defray the cost of student conference attendance
- **The various Graduate Support Funds:** Research assistantship and support for graduate students
- *** New * The Kay Fowler-Billings Fund:** to fund community efforts to increase and improve department climate

Visit geoscience.wisc.edu/geoscience/giving
for a complete list of funds and their UWF number or to make a secure gift with your credit card

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- **$16,830**: Graduate summer field & lab research
- **$50,000**: Seed capital for equipment purchases
- **$20,000**: Student conference travel & registration
- **$2,000**: Exemplary teaching assistant awards

Examples of impacts for giving levels

- **$10–$100:** Summer field camping fees/gas
- **$100–$1,000:** Student conference travel & field gear
- **$1,000–$50,000:** Graduate student research support
- **$50,000–$500,000:** New faculty start-up assistance
- **$500,000+:** Named student fellowship
- **$1 million+**: Transformative gifts such as named professorship ($5 million) and building or room renovations

If you prefer to send a check, please include the fund number and designation on the memo line and make it payable to the University of Wisconsin Foundation. Send it to:

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Milwaukee, WI 53278-0807

Alternatively, scan the QR code at right to make a donation.

For more information about giving, please contact Director of Development Mae Saul:

giving@geoscience.wisc.edu
608-216-6274

Graduate student Hanna Konavaluk and Assistant Professor Annie Bauer pause at the start of a hike near Bowman Lake on the west side of Glacier National Park, July 2024.

Degrees Conferred: Fall 2023 – Summer 2024

Geology & Geophysics Bachelor's Degrees Completed

Kathryn Abagil Akin
Shayla Marie Barrera-Skibinski
Alec John Baudry
Simon Paul Bushmaker
Kenz Carlton
Jillian Rose Finucane
Zachary Charles Giese
Grace Isabella Halstead
Martin Peter Heiser
RJ Maurice McCullum
William Runge
Connor Michael Seidel
Truely Sara Wallhaus
Finnley Fredrick Weigel
Emma Rose Zwirschitz

Geoscience Graduate Degrees Completed

MASTER'S DEGREES

Thais Altenberg
Sam Brockschmidt
Noah Brown
Deanna Flores
Taryn Isenburg
Ellen Nelson
Francisca Nunez Ferreira
Elizabeth Marie Runge
Kate Tobin

DOCTOR OF PHILOSOPHY

Catherine Christenson
Jacob Klug
Emily Mixon
Ethan Parrish
Miles Reed
Claudia Isabel Roig Gonzalez
Alexandra Villa

Department of Geoscience
UNIVERSITY OF WISCONSIN–MADISON

Department of Geoscience
University of Wisconsin–Madison
1215 W. Dayton St.
Madison, WI 53706-1692

DEPARTMENT OF GEOSCIENCE
September 2024

1 Michael Cardiff (Department Chair)
2 Michelle Szabo
3 Annie Bauer
4 Laurel Goodwin
5 Athena Ngheim
6 Eva Golos
7 Luke Zoet
8 Chloe Bonamici
9 Marianne Haseloff
10 Andrea Dutton
11 Kurt Feigl
12 John Valley
13 Dave Mickelson
14 Koki Kitajima
15 Noriko Kita
16 Zach Adam
17 Ken Ferrier
18 Alexander Kiner
19 Jaiden Zak
20 Aiden Lewandowski
21 Sophia Pinter
22 Grace Graham
23 Vy Le
24 Adam Ornelles
25 Eleanor McFarlan
26 Thais Altenberg
27 Neal Lord
28 Sam Kershner
29 Rachel Breunig
30 Rowan Gregoire
31 Emily Palmer
32 Ana Sotelo
33 Emily Mixon
34 Jianru Cheng
35 Tianyu Zhou
36 Hanna Konavaluk
37 Taryn Isenburg
38 Peter Sobol
39 Bryan Wathen
40 Bil Schneider
41 Gordon Medaris
42 John Fournelle
43 Rudy Molinek
44 Tyler Blum
45 Mingming Zhang
46 Khalil Droubi
47 Shanan Peters
48 Chris Zahasky
49 Selva Marroquin
50 Kayla McCabe
51 Clay Kelly
52 Pablo Moreno-Yaeger
53 Mike Tappa
54 Brian Jicha
55 Margriet Lantink
56 Will Nachlas
57 Logan Goulette
58 Daven Quinn
59 Ridwan Akorede Ajibade
60 Amy Fromandi
61 Kenz Carlton
62 Richard Slaughter
63 Mike Spicuzza
64 Andy Jones
65 Chelsea Volpano
66 Kayla Hubbard
67 Brooke Norsted
68 Noah Brown
69 Lisa Theo
70 Juyong Bak
71 Matt Aleksey
72 Kyrsten Johnston
73 Carrie Eaton
74 David Lovelace
75 Geoscience student
76 Geoscience student