University of Nevada, Reno

1st Annual Nevada Geosciences Research Symposium

April 11, 2025

Davidson Math and Science Center (DMSC)
1st Floor Lobby and DMSC 102 and 103

8:00 AM to 5:15 PM

NEVADA GEOSCIENCES
University of Nevada, Reno

Please see our website for more information:
https://events.unr.edu/event/nevada-geosciences-symposium-2025

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Nevada Bureau of Mines and Geology

Ralph J. Roberts Center for Research in Economic Geology

GEOLOGICAL SOCIETY OF NEVADA

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Welcome to the 1st annual Nevada Geosciences Research Symposium!

We are excited to kick off the inaugural Nevada Geosciences Research Symposium at the University of Nevada, Reno. This day-long event involves students, faculty, staff, and researchers in the integrated Nevada Geosciences group, which includes members of the Department of Geological Sciences and Engineering, the Nevada Bureau of Mines and Geology and the Nevada Seismological Laboratory.

Our research symposium provides an opportunity for undergraduate students, graduate students, researchers, and post docs to present their research to our broader Nevada Geosciences community, as well as members of other University departments, industry, the public and other government agencies. We hope this will inspire great discussion and potential collaborations as we all share the research we have been working on.

We received 36 submissions for this year's symposium. We will have a mix of both oral and poster presentations. The oral talks will be broadcast over Zoom so that others can listen in. The presentations this year cover a wide variety of topics, ranging from studies of Jupiter's moon Ganymede to earthquake early warning to gold mineralization in the Carlin Trend. There will be prizes for the top presentations, which will be voted on by YOU! There is a link and QR code setup for democratic voting. Make sure to cast your vote as we honor our wonderful presenters.

We appreciate all of the help and support in organizing this event and getting it off the ground. In particular Jill Lorentz for helping to organize the whole event and Micaela Imsdahl for web help. Finally, thank you to our generous sponsors GSN, CREG, and Terēan.

Andrew Zuza, Wendy Calvin, Rachel Micander, Terry Lee, Nicole Wagoner, Christie Rowe, and Simon Jowitt

Organizing and Planning Committee

Vote for the top presenters at the Nevada Geosciences Research Symposium!

Cast your vote for the top presentations at the 2025 Nevada Geosciences Research Symposium! Awardees will receive a certificate and cash prizes!

We have seven categories to honor our presenters:

- **Best presentation overall**
- **Geological Society of Nevada award – A project that addresses fundamental geologic problems in Nevada and the Great Basin**
- **People's Choice Award – Most engaging talk or poster presentation**
- **Best undergraduate research presentation**
- **Bridging science and society – Most societally relevant science.**
- **Fueling tomorrow with today's research – Best natural resource/energy related presentation**
- **Eye-catching science – Best graphics or figures**

Voting links

https://unr.az1.qualtrics.com/jfe/form/SV_3vNCTZ4oAHPsQE6

Nevada Geosciences Research Symposium – Friday April 11, 2025

Schedule

8:00-8:45	**Coffee, snacks, and introductory remarks**
	DMSC 1st floor lobby and DMSC 102
8:45-10:00	**Oral Session 1: Energy and resource geology**
	DMSC 102
	Moderators: Nicole Wagoner, Marcus Angus, and Nada Jacinto
10:00-12:00	**Poster Session 1 with Coffee**
	DMSC 1st floor lobby
12:00-1:00	**Lunch Break**
	DMSC 1st floor lobby and DMSC 103
1:00-2:30	**Oral Session 2: Geodesy, seismology, and ice**
	DMSC 103
	Moderators: Annie Patton, Maia Zhang, and Rob Fuller
2:30-2:45	*Break*
2:45-4:15	**Oral Session 3: Orogeny and geomorphology**
	DMSC 103
	Moderators: Terry Lee, Ryan Parkyn, and Abby Chobany
4:15-5:00	**Poster Session 2**
	DMSC 1st floor lobby
5:00-5:15	**Awards and Final Remarks**
	DMSC 103

Please join us a Lead Dog Brewing after for continued discussion and to celebrate our great presentations!

Oral presentations

Zoom webinar link: https://unr.zoom.us/j/89130966370?pwd=rvZ35TS9XbGDha7GfW8agwc94Fxdoi.1

Oral Session 1: Energy and resource geology

8:45-10:00 in DMSC 102

12-minute talks with 3 minutes for questions

T1 Nicole Wagoner **Exploring Geothermal Potential of Great Basin Sub-Regions**

T2 Amber Prevallet **Multi-Scale Structural and Geochemical Analysis of Gold Mineralization at the REN Deposit, Carlin Trend, Nevada**

T3 Travis Fisher **The Taylor District in White Pine County, Nevada: History and Geology**

T4 Brock Moody **The Global Lithium Landscape: Uncovering Resources for the Clean Energy Age**

T5 Marcus Angus **Constraining Mineralization and Alteration Through New Geologic Mapping at the Spring Peak Sinter-Vein System, Mineral County, NV**

Oral Session 2: Geodesy, seismology, and ice

1:00-2:30 in DMSC 103

12-minute talks with 3 minutes for questions

T6 Annie Patton **Systematic Measurements of Rupture Directivity for California Earthquakes**

T7 Nina Miller **Modulation of Lower Crustal Dike Openings by Seasonal Crustal Strain in the Western United States**

T8 Danielle Kinkel **Toward Earthquake Early Warning in Nevada**

T9 Maia Zhang **Insights into the 2020 Monte Cristo Range Earthquake Sequence from a Near-Source Aftershock Deployment**

T10 Aren Crandall-Bear **Effects on Siesmic Hazard from Seasonal to Multi-Annual Hydrological Mass Loading Changes of the Southern Sierra Nevada and Walker Lane Faults from GPS and InSAR Time Series Models**

T11 Kayleigh Dohm **Firn Velocity Structure with Distributed Acoustic Sensing on Thwaites Eastern Ice Shelf, Antarctica**

Oral Session 3: Orogeny and geomorphology

2:45-4:15 in DMSC 103

12-minute talks with 3 minutes for questions

T12 Jessie Shields **Experimental melting of eclogite hosted polycrystalline melt inclusions**

T13 Dominik Vlaha **Tectonic overpressure preserved in mid-crustal rocks of the Tethyan Himalaya**

T14 Henry Zhou **Numerical modeling of the topography and crustal thickness evolution in the transition stage between subduction and collision: a case study of the Gangdese magmatic orogeny, southern Tibet**

T15 Terry Lee **Continental Lithosphere Thermal Model: Case Studies from the Western U.S. and Central Asia**

T16 Priyasha Negi **Topographic Controls on Atmospheric CO2 Release from Shale Weathering**

T17 Cody Russo **Constraining empirical relationships for the prediction of mean debris flow velocity**

Poster Presentations

Please note the posters can be hung up all day. The main poster presentation times will be 10:00 am-12:00 pm, with an encore session 4:15-5:00 pm.

Energy and resource geology

P1 Alyssa Lindsey **Understanding Overlapping Mineralization of the Ruby Hill Deposit, Eureka, NV**

P2 Homay Fath **Exploring opportunities for increasing tellurium supply: How to not just to get by, but to get ahead**

P3 Cutter Morebeck **Mapping Likely Source Rock of Rhylite Ridge Lithium Project**

P4 Griffin Burke-Ruhl **A Mine is a Terrible Thing to Waste: Geospatial Inventory of Mine Waste Features in Western Nevada**

Geomorphology and geodesy

P5 Michael Robinson **Predicting the direction and rate of drainage divide migration from hillslope morphology**

P6 Adan Albarran Ayala **Cover in bedrock step-pool channels counter-intuitively increases with increasing water discharge**

P7 Rob Fuller **Isolating a Vertical and Eastward Anamoly in the United States Between 2001 & 2005**

P8 Hannah Martin **Geomorphic characterization of fault creep in the San Francisco Bay Area, California**

P9 Ruben Underwood-Aguilar **Possible Evidence of Paleoseismicity on the Whipple Detachment, California**

P10 Simone Masoch **Geological evidence of earthquakes along a Miocene detachment**

Volcanoes

P11 Jakob Scheel **Modeling Fluid-Solid Interaction During Mafic Magmatic Enclave Disintegration**

P12 Andrea Buian **Thermal evolution of the McDermitt Caldera plumbing system from quartz geothermobarometer and cathodoluminescence imaging**

P13 Philipp Ruprecht **Triple-Geohazard in the Southern Andes - How a volcanic system links active tectonics with eruption dynamics and surface evolution**

P14 Desiree Guzman **Investigating Magma Sources of Caldera-Forming Eruptions Using Trace Element Analysis**

Mountain building and orogeny

P15 David Alizadeh **Thermal architecture of the Tethyan Himalaya thrust belt, northwestern India**

P16 Samuel Rocha **Cretaceous and Miocene history of plutonism, diking, and deformation in the Chemehuevi metamorphic core complex**

P17 Abby Chobany **Evolution from Subduction into Convergence: A Metamorphic Analysis of the Gangdese Orogen**

P18 Ryan Parkyn **New insights into the back-arc basin evolution of the North American Cordillera**

Ice on Earth and other planets

P19 Wendy Calvin **Spectra of Condensed Oxygen (O2) with application to Jupiter's moon Ganymede**

Abstracts of oral presentations

Energy and resource geology

T1 Exploring Geothermal Potential of Great Basin Sub-Regions

Nicole Wagoner

The INnovative Geothermal Exploration through Novel Investigations Of Undiscovered Systems (INGENIOUS) project aims to discover new, economically viable hidden geothermal systems in the Great Basin region. By applying principal component analysis and k-means clustering to a database of known geothermal systems, distinct geologic domains have been identified that may influence geothermal potential. Understanding these clusters can enhance exploration strategies, improve characterization of hidden systems, and refine our understanding of regional heat and fluid flow variations.

Supported by the U.S. Department of Energy.

T2 Multi-Scale Structural and Geochemical Analysis of Gold Mineralization at the REN Deposit, Carlin Trend, Nevada

Amber Prevallet

The REN deposit investigation focuses on the structural history and controls on gold mineralization, emphasizing faults, breccias, and intrusive bodies. By integrating underground mapping, drill core logging, and 4D modeling, the study aims to determine which structures facilitated hydrothermal fluid flow and gold emplacement. This work provides new insights into the deposit's geologic evolution, refining exploration models for Carlin-type systems.

T3 The Taylor District in White Pine County, Nevada: History and Geology

Travis Fisher

The Taylor district features polymetallic massive sulfide, sediment-hosted silver, sediment-hosted gold, and banded quartz-calcite-sulfide veins hosted in Devonian to Mississippian carbonates and siliciclastics. The sediment-hosted mineralization and polymetallic massive sulfide bodies have spatial relationships suggestive of vertical and lateral geochemical and hydrothermal zonation, similar to porphyry copper deposits.

T4 The Global Lithium Landscape: Uncovering Resources for the Clean Energy Age

Brock Moody

Based on a compilation of the world's resources and reserves of lithium, analysis was conducted to understand the economic grades of the three primary deposit types (LCT Pegmatites, Brines, Claystone/Sedimentary deposits). Resources were then outlined by host countries while addressing uncertainties as they correlate with fears of resource scarcity with future demand.

Supported by Mike Brady and Geological Society of Nevada.

T5 Constraining Mineralization and Alteration Through New Geologic Mapping at the Spring Peak Sinter-Vein System, Mineral County, NV

Marcus Angus

Spring Peak is a newly discovered sinter-vein system in Mineral County, NV with a well-preserved epithermal footprint at surface and is hosted within a region constructed of Mesozoic metavolcanics and metasediments, Cretaceous granitic rocks related to satellite plutons of the Sierra Nevada batholith, Miocene subduction-related volcanics and associated volcaniclastics, and Late Pliocene-Pleistocene volcanic centers. New geologic mapping at Spring Peak aims to describe lithology, trends in alteration, and identify favorable structural controls in order to delineate additional upwelling zones with potential to host previously unrecognized gold mineralization. Detailed mapping of the Spring Peak sinter and preserved lithofacies is used to elucidate the locations of high-temperature vent conduits and low temperature, distal-apron fluid pathways, and validates the spatial and temporal relationships of sinter deposition with gold mineralization at depth.

Supported by U.S. Geological Survey, Headwater Gold, Inc., Geological Society of Nevada, and Society of Economic Geologists.

A geologist at play. Photo of Marcus Angus.

<u>Geodesy, seismology, and ice</u>

T6 Systematic Measurements of Rupture Directivity for California Earthquakes

Annie Patton

The tendency of some earthquakes to have a preferred rupture direction has important implications for earthquake hazard analysis, particularly in densely populated California. Here we present analysis of the direction and extent of rupture directivity for M3+ earthquakes throughout California to gain insight into the tendency of certain faults to have a preferred rupture direction.

T7 Modulation of Lower Crustal Dike Openings by Seasonal Crustal Strain in the Western United States

Nina Miller

This study explores the timing of three magmatic deep seismic swarms in the western US, which took place in California and Oregon in the early 2000s. Using high-precision GPS data, we model spatial and temporal variations in seasonal dilatational strain and find that hydrological loading drives vertical and horizontal geodetic displacements in the region. Peak seismicity for

all three deep seismic swarms occurred when the strain was dominated by dilatation oriented normal to the dike, with associated Coulomb stresses of less than 1 kPa.

T8 Toward Earthquake Early Warning in Nevada

Danielle Kinkel

Nevada is one of the most seismically active states in the U.S. with a large population living in high hazard areas, but it is not currently a part of ShakeAlert, the earthquake early warning system active for the west coast of the U.S. Integrating Nevada into ShakeAlert could provide warning times and potentially lifesaving benefits to its residents. Installing new stations and expanding the network would further increase warning times, as we show through event scenarios and grid density modeling, and we identify the best locations to do so by using upgrade scores.

Supported by U.S. Geological Survey and Nevada Division of Emergency Management.

T9 **Insights into the 2020 Monte Cristo Range Earthquake Sequence from a Near-Source Aftershock Deployment**

Maia Zhang

High quality near-source data can provide crucial information about earthquake processes, with salient applications to earthquake hazard assessment. Using unique, near-source coverage of the 2020 Monte Cristo Range Earthquake sequence, we present a machine learning workflow to generate a novel, high resolution earthquake catalog. This unconventional dataset newly illuminates key characteristics of a highly active aftershock sequence and provides the foundation for future near-source analyses.

Supported by the National Nuclear Security Administration.

T10 **Effects on Siesmic Hazard from Seasonal to Multi-Annual Hydrological Mass Loading Changes of the Southern Sierra Nevada and Walker Lane Faults from GPS and InSAR Time Series Models**

Aren Crandall-Bear

Mass loading of the Earth's surface affects the stress state on faults, bringing them closer or further from failure by affecting normal and shear stress across faults and influence seismicity. Whether loading brings a given fault closer or further from failure depends on the location of surface loads compared to the location, strike and dip of the fault. We model the seasonal hydrologic load of the Sierra Nevada using time series from GPS and InSAR which are corrected for non- seasonal effects from tectonics and seismicity and model the effect of seasonal hydrologic loading on nearby faults.

Supported by NASA.

T11 **Firn Velocity Structure with Distributed Acoustic Sensing on Thwaites Eastern Ice Shelf, Antarctica**

Kayleigh Dohm

Thwaites Eastern Ice Shelf, the floating extension of Thwaites Glacier, is critically impacted by changes in oceanic and atmospheric conditions leading to its potential for collapse and subsequent rising sea levels. Presented here are the initial results of a horizontal Distributed Acoustic Sensing array along a portion of the ice shelf utilizing both active and passive seismic sources. Findings include 2D P- and S-wave velocity models which can provide insights into firn and glacier dynamics on Thwaites.

Supported by National Science Foundation, Silixa Ltd, and Terean.

Orogeny and geomorphology

T12 Experimental melting of eclogite hosted polycrystalline melt inclusions

Jessie Shields

Melt inclusions trapped in peritectic minerals can record the earliest stages of melt generation and segregation during anatexis and provide insight into differentiation processes producing and modifying continental crust. Here we present a suite of polycrystalline melt inclusions, aka 'nanogranites', hosted in peritectic zircon from ultra-high pressure (UHP) eclogites in the D'Entrecasteaux Islands, southeastern Papua New Guinea (PNG) in order to understand partial melting deep within subduction zones.

T13 Tectonic overpressure preserved in mid-crustal rocks of the Tethyan Himalaya

Dominik Vlaha

Here, we investigate the Paleogene Tethyan Himalaya fold-thrust belt in Himachal Pradesh, northwestern India, which is the structurally highest part of the Himalayan orogen and deforms a ~10-15 km thick Neoproterozoic-Cretaceous passive margin stratigraphic section. Field-based kinematic studies demonstrate relatively moderate shortening strain across the Tethyan Himalaya. However, basal Tethyan strata consistently yield elevated pressure-temperature-time (P-T-t) estimates of 7-8 kbar and ~650°C, indicative of deep burial during Himalayan orogeny (ca. 20-45 Ma, 25-30 km depths). These P-T-t conditions can be reconciled by: (1) deep Cenozoic burial along cryptic structures and/or significant flattening of the Tethyan strata; (2) basal Tethyan strata recording metamorphism and deformation related to pre-Himalayan tectonism; or (3) non-lithostatic pressure conditions (i.e., tectonic overpressure).

Supported by National Science Foundation and Geological Society of America.

View of the Tethyan Himalaya, NW India. Photo from Dominik Vlaha.

T14 Numerical modeling of the topography and crustal thickness evolution in the transition stage between subduction and collision: a case study of the Gangdese magmatic orogeny, southern Tibet

Henry Zhou

The Tibetan Plateau is one of the world's most magnificent orogenic belts. Yet, the surface elevation and uplift mechanisms of the proto-Plateau during its transition from subduction to collision (60-45 Ma) remain unclear. The Gangdese Batholith, located on the southernmost Eurasian plate margin, shows a ~2-3 km apparent elevational discrepancy between crustal-thickness-inverted, isostatic elevation and stable isotope-based paleo-altimetry during 57-48 Ma.

Here, we use a 2D numerical model to investigate the processes of initial collision of the Indian plate and slab breakoff and how they could affect the Gangdese's topography and crustal thickness in the transition stage.

We find that the subduction of the leading margin of the Indian continental crust beneath the

Gangdese can isostatically support additional ~2-3km elevation, causing rapid topographic uplift of ~3 km within 5 Myr in the transition stage. Slab breakoff has a transient uplifting effect on topography but is minor compared to isostatic support from subducted Indian crust.

Our results show that both geochemical proxies and paleo-altimetry could be correct given the geochemical proxies only capture the overriding crust thickness but not the subducted Indian crust.

Our results suggest that crustal thickness to elevation conversion should be performed with carefulness. Lithospheric scale isostasy and a double-layered crust (Asian and India) should be considered during the transition stage.

T15 Continental Lithosphere Thermal Model: Case Studies from the Western U.S. and Central Asia

Terry Lee

The thermal architecture of the lithosphere governs rock rheology, dynamics, seismicity, and surface processes. We developed an open-source thermal model that integrates lithospheric temperature proxies to robustly reconstruct the continental lithosphere thermal structure, demonstrated through case studies in the western U.S. and Central Asia. Our user-friendly model facilitates the streamlined incorporation of robust lithospheric temperature estimates into wider applications in geodynamic modeling, earthquake hazard assessment, and thermochronological exhumation path interpretation.

Supported by Statewide California Earthquake Center.

T16 Topographic Controls on Atmospheric CO2 Release from Shale Weathering

Priyasha Negi

Shale weathering influences Earth's climate over million-year timescales by releasing CO2 into the atmosphere through petrogenic organic carbon (OCpetro) oxidation. Constraining this flux is challenging due to various physical, chemical, and biological factors affecting weathering processes. This study examines how weathering zone thickness - varying between ridges and valleys, controls CO2 release, highlighting the role of local topography in shale weathering.

T17 Constraining empirical relationships for the prediction of mean debris flow velocity

Cody Russo

Velocity is a key component used to quantify the destructive potential of debris flows for pre- and post-hazard assessment and mitigation strategies in steep, mountainous terrain. The assortment of established empirical relationships in use show conflict between what truly sets the velocity of a debris flow, with variation up to a factor of 10 in predicted values between relationships. To reduce this uncertainty, a general Newtonian turbulent flow model was fit to a set of 242 natural debris flows to analyze the trends of debris flow velocity, identify environmental factors contributing to the natural variation in debris flow velocity, and to better constrain the list, to only the most accurate, of empirical relationships.

Debris flow traveling over a check dam. Illgraben, CH.

Abstracts of poster presentations

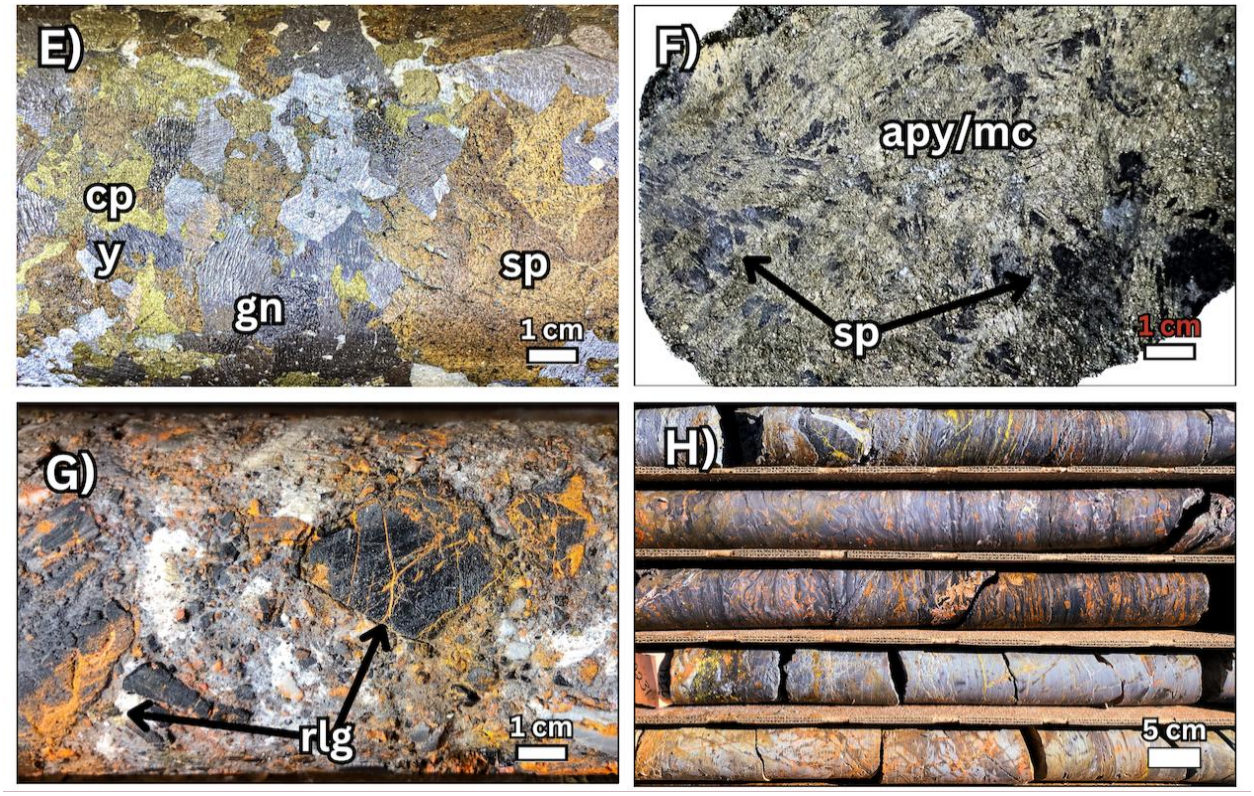
Energy and resource

P1 Understanding Overlapping Mineralization of the Ruby Hill Deposit, Eureka, NV

Alyssa Lindsey

This research focuses on the northern end of the Eureka Mining district which hosts zinc skarn, polymetallic carbonate replacement deposit (CRD), distal-disseminated Au-Ag, and Carlin-type Au mineralization. Research aims to understand the temporal, spatial, and genetic links between mineralization styles through geochemical, petrographic, and geochronologic analysis.

Supported by CREG and I-80 Gold Corp.



Core samples of various mineralization styles. Photo from Alyssa Lindsey.

P2 Exploring opportunities for increasing tellurium supply: How to not just to get by, but to get ahead

Homay Fath

Renewables are set to contribute 80% of new power capacity to 2030, with solar photovoltaic (PV) cells alone accounting for more than half. Tellurium (Te) is a key raw material for the

manufacture of CdTe PV modulesSupplies of Te are insecure considering the byproduct nature of Te and current sourcing with ongoing geopolitical risks.

P3 Mapping Likely Source Rock of Rhylite Ridge Lithium Project

Cutter Morebeck

Lithium in the sediment hosted Rhyolite Ridge deposit was likely leached out of the 6 Ma Rhyolite Ridge Formation and the 5.8 Ma Argentite Canyon Formation. Despite the economic importance of these units, they have largely been lumped into formations and their spatial extent is not well understood. We propose mapping these units in detail in southern Clayton Valley to better understand the depositional history of these units, and to increase the mapped extent of these formations.

Rhyolite Ridge Fm rhyolite flows and rhyolite tuffs in northern map area. Photo from Cutter Morebeck.

P4 A Mine is a Terrible Thing to Waste: Geospatial Inventory of Mine Waste Features in Western Nevada

Griffin Burke-Ruhl

In 2023, as part of the U.S. Geological Survey's (USGS) Earth Mapping Resources Initiative (Earth MRI), the Nevada Bureau of Mines and Geology (NBMG), in collaboration with Nevada Division of Environmental Protection (NEDP) and the Nevada Division of Minerals (NDOM), began a detailed inventory of mine waste sites. Using publicly available data, the Nevada team compiled information on 74 features across 15 sites in the western part of the state, adding them to the

USGS Mine Waste Geodatabase. The work will continue in subsequent years with further research, adding sampling and geochemical analyses for sites in eastern Nevada.

Supported by U.S. Geological Survey (Grant No. G23AC00422).

Geomorphology and geodesy

P5 Predicting the direction and rate of drainage divide migration from hillslope morphology

Michael Robinson

Drainage basins and the river networks they encompass function like the Earth's road network, guiding water and mass along defined paths. Shifting drainage divides can alter these pathways, impacting the availability of water and sediment, and even spurring aquatic speciation. We propose a novel framework for identifying unstable divides and directly measuring divide migration rate from hillslope morphology.

Supported by National Science Foundation.

P6 Cover in bedrock step-pool channels counter-intuitively increases with increasing water discharge

Adan Albarran Ayala

In fluvial systems, sediment can both enhance and restrict bedrock erosion via the commonly accepted theory of tools and cover. For constant sediment supply, the amount of sediment cover is commonly assumed to scale inversely with water discharge; however, this idea has not been tested in steep mountain channels with bedrock steps and pools. Here, we propose that complex flow hydraulics over bedrock steps and pools can lead to local decreases in shear stress with increasing water discharge, allowing (counter-intuitively) sediment cover to grow with increasing water discharge. We test our hypothesis by performing analog experiments in a one-dimensional flume, where synthetic bedrock made of polyurethane foam begins as a planar surface and is eroded with a constant sediment flux and discharge to form autogenic bedforms known as cyclic steps. Once the bedforms are established, we stepwise increase the water discharge while holding sediment flux constant and record any changes in cover. Preliminary results show that increasing water discharge causes an increase in the deposition of cover in the pools between bedrock steps. Similarly, decreasing water discharges promotes scouring of sediment from pools, consistent with our hypothesis. This preliminary work suggests that bedrock erosion in steep mountain channels with bedrock steps may be more efficient during small to moderate floods relative to large floods.

P7 Isolating a Vertical and Eastward Anomaly in the United States Between 2001 & 2005

Rob Fuller

There is an anomaly present in the residual time-series in GPS signals across the United States between 2001 and 2005. Using various geodetic and statistical methods we aim to isolate and confirm this anomaly in the United States.

P8 Geomorphic characterization of fault creep in the San Francisco Bay Area, California

Hannah Martin

Identification and characterization of creeping faults is a critical component of earthquake hazard assessment as creep can influence fault loading and stress transfer. We aim to create a geomorphic framework for delineating the subtle surface expression of slow or transiently creeping fault strands within the Calaveras Fault Zone that can be used as a template for future creep characterization.

P9 Possible Evidence of Paleoseismicity on the Whipple Detachment, California

Ruben Underwood-Aguilar

The Whipple Mountains in southeastern California - a region of significant geologic interest in the tectonics community- is known for an exceptionally well-preserved metamorphic core complex/low angle normal fault (detachment) system, which has inspired extensive debates regarding the mechanics of fault slip, and whether the detachment initiated at high or low angles. The brittle fault rock assemblage includes layered cataclasites, gouge injections, and, possibly, pseudotachylytes. These fault rocks indicate the fault may have generated earthquakes in the past. The pristine nature (e.g. sharp contacts and scale) of the gouge provides an exceptional opportunity to uncover slip history and assess whether the Whipple detachment was aseismic, as previously postured, or accommodated paleoseismicity.

P10 Geological evidence of earthquakes along a Miocene detachment

Simone Masoch

The seismic potential of low angle extensional faults remains a long-standing conundrum in tectonics and seismology. Here we report the discovery of pulverized fault zone rocks, markers of propagation of seismic ruptures related to Mw>6 earthquakes, on the Miocene Waterman Hills Detachment. Rock pulverization affects the stiffest lithologies of the crystalline footwall. Crosscutting relations indicate the pulverized fault zone rocks formed after the footwall passed through the frictional-viscous transition but prior to complete exhumation.

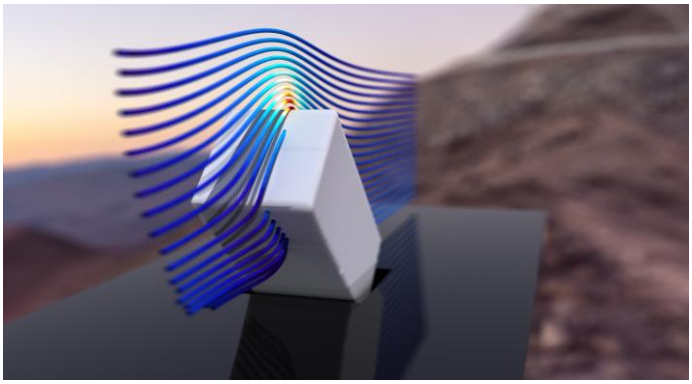
Volcanoes

P11 Modeling Fluid-Solid Interaction During Mafic Magmatic Enclave Disintegration

Jakob Scheel

Mafic magmatic enclaves, common to many silicic magmatic systems, are often interpreted as evidence for mixing of shallowly stored magma with basaltic magma from depth. To help constrain the survival times of mafic enclaves during this mixing process, this study aims to assess the relative importance of mechanical disintegration compared to diffusive equilibration.

Supported by National Science Foundation and High Performance Computing Core Facility at the University of California, Davis.



Solid cubical particle getting plucked in a highly viscous flow. Figure from Jakob Scheel.

P12 Thermal evolution of the McDermitt Caldera plumbing system from quartz geothermobarometer and cathodoluminescence imaging

Andrea Buian

We present data from five major volcanic units erupted within the McDermitt Caldera, spanning the compositional and temporal system evolution. Quartz from the metaluminous to peralkaline rhyolites and the McDermitt Tuff record a large thermal range of ~820-950ºC. These initial findings reveal a complex magmatic evolution of the Caldera, with significant temperature changes over approximately 340 ka.

P13 Triple-Geohazard in the Southern Andes - How a volcanic system links active tectonics with eruption dynamics and surface evolution

Philipp Ruprecht

The Cordon Caulle volcanic system, Chile, is the poster child for linked hazards where megathrust earthquakes may cause volcanic eruptions or landslides and where landslides can also trigger volcanic activity. Here, I will provide a snapshot of the multidisciplinary work we are

doing to understand especially the subvolcanic and surface processes associated with the 2011-12 eruption.

Regional view of the 2011-12 Cordon Caulle eruption, Chile with its lava flow and strongly deformed and uplifted vent area. Photo from Philipp Ruprecht.

P14 Investigating Magma Sources of Caldera-Forming Eruptions Using Trace Element Analysis

Desiree Guzman

During the Oligocene to Miocene, there was an increase of silicic volcanism that led to large, explosive caldera-forming eruptions (CFEs), leaving extensive ignimbrite deposits across the Great Basin. This period is recognized as the "ignimbrite flare-up" and is classically explained by flat-slab subduction and subsequent slab roll-back of the Farallon plate. Alternative theories suggest other mechanisms of magmatism, such as slab-failure magmatism. With the use of trace element analysis on clinopyroxene, constraints can be made on the origin of magmas that feed large silicic eruptions.

Mountain building and orogeny

P15 Thermal architecture of the Tethyan Himalaya thrust belt, northwestern India

David Alizadeh

Here, I present newly acquired Raman Spectroscopy of carbonaceous material (RSCM) thermometry data in the Tethyan Himalaya along the Sutlej River Valley, northwestern India. This data allows us to better understand the thermal architecture of Tethyan Himalayan sequence during Himalayan orogeny.

Supported by the National Science Foundation.

P16 Cretaceous and Miocene history of plutonism, diking, and deformation in the Chemehuevi metamorphic core complex

Samuel Rocha

The Chemehuevi Mountains are a metamorphic core complex in the Colorado River Extensional Corridor. They exhibit NE-trending lineations as a result of Cretaceous and Miocene plutonism. We created a field map and collected samples for thin sectioning and U-Pb dating to assess the ages and trends of deformation and to look for age relations in the diking.

Supported by the Nevada Undergraduate Research Association (NURA).

P17 Evolution from Subduction into Convergence: A Metamorphic Analysis of the Gangdese Orogen

Abby Chobany

This project's goal is to determine the origin, location, and timing of metamorphism of the metasedimentary rocks within the Gangdese orogen in Tibet. Doing so will lead to the understanding if sediment incorporation occurred during the transition from subduction to continent-continent collision and how/when deformation was partitioned in different structural layers of the crust due to the metasedimentary rocks being rheologically weaker than arc rocks. The pressure-temperature-time history of different metasedimentary packages at different structural levels within the orogen will be determined through zircon U-Th-Pb geochronology and the Thermocalc software paired with QuiG barometry and Zr-in-rutile thermometry.

P18 New insights into the back-arc basin evolution of the North American Cordillera

Ryan Parkyn

The Cordilleran Triassic back-arc basin experienced basin closure via the Luning-fencemaker fold-and-thrust belt. Understanding back-arc basins challenge geoscientists because back-arcs are prone to temperature-dependent mechanical weakening, thus resulting in juxtaposed temperature domains. Here we document preliminary data from Raman spectroscopy of carbonaceous material in order to investigate the origin of peak temperature variations from thrusted burial or back-arc heat flow.

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Ice on Earth and other planets

P19 Spectra of Condensed Oxygen (O2) with application to Jupiter's moon Ganymede

Wendy Calvin

Two absorption features in the visible reflectance spectrum of Ganymede are associated with dense phase molecular oxygen (O2). Molecular oxygen is the radiolytic product of energetic particle bombardment and breakdown of water ice, but there is still uncertainty around how it is maintained at the warmer surface temperatures on this moon. I will present transmission measurements of large pathlengths in liquid and solid oxygen and compare these to the features seen on Ganymede.