Natural Resources, Climate, and Clean Energy

Climate Science Research
Paleohydrology & Extreme Events

Bethany L. Coulthard
Assistant Professor
Department of Geoscience
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Using tree rings to study the influence of climate change on global water cycles relevant to human populations and ecosystems, with an emphasis on freshwater runoff, snowpacks, and forest hydrology.

• Examination of past and future snow droughts across the western North American cordilleras.

• Reconstructing extreme (flood/drought) events in the Fraser Basin, BC, Canada.
Sedimentary Geology

Dr. Ganqing Jiang
Professor
Department of Geoscience
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Email: Ganqing.Jiang@unlv.edu

Expertise:
• Sequence and chemostratigraphy
• sedimentology
• Carbonate diagenesis
• Sequence and chemostratigraphy
• Paleogeographic reconstruction
• Applications of stable isotopes and rare earth elements
• Paleoenvironmental change across major perturbations of the carbon cycle and mass extinctions
• Basin analyses and paleoceanography
• Fluid migration and carbonate diagenesis
• Tracing fluid migration in sedimentary basins using stable isotopes and trace elements
• Carbonate aquifer
Climate Science and Paleoclimatology

Matthew S. Lachniet
Professor
Department of Geoscience
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Matthew.Lachniet@unlv.edu
Paleoclimatology

- Study of the causes, timing, and consequences of climate change on timescales ranging from decades to millennia
- Cause of aridity in the Great Basin and Western United States
- Influence of ocean temperatures on precipitation in Nevada
- Cave archives of past climate with sites in Nevada, Mexico, Central America, and elsewhere
Dr. Matthew Petrie
Assistant Professor
School of Life Sciences
ph: 702-895-5844
e: matthew.petrie@unlv.edu

Expertise:
• Vegetation ecology and near-surface hydrology
• Forest regeneration
• Climate dynamics and climate change forecasting
• Extreme events
• Landscape ecology
• Manipulative field experimentation
Linking extreme climate events and ecological dynamics across space and time

Above: Disentangling locally- and regionally-observed ecological responses to multiyear high and low rainfall periods. Multiyear periods are a key component of understanding climate impacts to arid and semiarid regions. Our research focuses on the physical mechanisms that shape ecological responses, providing a foundation for understanding the effects of local and regional extreme events in a changing climate.
Forecasting climate change impacts

Above: Natural forest regeneration may decline substantially throughout the western US in the 21st century. We study how climate, landscape properties, and the stress tolerance of tree populations will shape the future of western forests.

Left: Forecasts for increasing belowground extreme temperature events in a changing climate. We use downscaled climate model projections to forecast the increasing occurrence of moderate (0-σ) and very high (2-σ) extreme temperature events throughout multiple depths in the soil profile for ecosystems of the central and western US.
Climate Change; Renewable Energy; Astronomy

Dr. George Rhee
Department of Physics and Astronomy
Phone: (702) 895-4453
email: grhee@physics.unlv.edu

Expertise
• Observational Astronomy/Cosmology
• Renewable Energy
• Colorado River Flow Projections
River flow projections using statistics from tree ring data from the upper Colorado River Basin. Gaussian processes with known covariance can be used to predict properties of river flows. Figure shows predictions for Colorado river flow 2015-2050.
Renewable Energy

Created an online calculator allowing the user to choose supply and demand options to make plans to zero out emissions in Nevada by 2050.

http://nv2050.physics.unlv.edu/.

Interview on KPNR and writeup describing the idea:


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<td>Home insulation</td>
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Astrophysics

Interested in:

Dark matter distribution in galaxies inferred from the rotation of neutral hydrogen gas in disks

Properties of galaxies in extreme low density environments (voids)

Measuring the masses of black holes using the variability of the central region in Seyfert galaxies and quasars. Spectral and brightness measurements