

Natural Resources, Climate, and Clean Energy

Climate Science Research

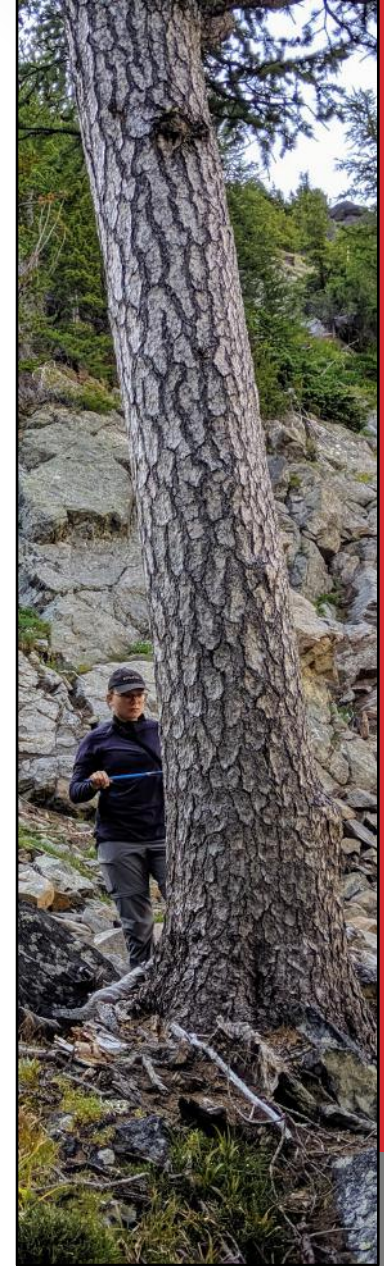
Paleohydrology & Extreme Events

Bethany L. Coulthard

Assistant Professor

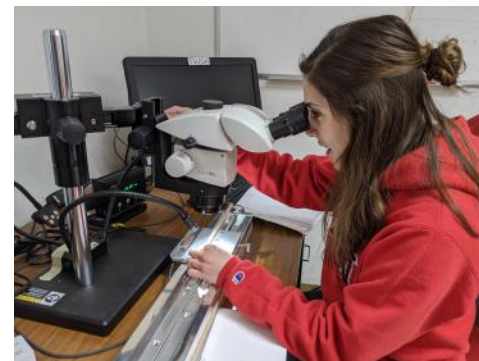
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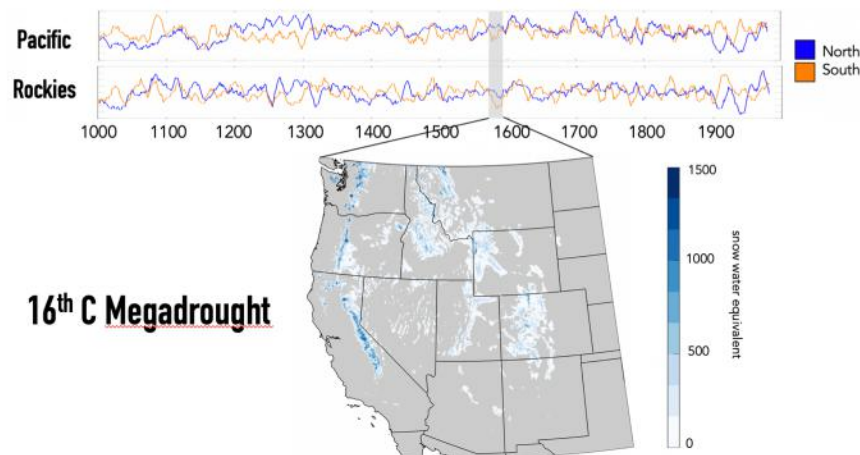
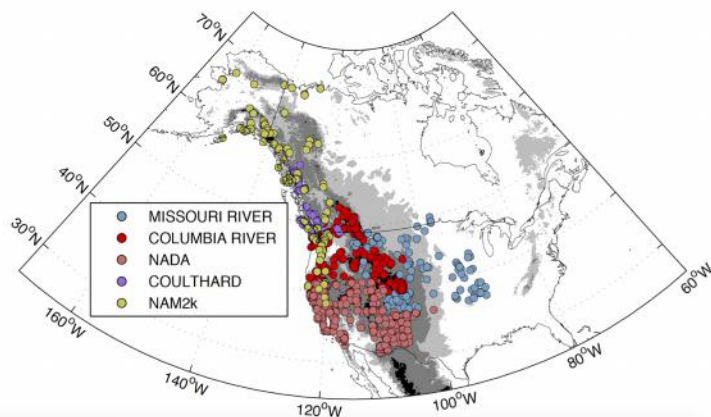


Using tree rings to study the influence of climate change on global water cycles relevant to human populations and ecosystems, with an emphasis on freshwater runoff, snowpacks, and forest hydrology.

- Examination of past and future snow droughts across the western North American cordilleras.
- Reconstructing extreme (flood/drought) events in the Fraser Basin, BC, Canada.



Western North American Paleosnow Network



Sedimentary Geology

Dr. Ganqing Jiang

Professor

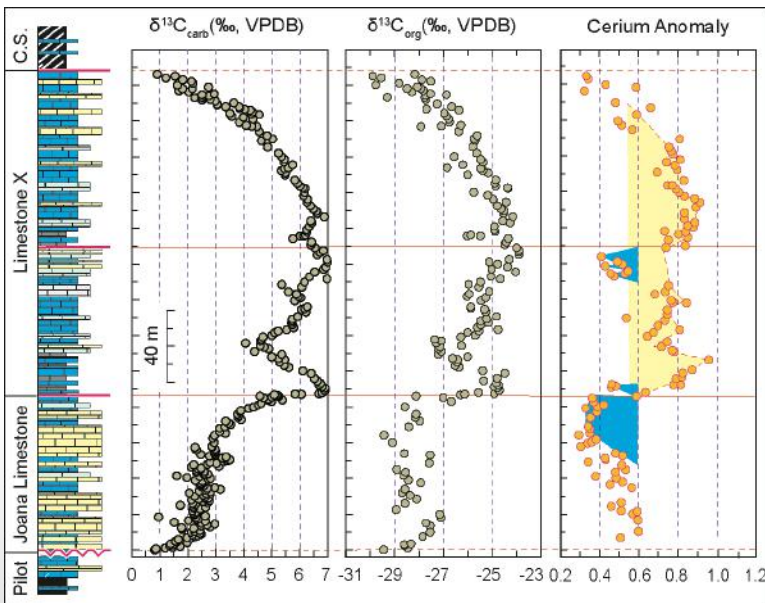
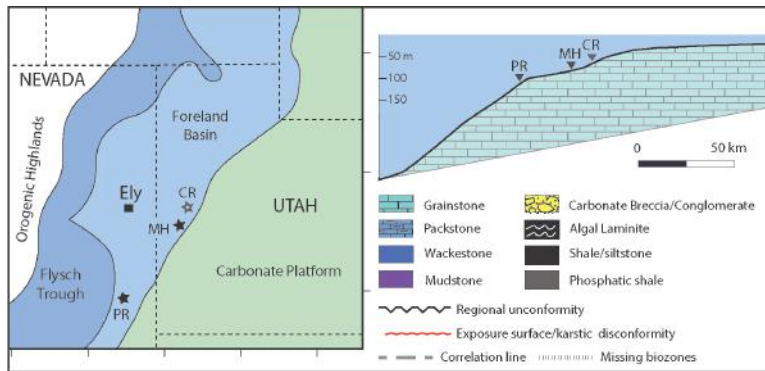
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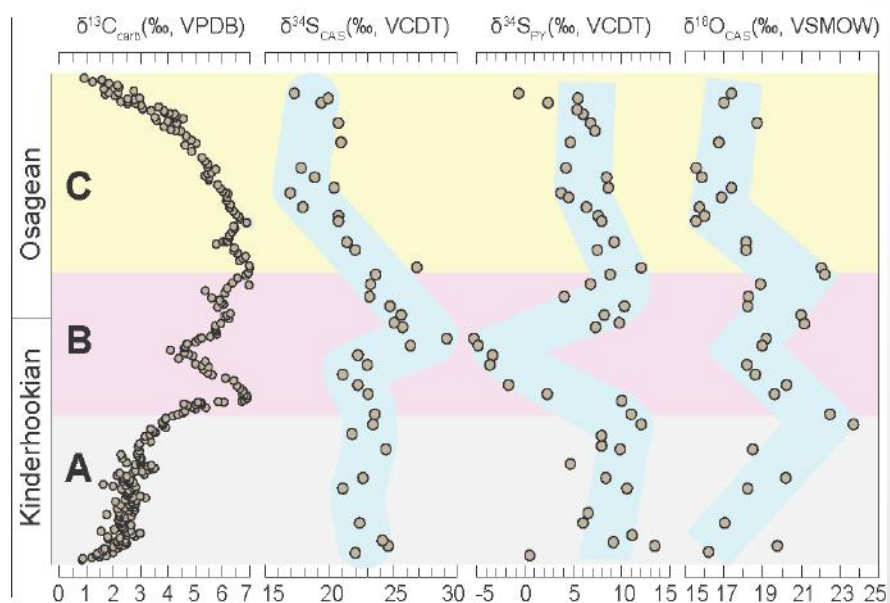
Email: Ganqing.Jiang@unlv.edu

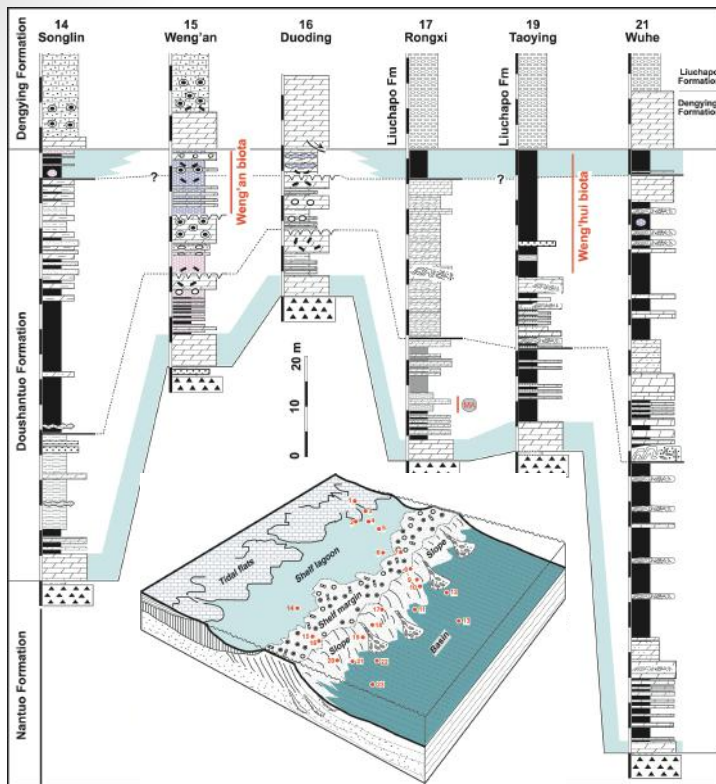
Expertise:

- Sequence and chemostratigraphy
- sedimentology
- Carbonate diagenesis

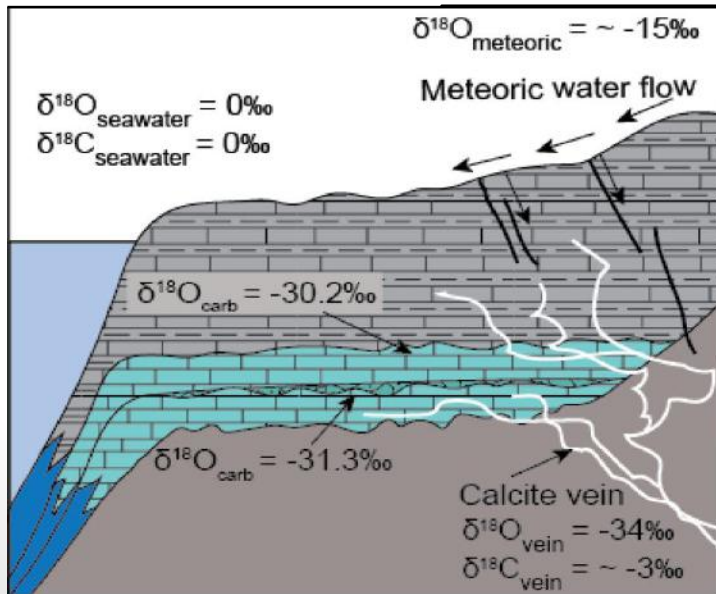


- Sequence and chemostratigraphy
- Paleogeographic reconstruction
- Applications of stable isotopes and rare earth elements
- Paleoenvironmental change across major perturbations of the carbon cycle and mass extinctions





- 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

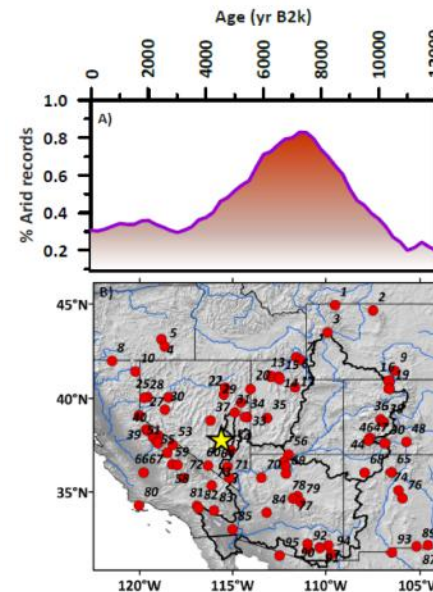
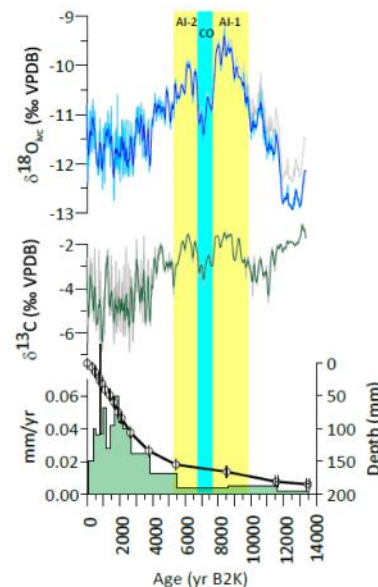
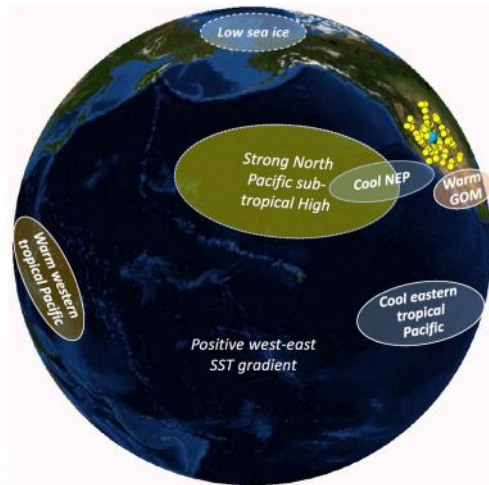
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Paleoclimatology

- 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



Dryland ecology, hydrology and climate dynamics

Dr. Matthew Petrie

Assistant Professor

School of Life Sciences

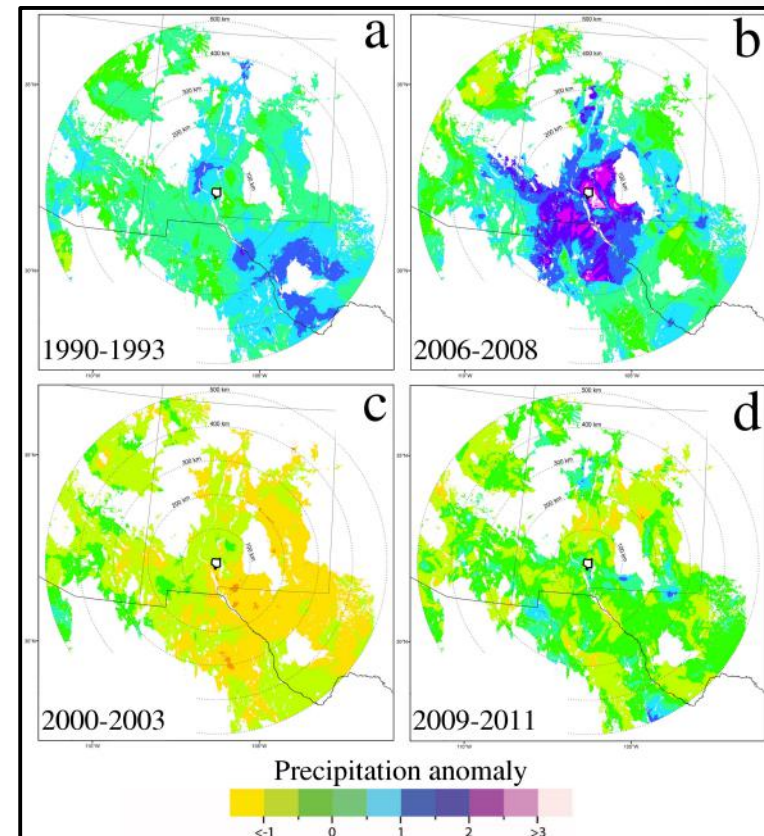
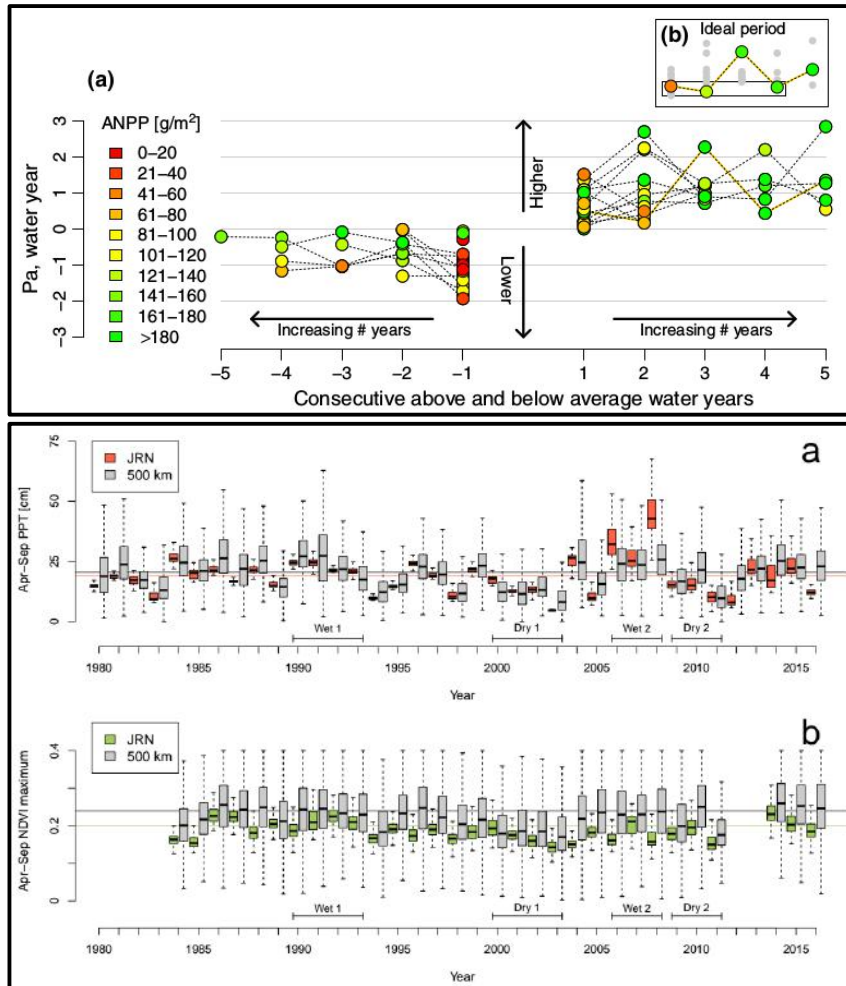
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Expertise:

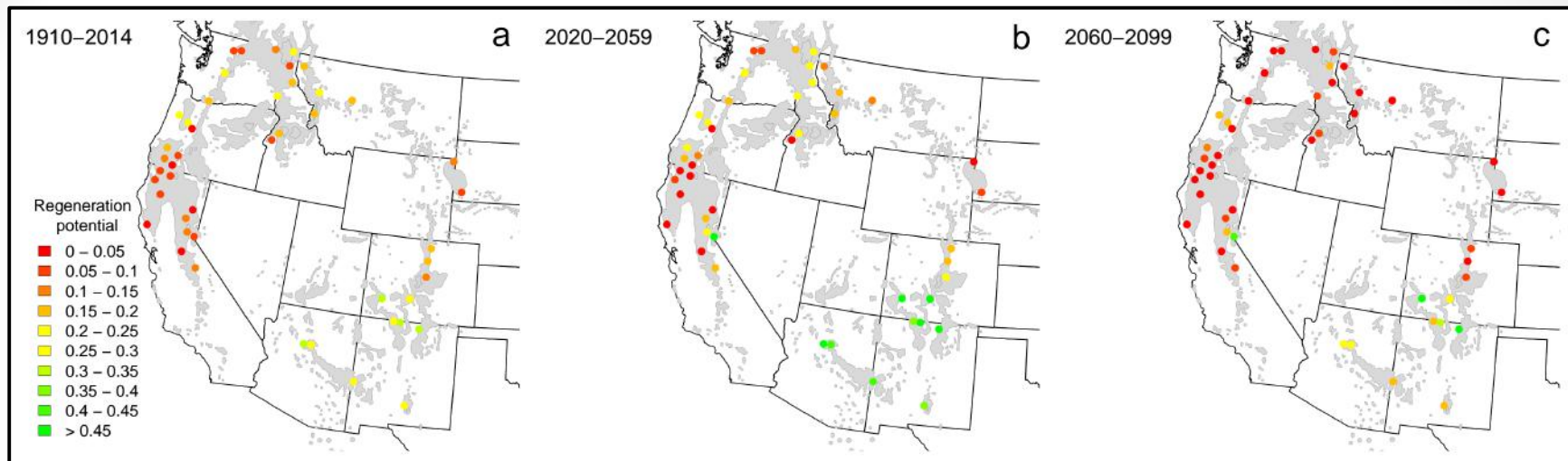
- Vegetation ecology and near-surface hydrology
- Forest regeneration
- Climate dynamics and climate change forecasting
- Extreme events
- Landscape ecology
- Manipulative field experimentation

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 declinest 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

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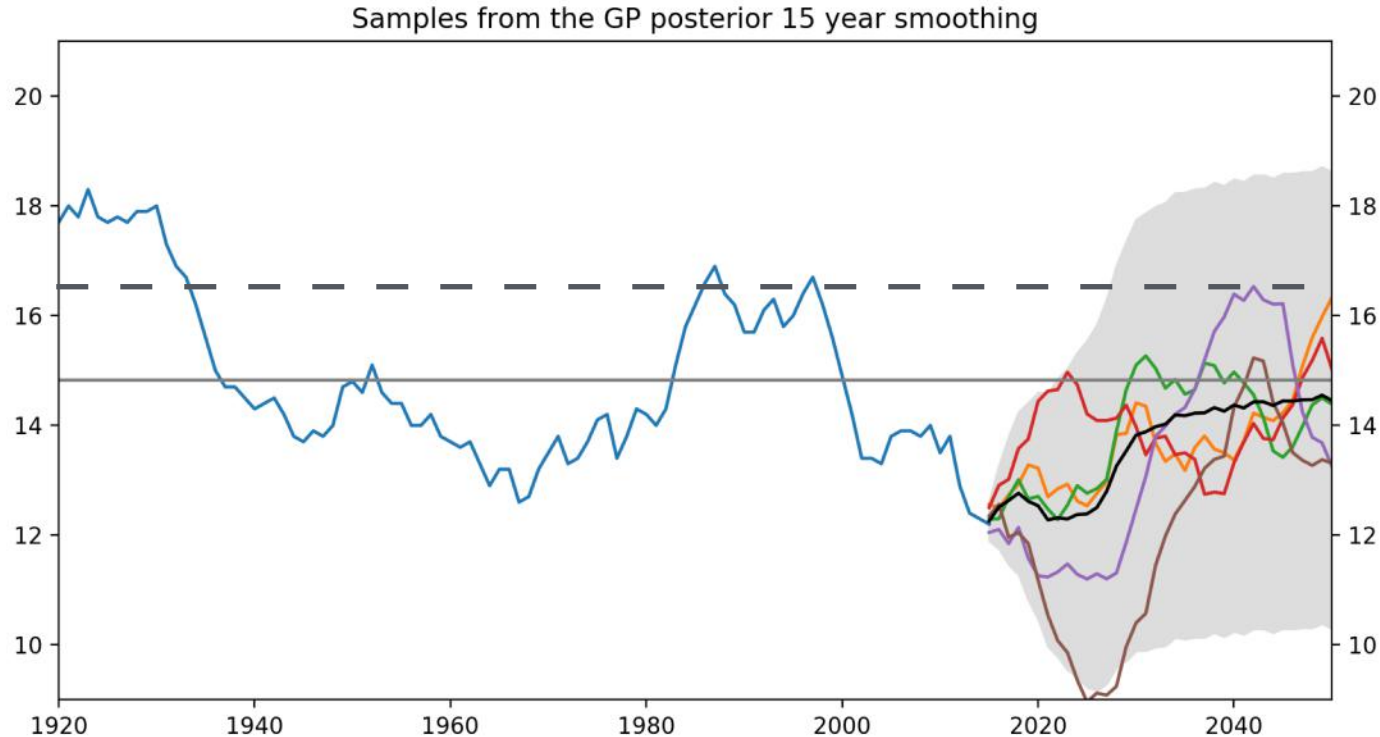
email: grhee@physics.unlv.edu

Expertise

- Observational Astronomy/Cosmology
- Renewable Energy
- Colorado River Flow Projections

Climate Change

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/>. I

Interview on KPNR and writeup describing the idea:

<https://knpr.org/desert-companion/2018-12/do-math>

Supply Choices

Nuclear Energy	<input type="text" value="no nuclear energy ever"/>	⬇
Wind energy	<input type="text" value="add two new wind farms by 2050"/>	⬇
Hydroelectric power	<input type="text" value="Lake Mead dries up by 2030 and generation stops"/>	⬇
Geothermal Energy	<input type="text" value="increase generation by 3% per year"/>	⬇
Rooftop Solar power	<input type="text" value="keep rooftop solar at its 2015 value"/>	⬇
Solar PV power plants	<input type="text" value="solar PV increases by 10 percent a year to 2050"/>	⬇
Concentrating Solar Power	<input type="text" value="build one new Tonopah plant every ten years"/>	⬇
Solar Thermal (hot water)	<input type="text" value="increase to 10% of demand by 2050"/>	⬇
Electricity imports	<input type="text" value="keep electricity imports at 0.15 GW"/>	⬇
Carbon Capture and Storage	<input type="text" value="no CCS, business as usual"/>	⬇

Demand Choices

International aviation	<input type="text" value="factor of three increase in international visitors by 2050"/>	⬇
Nevada transport	<input type="text" value="electrify transport completely by 2050"/>	⬇
Nevada freight	<input type="text" value="business as usual freight travels by road"/>	⬇
Industry growth	<input type="text" value="energy demand increases by 1.5% per year"/>	⬇
Commercial heating and cooling	<input type="text" value="5% increase in efficiency"/>	⬇
Commercial light and appliances	<input type="text" value="energy demand increases by 25% by 2050"/>	⬇
Home heating and cooling	<input type="text" value="energy demand increases by 1.5% per year"/>	⬇
Home lighting and appliances	<input type="text" value="electricity demand increases by 70% from 2015 to 2050"/>	⬇
Home insulation	<input type="text" value="no extra effort on home insulation"/>	⬇
Average home temperature	<input type="text" value="no thermostat adjustment"/>	⬇

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