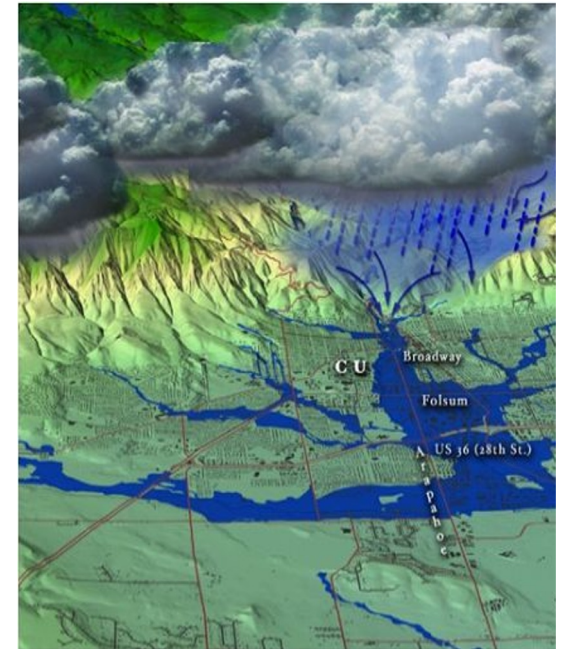
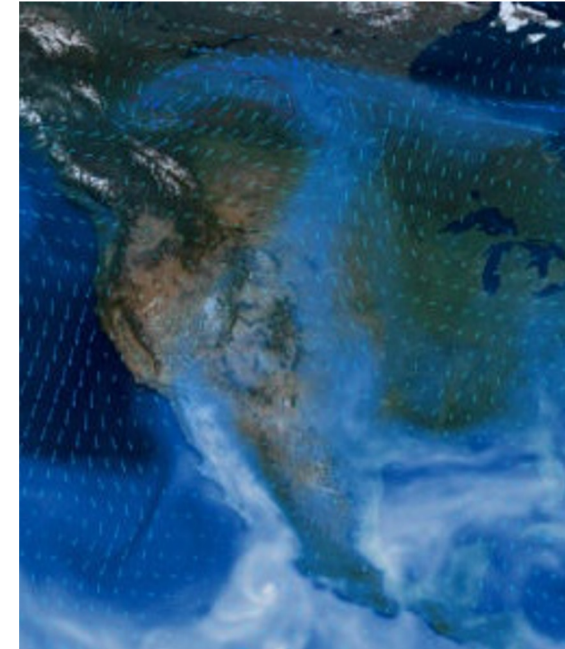
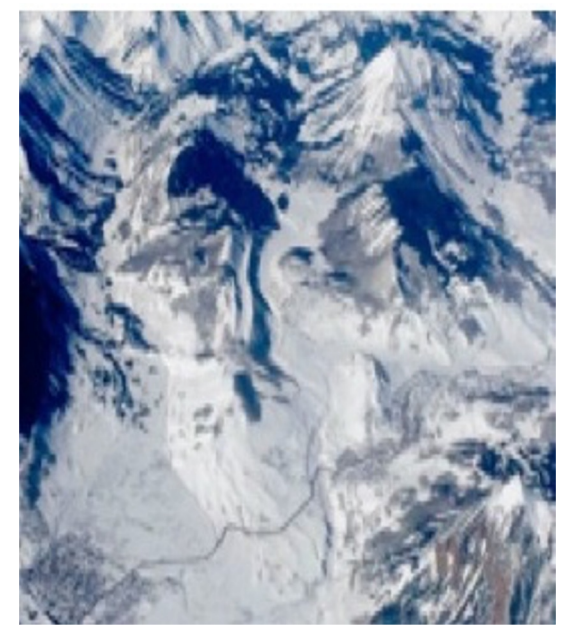


# Intro to, Summary of, and Next Steps for the SAIL Campaign

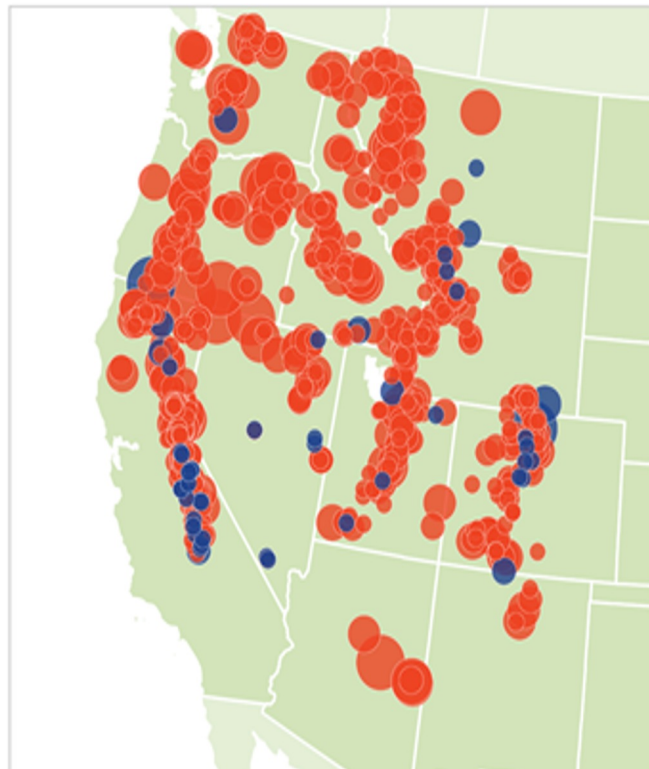
Dan Feldman and many, many others, including

A. Aiken, W. Boos, R. Carroll, V. Chandrasekhar, W. Collins, S. Collis, J. Creamean, G. de Boer, J. Deems, P. DeMott, J. Fan, A. Flores, D. Gochis, M. Grover, T. Hill, A. Hodshire, E. Hulm, C. Hume, R. Jackson, F. Junyent, H. Kalesse, A. Kennedy, A. Kotcsch, M. Kumjian, E. Levin, J. Lundquist, M. Maahn, J. O'Brien, M. Raleigh, J. Reithel, A. Rhoades, K. Rittger, W. Rudisill, Z. Sherman, E. Siirila-Woodburn, S. Skiles, J. Smith, R. Sullivan, A. Theisen, M. Tuftedal, A. Varble, A. Wiedlea, S. Wielandt, Z. Xu



# The Colorado River Watershed is Changing

1955-2016 trends in April Snowpack



Percent change:

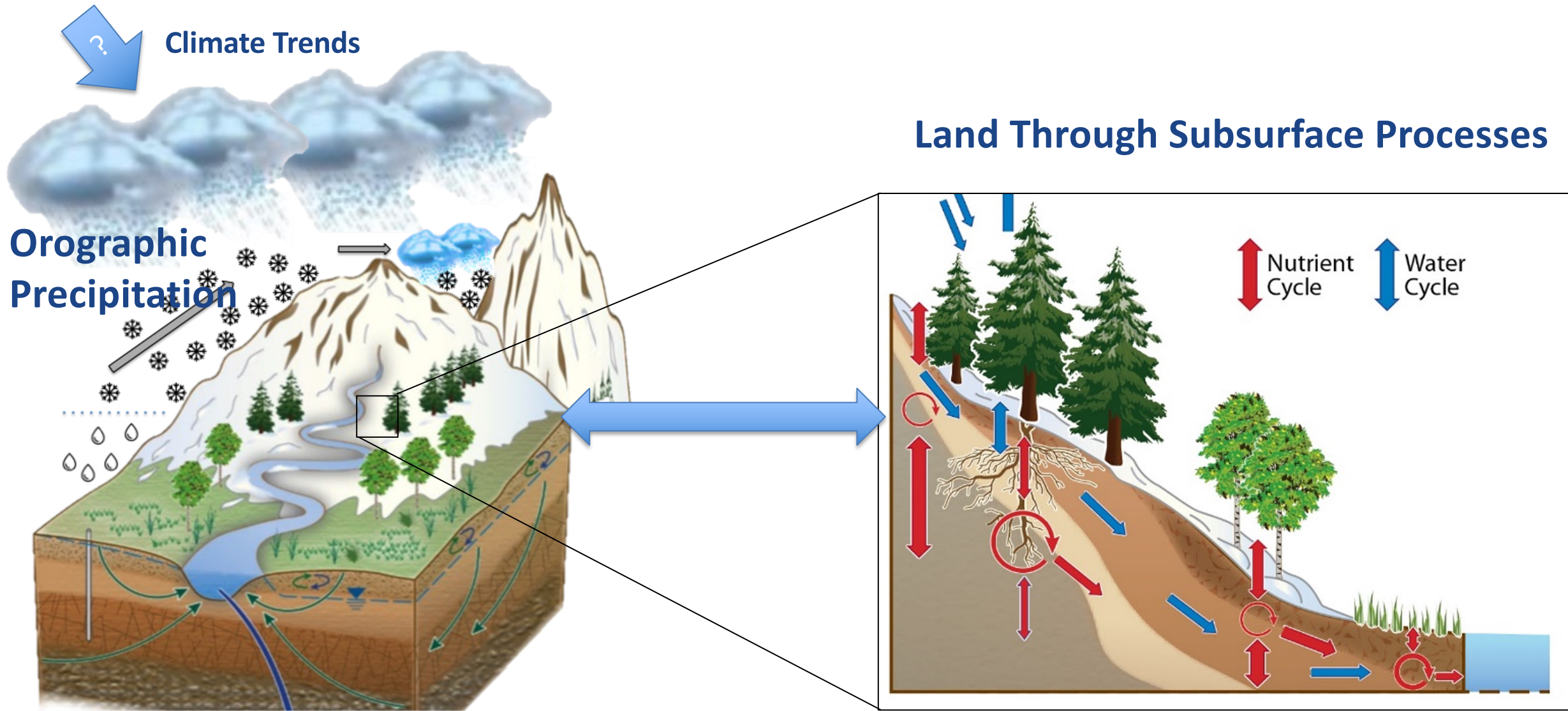
Mote and Sharp, 2016

Market Intel  
September 13, 2021

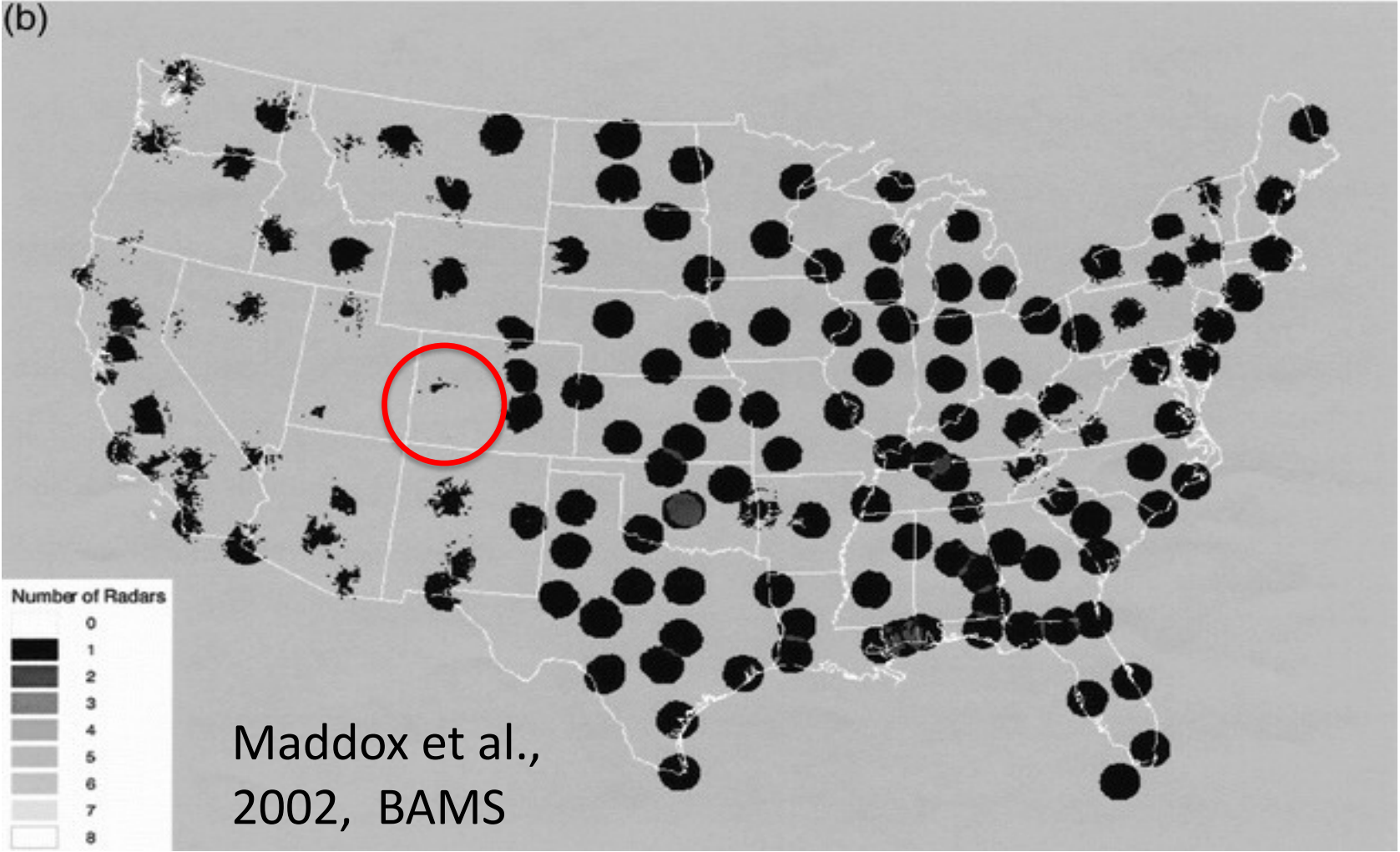
## First-Ever Colorado River Water Shortage Declaration Spurs Water Cuts in the Southwest



# The many scales of mountainous hydrology



# Observational Gaps Lead to Understanding and Prediction Gaps



# Observational Gaps Lead to Understanding and Prediction Gaps



Photo Credit: billy barr (2021)

# Observational Gaps Lead to Understanding and Prediction Gaps



Photo Credit: Ryan Currier (2021)

# SAIL: Surface Atmosphere Integrated Field Laboratory



Major U.S. Department of Energy ARM investment in Crested Butte, Colorado. 9/21 to 6/23



Colorado State University



BOISE STATE UNIVERSITY



PennState



THE UNIVERSITY OF UTAH



# SAIL: Surface Atmosphere Integrated Field Laboratory



Major U.S. Department of Energy ARM investment in Crested Butte, Colorado. 9/21 to 6/23





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Major U.S. Department of Energy ARM investment in Crested Butte, Colorado. 9/21 to 6/23



# SAIL: Surface Atmosphere Integrated Field Laboratory



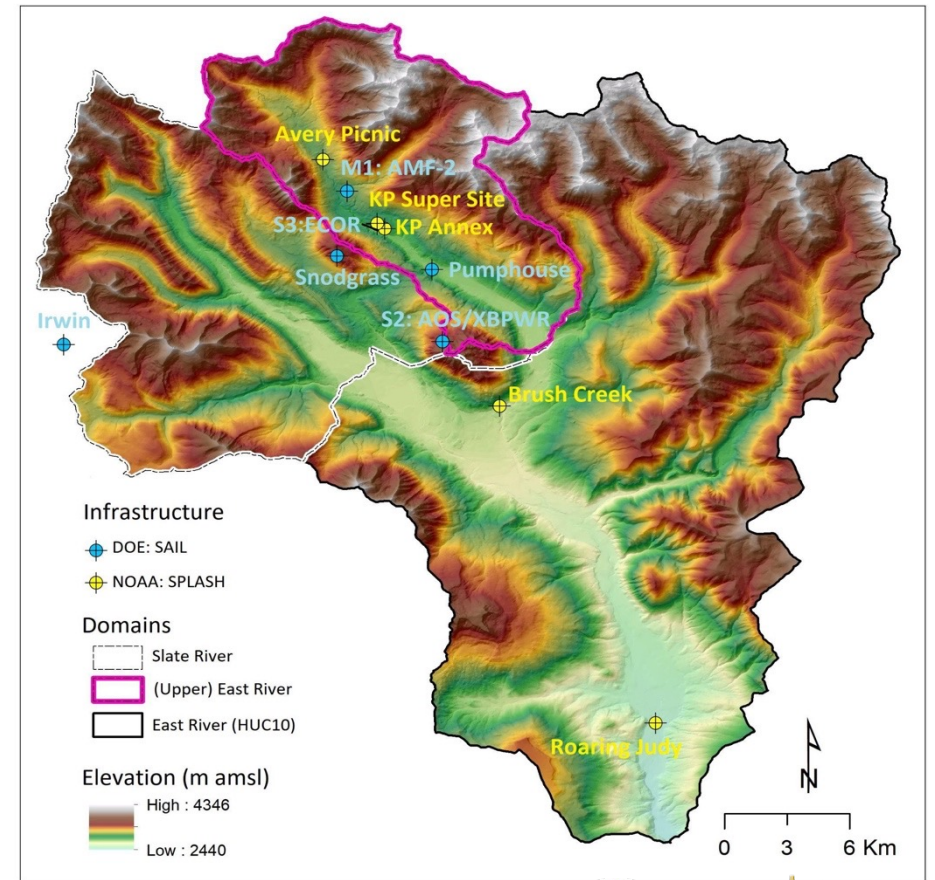
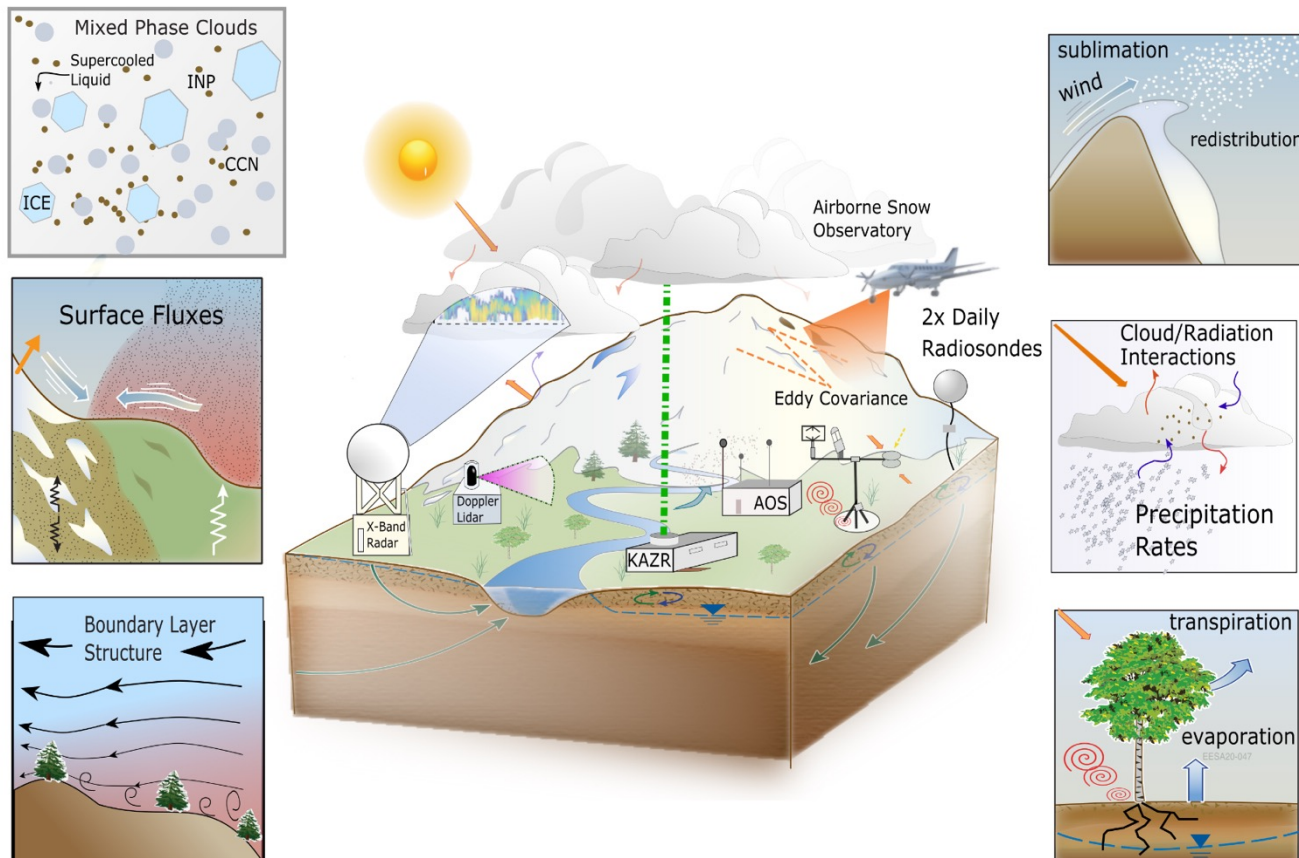
Major U.S. Department of Energy ARM investment in Crested Butte, Colorado. 9/21 to 6/23



# SAIL: Surface Atmosphere Integrated Field Laboratory



Major U.S. Department of Energy ARM investment in Crested Butte, Colorado. 9/21 to 6/23



# SAIL: It takes a team ...

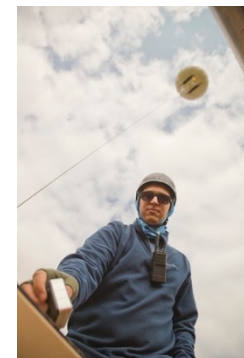


The ARM program, ARM staff, instrument mentors, translators, technicians, scientists, guest instrument providers, ...



Images courtesy of the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) user facility.

# To Rise to the Challenge



Images courtesy of the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) user facility.

# The Photos of SAIL Tell Many Stories

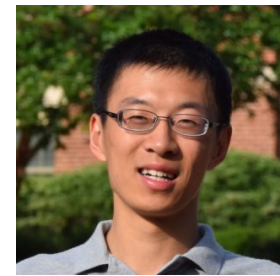
Check out the SAIL StoryMap!



# SAIL: New and ongoing investigations and investigators



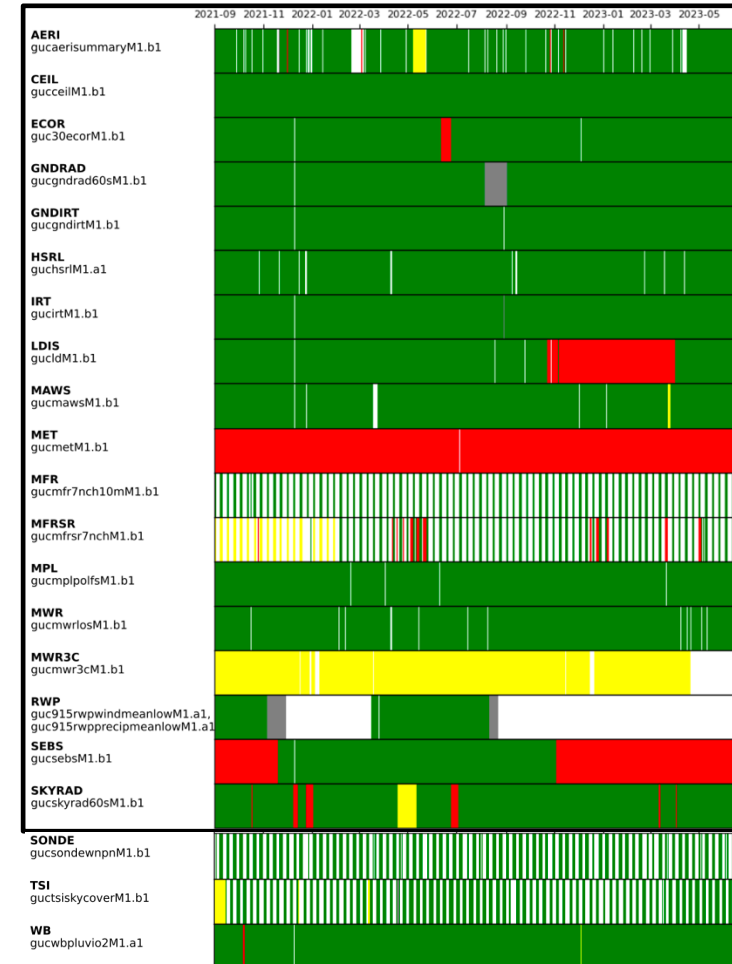
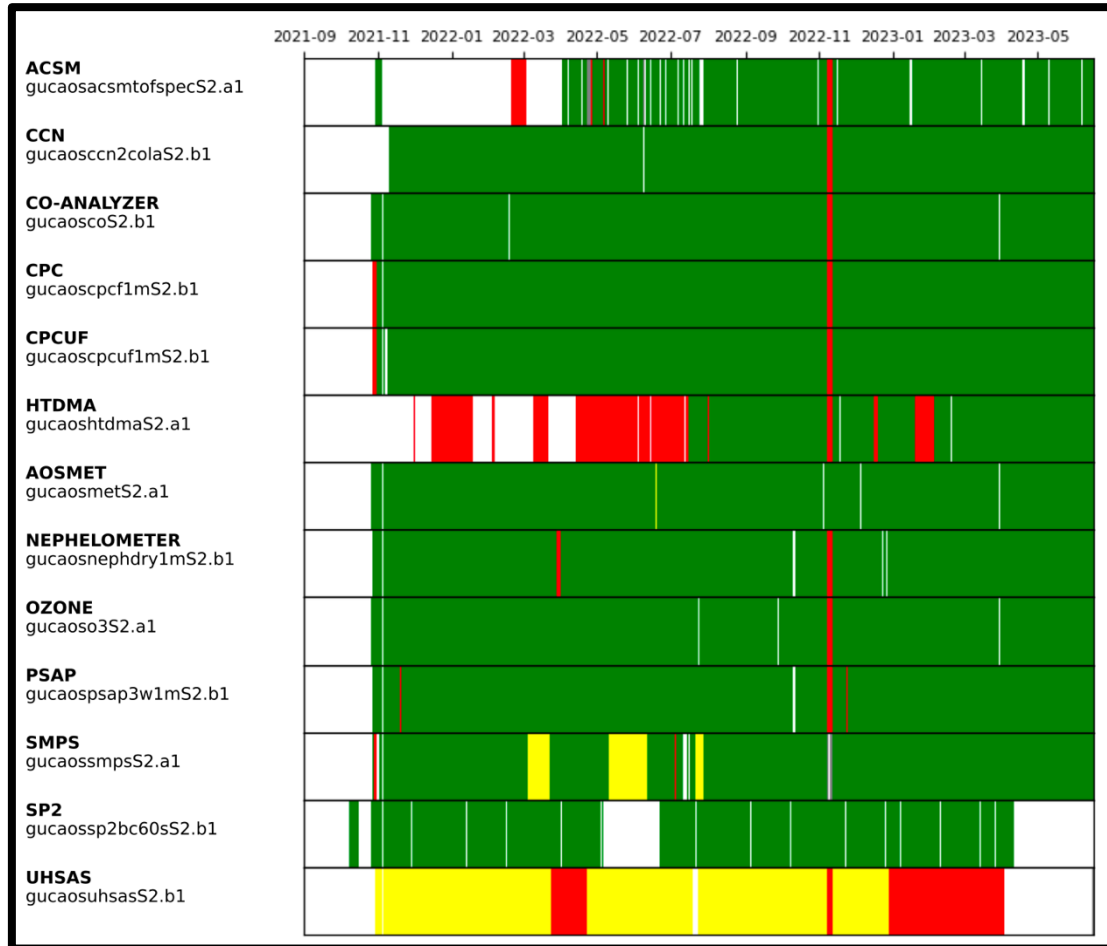
The analysis phase of SAIL begins.



# SAIL Data Holdings and Access Statistics



There are over 100 datastreams produced by the SAIL Campaign. Nearly 100 more planned  
13 guest instrument deployments. 700+ orders for SAIL data fulfilled  
This density of observations means we can simultaneously constrain multiple processes.





# SAIL Campaign Overview



## Background

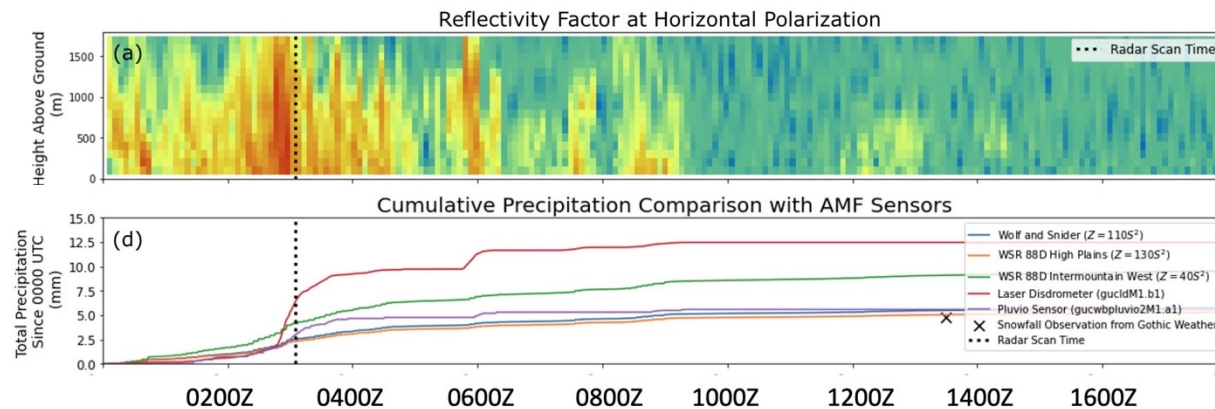
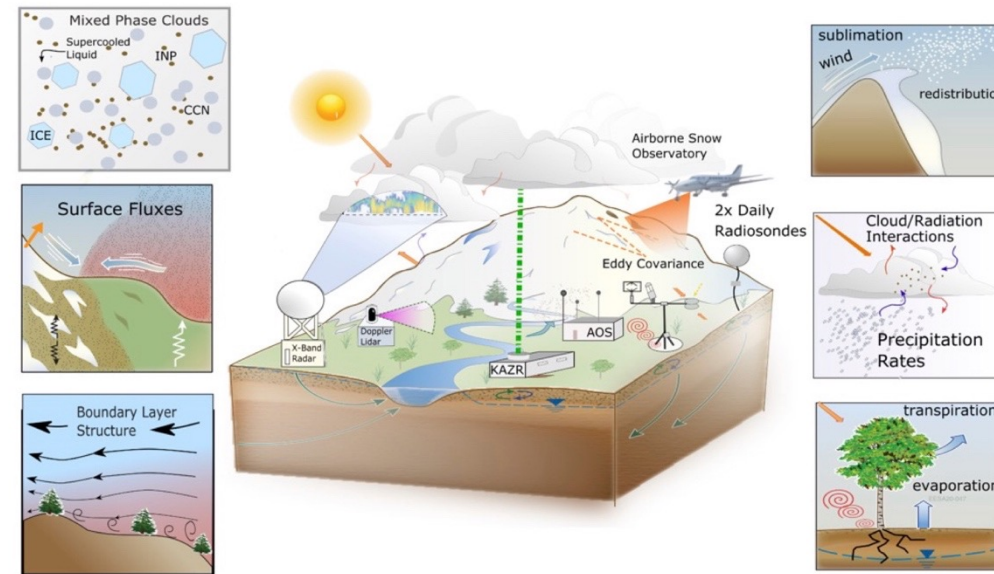
- Introduce the scientific community to the full depth and breadth of the SAIL campaign.

## Approach

- Described SAIL's science objectives and their underlying rationale.
- Described the campaign's approach to data collection, the wide range of the campaign's collaborations.
- Showed several examples of preliminary results.

## Impact

- Pique interest in the scientific community in SAIL.
- Serve as foundational reference for subsequent SAIL science.



# Diagnosing Widespread Surface Air Temperature Biases



## Objective

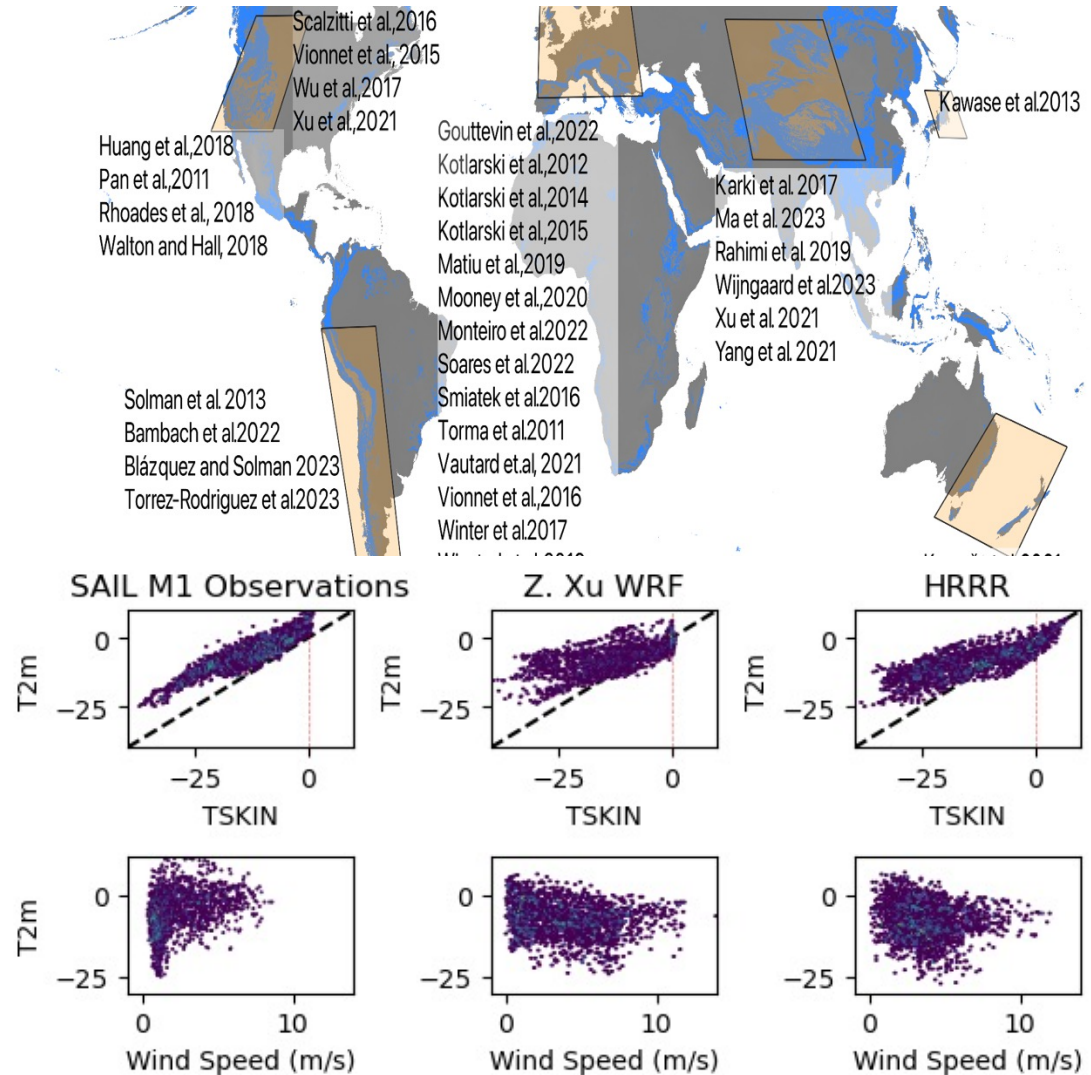
- Determine if atmospheric models are generally cold-biased in their surface air temperature (T2m) fields in mountains.

## Approach

- Reviewed published literature, finding 41 publications with T2m cold biases, 0 publications with T2m warm biases.
- Identified possible mechanisms for the shared biases.
- Analyzed SAIL data to reveal many components of the bias, and found that surface layer coupling as an issue that can explain a lot of the bias.

## Impact

- Raise awareness of this common model error and show how multivariate field observations can determine why it is so widespread.



# Next Steps ...

## Today

- This session here is meant to touch on SOME, but not all, of the research that is underway with SAIL/SPLASH/SOS data.

## Next Few Months

- SAIL/SPLASH/SOS Science Summit to plan out synergistic science activities and scope out student projects.
- Location TBD (Front Range likely)
- Date TBD (October likely)
- Biweekly SAIL/SPLASH/SOS teleconference
- Monthly SAIL/SPLASH/SOS snow measurement/modeling meetings
- Colorado River Climate and Hydrology Work Group 11/29 in Salt Lake City
- Missing Water Group Meeting

## AGU, AMS and Beyond ...

- SAIL/SPLASH/SOS session at AGU
- SAIL/SPLASH/SOS session at AMS ... submit your abstracts by 8/24
- SAIL product development.
- Connections to model development

# Discussion

Open mic to present research on SAIL/SPLASH/SOS data to date

Growth areas and upcoming research opportunities for 2023/2024

Questions from the audience about SAIL and SPLASH and SOS

Connections between SAIL, SPLASH, SOS and the IMHC Workshop Report

Fall 2023 Science Summit interests