Dust on Snow, Bark Beetles and Extreme Events
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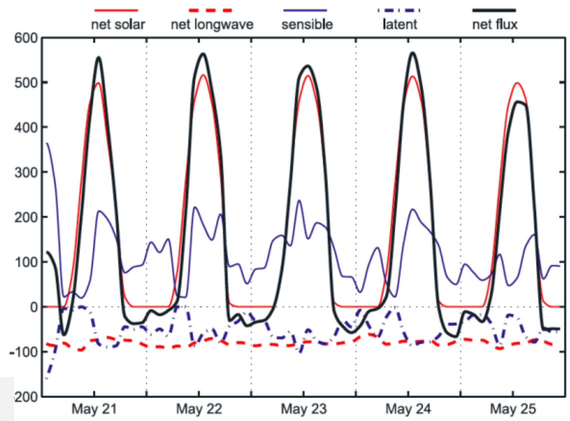
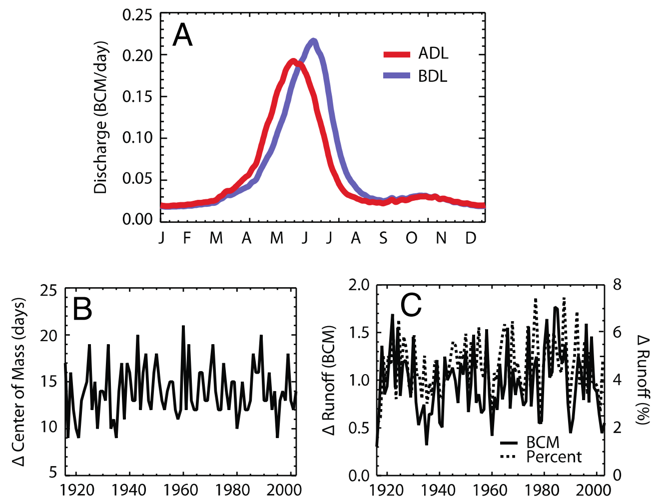
San Juan Mountains (photo courtesy Jeff Deems). Colorado plateau is a major source of dust.



Net solar radiation dominates spring energy balance in open conditions under clear sky conditions (Senator Beck Study Plot 2005)



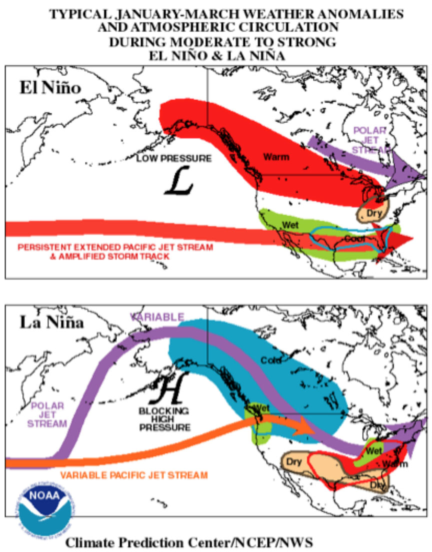
Differences in runoff timing and volume between ADL and BDL dust scenarios. (A) Mean discharge at Lees Ferry, AZ on the Colorado River for ADL and BDL scenarios across the period 1916–2003. (B) Time series of BDL versus ADL Δ runoff in billion cubic meters across 1916–2003. (C) Time series of BDL versus ADL Δ runoff in percent of ADL runoff.

Preliminary model results indicate that Mountain Pine Beetle-related canopy degradation leads to greater snow accumulation as a result of less canopy interception and reduced sublimation. Combined with a loss in root-water-uptake during the warm season, the increased soil moisture availability translates into an overall increase in water yield (i.e. streamflow) on the order of 3% - 15%, depending on MPB severity. The primary control of dust-on-snow is on the timing and rate of melt, with earlier and more rapid melt rates associated with more extreme dust deposition. It is anticipated that the final results will lead to a clearer understanding of system components and will better inform mitigation strategies and planning efforts.

Extreme Events and Climate Change in the Colorado River Basin

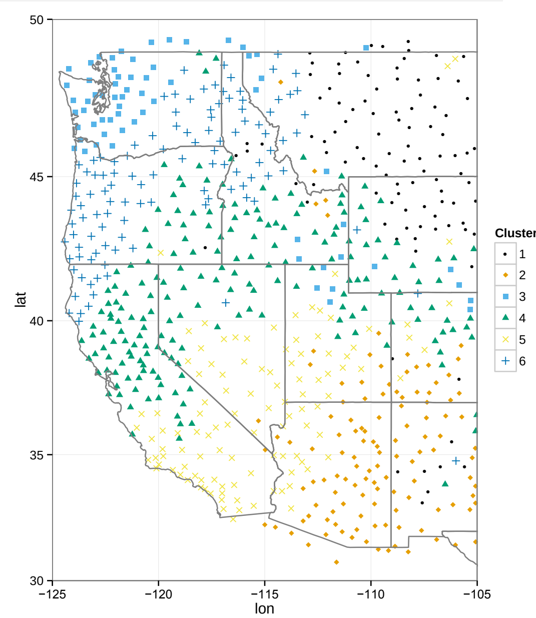
Research Questions:

- How will the frequency and timing of extreme events change in a changing climate?
- Do extreme precipitation events translate into extreme streamflow events?
- What are the physical drivers of extreme events?
- What do we need to do to prepare our existing infrastructure?

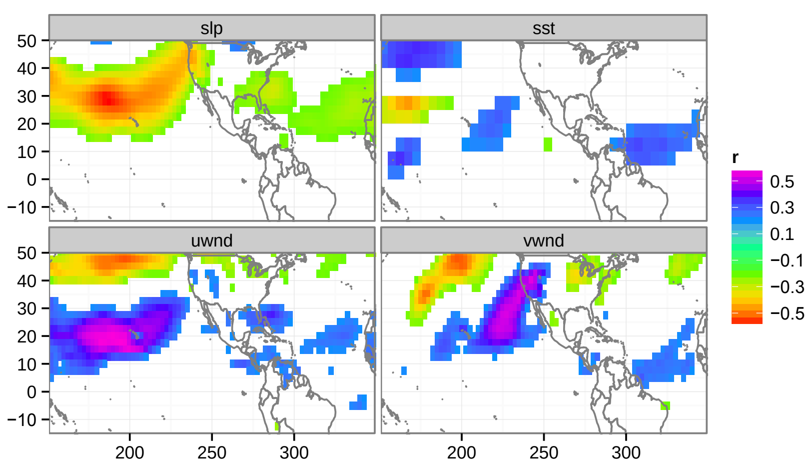


The Upper Colorado is in a region with a complex climate signal.

Statistical methods can be used to identify regions in which extreme event behave coherently. These regions are important for identifying atmospheric drivers of extreme precip and streamflow.



Identifying climate drivers of extreme precipitation aids in the construction of models.



In traditional engineering we think of the magnitude of an extreme event staying fixed in time, i.e. the 100 year flood is 2000 cfs. The magnitude of extreme events is actually nonstationary.