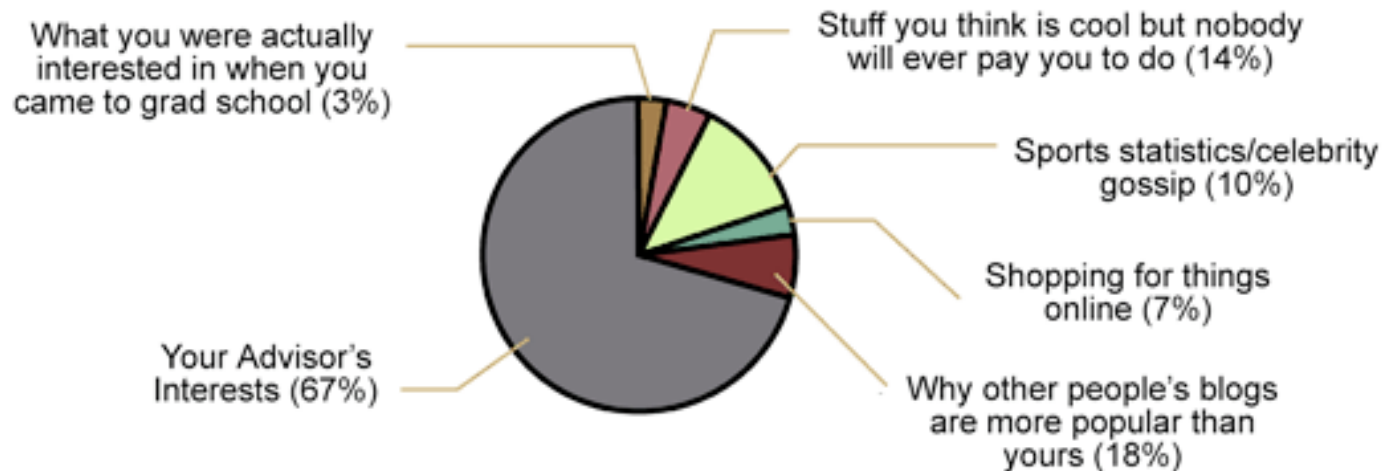
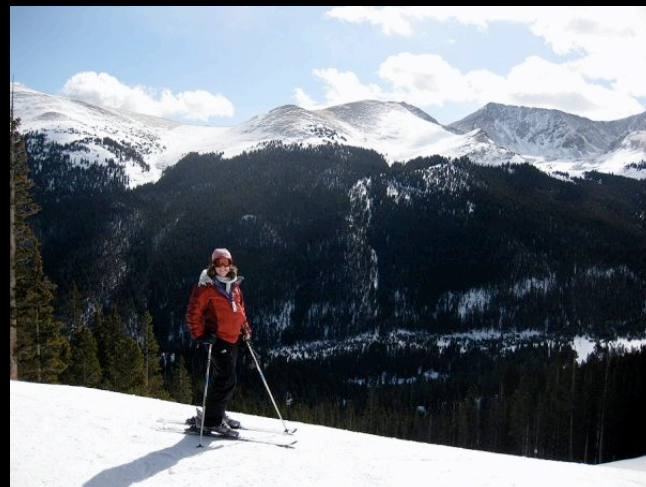
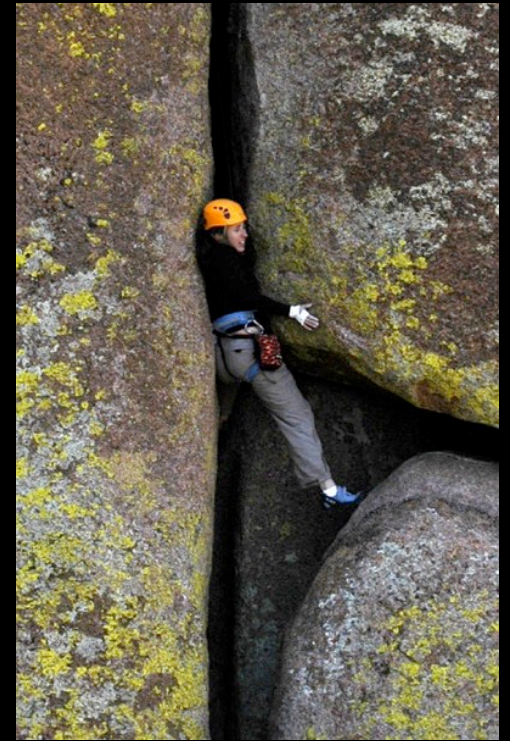


Rachel McCrary

a graduate student in constant transition

Your Research Interests:





Long-term Great Plains Drought



- The Great Plains region experienced two multi-year droughts during the 20th Century, one in the 1930s and a second in the 1950s.

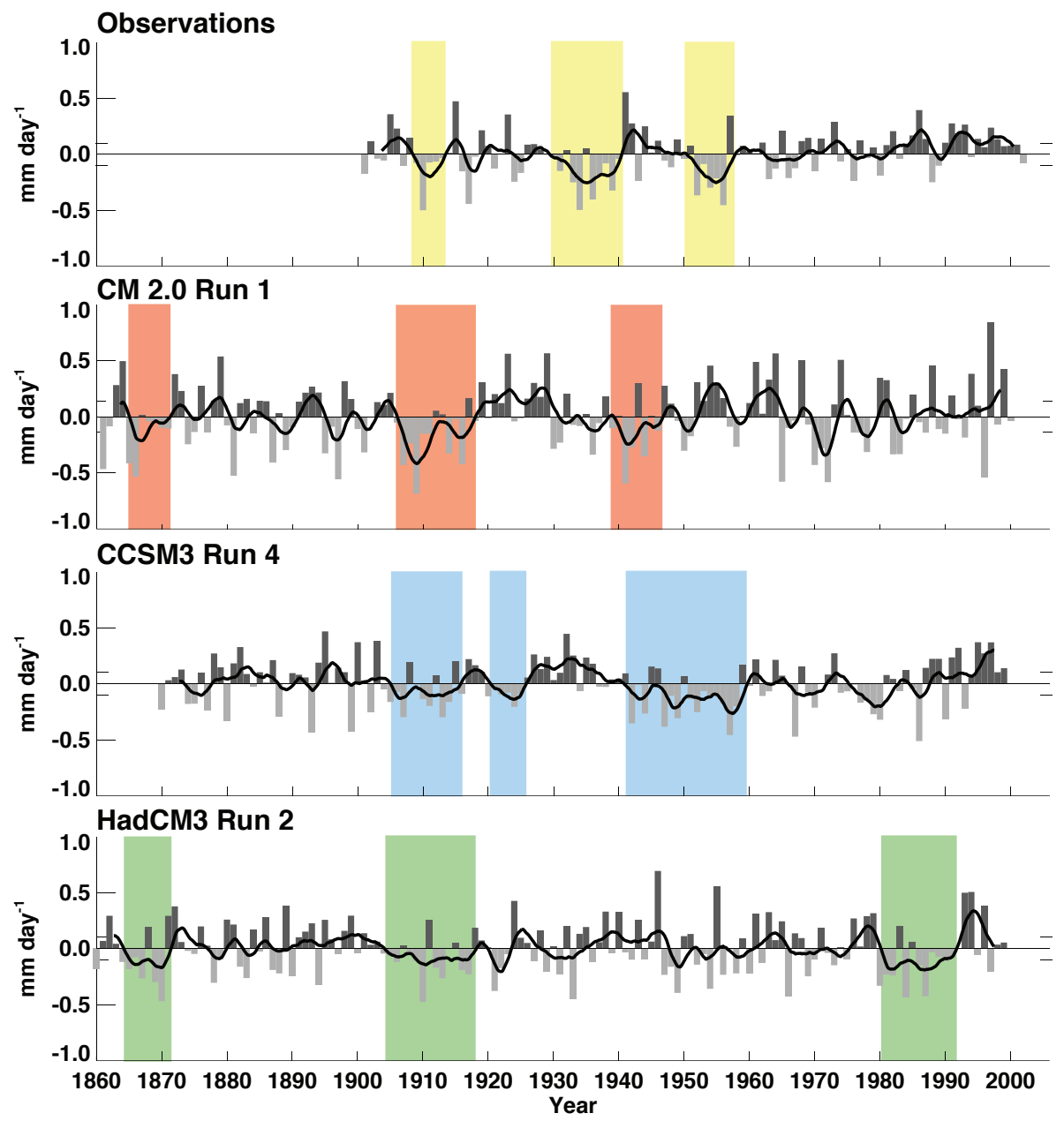
- 1930s drought commonly known as the “Dust Bowl”
- Great Plains region expected to get drier in the future ... scary



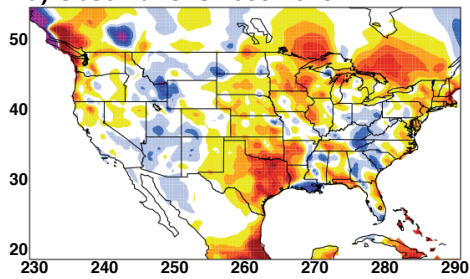
Climate of the 20th Century Experiments

- Fully coupled CGCM integrations

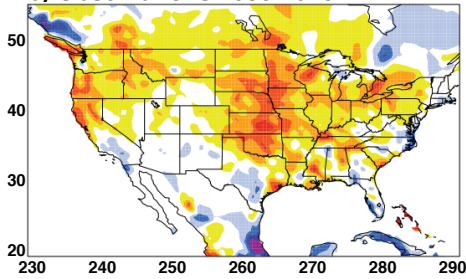
Model Name	Center/Country	Horizontal Resolution	Number of Levels	Number of Simulations	Key Reference
CM 2.0	Geophysical Fluid Dynamics Laboratory (GFDL)/United States	2.0° lat x 2.5° lon	24	3	Dellworth et al. (2004)
CCSM	National Center for Atmospheric Research (NCAR)/United States	T85 (~1.4° lat x 1.4° lon)	26	8	Collins et al. (2004, 2006)
HadCM3	Met office/ United Kingdom	2.5° lat x 3.75° lon	19	2	Gordon et al. (2000)



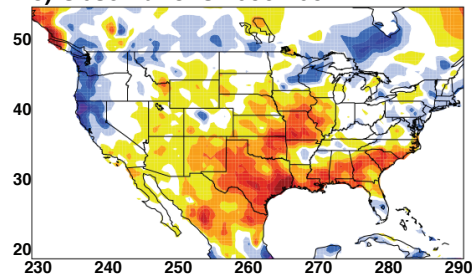
a) Observations 1908-1913



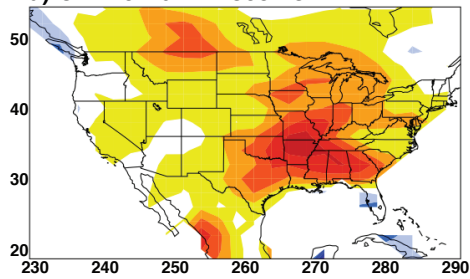
b) Observations 1930-1940



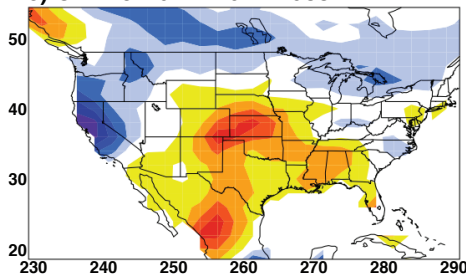
c) Observations 1950-1957



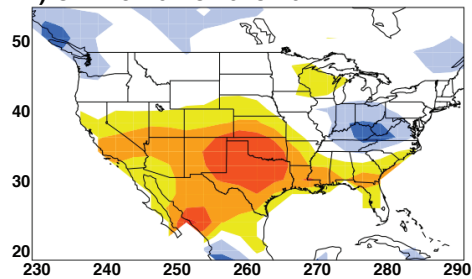
d) CM 2.0 Run 1 1865-1871



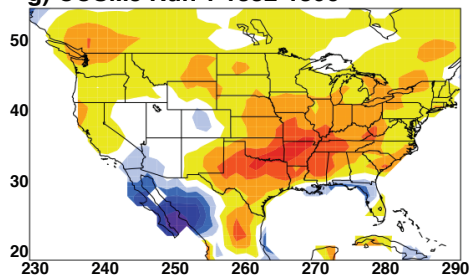
e) CM 2.0 Run 2 1924-1933



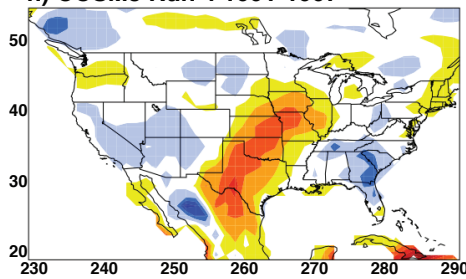
f) CM 2.0 Run 3 1923-1944



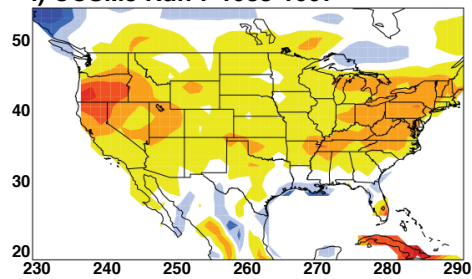
g) CCSM3 Run 1 1882-1890



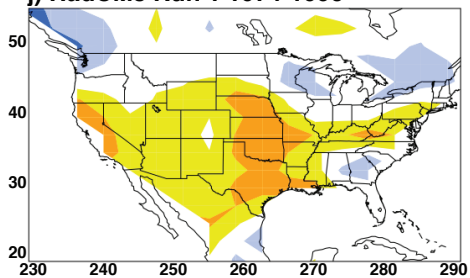
h) CCSM3 Run 4 1991-1997



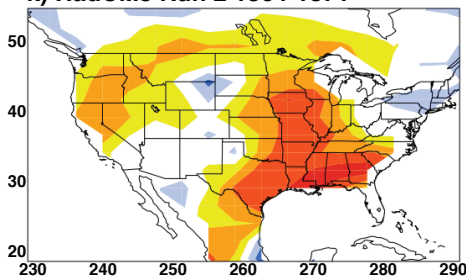
i) CCSM3 Run 7 1988-1997



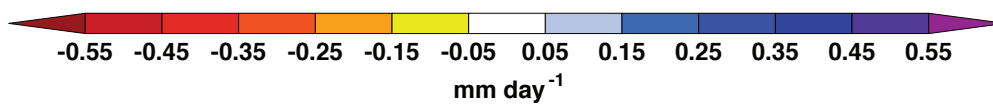
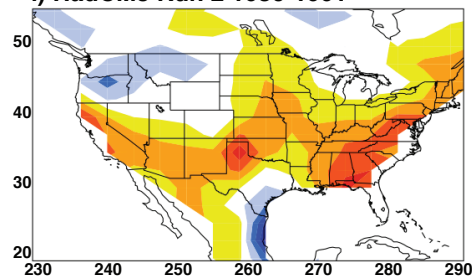
j) HadCM3 Run 1 1974-1990



k) HadCM3 Run 2 1864-1871



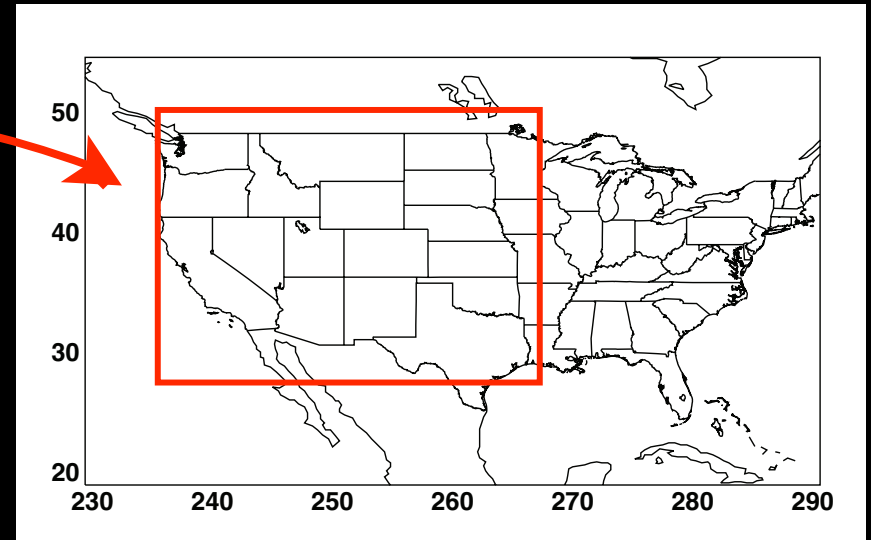
l) HadCM3 Run 2 1980-1991



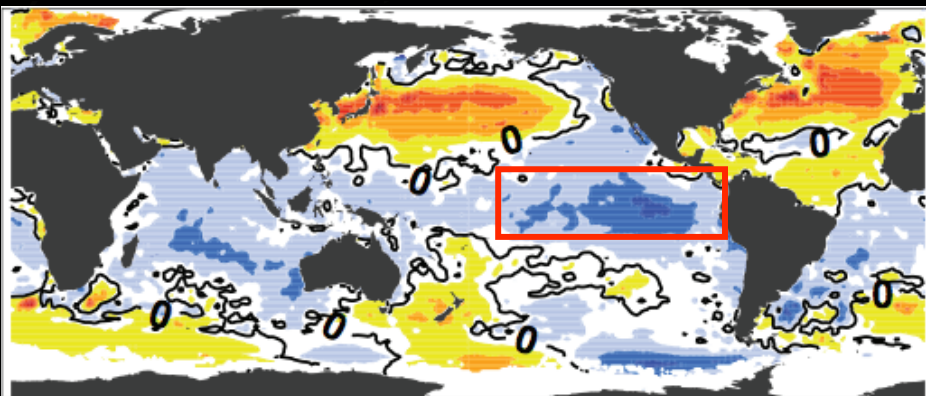
Causes of long-term drought

- Low-frequency variations in tropical Pacific Sea Surface Temperatures (SST)
- Local land-atmosphere interactions and feedbacks

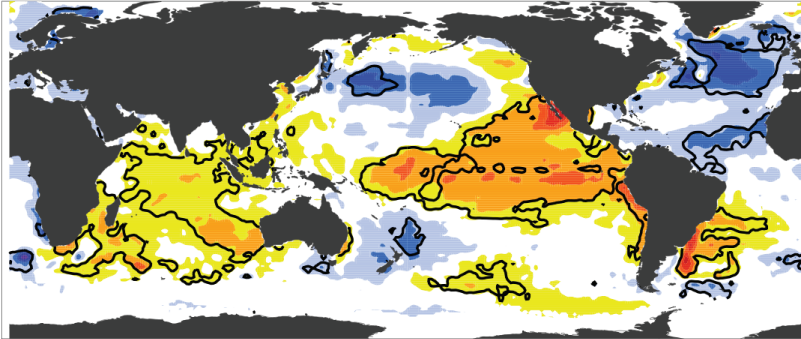
Cooler than normal conditions
in the tropical Pacific enhance
subsidence over the western
United States



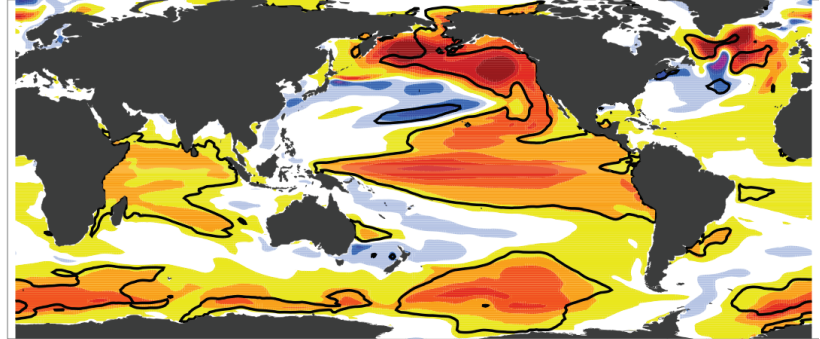
1950s drought



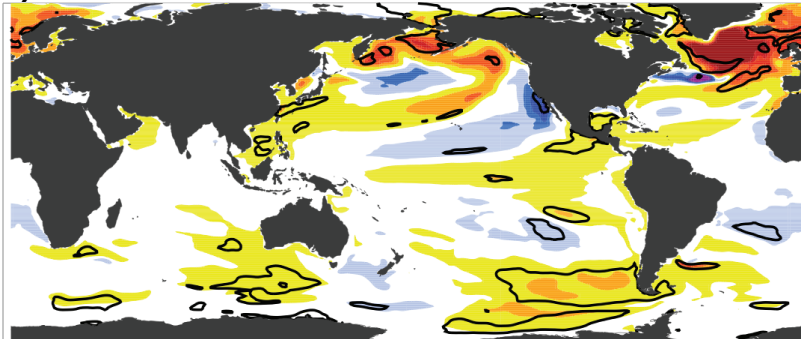
a) Observations



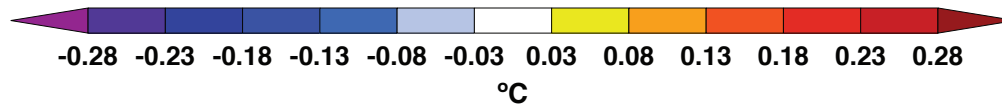
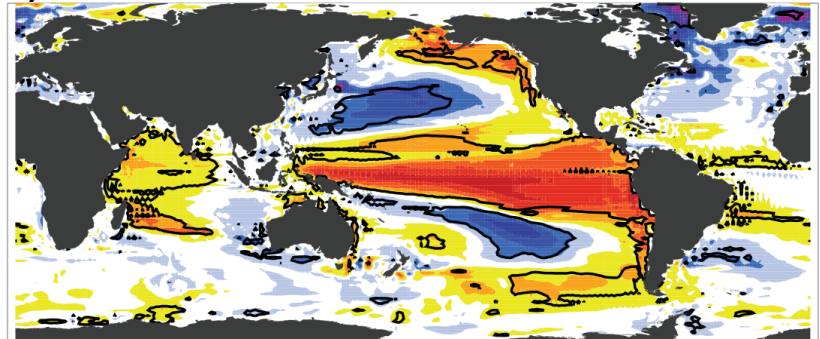
b) CM 2.0 Run 1

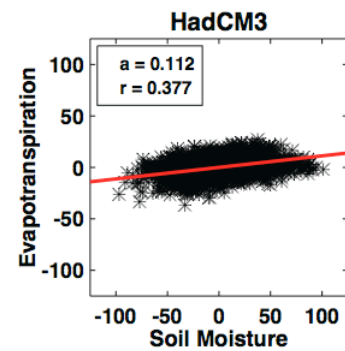
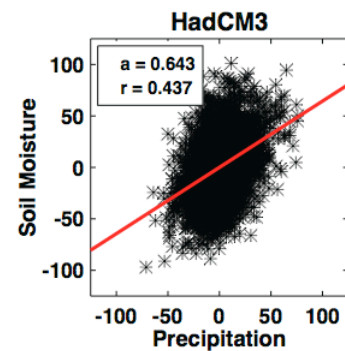
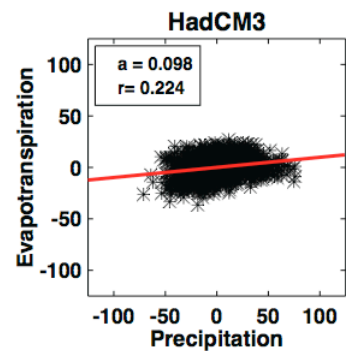
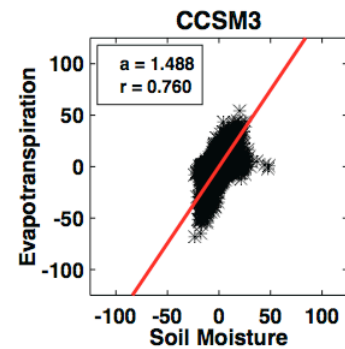
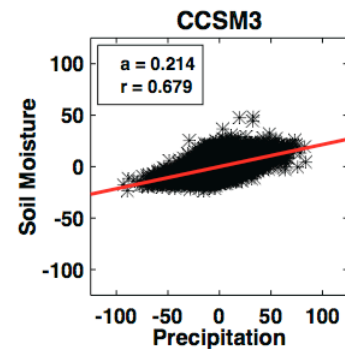
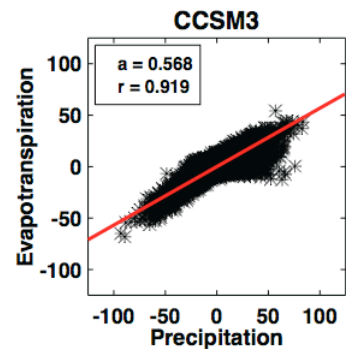
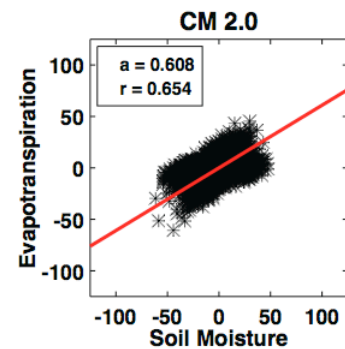
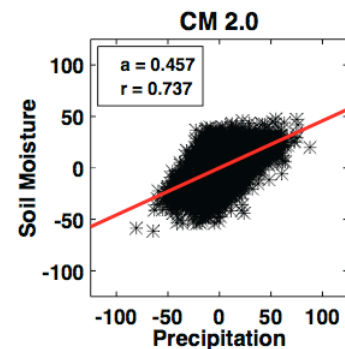
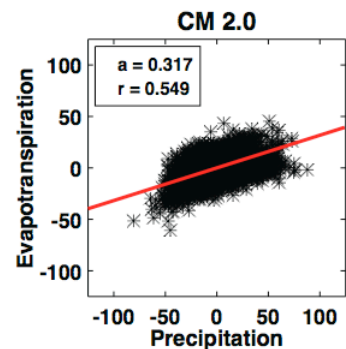
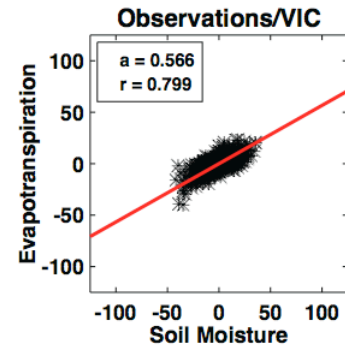
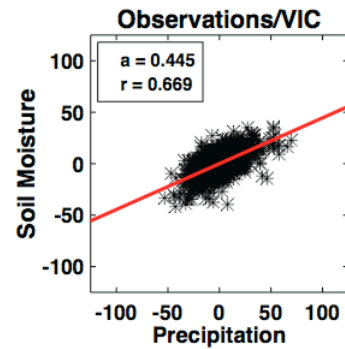
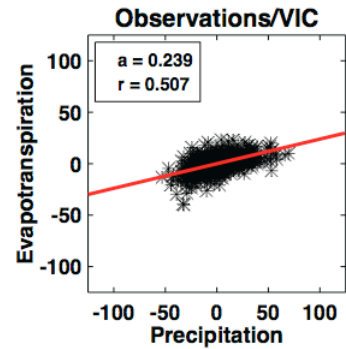


c) CCSM3 Run 4

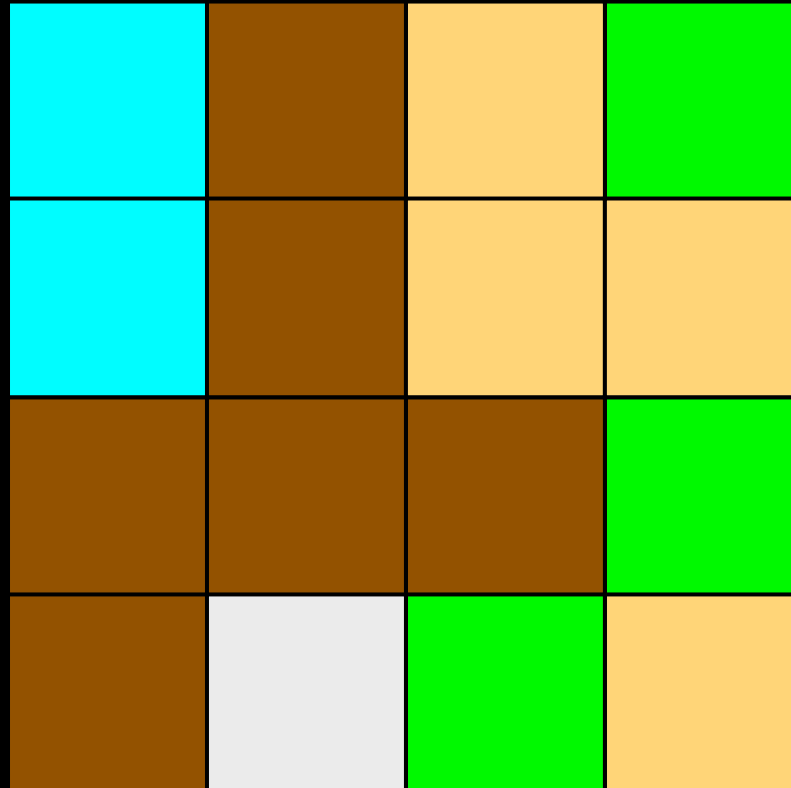


d) HadCM3 Run 1





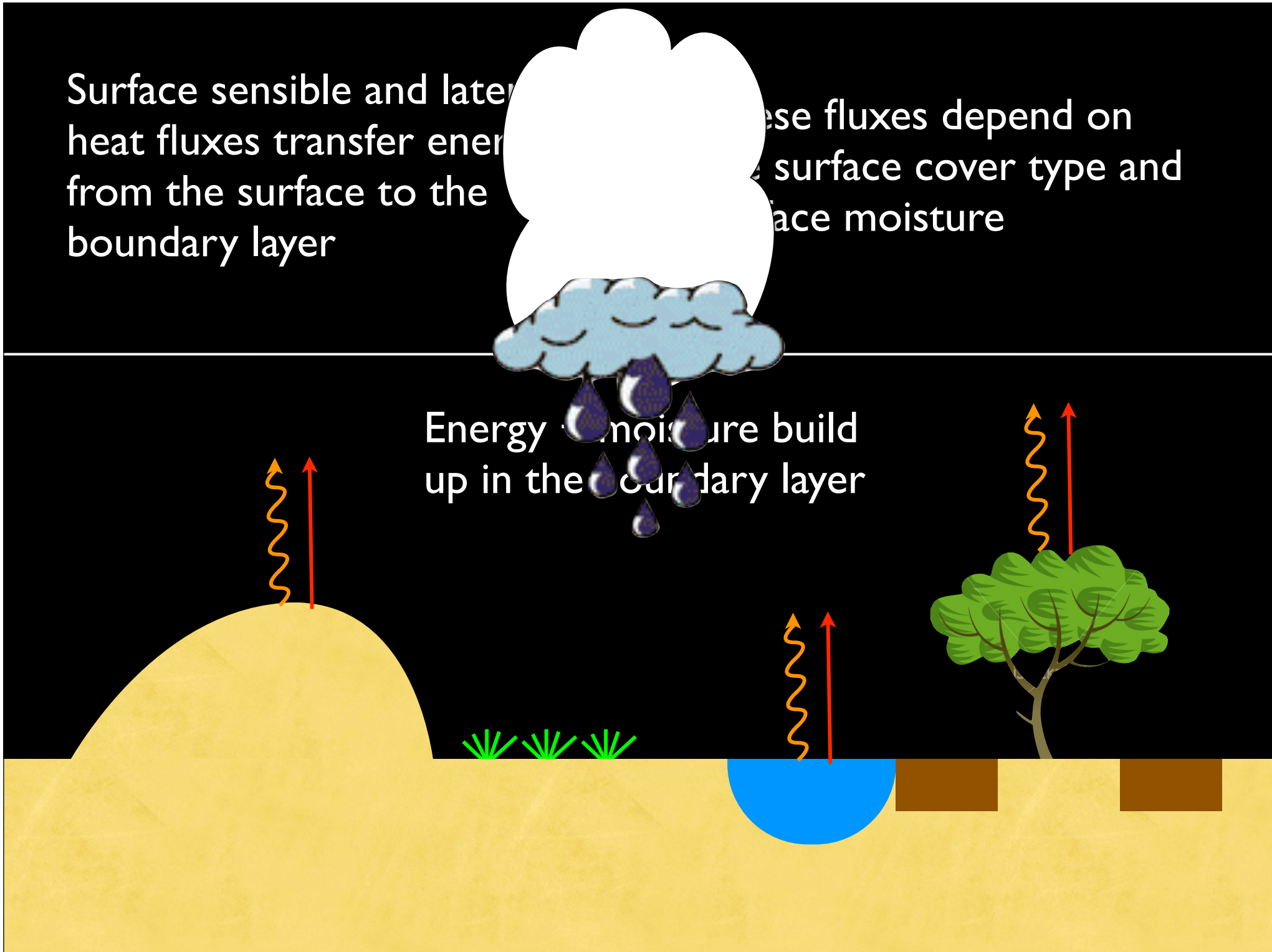
Different surface vegetation cover

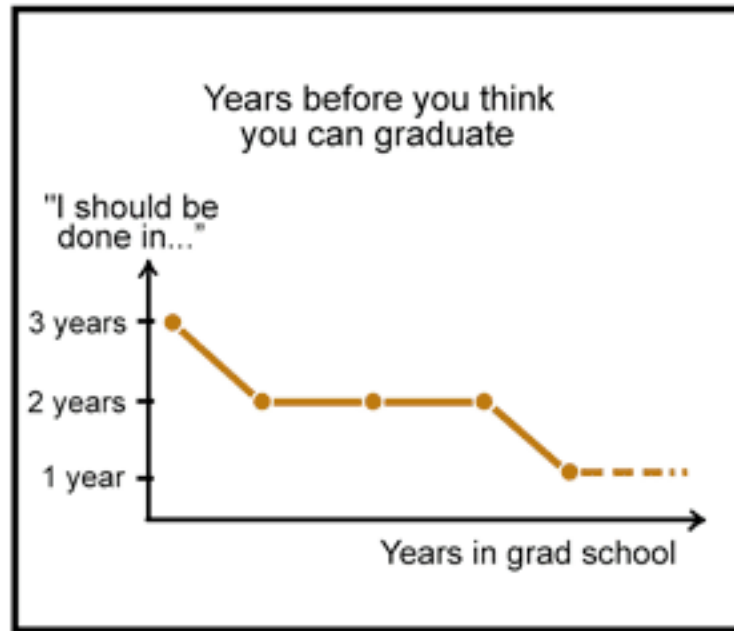


Surface sensible and latent heat fluxes transfer energy from the surface to the boundary layer

These fluxes depend on surface cover type and surface moisture

Energy and moisture build up in the boundary layer





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