

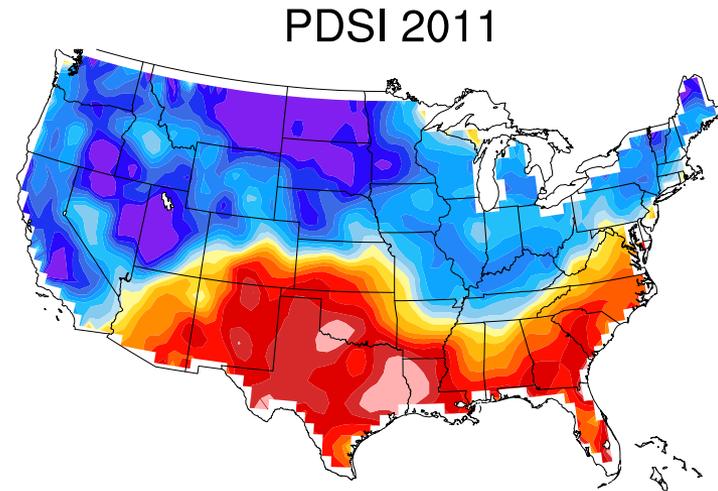
# Drought in the Central Plains: what effect do changes in the Great Plains low-level jet have?

Daniel Barandiaran & Simon Wang  
Climate Science Program  
Utah State University  
Kyle Hilburn, Remote Sensing Systems

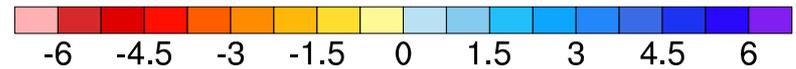
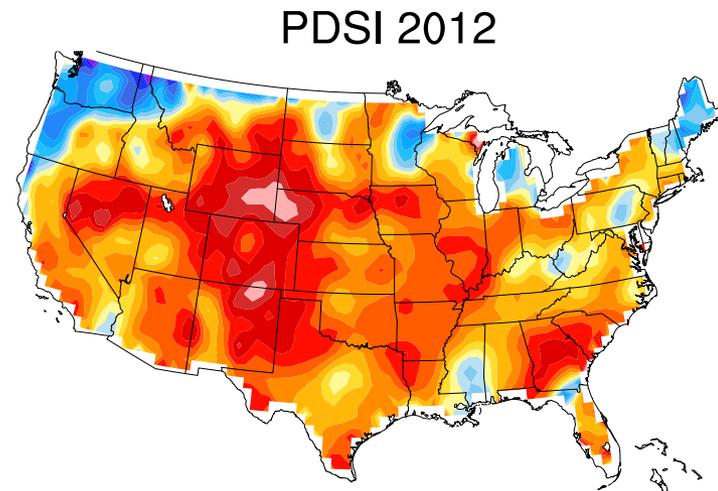


# Recent Drought

~\$12 bil. in damage

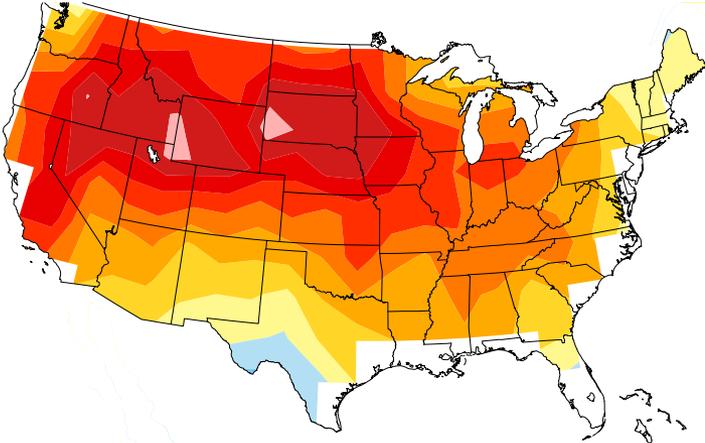


~\$30 bil. in damage  
still ongoing

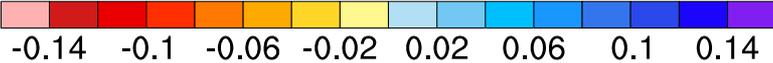
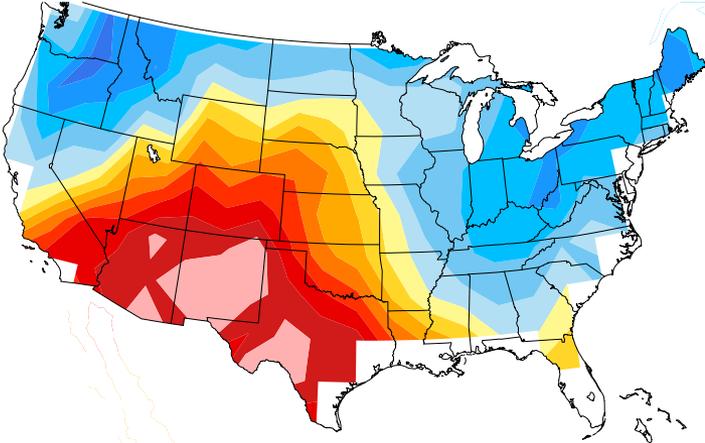


# Past Drought patterns

PDSI EOF 1 19.33%

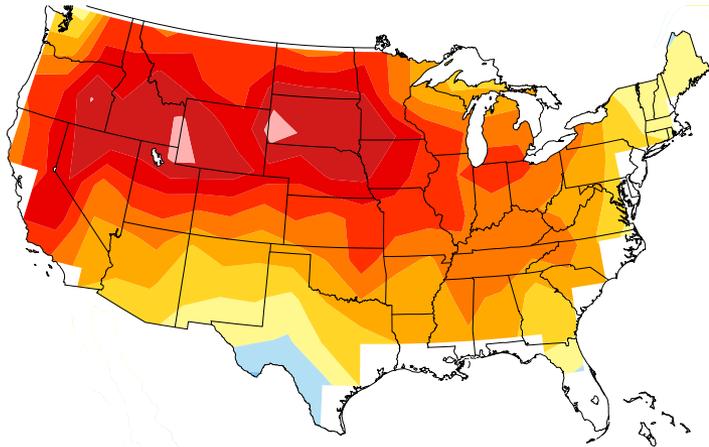


PDSI EOF 2 10.66%

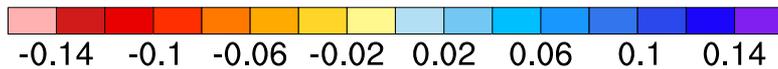
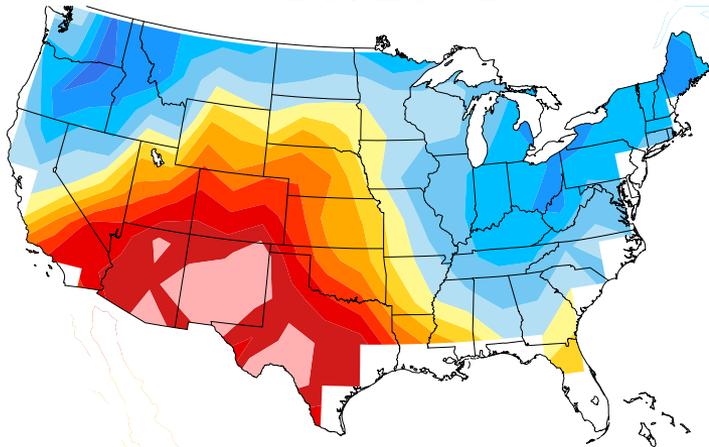


# Past Drought

PDSI EOF 1 19.33%

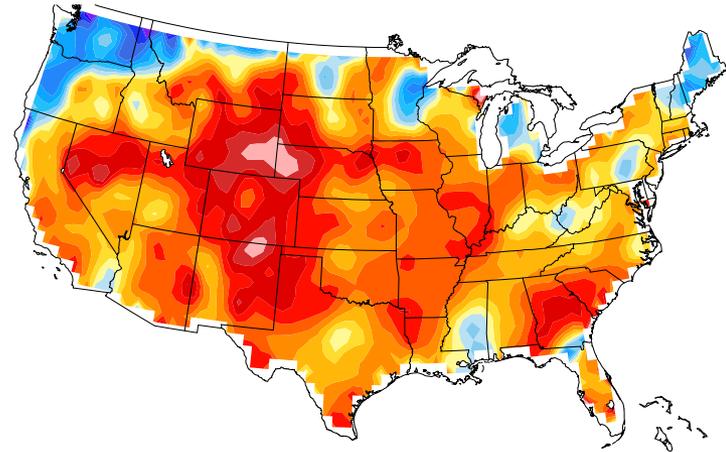


PDSI EOF 2 10.66%

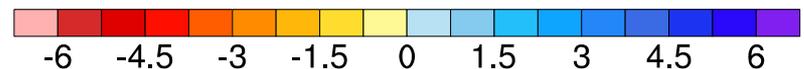
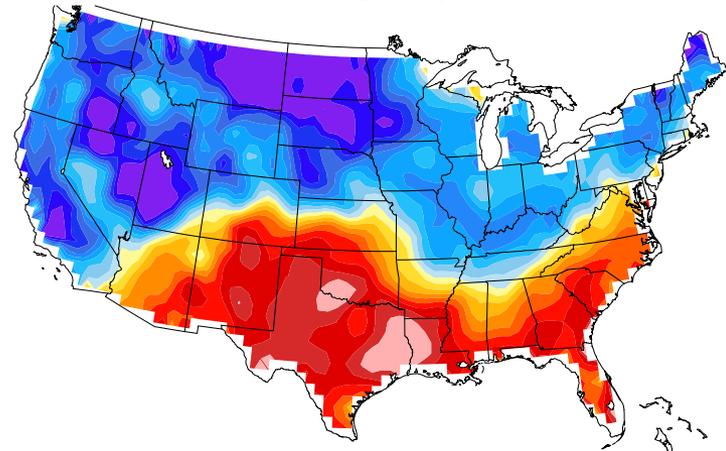


# Recent Drought

PDSI 2012

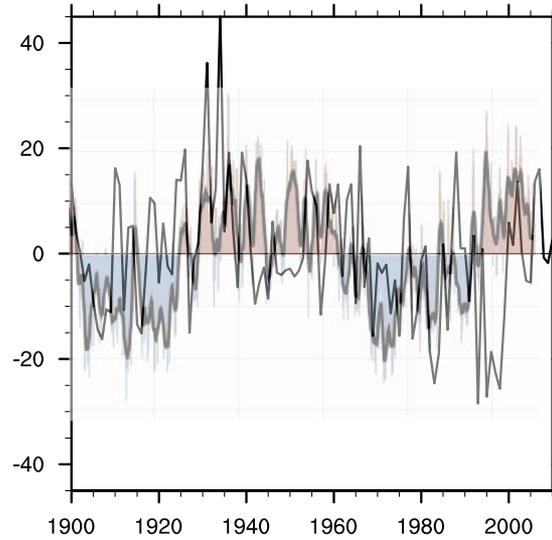
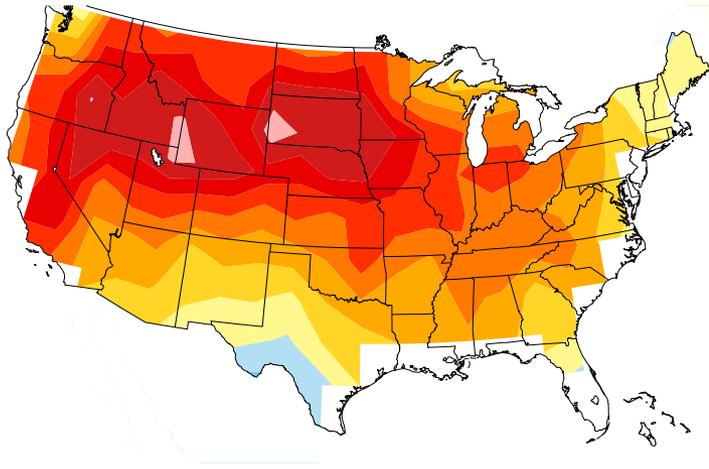


PDSI 2011



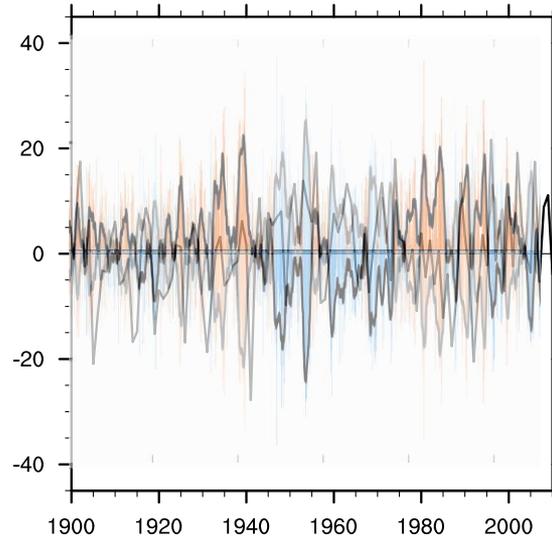
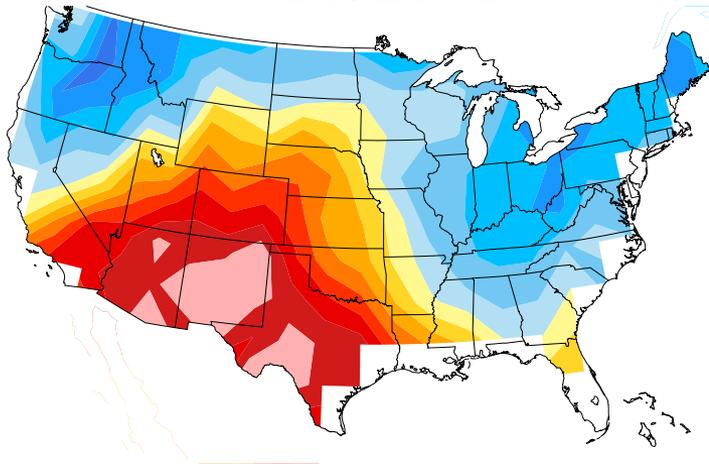
# EOF with PC Series

PDSI EOF 1 19.33%

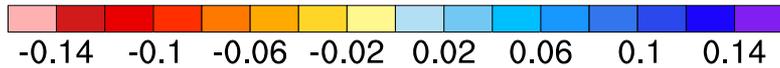


AMO

PDSI EOF 2 10.66%

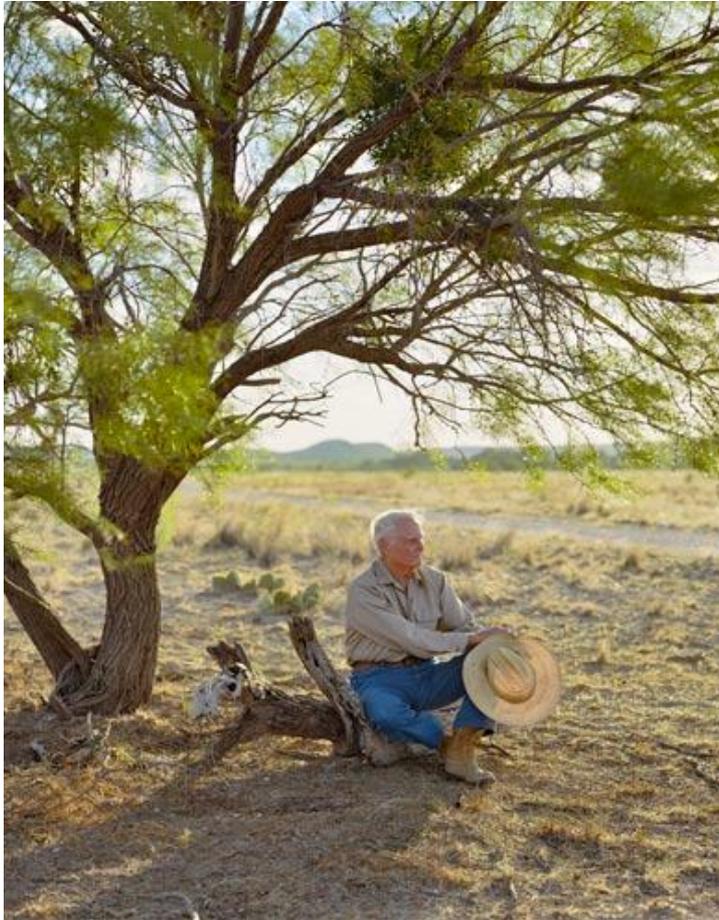


PDO



# What motivated our drought study?





## Texas: the new Dust Bowl

A local rancher described droughts of '30s and '50s, as well as recent drought.

North Texas has much of its rain during late spring, and during these droughts, "we just weren't getting any rain."

Sept. 2012

# The Spring Rainy Season

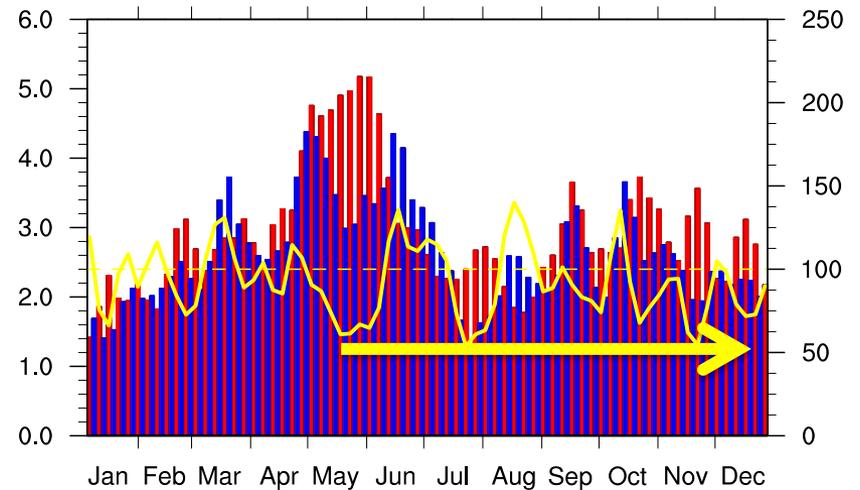
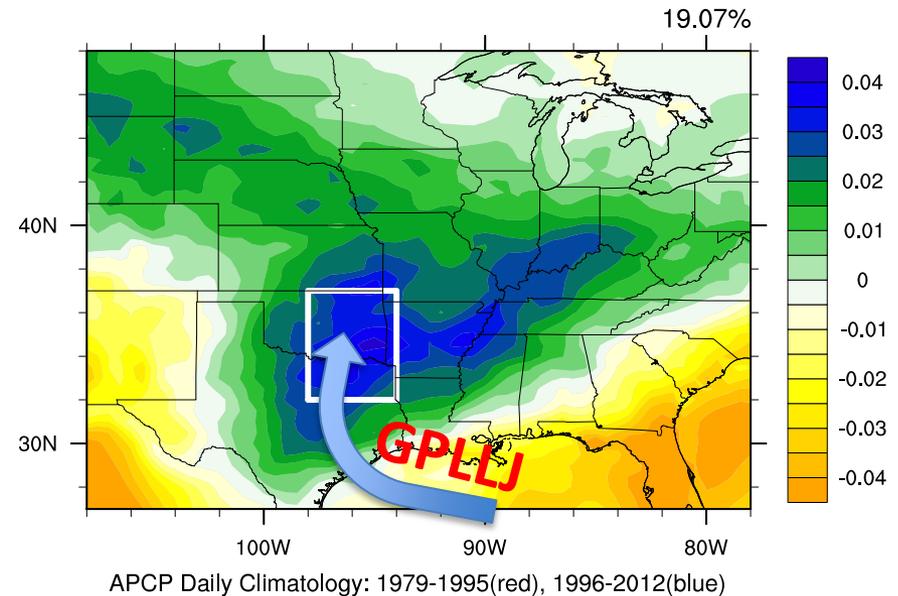
EOF2 of monthly precip →

PC2 with first part, fade out

1979-1995

vs.

1996-2012

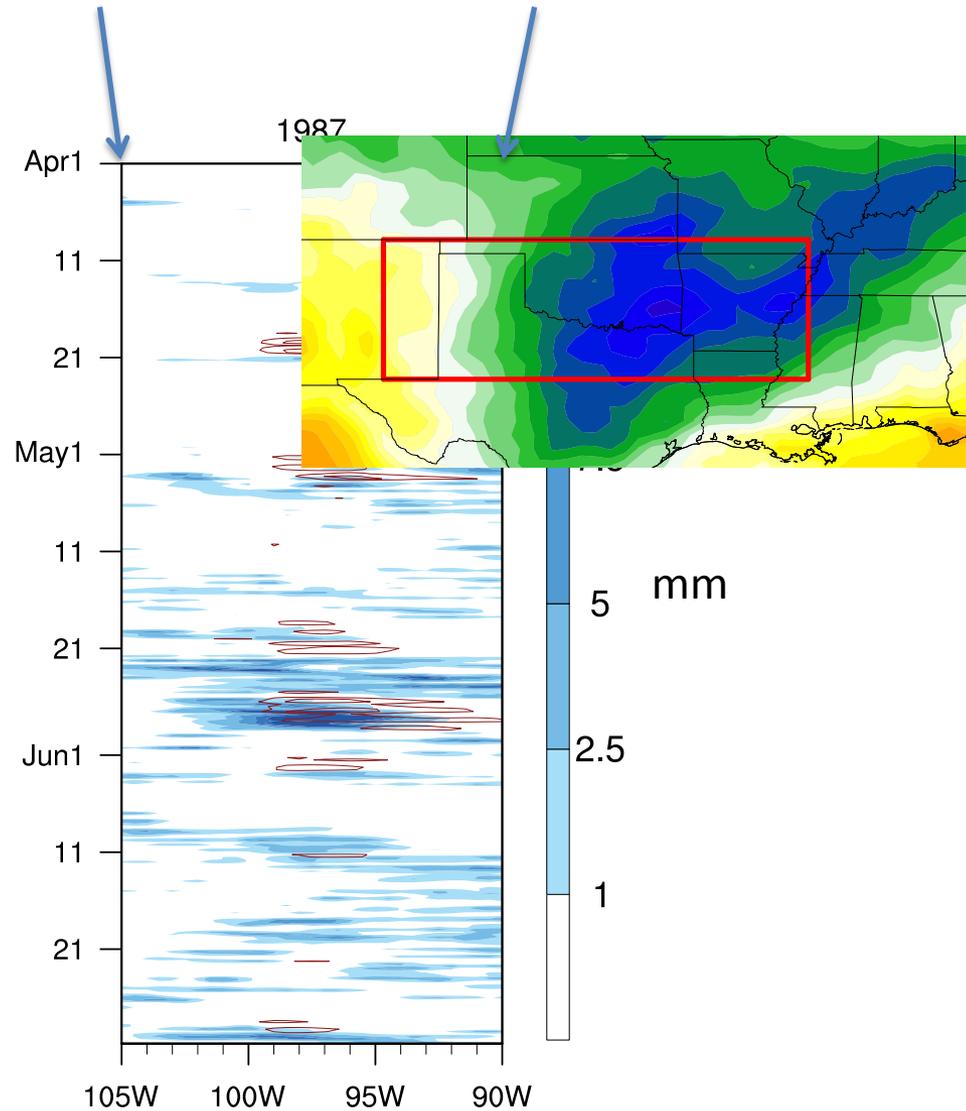


# Hovmöller Plots

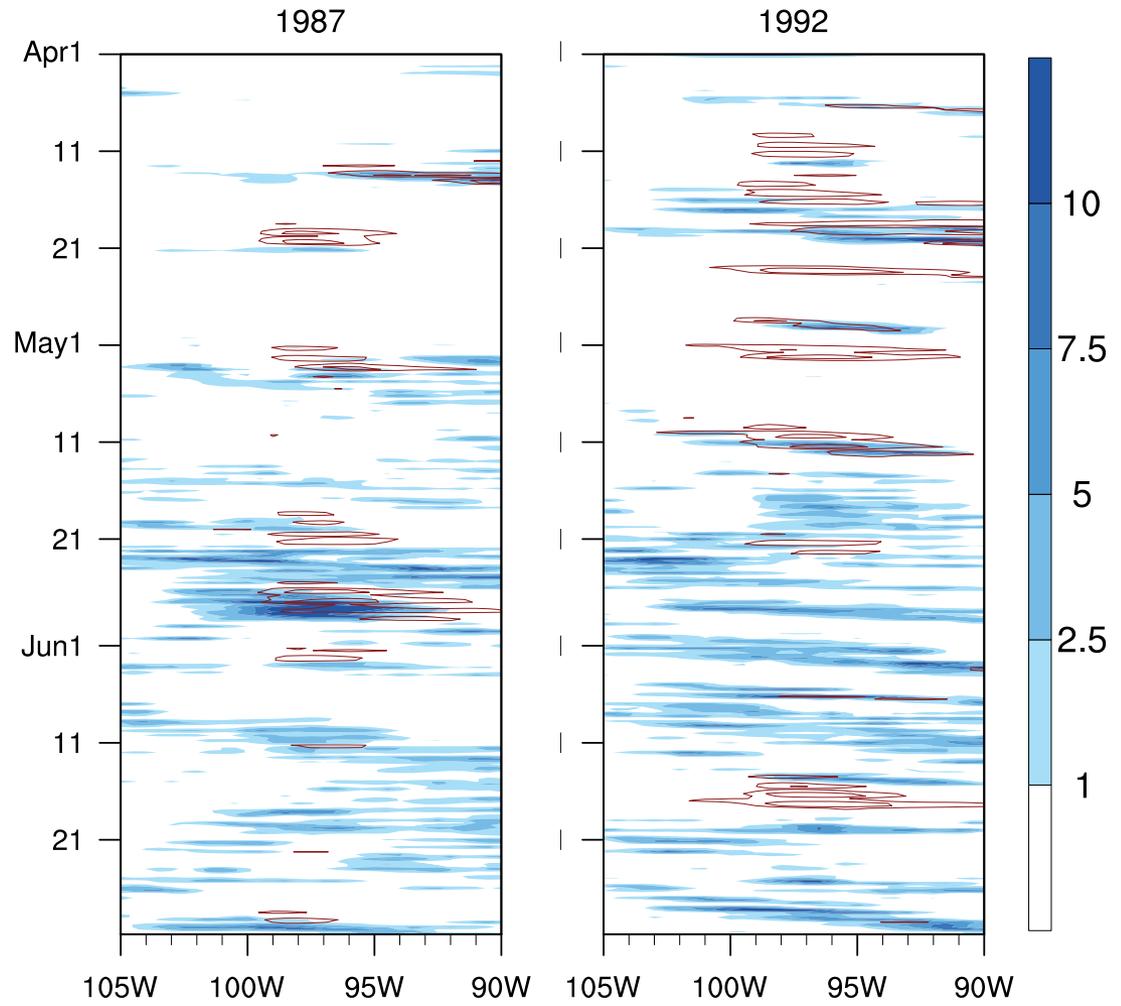
Averaged over latitude

Shows meridional evolution of weather over time.

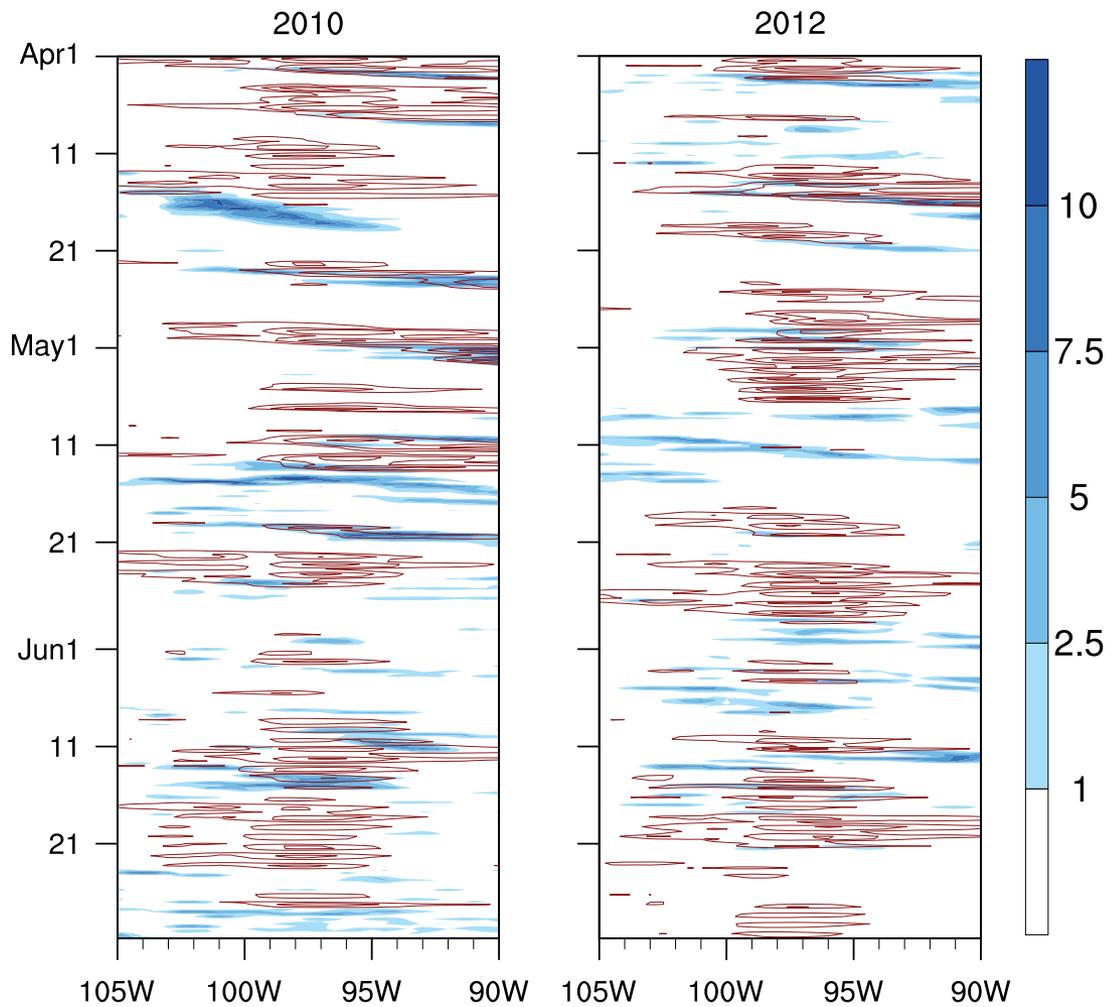
Plots depict the rainfall (shading) and the GPLLJ activity (contours).



# Wet Years



# Dry Years

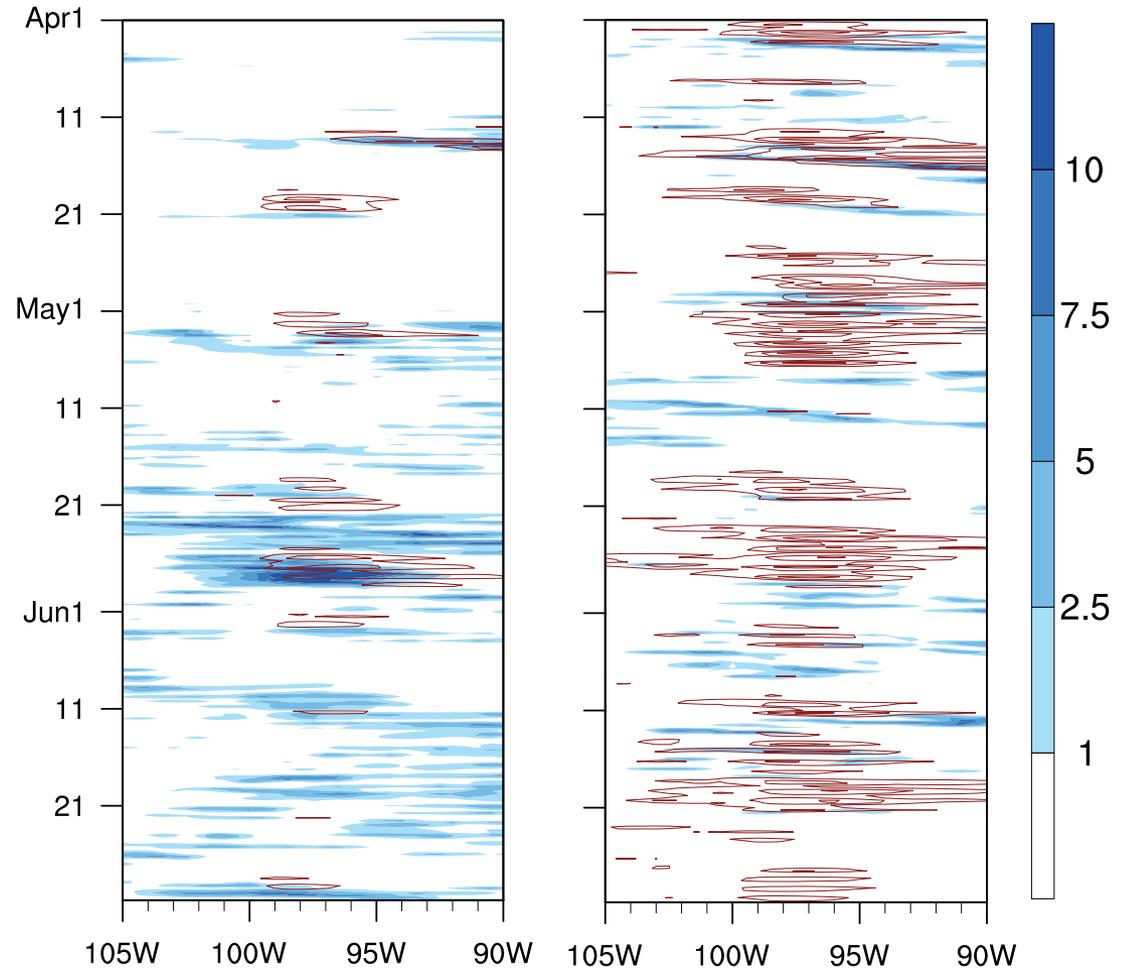


# Wet

# Dry

1987

2012

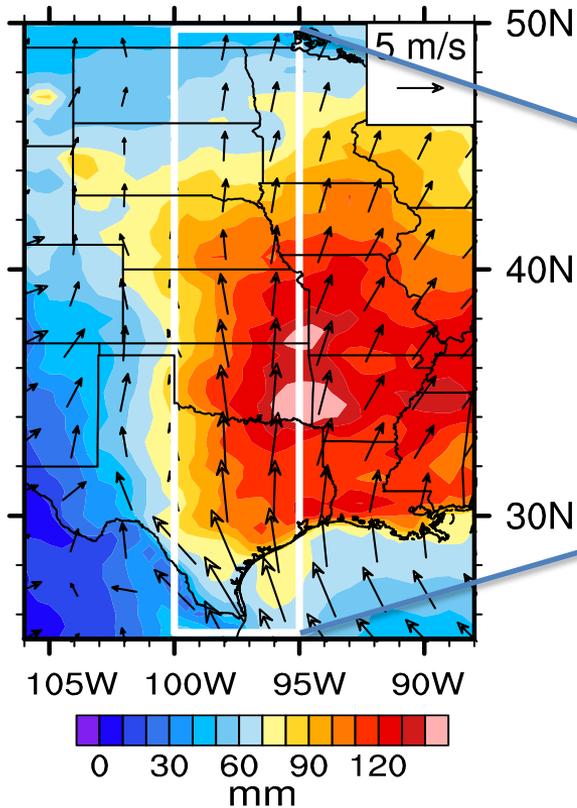


Northerly extent of LLJ  
is very important.

Jet exit region = Enhanced  
Precip

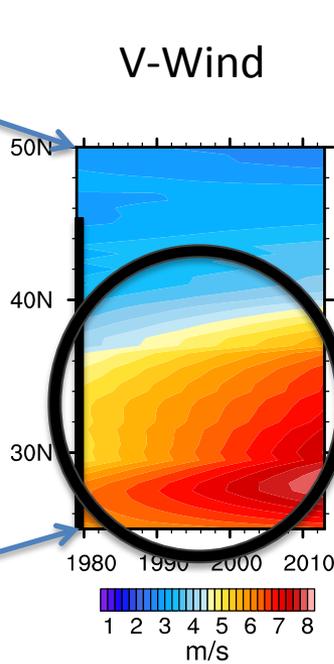
# Lat-Time Plots (long-term change)

## Climatology

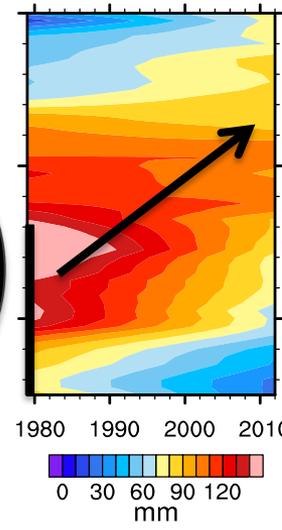


## May

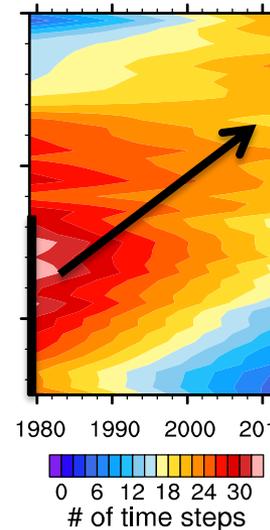
### V-Wind



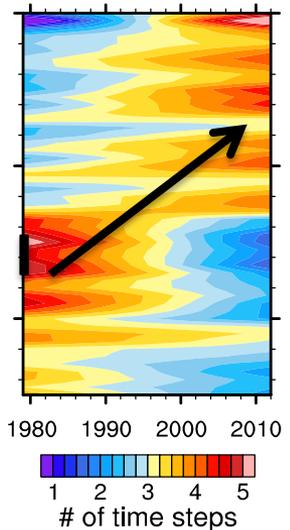
### Total Precip



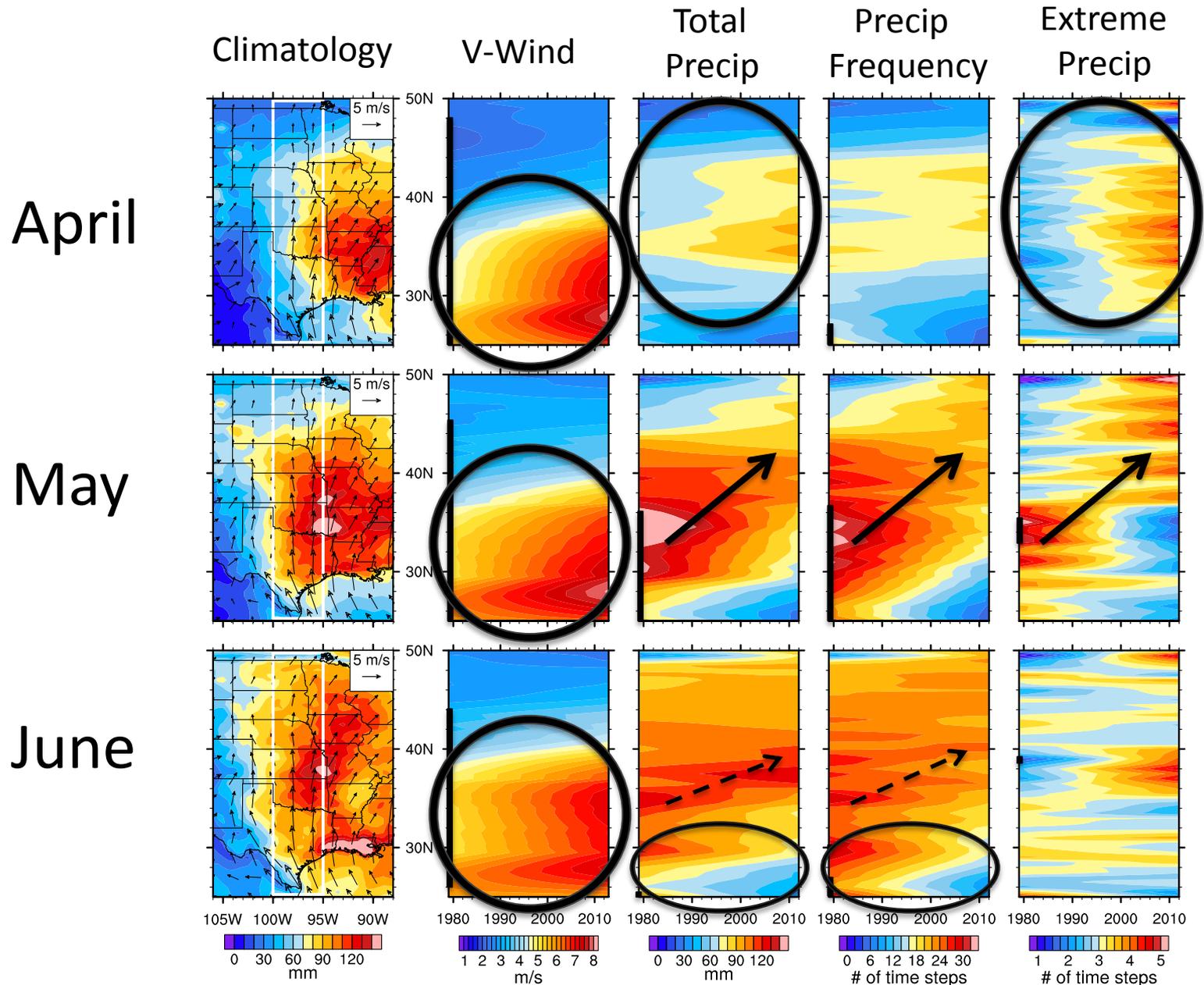
### Precip Frequency



### Extreme Precip



# Lat-Time Plots

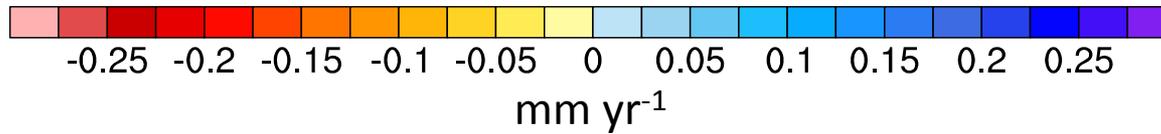
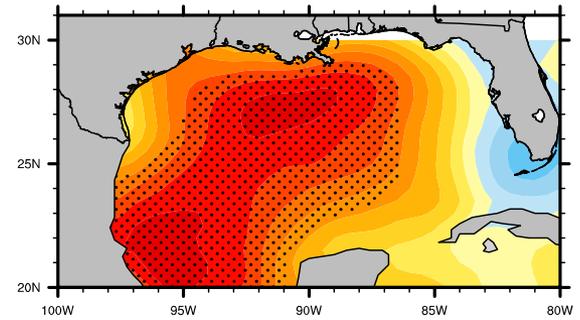
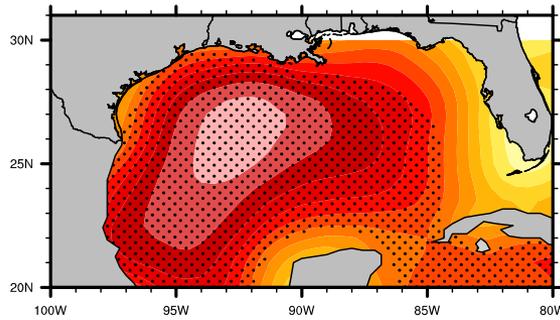
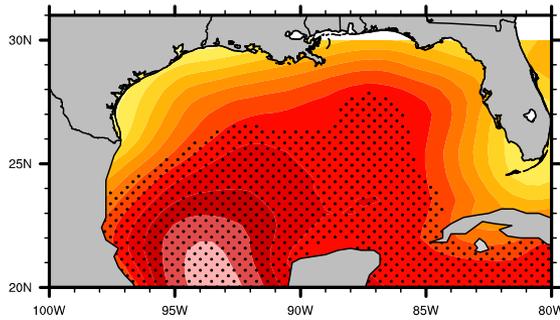


# What about source moisture?

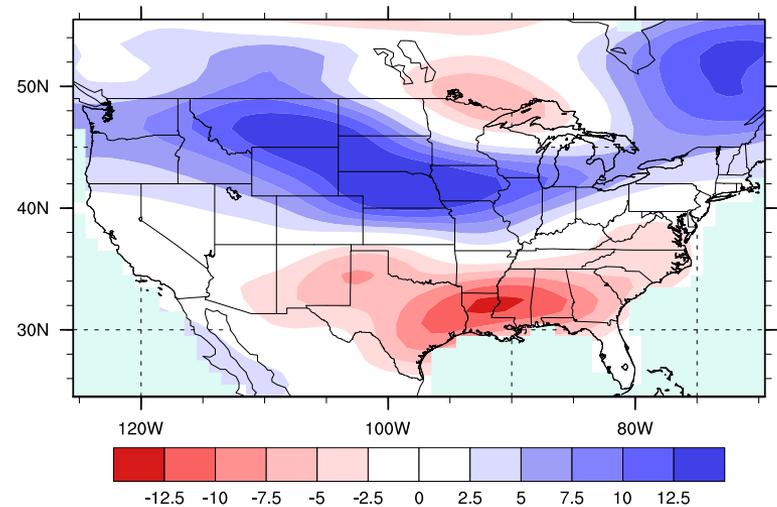
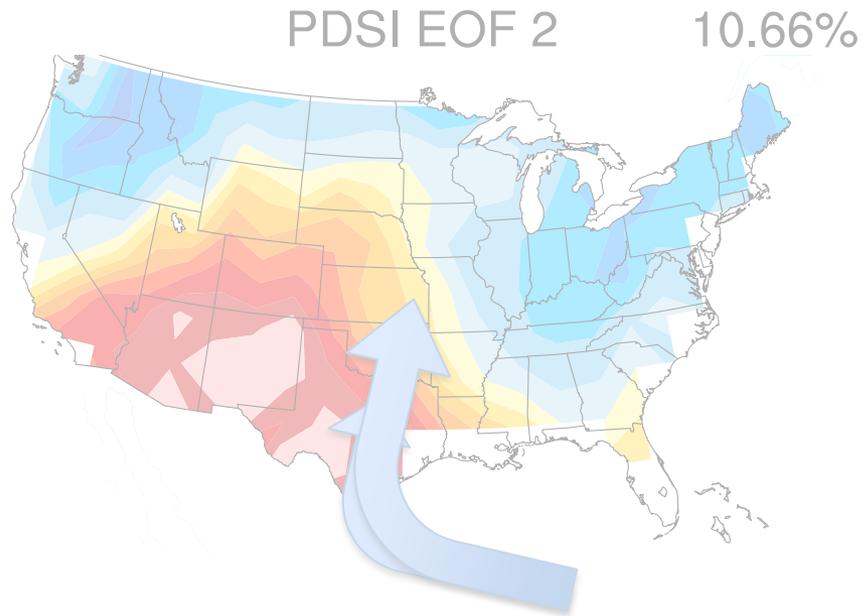
NARR  
SSM/I  
May

April

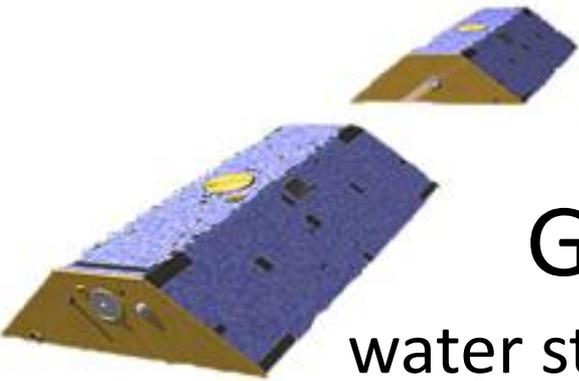
June



# Discussion

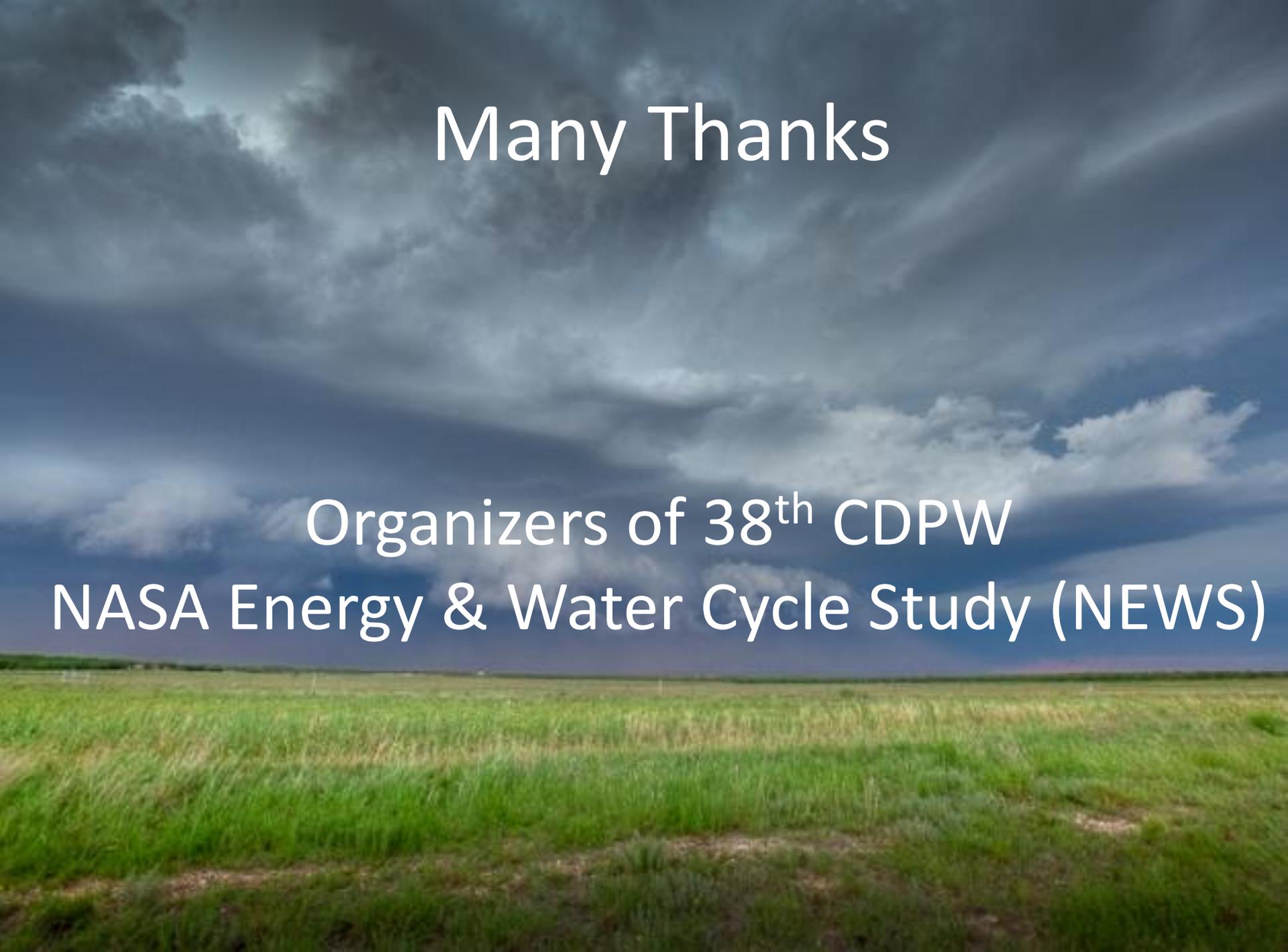


**GRACE**  
water storage change  
(2002-2012)



# Discussion

- Historical Studies:  
Weaver and Nigam (2008)  
Holt and Wang (2012)
- Future Studies:  
Cook et al. (2008)  
Patricola and Cook (2012)

A landscape photograph showing a vast green field in the foreground, leading to a flat horizon. The sky is filled with large, dark, grey clouds, with some lighter patches where the sun is breaking through, creating a dramatic and somewhat somber atmosphere.

Many Thanks

Organizers of 38<sup>th</sup> CDPW  
NASA Energy & Water Cycle Study (NEWS)

A wide-angle landscape photograph showing a lush green field in the foreground, extending to a flat horizon. The sky is filled with heavy, dark, grey clouds, with some lighter patches where sunlight breaks through, creating a dramatic and somewhat ominous atmosphere. The overall color palette is dominated by the greens of the grass and the greys and blues of the storm clouds.

Questions?