Climate Variability and Change Working Group
June 18, 8:42am, Ten Mile Room

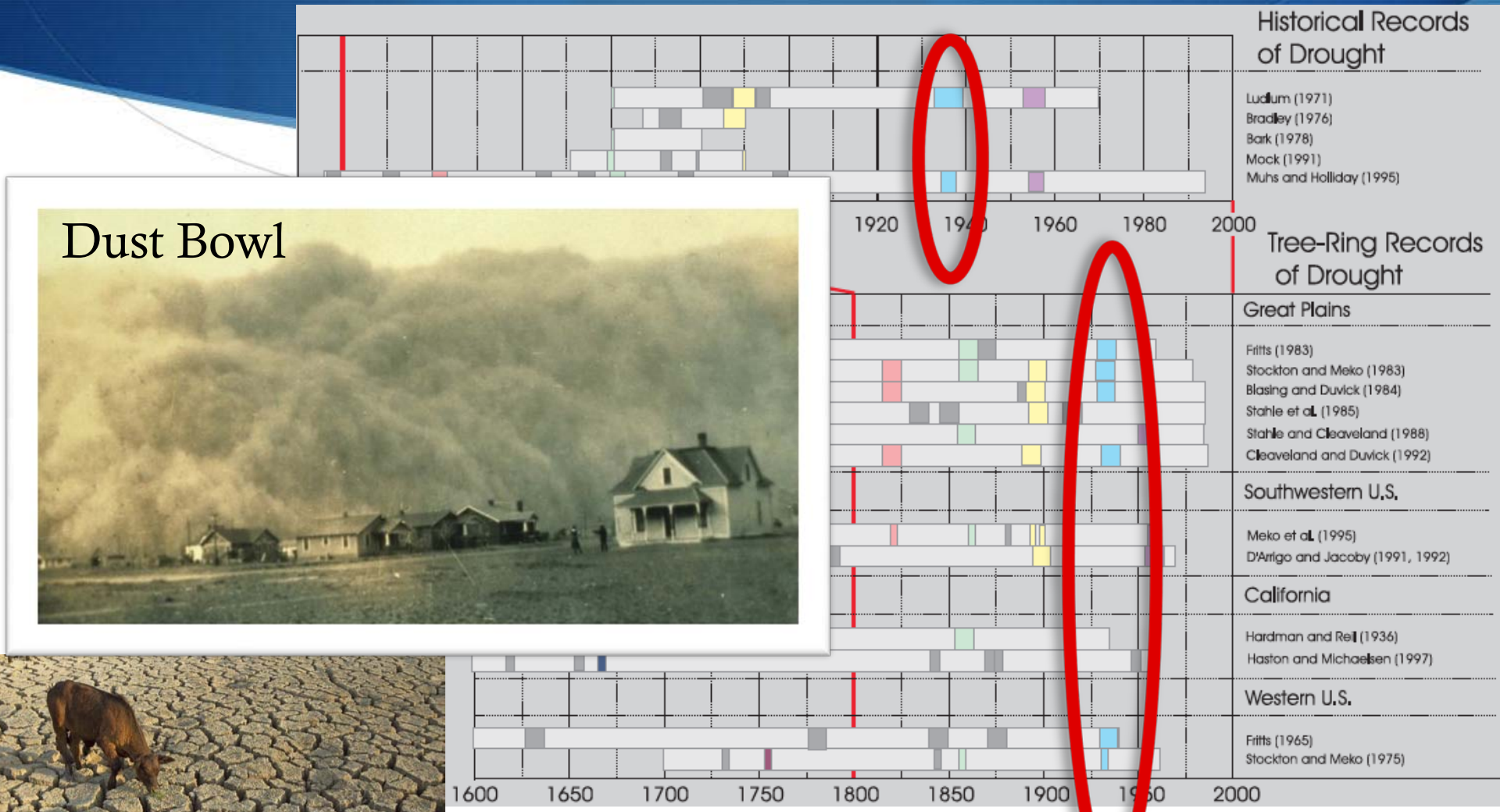
CESM workshop 2013,
Breckenridge, Colorado

Decadal potential predictability of North American hydrology in CESM

Y. Chikamoto, A. Timmermann, S. Stevenson, and P. DiNezio
IPRC, University of Hawaii at Manoa, Honolulu, HI, USA

Community Earth System Model

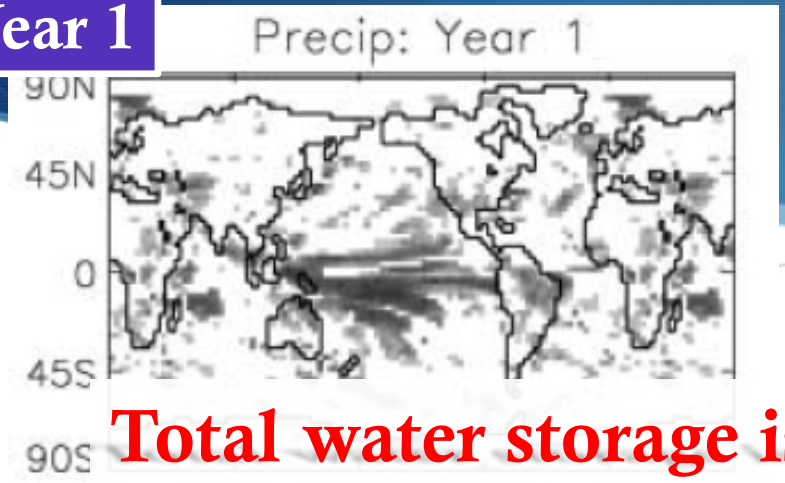
Mega-drought in US history



Woodhouse and Overpeck (1998)

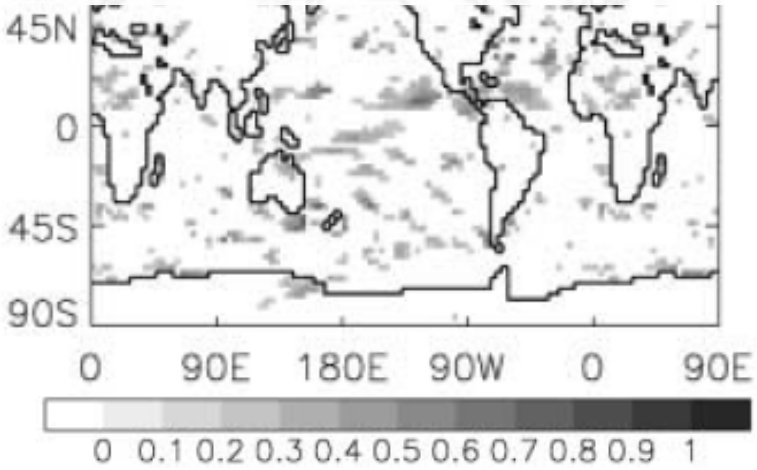
Predictability of precipitation

Year 1

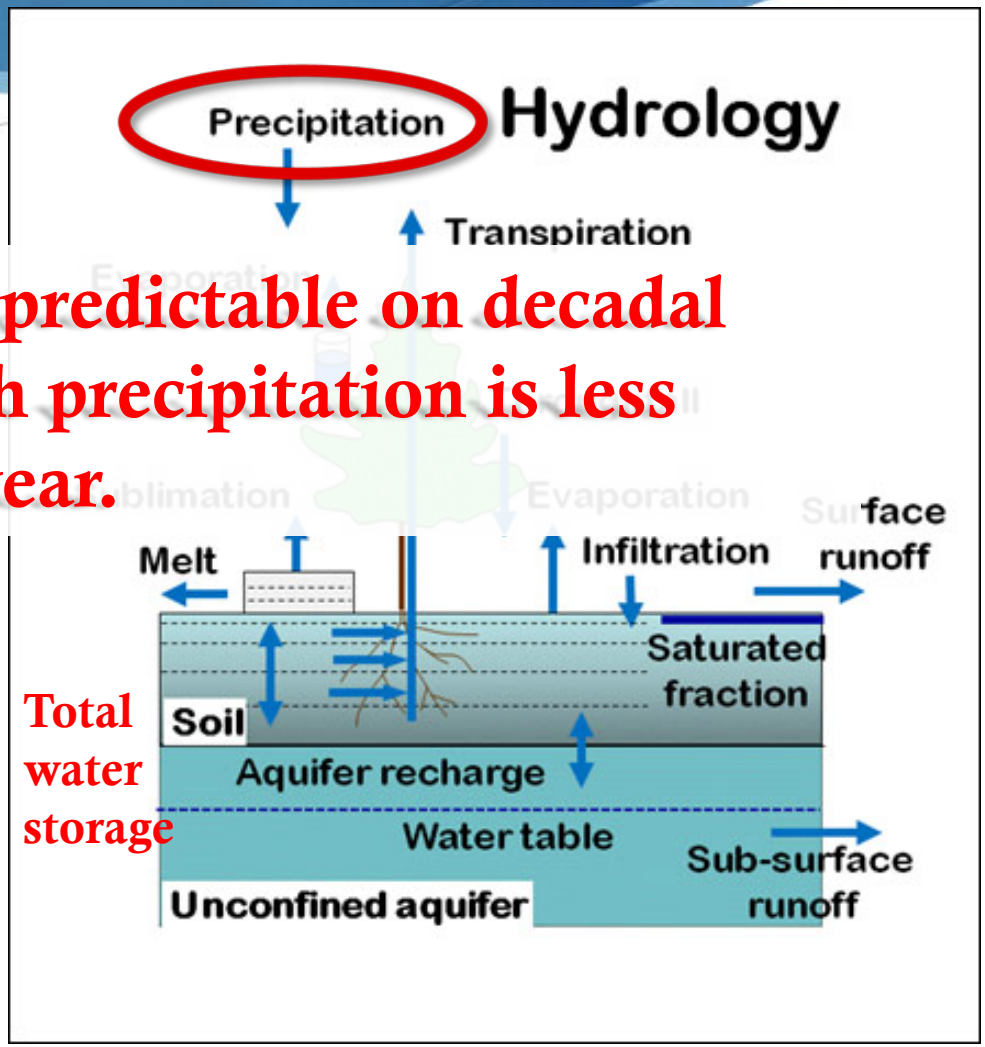


Total water storage is predictable on decadal timescales even though precipitation is less predictable beyond 1 year.

Year 5

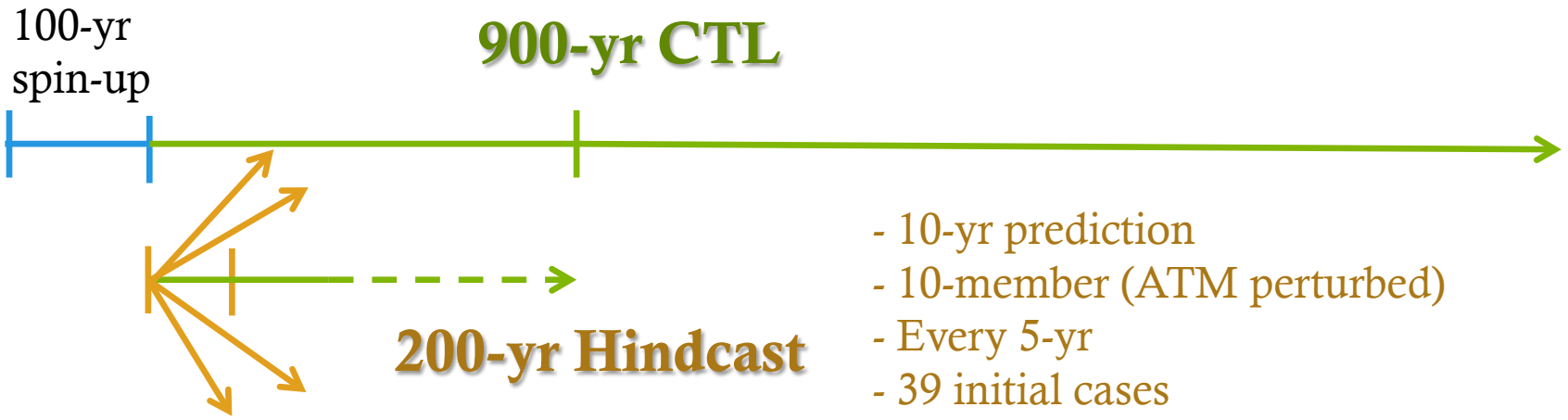


Collins (2002)



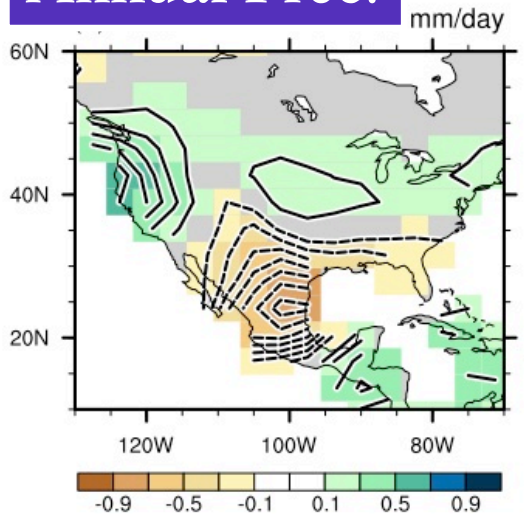
Model experiment

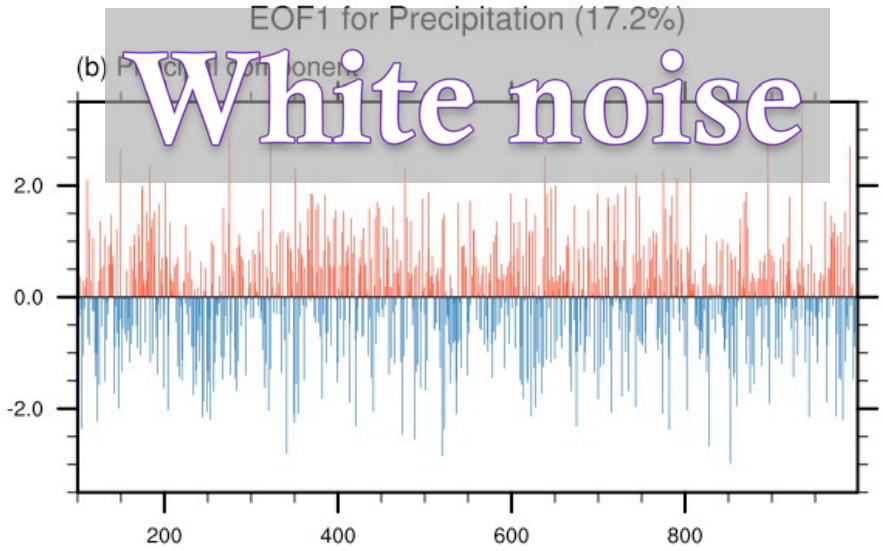
- Low-resolution version of CESM 1.0.3 (Shields et al. 2012)
  - ATM & LND: T31 L26
  - OCN & SEA ICE: 3 x 3 L60
- A 900-year-long pre-industrial control simulation (+100-yr spinup)
- Hindcast experiment for 200-yr CTL run.



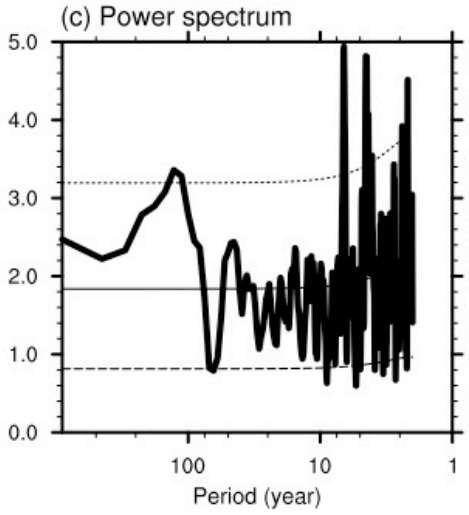
EOF1 for prec. and soil water

Annual Prec.

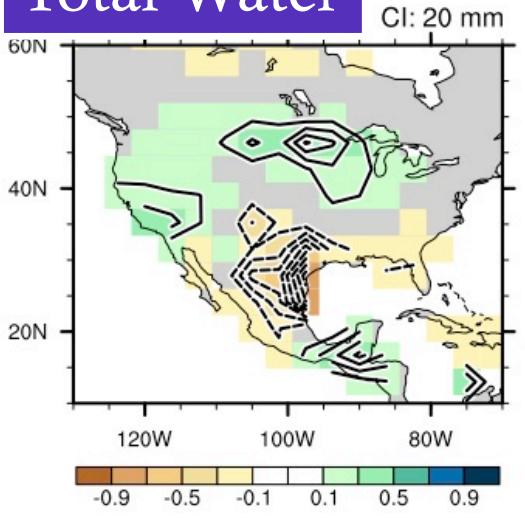


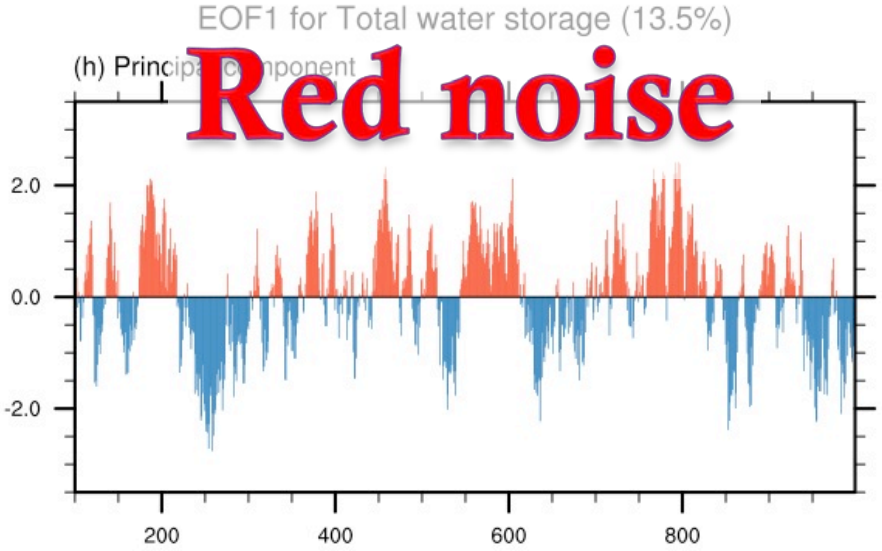


White noise

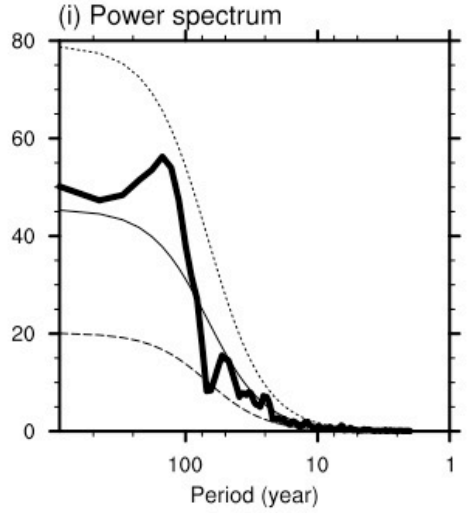


Total Water



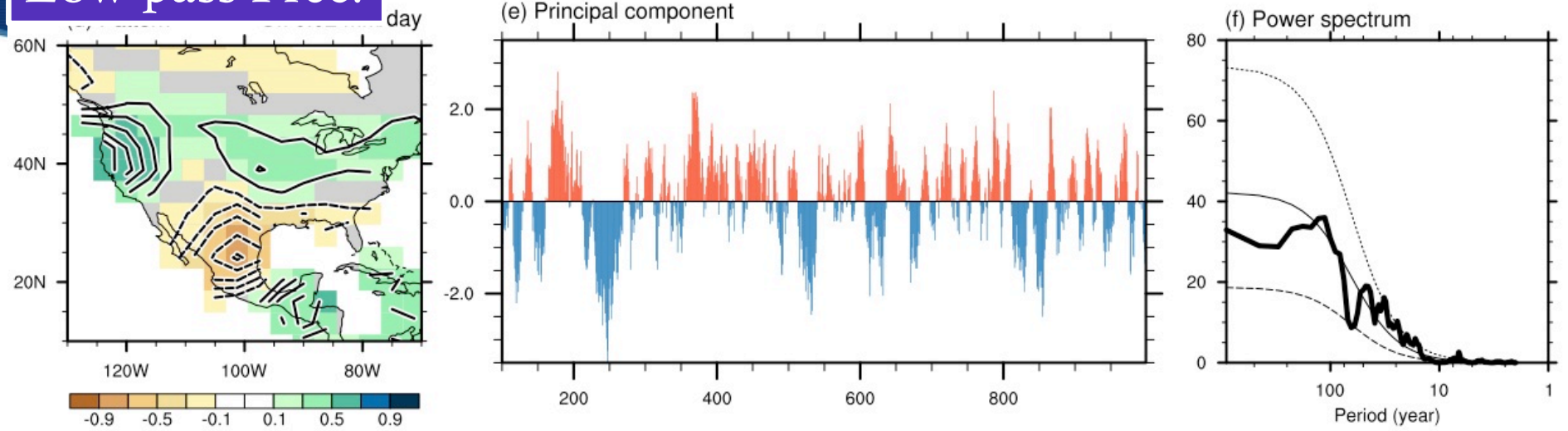


Red noise

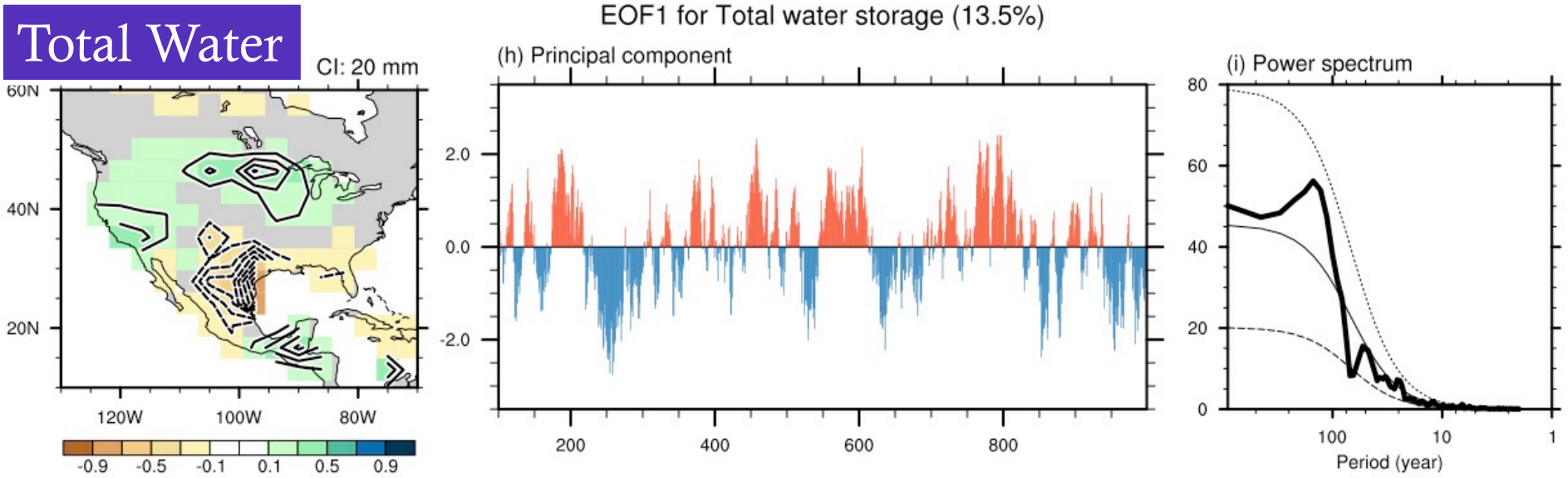


EOF1 for prec. and soil water

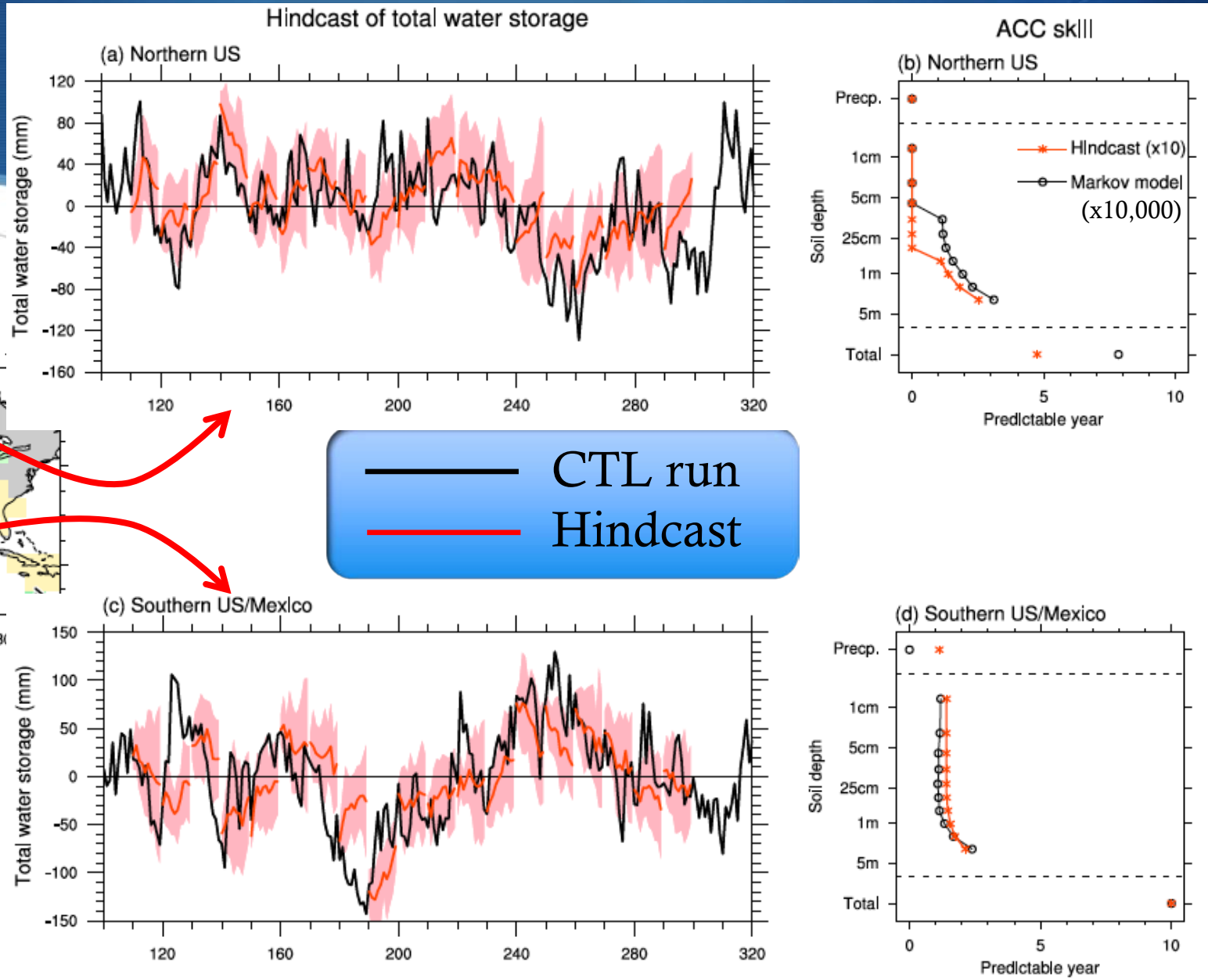
Low-pass Prec.



Total Water



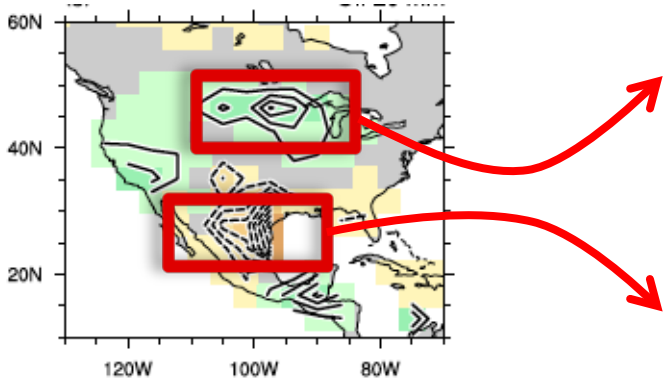
Hindcast exp. for total water storage

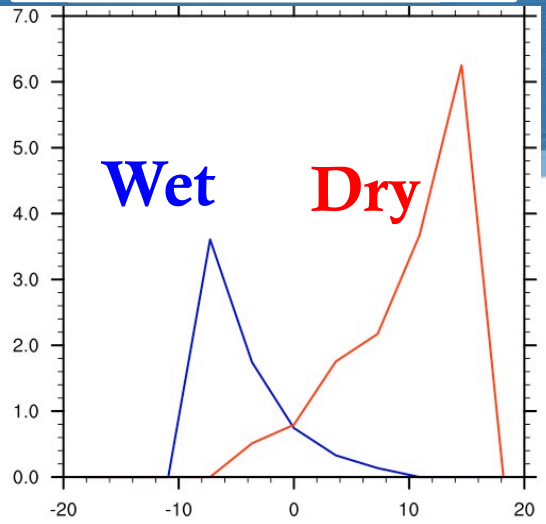


Impact of soil water on Fire Risk

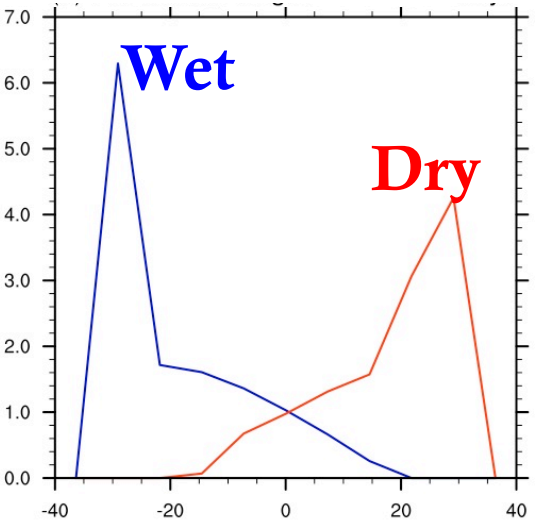
Fire RISK

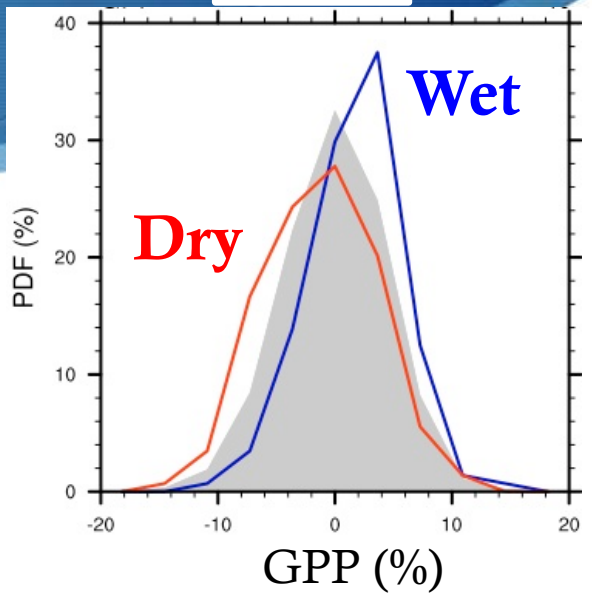
GPP



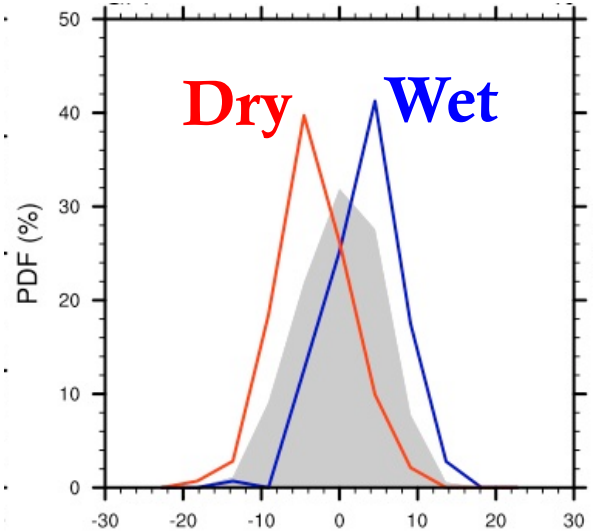


Fire season length (day)





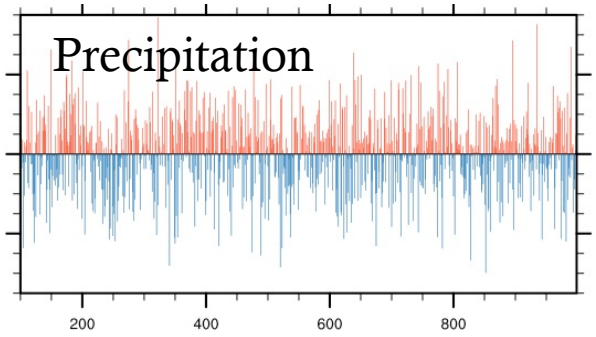
GPP (%)



Summary

- Precipitation is hard to predict beyond 1 year.
- But, total water storage is predictable on decadal timescales due to the filtering effect in soil.
- Below-normal soil water on decadal timescales would enhance the risk of wildfire occurrence and crop failure.

White noise



Red noise