Stochastically Generated North American Megadroughts

Sam Stevenson
University of Hawaii

Tuesday, June 18, 2013
“Megadroughts”: extreme events in the proxy record

Herweijer et al. (2008)
Palmer Drought Severity Index (PDSI) anomalies for drought events
Data from North American Drought Atlas (NADA; Cook et al. 2004)
Megadrought “conventional wisdom”: blame it on La Niña

Seager et al. (2008)

SST reconstructed from Palmyra coral:
(1360-1400)-(1886-1998)
NULL HYPOTHESIS

Can you get megadroughts from random atmospheric noise, without relying on ENSO?
Megadroughts/pluvials: 1000yr CESM T31x3 PI control


(Observed ann. cycle in precip)
Megadroughts/pluvials do happen without the ocean

**CTL:** fully coupled

**CLIM:** CAM4 w. SST ann. cycle

Tuesday, June 18, 2013
Results are robust to choice of region
Results are robust to choice of region
Cannot rule out chaotic midlatitude circulation “null hypothesis”

Dominant SLP modes show mixture of signatures from PNA/NPO/other influences: CTL, CLIM modes identical
Circulation during megadroughts differs in CTL, CLIM
Main conclusions

Events that look like megadroughts can occur with no ocean coupling.

Overall precip variability shows little ENSO signal... except possibly in the SE US.

Land/atmosphere coupling could be important; more work is needed to see whether land or ocean forcing matters more.

For more details... see Sally Langford’s poster!

CVC-6