Assessing the predictability of spring precursors to summer drought over Texas

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The exceptional drought that affected Texas in 2011 was notable in its intensification over late spring 2011. The term "flash drought" has been used repeatedly to refer to this sudden intensification. Was the spring intensification a random event? Or, is a dry spring a precursor to summer drought?

Observations show that convective inhibition (CIN), a key variable in summer drought in Texas, had a dramatic spike in late-April through early-May 2011. The increase in CIN coincided with the strong westerly zonal wind anomalies at 850 hPa that prevailed during the same period. An assessment of seasonal (DJF, MAM and JJA) rainfall deficits in past droughts, from 1895 to 2011, reveals that the 18 severe-to-extreme (PDSI < - 3) drought events experienced over Texas had below normal precipitation in all three seasons. Composites of April zonal winds at 850 hPa in these 18 extreme drought events show the prevalence of westerlies over Texas. CIN values also show spikes in April/May during past extreme drought years.

The westerly wind anomalies are strongly correlated with contemporaneous geopotential height anomalies at 850 hPa in the domain 180°W-70°W and 20°N-60°N, and with February SST anomalies in the central Pacific (NINO4) and north central Pacific (PDO region of action).

We assess the predictability of April zonal wind anomalies at 850 hPa (U850) over Texas using forecast fields of geopotential height and Pacific SSTs from Climate Forecast System version 2 (CFSv2). We estimate incremental skill increases with changes in lead time to ascertain the best lead time at which to issue a forecast of probable spring rainfall deficit. We next compare the skill of the CFSv2 April U850 forecasts with the skill of April U850 forecasts from the National Multi-model Ensemble (NMME).

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