Anatomy of an Extreme Event

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Texas Drought Outlook, August 2010

- Precipitation shortage is not a lock, but it’s a good bet
- Some areas will probably get lucky
- Odds start tilting around November-December
- La Nina “signal” remains strong until Spring
• Returning La Niña
  – Drought likely to continue
6 Month SPI Blend
April 23, 2012

Legend:
- Exceptional dryness
- Extreme dryness
- Severe dryness
- Moderate dryness
- Abnormal dryness
- Normal
- Abnormal wetness
- Moderate wetness
- Severe wetness
- Extreme wetness
- Exceptional wetness
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

**Intensity:**
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

**Drought Impact Types:**
- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

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http://droughtmonitor.unl.edu/

- Teamed up with NOAA’s Earth System Research Laboratory and Climate Prediction Center
- Broke down the 2011 heat wave into its root causes
- And now, for the (second) time…
Observed 2011 JJA Temperature

Degrees Celsius (°C)

Texas Summer (JJA) Temperature Departures

Degrees Celsius (°C) vs. Year

Probability Density Function

Degrees Celsius (°C) vs. Year

1895-1954

1955-2010

JJA 2011 OBS
From 1500-year “pre-industrial” simulation of CCSM4
Historical relationship: Summer Precipitation and Temperature

Texas: 1895–2010
Summer Pcpn vs. Summer Tmp
1981–2010 Reference Climatology

\[ R = -0.74 \]
\[ b = -0.019 \]
Atmosphere-only model, observed sea surface temperatures

Atmosphere-Ocean model, observed climate forcings
AMIP
Summer Tmp vs. Summer Pcpn

1981–2010

2011

R = -0.74
b = -0.021

R = -0.83
b = -0.023

CMIP5
Summer Tmp vs. Summer Pcpn

1981–2010

2011

R = -0.79
b = -0.025

R = -0.82
b = -0.026
Precipitation from eight hottest AMIP runs
Simulations of 1950-2010

Texas GFSv2 AMIP
Summer Pcpn vs. Summer Tmp

Temperature (°C)

Precipitation (%)
Dry going in, hot going through

Impact of Cumulative Drought
Texas JJA Temperature

Probability Density Function

Degrees Celsius (°C)

Unconditioned
Dry Oct-May/JJA

OBS
Warming in Texas

Texas–JJA Tmp Trend
CMIP5/GFSv2 and Observed

°C/Decade

Year

Global operational forecast models, initialized in May 2011.
Results

• Not impossible through natural effects alone
• The lack of rain was natural
• 40% of heat due to sea surface temps
• 40% of heat due to weather randomness
• 20% of heat due to global warming
P.S. Latest Texas Outlook

• El Niño probably not going to happen
• Little tilting of the odds this winter
• Maybe best chance to break drought before possible La Niña next year
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