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A NOAA RISA TEAM

Southern Climate Monitor

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Can Community Defined Critical Thresholds Make Climate Meaningful?

Sascha Petersen, Co-Founder, Adaptation International

We all know that communities across the south central region, the country, and even the world are already experiencing the effects of climate change. They have to deal with extreme weather events on a nearly annual basis. In the last five years, there has been at least one billion-dollar precipitation-related event (i.e. flood or drought episode) in every state on the continental US[1]. We also all know that climate change is likely to exacerbate these impacts and make those extreme events more frequent or more intense[2].

Yet, the general approach to discussing climate change and local community impacts over the last decade has been to start first with the global climate models and try to convince communities that those changes will matter to them. Too often the conversation starts with graphics like the correlation between atmospheric concentration of Carbon Dioxide (CO2) and global average temperatures (Figure 1). Yet that is not what matters to local communities.

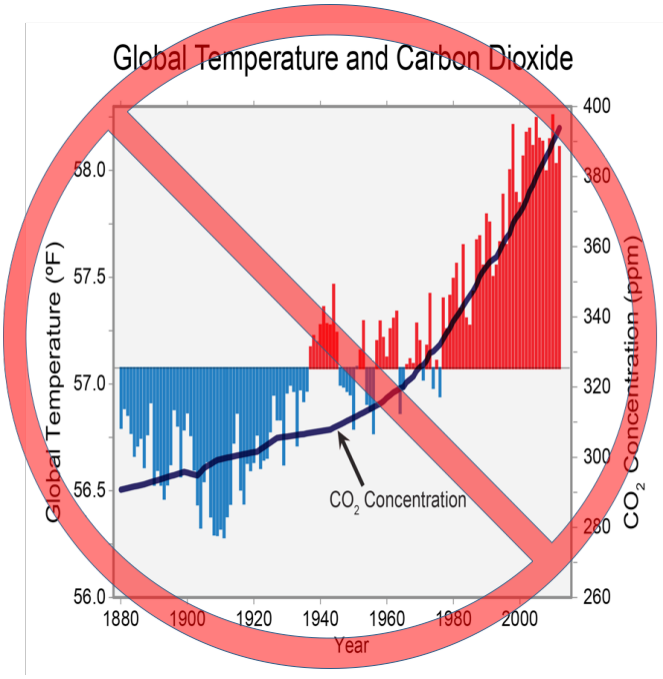


Figure 1: National Climate Assessment 2014

What matters to communities is when weather goes from being a nuisance to a problem. What matters to them is when their streets are flooded and residents' lives disrupted. What matters is when the temperatures are so hot that it endangers outdoor workers, older adults, and those with chronic health conditions. What matters is when ice storms coat tree branches, weighing them down, and knocking them into powerlines, potentially causing power outage when that electricity is really needed.

Adaptation International was fortunate enough to work with the Southern Climate Impacts Planning Program (SCIPP) at OU, the Climate Impact Assessment for the Southwest (CLIMAS), the Institute for Social and Environmental Transition (ISET), and ATMOS Research in a project funded by NOAA's Sectoral Applications Research Program to pilot a new approach to identifying critical extreme weather event thresholds. An approach that focuses first on what matters to the community and then brings in the climate change projections.

Over the course of 2015 and 2016, the project team worked with four small to medium-sized communities in the South Central United States: Boulder, CO; Las Cruces, NM; Miami, OK; and San Angelo, TX team to: 1.Collaborate on identifying critical thresholds for extreme weather events in their communities; 2.Create downscaled climate projections specific to those thresholds; 3. Review the customized climate projections; and 4. Identify and implement a resilience action project.

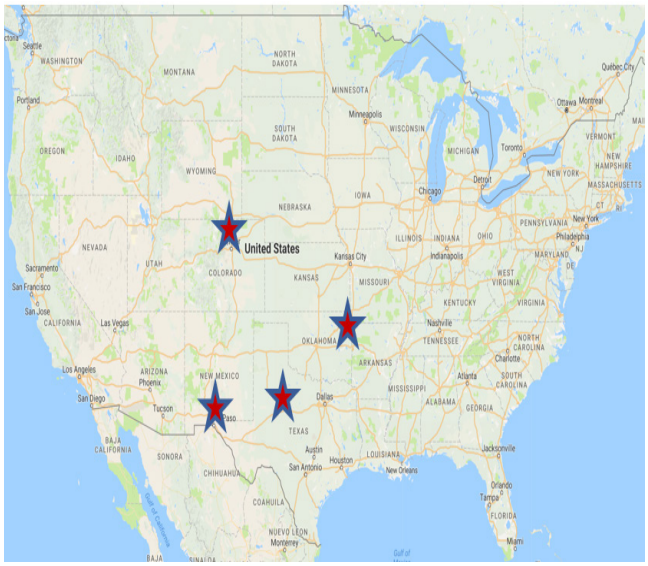


Figure 2: Four pilot cities who participated in the extreme events threshold project. Clockwise from top left - Boulder, CO; Miami, OK; San Angelo, TX; and Las Cruces, NM

A lot can be learned from the four pilot communities both about the potential value of using community-defined thresholds, and the nature of adaptation and building resilience in small and medium-sized communities across the United States.

Using a combination of workshops, meetings, and conference calls, the communities identified 10-30 thresholds of concern. Community participants represented a diverse range of city departments, local organizations, and state or federal agencies. Some of the thresholds identified could easily be used to customize downscaled climate model outputs (such as daily maximum temperature thresholds - Figure 3), while others were important but too complicated to be accurately modeled in this project (e.g. wildfire and ice storms).

In one of the most exciting aspects of the project, the grant provided seed funding for each pilot community to identify and complete a resilience action. These resilience actions were developed during a second workshop where the project team brought the results of the customized climate projections back to the communities and they discussed the implications of those changes and what they could do to be better prepared for those changes.

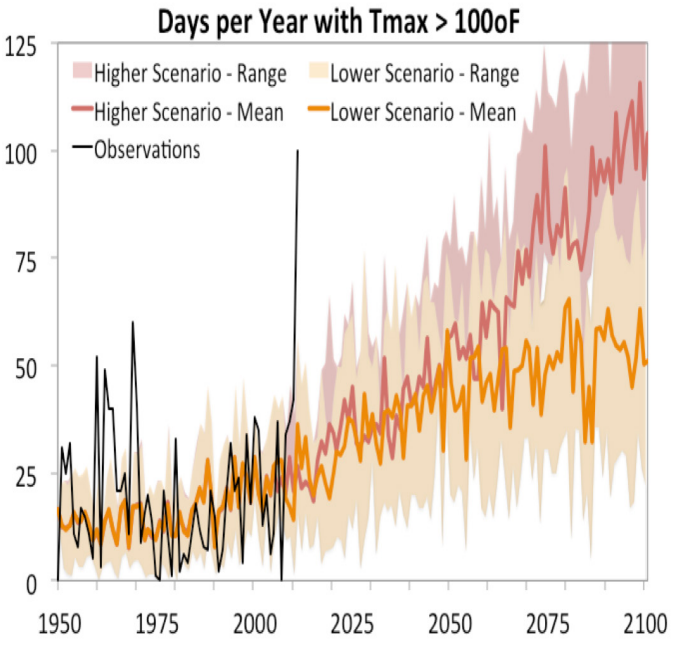


Figure 3: Number of days per year above 100 Degrees F in San Angelo, TX. Historical Observations (black line) and two different climate projections a lower warming scenario (RCP 4.5) shown in orange and a higher warming scenario (RCP 8.5) show in red

Figure 4: City of Boulder Department Climate workshop conducted as an outshoot of the extreme thresholds project. Photo Credit: Russ Sands

Communities are opportunistic when acting to build community resilience. In most cases, the communities chose resilience projects that fit with on-going efforts. In San Angelo, for example, that choice was based on a combination of pragmatism and political feasibility. The city had a nascent residential rainwater harvesting program they were trying to grow and was already supported by the city council. They had also already investigated the potential installation of a larger rainwater harvesting system in a central city park and knew that it could be done within the budget and time constraints for the project. This does not mean that the selected projects did not address climate concerns or build climate resilience, rather it highlights that there are many factors that influence action and whether those actions are initiated and successful. Each community selected a project that has co-benefits and helps build more than one aspect of resilience. For example, in Las Cruces, the rainwater harvesting project and green infrastructure plan not only reduced physical drought vulnerability in the area near the project, but also helped the city develop a more integrated planning process for infrastructure that addresses an underserved portion of the community. This effort was the catalyst for a $400,000 future investment in green storm water infrastructure in that same historically underserved community.

Figure 5: Students in Miami, OK completing hands on experiment and learning about extreme weather events, critical thresholds, and preparedness. Photo Credit – Danny Mattox

In Miami, the selected project focused on developing and teaching a classroom lesson to all eighth graders in the community focusing on extreme weather thresholds and preparedness. This effort helped reach a broad set of families (through their children), built the awareness of appropriate extreme weather responses, and helped strengthen the city's connection with the school district and the community.

The thresholds concept is useful as an entry point for discussions about climate change. It helped ground conversations in issues that matter to local stakeholders, helped put projected climate changes in the context of the past extreme events, and provided a foundation for presentations and discussions that demystified the black box of complex global climate models.

Nevertheless, most participants were either not prepared or not motivated to think beyond the daily-to-weekly time scales. This is perhaps because most participants' job responsibilities are associated with these shorter time-frames or because professional standards of planning practice (e.g., civil engineering design standards) do not yet incorporate climate projections. Further research on these perceptions and constraints would be useful in informing future climate change adaptation planning.

Successful co-production of actionable science, based on the extreme weather events thresholds concept, shows potential to bridge the gap between climate science and on-the-ground action to build resilience.

We are especially grateful for the active participation and insights provided by the participants in each of the pilot communities and the generous funding by NOAA's SARP Program, without which this project wouldn't have been possible. For more information on this project and additional project reports, videos, summary sheets, and other materials, visit www.adaptationinternational.com/projects or contact Sascha Petersen, sascha@adaptationinternational.com.

Funded By

References

[1] https://www.ncdc.noaa.gov/billions/mapping

[2] IPCC, 2012: Summary for Policymakers. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 1-19.

Drought Update

Kyle Brehe and Rudy Bartels,
Southern Regional Climate Center

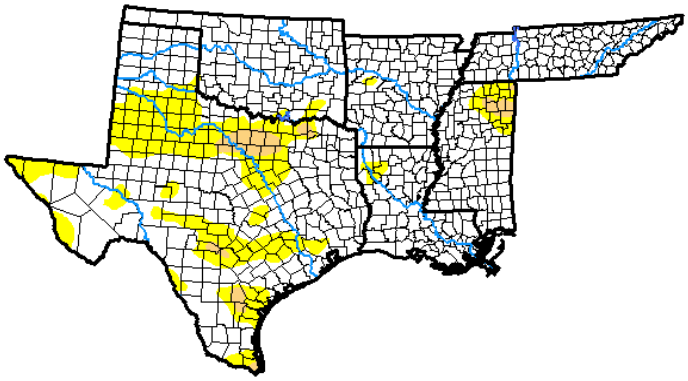
Over the month of May 2017, drought conditions improved for some parts of the region, such as areas in eastern Oklahoma, northern Louisiana, and western Arkansas. There were areas in northern Texas and a few counties in central Texas the entered moderate drought. Northeastern Mississippi stayed in moderate drought conditions from April into May. During the month of May, all of Tennessee and most of Oklahoma, Arkansas, and Louisiana experienced normal conditions. At this time, there are no areas experiencing extreme or exceptional drought.

On May 11, 2017, there were 13 tornadoes reported throughout Texas, Oklahoma, and Louisiana. There were reports of tennis ball sized hail in Kingfisher, Oklahoma and baseball sized hail in Logan, Arkansas. A strong wind event of 78 mph (125.53 kph) was reported in Stillwater, Oklahoma

On May 16, 2017, there were 18 tornado reports between Texas and Oklahoma. A tornado in Beckham, Oklahoma damaged many homes, replaced roofs, and caused one home to collapse.

On May 19, 2017, eight tornadoes were reported between Texas and Oklahoma. There were reports of softball sized hail in Coleman, Texas and tennis ball sized hail in Wichita, Texas.

On May 28, 2017, there were five tornadoes between Texas and Louisiana. Tea cup sized hail was reported in Edwards, Texas. A wind event in Caldwell, Louisiana caused the death of an 18 year old.



Released Thursday, June 1, 2017
Chris Fenimore, CPC/NCEP/NWS/NOAA

Above: Drought conditions in the Southern Region. Map is valid for May 30, 2017. Image is courtesy of National Drought Mitigation Center.

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	80.26	19.74	2.30	0.00	0.00	0.00
Last Week *05-23-2017*	86.34	13.66	1.72	0.09	0.00	0.00
3 Months Ago *02-28-2017*	51.08	48.92	19.35	7.59	0.35	0.00
Start of Calendar Year *01-03-2017*	53.95	46.05	27.69	11.09	1.11	0.00
Start of Water Year *09-27-2016*	76.89	23.11	6.74	1.89	0.28	0.11
One Year Ago *05-31-2016*	86.02	13.98	3.80	0.16	0.00	0.00

Intensity:

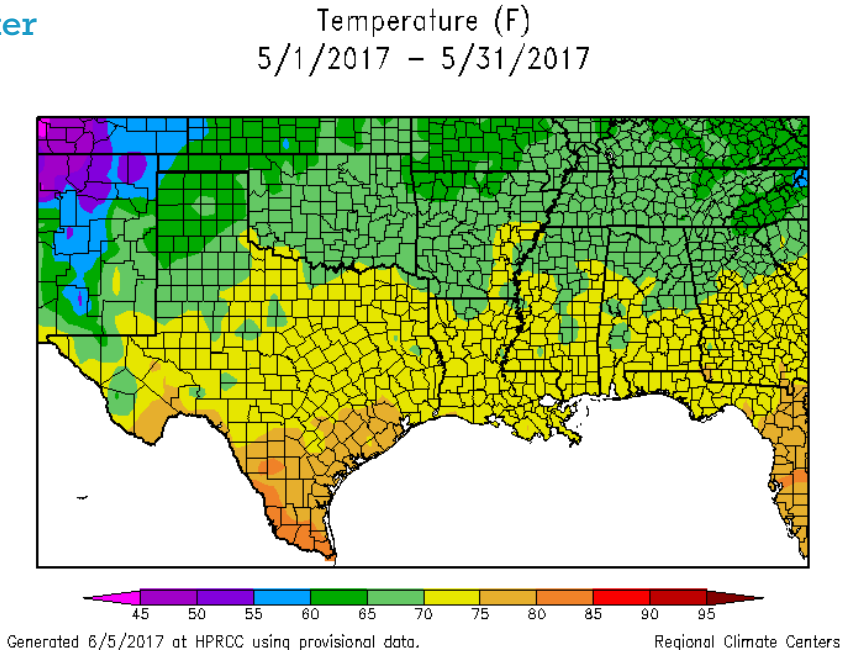
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

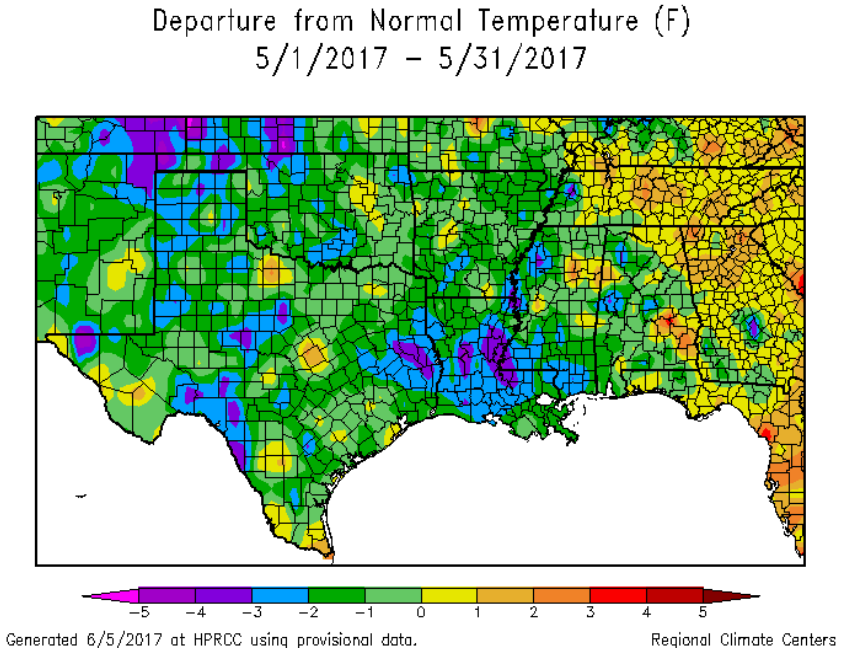
Temperature Summary

Kyle Brehe and Rudy Bartels,
Southern Regional Climate Center

May was cooler than normal for all states in the southern region besides Tennessee. Parts of Texas, Central Louisiana, and northwestern Oklahoma had reports of 3 to 4 degrees F (1.667 to 2.222 degrees C) below normal temperatures for May. Most of Arkansas, Mississippi, Louisiana, Oklahoma, and Texas were 1 to 3 degrees F (0.556 to 1.667 degrees C) below normal temperatures. The central and eastern part of Tennessee had 0 to 2 degrees F (0 to 1.111 degrees C) above normal temperatures. There were also clusters of near to above normal temperatures in all of the other states except Louisiana. The statewide monthly average temperatures were as follows: Arkansas reporting 67.70 degrees F (19.83 degrees C), Louisiana reporting 71.70 degrees F (22.06 degrees C), Mississippi reporting 70.20 degrees F (21.22 degrees C), Oklahoma reporting 66.80 degrees F (19.33 degrees C), Tennessee reporting 66.70 degrees F (19.28 degrees C), and Texas reporting 72.00 degrees F (22.22 degrees C). The state-wide temperature rankings for May are as follows: Arkansas (forty-third coldest), Louisiana (seventeenth coldest), Mississippi (thirty-ninth coldest), Oklahoma (thirty-fifth coldest), Tennessee (fifty-third warmest), and Texas (forty-ninth warmest). All state rankings are based on the period spanning 1895-2017.



Average May 2017 Temperature across the South

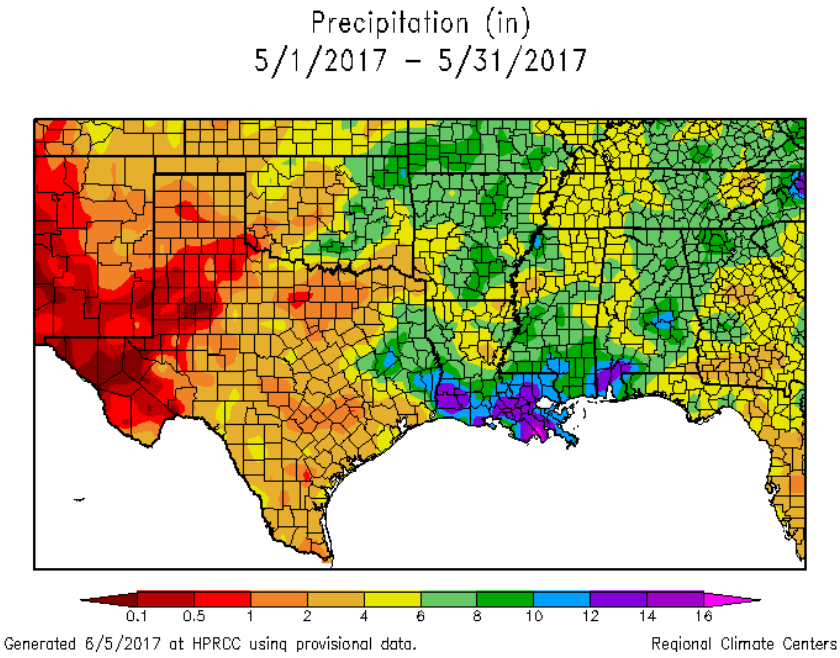


Average Temperature Departures from 1981-2010 for May 2017 across the South

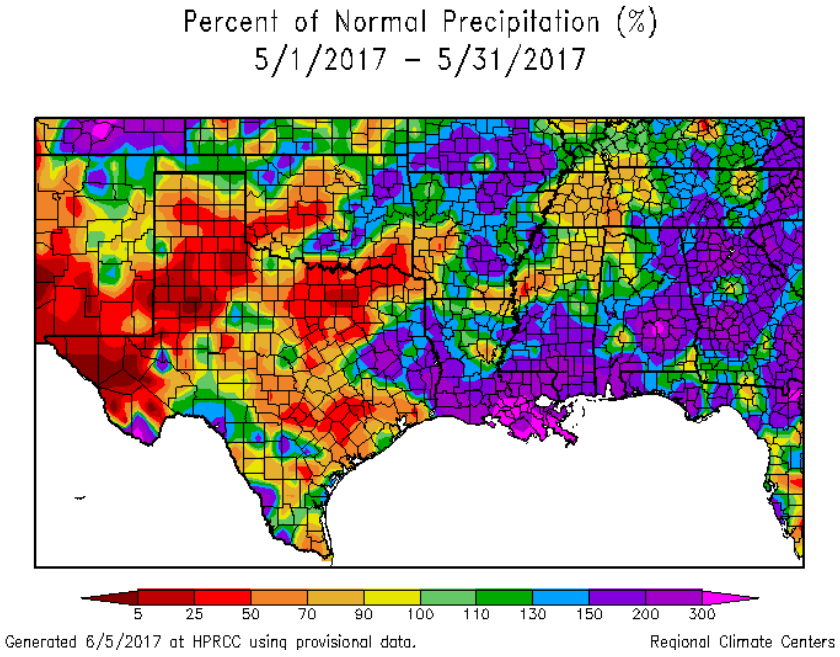
Precipitation Summary

Kyle Brehe and Rudy Bartels,
Southern Regional Climate Center

Precipitation values for the month of May varied spatially across the Southern Region. Precipitation totals in parts of eastern Texas, southern Louisiana, and southern Mississippi were 300 percent of normal. Each of the six states in the region had areas 150 to 300 percent of normal precipitation. In contrast, conditions were quite dry across north, central, and western Texas, southern Oklahoma, southwest Arkansas and west central Mississippi with stations reporting between 5 to 70 percent of normal. All states had clusters of normal, below normal and above normal levels of precipitation values. Most of Louisiana and Arkansas reported above normal precipitation values. The four other states in the region, Texas, Tennessee, Oklahoma and Mississippi had great contrasts of precipitation reports throughout their states. The state-wide precipitation totals for the month are as follows: Arkansas reporting 6.54 inches (166.12 mm), Louisiana reporting 8.95 inches (227.33 mm), Mississippi reporting 6.55 inches (166.37 mm), Oklahoma reporting 4.07 inches (103.38 mm), Tennessee reporting 5.89 inches (149.61 mm), and Texas reporting 2.51 inches (63.75 mm). The state precipitation rankings for the month are as follows: Arkansas (thirty-first wettest), Louisiana (ninth wettest), Mississippi (twenty-second wettest), Oklahoma (forth-ninth driest), Tennessee (twenty-first wettest), and Texas (thirty-ninth driest). All state rankings are based on the period spanning 1895-2017

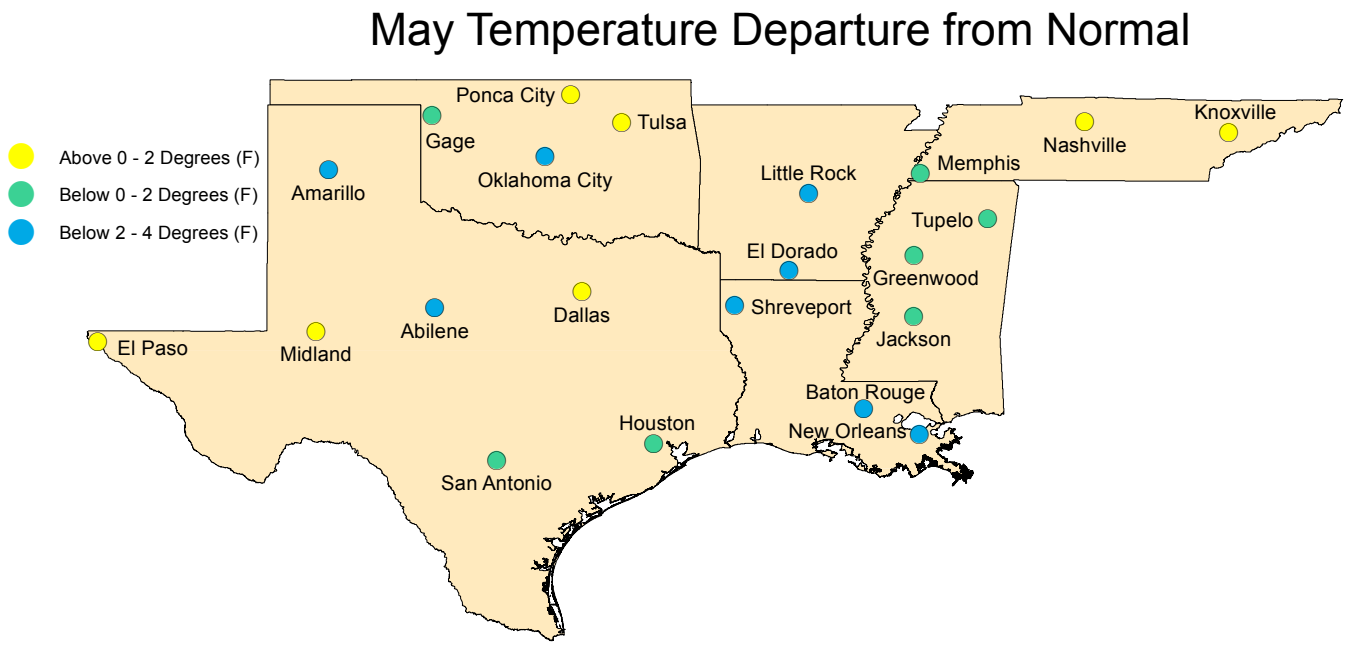


May 2017 Total Precipitation across the South

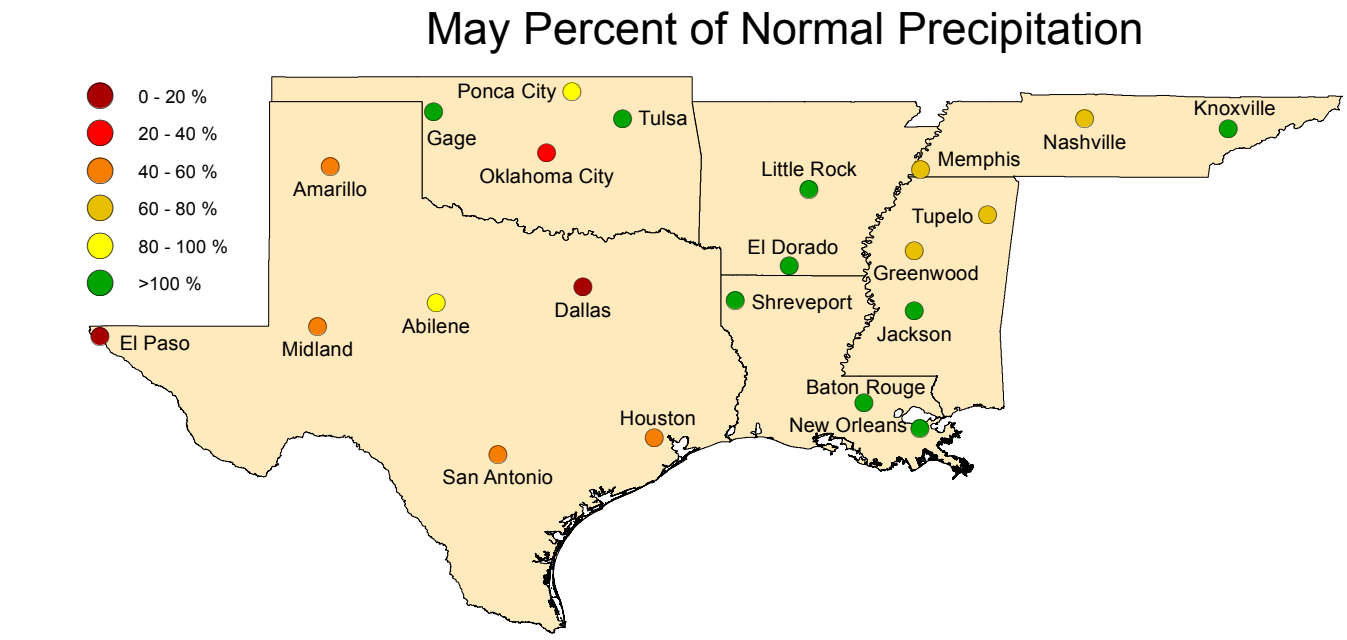


Percent of 1981-2010 normal precipitation totals for May 2017 across the South

Regional Climate Perspective in Pictures



May 2017 Temperature Departure from Normal from 1981-2010 for SCIPP Regional Cities



May 2017 Percent of 1981-2010 Normal Precipitation Totals for SCIPP Regional Cities

Climate Perspective

State	Temperature	Rank (1895-2017)	Precipitation	Rank (1895-2017)
Arkansas	67.70	43rd Coldest	6.54	31st Wettest
Louisiana	71.70	17th Coldest	8.95	9th Wettest
Mississippi	70.20	39th Coldest	6.55	22nd Wettest
Oklahoma	66.80	35th Coldest	4.07	49th Driest
Tennessee	66.70	53rd Warmest	5.89	21st Wettest
Texas	72.00	49th Coldest	2.51	39th Driest

State temperature and precipitation values and rankings for May 2017. Ranks are based on the National Climatic Data Center's Statewide, Regional, and National Dataset over the period 1895-2017.

Station Summaries Across the South

Station Summaries Across the South

Station Name	Temperatures								Precipitation (inches)		
	Averages				Extremes				Totals		
	Max	Min	Mean	Depart	High	Date	Low	Date	Obs	Depart	%Norm
El Dorado, AR	80.7	58.8	69.8	-1.5	89	05/27	46	05/06	7.26	2.21	144
Little Rock, AR	79.7	58.5	69.1	-2.0	89	05/27	46	05/02	6.82	1.95	140
Baton Rouge, LA	83.0	62.5	72.7	-3.0	91	05/19	49	05/06	9.08	4.19	186
New Orleans, LA	82.3	65.5	73.9	-2.8	90	05/28	53	05/04	9.93	5.30	214
Shreveport, LA	82.6	60.4	71.5	-1.7	91	05/19	45	05/01	7.60	2.67	154
Greenwood, MS	81.7	59.9	70.8	-1.0	90	05/19	46	05/06	3.23	-1.72	65
Jackson, MS	82.3	60.1	71.2	-1.1	92	05/19	46	05/06	6.30	1.92	144
Tupelo, MS	81.1	58.2	69.7	-1.0	88	05/31+	45	05/06	3.69	-1.87	66
Gage, OK	79.8	51.7	65.7	-0.6	91	05/15	33	05/01	4.68	1.41	143
Oklahoma City, OK	79.7	54.7	67.2	-2.7	95	05/27	41	05/01	1.10	-3.55	24
Ponca City, OK	80.0	55.5	67.7	0.1	91	05/31+	40	05/04	4.29	-0.52	89
Tulsa, OK	80.4	57.5	68.9	-0.4	93	05/27	43	05/04+	7.12	1.21	120
Knoxville, TN	77.8	58.3	68.0	0.8	91	05/20	42	05/07	4.85	0.34	108
Memphis, TN	80.8	60.5	70.7	-1.0	89	05/31+	47	05/06+	4.22	-1.03	80
Nashville, TN	80.2	58.6	69.4	1.9	91	05/20+	42	05/07	3.94	-1.56	72
Abilene, TX	83.4	58.0	70.7	-2.3	99	05/27+	42	05/05+	2.73	-0.45	86
Amarillo, TX	79.5	48.8	64.2	-1.4	95	05/25	33	05/01	1.15	-1.14	50
El Paso, TX	88.0	61.5	74.7	0.8	95	05/25+	50	05/01	0.03	-0.44	6
Dallas, TX	86.4	64.5	75.4	1.5	96	05/26	49	05/01	0.70	-4.20	14
Houston, TX	86.5	66.2	76.3	-0.6	93	05/27	51	05/01	2.41	-2.68	47
Midland, TX	87.7	59.9	73.8	0.2	102	05/25	48	05/05+	0.89	-0.85	51
San Antonio, TX	86.3	65.0	75.6	-1.3	97	05/27	50	05/05+	1.76	-2.25	44

Summary of temperature and precipitation information from around the region for May 2017. Data provided by the Applied Climate Information System. On this chart, "depart" is the average's departure from the normal average, and "% norm" is the percentage of rainfall received compared with normal amounts of rainfall. Plus signs in the dates column denote that the extremes were reached on multiple days. Blueshaded boxes represent cooler than normal temperatures; redshaded boxes denote warmer than normal temperatures; tan shades represent drier than normal conditions; and green shades denote wetter than normal conditions.

NOAA Forecasts Above-Normal 2017 Hurricane Season

Barry Keim, Louisiana State Climatologist, Louisiana State University

On May 25, the National Oceanic and Atmospheric Administration issued its forecast for the upcoming hurricane season. They are calling for between 11-17 named storms, and of those, 5-9 should become hurricanes, and of those, 2-4 should become major hurricanes. Note that the long-term averages for a season consist of the following: 12 named storms, 6 hurricanes, and 3 major hurricanes. So, assuming we fall somewhere near the middle of these forecasted ranges, we'll be looking at season that has near or above normal frequencies across most categories of intensity. The primary reason for the above normal forecast is that we're likely to have either no El Nino or a weak El Nino in place. Note that El Nino conditions tend to reduce the number and intensity of the storms. As such, El Nino is not likely to be much of a factor this upcoming season, which is unfortunate. In addition, sea surface temperatures over the breeding grounds are running near to somewhat above normal, which also leads to more storms. Together, these two variables point to season with near average to above average frequencies. Unfortunately, these forecasts tell us nothing about where the storms may turn up, but obviously, the more storms that are produced, the more storms we need to dodge. In Louisiana, we've been very lucky in that we've now gone 4 straight seasons with no landfalls. In addition, the U.S. has now gone 11 straight seasons without a major (Category 3-5) hurricane landfall – the last one was Hurricane Wilma in October 2005. Let's just hope our luck in both regards continues in 2017! Please contact me with any questions at keim@lsu.edu.

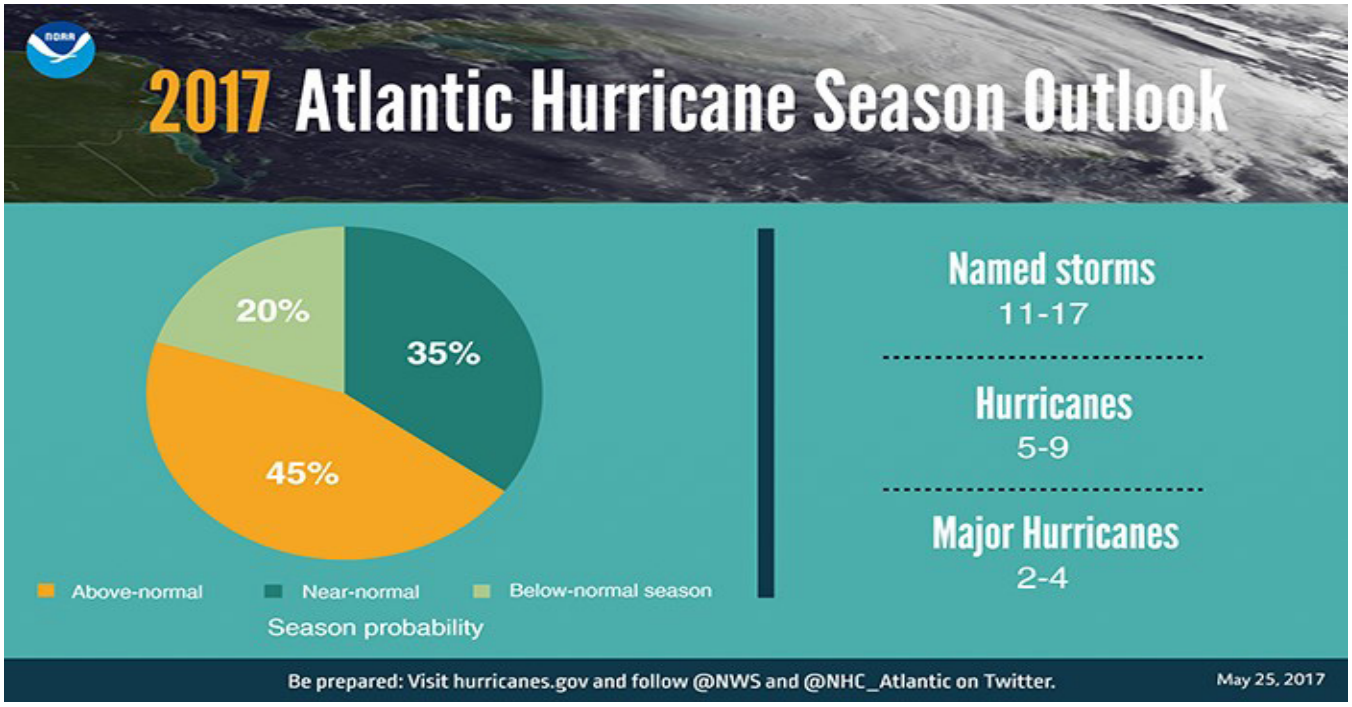


Figure 1. NOAA's forecast for the 2017 Atlantic Basin hurricane season. Image can be found at http://www.noaa.gov/media-release/above-normal-atlantic-hurricane-season-is-most-likely-year.

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Contact Us

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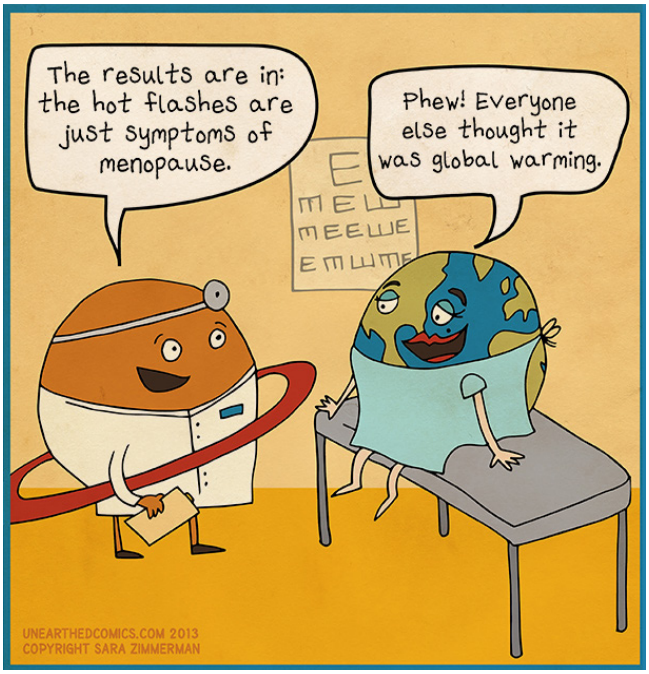
For any questions pertaining to historical climate data across the states of Oklahoma, Texas, Arkansas, Louisiana, Mississippi, or Tennessee, please contact the Southern Regional Climate Center at 225-578-5021.

For questions or inquiries regarding research, experimental tool development, and engagement activities at the Southern Climate Impacts Planning Program, please contact us at 405-325-7809 or 225-578-8374.

Monthly Comic Relief



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