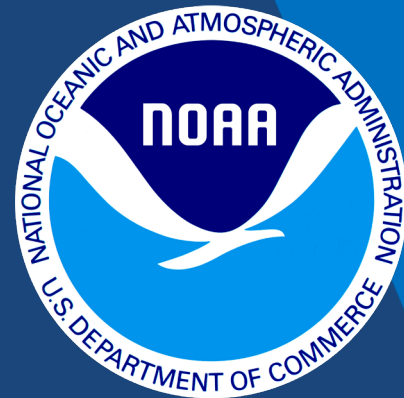




# 1991-2020 U.S. Climate Normals



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May 27, 2021



# Conventional Climate Normals: standard 30-year averages and statistics of weather observations

- From Latin *normālis*, “made according to a carpenter’s square”



- Putting today’s weather in proper context
- understanding today’s climate

...THE ASHEVILLE NC CLIMATE SUMMARY FOR NOVEMBER 11 2019...

CLIMATE NORMAL PERIOD 1981 TO 2010  
CLIMATE RECORD PERIOD 1869 TO 2019

WEATHER ITEM	OBSERVED TIME	RECORD YEAR	NORMAL VALUE	DEPARTURE FROM NORMAL	LAST YEAR
	VALUE	VALUE	VALUE	FROM NORMAL	YEAR
.....					
TEMPERATURE (F)					
YESTERDAY					
MAXIMUM	67 308 PM	75 1949	61	6	49
MINIMUM	35 733 AM	18 1973	37	-2	24
		1957			
AVERAGE	51		49	2	37
.....					
PRECIPITATION (IN)					
YESTERDAY	0.00	1.07	1.00	-0.00	1.00
MONTH TO DATE	0.12		1.17	-1.05	1.98
SINCE SEP 1	8.80		7.89	0.91	11.83
SINCE JAN 1	50.51		39.50	11.01	63.43

# Key Takeaways

- Climate normals meet the needs of our user communities
- NOAA National Weather Service measures weather and climate and provides most of the station data for normals:
  - Automated Surface Observing Systems Network – automated
  - Cooperative Observer Network – volunteers
- New additions for the first time to precipitation normals:
  - U.S. Department of Agriculture Snow Telemetry Network - automated
  - Community Collaborative Rain, Hail and Snow Network - volunteers
    - *Citizen Science is key*
- NOAA NCEI is the source of official climate normals for station locations in the U.S.
- 30-yr normals are not simple averages
- <https://www.ncei.noaa.gov/products/us-climate-normals>



# What do the New Normals Say?

- There are now almost 15,000 stations with precipitation normals and more than 7,300 stations with temperature normals
- Warming from 1981-2010 to 1991-2020 is widespread but not ubiquitous across the conterminous U.S., either in geographic space or time of year, with recent cooling in the north central U.S.
- Precipitation changes from 1981-2010 to 1991-2020 also vary considerably on a month-to-month basis, but are generally wetter in the southeast and central U.S.





# NWS and Partners use the data for...

- Drought Assessment
  - Various drought indices assess conditions for the US National Drought Monitor by comparing differences between observed data and normal.
- Freeze Risk
  - Farmers and gardeners plan their production practices considering dates/risk of spring and fall freezes based on normal last spring and first fall freeze dates.
- Energy
  - Energy companies monitor Heating and Cooling Degree-days and comparisons to normal to assess energy usage.
- Snow
  - Local government can use average or normal snowfall for budget and operations planning. Mountain snowpack is critical for water resources.
- Travel
  - What is the weather like where I'm planning my vacation?





# Conventional 30-Year Normals and New Supplemental 15-Year Normals

- First normals were developed in the mid-1930s, when most countries had collected only about 30 years of climate data: 1901-1930

- World Meteorological Organization requires member states to produce 30-year climate normals and provides guidelines

[https://library.wmo.int/index.php?lvl=notice\\_display&id=20130](https://library.wmo.int/index.php?lvl=notice_display&id=20130)

- Shorter-period normals, such as the new 15-year normals, are required by some sectors for applications that use normals to predict conditions in the near-term future
- The U.S. is replacing the current 1981-2010 normals with 1991-2020 normals and supplementing with new 2006-2020 normals



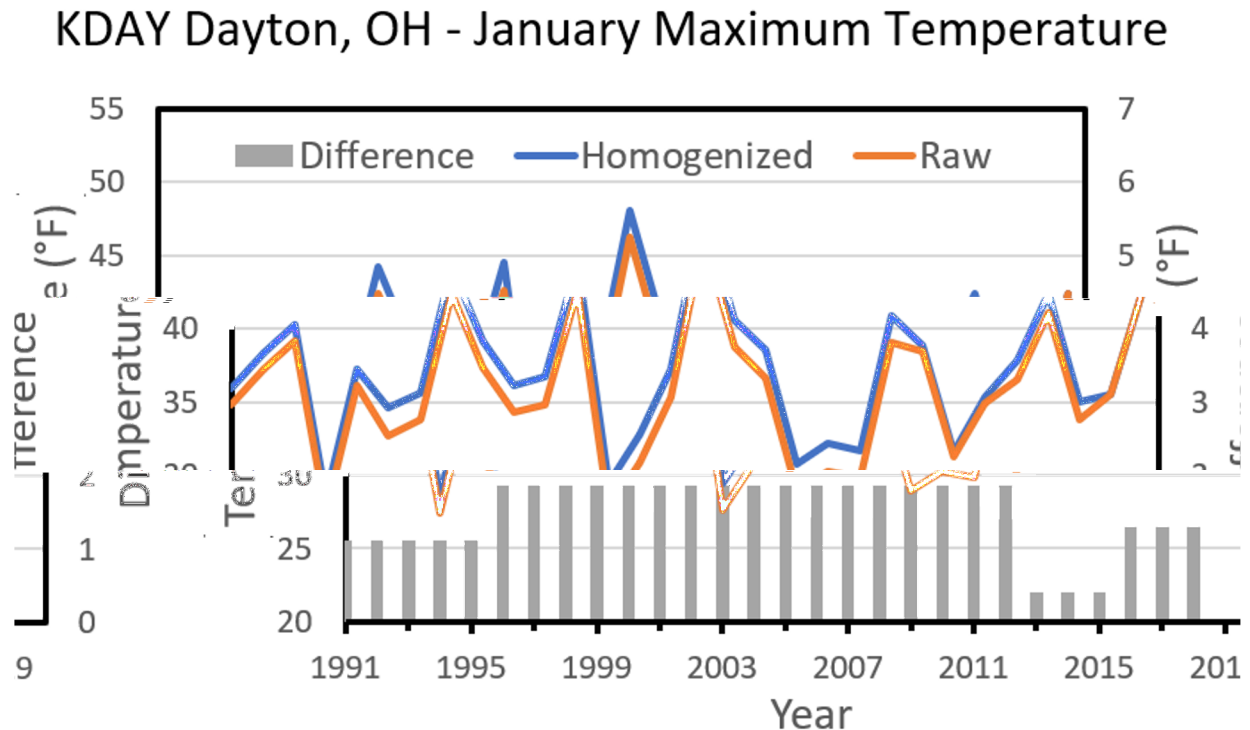
# Included in the Normals

- Overview:
  - Annual, seasonal, monthly, daily, and hourly statistics
  - Averages, frequencies, terciles, quartiles, quintiles
  - Temperature, precipitation, snow, dew point, sea level pressure, clouds, wind
- Here are some examples of normals at a weather station:
  - Average January high temperature
  - Average annual precipitation
  - Third quartile of February snowfall (75% of Februaries are below this amount)
  - Average number of July days with a high temperature at or above 90°F
  - Average low temperature on April 20

# Fundamental Normals – Not so Simple

- Monthly temperature data were homogenized before the normals were calculated, accounting for station discontinuities
- Monthly precipitation data are not homogenized; they are required to be complete with all days available for monthly normals

Example: Dayton, OH  
 Homogenized Time Series of Maximum Temperature Versus Raw Temperature, January 1991-2020







# Theoretical Basis for U.S. Climate Normals Has Not Changed from Last Time

## NOAA'S 1981–2010 U.S. CLIMATE NORMALS An Overview

BY ANTHONY ARGUEZ, IMKE DURRE, SCOTT APPLEQUIST, RUSSELL S. VOSE,  
MICHAEL F. SQUIRES, XUNGANG YIN, RICHARD R. HEIM JR., AND TIMOTHY W. OWEN

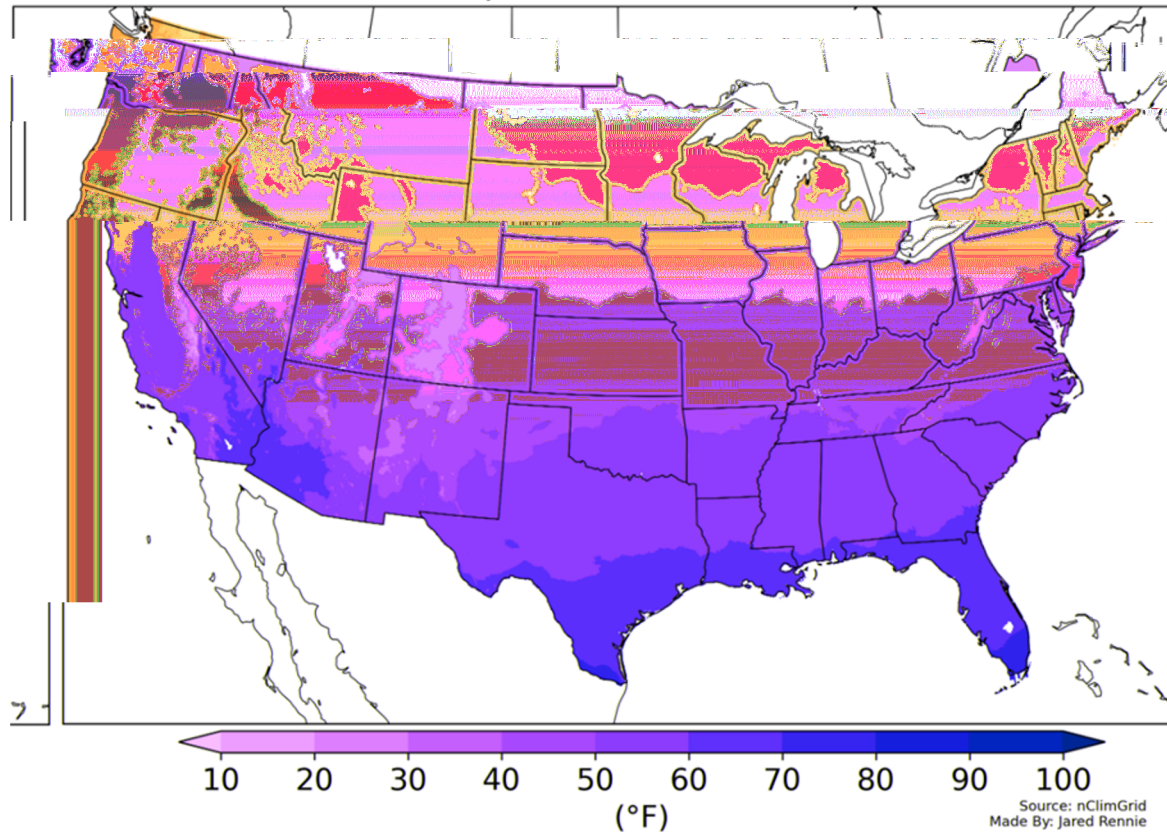
The latest 30-year U.S. Climate Normals, available from the National Climatic Data Center, were calculated for over 9,800 weather stations and include several new products and methodological enhancements.

Arguez et al. 2012. Bulletin of the American Meteorological Society, 93, 1687-1697. <https://doi.org/10.1175/BAMS-D-11-00197.1> and more details are in the publications listed at the bottom of this [web page](#).

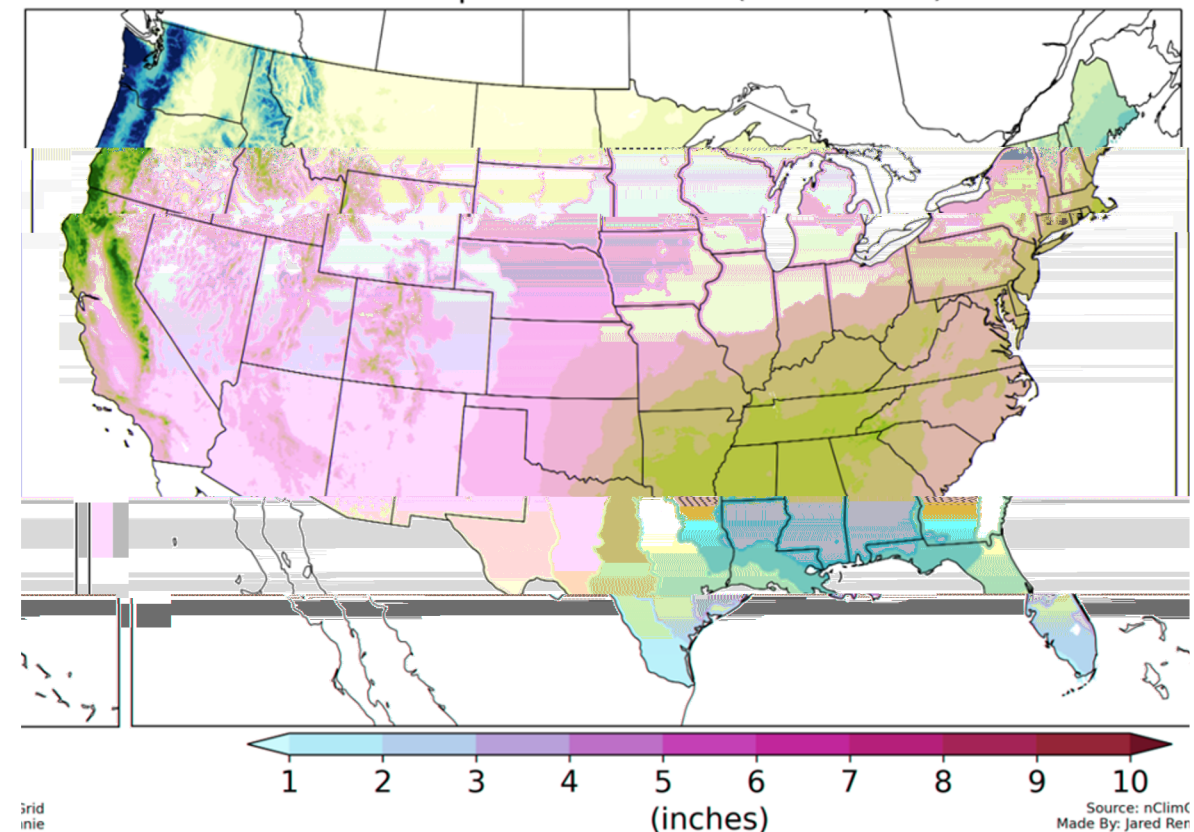
# Gridded Normals: Another New Product

- Example: March Temperature and Precipitation Normals

March Mean Temperature Normal (1991-2020)



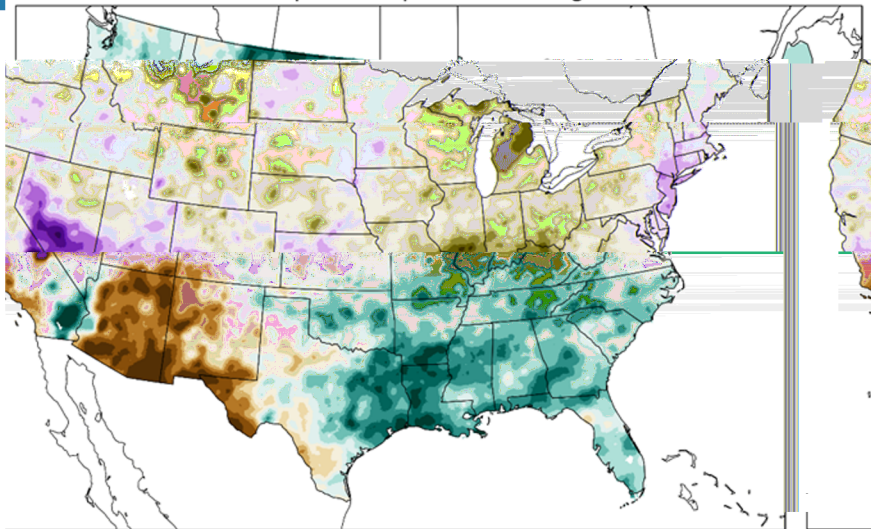
March Precipitation Normal (1991-2020)





# Example: April Changes New-Old Normals

### April Precipitation Change

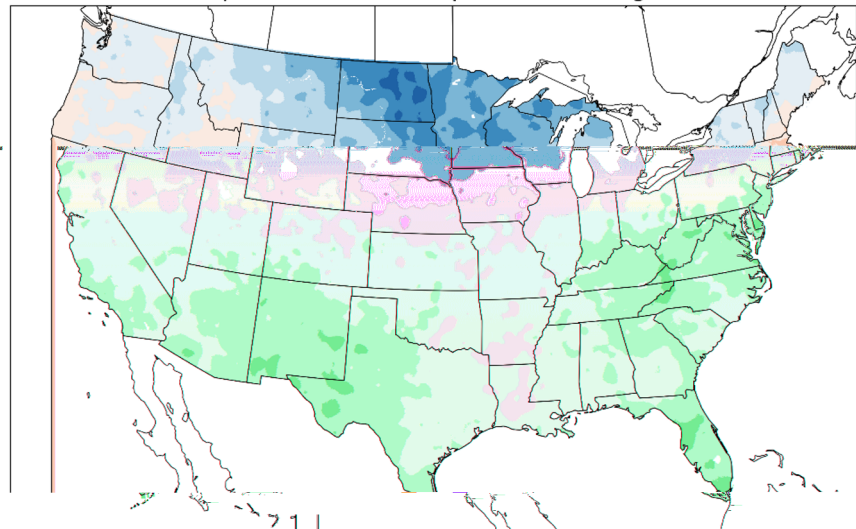


-20 -10 0 10 20

1991-2020 minus 1981-2010 (%)

Source: nClimGrid  
Made By: Jared Rennie

### April Maximum Temperature Change

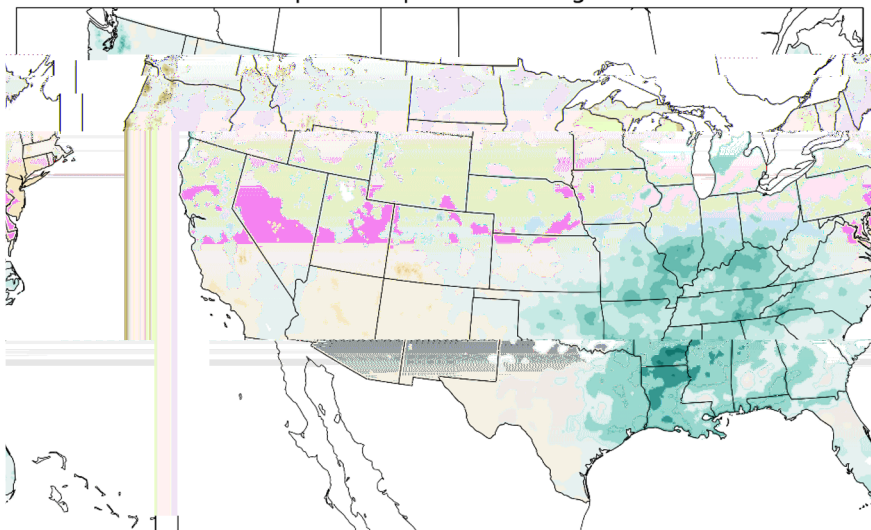


2 -2 -1 0 1

1991-2020 minus 1981-2010 (°F)

Source: nClimGrid  
Made By: Jared Rennie

### April Precipitation Change

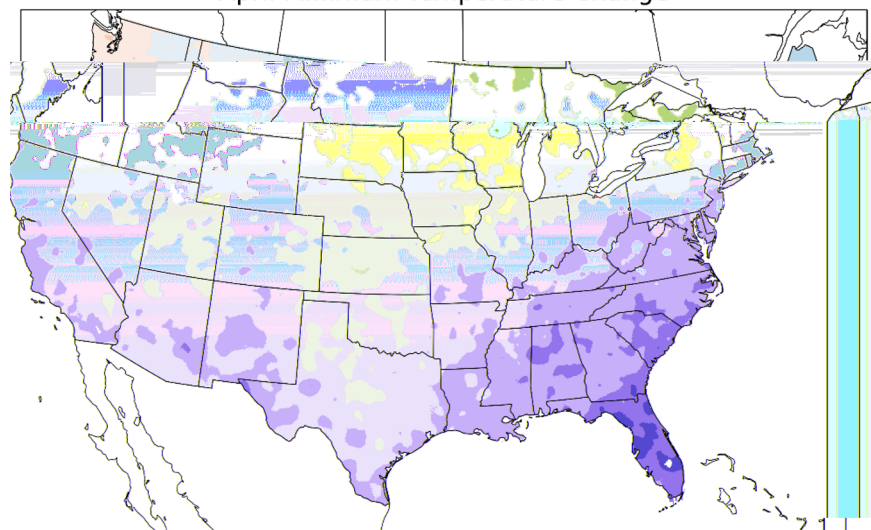


-1.5 -1.0 -0.5 0.0 0.5 1.0 1.5

1991-2020 minus 1981-2010 (inches)

Source: nClimGrid  
Made By: Jared Rennie

### April Minimum Temperature Change



-2 -1 0 1 2

1991-2020 minus 1981-2010 (°F)

Source: nClimGrid  
Made By: Jared Rennie