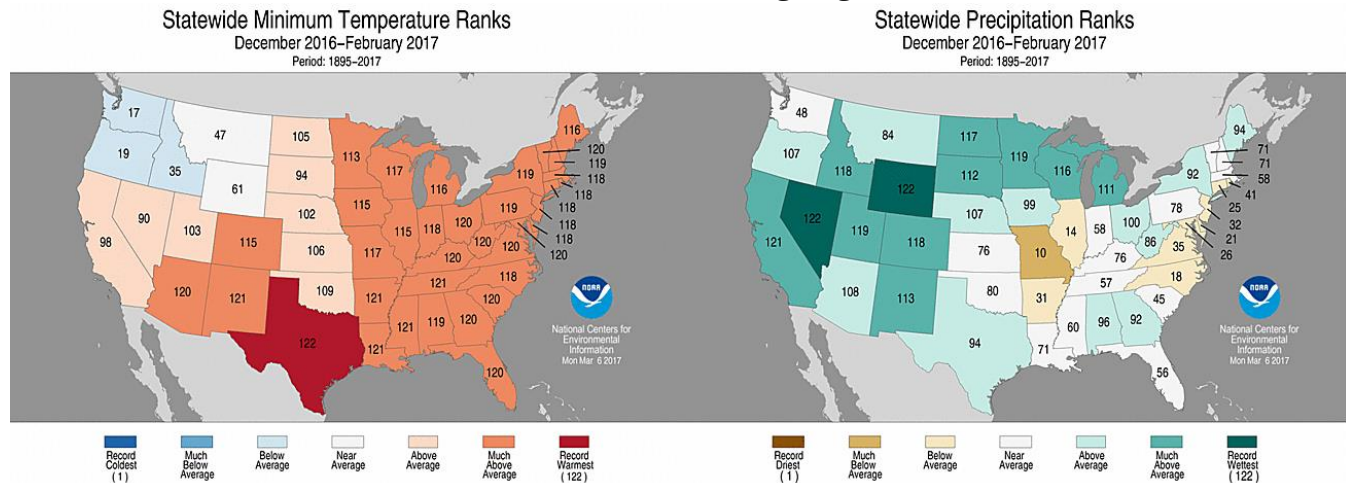


A MOSTLY WARM AND WET SPRING EXPECTED FOR U.S. GROWING AREAS...

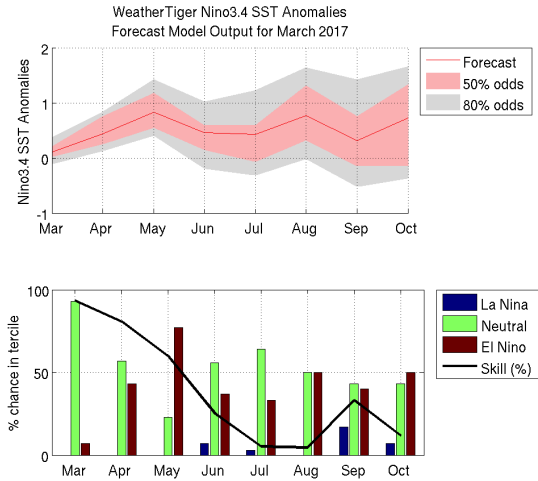
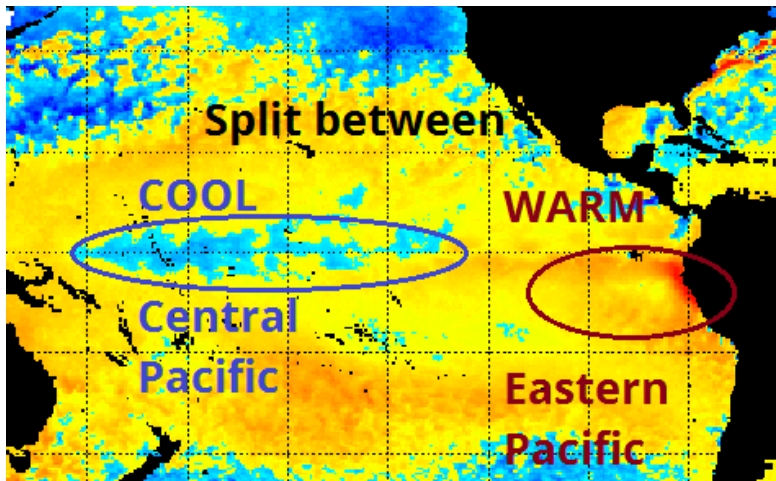
Outlook Overview

- **Winter 2016-17 was yet another season of extremes, with generally well above average temperatures punctuated by a few brutal cold snaps and significant snowstorms. With the weak La Niña that delivered the lower 48's sixth-warmest warmest winter in the process of potentially being replaced by an El Niño, look for April and May to yield temperature and precipitation anomalies are that mostly above average for most of the central and eastern U.S.**
- **A favored pattern based on historical analogs and WeatherTiger's proprietary modeling is a recurring ridge over the Southeastern U.S., and an active jet over the central United States during April and May. This would generally bring somewhat above average temperatures in the U.S. corn belt, Plains, and Delta, warmest east and coolest northwest. This pattern also means above normal precipitation for the western corn belt and near to above average precipitation in the eastern corn belt, Mississippi Delta, and northern Plains. Uncertainty increases towards the end of the period due to the potential development of an El Niño event.**

General Outlook for Central and Eastern U.S. Growing Regions

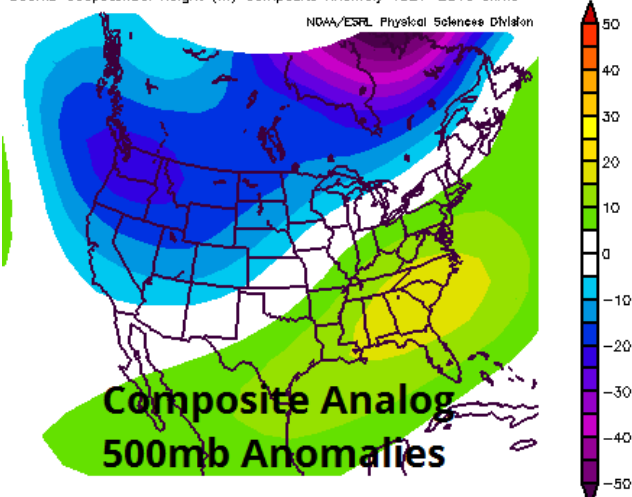


The winter of 2016-2017 was again marked by extreme weather contrasts. Temperature-wise, this winter was the second-warmest ever over much of the central and eastern U.S. agricultural region. Due to the combination of a persistent positive North Atlantic Oscillation anomalies, an incredibly strong Pacific jet, and a weak La Niña, this unseasonable warmth was especially significant during a mind-bogglingly hot February, while several strong cold air outbreaks in January and March moderated the seasonal anomalies a bit. In terms of precipitation, the dominant Pacific jet led to brisk jet flow from California to the Great Lakes. This added to above to well above normal precipitation from the West to the northern Plains and western corn belt, with a dry pocket centered on the southern Plains, Missouri, and the Delta. However, the Plains and Midwest have turned much wetter in the latter half of March as La Niña has declined.



With a warm and wet winter behind us, it's time to look ahead to April and May in the corn belt, southern Plains, and Mississippi Delta growing regions. The U.S. agricultural belt enters the planting season in good shape, with the exceptions being some regions of lingering soil moisture deficits in the Delta and Missouri. However, storms in the next week will likely further ameliorate these anomalies. In terms of global climate drivers, the weak La Niña that has influenced weather for the past six months has dissipated, though atmospheric conditions globally remain more like La Niña than El Niño. Interestingly, the Pacific is currently showing an unusual split between continued cool-neutral SSTs in the central Pacific and very warm waters close to South America. While dynamical models are in good agreement that the El Niño will continue to intensify into the summer, possibly reaching moderate or strong levels by late summer, WeatherTiger's proprietary El Niño model shown above is very sceptical of the development of anything exceeding neutral-positive or very weak +ENSO conditions. Nevertheless, the influence of La Niña on global weather patterns will

500mb Geopotential Height (m) Composite Anomaly 1981-2010 climo
NOAA/ESRL Physical Sciences Division

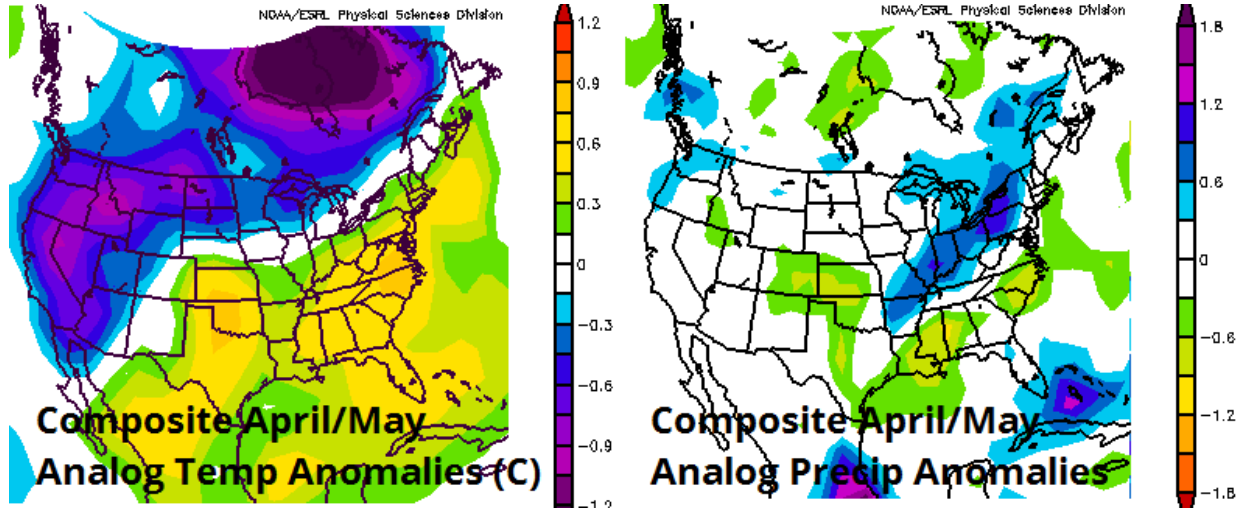


continue to wane through the end of May. The persistent presence of a Gulf of Alaska cold pool is also likely to be a key influence going forward. While the winter of 2016-17 was unique, it is still instructive to look at some other winters that shared these general characteristics, and see what conditions in aggregate were observed in the following springs. WeatherTiger's proprietary algorithms identified several reasonable matches for the unusual SST and atmospheric pattern, including 2011. While La Niña was much stronger in 2011 than 2017, the Atlantic, Gulf of Alaska, and positive west-to-east SST anomaly gradient are

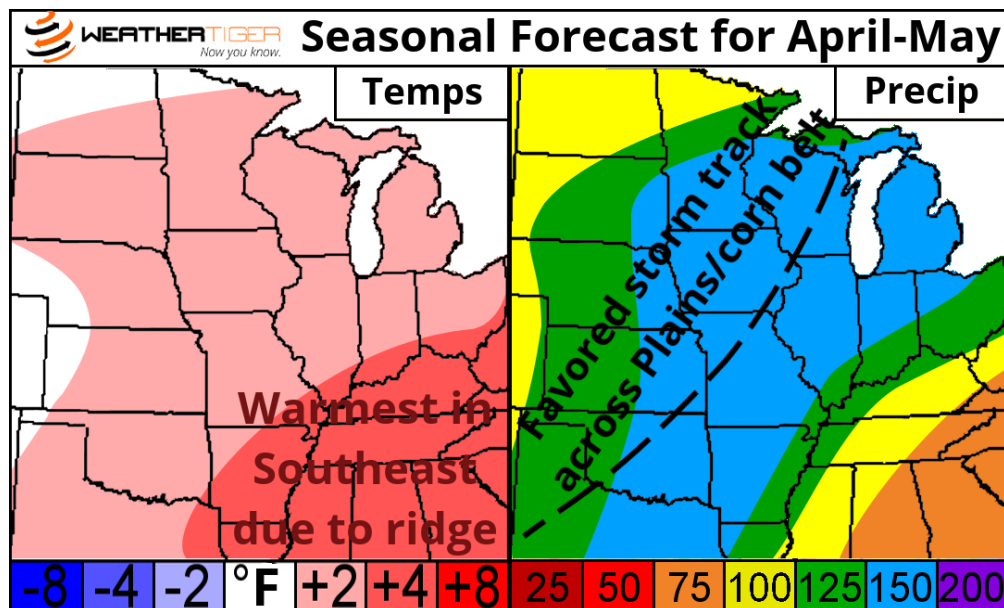
shared features of these early springs, which also featured a warm February and March in the east and positive zonal wind anomalies (strong west-to-east jet) over much of the United States.

At left above is the average 500mb anomaly for April and May over these analog years. The composite of these springs share a propensity for a strong progressive jet stream pattern over the continental U.S., anchored by a tendency for ridging over the Southeastern United States and

troughing over the Pacific Northwest, which is often seen when SSTs in the Gulf of Alaska are below average. This observation increases confidence in a similar tendency for this April and May.



What does this mean in terms of temperature and precipitation relative to normal? For the most part, this means that the overall trends observed in the U.S. over the last few weeks of March will likely continue into April and May. These tendencies include warmer than average temperatures across most of the growing area, ample moisture surging over the central and eastern U.S., and brief cold air outbreaks. April/May average temperature anomalies are shown at left below with precipitation anomalies at right. In general, the northern tier will see temps skewing somewhat above normal with periodic troughing, with more sharply above average temperatures across the southern tier due to southeastern ridging. Above average precipitation will likely continue as storms follow a favoured storm track from the Plains to the Ohio Valley between the average ridge and trough placements. These trends are further supported by recent output of the European weekly model through the end of April.



However, these data need to be adjusted to better reflect the overall pattern, as no historical example can fully capture natural variability or the idiosyncrasies of 2017. As the analog method is fraught with the possibility of drawing excessive conclusions from a small sample set of years, WeatherTiger's proprietary forecast models was run for April/May temperatures and precipitation in the three main U.S. growing regions. The predictions of these models were blended with the pattern-based method into region-specific seasonal guidance.

April/May Forecast for the Western Corn Belt including MN, ND, SD, NE, and IA

TEMPERATURES: Springs marked by transitional phases between La Niña and neutral or weakly positive ENSO conditions tend to be near normal in the western corn belt. The past month has seen a positive NAO and has been quite warm and dry in the northern Plains. Persistence of recent trends and the delayed transition to warmer ENSO leads me to believe that temperatures in the western corn belt will be generally **near normal** to **somewhat above average** this April and May.

PRECIPITATION: Look for a gradient between a drier north and wetter south and east portions of the western corn belt as the zone will be on the edge of the favored path of Pacific moisture. I expect **near normal** rainfall north, with accumulations clustering into relatively few rain events, and **somewhat above average** rainfall in Iowa and western Nebraska.

April/May Forecast for the Eastern Corn Belt including WS, OH, IN, IL, and MI

TEMPERATURES: Spring temperatures in the Ohio Valley have an inverse relationship with winter NAO, but this relationship does not hold during excessively positive Arctic Oscillation winters like 2017. With the expected progressive jet, warmer than average Great Lakes water temperatures, and Southeastern ridging, look for **above average** temperatures in southern sections of the eastern corn belt, with **slightly to somewhat above average** temperatures in northern sections.

PRECIPITATION: Indications including WeatherTiger models, analogs, and trends are supportive of continued **above normal** precipitation this spring in the eastern corn belt, wettest north and west.

April/May Forecast for the S. Plains/Delta including TX, OK, AR, KS, and MO

TEMPERATURES: Per statistical modelling, factors favoring a cooler spring over the southern tier include positive ENSO and NAO values. With the atmospheric pattern trending away from a -ENSO state, and continued rain threats, look for **near normal (west)** to **somewhat above average (east)** temperatures in the region, with few strong fronts but periods of extreme heat not favoured either.

PRECIPITATION: Based on the expected path of the favored storm track across the zone, this region is likely to see **somewhat above normal** to **above normal** rainfall in the Delta, which is likely to continue as the slow evolution of ENSO proceeds.

In general, the unusual SST configuration in the Pacific makes this spring's weather a bit of tricky forecast, particularly towards the end of May as ENSO uncertainty grows. However, there are multiple indications of the extension of a wet, warm pattern in the U.S. growing region through May.

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