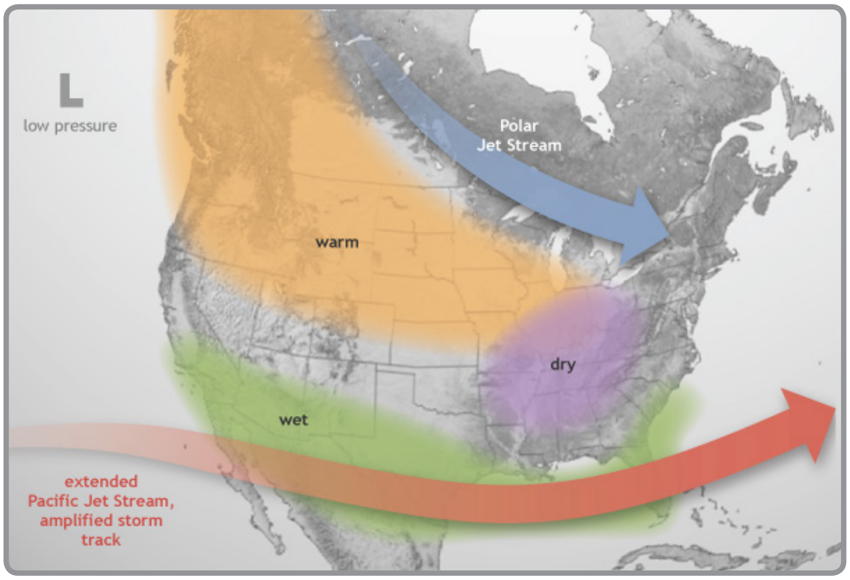
El Niño Impacts and Outlook

Eastern Region

October 2015

Typical El Niño Winter Pattern



The image above shows the typical pattern during El Niño winters. The polar jet stream tends to stay to the north of much of the Eastern Region, while an active Pacific jet stream is present across the southern U.S. Since much of the Eastern Region lies between the two storm tracks, temperature and precipitation patterns vary considerably from south to north. It is important to note that this is a schematic diagram representing general patterns and is not created from actual data. For more information, please visit: https://www.climate.gov/news-features/department/enso-blog.

An El Niño develops when sea surface temperatures are warmer than average in the equatorial Pacific for more than a season, altering the atmospheric circulation. This is important to North America because El Niño has an impact on our weather patterns, most predominantly in the winter.

Although each El Niño is different, there are some general patterns that are predictable. For instance, the polar jet stream is typically farther north than usual, while the Pacific jet stream runs across the southern United States (see figure to left).

This pattern brings above-normal precipitation to southern parts of the Eastern Region, as the Pacific jet stream steers storms along the Gulf and southeast Atlantic coasts. The active Pacific storm track also promotes cloudy conditions in the Southeast, resulting in cooler-than-normal temperatures over the southern portions of the Eastern Region.

It is more difficult to define conditions in the northern sections of the Eastern Region because of other atmospheric and oceanic influences. The dry winter conditions that characterize Ohio and the Midwest extend eastward, with drier-than-normal conditions common in western New York and Pennsylvania. As storms often move up the coast during El Niño winters, the Eastern Seaboard generally experiences above-normal precipitation. Typically with strong El Niños, such as the one this year, warmer temperatures extend further into the Northeast than seen in the accompanying diagram.

Potential Winter Impacts

Coastal Storms

Several research studies have noted an increased frequency of East Coast storms during El Niño winters. These storms, known as nor'easters, have a number of coastal impacts, ranging from beach erosion and high winds to heavy snowfall and precipitation. Storms that follow a classic nor'easter track from south of Cape Hatteras along the East Coast are the main contributor to this increase. Hirsch et al. (2001) found an additional two storms with this track occur during El Niño winters compared to other winters. Strong El Niño events are particularly associated with this increase. Significant snow storms such as the Blizzard of '58 and a second March 1958 nor'easter occurred in conjunction with El Niño conditions, as did the February 2003 Presidents' Day Storm. Storms such as the "Perfect Storm" in October 1991 brought 15 to 30 foot waves to coastal New England during a strong El Niño.

Snowfall

Snowfall along the Northeast coast is typically above average during El Niño winters. The exception to this is the lake-effect region in New York. Since 1950, six of the least snowy winters on record at Buffalo have occurred during El Niños. Typically, in regions closer to the coast, December through February snowfall is as much as 6 inches greater during such winters. In Washington, DC, eight of the ten greatest 2-day snowfalls since 1950 have occurred during El Niños. However, individual storm tracks can influence where precipitation falls as rain versus snow. Heavy East Coast snowfalls have negative impacts on transportation and the economy. Based on the Northeast Snowfall Impact Scale, an index that infers societal impacts based on the geographical extent and amount of snowfall along with population data, seven of the nine storms classified as crippling have occurred in conjunction with El Niño.

Energy Usage

Across a broad swath of the Southeast, El Niño winter temperatures average 1 to 2 degrees cooler than those that do not experience El Niño conditions. Therefore, heating degree day accumulations tend to be higher during El Niño winters in this region. The Residential Energy Demand Temperature Index (REDTI) provides a population-weighted view of heating degree day accumulation in a region, thus giving a measure of year-to-year fluctuations in energy demand for residential heating. In the Southeast, seven of the ten highest REDTI values since 1950 have occurred under El Niño conditions. Since energy consumption increases as the number of heating degree days increases, this winter's El Niño is likely to increase energy usage as the demand for heating will be above average. With warmer than normal temperatures more likely in the Northeast, energy consumption will likely be lower, which is reflected in historical REDTI values during El Niño in this region.

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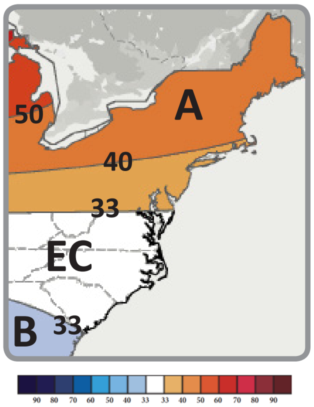
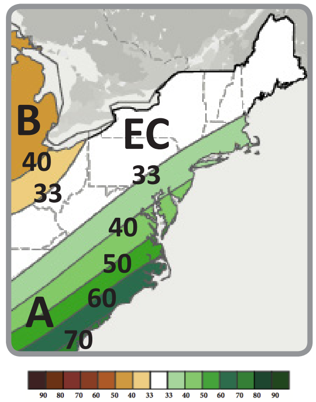
El Niño Outlook

Winter Temperature and Precipitation Outlooks



Valid for December 2015–February 2016

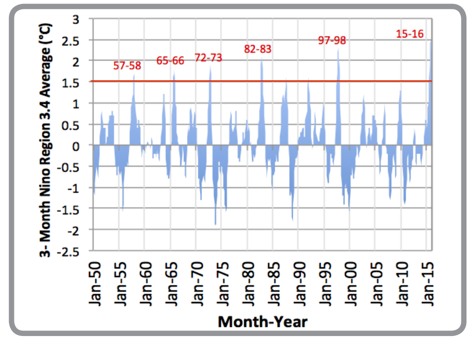
A: Above-normal
B: Below-normal
EC: Equal chances of above-, near, or below-normal
Number: Probability of above- or below-normal



As of October, the winter outlooks resemble the classic El Niño temperature and precipitation anomaly patterns for the region. The below-normal precipitation that is favored for the Midwest, extends into Ohio, while above-normal precipitation is very likely for the coastal Carolinas. This area of above-average precipitation extends through much of the coastal plain from the Carolinas to New England. Meanwhile, the temperature outlook indicates that the northern parts of the Eastern Region are more likely to experience above-normal temperatures. This pattern is supported by several climate model runs and is consistent with past strong El Niños. In the extreme south, increased chances for colder-than-normal temperatures are predominant. The seasonal outlooks above combine many factors including dynamical models, the effects of long-term trends, and soil moisture, in addition to past El Niño patterns. Therefore, they may not match typical El Niño conditions exactly. To learn more about these outlooks or see the latest temperature, precipitation, and drought outlooks, please visit the Climate Prediction Center at: http://www.cpc.ncep.noaa.gov.

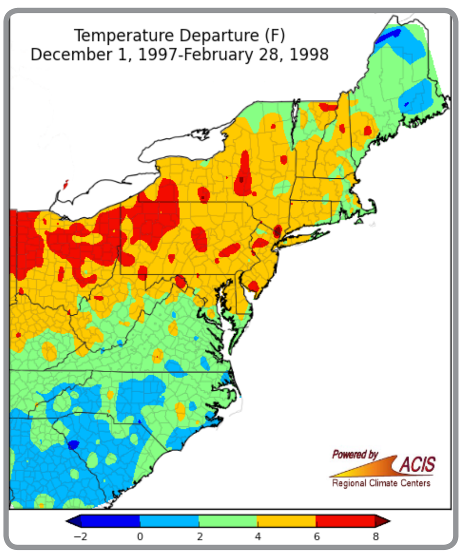
El Niño Strength

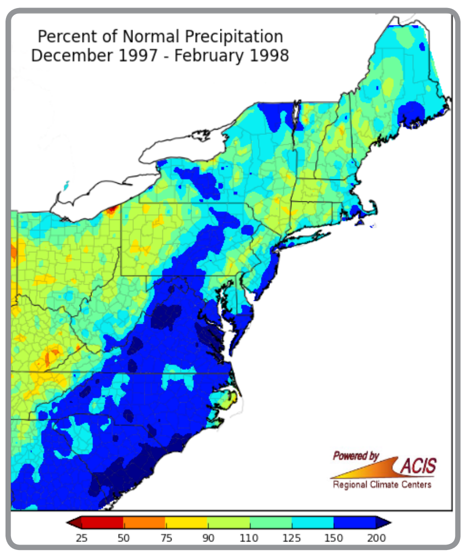
Winter 2015-2016



Atmospheric and oceanic observations through October 2015 and the mean of the IRI forecast plume values thereafter reflect a strong El Niño, persisting into early 2016. Currently, this El Niño ranks among the strongest on record, with the forecasted strength potentially exceeding the 1997-98 El Niño. According to the Climate Prediction Center, strong El Niños occur when the 3-month running-mean of sea surface temperature departure in the Niño 3.4 region of the central Pacific exceeds 1.5°C. Research has shown that strong El Niños are often followed by La Niñas, so conditions should continue to be monitored, especially if the El Niño weakens in the spring, as predicted.

Comparisons and Limitations





Winter Conditions During Past El Niños

The maps above illustrate the winter conditions of the record-breaking El Niño of 1997–98. Almost the entire region was warmer than average. Precipitation signals varied across the region. While the Ohio Valley and western Pennsylvania saw near-average precipitation, much of the Mid-Atlantic and Carolinas saw above-average precipitation. Despite El Niño's tendency to bring snowier-than-average winters to the East Coast, above-average temperatures led to below-average snowfall for most of the region. While the current El Niño is on track to be one of the strongest on record, please note that each El Niño is different.

Other factors can also affect winter conditions, such as pre-existing global snow cover patterns or climate variability associated with the Arctic Oscillation and the North Atlantic Oscillation. The Arctic Oscillation trumped El Niño during the winter of 2009–10. A similar situation occurred during the winter of 1965-1966 when expected El Niño precipitation was subdued due to a strong negative North Atlantic Oscillation. The problem associated with these patterns is that they are less able to be forecasted far in advance compared to El Niño, meaning that it is uncertain as to how much they will affect the upcoming winter season.

Eastern Region Partners

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Consortium on Climate Risk in the Urban Northeast
www.ccrun.org

Cooperative Institute for North Atlantic Research
www.cinar.org

Eastern Region State Climatologists
www.stateclimate.org

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