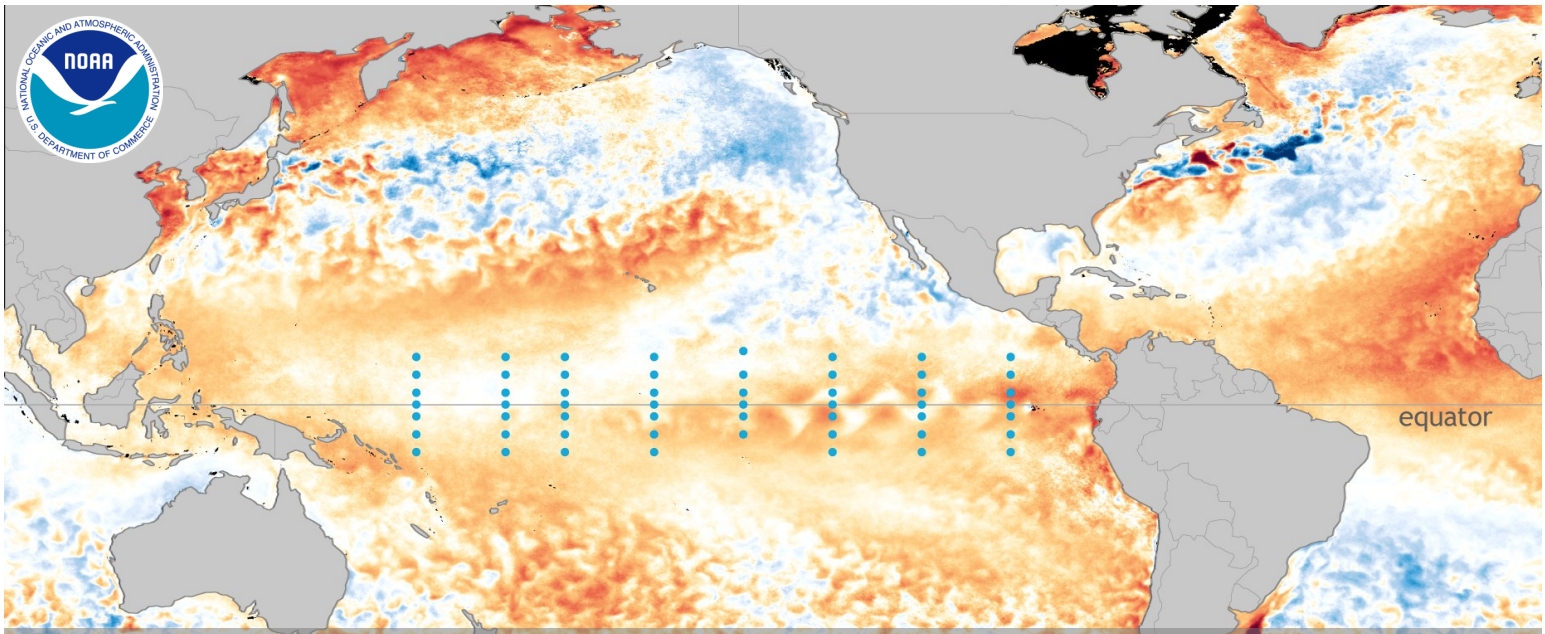


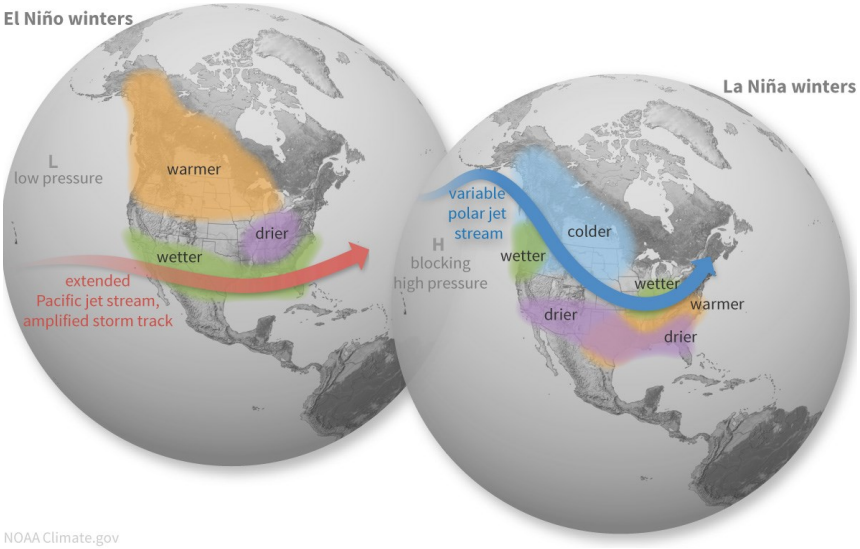
Tropical Pacific Observing System

The tropical Pacific Ocean has global impact. It is the source of the strongest and most predictable natural control on global climate and extreme weather - El Niño Southern Oscillation (ENSO). NOAA's contributions to the Tropical Pacific Observing System (TPOS) support better understanding and prediction of ENSO, which influences temperature and precipitation across the globe and throughout the United States. NOAA and our partners have made measurements in the tropical Pacific for decades, and worked to improve the forecast models that use this information. Improving our forecasting capabilities will profoundly impact agriculture, water management, marine ecosystems management, human health, and disaster preparedness.

ENSO is a cycle of warm (El Niño) and cool (La Niña) episodes of a recurring climate pattern in the tropical Pacific Ocean. Impacts to U.S. winter weather include:

→ **El Niño** usually brings milder conditions to the northern areas and wetter conditions to the south

→ **La Niña** typically brings cooler weather to the northwest and warmer weather to the southeast



TPOS Benefits to the U.S. — TPOS allows us to gain a greater understanding of the tropical Pacific, better address the uncertainty of climate variability, and provide improved predictions and longer forecast lead times. Better predictions of extreme climate episodes like floods and droughts could save the U.S. billions of dollars in damage costs and help to improve community resilience.

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ENSO IMPACTS ON THE U.S.

ENSO is the dominant mode of climate variability that can have global scale impacts on corn, wheat, and soybean crop production[1], which profoundly impacts regional and global food security. There is also evidence that ENSO impacts on rainfall patterns impact soil moisture which influences ecosystem productivity[2]. Understanding this seasonal variability is critical for monitoring global food production and predicting potential trends to allow for farmers and policymakers better respond to shifts in agricultural supply chains[3-5]. NOAA uses ENSO forecasts in developing their long-range hurricane outlooks (El Niño conditions favor a below-normal Atlantic hurricane season, while La Niña conditions favor an above-normal hurricane season), allowing farmers and emergency managers along the South/Southeast U.S. to better plan for localized disasters.

The impacts of ENSO events are demonstrated throughout the United States. Here are a few examples of why we need to better understand and predict ENSO:

Image Credit: University of Minnesota Extension


Image Credit: USGS


Image Credit: Dave Gatley, FEMA

Precipitation and Floods

ENSO conditions can lead to increased precipitation across the U.S. which can be both beneficial and detrimental. In some cases, this precipitation results in standard or above-average crop yields. In other instances, increased precipitation leads to flooding and crop damage.

Droughts

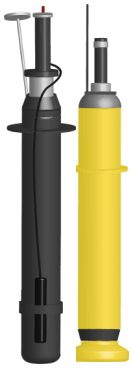
In the Southern U.S., heat waves and below-normal precipitation bring drought conditions and can lead to crop failures. Much of the drought concern in the Western U.S. is due to a strain on water resources through snowpack reduction.

Forecasting

ENSO forecasts help to enable more accurate agricultural planning. The value of improved ENSO forecasts to agriculture in the U.S. was estimated to exceed $200 million annually ($319 million, with 2020 inflation adjusted)[6].

Improving Weather and Climate Forecasts through Better Ocean Observing

Recognizing the need to continue to improve forecasts across multiple time scales and considering the remarkable developments in observing technologies, NOAA is currently leading efforts to implement a redesign of the Tropical Pacific Observing System. The new design leverages complementary data from buoys, satellites and new autonomous instruments to contribute to the next generations of earth system models. Leveraging complementary platforms, new technologies, and data assimilation advances will enable product and forecast system improvements and create opportunities for the development of new products to better meet end user needs. This will ensure that the U.S. continues its regional influence in the Tropical Pacific as a scientific leader.



References: [1] Anderson et al. 2017; [2] Flanagan and Adkinson 2011; [3] Hammer et al. 2001; [4] Iizumi et al. 2013; [5] Anderson et al. 2016; [6] Solow et al. 1998.

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