Wet Winter? Dry Winter? What's the Scoop?

by Nan Schmidt, based on a briefing document prepared by Randy Dole, NOAA CDC

Most forecasts indicate that El Niño conditions are likely to persist during the rest of 2002 and into early 2003; however, these forecasts also indicate that this event is likely to be weaker than the 1997-1998 event, with more uncertain climate impacts. The uncertainty in forecasting climate impacts stems, in part, from uncertainties in predicting moderate-to-weak El Niño conditions. Results from two climate models, one from the National Oceanic and Atmospheric Administration's (NOAA) National Center for Climate Prediction (NCEP) and the other from the National Aeronautics and Space Administration (NASA), illustrate the predicament that forecasters face this winter.

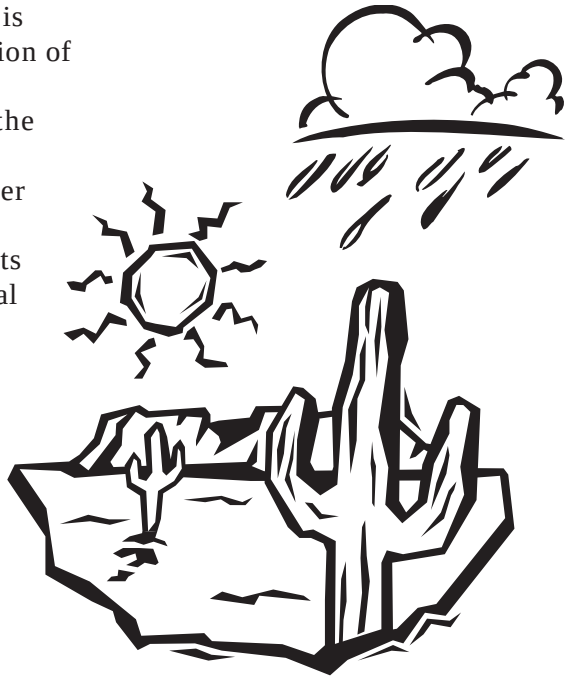
Although El Niño conditions are present, this does not ensure a wet winter in the southwestern United States. Uncertainties in forecasting precipitation for the upcoming winter are due primarily to differences in the predicted position and extent of warm sea surface temperature (SST) anomalies over the tropical Pacific and their subsequent impact on large-scale circulation patterns. By later in the fall, these conditions will develop fully, allowing more certain forecasts for the winter months. Until then, researchers rely on model results to build forecasts of precipitation impacts. Research at the NOAA CDC indicates that precipitation over the Southwest and much of the rest of the United States is sensitive not only to conditions in the central and eastern Pacific—where El Niño is usually defined—but also to SST conditions in the western tropical Pacific and eastern Indian Ocean "warm pool" region. Climate modeling results suggest that if the warming occurs predominantly in the eastern Pacific as simulated in the NOAA NCEP model (figure 1, upper left panel), a classical El Niño pattern will persist and there is an increased chance for above normal precipitation across the Southwest and much of the rest of the United States (figure 1, lower left panel).

If, however, the maximum warming occurs further west, as simulated by the NASA seasonal-interannual prediction model (figure 1, upper right), there is an increased chance for average precipitation across most of the Southwest and below average to average precipitation for most of the rest of the United States (figure 1, lower right). Because the ensuing impacts on U.S. precipitation of the two model scenarios are so different, there remains considerable uncertainty in the wintertime precipitation outlook. NOAA is monitoring closely the evolution of SSTs in both the Pacific and Indian Oceans, but details of the SST pattern for the winter are unlikely to be known until later this fall. The SST pattern that sets up by fall typically persists through the winter, so physical sources for uncertainty in the current suite of winter season forecasts can be expected to diminish over the next few months.

A comparison of Figures 1 and 2 illustrate the diminishing uncertainty as the lead time of the forecast shortens. Figure 1 is based on model forecasts made in September for November 2002 through January 2003; Figure 2 on forecasts made in July for the same time period. The NASA seasonal-interannual prediction model's results vary from July to September. In the July forecast (figure 2), there is an increased chance for below normal precipitation across the Southwest and much of the rest of the United States. The September forecast (figure 1) shows an increased chance of normal precipitation, bringing in more in line with the NCEP forecast..

As a positive aside to this story of uncertainty, the knowledge that will be gained by observing this winter's SST conditions and their subsequent impacts on large-scale circulation and precipitation will help researchers to refine both their understanding of the impacts of moderate-to-weak El Niño events and the models they use to forecast ENSO conditions.

For figures see page 5



Wet Winter? Dry Winter? continued

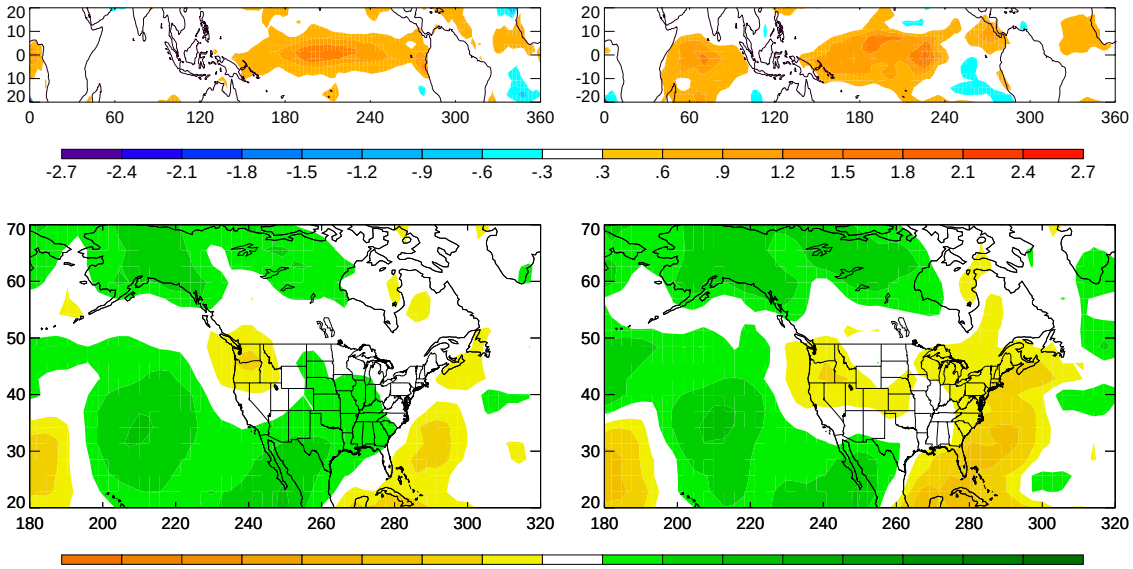


Figure 1. SST predictions for November 2002–January 2003 and associated U.S. precipitation impacts, September 2002. The NOAA NCEP model predicts continued warming in the central and eastern tropical Pacific, a typical El Ni o pattern (top left). In contrast, the NASA seasonal-interannual prediction model predicts warm SSTs further west (top right). Orange and red colors indicate above normal SSTs; blues below normal. Lower panels show the predicted impacts on U.S. precipitation, based on the SSTs. Greens indicated above normal precipitation, and yellows indicate below normal precipitation. The vertical axis is latitude, and the horizontal is longitude. Image courtesy NOAA-CIRES Climate Diagnostics Center.

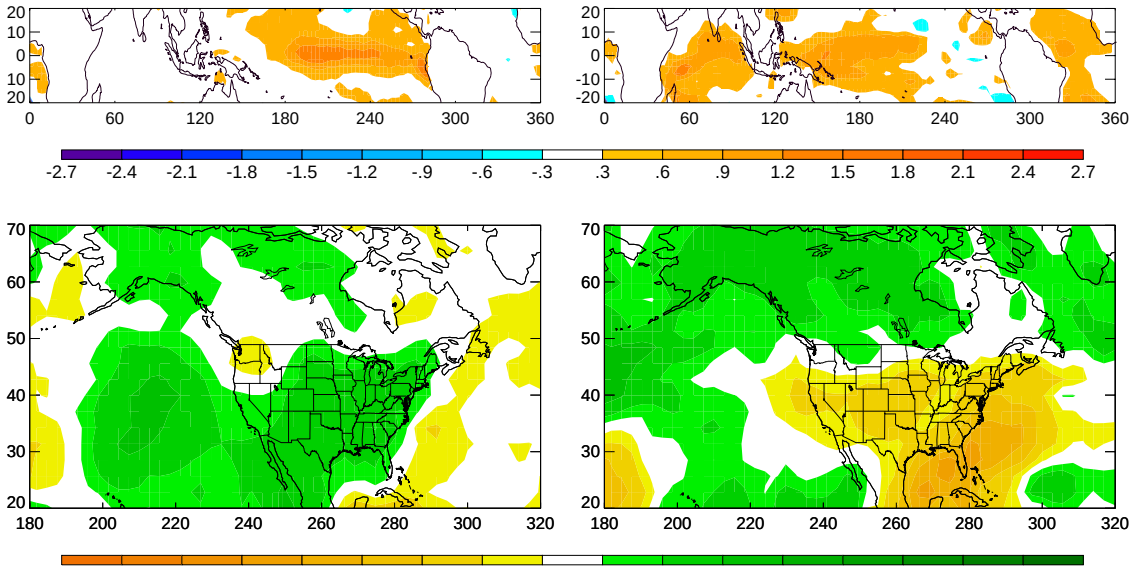


Figure 2. SST predictions for November 2002–January 2003 and associated U.S. precipitation impacts, July 2002. The NOAA NCEP model predicts continued warming in the central and eastern tropical Pacific, a typical El Ni o pattern (top left). In contrast, the NASA seasonal-interannual prediction model predicts warm SSTs further west (top right). Orange and red colors indicate above normal SSTs; blues below normal. Lower panels show the predicted impacts on U.S. precipitation, based on the SSTs. Greens indicated above normal precipitation, and yellows indicate below normal precipitation. The vertical axis is latitude, and the horizontal is longitude. Image courtesy NOAA-CIRES Climate Diagnostics Center.