A Successful Forecast of An El Niño Winter

The Pacific warming and its entourage of floods and heat are here on schedule, raising hopes for longer-range forecasts

IF IT'S A BALMY JANUARY IN FARGO AND pouring rain in Texas, meteorologists have learned to point the finger at El Niño, the warming of the tropical Pacific that occurs every 3 to 7 years. This year, for the first time, weather forecasters succeeded in taking advantage of that link. They used signs of a warming in the tropical Pacific as the basis for a long-range prediction of winter weather patterns across the United States. And as sodden Texans and shirt-sleeved northerners now know, the prediction, made at Thanksgiving, was still holding up in mid-January. Now forecasters are talking about the next step: stretching the lead time for such forecasts by a year or more.

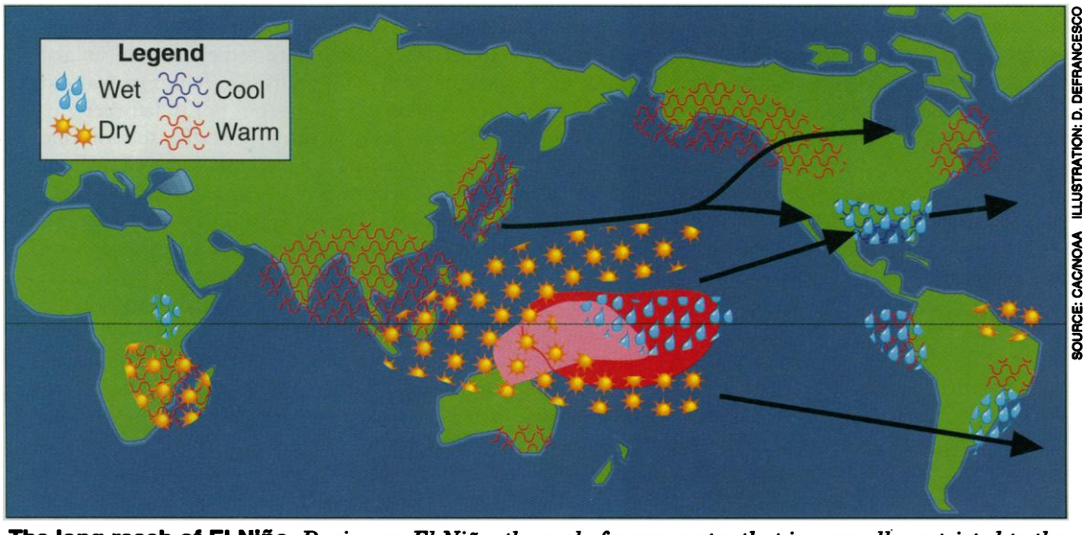
That seems feasible because although this Pacific warming was unmistakable by the time forecasters at the National Weather Service's Climate Analysis Center (CAC) in Camp Springs, Maryland, issued their winter forecast, the El Niño itself had been predicted almost 2 years in advance by a computer model. Next time around, the CAC may well be listening to the modelers and predicting El Niño-related patterns of warmth and flooding seasons in advance.

The power of the El Niño models was underscored last year, when CAC didn't listen to the computer modelers and its 3-month forecast stumbled. At the end of November 1990, CAC forecasters had assumed that a nascent warming in the Pacific would soon become a full-blown El Niño, which led them to factor the long-range effects of Pacific warming into their forecast. But the El Niño prediction model run by Mark Cane and Stephen Zebiak of Columbia University's Lamont-Doherty Geological Observatory disagreed. It had successfully predicted the 1986-87 El Niño a year ahead, and it was saying the Pacific was not yet ready for another one; 1991 would be the year. The Lamont model turned out to be right about 1990, so the winter forecast was wrong, very wrong (*Science*, 8 March 1991, p. 1182).

In 1991, winter forecasters had no need to rely on faint signs of a possible El Niño, because the event was well under way by Thanksgiving. Its early arrival allowed CAC forecasters to predict an El Niño winter with confidence. They predicted that the tropical warmth would displace the tracks of both the subtropical and the mid-latitude jet streams, which steer weather systems across the continent. The southern jet would bring rain-laden storms to the Gulf Coast and the southeast, and the mid-latitude jet would pump warmth to the north.

Now that the real thing has arrived, El Niño is delivering as CAC predicted. From central Alaska through western Canada to Lake Superior temperatures were 3°C to 7°C above normal during the first 5 weeks of the forecast, and precipitation was 200% and more above normal across Texas. Although the forecast did not include the rain-laden storms that have hit Southern California, they too are an El Niño effect, albeit a less reliable one.

And through mid-January, the El Niño itself had developed just as the Lamont group had forecast. "So far, so good," says Zebiak. Now the question is whether the warming in the central tropical Pacific will level off and then decline late this year, as the model calls for, or continue to build. Either way, forecasters think the topsy-turvy weather will persist for the rest of the winter—though the exact pattern of El Niño effects may change. When CAC forecasters unveiled a new 3-month forecast on 13 January, they were assuming that a split in the mid-latitude jet stream—the event underlying the December rains in Southern California—would persist. It often has during other El Niños. Sometimes, though, the split has merged back into a single stream, swung farther north to bring warmth to Alaska, and then dived south again to send frigid air into the eastern half of the nation. That would put a big hole in the temperature forecast.



SOURCE: CAC/NOAA ILLUSTRATION: D. DEFRANCESCO

The long reach of El Niño. *During an El Niño, the pool of warm water that is normally restricted to the western Pacific* (pink) *expands eastward by December* (red). *The tropical warmth can displace jet streams* (black arrows) *that can then steer unusual weather systems into distant regions around the world. The U.S. effects have already been seen, but elsewhere unusual weather may not develop until the spring.*

Whatever surprises the remainder of the winter may hold, the mood among forecasters is buoyant. Chester Ropelewski of CAC told the American Geophysical Union meeting last month that, on an experimental basis, Anthony Barnston of CAC and his colleagues had made a forecast for the winter of 1991-92 in August rather than waiting until the end of November. The forecast, which the researchers based on their own pattern-recognition scheme for predicting El Niño, was similar to the one officially released almost 4 months later. And given the success of the Lamont El Niño prediction, Ropelewski thinks such forecasts might be possible up to 2 years in advance. Even *The Old Farmer's Almanac* has not been so bold. ■ RICHARD A. KERR