The Weather in the Wake of El Niño

This El Niño is disappearing as it releases its hold on the world's weather; it was a sobering experience

El Niño, the great perturber of the world's weather, is gone now. The episode that began in 1986 officially ended this March as the warmer-than-normal waters of the equatorial eastern Pacific faded. This El Niño did everything from drying out India by weakening the monsoon to warming an already overheating globe. Researchers are a bit wiser, humbler, and more concerned about the future after studying its effects. Here are some highlights.

■ **Not a textbook El Niño.** It was with some relief that researchers bid this event adieu. It had them on tenterhooks for 2 years, beginning in January 1986 when computer model forecasts for a new El Niño were issued. In the spring it seemed to be on its way, by June it appeared to have fizzled, but by August it was truly under way. In January 1987 it was said to be in its "mature phase" and about to fade away. Its demise was again seen as imminent the following August. By late fall most researchers were assuming, with a good deal of caution, that it was on its way out, which it finally was.

Vernon Kousky of the National Weather Service's (NWS's) Climate Analysis Center in Camp Springs, Maryland, found the whole experience quite instructive. "One thing we learned is that it's going to be a very difficult problem to forecast how these [episodes] progress. It was a sobering experience. The modelers had some encouraging results, but they had their problems too." The textbook picture of an El Niño, actually an El Niño–Southern Oscillation (ENSO) event including atmospheric changes, was shaken by the capriciousness of the 1982–83 event. Such idealized concepts have now been put aside. The timing and amplitude of each stage of an ENSO event are too variable for simple classification.

■ **Dwindling weather effects.** As this ENSO event faded, so did its effects on the weather around the globe. After the stunningly warm 1986–87 winter across most of Canada, when average temperatures were up to 9°C above normal, temperature anomalies during 1987–88 were about half as large and were centered in eastern Alaska and the northern parts of Canada. The Gulf Coast, which had an ENSO-related wet winter in 1986–87, was wet this December but then dried out. Even before the warm water has disappeared in the Pacific, the modulation of weather over North America and the rest of the globe has ceased, says Kousky.

The NWS's long-range forecasters chose to ignore the ongoing ENSO event when they made their winter weather prediction. That was prudent, as it turned out, but not of much help. Nothing worked. The observed temperatures, resulting from a jumble of highly variable weather that tended to average out to near normal, was "a forecaster's nightmare," according to Donald Gilman, head of the long-range forecasting group. The temperature forecast was "distinctly poorer than the average winter forecast" and exhibited essentially zero skill. The precipitation forecast was so bad that they would have been better off making no forecast at all, says Gilman. As can be all too typical of the weather forecasting business, their two subsequent 90-day forecasts "have been sensational."

■ **The ENSO year, the warmest on record.** The year 1987 was the warmest, on average around the globe, in the 100-year record of instrumentally recorded temperatures. The four warmest years in the record were all in the 1980s. Is this the greenhouse warming?

The warming itself is incontrovertible. Philip Jones and his colleagues at the University of East Anglia have extended their compilation of sea surface temperatures and surface air temperatures over land through 1987 and found that the global mean temperature was 0.33°C above the 1950–1979 average. The globe has warmed about 0.3°C since the mid-1960s, a rise equaled in steepness only a couple of times in the past century. James Hansen and Sergej Lebedeff at the Goddard Institute for Space Studies in New York have found the same trends in their compilation.

The interpretation of the warming is not so clear. No one is certain how to distinguish a greenhouse warming from natural variability (*Science*, 5 February, p. 559). The cause of the concentration of record years in the 1980s is clear. In a time of generally rising temperatures, any years that are a bit warmer than their neighbors will inevitably stand out. Global temperatures have risen about 0.5°C since 1880; the recent warming surge since 1965 is pushing Earth to temperatures that rival the warmest since the last ice age. And ENSO years such as 1983 and 1987 are warmer than non-ENSO years. So it is the long-term warming trend rather than the record years that concern scientists.

Opinions vary, but Jones, for one, cannot see a clear pattern in the warming that would mark it as greenhouse-induced. Compared to the variability of temperature in a given region, he says, the largest warmings are at mid-latitudes in the Northern and Southern Hemispheres, not at high latitudes as predicted by computer models. But then the models have their limitations. "You can't attribute the warming categorically to the greenhouse," he says. "You can say it is consistent with it. If 1988 and 1989 are warm without an El Niño, you might have more faith." ■ RICHARD A. KERR

The warming

The global temperature trend has been bumpy but definitely upward. The increases have been abrupt, as after 1965 and around 1920. The coolings are unexplained. Inner error bars, 5-year mean; outer error bars, annual mean.