Old and tired, an El Niño hints of its end

After upsetting global weather patterns for the last half-year, the El Niño warming in the Pacific Ocean has weakened in the past month — a trend that could signal its coming demise. Forecasters now predict that Pacific waters will soon turn abnormally cold, sparking a different weather-altering pattern that could also affect much of the globe.

While sea-surface temperatures across most of the tropical Pacific remain warmer than normal at this time, "the water right along the equator has cooled off considerably in the last four weeks," says Vernon E. Kousky of the National Weather Service's Climate Analysis Center in Camp Springs, Md. "That's usually the first sign that [a warm event] has entered its decay stage."

Warmings and coolings in the Pacific represent opposite phases of one basic pattern called the El Niño-Southern Oscillation (ENSO) — a complex duet between ocean currents and wind streams in the tropical Pacific. During warm events, such as the one that developed late last year, the normal easterly winds (which flow east to west) weaken along the equator, allowing warm water to spread from the New Guinea area toward the central and eastern Pacific. Cold events, called La Niñas by some researchers, occur when the easterlies grow strong, pulling up cold, deep water from the eastern Pacific and spreading it westward across the equatorial belt. The El Niño warm events and La Niña cool events recur irregularly, about four to seven years apart.

This year's warm event in the tropical Pacific brought a devastating drought to southern Africa and dry conditions to India, Indonesia and northern Australia. On the opposite side of the Pacific, severe rains hit South America's west coast, southern California and Texas as well as other parts of the world (SN: 12/14/91, p.389; 3/7/92, p.159).

Kousky points to several recent developments that suggest the warming may soon end. Aside from the sea-surface cooling along the equator, which has reached as much as 1 °C below normal in some places, the equatorial easterly winds have strengthened recently.

Measurements made below the ocean surface also show significant changes in the depth of the thermocline — the border between warm surface water and colder deep water. During warm events, this boundary sinks in the central and eastern Pacific as a pool of warm water floods the region. But the thermocline rose rapidly during May and June in the eastern Pacific, says Kousky. He cautions, however, that these changes could prove deceptive; the present trend could stall, prolonging the warm event.

Most of the various ENSO forecast models call for a cold event to follow this year's warm one, but they differ on the timing, a factor the models have trouble predicting. A model at the Climate Analysis Center, based on the statistics of past weather patterns, predicts that Pacific Ocean temperatures will remain higher than normal for several months and then decline, with a cold event emerging by next year.

A much faster descent into cold conditions is predicted by a new model developed jointly by the Scripps Institution of Oceanography in La Jolla, Calif., and the Max Planck Institute for Meteorology in Hamburg, Germany. This model — a marriage between an ocean general circulation model and a statistical atmosphere model — calls for a cold event to appear this summer and reach its peak around the end of the year, says Tim P. Barnett of Scripps.

A third model, developed at Columbia University's Lamont-Doherty Geological Observatory in Palisades, N.Y., had previously called for cold conditions to develop next year, but more recently started showing a cooling late this year.

Like their warm counterparts, cold events can play havoc with world weather, often causing the exact opposite trends to develop over specific regions. Today's ENSO models remain far too limited to offer specific forecasts for individual areas. But past patterns during cold events would suggest dry conditions for the Gulf states, cold weather for the northern plains and above-normal precipitation in Indonesia, northern Australia and southern Africa.

With most models calling for a cold event to come, ENSO aficionados will keep close tabs on the Pacific. But cold events do not always follow warm ones, and nature may yet pull a surprise. That would make for many unhappy ENSO forecasters. — *R. Monastersky*

New hormone may lift Montezuma's vendetta

Travelers jokingly call it Montezuma's revenge. Physicians know it as traveler's diarrhea. Whatever it's called, this infectious disease can be debilitating to healthy adults and deadly to children, especially those living in developing countries.

But pharmacologists Mark G. Currie and Leonard R. Forte have made a discovery that may someday loosen diarrhea's grip on the gut.

Traveler's diarrhea springs from *Escherichia coli* bacteria. These microbes make proteins called heat-stable enterotoxins, which bind to receptors on the cells lining the intestines, sparking a series of chemical reactions inside them. The reactions cause the cells to leak water and salt into the gut and to lose their ability to sponge up excess fluids. This flooding produces diarrhea.

In the past, scientists have noted with bewilderment that the body doesn't seem to produce any substance that binds to these receptors. Obviously, the receptors didn't evolve so that disease-causing bacteria could ravage the intestines. "There's no real reason for us to have this receptor unless *we* make a [protein] for it too," says Currie, a researcher at the Monsanto Co. in St. Louis.

That hunch has now proved correct. Last week, at a meeting of the Endocrine Society in San Antonio, Texas, Currie announced the discovery of a hormone that binds to the same receptors as *E. coli's* heat-stable enterotoxins. He calls the hormone guanylin.

Currie and Forte, who works at the University of Missouri School of Medicine in Columbia, have compared the hormone and the bacterial protein and have found that they look and behave alike. The researchers showed that guanylin, like the heat-stable enterotoxins, causes the intestinal cells to release water and salt into the gut. Although the hormone's exact role in the body remains unknown, Curry speculates that it helps prevent intestinal mucus from drying up. Just as too much fluid in the gut can cause problems, so can too little: If the mucus in the intestines were to dry up, constipation could result.

Currie and Forte are trying to develop a dummy protein that looks enough like guanylin to bind to the receptors but that doesn't affect the cells. If physicians could use such a drug to block all the guanylin receptors in the intestines, *E. coli's* heat-stable enterotoxins would have nowhere to dock. "We could drastically decrease the effects of the diarrhea," says Currie.

In the Third World, that could mean the difference between life and death. According to the World Health Organization, acute diarrhea kills approximately 3.2 million children in developing countries each year. "They're secreting liters of water a day, dehydrating faster than you can imagine," Currie says.

Other researchers echo the importance of halting *E. coli's* intestinal foul play. Michael Field, a gastroenterologist at Columbia University in New York City, calls infectious diarrhea caused by *E. coli* "one of the major health hazards in the world."

Studies of guanylin also have broader scientific implications. "What is that hormone doing in the intestinal tract?" Field asks. Answering this question, he says, will provide "a greater understanding of how the intestinal tract is regulated." — *M. Stroh*