Pacific Warmth Augurs Weird Weather

The central Pacific has spiked a fever in the last 4 months, hinting at the incipient arrival of El Niño—an ocean warming that upsets weather patterns in the United States and around the globe.

"We've been noticing ever since the end of last year that the waters have warmed rather rapidly throughout the central equatorial Pacific, as well as near the South American coast," says Vernon Kousky of the National Oceanic and Atmospheric Administration (NOAA) in Camp Springs, Md. "At the same time, the low-level easterly winds have slacked off and become weaker than normal. Those are what we consider red flags that something is brewing out there."

The Pacific has shown other signs of an impending El Niño. Thunderstorm activity has shifted recently from its normal position near Indonesia to the central part of the ocean, as it traditionally does during an El Niño. An atmospheric pressure pattern known as the Southern Oscillation Index has reversed in the last 2 months, another telltale sign.

These indications led NOAA to issue an advisory on May 9 saying that "we can expect warm episode [El Niño] conditions to intensify during the next several months."

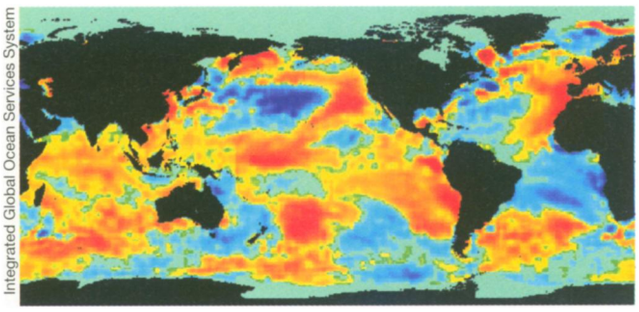
Climate researchers in the last decade have made great strides in forecasting El Niños, but their success rate is far from perfect. The recent warming, though dramatic, could fade quickly and never develop into a full-fledged El Niño.

Kousky and his colleagues issued the current warning in part because of forecasts from computer climate models run at the National Centers for Environmental Prediction in Camp Springs. For several months, their complex ocean-atmosphere model has been predicting a strong El Niño for later this year. A similar message has come out of the centers' statistical model, a much simpler forecasting tool that relies on past weather patterns.

Other models have not been as bullish, though. An ocean-atmosphere computer model at the Lamont-Doherty Earth Observatory in Palisades, N.Y.—one of the premier forecasting models—has been calling for cool to normal conditions in the central equatorial Pacific, with only slight warming by year's end.

"What gives us a little cause for concern was that some other models, as well as statistical techniques, did not indicate it. All techniques suffer at this time of year. It's a tough time to make forecasts," says Kousky.

Though the computers may be arguing, human meteorologists sense El Niño's presence. "We can see the whites of its eyes," says Mary Voice of the Australian National Climate Centre in Melbourne. Her office of the Australian Bureau of Meteorology recently issued a forecast for warming in the Pacific. Such forecasts can help a wide variety of industries plan for the unusual weather that El Niño sparks.



A map of abnormal sea-surface temperatures in April shows strong warming (red and orange) in the central equatorial Pacific and off the west coast of South America.

El Niño is a natural climate phenomenon that develops when a pool of warmth normally located in the western equatorial Pacific spreads eastward toward the central part of the ocean. Wind shifts cause pronounced warming along the South American coast as well, traditionally peaking around Christmastime, which led fishermen there to name the warming El Niño, a Spanish term referring to the infant Jesus.

The Pacific warming redirects atmospheric wind patterns downstream and makes itself known around the world. Traditionally, it washes Texas and the Gulf Coast with extraordinary amounts of rain during winter, while western Canada and the northern United States bask in abnormally warm winters. Sometimes, El Niño can bring heavy rains to California yet dry out the Pacific Northwest, says Kousky.

The Pacific warming often steals rain from Australia, Indonesia, parts of Brazil, and eastern and southern Africa. Conversely, it floods the normally dry west coast of South America.

If the current warming blossoms into a full-scale El Niño, it will perpetuate an unusual streak of warm years that has gripped the central Pacific since 1976. The cause of this trend remains uncertain, but some climate researchers interpret the enhanced frequency of El Niño events as a symptom of greenhouse gas pollution and global warming. *—R. Monastersky*

Napless cats awaken interest in adenosine

Nearly 2 decades ago, scientists unearthed the biochemical explanation for why so many people crave a morning cup of coffee. Caffeine, the well-known stimulant in coffee, tea, and many sodas, revives people by preventing a compound called adenosine from binding to brain cells.

Since that discovery, adenosine has begun to intrigue more and more sleep investigators. Many studies in animals have shown that blocking adenosine's actions in the brain increases alertness, while injections of adenosine or similar compounds induce apparently normal sleep.

Now, by monitoring the brain chemistry of cats, a team of researchers has shown that natural adenosine concentrations in at least some parts of the brain build up during waking periods and decline during sleep. Moreover, the investigators report in the May 23 SCIENCE, adenosine concentrations in the brain shoot up dramatically in animals forced to stay awake.

The findings offer the most compelling evidence yet that adenosine is one of the long-sought factors whose fluctuating concentrations in the brain determine when an animal must sleep.

"That's fantastic. We predicted what they got," says Miodrag Radulovacki of the University of Illinois College of Medicine in Chicago, the earliest champion of the adenosine theory of sleep.

The new adenosine research may bolster a recent theory that the body's regular desire for sleep stems from the brain's periodic need to replenish low stores of energy.

Adenosine is a relatively simple, nitrogen-containing compound used widely by the body. It forms the core of adenosine triphosphate, or ATP, the energy-storage molecule that powers most of the biochemical reactions inside cells.

In the brain, adenosine secretion by cells such as neurons and glia often reflects how busy the cells are. "Areas that are active generate adenosine; areas that aren't active tend not to," says