Cousin of El Niño Haunts Indian Ocean

For decades, climate researchers have regarded the Indian Ocean as a boring basin, lacking the commotion that El Niño and La Niña stir up in the Pacific. Now, two teams of scientists have independently identified the climatic kin of El Niño in the Indian Ocean, where it caused widespread weather problems in 1997.

The finding raises the hope that forecasters will soon learn to predict abnormal torrents and droughts in East Africa, India, and Indonesia.

"It's like we've found a raw gem. Now, we have to polish it and see how good it is," says Peter J. Webster of the University of Colorado at Boulder, the leader of one team. His group published its results in the Sept. 23 NATURE, as did a trio of Japanese and Indian researchers.

The two sets of scientists noticed that water temperatures along the equatorial Indian Ocean have a habit of flip-flopping. Usually, warm water accumulates in the eastern part of the ocean near Indonesia, while the western section near Africa remains relatively cool. This pattern can occasionally reverse, however, when winds and ocean currents conspire to chill the eastern Indian Ocean, contend the scientists.

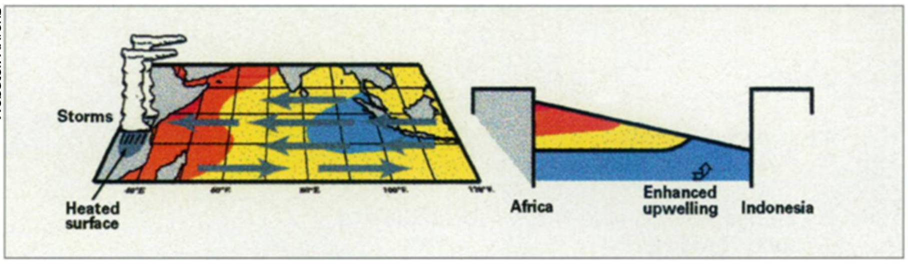
Historical data show this kind of extreme turnabout has happened six times in the past 40 years, reports Toshio Yamagata at the University of Tokyo and his colleagues. When the western Indian Ocean warms dramatically, it can bring devastating rains to Kenya and neighboring countries, which in turn spawn epidemics there (SN: 7/17/99, p. 36).

Scientists had previously detected hints of this temperature reversal while studying the climate of 1961, a catastrophically wet year in East Africa. They had, however, thought that the 1961 episode was unique, says Webster. The pattern sprang to life again in 1997 but got overshadowed by the century's biggest El Niño.

"All of the commentaries in 1997 and 1998 were referring to the great El Niño, and here we had this enormous temperature variation in the Indian Ocean, and nobody had noticed it," says Webster.

The Colorado scientists used measurements of sea level, thunderstorm activity, and ocean temperatures to reconstruct the events in the Indian Ocean. The unusual ocean pattern started to develop in early 1997, when a broad swelling in the sea surface rippled westward, piling up warm water near the African coast. In June, winds along the coast of Sumatra in Indonesia pulled up cool ocean water.

As East Africa warmed and the Sumatran region cooled, the winds that normally blow eastward along the equator reversed direction. The shift enhanced the temperature disparity, feeding the growth of storms over East Africa and fostering record drought and fires in Indonesia. In mid-1998, monsoonal winds sweeping across the Indian Ocean wiped out the unusual pattern, says Webster.



Webster/NATURE

Indian Ocean map shows equatorial winds blowing westward in autumn of 1997, piling up warm water along the East African coastline, as depicted in the ocean-height diagram on right.

The Indian Ocean reversal is an independent beast that has no clear link to El Niño, contend the two teams. Although the two events coincided in 1997, the Indian pattern occurred on its own in 1961 and at other times in recent decades.

If researchers can discern how the temperature shift in the Indian Ocean affects weather around the basin, forecasters might better predict conditions months in advance, in much the same way that El Niño gives a forewarning of unusual climatic events.

"That is the hope, but it remains to be demonstrated," says David Anderson of the European Centre for Medium-Range Weather Forecasts in Reading, England.

At present, most computer climate-forecasting models ignore the Indian Ocean, but the two reports and other new studies will likely redirect researchers' attention. For example, Lisa Goddard and Nicholas E. Graham of the Scripps Institution of Oceanography in La Jolla, Calif., used a model to show that Indian Ocean temperature plays a much bigger role than Pacific temperatures in influencing African rains, they report in an upcoming issue of the JOURNAL OF GEOPHYSICAL RESEARCH.

"It's important," says Graham. "You can't leave out the Indian Ocean, as some people do." —*R. Monastersky*

By a nose, worms reveal new Prozac targets

The scrunched-up noses of worms swimming in a solution of Prozac could help explain the popular antidepressant's side effects, such as insomnia, sexual dysfunction, and nausea. They may even challenge the current theory of how the drug lifts spirits.

Although millions of people each year receive prescriptions for Prozac, a debate continues about how it and related antidepressants work. The prevailing hypothesis holds that these drugs correct a deficiency of the brain chemical serotonin by binding to and interfering with cell-surface proteins, the serotonin reuptake transporters, that mop up the neurotransmitter.

Some investigators, however, contend that Prozac doesn't battle depression much better than placebo pills or talk therapy. Others accept the drug's value but dispute the evidence that serotonin deficiency causes depression.

"It's not that the drugs don't help some people—I think they do—but I don't think we know why," says Elliot S. Valenstein of the University of Michigan in Ann Arbor, a critic of the serotonin hypothesis. "There's so much that contradicts this simple theory, but we don't know what to turn to."

To explore the workings of Prozac, Robert K.M. Choy and James H. Thomas of the University of Washington and the Fred Hutchinson Cancer Center, both in Seattle, chose the humble nematode *Caenorhabditis elegans*. While its nervous system is extremely simple, the worm's nerve cells employ many of the same molecules, such as serotonin and its transporters, that the human brain does.

When bathed in Prozac, *C. elegans* responds in two obvious ways. First, the drug triggers the female worms to lay eggs. Second, it induces muscle contractions, most dramatically in the muscles around the olfactory cells at the worm's tip.

Investigators had previously shown that the egg-laying response stems from Prozac's interactions with the serotonin system. Choy and Thomas, however, found that the nose-muscle contractions occur independently of the drug's inhibition of serotonin transporters. This suggests that Prozac has other molecular