What is El Niño Taimasa?

During very strong El Niño events, sea level drops abruptly in the tropical western Pacific and tides remain below normal for up to a year, especially around Samoa. The Samoans call the wet stench of coral die-offs arising from the low sea levels taimasa (pronounced [kai’ ma’sa]). Studying the climate effects of this particular variation of El Niño and how it may change in the future is a team of scientists at the International Pacific Research Center, University of Hawai‘i at Mānoa and at the University of New South Wales, Australia.

Two El Niño Taimasa events have occurred in recent history: 1982/83 and 1997/98. El Niño Taimasa differs from other strong El Niño events, such as those in 1986/87 and 2009/10, according to Matthew Widlansky, postdoctoral fellow at the International Pacific Research Center, who spearheaded the study.

“We noticed from tide gauge measurements that toward the end of these very strong El Niño events, when sea levels around Guam quickly returned to normal, that tide gauges near Samoa actually continued to drop,” recalls Widlansky.

During such strong El Niño, moreover, the summer rainband over Samoa, called the South Pacific Convergence Zone, collapses toward the equator. These shifts in rainfall cause droughts south of Samoa and sometimes trigger more tropical cyclones to the east near Tahiti.

Using statistical procedures to tease apart the causes of the sea-level seesaw between the North and South Pacific, the scientists found that it is associated to the well-known southward shift of weak trade winds during the termination of El Niño, which in turn is associated with the development of the summer rainband.

Looking into the future with the help of computer climate models, the scientists are now studying how El Niño Taimasa will change with further warming of the planet. Their analyses show, however, that sea-level drops could be predictable seasons ahead, which may help island communities prepare before the next taimasa.

Abstract

PROJECTIONS OF EXTREME SEA LEVEL VARIABILITY DUE TO EL NIÑO TAIMASA

During strong El Niño events, sea level drops around some tropical western Pacific islands by up to 20–30 cm. Such extreme events (referred to as ‘taimasa’ in Samoa) expose shallow reefs, thereby damaging associated coastal ecosystems and contributing to the formation of ‘flat topped coral heads’ often referred to as microatolls. We show that during the termination of strong El Niño events, a southward movement
of weak trade winds prolongs extreme low sea levels in the southwestern Pacific. Whereas future sea levels are likely to gradually rise, recent modeling evidence suggests that the frequency of strong El Niño events (which alter local trade winds and sea level) is very likely to increase with greenhouse warming. Such changes could exacerbate El Niño-related sea level drops, especially in the tropical southwestern Pacific. Using present-generation coupled climate models forced with increasing greenhouse-gas concentrations, we assess how the interplay between global mean sea level rise, on one hand, and more frequent interannual sea level drops, on the other, will affect shallow reef ecosystems.

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