

# By storing more heat, oceans create 'hiatus periods' in rise of global warming -- study

Lauren Morello, Environment & Energy Publishing, 9-19-11

The "missing heat" needed to balance the Earth's energy budget may be lurking in the deep oceans, a new study finds.

That deep ocean heat storage could help explain periods when global warming has slowed, even though satellite data show no change in the amount of energy trapped in the Earth's atmosphere.

That "missing heat" is hiding out in ocean waters at depths of 1,000 feet or more, according to researchers from the United States and Australia. Their findings, based on computer climate simulations, were published yesterday in the journal *Nature Climate Change*.

The study also predicts that the continued warming of the climate will be punctuated by brief periods when the rate of warming slows, stops or even reverses, slightly.

"We will see global warming go through hiatus periods in the future," said the study's lead author, Gerald Meehl of the National Center for Atmospheric Research. "However, these periods would likely last only about a decade or so, and warming would then resume. This study illustrates one reason why global temperatures do not simply rise in a straight line."

Understanding what's happening during such warming hiatuses will help scientists and policymakers weigh the merits of policies to fight climate change and determine which natural events are driven by warming.

The "missing heat" problem was driven home by recent warming trends, the new study notes. Although the period between 2000-2009 is the warmest decade on record, 1998 stood alone as the warmest single year on record until 2010.

Yet during that time, the world's greenhouse gas output continued to rise. Satellite measurements tracking the amount of energy reaching and leaving the Earth showed an increasing amount of energy was being trapped in the planet's atmosphere.

## 'Missing' energy will reappear

So why didn't air temperatures rise during that period as greenhouse emissions data and energy flux measurements might suggest? The answer might be in the deep ocean, in areas where there are few measurements, two of Meehl's co-authors, NCAR researchers Kevin Trenberth and John Fasullo, suggested last year in a paper published in *Science*.

That hunch is borne out by the new study, which draws on computer climate simulations to track the missing heat.

The researchers began by running five simulations of the future climate based on projections of future greenhouse gas emissions from human activities. All of the simulations showed a continued rise in global temperatures this century, but they included brief periods when the rate of warming stabilized for about a decade before they again began increasing.

A closer examination of those warming hiatuses simulated by the computer model showed more energy was being stored in the deep oceans than during other periods when the global temperature was climbing faster.

Areas at depths of 1,000 feet or more warmed 18 to 19 percent faster during those warming hiatuses than they did at other times.

The pattern of deep-ocean heat storage resembled changes in ocean heat and circulation that take place during a La Niña event, the scientists said.

"It's a good paper," said David Easterling, chief of the Global Applications Division at the National Climatic Data Center, who was not involved in the new study.

"We know the ["missing"] energy has to be somewhere in the climate system because if you look at the top of the atmosphere, you have a net imbalance -- more energy coming than going out," Easterling said of the hiatus periods. "This paper gives you a physical mechanism as to why that's happening. ... The energy goes down in the ocean, and sooner or later, it's going to be released to the atmosphere, and that's what's really critical about this."