

## The Mystery of Global Warming's Missing Heat

by Richard Harris



Stuart Westmorland

Oceans hold much more heat than the atmosphere can. Corbis

Morning Edition, March 19, 2008 · Some 3,000 scientific robots that are plying the ocean have sent home a puzzling message. These diving instruments suggest that the oceans have not warmed up at all over the past four or five years. That could mean global warming has taken a breather. Or it could mean scientists aren't quite understanding what their robots are telling them.

This is puzzling in part because here on the surface of the Earth, the years since 2003 have been some of the hottest on record. But Josh Willis at NASA's Jet Propulsion Laboratory says the oceans are what really matter when it comes to global warming.

In fact, 80 percent to 90 percent of global warming involves heating up ocean waters. They hold much more heat than the atmosphere can. So Willis has been studying the ocean with a fleet of robotic instruments called the Argo system. The buoys can dive 3,000 feet down and measure ocean temperature. Since the system was fully deployed in 2003, it has recorded no warming of the global oceans.

"There has been a very slight cooling, but not anything really significant," Willis says. So the buildup of heat on Earth may be on a brief hiatus. "Global warming doesn't mean every year will be warmer than the last. And it may be that we are in a period of less rapid warming."

In recent years, heat has actually been flowing out of the ocean and into the air. This is a feature of the weather phenomenon known as El Nino. So it is indeed possible the air has warmed but the ocean has not. But it's also possible that something more mysterious is going on.

That becomes clear when you consider what's happening to global sea level. Sea level rises when the oceans get warm because warmer water expands. This accounts for about half of global sea level rise. So with the oceans not warming, you would expect to see less sea level rise. Instead, sea level has risen about half an inch in the past four years. That's a lot.

Willis says some of this water is apparently coming from a recent increase in the melting rate of glaciers in Greenland and Antarctica.

"But in fact there's a little bit of a mystery. We can't account for all of the sea level increase we've seen over the last three or four years," he says.

One possibility is that the sea has, in fact, warmed and expanded — and scientists are somehow misinterpreting the data from the diving buoys.

But if the aquatic robots are actually telling the right story, that raises a new question: Where is the extra heat all going?

Kevin Trenberth at the National Center for Atmospheric Research says it's probably going back out into space. The Earth has a number of natural thermostats, including clouds, which can either trap heat and turn up the temperature, or reflect sunlight and help cool the planet.

That can't be directly measured at the moment, however.

"Unfortunately, we don't have adequate tracking of clouds to determine exactly what role they've been playing during this period," Trenberth says.

It's also possible that some of the heat has gone even deeper into the ocean, he says. Or it's possible that scientists need to correct for some other feature of the planet they don't know about. It's an exciting time, though, with all this new data about global sea temperature, sea level and other features of climate.

"I suspect that we'll be able to put this together with a little bit more perspective and further analysis," Trenberth says. "But what this does is highlight some of the issues and send people back to the drawing board."

Trenberth and Willis agree that a few mild years have no effect on the long-term trend of global warming. But they say there are still things to learn about how our planet copes with the heat.