

Science News

from research organizations

Global ocean warming started later in the 20th century than previously estimated

Date: August 9, 2021

Source: University of California - Santa Barbara

Summary: In estimations of ocean heat content -- important when assessing and predicting the effects of climate change -- calculations have often presented the rate of warming as a gradual rise from the mid-20th century to today. However, new research could overturn that assumption, suggesting the ocean maintained a relatively steady temperature throughout most of the 20th century, before embarking on a steep rise. The newly discovered dynamics may have significant implications for what we might expect in the future.

Share: [!\[\]\(17413706fd4997a1a4bdf85c6864eee1_img.jpg\)](#) [!\[\]\(f419710cbe076aa30a9c6c031b5cbe84_img.jpg\)](#) [!\[\]\(2726020a4107bdc9042b257034f90eb3_img.jpg\)](#) [!\[\]\(9459655bf14a84f4d775e8d814cca8c9_img.jpg\)](#) [!\[\]\(de47dbdca34225b222a4a87ac0e499b3_img.jpg\)](#)

FULL STORY

In estimations of ocean heat content -- important when assessing and predicting the effects of climate change -- calculations have often presented the rate of warming as a gradual rise from the mid-20th century to today. However, new research from UC Santa Barbara scientists Timothy DeVries and Aaron Bagnell could overturn that assumption, suggesting the ocean maintained a relatively steady temperature throughout most of the 20th century, before embarking on a steep rise. The newly discovered dynamics may have significant implications for what we might expect in the future.

"There wasn't an onset of an imbalance until about 1990, which is later than most estimates," said DeVries, an associate professor in the Department of Geography, and a co-author on a paper that appears in the journal *Nature Communications*. According to the study, the period from 1950 to 1990 saw temperature fluctuations in the water column but no net warming. After 1990, the study continues, the entire water column switched from cooling to warming.

These findings are the result of the addition of a largely underexplored factor in ocean heat content (OHC): deep ocean temperatures.

"Prior studies didn't consider the deep ocean," said Bagnell, a graduate scholar in DeVries' laboratory and the paper's lead author. Because of the challenges involved in getting temperature measurements in the deep ocean (below 2,000 meters) that region has gone largely unaccounted for, and data has been sparse. "There is some existing data, from research cruises and autonomous floats," he added.

The researchers used an autoregressive artificial neural network (ARANN) and machine learning methods to connect the dots between data points and "produce a single consistent estimate of the top-to-bottom OHC change for 1946 to 2019." The result was a trend that delays warming by decades over previous models.

There are two main possibilities for why the effects of global warming took so long to reach the ocean, De Vries said.

"One is that anthropogenic warming might have been weaker than previously thought during the 20th century, perhaps due to the cooling effects of aerosol pollution," he said. The other is that the deep ocean may still be exhibiting the effects of climate events long past.

"It can take centuries for climate signals to propagate from the surface to the interior," he said. Thus, the effects of a cooling event such as the Little Ice Age might be deep history to us on the surface, but the echoes of the event may have continued to resonate in the deep ocean into the 20th century, providing a buffer to the warming Earth.

The delayed cooling effect ended in 1990, after which ocean temperatures, according to the study, have been accelerating upward.

"The lag is catching up and the ocean is warming more strongly now," Bagnell said. The Atlantic Ocean and Southern Ocean are currently where most of the warming is, with the Pacific Ocean and Indian Ocean not far behind.

Ocean warming is a concern on many levels, as it can cause changes in circulation, reduce its ability to absorb carbon and fuel more intense storms, in addition to causing sea level rise and creating inhospitable environments for undersea life. If the trend continues, the effects might last centuries, thanks to the same lag that kept the oceans cool until the last 30 years.

"The ocean remembers," DeVries said.

MAKE A DIFFERENCE: SPONSORED OPPORTUNITY

Story Source:

Materials provided by **University of California - Santa Barbara**. Original written by Sonia Fernandez. *Note: Content may be edited for style and length.*

Journal Reference:

1. A. Bagnell, T. DeVries. **20th century cooling of the deep ocean contributed to delayed acceleration of Earth's energy imbalance**. *Nature Communications*, 2021; 12 (1) DOI: 10.1038/s41467-021-24472-3
-

Cite This Page:

MLA

APA

Chicago

University of California - Santa Barbara. "Global ocean warming started later in the 20th century than previously estimated." ScienceDaily. ScienceDaily, 9 August 2021. <www.sciencedaily.com/releases/2021/08/210809162742.htm>.

RELATED STORIES

Tree Rings Show Unprecedented Rise in Extreme Weather in South America

July 7, 2020 — A new South American Drought Atlas reveals that unprecedented widespread, intense droughts and unusually wet periods have been on the rise since the mid-20th ...

Figuring out How Fast Greenland Is Melting

July 5, 2017 — A new analysis of Greenland's past temperatures will help determine how fast the island's vast ice sheet is melting. Other research shows the accelerated melting of Greenland's ice sheet is ...

Coastal Cities at Risk from Rapid Sea-Level Rise With Warming Above Two Degree

Nov. 8, 2016 — The first predications of coastal sea level with warming of two degrees by 2040 show an average rate of increase three times higher than the 20th century rate of sea level rise, report ...

Historical Records May Underestimate Global Sea Level Rise

Oct. 3, 2016 — New research shows that the longest and highest-quality records of historical ocean water levels may underestimate the amount of global average sea level rise that occurred during the 20th ...

FROM AROUND THE WEB

ScienceDaily shares links with sites in the TrendMD network and earns revenue from third-party advertisers, where indicated.

RECENT PROGRESS ON SPECIFIC CLIMATIC STAGES AND DRIVING FORCES OVER LAST 2000 YEARS

HUANG Bojin et al., Marine Geology and Quaternary Geology

Forcing and impacts of warm periods in the past 2000 years

QuanSheng GE et al., Chinese Science Bulletin

Tropical Indian Ocean Basin Mode recorded in coral oxygen isotope data from the Seychelles over the past 148 years

Yan DU et al., SCIENCE CHINA Earth Sciences, 2014

Debates on the Causes of Global Warming

Huang Jian-Bin et al., Advances in Climate Change Research, 2015

Rates of temperature change in China during the past 2000 years

QuanSheng GE et al., SCIENCE CHINA Earth Sciences, 2011

Misdiagnosis of Earth climate sensitivity based on energy balance model results

Mark Richardson et al., Science Bulletin, 2015

CMS-Proposed Coverage of NGS Cancer Tests Could Lead to Off-Label Scripts, Oncologists Worry

Precision Oncology News, 2018

Genentech Begins Phase III Study of Tecentriq in MRD-Positive Bladder Cancer


Precision Oncology News, 2021

Powered by **TREND MD**

Free Subscriptions

Get the latest science news with ScienceDaily's free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

 [Email Newsletters](#)

 [RSS Feeds](#)

Follow Us

Keep up to date with the latest news from ScienceDaily via social networks:

 [Facebook](#)

 [Twitter](#)

 [LinkedIn](#)

Have Feedback?

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

 [Leave Feedback](#)

 [Contact Us](#)

[About This Site](#) | [Staff](#) | [Reviews](#) | [Contribute](#) | [Advertise](#) | [Privacy Policy](#) | [Editorial Policy](#) | [Terms of Use](#)

Copyright 2021 ScienceDaily or by other parties, where indicated. All rights controlled by their respective owners. Content on this website is for information only. It is not intended to provide medical or other professional advice. Views expressed here do not necessarily reflect those of ScienceDaily, its staff, its contributors, or its partners.

Financial support for ScienceDaily comes from advertisements and referral programs, where indicated.

— [CCPA: Do Not Sell My Information](#) — — [GDPR: Privacy Settings](#) —