

Breaking news as it happens

Climate change Climate Consensus - the 97%

Global warming is unpaused and stuck on fast forward, new research shows

[A new paper](#) shows that global warming has continued over the past decade, and been manifested in different ways



📷 Forget the pause button, global warming is stuck on fast forward. Photograph: Eyebyte/Alamy

Dana Nuccitelli

Tuesday 10 December 2013 14.00 GMT



Shares

1,087

Comments

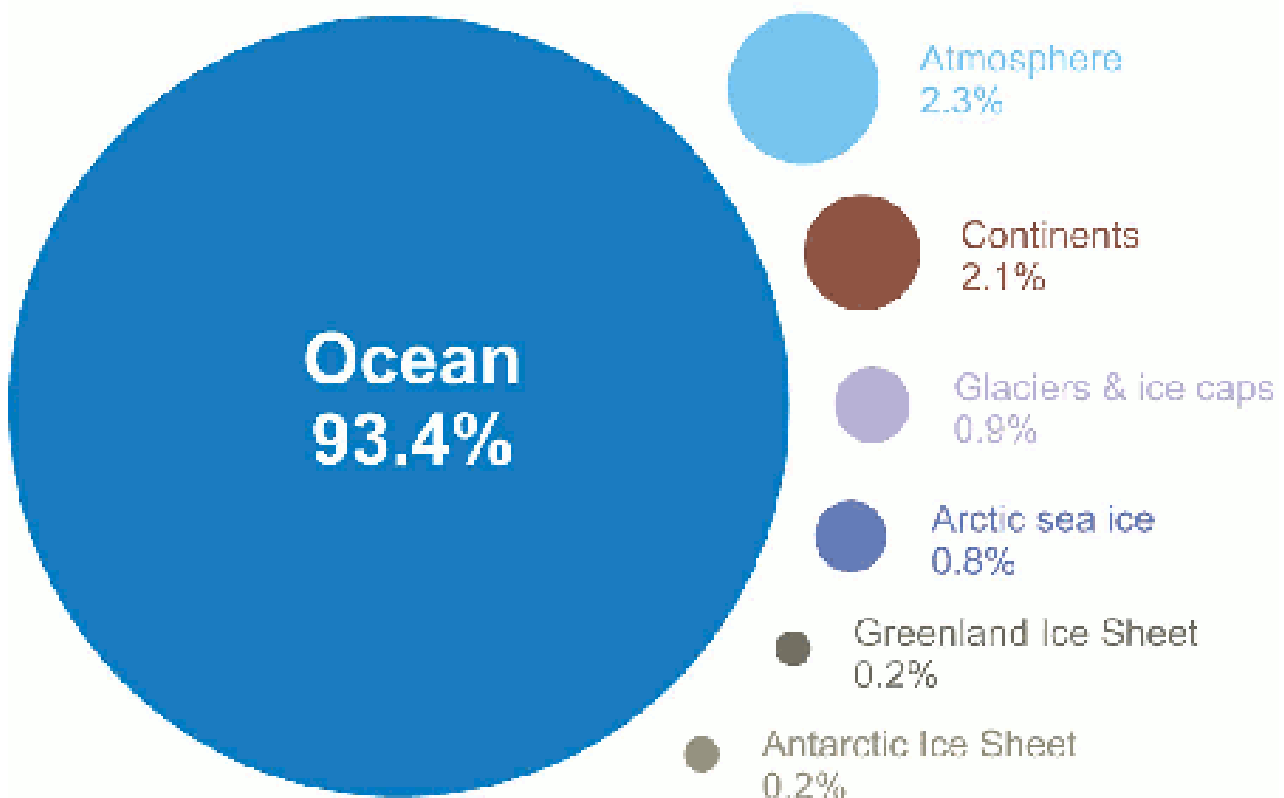
383

New research by Kevin Trenberth and John Fasullo of the National Center for Atmospheric Research investigates how the warming of the Earth's climate has behaved over the past 15 years compared with the previous few decades. They conclude that while the rate of increase of average global

surface temperatures has slowed since 1998, melting of Arctic ice, rising sea levels, and warming oceans have continued apace.

The widespread [mainstream media focus on the slowed global surface warming](#) has led some climate scientists like Trenberth and Fasullo to investigate its causes and how much various factors have contributed to the so-called 'pause' or 'hiatus.' However, the authors note that while the increase in global temperatures has slowed, the oceans have taken up heat at a faster rate since the turn of the century. Over 90 percent of the overall extra heat goes into the oceans, with only about 2 percent heating the Earth's atmosphere. The myth of the 'pause' is based on ignoring 98 percent of global warming and focusing exclusively on the one bit that's slowed.

Where Global Warming is Going



Nevertheless, the causes of the slowed global surface temperature increase present an interesting scientific question. In examining changes in the activity of the sun and volcanoes, Trenberth and Fasullo estimated that they can account for no more than a 20 percent reduction in the Earth's energy imbalance, which is what causes global warming. Thus the cause of the slowed surface warming must primarily lie elsewhere, and ocean cycles are the most likely culprit.

Trenberth and Fasullo found that after the massive El Niño event in 1998, the Pacific Ocean appears to have shifted into a new mode of operation. Since that time, [Trenberth's research has shown](#) that the deep oceans have

absorbed more heat than at any other time in the past 50 years.

As [a recent paper published in the journal Nature](#) showed, the Pacific Ocean in particular appears to be the key component of the climate's natural internal variability, and the main culprit behind the slowed global surface warming over the past 15 years. However, another important recent paper by Kevin Cowtan and Robert Way showed that the global surface temperature rise has not slowed as much as some previously thought; in fact, the [surface warming since 1997 happened more than twice as fast](#) as previous estimates.

Trenberth and Fasullo's new paper also casts doubt on the conclusions a few recent studies that estimated the Earth's climate is less sensitive to the increased greenhouse effect than previously thought. These studies have been based on measurements of recent climate change, including the warming of the oceans. [Climate contrarians like Matt Ridley](#) have of course emphasized their results, because these few papers seem to suggest the climate won't warm quite as much over the next century as climate scientists previously thought.

However, the type of approach taken by these studies suffers from some significant drawbacks. Mainly the size of the cooling effect due to human aerosol pollution remains highly uncertain, and while the oceans have been warming rapidly, just how rapidly is another unsettled question.

Previous estimates put the amount of heat accumulated by the world's oceans over the past decade equivalent to about [4 Hiroshima atomic bomb detonations per second](#), on average, but Trenberth's research puts the estimate equivalent to more than 6 detonations per second. Trenberth and Fasullo note that using their ocean heating estimate by itself would increase the [equilibrium climate sensitivity](#) estimate in the paper referenced by Ridley from 2°C to 2.5°C average global surface warming in response to a doubling of atmospheric carbon dioxide, and using other more widespread accepted values would bring the estimate in line with the standard value of 3°C. They thus note,

"Using short records with uncertain forcings of the Earth system that is not in equilibrium does not (yet) produce reliable estimates of climate sensitivity."

In any case, the main point of the paper is that global warming is stuck on fast forward. Ice continues to melt, sea levels continue to rise, and the oceans continue to warm rapidly. While the warming of global surface temperatures has slowed somewhat, that appears to primarily be due to changing ocean cycles, particularly in the Pacific. However, these changes are mostly just causing the oceans to absorb more heat, leaving less for the

atmosphere. As Trenberth and Fasullo conclude,

"[Global warming] is very much alive but being manifested in somewhat different ways than a simple increase in global mean surface temperature."

Climate change (Environment)

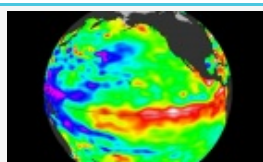
Climate change scepticism

Oceans

Climate change (Science)



related content



Climate models accurately predicted global warming when reflecting natural ocean cycles

21 Jul 2014 603



Global warming can't be blamed on CFCs - another one bites the dust

18 Apr 2014 304



A remarkably accurate global warming prediction, made in 1972

19 Mar 2014 347



Global warming continues and won't be stopped by wishful thinking

30 Jan 2014 655

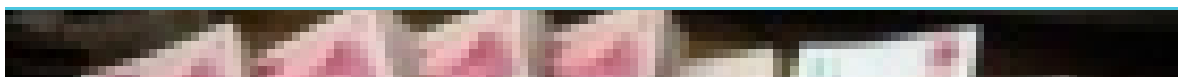
Global warming is being caused by humans, not the sun, and is highly sensitive to carbon, new research shows

9 Jan 2014 757

New widget counts global warming happening at 4 Hiroshima atomic bombs per second

25 Nov 2013 466

Climate Consensus - the 97% →





Economics supports immediate action on global warming

6d



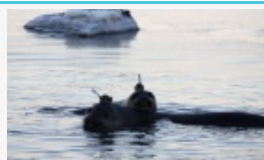
Pope Francis plants a flag in the ground on climate change

6 Jan 2015



Time is running out on climate denial

30 Dec 2014



Scientists in focus - Susan Wijffels and Rebecca Cowley

26 Dec 2014



Scientists connect the dots from identifying to preventing dangerous climate risks

23 Dec 2014



2014 will be the hottest year on record

17 Dec 2014

comments (383)

This discussion is closed for comments.

Order by **Oldest** ▾ | Threads **Collapsed** ▾



**Slidewinder**

10 Dec 2013 9:31

35

The only reason that people have concentrated on land surface temperatures is because this was the scope of a significant amount of scientific papers in the 1980s and 1990s. I'm glad to see that they are eventually taking a more holistic approach.

Report

DanaNuccitelli → **Slidewinder**

61

CONTRIBUTOR

It's also the part of the climate where we have the best measurements, but our ocean heat measurements are becoming much better now.

Report

rancidfessant → **DanaNuccitelli**

24

But even [ECMWF](#) who developed ORAS4 say this in their disclaimer.

There is large uncertainty in the ocean reanalysis products (especially in the transports), difficult to quantify. These web pages are aimed at the research community. Any outstanding climate feature should be investigated further and not taken as truth.

Perhaps wait a while until the ORAS4 product is deemed more reliable before using it as input into other models and claiming the next big discovery in climate change?

Report

[+ Show 19 more replies](#)**Matthew2012**

10 Dec 2013 10:06

32

The first point which needs to be hammered home is regardless of whether the warming is slower than before or if it is being underestimated is that from 1998 - now still has shown significant warming ~0.05C.

This is simple fitting of a best-fit line and is basic maths. It is not the case that this is insignificant warming.

Second is that we were in a near equilibrium conditions a record high temperature plateau would still be a massive distortion of the conditions we know.

Third, we can give an exact thermodynamic description of the Earth's energy budget via measuring EM arriving and leaving. Unless these two are the same the Earth's climate cannot be considered to have reached a new equilibrium. The only mechanism for an equilibrium to arrive is when the energy in is equal to the energy out.

When a GHG is added to the Earth's atmosphere this reduces the amount of outgoing energy at a particular range of frequencies via absorption. The only way that this extra absorbed energy can be compensated for (with the same incoming energy) is to increase the the remainder of the outgoing energy. This can only naturally be accomplished by increasing the temperature of the planet.

We know that there can be feedbacks which take centuries to filter through the system according to the IPCC. So until we stop adding GHGs we cannot consider the climate to be stable.

We know that the climate change cannot pause while we are adding more GHG and then probably not for at least another 100 years afterward. How quickly we will see the rest of the changes is up for debate the rest is not

Then we move onto points such as this could be an underestimate due to gaps in the measurements of Arctic region. Or explanations as to how climate change is manifesting itself.

Report

[LochnessMunster](#) → [Matthew2012](#)

9 ↑

from 1998 - now still has shown significant warming ~0.05C.

Nope.

[The warming has averaged 0.12C per decade since 98.](#)

Report

[LochnessMunster](#) → [LochnessMunster](#)

7 ↑

Ooops

Damn those pesky decimal points.

I meant to say:

[The warming has averaged 0.012C per decade since 98](#)

More than twice as fast as previously thought.

Report

[+ Show 3 more replies](#)

[+ View more comments](#)

popular →

in environment

across the guardian

1 Does Europe's coke habit mean massacring 'uncontacted' indigenous people?

2 The mystery of the missing hen harriers

3 Researcher threatens to withhold information if WA keeps killing tagged sharks

4 2014 Wildlife photography awards round-up - in pictures

- 1
- 5 **Climate denier Ted Cruz will oversee Nasa - what could possibly go wrong?**
- 6 **Will Gadd: 'We were climbing ice that isn't going to be there next week'**
- 7 **Hebei's steel cities and China's pollution crisis - in pictures**
- 8 **Iceland brewery makes beer using smoked whale testicles**
- 9 **Koala mittens needed to help bushfire victims with burnt paws**
- 10 **Low carbon battery-powered train carries first passengers**

Advertisement

 **Breaking news as it happens**

More stories from around the web

Promoted content by Outbrain

9 Maps to Change How You See the World

Goodnet

Guess What Steve Jobs Buried in a Time Capsule 30 Years Ago [VIDEO]

Goodnet

How to Create a Functional, Solar-Powered Home

Sustainable Living

Forget About Piranhas, This Is the Most Dangerous Creature in the Amazon

OZY

College Student Spends Summer Coding OpenStack; Discovers the Ins and Outs of Open Source

Build Your Best Cloud

Why Gartner Believes the Internet of Things Will Disrupt Data Center Management

CIO

Recommended by  Outbrain



back to top

[membership](#)

[jobs](#)

[dating](#)

[masterclasses](#)

[subscribe](#)

[all topics](#)

[all contributors](#)

[info and resources](#)

[contact us](#)

[feedback](#)

[complaints & corrections](#)

[terms & conditions](#)

[privacy policy](#)

[cookie policy](#)

[securedrop](#)