This is the print version of the Skeptical Science article 'No warming in 16 years', which can be found at http://sks.to/16years.

Human activity continues to warm the planet over the past 16 years

What The Science Says:
Once natural influences, in particular the impact of El Niño and La Niña, are removed from the recent termperature record, there is no evidence of a significant change in the human contribution to climate change.

Climate Myth: No warming in 16 years

"...there has been no increase in the global average surface temperature for the past 16 years" (Judith Curry and David Rose)

Update 26/05/2013: The '16 years' video, originally linked from this article, is not representative of the scientific consensus. In fact the short term trends are rather more complicated. The problem is explained in more detail in this article.

Humans have continued to contribute to the greenhouse warming of the planet over the past 16 years. The myth arises from two misconceptions. Firstly, it ignores the fact that short term temperature trends are strongly influenced by a variety of natural factors and observational limitations which must be analyzed to isolate the human contribution. Secondly it focuses on one small part of the climate system (the atmosphere) while ignoring the largest part (the oceans). We will address each of these errors in turn.

What factors influence the 16 year trend?

Climate scientists have traditionally looked at climate over long periods - 30 years or more. However the media obsession with short term trends has focussed attention on the past 15-16 years. Short term trends are much more complex because they can be affected by many factors which cancel out over longer periods. In a recent interview James Hansen noted "If you look over a 30-40 year period the expected warming is two-tenths of a degree per decade, but that doesn't mean each decade is going to warm two-tenths of a degree: there is too much natural variability".

The list of factors which can affect short term temperature trends is extensive, and some of them can rival the global warming signal in magnitude over short periods. The following table identifies a range of influences on the recent temperature trend:

Influence	Effect	Notes
Human GHG emissions	Warming	
Human sulphate emissions	Cooling	Recent emissions from China
Coverage bias	Cooling	HadCRUT4 and NOAA only
Sea surface temperature bias	Cooling	GISTEMP and NOAA only
The El Niño oscillation	Cooling	The recent run of La Niñas

Volcanic erruptions	Warming	Recovery from Pinatubo erruption
Solar cycle	Cooling	Recent solar minimum
Longer term oscillations	Unknown	AMO and PDO
Change in ocean heat uptake	Cooling	Balmaseda et al (2013), Guemas et al (2013)

Most of the short term influences, with the exception of greenhouse gas emissions and probably volcanoes (but see Neely et al 2013), have had a cooling influence. As a result it is unsurprising that we have seen a reduced rate of warming over the past 16 years. The fact that there has been any warming at all is strongly supportive of the warming effect of greenhouse gas emissions.

The fundamental mechanism of global warming is a change in the top-of-atmosphere energy balance, and as a result the energy content of the climate system provides a more direct measure of global warming which avoids many of these problems, although the observational record is shorter and less complete (e.g. Church et al 2011).

The rest of the climate system

Focusing on surface air temperatures also misses more than 90% of the overall warming of the planet (Figure 2).

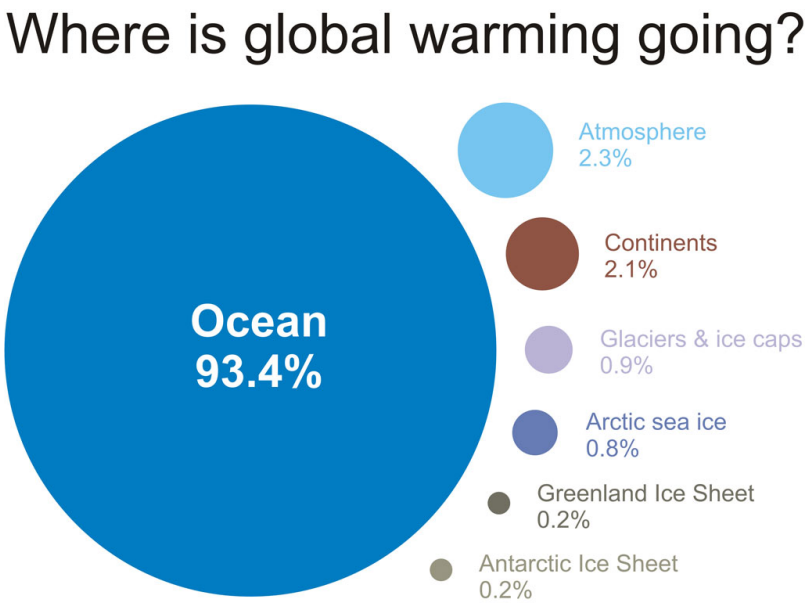

Figure 2: Components of global warming for the period 1993 to 2003 calculated from IPCC AR4 5.2.2.3.

Nuccitelli et al. (2012) considered the warming of the oceans (both shallow and deep), land, atmosphere, and ice, and showed that global warming has not slowed in recent years (Figure 3).

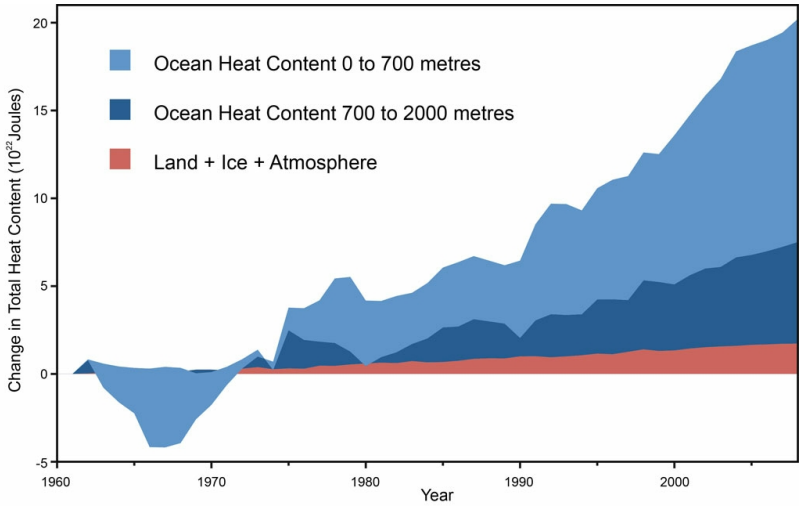

Figure 3: Land, atmosphere, and ice heating (red), 0-700 meter OHC increase (light blue), 700-2,000 meter OHC increase (dark blue). From Nuccitelli et al. (2012).

References

- Foster and Rahmstorf (2011), *Global temperature evolution 1979–2010* doi:10.1088/1748-9326/6/4/044022
- Nuccitelli et al. (2012) *Comment on Ocean heat content and Earth's radiation imbalance. II. Relation to climate shifts* doi:10.1016/j.physleta.2012.10.010

Credits: Calculations and video: Kevin C. Voiceover: Daniel Bailey. Advice: The SkS team.

Intermediate rebuttal written by Kevin C

Update July 2015:

Here is a related lecture-video from Denial101x - Making Sense of Climate Science Denial

[*see video at **this link**.*]

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Skeptical Science explains the science of global warming and examines climate misinformation through the lens of peer-reviewed research. The website won the Australian Museum 2011 Eureka Prize for the Advancement of Climate Change Knowledge. Members of the Skeptical Science team have authored peer-reviewed papers, a college textbook on climate change and the book Climate Change Denial: Heads in the Sand. Skeptical Science content has been used in university courses, textbooks, government reports on climate change, television documentaries and numerous books.

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