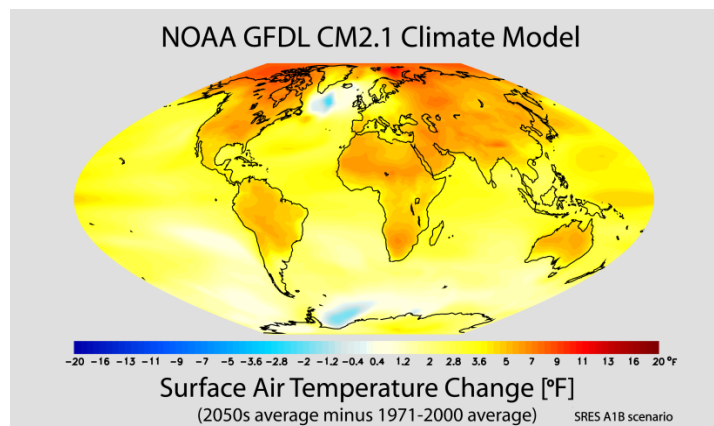


Global warming is dead, long live global heating?

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There has been a lot of talk recently about a so-called [‘pause’ or ‘hiatus’](#) in global warming. Some argue that it poses a serious challenge to established climate science and may undermine its theories and predictions. Others see it only as a challenge to those unable to read graphs. And others argue that it indeed poses some challenges to climate science that, once addressed, may well enhance its theory and predictions. Some scientists belonging to the latter group try to provide explanations for this apparent hiatus and, in the processes, have utilised an apparently new term in an attempt to clarify their position: ‘global heating’.

In this post we discuss how global heating is used in comparison to global warming; we shall look at its semantic history and we shall examine the communicative problems it may pose and the [confusion](#) it may lead to.

Explaining the hiatus

One of the most prominent articles using the new phrase was published in December 2013 by Trenberth and Fasullo (2013) entitled [An apparent hiatus in global warming?](#) The authors favour ‘global heating’ as a ‘more scientifically accurate’ headline description of human influence on the Earth’s climate, allowing for the paradox of a planet which is heating and yet displaying virtually no atmospheric warming at the surface because of heat uptake by the deep ocean:

The authors ask:

“Has global warming stalled? Or is it entirely expected that natural variability rears its head and can offset warming for a decade or two?”

In part the answer depends on what we mean by 'global warming'. For many it means the global mean temperature increases. But for anthropogenic climate change, it means the climate change resulting from all kinds of human activities, and it is now well established that by far the biggest influence occurs from changes in atmospheric composition, which interfere with the natural flow of energy through the climate system (IPCC, 2007). Referred to as 'radiative forcing' by scientists, the biggest effect comes from increasing carbon dioxide in the atmosphere because carbon dioxide is a greenhouse gas (GHG) [...] Preindustrial values are estimated to average about 280 ppmv (parts per million by volume) but values in 2013 have exceeded 400 ppmv, a 43% increase, mainly from the burning of fossil fuels. Several other GHGs (methane, nitrous oxide, and chlorofluorocarbons) have also increased from various human activities, while tiny particulates (aerosols) in the atmosphere can cause both warming by absorbing radiation or cooling by scattering and reflecting radiation back to space. The result is a positive (down) energy imbalance at the top-of-atmosphere. In that sense 'global warming' really means global heating. Increasing global mean temperature is but one manifestation of the effects [...] The analysis in this article does not suggest that global warming has disappeared; on the contrary, it is very much alive but being manifested in somewhat different ways than a simple increase in global mean surface temperature." (Emphasis added)

We cannot remember anyone ever using or talking about 'global heating' in public before 2013, but this does not mean that nobody did. So we began to check the uses of global warming and global heating over time.

Global warming

It seems that, according to the Oxford English Dictionary, 'global warming' was first used in 1952. "*San Antonio (Texas) Express* 28 Apr. 2/5: Scientists who are studying global warming trends point out that not a single iceberg was sighted last year south of Parallel 46." Its first use in the journal *Science* came in June 1971 (Russell & Landsberg, 1971, p. 1312). Since then it has become the dominant term in climate change debates, especially in the US.

According to the most authoritative source on the state of the English language, the *Oxford English Dictionary* (3rd edition, 2009)¹, 'global warming' means:

"A long-term gradual increase in the temperature of the earth's atmosphere and oceans, spec. one generally thought to be occurring at the present time, and to be associated esp. with side effects of recent human activity such as the increased production of greenhouse gases."

However, climate scientists seem to have used the phrase in a more restrictive sense as meaning: a rise in global mean surface air temperature or "mean planetary

¹ We use a dictionary definition from the OED in this post, but during the research it became apparent that definitions of global warming vary substantially between dictionaries. We will be looking at this issue in a future post.

temperature” (Broecker, 1975). There may therefore be a difference between the general (and popular) understanding of global warming in the broad sense as referring to overall Earth system warming in both atmosphere and oceans (what one may call ‘global warming 1’) and the more specific scientific usage of global warming in the narrow sense of surface air temperature warming (what one may call ‘global warming 2’), which can lead to confusion.

Global warming 1, broad meaning (*à la* OED) - refers to warming of the whole Earth system: atmosphere, cryosphere and oceans

Global warming 2, narrow meaning (*à la* Broecker and other climate science literature) - refers to warming of global mean surface air temperature; refers to the lowest part of the atmospheric boundary layer

The more narrow scientific meaning came to dominate policy discourses around limiting global warming to 2 degrees, determining the carbon budget and so on. (Interestingly, Wigley et al. (1981) drew attention to the danger of focusing on surface air temperature rather than full atmospheric heat content – they didn’t mention ocean heat -- in a short commentary in *Nature*.)

Global heating

The OED has no entry for ‘global heating’, but when we checked the Lexis Nexis News database we found a first use in 1975, from the magazine *Chemical Week* (Hester, 1975), in the context of a discussion of ‘propellants’:

“The global heating, Ramanathan explains, would result from the ‘greenhouse effect’ in which the fluorocarbons would absorb solar radiation but not allow heat to escape back into space. Many scientists fear that an atmospheric buildup of carbon dioxide released by the world’s industries could also lead to runaway heating of the earth by the same process.”

The latest attested uses on Lexis Nexis refer to the Trenberth and Fasullo paper (but the phrase global heating is also used in Australia in the context of the most recent heat wave). Between 1975 and now ‘global heating’ was used 392 times in English Language news, while global warming was used on more than three times as many occasions *in the past week*.

However, it seems clear that originally global heating and global warming were quasi-synonyms, but that global warming won out in the end.

As a [Dot Earth blog post](#) by Andrew Revkin shows, global heating was still used as a quasi-synonym of global warming in 2008. Revkin quotes from a 2006 interview with James Lovelock, for example, who said:

“Warming is something that’s kind of cozy and comfortable. You think of a nice duvet on a cold winter’s day. Heating is something you want to get away from.”

However, global heating is used here to stress the dangers of global warming. This could be seen as a stronger or hyperbolic meaning of global warming.

Interestingly, we found the link to the 2008 post inside a [2013 Tumblr by Revkin](#) which highlights a recent NOAA graph relating to ‘global heating’. Here we find the present-day use of the phrase by some climate scientists which is now beginning to spread more widely, namely as indicating that greenhouse gas emissions are affecting the energetics of the whole Earth system.

This means that there are three meanings of ‘global heating’: ‘global heating 1’ as an early synonym for global warming; ‘global heating 2’ as a more emphatic meaning of global warming, highlighting the real (dangerous) meaning of global warming (*à la* Lovelock); and ‘global heating 3’ as referring to a different (‘more scientifically accurate’ *à la* Trenberth) description of human influence on the Earth’s climate which takes into account [ocean heat](#) content, cryosphere melting, etc., as well as atmospheric temperature.

Global heating 1 - early synonym for global warming (*à la* Chemical Week)

Global heating 2 - emphatic or strong meaning of global warming (*à la* Lovelock)

Global heating 3 - new use of the phrase (*à la* Trenberth) in the context of the ‘hiatus’ debate. Essentially a new name for global warming 1.

What does ‘global warming’ really mean and do we need ‘global heating’?

Having surveyed the various meanings of ‘global warming’ and ‘global heating’, it becomes clear that the debate about the so-called ‘pause’ in global warming only seems to work in the context of debates about ‘global warming 2’ (or surface air temperature warming), rather than ‘global warming 1’ (or total system warming). In order to explain the apparent

'pause' in 'global warming 2', scientists are now looking for a phrase with a more extended meaning. Since 'global warming 1' is not current usage, they are proposing 'global heating 3' as the 'real' meaning of 'global warming'. Scientific explanations of the pause now draw on new data covering the whole system, including ocean temperatures at various depth, energy required for ice melt, and so on.

There are several difficulties related to the emergence of global heating as an attempt to explain recent scientific understandings of climate change:

(1) Overall we have a recipe for confusion, between 'global warming 1' (total system warming) and 'global warming 2' (global air surface warming), but also between 'global heating 1' (as a synonym 'global warming 1'), 'global heating 2' as a more emphatic way of talking about 'global warming 1' and 'global heating 3' as a new phrase proposed to replace 'global warming 2'.

(2) Another difficulty is that those publics who have been attentive to the issue of global warming understand the issue through the lens of science and the language of global surface temperature (global warming 2). Policy talk about [2 degrees](#) (Shaw, 2013), popular books about [6 degrees](#) (Lynas, 2008), the popular slogan 'mitigate for 2, adapt for 4' and annual press releases telling us the global surface air temperature for the year all feed into this popular understanding of climate change. If scientists now say that what really matters is the amount of heat (energy) accumulating in the whole system, and not merely global surface temperature, then public understandings of global warming will likely be disrupted.

(3) Climate policy has, up to now, been built around measurements of global warming 2 (derived mostly from land and marine surface thermometers) and yet is now being supposed to draw upon scientific insights into global warming 1/global heating 3. Scientifically, the basic physics related to greenhouse effect may not have changed, but one can see how critics may think the goalposts are being moved. Questions may also be asked as to why global warming was ever defined in a restrictive way anyway. Was it because of restrictions on what scientists were able to measure at the time? Was it because of science communication, as we understand air temperature (the language of quotidian weather) better than energy content (the language of a physical system)? Was it to facilitate a policy goal that was easy to comprehend? Most likely it was all three, which is why a move to global heating now may be problematic.

[This blog post is not only linked to the work carried out within the Leverhulme Making Science Public programme, but also to a systematic study of climate change a complex social problem supported by the [ESRC](#)]

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