



This is the print version of the [Skeptical Science](http://skeps.com) article "[The science isn't settled](http://skeps.com/settled)", which can be found at <http://skeps.com/settled>.

Is the science settled?

What The Science Says:

That human CO₂ is causing global warming is known with high certainty & confirmed by observations.

Climate Myth: The science isn't settled

"Many people think the science of climate change is settled. It isn't. And the issue is not whether there has been an overall warming during the past century. There has, although it was not uniform and none was observed during the past decade. The geologic record provides us with abundant evidence for such perpetual natural climate variability, from icecaps reaching almost to the equator to none at all, even at the poles.

The climate debate is, in reality, about a 1.6 watts per square metre or 0.5 per cent discrepancy in the poorly known planetary energy balance." ([Jan Veizer](#))

Skeptics often claim that the science of anthropogenic global warming (AGW) is not "settled". But to the extent that this statement is true it is trivial, and to the extent that it is important it is false. No science is ever "settled"; science deals in probabilities, not certainties. When the probability of something approaches 100%, then we can regard the science, colloquially, as "settled".

The skeptics say that results must be double-checked and uncertainties must be narrowed before any action should be taken. This sounds reasonable enough – but by the time scientific results are offered up to policymakers, they have already been checked and double-checked and quintuple-checked.

Scientists have been predicting AGW, with increasing confidence, for decades (indeed, the idea was first proposed in 1896). By the 1970s, the scientific community were becoming concerned that human activity was changing the climate, but were divided on whether this would cause a net warming or cooling. As science learned more about the climate system, a consensus gradually emerged. Many different lines of inquiry all converged on the IPCC's 2007 conclusion that it is more than 90% certain that anthropogenic greenhouse gases are causing most of the observed global warming.

Some aspects of the science of AGW are known with near 100% certainty. The greenhouse effect itself is as established a phenomenon as any: it was discovered in the 1820s and the basic physics was essentially understood by the 1950s. There is no reasonable doubt that [the global climate is warming](#). And there is also [a clear trail of evidence](#) leading to the conclusion that it's caused by our greenhouse gas emissions. Some aspects are less certain; for example, the net effect of aerosol pollution is known to be negative, but the exact value needs to be better constrained.

What about the remaining uncertainties? Shouldn't we wait for 100% certainty before taking action? Outside of logic and mathematics, we do not live in a world of certainties. Science comes to tentative conclusions based on the balance of evidence. The more independent lines of evidence are found to support a scientific theory, the closer it is likely to be to the truth. Just because some details are still not well understood should not cast into doubt our understanding of the big picture: humans are causing global warming.

In most aspects of our lives, we think it rational to make decisions based on incomplete information. We will take out insurance when there is even a slight probability that we will need it. Why should our planet's climate be any different?

Basic rebuttal written by James Wight

Update July 2015:

Here is a related lecture-video from [Denial101x - Making Sense of Climate Science Denial](#)



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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