This is the print version of the Skeptical Science article 'It's not us', which can be found at http://sks.to/agw.

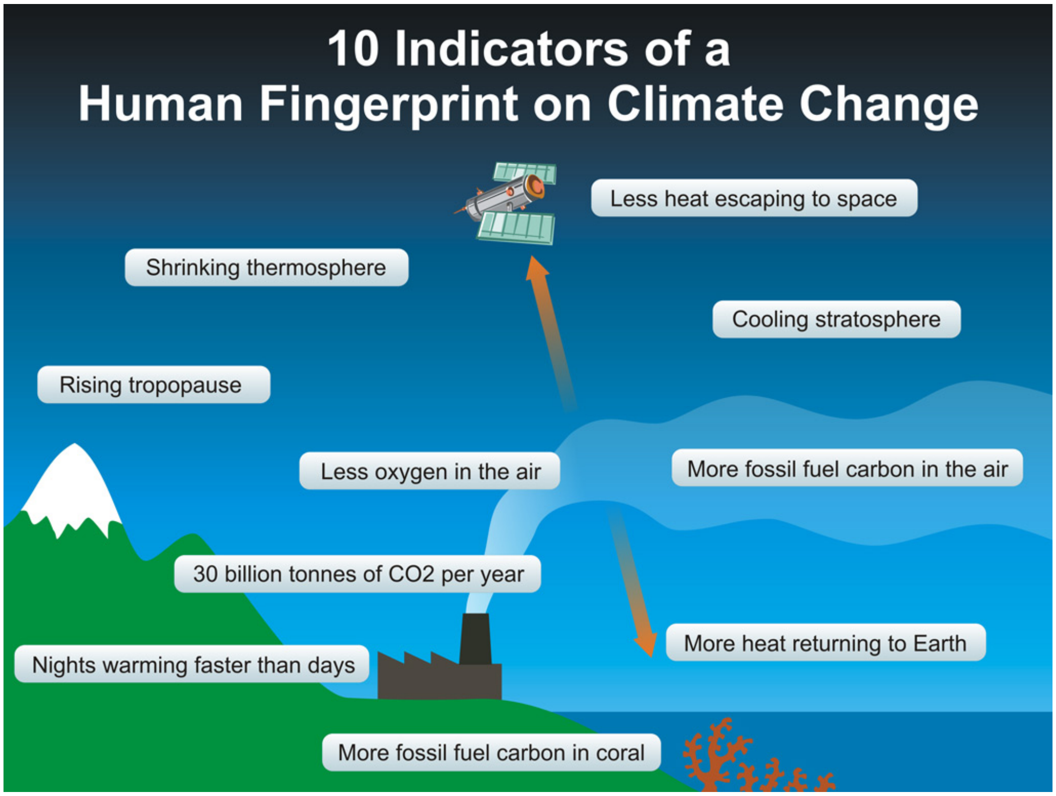
The human fingerprint in global warming

What The Science Says:
Multiple sets of independent observations find a human fingerprint on climate change.

Climate Myth: It's not us
'What do the skeptics believe? First, they concur with the believers that the Earth has been warming since the end of a Little Ice Age around 1850. The cause of this warming is the question. Believers think the warming is man-made, while the skeptics believe the warming is natural and contributions from man are minimal and certainly not potentially catastrophic à la Al Gore.' (Neil Frank)

When presented with the overwhelming evidence that the planet is warming, many people react by asking "but how can we be sure that we're causing the warming?" It turns out that the observed global warming has a distinct human fingerprint on it.

In climatology, as in any other science, establishing causation is more complicated than merely establishing an effect. However, there are a number of lines of evidence that have helped to convince climate scientists that the current global warming can be attributed to human greenhouse gas emissions (in particular CO_2). Here are just some of them:



The first four pieces of evidence show that humans are raising CO_2 levels:

1. Humans are currently emitting around 30 billion tonnes of CO_2 into the atmosphere.
2. Oxygen levels are falling as if carbon is being burned to create carbon dioxide.

3. Fossil carbon is building up in the atmosphere. (We know this because the two types of carbon have different chemical properties.)
4. Corals show that fossil carbon has recently risen sharply.

Another two observations show that CO_2 is trapping more heat:

1. Satellites measure less heat escaping to space at the precise wavelengths which CO_2 absorbs.
2. Surface measurements find this heat is returning to Earth to warm the surface.

The last four indicators show that the observed pattern of warming is consistent with what is predicted to occur during greenhouse warming:

1. An increased greenhouse effect would make nights warm faster than days, and this is what has been observed.
2. If the warming is due to solar activity, then the upper atmosphere (the stratosphere) should warm along with the rest of the atmosphere. But if the warming is due to the greenhouse effect, the stratosphere should cool because of the heat being trapped in the lower atmosphere (the troposphere). Satellite measurements show that the stratosphere is cooling.
3. This combination of a warming troposphere and cooling stratosphere should cause the tropopause, which separates them, to rise. This has also been observed.
4. It was predicted that the ionosphere would shrink, and it is indeed shrinking.

(References for all of these findings can be found here.)

Often one hears claims that the attribution of climate change is based on modeling, and that nobody can really know its causes. But here we have a series of empirical observations, all of which point to the conclusion that humans are causing the planet to warm.

Basic rebuttal written by James Wight

Update July 2015:

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

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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.