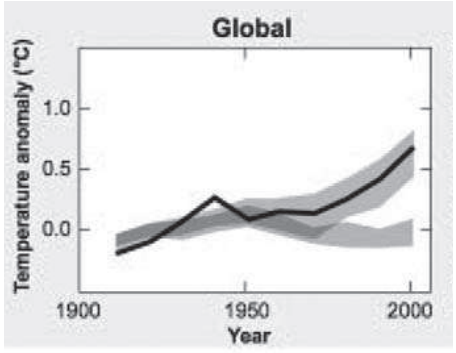
Common climate myths

Given the recent media attention devoted to climate sceptic views, Stuart Parkinson debunks some of their most common claims.

1. Human emissions of greenhouse gases are not enough to significantly affect climate, so current climate change must just be natural variation.

Sceptics generally accept that human activities emit billions of tonnes of CO_2 and other greenhouse gases (GHGs) into the atmosphere. However, they point out that the size of CO_2 emissions is much smaller than the natural exchanges of this gas between the atmosphere, the oceans and the biosphere. While this is true – for example, before human activities became significant, the land-based biosphere annually emitted (and absorbed) about 17 times the amount that human activities currently release – the key point is that the natural exchanges were approximately in balance[1,2]. With industrialisation, the emissions from human activities have become large enough to disrupt this balance, and this is shown by the sharp increases in the atmospheric levels of GHGs over the industrial period, measured directly in the atmosphere since 1958 and indirectly through, for example, samples of the gases trapped in ancient layers of ice (known as 'ice core data'). Figure 1 (on p.12) shows the sharp rise for the three main GHGs.

Some sceptics accept this, but argue that the warming effect due to these higher atmospheric GHG levels is negligible. This argument downplays the direct heat-trapping properties of GHGs and, most crucially, ignores the indirect feedback effects that enhance the warming. The most important of these feedbacks relate to water vapour levels (including clouds). As GHGs emitted by humans enter the atmosphere and trap heat, the level of water vapour that the atmosphere can hold increases. Since water vapour is itself a powerful GHG, this creates a positive feedback, which further increases the warming. Because the GHGs emitted by humans have a long average residence time in the atmosphere (tens to thousands of years), whereas water vapour only has a very short residence time (days), it is the levels of the long-lived gases that are most critical in determining the overall level of warming[3,4].



Credit: IPCC WGI ©

Figure A – Comparison of observed global temperature with results simulated by climate models using natural and human forcing. Black line is the observational record (decadal averages). Lower shaded band shows the range using only the natural forcing (solar activity and volcanoes). Upper shaded band shows the range using both natural and human forcing.

Estimates of the total warming effects of GHGs (and natural factors) can only be produced using mathematical models which include all feedback effects. Models are based on a combination of experimental physics and observations of GHG levels, temperature and many other conditions. The wide range of mathematical models used to produce the results in the IPCC reports and elsewhere show that the recent temperature changes are mainly explained by the higher atmospheric levels of GHGs caused by humans – just including natural effects in the models fails to reproduce the observed warming as shown in Figure A[5].

2. Current climate change is due to variations in incoming solar radiation, volcanic eruptions etc.

The Sun is obviously a very important factor in Earth's climate. Indeed, long-term cyclical changes in the Earth's orbit around the Sun – known as the Milankovitch cycles – lead to variations in the amount of solar energy reaching the Earth. These cycles drive the climate into and out of ice ages[6].

Some sceptics argue that historic variations in global temperature correlate well with changes in incoming solar energy and that this solar energy is now at a level higher than for several centuries. However, these recent variations in solar energy are too small to adequately explain the size of the current temperature changes. The latest estimate from the IPCC is that the net warming effect due to human activities is currently more than ten times that due to changes in solar activity[7].

Some sceptics have claimed that CO_2 emissions from volcanoes dwarf those from human activities. This is simply not true. Annually-averaged emissions from volcanoes on land are estimated to be equivalent to about a hundredth of current human emissions[8].

3. Global temperatures did not rise between 1940 and 1970 at a time when industrial GHG emissions were growing fast. Therefore GHG emissions cannot be causing warming.

It is true that global temperature did not rise between about 1940 and 1970 when GHG emissions were rising. However, there are two reasons why no warming was seen during this period. Firstly, there is a time lag between when the GHG emissions occur and when the full impacts on the global temperature become visible. Secondly, and most critically, human emissions of aerosols (especially sulphate particles) were very high during this period. Aerosols have a cooling effect on the climate, which cancelled out much of the warming around this time. As human emissions of aerosols were cut back – because they were a cause of local air pollution and acid rain – the global warming trend re-emerged[9].

Dr Stuart Parkinson is Director of Scientists for Global Responsibility. He holds a PhD in climate science.

References

1. Brahic C. (2007). Climate myths: Human CO_2 emissions are too tiny to matter. New Scientist, 16 March. http://environment.newscientist.com/channel/earth/climate-change/dn11638
2. FAQ 7.1 in: IPCC (2007). Frequently Asked Questions. http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Pub_FAQs.pdf
3. Chandler D. L. (2007). Climate myths: CO_2 isn't the most important greenhouse gas. New Scientist, 16 March. http://environment.newscientist.com/channel/earth/climate-change/dn11652
4. FAQ 2.1 in: IPCC (2007) – see note 2.
5. FAQs 8.1 and 9.2 in: IPCC (2007) – see note 2.
6. FAQ 6.1 in: IPCC (2007) – see note 2.
7. As note 4.
8. As note 1.
9. Brahic C. (2007). Climate myths: The cooling after 1940 shows CO_2 does not cause warming. New Scientist, 16 March. http://environment.newscientist.com/channel/earth/climate-change/dn11639

Further reading

Houghton J. (2004). Global Warming: the complete briefing (3rd ed). Cambridge University Press. http://www.cambridge.org/
See also references listed on p.1 in 'A few words...' article.