

Cold & Snowy Weather

Cold & snowy weather might generate headlines and even sway public opinion, but it doesn't disprove climate change.

Summary

- The winter of 2009-10 was the coldest for over 30 years in the UK. Over the entire Northern hemisphere however, it was the 5th hottest winter on record.
- A warming climate does not mean that there will be no cold or extreme winters.
- In fact, some research suggests we could have cold winters in Europe and the US over the next few years.
- Snowfall may increase in some places in the future as a result of a warmer climate.

Context

During the cold spell of 2009-2010, relatively few sceptics attempted to put forward the argument 'It's so cold, how could global warming be real?' Unfortunately some British media outlets headlined stories along these lines.¹²³ With or without the media influence, it is likely the cold winter played a significant role in decreasing public belief in climate change.⁴⁵

Historically, the last few winters have only been harsh relative to a period of quite mild winters.⁶ The coldest UK winter was in 1963: blizzards covered parts of the country in 6-metre snow drifts; farm animals died from the cold.⁷ The second coldest was 1944-45: parts of the sea were frozen, as was the river Cam and parts of the Thames; over 400 league football matches were cancelled and some pitches were even re-opened as ice rinks.⁸⁹¹⁰

Background science

Weather is not the same as climate for the following reasons:

1. Most importantly, *weather* is **short-term**. It can be colder than normal for a few months, but if it's been warmer than normal, for longer (years, decades), then the temperature is rising. *Climate* is **long-term**. So while weather can change quickly, climate changes slowly.
2. *Weather* is **local**. It can be colder than normal here, but hotter than normal elsewhere (as was the case during winter 2009-10. See image below).¹¹ *Climate change* is **global**: it affects the whole planet. Even though winter (Dec-Feb) 2009-10 was the coldest *in the UK* for over 30 years¹², in the *Northern hemisphere* it was the 5th hottest winter on record. At the same time, it was the hottest summer ever recorded in the Southern hemisphere.

An unusually cold winter in the UK or US does not therefore stop, disprove, or 'cancel-out' the long-term warming of the climate.

Overall picture

Natural cycles have been responsible for cold and snowy winters in the past, and will produce more in the future.¹³¹⁴ However, as average temperature increases over the coming century, we are likely to see cold winters become less severe and less common.

Cold spells & climate change

Cold spells in the UK are mainly caused by natural atmospheric cycles, which change air pressure around the Arctic and allow more cold air to pass down to us. These cycles are called the North Atlantic Oscillation (NAO) and Arctic Oscillation (AO)¹⁵¹⁶, which can be seen as slightly different regional outputs of the same air pressure changes. The two result in cold weather for parts of Europe, North America, and Northern Asia.

The sun may also play a small part, either contributing to the effects, or influencing the cycles above. We are currently at a low in the 11-year solar cycle, which may also cause changes in air pressure, and allow colder winds from the North and East to blow over Europe.^{17,18}

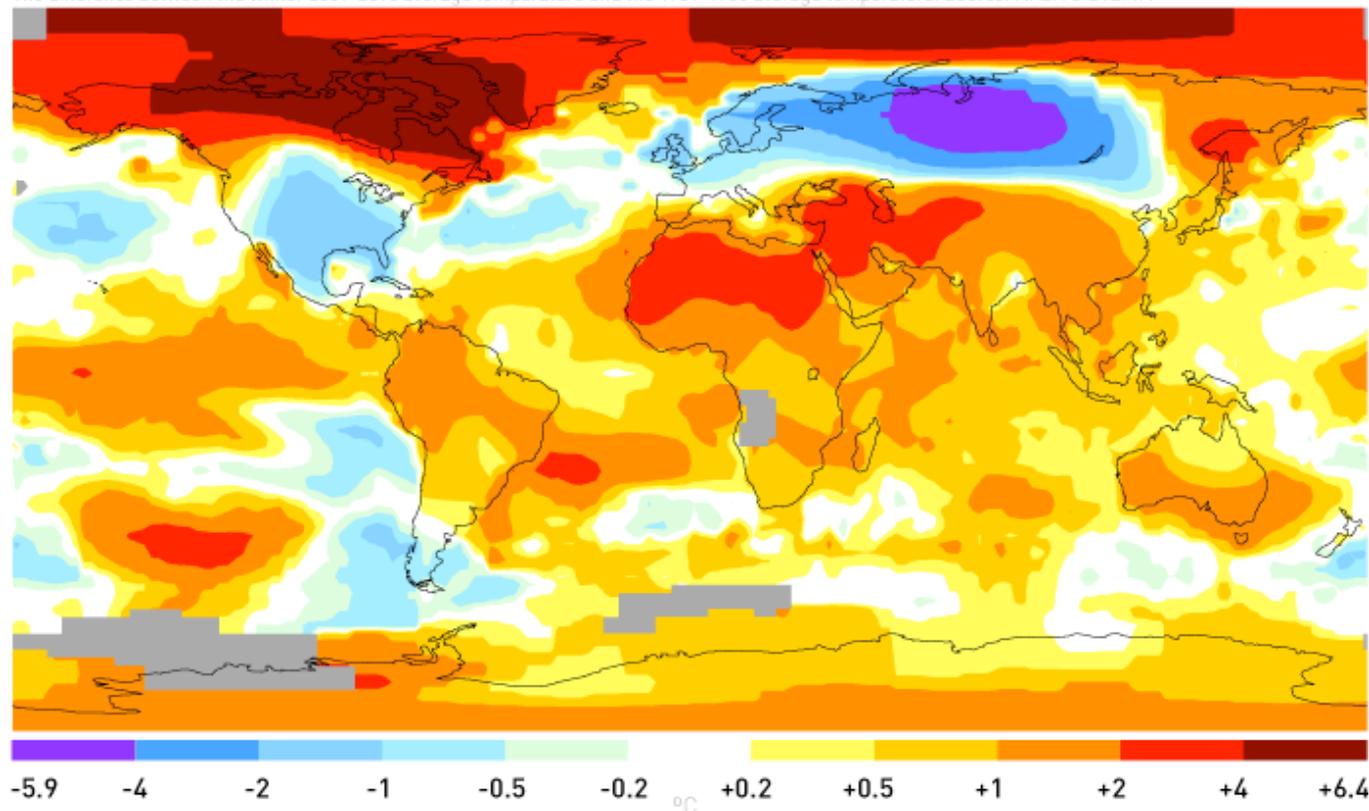
Snow & climate change

Somewhat counter-intuitively, a warmer world could lead to more snow in some places. In warmer areas there is likely to be more evaporation, which means more moisture in the air and makes for more extreme precipitation.¹⁹ If this moisture travels to colder areas, this will still fall as snow. A warmer world does not mean that there will be *no* cold places - in a winter that is usually minus 4°C a warming of 2°C will not stop it being cold enough to snow.²⁰

Global Surface Temperature Anomaly

Winter 2009-2010, December-February (+0.68°C)

The difference between the winter 2009-2010 average temperature and the 1951-1980 average temperature. Source: NASA GISTEMP.



What the scientists said

Robert Henson (UCAR, US): "People across the northern hemisphere are facing the fact that a warming planet doesn't get rid of winter ... now is a good time to remind ourselves that weather, like death and taxes, will always be with us."²¹

Kevin Trenberth (NCAR, US): "Too many think global warming means ... relentless warming everywhere year after year. It does not happen that way."²²

James Hansen (NASA, US): "The 48 states cover only 1.5 percent of the world area, so the U.S. temperature does not affect the global temperature much"²³ (The UK covers only 0.05%).²⁴

Peter Stott (Met Office, UK): "The famously cold winter of 1962/63 is now expected to occur about once every 1,000 years or more, compared with approximately every 100 to 200 years before 1850."²⁵

What the sceptics said

It's cold/snowing, so climate change has stopped: Very cold or snowy weather is often *short-term* and *local* - it does not disprove climate change. The *long-term* trend in *global* average temperature is increasing.

Global warming is due to natural cycles, not humans: Natural cycles do play a part in weather - they can make colder and snowier winters more likely, or more extreme. However, we can't explain the long-term warming trend in global temperatures with natural cycles.²⁶ Only additional CO₂ explains the trend we see (for more on this, see: <http://bit.ly/notnaturalcycles>).

It's the Sun: The possible link between low solar activity and cool winters has re-ignited discussion of solar activity as the cause of climate change.²⁷ Again, this natural cycle does not account for the warming we've observed. Even when the sun is at its 'hottest' it doesn't have enough of an effect to explain the temperature increase (see, for instance, <http://bit.ly/climatesun>).

For more info

An excellent short video on snowy winter is available here: <http://bit.ly/reallygoodvideo>

A short report (pdf) on the winter of 2009-10 is available here: <http://bit.ly/winter2009-10>

Climate change, cold and snowy winters at the same time: <http://bit.ly/warmsnow>

Experts

Professor Mark Saunders (University College London), Expert in, among other things, temperature, winter storms. mas@mssl.ucl.ac.uk / 01483 204187

Prof Mike Lockwood (University of Reading), expert in solar variability/activity; influence on climate variability; winter. m.lockwood@reading.ac.uk / 0118 378 5572

Dr Stephen Dorling (UEA), expert in numerical weather prediction; climate change impacts; wind power; environmental science; air quality. s.dorling@uea.ac.uk / 01603 592533

¹ [Could we be in for 30 years of global COOLING?](#), 11 Jan 2010 | *Daily Mail*

² [The mini ice age starts here](#), David Rose, 10 January 2010 | *The Daily Mail*

³ [SNOW CHAOS: AND THEY STILL CLAIM IT'S GLOBAL WARMING](#), Martyn Brown, 6 January 2010 | *The Daily Express*

⁴ [Climate scepticism 'on the rise', BBC poll shows](#),

7 February 2010 | *BBS News*

⁵ 'Climategate', uncertainty and attitude polarisation. Corner, A., Whitmarsh, L. & Xenias, D., 2010 | *Manuscript in preparation*

⁶ [The history of British winters](#), netweather.tv | D.Fauvell, I.Simpson

⁷ [The winter season 2008-2009 - how does it compare with past cold winters?](#), 16 Feb 2009 | *MeteoGroup*

⁸ [The coldest winters in the UK](#), Sam Jones, 5 Jan 2010 | *The Guardian*

⁹ [Rewind: The big freeze of 1962-63](#), Martin Williamson,

January 12, 2010

¹⁰ [Severe Winters](#) | *Met Office*

¹¹ [UK snow: It's the weather, sceptics](#), Geoffrey Lean, 8 Jan 2010 | *The Telegraph*

¹² [Coldest UK winter for over 30 years](#), 1 March 2010 | *The Met Office*

¹³ [Leading climate scientist challenges Mail on Sunday's use of his research](#), David Adam, 11 Jan 2010 | *The Guardian*

¹⁴ [Advancing decadal-scale climate prediction in the North Atlantic sector](#), N. S. Keenlyside, M. Latif, J. Jungclaus, L. Kornblueh & E. Roeckner, 1 May 2008 | *Nature* 453, 84-88

¹⁵ [Assessment of the observed extreme conditions during the 2009/2010 boreal winter](#), World Meteorological Organization, 2010

¹⁶ [The record-breaking cold temperatures during the winter of 2009/2010 in the Northern Hemisphere](#), Chunzai Wang, Hailong Liu and Sang-Ki Lee, 8 July 2010 | *ATMOSPHERIC SCIENCE LETTERS*, *Atmos. Sci. Let.* 11: 161-168

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- 18 [Quiet sun puts Europe on ice.](#) Stuart Clark, 4 May 2010 | *New Scientist*
- 19 [El Nino, Global Warming, and Anomalous U.S. Winter Warmth](#), John Wallace (Mike), 8 Jan 2007 | *RealClimate.org*
- 20 [Heavy snowfall in a warmer world](#), Jeff Masters, 8 Feb 2010 | *Dr Jeff Master's Wunder Blog (wunderground.org)*
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- 24 % of global surface area covered by UK (in km²)
= (UK surface area / global surface area) * 100
= (243,610 / 510,072,000) * 100
= 0.05%
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