

COMMENTARY:

Pause for thought

Ed Hawkins, Tamsin Edwards and Doug McNeall

The recent slowdown (or ‘pause’) in global surface temperature rise is a hot topic for climate scientists and the wider public. We discuss how climate scientists have tried to communicate the pause and suggest that ‘many-to-many’ communication offers a key opportunity to directly engage with the public.

Since the late 1990s, global mean surface temperature increased more slowly than during the preceding two decades. The reasons for this ‘pause’ are being actively debated by the climate science community^{1–4}. The recent Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5) concluded in their Summary for Policymakers (SPM) that this slowdown “is due in roughly equal measure to a reduced trend in radiative forcing and a cooling contribution from natural internal variability”¹.

Discussion of the pause, while a relatively small part of the IPCC report, was prominent in the mainstream media reporting⁵ following the release of the AR5 Working Group I SPM. Much of the coverage accurately reflected the views of scientists, although some was less aligned with the conclusions of the IPCC. This media attention was perhaps predictable, given the long-term sceptical narrative about the pause, which can be traced back to at least 2006⁶. For example, in 2007, *New Statesman* proclaimed that “global

warming has stopped”⁷, starting a pervasive trend in some parts of the media (especially in the UK) to prominently highlight the slowdown and suggest that climate models are “running too hot”⁸ or that climate sensitivity is on “negative watch”⁹.

These media articles raise questions about the public communication efforts of the climate science community, especially since the ‘Climategate’ affair of 2009, and highlight the need for climate scientists to accurately convey information of societal relevance to a very wide range of interested parties^{10,11}. Did the climate science community do enough in communicating the slowdown, and how could it do better in the future?

Communicating the possibility

The IPCC suggests that the slowdown is likely to be due to a combination of factors¹. Here we mainly focus on the communication of one particular aspect — the role of internal climate variability — but the radiative forcing changes are also important.

The peer-reviewed literature contains much discussion of unforced decadal

fluctuations in global surface temperature and the IPCC discusses internal climate variability extensively in all of their reports. Such variability has been invoked to help explain both the early twentieth-century warming¹² and the faster warming during the 1980s and 1990s¹³. In addition, projections from global climate models have shown decadal periods of cooling embedded within longer-term warming from when they were first developed¹⁴ to the present^{15,16}.

However, to our knowledge, the possibility that warming might slow due to internal variability was not highlighted by the mainstream media prior to 2006, raising the possibility that climate scientists did not stress the importance of such variability enough. For example, during an otherwise successful UK press briefing on the pause in 2013¹⁷, one senior science journalist remarked that he had “never heard leading researchers mention the possibility [of a slowdown] before”¹⁸. What could have caused a breakdown in communication of this magnitude?

First, it is possible that the chance of a slowdown was communicated effectively to the media, and subsequently ignored as not newsworthy. Alternatively, previous communications may have focused on long-term changes to inform mitigation discussions, whereas there is now more focus on near-term adaptation issues, for which climate variability is more important. Although several papers have estimated the probability of a pause^{19–21}, they were published after it had started. Also note that the IPCC has not included a clear statement of the chance of a slowdown in any of its SPMs (Box 1).

Second, although no ‘one size fits all’ method exists for communicating climate projections^{22,23}, graphically presenting future projections as ensemble means and spreads, without showing the individual simulated trajectories, could have led to an under-appreciation of the possible role of variability. For example, users of hurricane predictions were found to over emphasize

Box 1 | IPCC summary statements on the role of climate variability.

AR1 SPM 1990 — “the Earth’s climate would still vary without being perturbed by any external influences. This natural variability could add to, or subtract from, any human-made warming; on a century timescale this would be less than changes expected from greenhouse gas increases.”

AR2 SPM 1995 — “Any human-induced effect on climate will be superimposed on the background ‘noise’ of natural climate variability.”

AR3 SPM 2001 — “Changes in climate occur as a result of both internal variability within the climate system and external factors.”

AR4 SPM 2007 — “On [regional] scales, natural climate variability is relatively larger, making it harder to distinguish changes expected due to external forcings.”

AR5 SPM 2013 — “In addition to robust multi-decadal warming, global mean surface temperature exhibits substantial decadal and interannual variability. Due to natural variability, trends based on short records are very sensitive to the beginning and end dates and do not in general reflect long-term climate trends.”

the most likely path, potentially unduly influencing evacuation decisions²⁴.

The real world will not evolve like an ensemble mean, but will behave more like an individual simulation^{15,25}. As an illustration, ten simulations with the same climate model and forcing pathway show an ensemble mean trend of around 0.2 °C per decade over the next 40 years (Fig. 1), but different 15-year periods within individual simulations show trends in the range 0.0–0.4 °C per decade. For comparison, the observed trend is 0.04 °C per decade for the 1998–2012 period. Note that each simulation shows periods, often lengthy, outside the ensemble spread. Consequently, we should expect observations to fall outside the projected ensemble spread some of the time. We note that the most recent IPCC AR5 Technical Summary does include such a ‘spaghetti’ plot of all the individual simulations.

The communication of the slowdown and its implications is complex. Although the most recent decade is the warmest since 1850¹, this does not mean there is no pause, as some have seemed to suggest²⁶. To overcome these communication challenges, some have discussed the overall energy budget of the Earth, which has been suggested as a more robust indicator of climate change than surface temperature alone^{27,28}. However, surface warming impacts people directly, is readily understood by the public and is also the canonical example of climate change which has been iconic for many years.

Online media influence and social media

Trends in online searches suggest that media articles, even if published in a single country, can drive interest and discussion among the global public. Google trends (Fig. 2) suggest that searches for ‘global warming stopped’ increased sharply in early 2008, just after the *New Statesman* article⁷. A peak in October 2012 can potentially be traced to an article in *Mail Online*²⁹. From March 2013, the term ‘global warming pause’ became popular, coincident with the phrase’s use in articles in *Mail Online*⁸ and *The Economist*⁹. Another peak in September 2013 is coincident with media coverage of the launch of the IPCC AR5 Working Group I SPM¹.

Those who do search online find content that is dominated by blog posts from popular commentators, often ‘sceptics’, and sometimes matched by ‘mainstream’ counterparts. This is a fast-paced, often vitriolic and enormously prolific stream of opinions and analyses responding to climate science news. Such blogs massively dominate those of climate scientists in both number and traffic, resulting in a potential misrepresentation of the discussion. Twitter is also an active ‘many-to-many’ forum

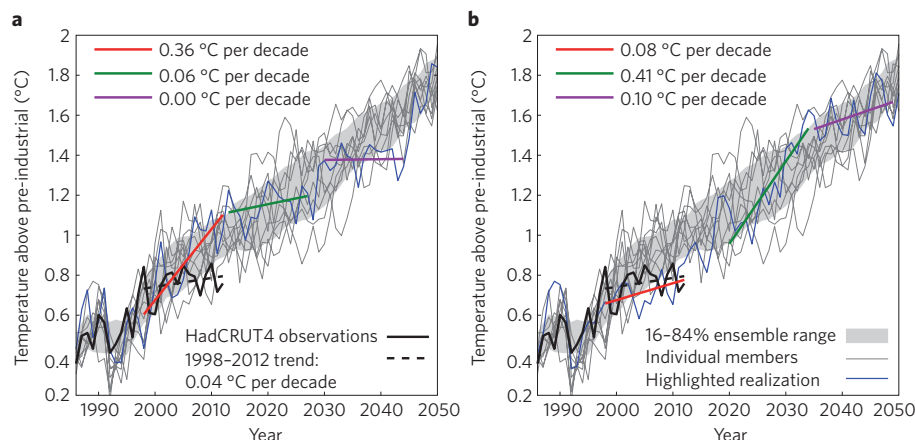


Figure 1 | The role of variability in global temperatures. Observed global mean surface air temperatures (HadCRUT4³³, solid black line) and recent 1998–2012 trend (dashed black line), compared with ten simulations of the CSIRO Mk3.6 global climate model, which all use the RCP6.0 forcing pathway (grey lines). The grey shading represents the 16–84% ensemble spread (quantiles smoothed with a 7-year running mean for clarity); the ensemble mean trend is around 0.20 °C per decade. Two different realizations are highlighted (blue), and linear trends for specific interesting periods are shown (red, green, purple lines). **a**, The highlighted realization shows a strong warming in the 1998–2012 period, but a 15-year period of no warming around the 2030s. **b**, The highlighted realization is more similar to the observations for 1998–2012, but undergoes a more rapid warming around the 2020s. Note also that this realization appears outside the ensemble spread for 9 out of 10 consecutive years from 2003–2012.

for climate science talking points, often discussing rather complex technical issues from the latest literature.

There is undoubtedly still a clear need for traditional forms of communication through the media, public events and peer-reviewed activities such as the IPCC. However, if climate scientists are to communicate more effectively, then increasing their online and interactive presence offers a real opportunity to reach a broader range of interested parties directly. For example, an unpublished figure in a recent blog post³⁰ was used in media articles^{8,9} and even a US Senate hearing. A recent paper⁴ on the pause used webpages and online videos to enhance communication, which may have helped generate a front-page article in *The Independent*³¹.

Some lessons learned

There is a small but dedicated community of climate scientists engaging on blogs and social media^{10,11}, with diverse approaches to online engagement: more would be welcomed (see ref. 32 for a list of blogs by climate scientists). Although online conversations can be unpredictable, rambunctious and frustrating, they are often personally and professionally rewarding. However, potential benefits need to be weighed against the time and effort expended and the real risks of feeling under attack. Additional recognition of the value and importance of such activities among academic employers would also help.

From our experience, the online ‘audience’ is often technically proficient, but neither captive nor necessarily interested or

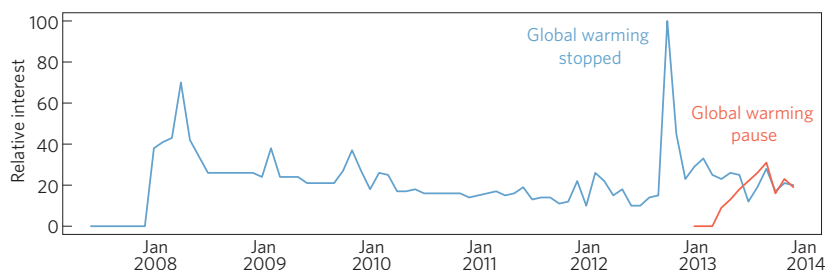


Figure 2 | Global internet search trends. Quantity of Google searches³⁴ for the terms ‘global warming stopped’ (blue) and ‘global warming pause’ (red) over the period from January 2007 to December 2013, expressed as ‘relative interest’ with the highest monthly total given an index of 100. Note that the Google data was accessed on 23 January 2014 and is subject to change.

patient, so conversations are more successful than lessons. We always expect, and try, to learn something from those we seek to 'teach'. Where there is a genuine uncertainty we must not ignore it. We find that being defensive, over-confident or dogmatic are not successful strategies. Humour and humility are useful in keeping people on board and one's sanity intact.

The pause is easy to fit into a pre-defined narrative — 'climate change is not as bad as we thought' — while the reasons we might see a slowdown are many, uncertain, complex and technical. But we should see the pause as an opportunity, offering a clear hook to explore exciting aspects of climate science; to draw back the curtain on active scientific discussions that are often invisible to the public. The pause is a grand 'whodunnit' at the edge of our scientific understanding — we have an unusual (but not totally unexpected) event, with incomplete but rapidly improving information and understanding. The outcome of our investigations is important at the global scale, both in the near-term (decadal) and the long-term (end of century). The challenge is to embrace the complexity of the situation, to acknowledge the uncertainty and the nuance, to welcome questions and investigation and show the process of climate science in good health. Online engagement would seem to be essential in this endeavour. □

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COMMENTARY:

Media discourse on the climate slowdown

Maxwell T. Boykoff

We must not fall victim to decontextualized and ahistorical media accounting of climate trends.

In August 1968, protestors from the Students for a Democratic Society — an activist movement in the United States — repeatedly hurled the phrase 'the whole world is watching' outside the hotel in Chicago where the Democratic National Convention was being held. As Columbia University professor Todd Gitlin later documented in a book¹ titled by the same phrase, media coverage of the clashes accompanying the refrain then served to draw wider visibility to their antiwar activities and claims. He found that

implications from the media representations were twofold: first, coverage largely framed the protests as a fringe action promoted by marginalized actors; however, second, the increased media coverage of the Students for a Democratic Society actions actually boosted awareness and bolstered member enrolments in the student-led movement.

These insights from Gitlin, along with those of other scholars across a range of perspectives, help inform considerations of the interactions between climate

science, policy, media and the public today. Specifically, these findings guide our thinking about the swirling media discourses of a global warming pause, or hiatus or slowdown, that gained momentum, especially in this past year.

Discourses are essentially sets of categories, ideas and concepts that give meaning to phenomena. Maarten Hajer has pointed out that they can "frame certain problems ... [and can] dominate the way a society conceptualizes the world"². Through