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In Terms of Scientific Consensus, Modern Climate Change Stands Apart From All Other Scientific Disciplines

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Comment

When it comes to public consensus, climate science is in a critical phase. On the one hand, publishing climate scientists do show a massively overwhelming consensus on what causes present-day climate change, on the other side, climate sceptics categorically deny this. At the same time, they fail to reach an internal consensus; as there is no agreement among them on what specific natural agent is responsible for the current warming trend, they never tell you what specific natural factor must be blamed. They only speak in general terms about different natural factors such as water, clouds, solar radiation, volcanic eruptions, and natural ocean currents, etc., which they believe may have caused the warming of the last hundred years. However, they fail to demonstrate a correlation between temperature and any of these agents during the **relevant** time span, a correlation that could be the basis of a solid consensus. In other words, climate sceptics are unable to provide reasonable explanations for the temperature rise in the last century. On the other hand, 97-99% of actively publishing climate scientists, biophysical scientists, geologists support the conclusion that human activities are the primary driver of recent global warming (Benestad et al., 2016; Cook et al., 2013; Lynas et al., 2021). The most recent analyses indicate this consensus now exceeds 99% (Mytych, 2024), making it one of the few instances in scientific history where almost all experts in a field agree on a particular topic (see Fig. 1).

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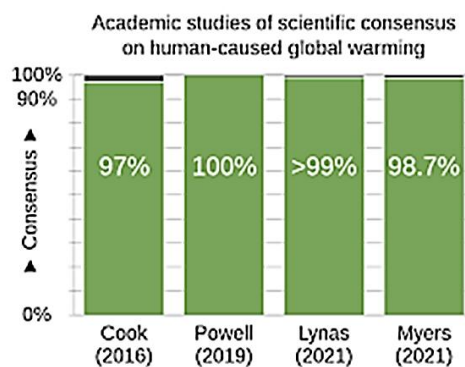


Figure 1: The degree of agreement on the cause of current global warming.

The strange situation arose because the rejection of the consensus, especially when no suitable alternative perspective is advanced, may in fact be regarded as a rejection of science. True, the Earth's climate has always changed due to natural causes, but the warming observed since the early 20th century stands out as unusual in both its speed and pattern. Multiple lines of scientific

evidence demonstrate they cannot explain the magnitude and characteristics of warming experienced over the last century. The timing, geographic distribution, and rate of recent temperature increases point to human activities, particularly the emission of greenhouse gases from burning fossil fuels, as the primary cause of modern climate change. This conclusion is supported by climate models, direct observations, and statistical analyses that consistently show natural variability alone falls short of explaining current warming trends. The relationship between CO₂ and global temperature shows an excellent correlation, with atmospheric concentrations rising from 280 ppm before industrialization to over 398 ppm by 2013, representing approximately a 40% increase. The scale of this change is unprecedented - CO₂ concentrations never rose above 300 ppm between the advent of human civilization roughly 10,000 years ago and 1900.

The mechanism behind CO₂'s warming effect is well understood - it acts as a heat-trapping gas that allows sunlight to reach Earth's surface but prevents heat from escaping back to space. In addition, ocean acidification represents a *distinct and independent* line of evidence for anthropogenic climate change, separate from, but complementary to atmospheric warming. While both processes stem from the same source - increasing atmospheric CO₂ concentrations from human activities - they operate through different physical and chemical mechanisms (Zoccola et al., 2016). Ocean acidification occurs through direct chemical reactions when CO₂ dissolves in seawater, - an issue that addresses the same fundamental cause but manifests as a separate environmental problem (Owens et al., 2021). The World Meteorological Organization now officially recognizes ocean acidification as one of seven key global climate indicators, alongside atmospheric CO₂ concentrations, surface ocean temperature, ocean heat content, sea level, sea ice, and glaciers (Metzl et al., 2024). The strength of climate science lies in the convergence of evidence from multiple independent climate indicators across the atmosphere, continents and oceans. This multi-indicator approach makes the evidence particularly robust because it would be nearly impossible for natural variability alone to create consistent warming signals across so many different measurement systems simultaneously. Seeing from a broader perspective, it doesn't even matter if the consensus number is 90% or 100%. The level of scientific agreement on anthropogenic global warming is overwhelmingly high because the supporting evidence is overwhelmingly strong and robust.

Science should be viewed as a single entity. There can be no such a thing as "science beyond previous science." Instead, we must mutually and respectfully acknowledge the merits of each other's scientific achievements. For example, the result that CO₂ does not always correlate perfectly with climate warming observed during a short period must be welcomed (typical chicken and egg problem). This suggests that while CO₂ is the dominant long-term driver, the relationship between emissions and temperature changes may involve complex timing and feedback mechanisms that are not immediately apparent. Similarly, the ocean's massive heat capacity can mask or delay the full temperature response to greenhouse gas increases, potentially affecting how we interpret the timing and magnitude of CO₂'s warming effects. However, these factors don't diminish the fundamental role of carbon dioxide in driving climate change, but they highlight the complexity of the climate system and the importance of considering multiple indicators and timeframes when assessing the relationship between greenhouse gas emissions and observed warming patterns.

Now, the big question: What prevents climate scientists of both sides to reach a consensus?

To this end, I find Reusswig' thoughts highly revealing: „Climate change stands apart from other areas of scientific consensus because of its profound economic and political implications. While climate scientists themselves are often apolitical, the issue they study is inherently political in nature. If global warming were caused solely by natural factors, society would only need to adapt, but the reality of anthropogenic climate change demands something far more disruptive: the decarbonisation of the global economy”(Reusswig, 2013).

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