



MONITORING TEMPERATURES AND SEA ICE WITH SATELLITES

HOT TAKES

- 1 Warming measured by satellites since 1979 is only half that predicted by climate models.
- 2 From 1979 to 2019 Arctic sea ice declined while Antarctic sea ice increased.
- 3 Real-world observations show CO₂-centric climate models are wrong, casting doubt on whether increasing CO₂ really drives recent warming.

Since 1979 satellites have provided global measurements of temperature and sea ice extent. Satellite measurements of the lower troposphere (the lowest part of the atmosphere) are the only truly global way to directly monitor the critical portion of the climate system that largely governs how the Earth cools by radiating heat towards space.

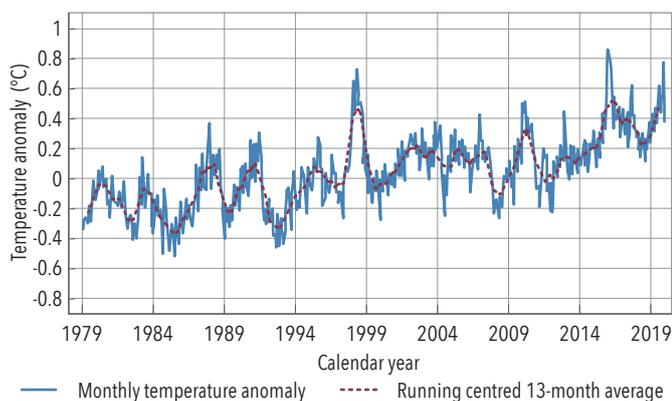
According to global warming theory¹ these measurements cover the period during which warming should be greatest. Therefore they provide an opportunity to test climate models' predictions of warming. Warming measured by satellites has been +0.13°C per decade (1979 through 2019), only half that predicted by climate models. If real-world observations show the models are wrong, we can ask whether increasing CO₂ is in fact the main driver of recent warming.

Global Temperature Trends, 1979–2019

The monthly global-average temperature variations of the lower troposphere from 1979 through to April 2020 are shown in Figure 1.

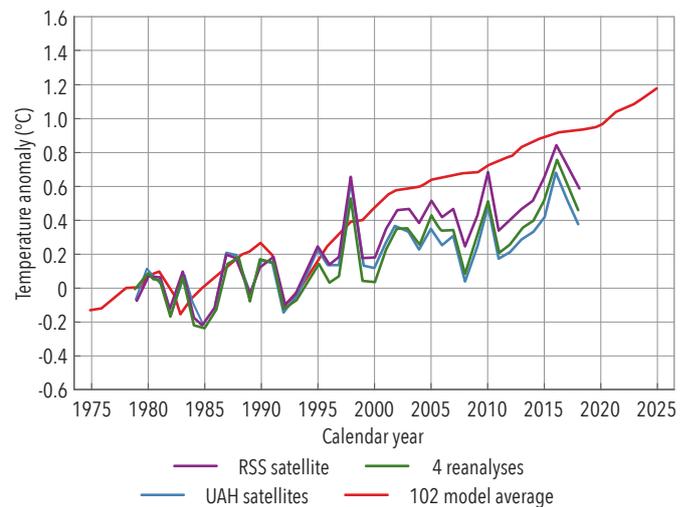
The satellite data suggests that there has been a weak warming trend since 1979 equivalent to just 1.3°C in 100 years. This is

Figure 1: Monthly average global temperature anomalies since 1979²



Monthly global anomalies as the departure from the 1981 to 2010 average.

Figure 2: Lower tropospheric temperatures: models versus observations since 1979³



Averaged 102-model output from the CMIP5⁴ versus satellite and radiosonde (balloon) observations for yearly global-average tropospheric temperature. Anomalies are a departure from the 1979 to 1984 average.

only about half the average predicted by the models tracked by the Intergovernmental Panel on Climate Change (IPCC).

If we compare the warming predicted by these climate model runs with the satellite-measured warming we see they have diverged since about 1998, as shown in Figure 2. Virtually none of the 102 individual models projected the slow rate of warming observed.

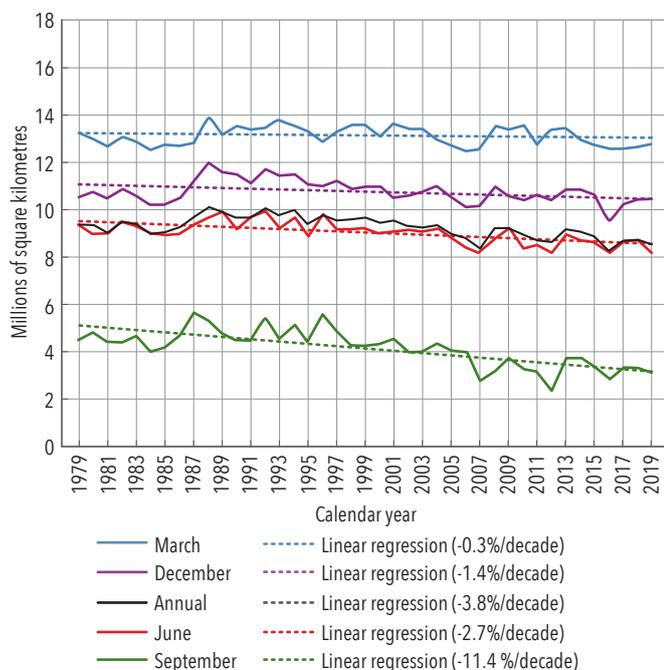
The most likely explanation for the difference is that the models have been 'tuned' to be too sensitive to increasing CO₂. The direct warming effect of doubling CO₂ in the atmosphere is only about 1°C, but hypothetical effects which amplify responses to the CO₂ then triple this to an indirect effect of about 3°C. But because the actual net impact of the amplifying changes is so poorly known, it is impossible to model their effect from first physical principles. Instead, the models are empirically 'fudged' on the assumption there would have been no climate change in the absence of increasing CO₂, and that all recent warming is entirely due to man-made CO₂. This means all of the warming in the models will be driven by the postulated CO₂ effect, because that is what was assumed at the outset.

However the net response of the climate system to CO₂ may not amplify its weak direct warming effect by anything like a factor of three. Model response is a function of the assumptions made when constructing the models. If the assumptions are wrong then the predicted warming will fail to match the subsequent observations. This is what has happened.

Global Sea Ice Trends, 1979–2019

The Arctic has warmed more than the global average, with a decadal trend of $+0.26^{\circ}\text{C}$. There has been a 3.8% per decade decrease in Arctic sea ice area, as shown in Figure 3.

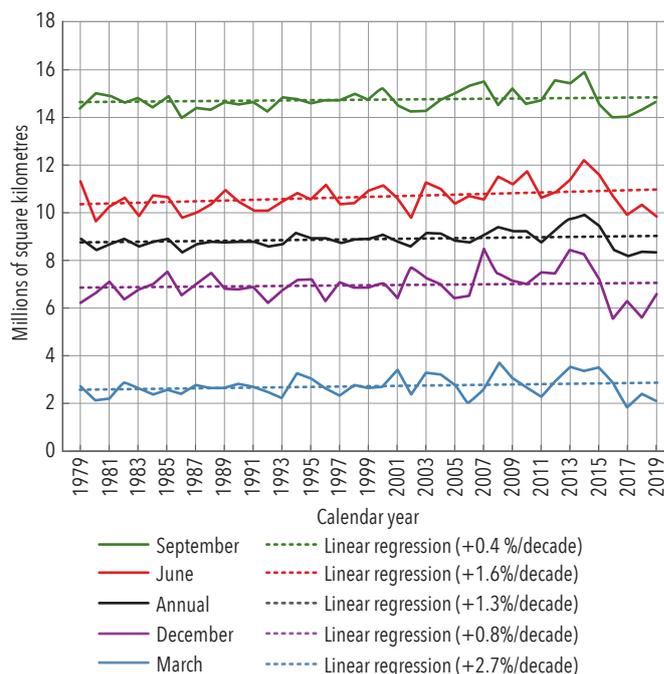
Figure 3: Arctic sea ice area from 1979 to 2019⁵



In Antarctica there has been no tropospheric warming from 1979 to 2019. The sea ice around Antarctica shows a slight upward trend of $+1.3\%$ per decade increase, as shown in Figure 4. Sea ice was nearly 16 million square kilometres in September 2014. There was a large decline in February 2016 corresponding with an El Niño that summer.

Forty-year trends in Arctic and Antarctic sea ice cover are moving in opposite directions. There is no correlation. If global warming was driving the changes you would expect to see similar long term trends in both polar regions.

Figure 4: Antarctic sea ice area from 1979 to 2019⁵



Conclusion

Since 1979, the global-average lower troposphere has warmed at a rate of only about half that expected by the CMIP5 climate models used by the IPCC, but the modellers need to re-examine some underpinning assumptions. A major limitation is that the models cannot simply be designed from first physical principles, because measurements of the radiant flows of energy into and out of the global climate system are not accurate enough. Because of this uncertainty, climate modellers simply assume the climate system is normally in natural long term energy balance, and that recent warming reflects an imbalance that can only be due to increasing man-made CO_2 . When the resulting models are tuned to be self-consistent with this hypothesis, and then held up as evidence of CO_2 -causation, it is an act of circular reasoning.

SEE ALSO

FACT SHEET #2: Climate Change in the Polar Regions

FACT SHEET #7: Winter Temperature Trends in Antarctica

Information in this fact sheet has been drawn from *Climate Change: The Facts 2020* (IPA 2020), Chapter 6, by Dr Roy W. Spencer. Fact Sheet series general editor: Dr Arthur Day

1. Global warming theory is fundamentally about the role of CO_2 in reducing the ability of the Earth to cool itself. This is because CO_2 affects how efficiently the climate system cools through infrared (heat) radiation to outer space. Most of the radiation that actually escapes into space is emitted from the atmosphere and not from the surface but the question remains: how big is the effect of extra CO_2 , and is it dangerous if the effect is too small to even directly detect?
2. Source: Roy Spencer and John Christy, https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahnadc_lt_6.0.txt
3. Source: CMIP5 data available from Royal Netherlands Meteorological Institute at <https://climexp.knmi.nl/start.cgi?id=someone@somewhere>
4. CMIP5 is the 'Coupled Model Intercomparison Project', Phase 5. This is a major IPCC-sponsored project systematically comparing the performance of different climate models in a controlled setting.
5. Source: Data from the National Snow and Ice Data Center.

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