# Earth is heating up faster than at any time in its history

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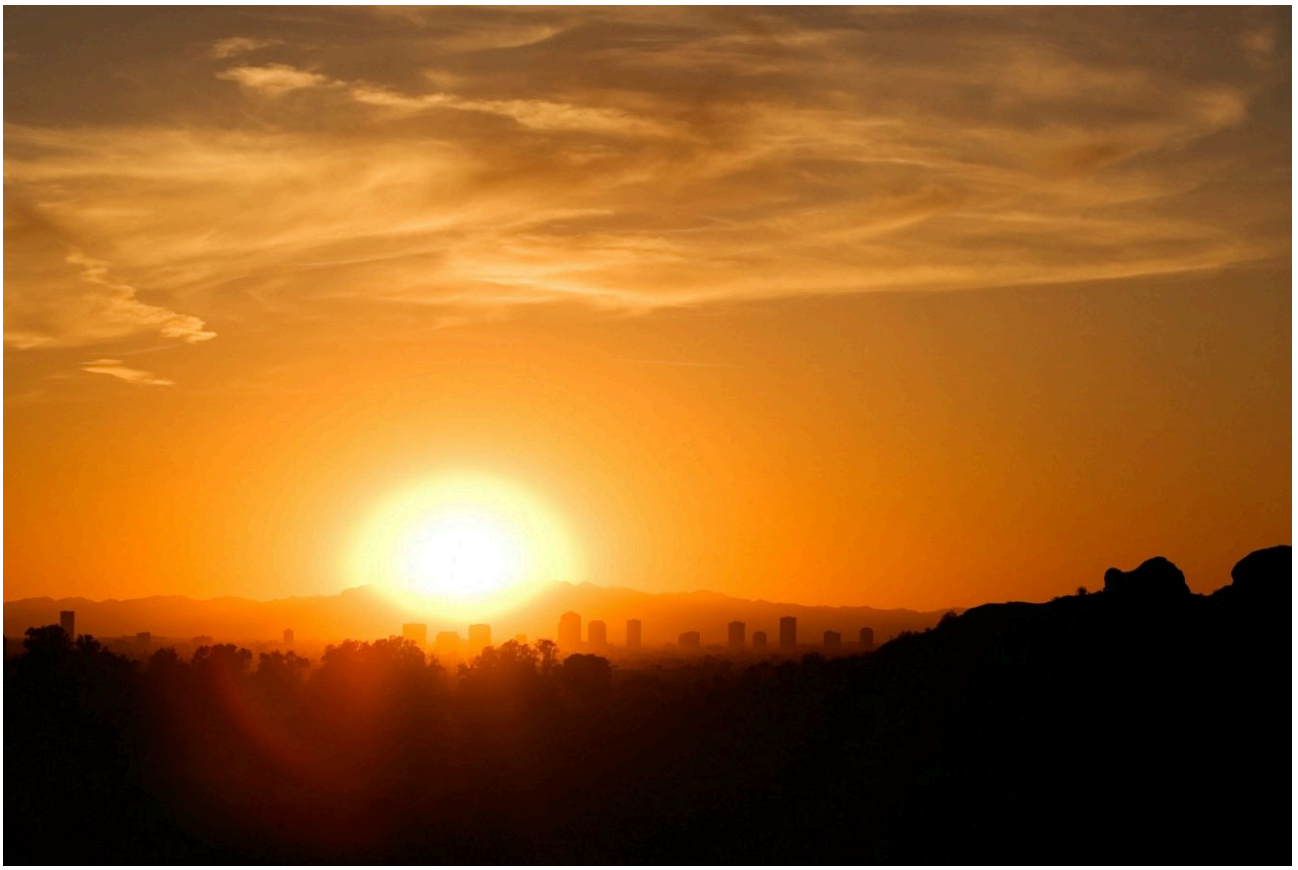
Bill McGuire 11 January 2030

**Environment**

To understand where climate change is heading, we have to look at the planet's distant past and appreciate the disturbing uniqueness of our situation, says Bill McGuire



Rising levels of carbon dioxide in the atmosphere are trapping more heat

As Europe bakes in what could be its hottest and driest summer on record, the rapid transformation of our climate is harder than ever to ignore. But how much hotter will it get, and what will that mean for life on Earth?

To get a picture of our future, we can either use computer models or look to episodes of rapid climate change in the geological record. While models are invaluable in terms of tracking where our world may be heading, peering back into deep time provides unrivalled information about cause and effect; about how the climate has changed in the past and what the consequences were. There is no guesswork involved, as the evidence is all laid out for us in the sediments and rocks, in the ice sheets and in the remains of ancient life.

Looking back in time also helps us to put human-caused global heating in context by making comparisons with past episodes of rapid temperature increase, and when we do this, the news isn't good. It isn't so much the degree of heat that is the issue – our world

has been much hotter than it is today for much of its 4.6-billion-year history – but the speed of change.

Perhaps barring the immediate aftermath of the dinosaur-obliterating asteroid impact 66 million years ago, atmospheric carbon dioxide levels have never risen as quickly as they have in the last couple of centuries. Even worse, nowhere in the geological record is there evidence for the average temperature of our world climbing as quickly as it is now. This means 10 times faster than during the Palaeocene-Eocene Thermal Maximum, which marked extreme hothouse conditions 56 million years ago, and at least 20 times faster than at the end of the last glacial period.

Judicious analysis of past climates also permits us to recognise potential analogues for where our world is heading in the decades and centuries to come. Over the last 50 million years or so, the planet's climate has followed a broadly cooling trend, which we are now rapidly rewinding – a process, if you like, of prehistorification. Deciding how far back we will end up is still within our gift, but it is a given that our grandchildren will grow up in a climate different to any experienced during the tenure of human civilisation.

Modelling studies suggest that if – and it's still a big if – emissions peak by 2040 and then fall quickly, we will rewind the climate clock 3 million years and bequeath to our descendants a Late Pliocene climate. Then, atmospheric CO2levels were much lower than today, at 330 to 400 parts per million (ppm), but the temperature was between 2.5ºC and 4ºC above the pre-industrial average, and sea level 15 to 25 metres higher. Pliocene conditions could start to appear in the continental heartlands as soon as the 2030s and spread out from there.

If we fail to rein in emissions fast enough, or if natural feedback effects drive more heating than expected, then a further rewinding of the climate clock back to the Miocene becomes more likely; to a time 15 million to 17 million years ago, when CO2concentrations, at 400 to 600 ppm, were a bit lower to moderately higher than they are today. At 6ºC to 8ºC above the 1800s, however, the temperature was far higher than expected for such CO2 levels, suggesting the involvement of other heating factors that we don't yet fully understand. Sea level was maybe 50 metres higher than it is today.

But this may not be the end of it. The current high rate of heating documented by satellite observations and borne out by Earth's rapidly escalating energy imbalance implies that rewinding the climate clock back fully 50 million years remains within the bounds of possibility, eventually reprising the blistering heat of the early Eocene hothouse. Such conditions would make most of our world uninhabitable for humans, and severely test the capacity of our species to prevail.

As the Persian poet and mathematician Omar Khayyam observed almost 1000 years ago: "When I want to understand what is happening today, or try to decide what will happen

tomorrow, I look back.” They are words that serve us well as we contemplate our future climate, and that we ignore at our peril.

*Bill McGuire is professor emeritus of geophysical and climate hazards at University College London. His book,* The Fate of the World: A history and future of the climate crisis, *is published by HarperNorth.*