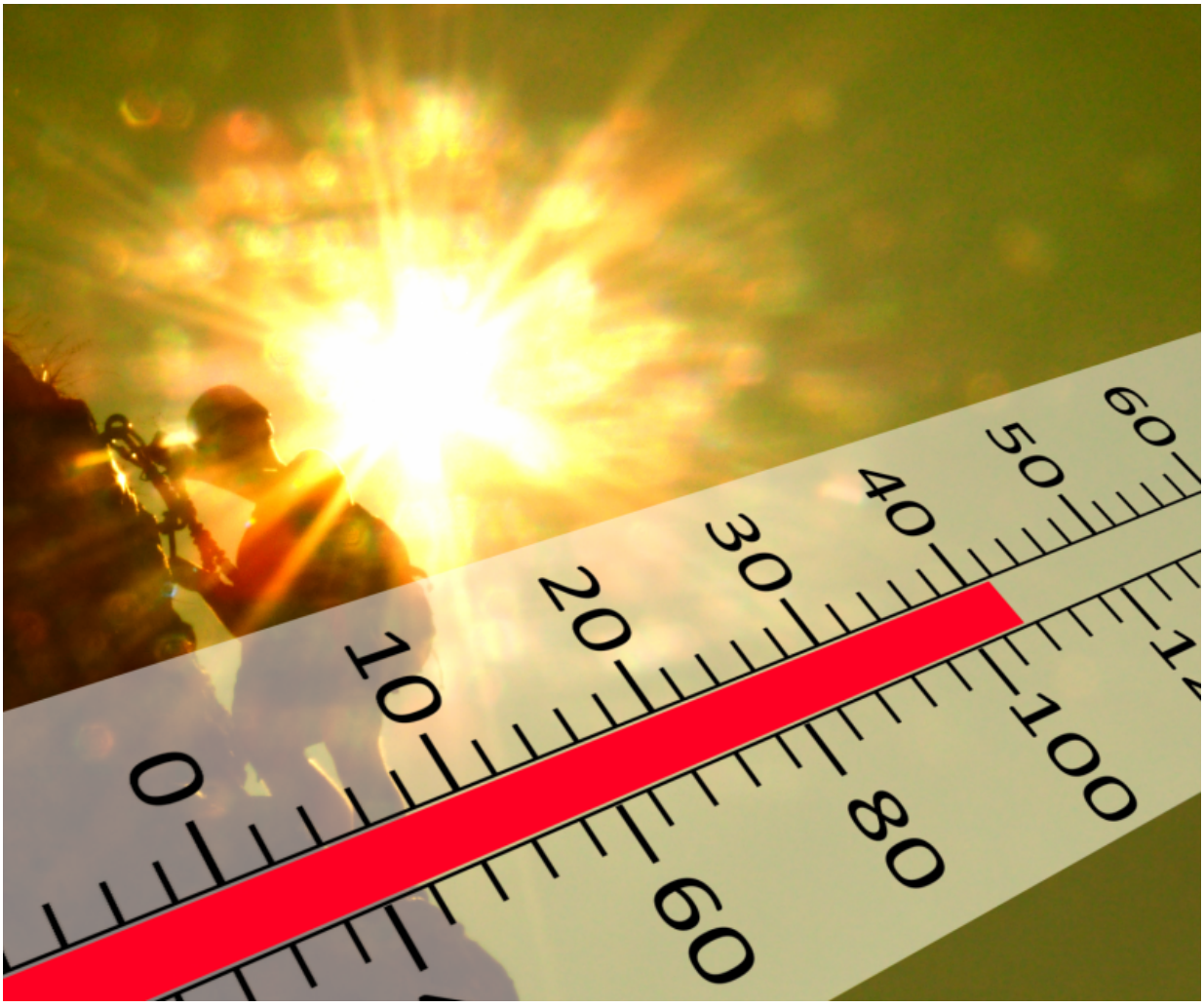
Researchers show that global warming happened just as fast in the past as today

November 11 2015



Credit: Kilian Eichenseer

Climate change is progressing rapidly. It is not the first time in our planet's history that temperatures have been rising, but it is happening much faster now than it ever has before. Or is it? Researchers at Friedrich-Alexander-Universität Erlangen-Nürnberg have shown in the latest edition of the journal Nature Communications that the temperature changes millions of years ago probably happened no more slowly than they are happening today.

In order to predict how today's ecosystems will react to increasing temperatures over the course of global warming, palaeobiologists study how climate change happened in the earth's history and what the consequences were. In order to compare the events of the past with current changes researchers need data on the scope of the changes. What was the speed with which temperatures increased or decreased? What was the magnitude of the change in temperatures? Until now, the general consensus has been that current climate change is happening more quickly than any previous temperature fluctuations.

Climate change in the earth's past faster than previously thought

Together with a British colleagues, palaeobiologist Prof. Dr. Wolfgang Kießling and geosciences student Kilian Eichenseer, both from FAU, have published a pioneering study in *Nature Communications* explaining that the idea that environmental changes in the earth's past happened slowly in comparison to current, rapid climate change is wrong. The reason for this incorrect assumption is the different time periods that are examined in climate research. 'Today we can measure the smallest fluctuations in climate whenever they occur,' Kilian Eichenseer explains. 'Yet when we look at geological history we're lucky if we can determine a change in climate over a period of ten thousand years.'

Therefore, if we compare global warming over recent decades with the increase in temperature that happened 250 million years ago over the Permian-Triassic boundary, current climate change seems incredibly fast. Between 1960 and 2010, the temperature of the oceans rose at a rate of 0.007 degrees per year. 'That doesn't seem like much,' Prof. Kießling says, 'but it's 42 times faster than the temperature increase that we are able to measure over the Permian-Triassic boundary. Back then the temperature of the oceans rose by 10 degrees, but as we are only able to limit the period to 60,000 years, this equates to a seemingly low rate of 0.00017 degrees per year.'

Rapid changes are invisible, not absent

In their study the researchers looked at around two hundred analyses of changes in climate from various periods in geological history. It became clear that the apparent speed of climate change appears slower the longer the time periods over which increases or decreases in temperature are observed. The reason for this is that over long periods rapid changes in climate do not happen constantly in one direction. There are always phases during which the temperatures remain constant or even sink—a phenomenon that has also been observed in the current period of global warming. 'However, we are unable to prove such fast fluctuations during past periods of climate change with the available methods of analysis.

As a consequence, the data leads us to believe that climate change was always much slower in geological history than it is today, even when the greatest catastrophes occurred. However, that is not the case,' Prof. Kießling says. If we consider these scaling effects, the temperate increase over the Permian-Triassic boundary was no different to current climate change in terms of speed. The increase in temperature during this event is associated with a mass extinction event during which 90 percent of marine animals died out.

More information: David B. Kemp et al. Maximum rates of climate change are systematically underestimated in the geological record, *Nature Communications* (2015). DOI: 10.1038/ncomms9890

Provided by University of Erlangen-Nuremberg