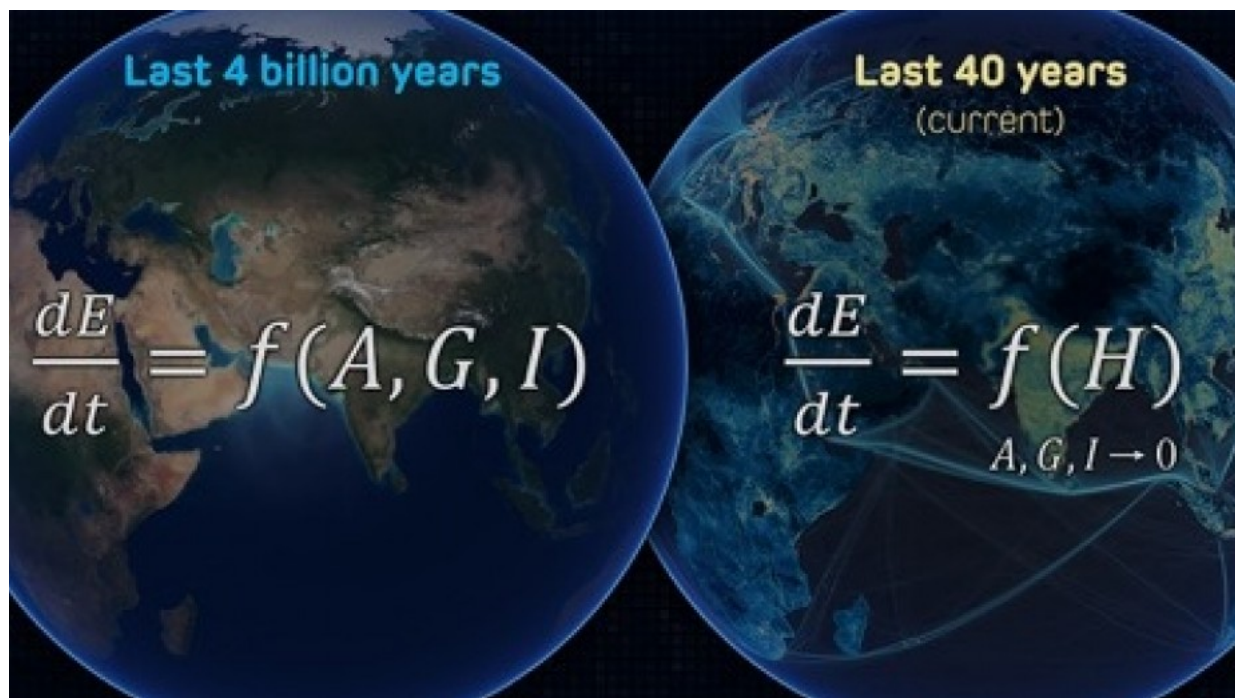


Humans affect Earth system more than natural forces

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The Anthropocene equation: E is the Earth system; A is astronomical forces; G is geophysical forces; I is internal dynamics; and H is industrialised societies.
 Credit: Australian National University

Humans are causing the climate to change 170 times faster than natural forces, new research co-led by The Australian National University (ANU) has found.

Co-researcher Professor Will Steffen from ANU said the study for the first time came up with a [mathematical equation](#) to describe the impact of human activity on the Earth system, known as the Anthropocene equation.

"Over the past 7,000 years the primary forces driving change have been astronomical - changes in solar intensity and subtle changes in orbital parameters, along with a few volcanoes. They have driven a rate of change of 0.01 degrees Celsius per century," said Professor Steffen, from the Fenner School of Environment and Society and the Climate Change Institute at ANU.

"Human-caused greenhouse gas emissions over the past 45 years have increased the rate of temperature rise to 1.7 degrees Celsius per century, dwarfing the natural background rate."

The paper published in *The Anthropocene Review* examines the Earth system as a single complex system and assesses the impact of human activities on the system's trajectory.

"We are not saying the astronomical forces of our solar system or geological processes have disappeared, but in terms of their impact in such a short period of time they are now negligible compared with our own influence," Professor Steffen said.

"Crystallising this evidence in the form of a simple equation gives the current situation a clarity that the wealth of data often dilutes.

"It also places the contemporary human impact in the context of the great forces of nature that have driven Earth system dynamics over billions of years."

Professor Steffen said humanity still had a chance to prevent

catastrophic climate change, but time was rapidly running out.

"The global economy can function equally well with zero emissions. Research shows we can feed nine billion people - the projected world population by 2050 - and reduce [greenhouse gas emissions](#) at the same time," he said.

More information: Owen Gaffney et al. The Anthropocene equation, *The Anthropocene Review* (2017). [DOI: 10.1177/2053019616688022](https://doi.org/10.1177/2053019616688022)

Provided by Australian National University

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