

If greenhouse gas emissions stopped now, Earth still would likely get warmer: study

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While governments debate about potential policies that might curb the emission of greenhouse gases, new University of Washington research shows that the world is already committed to a warmer climate because of emissions that have occurred up to now.

There would continue to be warming even if the most stringent policy proposals were adopted, because there still would be some emission of heat-trapping greenhouse gases such as carbon dioxide and methane. But the new research shows that even if all [emissions](#) were stopped now, temperatures would remain higher than pre-Industrial Revolution levels because the greenhouse gases already emitted are likely to persist in the atmosphere for thousands of years.

In fact, it is possible temperatures would continue to escalate even if all cars, heating and cooling systems and other sources of greenhouse gases were suddenly eliminated, said Kyle Armour, a UW doctoral student in physics. That's because tiny [atmospheric particles](#) called aerosols, which tend to counteract the effect of greenhouse warming by reflecting sunlight back into space, would last only a matter of weeks once emissions stopped, while the greenhouse gases would continue on.

"The aerosols would wash out quickly and then we would see an abrupt rise in temperatures over several decades," he said.

Armour is the lead author of a paper documenting the research, published recently in the journal [Geophysical Research Letters](#). His co-

author is Gerard Roe, a UW associate professor of Earth and space sciences.

The global temperature is already about 1.5 degrees Fahrenheit higher than it was before the Industrial Revolution, which began around the start of the 19th century. The scientists' calculations took into account the observed warming, as well as the known levels of greenhouse gases and aerosols already emitted to see what might happen if all emissions associated with industrialization suddenly stopped.

In the best-case scenario, the global temperature would actually decline, but it would remain about a half-degree F higher than pre-Industrial Revolution levels and probably would not drop to those levels again, Armour said.

There also is a possibility temperatures would rise to 3.5 degrees F higher than before the Industrial Revolution, a threshold at which [climate](#) scientists say significant climate-related damage begins to occur.

Of course it is not realistic to expect all emissions to cease suddenly, and Armour notes that the overall effect of aerosols – particles of sea salt or soot from burning fossil fuels, for example – is perhaps the largest uncertainty in climate research.

But uncertainties do not lessen the importance of the findings, he said. The scientists are confident, from the results of equations they used, that some warming would have to occur even if all emissions stopped now. But there are more uncertainties, and thus a lower confidence level, associated with larger temperature increases.

Climate models used in Intergovernmental Panel on Climate Change assessments take into consideration a much narrower range of the possible aerosol effects, or "forcings," than are supported by actual

climate observations, Armour said. The Nobel Peace Prize-winning panel, sponsored by the United Nations, makes periodic assessments of climate change and is in the process of compiling its next report.

As emissions of [greenhouse gases](#) continue, the "climate commitment" to a warmer planet only goes up, Armour said. He believes it is helpful for policy makers to understand that level of commitment. It also will be helpful for them to understand that, while some warming is assured, uncertainties in current climate observations – such as the full effect of aerosols – mean the warming could be greater than models suggest.

"This is not an argument to say we should keep emitting [aerosols](#)," he said. "It is an argument that we should be smart in how we stop emitting. And it's a call to action because we know the warming we are committed to from what we have emitted already and the longer we keep emitting the worse it gets."

More information: The paper was published in the Jan. 15 edition of *Geophysical Research Letters*.

Provided by University of Washington

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