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Sulfur stalls surface temperature rise

[Findings explain decade without warming](#)

By Nadia Drake

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A new study demonstrates why global surface temperatures defied a decades-long trend and didn't continue to rise between 1998 and 2008: Pollution-spewing, coal-burning power plants in Asia, while emitting warming greenhouse gases, simultaneously sent cooling sulfur particles into the atmosphere.

During that decade — sometimes cited as evidence to deny global warming — these Asian emissions mostly balanced one another and dampened the effects of natural cooling cycles associated with the sun and ocean temperatures.

A team of scientists led by Boston University's Robert Kaufmann reached this conclusion by analyzing factors contributing to global surface temperature, including human-caused emissions, the 11-year solar cycle and a shift from warming El Niño to cooling La Niña climate patterns. Without human input, temperatures would have been expected to cool, based on the La Niña shift and decreasing solar radiation.

After simulating temperature change over the decade based on these factors, the researchers identified the smoking gun behind the steady temperatures: sulfur particles spit into the atmosphere by coal-burning power plants. Sulfur aerosols reflect light back into space and counteract the warming effects of greenhouse gases.

"This looks like a very solid, careful statistical analysis of the factors influencing recent global temperature changes," says climate scientist Michael E. Mann of Pennsylvania State University, who was not involved in the study. "There is a clear impact of human activity on the ongoing warming of our climate."

The study was published online July 5 in the *Proceedings of the National Academy of Sciences*.

Most of the greenhouse gases came from China, where coal consumption more than doubled between 2002 and 2007, accounting for 77 percent of the rise in coal use worldwide, the scientists report. During that same period, Kaufmann says, global sulfur emissions increased by 26 percent.

From 1998 to 2008, these human-generated emissions effectively canceled each other out.

"Humans do two things to the planet," Kaufmann says. "They warm it by emitting greenhouse gases like carbon dioxide and methane, and they cool it by emitting these sulfur aerosols."

Sending sulfur into the air isn't helpful, though. In addition to causing respiratory problems, sulfur aerosols combine with water vapor to form acid rain, which harms ecosystems and damages buildings. "You wouldn't want to increase the amount of junk in the air to decrease the effects of global warming," cautions climate scientist Gavin Schmidt of NASA's Goddard Institute for Space Studies in New York.

The researchers did a good job teasing apart the factors influencing global temperatures during the decade studied, Schmidt says. He compares global warming to driving a car: Humans are stepping on the accelerator, but bumps in the road vary the car's speed. On shorter time scales, these bumps include things like the 11-year solar cycle and El Niño/Southern Oscillation events, both of which peaked early during the decade.

Because uncontrollable natural forces affect climate, it's even more crucial to regulate human-produced greenhouse gas emissions, says Caspar Ammann, a climate scientist at the National Center for Atmospheric Research in Boulder, Colo. When sulfur emissions are reduced, "What you will see in the short term is a relative rapid rise in temperature, because you have taken away the brake," Ammann says. Kaufmann says China has begun using scrubbers at its coal-burning facilities to reduce sulfur emissions — similar to what happened in the United States after passage of the Clean Air Act more than four decades ago.

Judith Curry of the Georgia Institute of Technology in Atlanta notes that decadal oscillations in ocean currents might be at least as likely to explain the observed stall in temperature rise as increased sulfur emissions from China.

But Kaufmann says that when sulfur is removed from the analysis, the model falls apart. "Only sulfur aerosols can explain the recent pattern," he says. "Diminishing the importance of aerosols is inconsistent with the data."

SUGGESTED READING :

J. Raloff. Trade affects China's carbon footprint. Science News Online, July 31, 2008.

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A. Witze. Climate researcher speaks out. Science News Online, November 7, 2010.

CITATIONS & REFERENCES :

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