Simulations of Massive Ancient Volcanic Eruption Show Unexpected Climate Warming

A team of Goddard scientists used Goddard Earth Observing System Chemistry-Climate Model (GEOSCCM) to simulate the aftermath of an ancient, massive volcanic eruption. Eruption occurred 15 to 17 million years ago in the Columbia River Basalt Group region of the U.S. Pacific Northwest.

They found unexpected climate warming response: Based on modern volcanic eruptions, scientists were expecting a large emission of sulfur dioxide to produce intense climate cooling. But while the climate cooled briefly in the simulations, it was then overwhelmed by intense climate warming. After some study, the team determined this was due to a secondary effect of the eruption: a thousand-fold increase in stratospheric water vapor, which acted as a greenhouse warming agent.

This result challenges the volcano research community's prevailing "volcanic winter" paradigm of long-duration cold and darkness after massive flood basalt eruptions.

Funded by SEEC, this study included planetary and Earth scientists from Goddard, both theorists and field geologists.

A cloud of volcanic ash and gas rises above Mount Pinatubo, Philippines, on June 12, 1991. The NASA-simulated volcano released about 1,500 times as much sulfur dioxide into the atmosphere as the Pinatubo eruption. Photo by Dave Harlow, U.S. Geological Society.

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Press release: https://www.nccs.nasa.gov/news-events/nccs-highlights/volcano-eruption