

No doubt there are many reasons for the existence of climate skepticism, but at least one is probably based on a sense of scale. The amount of CO<sub>2</sub> emissions is large in absolute term — now about 10 gigatons per year roughly speaking — but the atmosphere is much, much bigger. Of course, CO<sub>2</sub> has been accumulating, so the amount in the atmosphere is larger by a significant factor, but it's still very small compared with the total atmosphere. Is the climate sensitive sensitive to atmospheric changes of this magnitude?

The answer is clearly yes — the climate really is *that* sensitive to at least some substances. Mount Pinatubo erupted in 1991. The eruption released into the atmosphere approximately 10 gigatons of magma, and 20 megatons of SO<sub>2</sub>. This caused a temperature decrease in the Northern hemisphere of 0.5–0.6 °C (0.9–1.1 °F), and a global fall of about 0.4 °C (0.7 °F).

The Pinatubo effect seems to be clear and, so far as I can tell, isn't contested. For example, this chart is from a [climate denial website](#):



Of course, the fact small changes in some components (suspended solids and SO<sub>2</sub>) can have a significant climate impact doesn't prove that larger amounts of CO<sub>2</sub> are changing the climate, any more than the fact that one substance is poisonous proves that another one is. What it does show, however, is that even small traces of substances can have significant climate impacts. So the claim that CO<sub>2</sub> and other GHGs have such impacts cannot be rejected as implausible merely because CO<sub>2</sub> is a trace gas.

By the way, the climate denial site argues from this that climate responds quickly to changes in radiative forcing and that therefore CO<sub>2</sub> levels have already changed the climate as much as they ever will. I think this overlooks feedback effects, the heat capacity of the ocean, and the difference between a transitory change in radiative forcing and one that lasts decades or centuries. Some poisons kill quickly or not at all; others accumulate over time to deadly effect.