# Scientists create new idea on how to hack a warming planet: drying the upper atmosphere

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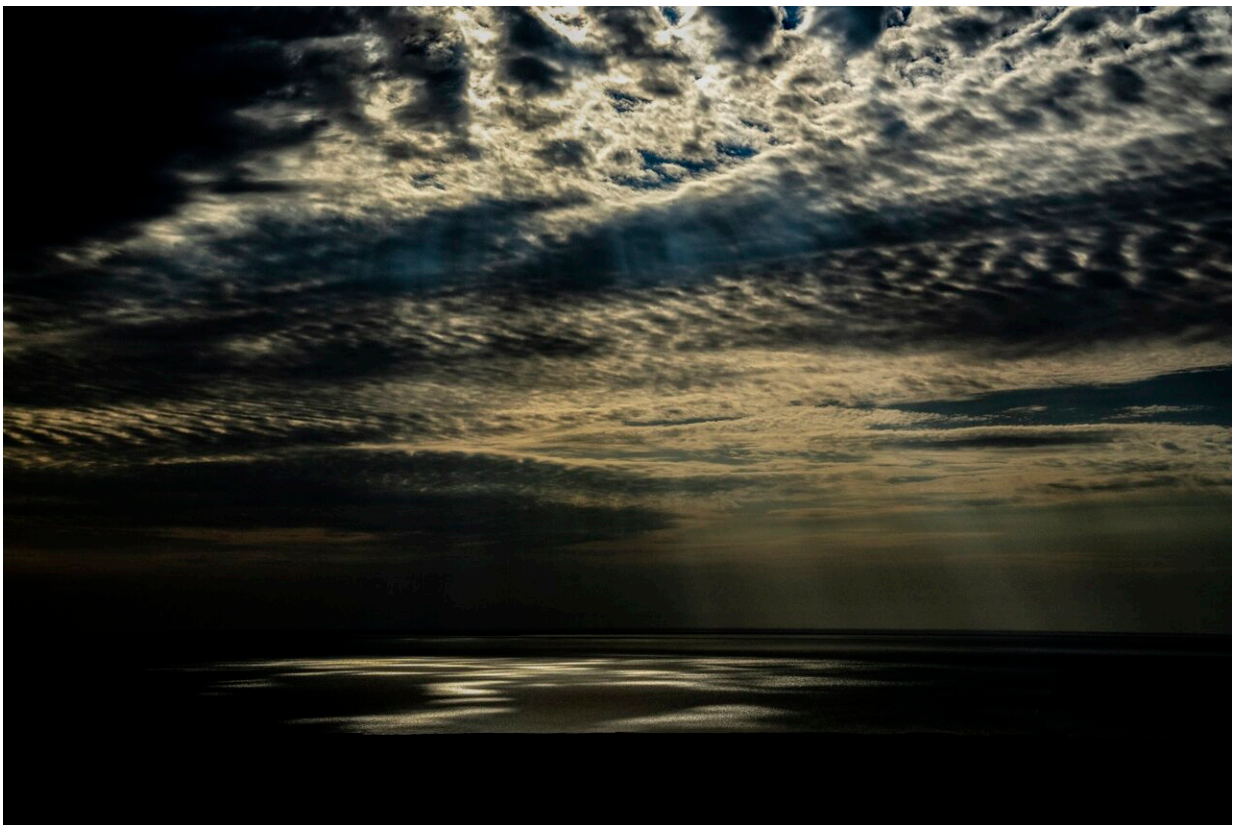

Light is reflected on part of the Aral Sea outside Muynak, Uzbekistan, June 25, 2023. Researchers at the National Oceanic and Atmospheric Administration and NASA believe if they can inject ice high up in the air, water vapor, water in its gas form, in the upper atmosphere would get a bit drier and that could cool Earth. Credit: AP Photo/Ebrahim Noroozi, File

Government scientists have cooked up a new concept for how to potentially cool an overheating Earth: Fiddle with the upper atmosphere to make it a bit drier.

Water vapor—water in its gas form—is a natural greenhouse gas that traps heat, just like carbon dioxide from burning coal, oil and gas. So researchers at the National Oceanic and Atmospheric Administration and NASA figure if they can just inject ice high up in the air, water vapor in the upper atmosphere would get a bit drier and that could counteract a small amount of the human-caused warmth.

It's just the spark of an initial idea, said the lead author of a study in Wednesday's journal *Science Advances*.

The idea of drying the upper atmosphere is the newest addition to what some scientists are calling a last-ditch toolbox to deal with climate change by manipulating the world's atmosphere or oceans. Known as geoengineering, it's often rejected because of potential side effects, and is usually mentioned not as an alternative to reducing carbon pollution, but in addition to emission cuts.

"This isn't something that we can even implement right now," said Joshua Schwarz, a NOAA physicist who is lead author of a study in Wednesday's journal Science Advances. "This is about exploring what might be possible in the future and identifying research directions."

The way it would conceivably work is that high-tech planes could inject ice particles about 11 miles (17 kilometers) high, just below the stratosphere, where the air slowly rises. Then the ice and cold air rise to where it's coldest and gets the water vapor to turn to ice and fall, dehydrating the stratosphere, Schwarz said. So far there is no workable injection technique, he said.

At its maximum, injecting 2 tons a week, it could conceivably take out enough water vapor to reduce heating a small amount, about 5% of the overall warming created by carbon from the burning of fossil fuel, Schwarz said. It's not much and shouldn't be used as an alternative to cutting pollution, he said.

Schwarz is not quite sure about what side effects could occur, and that's the problem, other scientists said.

Purposely tinkering with Earth's atmosphere to fix climate change is likely to create cascading new problems, said University of Victoria climate scientist Andrew Weaver, who wasn't part of the study. He said the engineering side of this makes sense, but he compared the concept to a children's story where a king who loves cheese is overrun with mice, gets cats to deal with the mice, then dogs to chase away the cats, lions to get rid of the dogs and elephants to eliminate the lions and then goes back to mice to scare off the elephants.

It makes more sense to deal with the initial problem—the cheese or the carbon dioxide, Weaver said.

Scripps Institution of Oceanography atmospheric chemist Lynn Russell, who wasn't part of the research, said the idea is worth examining, but the study "doesn't have a lot of answers given all the uncertainties."

Groups from the U.S. National Academy of Sciences to the United Nations Environment Programme have looked at the ethics, side effects, legal complications and benefits of geoengineering with various degrees of skepticism and cautious interest.

At the UN environment assembly, nations are considering a resolution to study solar radiation modification—essentially putting particles in the air to reflect sunlight and cool the atmosphere—and possible regulations on

countries or companies that would do it.

"If you're going to do lab experiments indoors, maybe that's all right," UNEP Executive Director Inger Andersen told The Associated Press. "But we do believe, from a UNEP perspective, that the moment we step outdoors and we begin to do small- and large-scale experimentation outdoors we need actually need to have a global conversation."

"I do think that solar radiation modification is a little bit like artificial intelligence," Andersen said. "Once a genie is out of the bottle, you can't put it back in. It's a technology that is there. We do not think in any way shape or form that it should be considered as a climate solution."

**More information:** Joshua P. Schwarz et al, Considering intentional stratospheric dehydration for climate benefits, *Science Advances* (2024). DOI: 10.1126/sciadv.adk0593