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## A Climate Cure's Dark Side



by [Sharon Begley](#) January 30, 2011



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It sounded like a panacea for climate change: “geo-engineering” the atmosphere to block some sunlight and counter global warming. Now scientists scrutinizing the approach say it could produce dangerous cascade effects, severely disrupting weather and agriculture—and might fail to block the worst of the greenhouse effects anyway.

Two prominent climate scientists raised the possibility of geo-engineering in 2006, and it's been invoked as the world's emergency escape hatch ever since—a quick fix to stabilize or even reverse the heating of the planet. It would head off worsening heat waves, droughts, and rising sea levels. The estimated price is right, too. A 2009 analysis found that geo-engineering would cost only \$2 billion or so a year, chump change compared with converting from CO<sub>2</sub>-producing coal, oil, and natural gas to wind, solar, nuclear, and biofuels.

But further study shows worrying pitfalls, according to a series of research papers that will appear in the next issue of *Atmospheric Science Letters*. The greatest threat is to Asian

monsoons, which are driven by the temperature difference between warm land and cooler seas. In one scheme, a fleet of jets would crisscross the planet releasing five megatons of sulfur dioxide gas every year. The gas would mix with water in the stratosphere to form minuscule particles called sulfate aerosols, which scatter incoming sunlight back to space before it warms the atmosphere or ground. (That's also how volcanic eruptions cool the planet.)

But oceans are harder to cool than land. As the sun effectively dims, warmer land cools faster than cooler oceans, explains meteorologist Alan Robock of Rutgers University. Shrinking that land-sea temperature gap would enfeeble the summer monsoons over Asia and Africa, a possible catastrophe for the billions who depend on that rain for their crops.

Perversely, geo-engineering might also reinforce some of the worst consequences of global warming, says climate modeler Olivier Boucher of the British Met Office, the U.K.'s national weather service. He has focused on a plan for ships to spray seawater up above the oceans, where it would evaporate to form a layer of sea-salt aerosols—making marine clouds brighter and reflecting more sunlight back to space. But because of where the clouds cluster, cooling effects wouldn't be uniform. That would likely intensify greenhouse-induced drying in the Amazon, threatening the riot of species that live there, as well as the rainforest's ability to suck up CO<sub>2</sub>.

In perhaps the greatest surprise to scientists, geo-engineering looks like it would fail to stop warming in the Arctic. "Quite a bit of warming keeps occurring there," says Boucher, "so you don't manage to reverse the greenhouse effect there." Trouble is, loss of sea ice saps high-pressure bands that bottle up arctic winds, steering winter storms farther south. Europe and the U.S. would continue to be walloped by severe winter cold and snow, and ocean levels would keep rising. (Expect a seller's market in sea walls.)

Most worrisome is how geo-engineering might disrupt "teleconnections." These long-distance links let atmospheric conditions in one place influence weather half a world away. The best known teleconnection is the El Niño/Southern Oscillation: warm waters in the eastern Pacific that weaken the easterly trade winds, bringing deluges to the Southern U.S. and Peru but drought to Indonesia and Australia. "The strength and occurrence of [El Niño] might change in a geo-engineered world," says climate scientist Peter Braesicke of the University of Cambridge. Even if safe and effective approaches are found, scientists can't answer what may be the ultimate challenge: securing long-term political and economic support for the such measures. If the world becomes suddenly unwilling or unable to keep supplying the atmosphere with sunblock even as we continue to pump out CO<sub>2</sub>, we'll be worse off than where we started.