Geoengineering: A whiter sky

May 31 2012

One idea for fighting global warming is to increase the amount of aerosols in the atmosphere, scattering incoming solar energy away from the Earth's surface. But scientists theorize that this solar geoengineering could have a side effect of whitening the sky during the day. New research from Carnegie's Ben Kravitz and Ken Caldeira indicates that blocking 2% of the sun's light would make the sky three-to-five times brighter, as well as whiter. Their work is published June 1st in *Geophysical Research Letters*, a journal of the American Geophysical Union.

Carbon dioxide emissions from the burning of coal, oil, and gas have been increasing over the past decades, causing the Earth to get hotter and hotter. Large volcanic eruptions cool the planet by creating lots of small particles in the stratosphere, but the particles fall out within a couple of years, and the planet heats back up. The idea behind solar geoengineering is to constantly replenish a layer of small particles in the stratosphere, mimicking this volcanic aftermath and scattering sunlight back to space.

Using advanced models, Kravitz and Caldeira—along with Douglas MacMartin from the California Institute of Technology—examined changes to sky color and brightness from using sulfate-based aerosols in this way. They found that, depending on the size of the particles, the sky would whiten during the day and sunsets would have afterglows.

Their models predict that the sky would still be blue, but it would be a lighter shade than what most people are used to looking at now. The

research team's work shows that skies everywhere could look like those over urban areas in a world with this type of geoengineering taking place. In urban areas, the sky often looks hazy and white.

"These results give people one more thing to consider before deciding whether we really want to go down this road," Kravitz said. "Although our study did not address the potential psychological impact of these changes to the sky, they are important to consider as well."

There are several larger environmental implications to the group's findings, too. Because plants grow more efficiently under diffuse light conditions such as this, global photosynthetic activity could increase, pulling more of the greenhouse gas carbon dioxide out of the atmosphere. On the other hand, the effectiveness of solar power could be diminished, as less sunlight would reach solar-power generators.

"I hope that we never get to the point where people feel the need to spray aerosols in the sky to offset rampant global warming," Caldeira said. "This is one study where I am not eager to have our predictions proven right by a global stratospheric aerosol layer in the real world."

Provided by Carnegie Institution for Science