Targeting solar geoengineering to minimize risk and inequality

Harvard School of Engineering and Applied Science

*Sunset in the Arct
at Harvard explore
of using cautio
solar geoenginee
the loss of Arc
photo courtesy o*

New study suggests that solar geoengineering can be tailored to reduce inequality or to manage specific risks like the loss of Arctic sea ice

Cambridge, Mass., and Washington, D.C. – October 21, 2012 – By tailoring geoengineering efforts by region and by need, a new model promises to maximize the effectiveness of solar radiation management while mitigating its potential side effects and risks. Developed by a team of leading researchers, the study was published in the November issue of Nature Climate Change.

Solar geoengineering, the goal of which is to offset the global warming caused by greenhouse gases, involves reflecting sunlight back into space. By increasing the concentrations of aerosols in the stratosphere or by creating low-altitude marine clouds, the as-yet hypothetical solar geoengineering projects would scatter incoming solar heat away from the Earth’s surface.

Critics of geoengineering have long warned that such a global intervention would have unequal effects around the world and could result in unforeseen consequences. They argue that the potential gains may not be worth the risk.

“Our research goes a step beyond the one-size-fits-all approach to explore how careful tailoring of solar geoengineering can reduce possible inequalities and risks,” says co-author David Keith (pictured at right), Gordon McKay Professor of Applied Physics at the Harvard School of Engineering and Applied Sciences (SEAS) and Professor of Public Policy at Harvard Kennedy School. “Instead, we can be thoughtful about various tradeoffs to achieve more selective results, such as the trade-off between minimizing global climate changes and minimizing residual changes at the worst-off location.”

The study—developed in collaboration with Douglas G. MacMartin of the California Institute of Technology, Ken Caldeira of the Carnegie Institution for Science, and Ben Kravitz, formerly of Carnegie and now at the Department of Energy—explores the feasibility of using solar geoengineering to counter the loss of Arctic sea ice.

“There has been a lot of loose talk about region-specific climate modification. By contrast, our research uses a more systematic approach to understand how geoengineering might be used to limit a specific impact. We found that tailored solar geoengineering might limit Arctic sea ice loss with several times less total solar shading than would be needed in a uniform case.”

Generally speaking, greenhouse gases tend to suppress precipitation, and an offsetting reduction in the amount of sunlight absorbed by Earth would not restore this precipitation. Both greenhouse gases and aerosols affect the distribution of heat and rain on this planet, but they change the temperature and precipitation in different ways in different places. The researchers suggest that varying the amount of sunlight deflected away from the Earth both regionally and seasonally could combat some of this problem.

“These results indicate that varying geoengineering efforts by region and over different periods of time could potentially improve the effectiveness of solar geoengineering and reduce climate impacts in at-risk areas,” says co-author Ken Caldeira, Senior Scientist in the Department of Global Ecology at the Carnegie Institution for Science.

The researchers note that while their study used a state-of-the-art model, any real-world estimates of the possible impact of solar radiation management would need to take into account various uncertainties. Further, any interference in Earth’s climate system, whether intentional or unintentional, is likely to produce unanticipated outcomes.

“While more work needs to be done, we have a strong model that indicates that solar geoengineering might be used in a far more nuanced manner than the uniform one-size-fits-all implementation that is often assumed. One might say that one need not think of it as a single global thermostat. This gives us hope that if we ever do need to implement engineered solutions to combat global warming, that we would do so with a bit more confidence and a great ability to test it and control it.”

Original release:
http://www.seas.harvard.edu/news-events/press-releases/targeting-solar-geoengineering-to-minimize-risk-and-inequality [1]

Links:
[1] http://www.seas.harvard.edu/news-events/press-releases/targeting-solar-geoengineering-to-minimize-risk-and-inequality