NISKANEN CENTER

Public Interest Comment

Comments submitted to the American Geophysical Union in the Matter of:

Geoengineering Responses to Climate Change Require Enhanced Research, Consideration of Societal Impacts, and Policy Development

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Introduction

The American Geophysical Union's (AGU) draft statement is an important step forward in recognizing the need for research into climate geoengineering, which may be deployed as a means of reducing some of the risks of human-caused climate change. Climate geoengineering is a topic wrought with controversy, and careful guidance from the scientific community can help policymakers weigh the risks of managing particular aspects of the climate system, now and in the future. The Niskanen Center concurs that this issue is likely to cause tension between policymakers, scientists, and the public, especially in light of the politicization of climate change research (AGU Draft Statement, line 90). We applaud the AGU's forward-looking statement on geoengineering research. However, we believe the statement can go further; while the AGU offers supportive sentiments, we believe there are more specific and detailed proposals that warrant consideration.

Response to the AGU Statement

Decades of scientific research indicate that industrial emissions of greenhouse gases will be a leading factor in the evolution of the climate system in the coming centuries and that human-caused global warming will have deleterious effects.[1] While it is impossible to know the precise impacts of future climate change, the potential speed and scale of climate change this century could exceed human and natural adaptive capacities in particular places.[2] Climate geoengineering—specifically solar radiation management (SRM)—has been proposed as a means of preventing or reducing the severity of the worst effects of climate change. As the AGU statement notes: "[SRM] could, in theory, cool the climate quickly and thus prove highly valuable should society at some point face rapid changes in climate that cause unacceptable damage."[3]

While not a substitute for mitigation, geoengineering could substantially add to the risk-mitigation tools at humanity's disposal. Although we agree with the draft statement that "[t]he deployment of SRM systems would be highly premature,"[4] it is important to recognize that models have already demonstrated that the worst temperature-driven effects of climate change could be avoided with SRM.[5] Unfortunately, we are rapidly approaching the limits of how much we can understand about this technology through bench experiments and computer modeling. As such, small-scale field experimentation is a necessary next step in expanding our understanding of how candidate technologies fare when deployed under real world conditions.[6]

To that end, we are pleased that the AGU draft statement notes that "an effective SRM research program must recognize that important advances in knowledge may also require field experiments."[7] Therefore, suggesting "additional governance mechanisms" for field experiments is well-advised.[8] However, the draft statement stops short of providing particular recommendations for managing and governing such real-world experiments. In particular, it makes no recommendations for national government involvement in SRM field experimentation, offers no distinction between small-scale and

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[1] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

[2] Mark New, Diana Liverman, Heike Schroder, Kevin Anderson, Philosophical Transactions of the Royal Society of London, "Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications," A 2011 369 6-19; DOI: 10.1098/rsta.2010.0303, published November 29, 2010, http://rsta.royalsocietypublishing.org/content/369/1934/6.
"Turn Down the Heat: Why a 4°C Warmer World Must Be Avoided," World Bank, 2012, https://openknowledge.worldbank.org/handle/10986/11860.

[3] AGU Draft Statement, line 61.

[4] AGU Draft Statement, line 65.

[5] National Academies of Science "Climate Intervention: Reflecting Sunlight to Cool Earth", 2015, p. 51 and 54.

[6] John A. Dykema, David W. Keith, James G. Anderson, Debra Weisenstein, Philosophical Transactions of the Royal Society of London, "Stratospheric controlled perturbation experiment: a small-scale experiment to improve understanding of the risks of solar geoengineering," A 2014 372 20140059; DOI: 10.1098/rsta.2014.0059, November 17, 2014.

[7] AGU Draft Statement, line 86.

[8] AGU Draft Statement, line 87.

large-scale deployment testing, and provides no direct support for federally-funded research grants (as is the case for the Earth and Space Sciences, generally[9]). We believe AGU's statement can, and should, do all of these.

Recommendations

We support AGU's recognition of a need for "significant additional research, risk assessment, and consideration of difficult policy questions" that must be addressed "before the potential of geoengineering systems ... can be evaluated adequately."[10] However, we believe the recommendations for this technology require more specific and actionable provisions. To strengthen the statement's counsel, we offer the following comments for consideration.

1. *Research into geoengineering should be governed separately and distinctly from future large-scale research and deployment efforts.*

Regulatory governance for emerging technologies requires balancing the need to ensure public safety with the rapid innovation that comes from a permissive and well-funded research environment. To achieve that balance, an appropriate governance structure for research and experimentation can be clearly defined separately from efforts to govern deployment. The most important distinguishing characteristic between non-risky experiments and more-risky deployment regimes is the size of the interventions, and the resulting perturbations to radiative balance (or other aspects of the climate system) that the increased magnitudes yield.

Policymakers rely on the AGU and other members of the scientific community to help inform these types of decisions. Therefore, we recommend the AGU include a provision that develops reasonable criteria for selecting attributes of geoengineering research that might be reasonably restricted and recommends an upper bound on acceptable SRM deployments for field experimentation over each one. In this way, the entire regulatory discussion can be focused towards defining the dividing line between near-term experiment scale and longer-term deployment scale efforts.[11]

The adoption of this regulatory bright line would have several implications. Setting up a distinction between small *de minimis* experiments and deployment-scale experiments would allow governance considerations to be set at the appropriate level. A light regulatory touch for small-scale field experiments, which would not be climatically significant, will allow for experimental diversity and thus maximize the speed of innovation and return on investment for research funds. A hard cap on field experiments, or a ban on larger experiments, would ease concerns about a too-fast move toward

[9] AGU Position Statement on Basic Research Support https://sciencepolicy.agu.org/files/2013/07/AGU-Basic-Research-Support-Position-Statement-September-2016.pdf
[10] AGU Draft Statement, line 5.
[11] Several other people have suggested a similar governance parsing along environmental impact lines. *See* Anna-Maria Hubert and David Reichwein, "An Exploration of a Code of Conduct for Responsible Scientific Research involving Geoengineering," Introduction, Draft Articles and Commentaries, 10.2312/iass.2015.013 , 2015, https://www.insis.ox.ac.uk/sites/default/files/insis/documents/media/an_exploration_of_a_code_of_conduct.pdf.

deployment and would require policymakers to revisit governance of large-scale, climatically-relevant, research efforts when the scientific community is ready to meaningly inform governance decisions on those scales.

We believe the United States Global Change Research Program (USGCRP) is a suitable resting place for the authorities to govern the small-scale experimentation efforts in SRM. Numerous reports from the Government Accountability Office (GAO),[12] testimonies from the scientific community,[13] and the guiding statutory mandate granted to USGCRP[14] suggest that USGCRP is the most suitable home for any initial regulatory governance structure that would be built to accommodate near-term research into geoengineering and SRM research.

2. *Focus first and foremost on domestic governance and federal support; international governance and public support will follow.*

The research goals outlined in the draft statement are overly focused on international governance implications and confusing guidance around "intent."[15] Instead, the draft statement should refocus on the near-term domestic goals of climate engineering research and specific governance mechanisms for stipulating the restraints on field experiments, as outlined in the previous recommendation.

Government sponsorship of geoengineering programs can help resolve the two most important concerns related to this research area: public controversy and international governance. If the government sanctions geoengineering experiments by delivering a proposal—including public funding, transparency reporting requirements, and hard caps on experimental impacts—it will help establish the necessary social license to avoid the kinds of techno-panics often associated with new emerging technologies.[16] Setting up a cohesive regulatory structure to govern SRM and geoengineering research domestically with US authority also grounds the international conversation of governance to actionable legislation or agreement, rather than more amorphous calls for ongoing conversations.

While international governance is certainly an important consideration in ongoing research and deployment efforts, the academic institutions and global fora in which such conversations occur are not

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[12] United States Government Accountability Office, "Climate Change: A Coordinated Strategy Could Focus Federal Geoengineering Research and Inform Governance Efforts," GAO 10-903, September 2010, p.24, http://www.gao.gov/assets/320/310105.pdf.

[13] Statement of Frank Rusco, "Climate Change: Preliminary Observations on Geoengineering Science, Federal Efforts, and Governance Issues," Testimony before the Committee on Science and Technology, House of Representatives, March 18, 2010, p. 14, http://www.gao.gov/new.items/d10546t.pdf.

[14] 15 U.S.C. § 2931(b), https://www.law.cornell.edu/uscode/text/15/2931.

[15] AGU Draft Statement, line 91.

[16] *See* Daniel Castro and Alan McQuinn, "The Privacy Panic Cycle: A Guide to Public Fears About New Technologies," Information Technology and Innovation Foundation, September 2015, http://www2.itif.org/2015-privacy-panic.pdf; *See also* Ryan Hagemann, "The Parallel Fears Driving Perceptions of AI and Genomics," Niskanen Center, August 30, 2017, https://niskanencenter.org/blog/parallel-fears-driving-perceptions-ai-genomics/; *See also* Adami Thierer, "Ongoing Series: Moral Panics / Techno-Panics," Technology Liberation Front, accessed September 21, 2017, https://techliberation.com/ongoing-series/ongoing-series-moral-panics-techno-panics/.

well-positioned to address the realities of regulatory governance for the types and scale of experiments that we would expect in the coming decades.[17] By focusing first on regulatory efforts at the nation-state level, the future international governance conversation will be tethered to real world experiments and experience.

Conclusion

Overall, we believe the AGU has adopted a reasonable perspective towards geoengineering research. The risks posed by climate change are profound, but the unique risk-mitigating potential of SRM could alleviate dangers of climate change. Before Policymakers can deliberate *whether* to embrace this technology, however, scientists first need to *understand* it. Wisdom is born of experience, and experience requires experimentation. That is why small-scale field tests, a domestic regulatory governance structure for research, and the social license afforded by a permissive regulatory structure are of paramount importance. A federally-funded research program under the authority of the USGCRP would ease public fears and give the greenlight to geoengineering researchers.

We thank the AGU for its consideration of these comments.

[17] David W. Keith, Riley Duren, Douglas G. MacMartin, Philosophical Transactions of the Royal Society of London, "Field experiments on solar geoengineering: report of a workshop exploring a representative research portfolio" A 2014 372 20140175; DOI: 10.1098/rsta.2014.0175. Published 17 November 2014 http://rsta.royalsocietypublishing.org/content/372/2031/20140175