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Climate Intervention

A Policy Statement of the American Meteorological Society Adopted by the Council 2 February 2022

It is now well established that global average surface temperatures are increasing, and the associated changes in climate are causing ecological and societal disruptions. Further, there is overwhelming evidence that climate change in recent decades is caused by human activities. Greenhouse gas emissions, particularly of carbon dioxide from burning fossil fuels, have already contributed and will continue to contribute to widespread climate changes, with major negative consequences for most humans and ecosystems. This has motivated discussion of mechanisms to reduce warming of the Earth system through intentional interventions, with the goal of reducing the negative impacts of climate change.

Aggressive action must be taken to reduce greenhouse gas emissions and adapt to the changes that are already occurring. At the same time, additional strategies should be investigated. This policy statement focuses on large-scale efforts to intentionally modify the climate system to counteract the consequences of increasing greenhouse gas concentrations. Such efforts are now commonly referred to as climate intervention (also called geoengineering): the deliberate manipulation of physical, chemical, or biological aspects of the Earth system with the intention of tempering the harmful effects of anthropogenic greenhouse gas emissions.

Proposals to intervene in the climate system generally fall into two broad categories: 1) actively removing CO₂ (and possibly other greenhouse gases) from the atmosphere, known as carbon dioxide removal; 2) exerting a cooling influence on Earth by reflecting sunlight (known as solar radiation management) or altering thermal emissions to space by thinning cirrus clouds. These proposals differ widely in their potential to reduce impacts, create new risks, and redistribute risks among nations. Techniques that remove CO₂ directly from the air would confer global benefits by directly addressing the source of the climate problem. However, it may not be feasible to rapidly remove CO₂ at a scale that will significantly limit warming. The effects of CO₂ removal approaches are not fully understood and could create adverse local and global impacts. Reflecting sunlight would reduce Earth's average surface temperature but would not offset all aspects of climate change and would produce a different set of risks than those resulting from unmitigated warming.

The American Meteorological Society recommends an accelerated and robust climate intervention research program, and associated governance framework, to inform public policies.

This should not include the development of deployment platforms but needs to include study of the feasibility of different deployment scenarios and strategies and how they would affect climate risk. The governance framework should account for the range of expertise needed beyond science and technology, and ensure that the U.S. research program is coordinated with international efforts. The research program should include inputs from civil society and other key stakeholders, including climate-vulnerable communities and underrepresented groups, and from indigenous populations, to assess how climate intervention could affect climate risks, including their distribution across different ecosystems and sectors of society.

The research program should address 1) the scientific and technological potential for intentional interventions in the climate system to reduce climate warming, 2) quantification of the intended and unintended environmental responses of such interventions, and 3) continuous and enhanced observation of the Earth system. Because intentional climate intervention is inherently controversial, it is particularly important for research in this area to be transparent, open, unbiased, and accessible. Moreover, research results should be couched in terms that acknowledge the presence of irreducible uncertainties in projecting the outcomes of both anthropogenic climate change and of any interventions intended to counter it. The desired outcome is for society to have the best possible information in hand to assess different options for reducing the risks of climate change and to decide if actions should include intentional climate intervention.

Comprehensive Earth system model simulations will play a critical role in quantifying the regional to global impacts of different climate intervention approaches. By their nature, models are imperfect, and, as with any other climate projections, a projection of climate intervention outcomes will be subject to considerable uncertainty. To reduce uncertainties in the Earth system models, improved understanding and representation of key processes is needed. This could be achieved through a program of laboratory and field experiments and process-oriented simulations. Sustained monitoring of the Earth system and targeted field campaigns will be critical, not only to improve our understanding of key processes but for establishing an observational baseline of the system behavior prior to any intervention. Monitoring and field studies would also be needed for quantifying impacts should an intervention be implemented. These studies will yield additional benefits in our understanding of atmospheric processes and the climate system, with implications beyond what is needed for decisions related to climate intervention, such as improved weather predictions and climate projections.

The climate crisis must be addressed by ending net emissions of greenhouse gases, and at the same time, adapting to changes already happening. While it is currently premature to either advocate for or rule out climate interventions, these decisions, when they are made, must be

based on the best scientific and technical information. With this goal in mind, AMS calls for a robust program of research with a strong governance framework to assess climate interventions. Such a program should be designed to provide the knowledge base to support decisions that may need to be made within the next decade regarding the inclusion of climate intervention among our responses to global warming.

[This statement is considered in force until February 2027 unless superseded by a new statement issued by the AMS Council before this date.]