

INTERNATIONAL COMMISSION ON CLOUDS AND PRECIPITATION (ICCP)

STATEMENT ON RADIATION MANAGEMENT CLIMATE ENGINEERING

Global average temperatures are rising due to human emissions of greenhouse gases (GHGs). This is helping to drive widespread melting of snow and sea ice and will result in significant changes in precipitation patterns that will be detrimental to humanity and to Earth's biodiversity.

Different strategies have been proposed to reduce climate change risks. Emissions reductions are a possible long-term solution, but it has been difficult to make progress in achieving such reductions. Adaptation is a second possible course of action, but is likely to be one that sees large reductions in biodiversity and would not be a suitable strategy in the event of catastrophic climate change such as rapid melting and disintegration of the Greenland or West Antarctic ice sheets. A third possible course of action, and the most radical, involves *climate engineering* (or *geoengineering*). This is the deliberate manipulation of the Earth's physical, chemical or biological processes to counteract deleterious effects of climate change.

This ICCP policy statement focuses upon a subset of climate engineering strategies called *Radiation Management* (RM) that attempt to reduce the amount of solar or infrared radiation reaching the Earth's surface. Proposed RM techniques include: 1) those designed to reflect more sunlight back to space, examples of which include space-based mirrors, introducing sulfate aerosols into the stratosphere and increasing the droplet concentration in marine low clouds; 2) reducing thin cirrus optical depth and cloud cover that prevents longwave radiation escaping to space.

Given the current state of understanding, RM could only be considered as a strategy of last resort should catastrophic climate change become unavoidable in the future. ICCP recognizes that current scientific research on RM techniques is in its infancy and that the current level of scientific knowledge about the feasibility of RM techniques is an inadequate basis for shaping policy decisions. Little is known about the potential risks of deliberate attempts to change the Earth's radiation budget. For example, it is becoming widely accepted that anthropogenic GHGs, ozone and absorbing aerosols may all be playing important roles in changing the latitude of storm tracks and the intertropical convergence zone. Further regional to global-scale adjustments caused by climate engineering would induce regional precipitation changes that would not necessarily cancel those caused by GHGs and therefore may not uniformly benefit all nations, peoples and ecosystems. This has major sociopolitical and ethical implications that have to be considered.

In addition to the potential risks of climate engineering applications, there are also major concerns that the development of RM strategies might be seen as an equivalent to emissions reduction strategies. Radiation management cannot substitute for GHG emissions reduction strategies for the following reasons: 1) the areal patterns of radiative forcing associated with GHGs is fundamentally different from those expected from RM, 2) RM management does not prevent other deleterious impacts of GHGs such as ocean acidification, and 3) the lifetimes of GHGs are much longer than the species of gases and particles that have been proposed as potential geoengineering agents.

The International Commission on Clouds and Precipitation recommends:

- That further research is pursued to better understand the fundamental science and possible efficacy of radiation management climate engineering schemes.
- That climate engineering research be conducted in an open and independent manner that engages public participation, and is used to properly assess the potential risks involved.
- That research activities must include studies of the human impacts, ethics, legal and political impacts of climate engineering

Given the poor state of the current knowledge on clouds, aerosols, precipitation and their interactions, the ICCP does not support the implementation of climate engineering and does not expect that climate engineering can solve the global warming problem. Climate engineering cannot substitute for aggressive emissions reduction. However, ICCP supports conducting research to improve our basic understanding of the processes needed to explore the possibility that climate engineering might contribute to a broad risk management strategy to temporarily reduce some of the dangerous effects of climate change.