



Governance and science implications of low environmental impact outdoors solar radiation management experiments

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There are many uncertainties surrounding solar radiation management (SRM), which cannot all be quantified and reduced using models, laboratory experiments or observations of natural analogs such as volcanic eruptions, ship tracks, or dust storms. While there is broad consensus both in- and outside the scientific community that better understanding of the climate system is beneficial to policy makers and society, the value of improved knowledge of SRM has been highly controversial. Yet, it is evident that SRM research can contribute to quantifying and reducing important uncertainties pertaining to fundamental knowledge on the workings of the Earth system, while also providing essential specific knowledge on positive and negative impacts of SRM to inform future decisions.

In 2016, a group of SRM experts gathered at the Institute for advanced sustainability studies in Potsdam for a workshop to formulate a set of low environmental impact SRM experiment proposals. We present these as a non-exhaustive set of possible experiments with no measurable environmental side effects that could provide valuable information that cannot be obtained from models or lab experiments. Both perturbative and non-perturbative experiments are proposed for different SRM methods including marine cloud brightening, stratospheric aerosol injection and cirrus cloud thinning.

It was found that in the time period between 2016 and now several of the research questions addressed in the experiment proposals have been answered by unrelated experimental environmental science studies, whereas no experimental studies have been carried out in the context of SRM. This finding shows that there is significant overlap in high priority research questions and outcomes of non-SRM and SRM environmental research. In addition, it shows that non-controversial environmental science experiments can provide similar SRM-relevant knowledge as dedicated SRM-experiments. Given that one of the main arguments against SRM research is the potential danger of the acquired knowledge, the finding that obtained knowledge of non-SRM and SRM experiments can be similar raises the question which effect the declared

relationship to SRM on outdoors research proposal review and regulation should be.