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Stratospheric Particle Injection for Climate Engineering

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Climate change is a major threat to humankind. Future projections by climate models indicate substantial changes in future decades, much of which is on a regional scale that will severely impact regions of the world that are already under stress. This has prompted consideration of intervention by alternative means. Although considered by the majority to be the 'Plan B' that should be avoided if at all possible, there is increased consensus that the benefits, risks, costs and feasibility of geoengineering require consideration. A variety of geoengineering schemes have been proposed, including solar radiation management (SRM) by reducing incoming solar radiation through injecting sulphate aerosol into the stratosphere. This option was considered the most rapidly deployable, affordable and effective option by the recent Royal Society report on Geoengineering the Climate.

Volcanic eruptions provide evidence that sulphate particle injection leads to reductions in globally-averaged surface temperatures. However, there are concerns that there will be substantial regional impacts, on temperatures, rainfall and other aspects of climate. There are also uncertainties concerning timescales e.g. how rapidly injection might act, how quickly it could be 'turned off' and whether the climate responds differently to continued injection of aerosols compared with the episodic nature of volcanic eruptions.

The SPICE project has begun to investigate the effectiveness of stratospheric particle injection and aims to address three grand challenges in solar radiation management: 1. How much, of what, needs to be injected where into the atmosphere to effectively and safely manage the climate system? 2. How do we deliver it there? 3. What are the likely impacts on stratospheric chemistry, climate and the biosphere? Here the SPICE team will report preliminary results from the first six months of activity and discuss the future of the project.