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To what extent can cirrus seeding counteract global warming?

Blaz Gasparini and Ulrike Lohmann
ETH Zürich, Zürich, Switzerland (blaz.gasparini@env.ethz.ch)

The idea of modifying cirrus clouds to directly counteract greenhouse gas warming has gained a lot of momentum in recent years, despite large disputes over its physical feasibility. We use the ECHAM-HAM general circulation model to evaluate the temperature and precipitation responses to cirrus thinning by seeding with efficient ice nucleating particles and increasing ice crystal sedimentation velocities in a 1.5xCO_2 world. The seeding scenario can counteract about 40% of the warming and precipitation increase induced by 1.5 x CO_2 concentrations with respect to present day values. The idealized ice crystal sedimentation velocity increase scenario on the other hand fully restores the global annual temperature but counteracts only half of the precipitation increase. Moreover, we define a climate damage function, quadratic in temperature and precipitation anomalies to calculate the damage of the different scenarios in 21 selected land regions. Seeding can decrease about 55% of the CO_2 induced damage, while the sedimentation velocity increase can counteract about 95% of the damage. A regional analysis shows the negative responses of seeding are minimal both in terms of precipitation and temperature, which makes cirrus seeding an attractive geoengineering method.