Letter abstract

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Regional climate response to solar-radiation management

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Concerns about the slow pace of climate mitigation have led to renewed dialogue about solar-radiation management, which could be achieved by adding reflecting aerosols to the stratosphere[1, 2, 3, 4, 5, 6]. Modelling studies suggest that solar-radiation management could produce stabilized global temperatures and reduced global precipitation[4, 5, 6]. Here we present an analysis of regional differences in a climate modified by solar-radiation management, using a large-ensemble modelling experiment that examines the impacts of 54 scenarios for global temperature stabilization. Our results confirm that solar-radiation management would generally lead to less extreme temperature and precipitation anomalies, compared with unmitigated greenhouse gas emissions. However, they also illustrate that it is physically not feasible to stabilize global precipitation and temperature simultaneously as long as atmospheric greenhouse gas concentrations continue to rise. Over time, simulated temperature and precipitation in large regions such as China and India vary significantly with different trajectories for solar-radiation management, and they diverge from historical baselines in different directions. Hence, it may not be possible to stabilize the climate in all regions simultaneously using solar-radiation management. Regional diversity in the response to different levels of solar-radiation management could make consensus about the optimal level of geoengineering difficult, if not impossible, to achieve.

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