Temperature and precipitation responses to a stratospheric aerosol geoengineering experiment using the Community Climate System Model 4

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Summary

As the global climate continues to change it may become critical to explore possibilities for climate intervention and remediation to counteract warming by greenhouse gases. One such 'geoengineering solution' proposes to inject reflective aerosol particles into the atmosphere to decrease insolation, the amount of radiation coming from the sun received by the Earth. Given constraints due to a lack of technology and restricted physical experimentation, we study the unintended potential consequences of this experimental solution by examining the temperature and precipitation response to historical scenarios, projected radiative forcing, and idealized geoengineering scenarios to counteract radiative forcing due to human influences, using the Community Climate System Model version 4, CCSM4. The model projects increased temperature globally, increased precipitation in the Tropical Pacific, and decreased precipitation in some semi-arid regions if climate change continues without mitigation. Although these changes are not as severe with geoengineering, global temperature and precipitation are still redistributed globally. This research helps to understand the possible effects of geoengineering on the radiative balance affecting the Earth's temperature and hydrologic cycle.