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Comparative climate response of using three different aerosol geoengineering techniques to transfer from RCP8.5 to RCP4.5

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Considering the ambitious climate targets of the Paris Agreement to limit global warming to 2°C, with aspirations of even 1.5°C, questions regarding how to achieve this arise. Geoengineering has been proposed as potential tool in such efforts to minimise global harm from anthropogenic climate change. An Earth system model is here used to evaluate the feasibility of transferring from the high CO_2 concentrations scenario RCP8.5 to a middle-of-road scenario, RCP4.5, using geoengineering. Three different atmospheric aerosol - based geoengineering techniques are considered: stratospheric aerosol injections (SAI), marine sky brightening (MSB) and cirrus cloud thinning (CCT). We furthermore assess the climate response to these three methods.
The climate of the geoengineered cases are for the most much closer to that of RCP4.5 than RCP8.5 and many anthropogenic global warming symptoms are alleviated. All three techniques result in comparatively the same global temperature evolution. Though there are some notable differences in other climate variables due to the nature of the forcings applied. CCT acts mainly on the longwave part of the radiation budget, as opposed to MSB and SAI acting in the shortwave, yielding a difference in the response, particularly for the hydrological cycle.
Finally, the effects of a sudden cessation of large-scale aerosol geoengineering deployment is explored. The climate very rapidly, within few years, reverts back to the path of RCP8.5 post-termination, urging the need for simultaneous mitigation and possibly carbon removal from the atmosphere, even if one would dare to enter into any such form of geoengineering.