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Initial Climate Response to a Termination Shock

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The risk of the termination of a deployment of solar radiation management (SRM) geoengineering has been raised as one of the key concerns about these ideas. Early studies demonstrated that a rapid warming of the climate would follow such a termination with global mean temperatures rapidly rising towards the levels that would have been expected in the absence of SRM geoengineering. Further work has noted the contrasting timescale of the adjustment of global mean temperature and sea-level rise, with sea-levels responding much slower and not reaching the same levels as would have been the case in the absence of SRM geoengineering.

Whilst these previous studies have shown the basics of the response to a termination of SRM, a detailed analysis of the climate response in the first months or years of a termination has not been investigated. To conduct such an analysis tens of simulations with a termination of SRM are conducted, starting from the end of a G1 simulation with the HadCM3 model. The termination is initiated in Spring, Summer, Autumn and Winter to investigate whether the response depends on the season.

Analyzing these results I find some novel dynamic responses in the initial months and years following a termination of SRM which have not been seen in previous studies which employed decadal-scale averages. These include: A reduction in the global-scale hydrological cycle's intensity in the first weeks following termination, counter to the longer-term increase; An almost instantaneous adjustment of land-mean precipitation to the equilibrium value; And substantial shifts in the pattern of precipitation in the initial years that are distinct from those seen in the equilibrium response and which are characterized by large increases in terrestrial precipitation and runoff in many regions.