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Multi-model simulation of solar geoengineering indicates avoidable destabilization of the West Antarctic ice sheet

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Heat transported in Circumpolar Deep Water is driving the break-up of ice shelves in the Amundsen Sea sector of Antarctica, that has been simulated to be unavoidable under all plausible greenhouse gas scenarios. However, climate intervention scenarios have not been considered. Solar geoengineering changes global thermal radiative balance, and atmospheric and oceanic transportation pathways. We simulate stratospheric aerosol injection (SAI) designed to reduce global mean temperatures from those under the unmitigated SSP5-8.5 scenario to those under the SSP2-4.5 scenario with six CMIP6-class Earth System Models. These consistently show intensified Antarctic polar vortex and sub-polar westerlies, which mitigates changes to easterly winds along the Amundsen Sea continental shelf compared with greenhouse gas scenarios. The models show significantly cooler Amundsen Sea waters and lower heat content at 300-600 m under SAI than with either solar dimming or the SSP5-8.5 unmitigated greenhouse gas scenarios. However, the heat content increases under all scenarios compared with present day suggesting that although vulnerable ice shelves would continue to thin, the rate would be lower for SAI even with SSP5-8.5 specified greenhouse gases, than for the moderate (SSP2-4.5) scenario. The simulations here use climate interventions designed for global temperature targets; interventions targeted at preserving the frozen high latitudes have also been proposed that might be expected to produce bigger local effects, but potentially deleterious impacts elsewhere. Considering the huge disruptions to society of ice sheet collapse, more research on avoiding them by intervention technology is a moral imperative.