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# Effect of Arctic Geoengineering on Tropical Precipitation

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Arctic geoengineering wherein sunlight absorption is reduced only in the Arctic has been suggested as a remedial measure to counteract the on-going rapid climate change in the Arctic. Several modeling studies show that Arctic geoengineering can minify Arctic warming but it would shift the ITCZ southward. In this study, we investigate and quantify the implications of this ITCZ shift for the global monsoon regions using the Community Atmosphere Model version 4 (CAM4). In our Arctic geoengineering simulation, a prescription of 11 Mt of sulfate aerosols in the Arctic stratosphere, nearly cancels the Arctic warming (6 K) due to a $CO_2$ doubling but it shifts ITCZ southward by $\sim 1.5^0$, resulting in a decrease/increase in annual mean precipitation in the Northern Hemisphere (NH)/Southern Hemisphere (SH) monsoon regions by up to -12/+17%. Polar geoengineering, where sulfate aerosols are prescribed in both Arctic and Antarctic, reduces the southward ITCZ shift to $0.15^0$ and correspondingly reduces the precipitation changes in the monsoon regions keeping the annual mean changes within $\pm 7$ %. ITCZ shift due to Global geoengineering, where aerosols are prescribed uniformly around the globe, is much smaller and keeps precipitation changes in most monsoon regions within $\pm 2$ %. Global geoengineering also cancels the Arctic warming appreciably and restores the Arctic sea-ice extent. Further, the zonal wind anomaly and stratospheric water vapour increase due to Global geoengineering are much smaller than Arctic and Polar geoengineering. Therefore, we conclude that Global geoengineering is a better choice than regional geoengineering proposals such as the Arctic and Polar geoengineering if the goal is to alleviate climate change in the Arctic.