EGU22-7372
https://doi.org/10.5194/egusphere-egu22-7372
EGU General Assembly 2022

Springtime stratospheric volcanic aerosol impact on midlatitude cirrus clouds

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Explosive volcanic eruptions can reach the stratosphere and cause elevated concentrations of sulfate particles for months to years. When these particles descend into the troposphere they can impact cirrus clouds, though to what degree is unknown. In this study we combine three satellite datasets to investigate the impact of downwelling sulfate aerosol on midlatitude cirrus clouds during springtime. The results show that cirrus clouds in the northern hemisphere (NH) have lower ice water content (IWC), ice crystal number concentrations and cloud fraction (CF) when the aerosol load in the lowermost stratosphere is elevated by volcanism. These changes are largest for the coldest clouds at the highest altitudes. The cirrus clouds in the southern hemisphere on the other hand show no significant changes with downwelling aerosol levels. The reduction in cirrus IWC and CF in the NH imply that volcanic aerosol can cool the climate through reduced warming from cirrus clouds.