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Model comparison of volcanic aerosol forcing and climate impact of tropical and extratropical eruptions

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Major volcanic eruptions increase sulfate aerosols in the stratosphere. This causes a large-scale dimming effect with significant surface cooling and stratosphere warming. However, the climate impact differs for tropical and extratropical eruptions, and depends on the eruption season and height, and volcanic volatiles injections. In order to study different volcanic aerosol forcing and their climate impact, we perform simulations based on the fully coupled Community Earth System Model version 2 (CESM2) with the version 6 of the Whole Atmosphere Community Climate Model (WACCM6) with prognostic stratospheric aerosol and chemistry. In this study, explosive eruptions at 14.6 N and 63.6 N in January and July injecting 17 MT and 200 MT SO_2 at 24 km with and without halogens are simulated, in line with Central American Volcanic Arc and Icelandic volcanic eruptions. Simulated changes in the stratospheric sulfate and halogen burdens, and related impacts on aerosol optical depth, radiation, ozone and surface climate are analyzed. These simulated volcanic eruption cases will be compared with simulations based on the aerosol-climate model MAECHAM5-HAM.