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Impact of major volcanic eruptions on stratospheric water vapor

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Volcanic eruptions can have significant impact on the earth's weather and climate system. Besides the subsequent tropospheric changes also the stratosphere is influenced by large eruptions. Changes in stratospheric water vapor after the two major volcanic eruptions of El Chichón in Mexico in 1982 and Mount Pinatubo on the Philippines in 1991 are investigated with chemistry-climate model simulations. This study is based on two simulations with specified dynamics of the EMAC model, performed within the Earth System Chemistry integrated Modelling (ESCiMo) project, of which only one includes the volcanic forcing through prescribed aerosol optical properties. The results show a significant increase in stratospheric water vapor after the eruptions, resulting from increased heating rates and the subsequent changes in stratospheric and tropopause temperatures in the tropics. The tropical vertical advection and the South Asian summer monsoon are identified as important sources for the additional water vapor in the stratosphere. Additionally, volcanic influences on the tropospheric water vapor and ENSO are evident.