



Radiative effects of lower stratospheric volcanic and carbon aerosol as simulated by the CCM EMAC for 2002 to 2011

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A 10-year simulation with the chemistry climate model EMAC with interactive aerosol module shows that medium and smaller volcanic eruptions contribute significantly to radiative forcing and also radiative heating of the lower stratosphere. This simulation includes about 140 eruptions mostly derived from SO₂ observed by MIPAS on ENVISAT. Organic and black carbon from biomass burning contributes considerably to radiative heating of the lower stratosphere, notably in monsoon regions, even if its contribution to total aerosol optical depth of the stratosphere is small. We also show that the simulated stratospheric optical depth and radiative forcing at the tropopause is consistent with the corresponding values derived from SAGE and OSIRIS satellite observations, and that the inclusion of smaller eruptions is necessary.