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Whole-atmosphere aerosol-microphysics simulations of the Mt Pinatubo eruption: evaluation of simulated aerosol properties

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The Mount Pinatubo volcanic eruption in June 1991 injected between 14 and 20 Tg of sulphur dioxide into the tropical stratosphere between about 21 and 28km altitude. Following chemical conversion to sulphuric acid, the stratospheric aerosol layer thickened substantially causing a strong radiative, dynamical and chemical perturbation to the Earth's atmosphere. We will present results from modelling experiments to simulate the evolution of the stratospheric aerosol through the Pinatubo period. The simulations are carried out in the UK Chemistry and Aerosol composition-climate model (UKCA) which extends the high-top version of the HadGEM climate model. The UKCA model uses the GLOMAP-mode aerosol microphysics module coupled with a stratospheric chemistry scheme including sulphur chemistry.

We evaluate simulated size-resolved stratospheric aerosol properties against observations from mid-latitude balloon-borne optical particle counter measurements. We also compare the model to a range of satellite measurements through the Pinatubo period and quantify simulated aerosol radiative forcings. We explore the sensitivity to varying several uncertain parameters associated with the magnitude and altitude of the injected sulphur.