Geophysical Research Abstracts
Vol. 18, EGU2016-17292, 2016
EGU General Assembly 2016

Whole-atmosphere aerosol microphysics simulations of the Mt Pinatubo eruption: Part 2: Quantifying the direct and indirect (dynamical) radiative forcings

Graham Mann (1), Sandip Dhomse (1), Ken Carslaw (1), Martyn Chipperfield (1), Lindsay Lee (1), Kathryn Emmerson (2), Luke Abraham (3), Paul Telford (3), John Pyle (3), Peter Braesicke (4), Nicolas Bellouin (5), Mohit Dalvi (6), and Colin Johnson (6)

(1) University of Leeds, Institute for Climate and Atmospheric Science, School of Earth and Environment, LEEDS, United Kingdom (gmann@env.leeds.ac.uk), (2) CSIRO Aspendale, Melbourne, Australia, (3) University of Cambridge, Cambridge, U.K. , (4) KIT, Karlsruhe, Germany, (5) University of Reading, Reading, U.K., (6) U.K. Met Office, Exeter, U.K.

The Mt Pinatubo volcanic eruption in June 1991 injected between 10 and 20 Tg of sulphur dioxide into the tropical lower stratosphere. 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 with effects lasting several years.

In this presentation we show results from model experiments to isolate the different ways the enhanced stratospheric aerosol from Pinatubo influenced the Earth's climate. The simulations are carried out in the UK Chemistry and Aerosol composition-climate model (UKCA) which extends the high-top (to 80km) version of the UK Met Office Unified Model (UM). The UM-UKCA model uses the GLOMAP-mode aerosol microphysics module coupled with a stratosphere-troposphere chemistry scheme including sulphur chemistry.

By running no-feedback and standard integrations, we separate the main radiative forcings due to aerosol-radiation interactions (i.e. the direct forcings) from those induced by dynamical changes which alter meridional heat transport and distributions of aerosol, ozone and water vapour.