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Steady-state aerosol distributions in the extra-tropical, lower stratosphere and the processes that maintain them

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Abstract. Measurements of aerosol, N₂O and OCS made in the Northern Hemisphere below 21 km altitude following the eruption of Pinatubo are presented and analyzed. After September 1999, the oxidation of OCS and sedimentation of particles in the extra-tropical overworld north of 45 N are found to maintain the aerosol in a steady state. This analysis empirically links precursor gas to aerosol abundance throughout this region. These processes are tracked with age-of-air which offers advantages over tracking as a function of latitude and altitude. In the extra-tropical, lowermost stratosphere, normalized volume distributions appear constant in time after the fall of 1999. Exchange with the troposphere is important in understanding aerosol evolution there. Size distributions of volcanically perturbed aerosol are included to distinguish between volcanic and non-volcanic conditions. This analysis suggests that model failures to correctly predict OCS and aerosol properties below 20 km in the Northern Hemisphere extra tropics result from inadequate descriptions of atmospheric circulation.

Final Revised Paper (PDF, 1236 KB) Discussion Paper (ACPD)

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