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A 3D-CTM with detailed online PSC-microphysics: analysis of the Antarctic winter 2003 by comparison with satellite observations

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Abstract. We present the first detailed microphysical simulations which are performed online within the framework of a global 3-D chemical transport model (CTM) with full chemistry. The model describes the formation and evolution of four types of polar stratospheric cloud (PSC) particles. Aerosol freezing and other relevant microphysical processes are treated in a full explicit way. Each particle type is described by a binned size distribution for the number density and chemical composition. This set-up allows for an accurate treatment of sedimentation and for detailed calculation of surface area densities and optical properties. Simulations are presented for the Antarctic winter of 2003 and comparisons are made to a diverse set of satellite observations (optical and chemical measurements of POAM III and MIPAS) to illustrate the capabilities of the model. This study shows that a combined resolution approach where microphysical processes are simulated in coarse-grained conditions gives good results for PSC formation and its large-scale effect on the chemical environment through processes such as denitrification, dehydration and ozone loss.

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