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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ice condensation on sulfuric acid tetrahydrate: implications for polar stratospheric ice clouds" *by* T. J. Fortin et al.

Anonymous Referee #2

Received and published: 1 April 2003

Review report on MS-NR: acpd_2002_0105 Title: Ice condensation on sulfuric acid tetrahydrate: implications for polar stratospheric ice clouds.

Author(s): T. J. Fortin, K. Drdla, L. T. Iraci, and M. A. Tolbert

General comment:

This clearly written paper presents laboratory measurements of ice nucleation by vapour deposition on sulphuric acid tetrahydrate (SAT), relevant to the formation of ice type 2 polar stratospheric clouds (PSC) and dehydration. The atmospheric implications of the lab results are discussed, based on microphysical simulations. The findings in this paper are very important for our understanding of type 2 PSC formation and dehydration and the wider implications for ozone depletion, in particular in the Arctic stratosphere. The paper is therefore relevant to the atmospheric science community

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and I can recommend it to be published in ACPD after a few minor points have been taken into consideration.

I have two points of more general nature that might be included somewhere in the discussion in the paper:

1) How would the presence of HNO3 affect the ice particle formation if HNO3 would nucleate on top of SAT above the ice frost point, forming a NAT particle? Usually it is assumed that SAT is not suited for NAT nucleation, but Zhang et al., GRL 23, 1669-1672, 1996 found that preactivated SAT could be suited for NAT nucleation.

2) How would the SAT particles have formed in the stratosphere? These solid particles would probably not survive in the solid state if temperatures go above 215 K (SAT melting), and would it not require temperatures several degrees below the ice frost point for these solid particles to form, thereby partly masking their effect on ice particle formation just slightly below the ice frost point as you describe it?

Specific comments:

Figure 4: It seems that you have negative saturation ratios before 500s.

Figure 8b: What are the units of Vortex-averaged dehydration?

page 878, line 21: Will SAT particles survive in the solid state in those trajectories where the temperature goes above the SAT melting temperature?

page 880, line 21: Is ice allowed to nucleate on type 1 PSC particles in these simulations?

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 867, 2003.

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Interactive Comment