

## ***Interactive comment on “Detailed modeling of mountain wave PSCs” by S. Fueglistaler et al.***

### **Anonymous Referee #2**

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#### Summary comments

This is a very nice study and illustrates (no surprise) that temperatures and cooling rates in mountain wave PSCs are much better simulated in a mesoscale NWP model than in larger-scale analyses. These better simulations are reflected in the enhanced ability to predict the LIDAR backscatter from the ice clouds. The authors seem to imply that because the nucleation rates used to predict PSC characteristics produce ice clouds in broad agreement with the observations that they are correct (pg 266 ln 25 ? pg 267 ln 7). There are no sensitivity studies described, however, that demonstrate that the simulations are sensitive to the nucleation rate. In many regions the model predicts 100% activation, and therefore may be rather insensitive to nucleation rate? Or do the vertical extent of the ice clouds yield sufficient sensitivity to support this conclusion? A few comments would clear this up.

Small comments and grammatical issues:

pg 254 ln 10 "state-of-the-art" incorrect usage try "best available"

pg 254 ln 10 " is capable of reproducing "

pg 255 ln 9 "that enhances". Actually, "enhances" is not the correct word here. Denitrification slows the transfer of active chlorine into ClONO<sub>2</sub>

pg 257 ln 2 degrees of freedom

pg 258 ln 21-23 wavelength reference for the LIDARs would be better placed after the word "lidar" rather than after the aircraft.

pg 262 ln 6 .. the simulation steps 12-36 hours .. I don't understand this comment.

pg 263 ln 5-6 the background aerosol from taking up HNO<sub>4</sub> before ice

pg 263 ln 7 Only during the evolution (sp) of the ice cloud do the liquid particles take of HNO<sub>3</sub>, depleting the gas-phase.

pg 268 ln 2-4 ECMWF analysis - this sentence is confusing as to whether it applies just to 2nd cloud or entire trajectory

pg 268 ln 12 " calculated maximum NAT saturation rations in the presence of ice (SNAT)." Question: does the presence of ice mater here? also same comment at end of next PP.

pg 269 ln 2 The largest particles are the ... perhaps comment in the model section about how the size dependence of nucleation is done in the model. A reference to the recent study by Azadeh on surface vs volume freezing rates would be appropriate.

pg 269 ln 10 "despite the fact that" This comment is confusing as it is not clear what the chronology is. When does the max. cooling rate occur? What is the evolution of the cooling rate in the cloud and when does freezing occur? Perhaps combine fig. 9 A and B in one figure to help with this point?

pg 271 ln 6 "PSC prevail until". (remove second "downstream")

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pg 273 ln 16 I didn't see these sensitivity studies described earlier.

pg 275 ln 18 misspelled "unequivocally"

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Interactive comment on Atmos. Chem. Phys. Discuss., 3, 253, 2003.

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