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Interactive comment on "Liquid particle composition and heterogeneous reactions in a mountain wave Polar Stratospheric Cloud" *by* D. Lowe et al.

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This paper present detailed microphysical and chemical simulation of the mountain wave induced PSC which was probed by the high flying aircraft in situ by several instrumentations. The impact of the kinetic gas diffusion on the volume, surface and composition of the STS particles of Mountain wave PSC and therefore on the heterogeneous chemistry is an issue which is not well documented in the literature before.

The MS is well written und well structured. After the consideration some a few remarks, the MS should be published.

Comments: 1. The impact of non-equilibrium of STS on heterogeneous chemical reaction is a key result of the present MS. I do not understand why a comparison with the measured Cl2O2 is not possible. A comparison of Cl2O2 value at the upwind and down wind of MW (at the time when the aircraft crossed these regions) would be very useful and it is also possible. Two set of trajectories (with different time only) are required. I am forward to see the result of such comparison.

2. Due to the fast temperature fluctuations, the liquid particles are out of equilibrium with the gas phase shown by Figure 8a. One feature in Figure 8a has to be cleared: i.e. in the kinetic simulation, the NOy signal (blue curve of Figure 8a) begins to decrease at a time at 0.9 hr for the major maximum. At this time, the equilibrium NOy value is much higher than the kinetic value requiring a further HNO3 uptake by the STS particles. Therefore, there is a contradiction. Similar behaviour can be observed at other maxima of simulations. I guess that this difference could be caused by the neglect of the Kelvin effect for the equilibrium calculation and/or a different model parameter for the simulations. In order to separate kinetic effect from other factors, the same parameter set should be used for both kinetic and equilibrium simulation.

3. The initialisation of the background aerosol is obvious to high as can be seen from Figure 9b. The maximum surface area (2-4E8 cm2) is only about a factor 3 larger than the surface area of binary aerosol used here. A smaller value of surface area of binary aerosol has definitely some impact on the numbers given by this MS.

Minor technical points:

1. P9552 Line 19: “1999) is a short range lidar instrument” should be “1999) is a short range optical instrument”.

2. The flight tracks in Figure 1 and figure 2 differ, The location of the cloud event analysed located at totally different latitude.

3. Are you sure that the blue marked part are STS clouds (Figure 2)? Pls show an

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overview plot for MAS and NOy.

4. Is the uncertainty of 3% of MAS data on aerosol backscattering coefficient given in Figure caption 8 correct?

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 9547, 2005.