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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric sub-3 nm particles at high altitudes" *by* S. Mirme et al.

Anonymous Referee #1

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This manuscript deals with sub-3 nm particles at high altitudes. The authors analyze data from several CPC's and NAIS instrument onboard DLR Falcon 20 aircraft. They present data that has not been measured or published earlier. In this respect it is unique paper. As a result they conclude that new particle formation takes place actively throughout the tropospheric column and these particles are formed via neutral pathways in boundary layer and there were no signal of increasing role by ion-induced nucleation towards the upper troposphere. However it should be kept in mind that these measurements do not present the whole atmosphere, rather one experiment in May 2008 in western Europe. Authors do say that they results "indicate". So this is by no means any closure, rather just one observation, and I would state this more clearly.

Other minor comments and suggestions: - move text page 19438, line 8-19 to materials and methdods - page 29439, line 25; ...is able to measure at varying altitudes from inside the aircraft. I know what authors mean I get impression that the sample is taken

from inside the aircraft. Also, is the instrument in environmental pressure or in the pressure inside cabin. - page 19441, equation 1, please define Epsilon_0 - section 2.6, the calibration of the CPC are done close to sea level pressure, the cabin is at lower pressure. The CPC's are tuned up to measure particles larger than 10 and 4 nm. Especially the 4 nm limit is very sensitive to small changes in supersaturation. This is strong function of diffusion coefficient which is inversely proportional to pressure. Does author have idea of the magnitude of this effect ? - page 19445, lines 16-23, does author have idea of the magnitude of overcharging ? - page 19447, lines 17-19, to me it seems that in figure 11 the histograms are shifted to higher particle/ion ratios as the altitude increases. - section 3.3: please define "in-cloud" and "out-of-cloud"

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