

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

Anonymous Referee #3

Received and published: 20 November 2009

General comments:

In this work, the authors report airborne measurements of size distributions of charged and neutral clusters and aerosol particles at different altitudes. The uniqueness of this report is that the authors have utilized recently developed instrumentation for detecting sub-3 nm atmospheric particles at varying air pressure conditions. These data gives a useful contribution to scientific community and lead us one step closer to understanding the phenomenon of new particle formation in the atmosphere. The paper gives us a new knowledge about new particle formation and nucleation mechanisms at different compartments in the atmosphere and good hints for future work in this area. Therefore, I recommend the manuscript for publication in ACP. However, I have some specific comments and suggestions which could improve the paper and make it more readable.

C7321

Specific comments:

i) In introduction part more references to earlier aircraft measurements of nucleation mode particles could be mentioned. For example the following recent publications:

C. D. O'Dowd, Y. J. Yoon, W. Junkerman, P. Aalto, M. Kulmala, H. Lihavainen, and Y. Viisanen (2007) Airborne measurements of nucleation mode particles I: coastal nucleation and growth rates, *Atmos. Chem. Phys.*, 7, 1491–1501.

C. D. O'Dowd, Y. J. Yoon, W. Junkermann, P. Aalto, M. Kulmala, H. Lihavainen, and Y. Viisanen (2009) Airborne measurements of nucleation mode particles II: boreal forest nucleation events, *Atmos. Chem. Phys.*, 9, 937–944.

ii) In general some figures could have more comments and more self-informative captions.

If possible, I suggest to add in Figure 4 one more panel with air pressure profile.

In Figures 3, 8, 9, 10 and 11 the authors use different colors. However, some of the color codes are not well described in the figure captions.

iii) Scatterplots in Figure 6 show that the results from CPC and NAIS are closer to each other at lower concentrations ($< 1000 \text{ cm}^{-3}$) at higher altitudes. I would expect that those instruments show better concordance at higher concentrations. Could authors comment that?

iv) Figure 8 illustrates measurements results from flights over Central Europe. However, some of the measurements were made over Atlantic near west coast of Ireland. Why these measurements were not included? Do other figures contain those Atlantic measurements? Is there any difference between measurement results over Central Europe and Atlantic near west coast of Ireland? I would expect that these questions were commented in the paper.

v) Figure 9 shows that the negative small ion concentration is higher than positive

C7322

one at altitudes below 4 km and lower at altitudes above 4 km. Could the authors give more comments about what would causes sudden changes in negative small ion concentration at altitudes 4 – 6 km?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 19435, 2009.

C7323