Atmos. Chem. Phys. Discuss., 9, C1759–C1761, 2009
www.atmos-chem-phys-discuss.net/9/C1759/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric nanoparticle observations in the low free troposphere during upward orographic flows at Izaña Mountain Observatory" *by* S. Rodríguez et al.

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Received and published: 11 June 2009

♢ General comments

The manuscript presents interesting and novel data, which enhance our understanding of processes and conditions governing new particle formation in the low free troposphere. In some places, a more specific data analysis can, however, make the conclusions more substantial. I recommend its publication in ACP once the following issues are better considered.

♢ Specific comments

The short time variations of 3–10 nm particles are statistically investigated by Principal Component Analysis (PCA). About 25 PCAs are calculated according to different input datasets - separately for every month and only during daylight (9:00–16:00). The results of this statistical analysis can be misleading for two major reasons: Data availability varies a lot with the months. (In June there only are 5 available days, in July 31, cf. tab.3.) From a statistical perspective, the number of cases does not guarantee for every month a statistically representative dataset. As the major consequence, the resulting principal components (PCs) extracted are difficult to investigate. (E.g., it is difficult to understand the meaning of PC3 calculated in Nov 2007, tab.2.) I suggest to build up one single dataset, including all data observed - including one year, night and day data and excluding only cases when available data are below the detection limit. Seasonal and diurnal variations can be analyzed in terms of the temporal variability of the scores calculated by the PCA. The meaning of the PCs so extracted is probably easier to investigate, and the results of the PCA are probably more substantial.

Interestingly, the manuscript discusses the differences between different conditions of new particle formation and growth - morning SO_2 correlated events (Type I) and afternoon events with higher concentrations of NO and NO_y (Type II). The analysis is very interesting, but it should be more precise to substantiate the conclusions. I suggest a deeper investigation of the - common and odd - sources of NO, NO_y, SO_2, and PM_{10} concentrations affecting the measurements at Izana Mountain Observatory. (E.g.: Weekly cycles may be investigated to separate anthropogenic emission sources from biogenic contributions. The different evolution of NO and NO_y–NO concentrations can be analyzed to identify fresh emissions sources, and aged air masses. The decoupling of SO_2 and PM_{10} sources can clarify the negative association with N_{3-10} not shown in PC3 of Nov07, tab.2.) Particularly, the understanding of the reasons causing the higher concentrations of the nitrogen compounds during Type II events has probably the potential to elucidate mechanisms still unknown.

With the aim to generalize the results and conclusions of the manuscript, I suggest to summarize in a separate section (paragraph, table, etc.) the comparison with similar previous works from other stations in the remote troposphere. This can also make the overall presentation clearer. As well, the readability can be improved by adding a table summarizing the temporal data coverage of the whole dataset (i.e., particles number and mass, gaseous compounds and meteorology), and the PM_{10} values in Figure 5.

♢ Technical corrections

The discussion of the negative association of the particle mass concentrations (PM_{10}) with the nucleation mode particle number concentration (N_{3-10}) presented in the paragraph 4.4.2 should clarify when only summer data are considered - e.g., PC3 in Nov07, tab.2, shows no negative correlation. (On this subject, was the principal component analysis calculated in terms of correlation of covariance?)

Caption of Figure 9: replace “1 October” with “15 December”.

Check for references missing, e.g.: Herman et al., 2003; Benson et al., 2008.

Par.3.1, pag.10919 line 2: replace “a electrostatic” with “an electrostatic”.

Page 10923, line 10: replace “dN/dogD” with “dN/dlogD”.

Pag10922 line 14: replace “de” with “the”.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 10913, 2009.