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***Interactive comment on* “Seasonal variations of aerosol size distributions based on long-term measurements at the high altitude Himalayan site of Nepal Climate Observatory-Pyramid (5079 m), Nepal” by K. Sellegri et al.**

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R: The paper "Seasonal variations of aerosol size distributions based on long-term measurements at the high altitude Himalayan site of Nepal Climate Observatory-Pyramid (5079 m), Nepal" by Sellegri et al. presents a two-year data set of particle size distribution measurements at a high altitude Himalayan site. The paper uses only SMPS and OPC data in the analysis and relies on their parallel papers on supporting data. The data set is unique, since only few studies of such long-term measurements have been conducted in Asia and especially at such high altitudes. The data present-

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Interactive Discussion

Discussion Paper



Interactive
Comment

tation is satisfactory and the findings are explained in reasonable manner. Tools used in the analysis are common to the scientific community. The frequent referring to the group's parallel papers makes it hard for the reader in some parts of the manuscript. Some details should be included in the manuscript to make it more readable on its own, without having for example Bonasoni et al., 2010 paper on the side. Detailed comments are listed below. Overall, the unique data set provided by this paper deserves to be published in ACP after considering the following issues. A: We thank the reviewer for his comments and suggestions. We answered all questions to, we hope, meet the reviewer's expectations and enhance the paper's quality. References to parallel papers are still given (because we can not double publish figures and tables), but more information is also included to support our analysis, especially on air mass types.

Detailed scientific comments: R: - Page 6539, row 5: I found four different data periods in this study. Please correct and use the same throughout the paper. (see also: p6542 r19, p6543 r13, p6554 r11) . A: Done

R: - Page 6540, row 10: Seems to be a missing reference. A: Reference has been added

R: Page 6543, rows 15-18: Please clarify how the SMPS and Grimm data were merged (since they measure different diameters). A: SMPS and GRIMM size distributions were overlapped for different time of the day/year and compared. It was found that the two size distributions match one with the other on the overlapping diameters only for the 400 nm-650 nm range. We chose to use SMPS data until 400 nm while using GRIMM data on the 400 nm 30 μm size range. This is now explained in the text.

R: Page 6543, rows 18-21: How and why you have selected these limits for the mode mean diameters? This should be justified for the reader. A: The diameter which were given in this part of the text were not limits for the mode mean diameters, but the diameters actually found in the study after averaging for the different seasons. This was an error, as the limits of the diameters used to determine Nucleation/Aitken/accumulation

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Interactive
Comment

modes are different. Three modes were usually found after the fitting procedure, the first one having a mean geometric diameter lower than 30 nm, we naturally named it nucleation mode the second one has a geometric mean diameter being comprised between 30 and 85 nm (Aitken mode), and the third mode has a geometric mean diameter larger than 85 nm between (accumulation mode). This is corrected in the text.

R: Page 6543: It would be valuable for the reader to have a sentence or two about the treatment of the sample aerosol (inlet/dryer/etc) and possible particle losses. A: Done

R: Page 6544: Please define the seasons in understandable way (i.e. "pre-monsoon (Mar-May)"). A: Done

R: Page 6546, row 14: Would you have any estimate of how much of the particles are lost by cloud droplet activation? With such low number concentration, the activation percentage would be relatively large in the occurrence of a cloud at the site. A: RH was measured at the station continuously, and can give indications on the frequency of occurrence of clouds at the level of the station. When the cloud is present, the RH sensor records 100 % over the cloud event, and usually also a few hours after the cloud disappeared. At the PDD station, where LWC is measured simultaneously to RH, it was found that when the LWC is higher than 0.05, the RH sensor is indicating higher values than 98% for 95% of the time. The same comportment was observed on a small number of days at the NCO-P when the web-cam images were analyzed in comparison to the values of the RH sensor. Hence, based on the RH sensor, it was found that the station was at maximum 17% of the time in cloud. This effect can lower the concentration of particles larger than 100nm (usual activation diameter) at maximum by 17% on average and we now mention it explicitly in the text.

R: Page 6546, row 20: I would prefer stating only that this will be "confirmed" or "disproved" later on in Sect 3.2, not both. A: Done

R: Page 6547, rows 20-22: "In order to. . .". This sentence needs some re-phrasing, or it is missing something. Done

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Interactive
Comment

A: Page 6552, row 9-10: Three or two sub-classes here? Only two are listed in this sentence. Done

R: Page 6552: The term "regional air masses" needs to be clarified. All other air masses with specific directions should be clear to the reader, but regional needs a sentence or two of explanation. A: Done

R: Page 6554, row 15: Descesari et al., 2010 is not listed in the reference list. A: Done

R: Table 2: The caption talks about Aitken and acc modes, the table shows acc and coarse modes, please correct the caption. A: Corrected

R: Table 3: It would be informative to add a column with the number of trajectories from each air mass origin. A Table showing the frequency of occurrence of each air mass type per season is now added

R: It would be interesting to see a figure of diurnal evolution of total particle number concentration in different seasons (as in Komppula et al., 2009, Figure 8b). A: We included a new figure showing the average diurnal variation of total particle number concentrations and nucleation mode integrated number concentrations per season (new figure 2).

R: Technical comments: - Page 6542, row 10: "Mt. Lemnon" should be "Mt. Lemmon", correct throughout the paper. - Page 6545, row 25: "port-monsoon" correct to "post-monsoon". - Page 6546, row 1: "Kompulla" correct to "Komppula", also in p6547 r24. - Page 6550, row 9: "lower?", no need for a question mark. - Figure 1: Is bit shady in my print. - Figures 2 & 3: The fontsize should be increased to make the figures more readable. A: All technical corrections done

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 6537, 2010.

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