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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.**

**K. Sellegri et al.**

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R: Overall this manuscript is interesting and well-written. I recommend it for publication once a few points, listed below, are addressed. 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.

R: One issue that is perhaps a little confusing is the authors' distinction between region sampling and free tropospheric sampling. At the beginning of the manuscript the dis-

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discussion primarily centers around comparing daytime and nighttime observations, and then starting in Sec 3.3 the discussion implies that nighttime sampling corresponds to free tropospheric air. To me, this seems to be an overly simplistic view as I would imagine that some nighttime periods actually correspond to regional airmasses. If this is the intention of the authors (to equate evening samples with the free troposphere), then the authors should explicitly state this in the text. A: Yes, we agree that the view is simplistic. Our intention is to try to exclude the PBL influence as much as possible. We are now more cautious and do not equal nighttime measurements with free tropospheric air, and only presume that nighttime measurements are dominated by long range transported air masses. The analysis of nighttime samples, sorted by air mass, further permits to exclude regional air masses which could contaminate free tropospheric samples with PBL air, as shown from the vertical analysis of the back trajectories.

R: The one place where I think the authors state this is on page 6547, line 22, but it's not clear whether they refer to their dataset (and the subsequent discussion in Sect. 3.3) or the European datasets. I would recommend that the authors add some text to make a clearer definition of "FT/residual layer" sampling. A: Done, this section now explicitly mentions that the segregation between nighttime and daytime is usually performed on European data sets to separate periods during which the sites are presumably mainly in the free troposphere, from periods during which they are likely influenced by the PBL.

R: Also if their intention in Sect 3.1 and 3.2 is to equate "nighttime" with "FT/residual layer" then that needs to be more explicitly stated. A: Our intention is not to equate "nighttime" with "FT/Residual layer". We now make it clearer

R: Specific recommendations/questions (page and line number indicated, if just line number is used it means that the previous page number applies): 6540, 10: (reference) : : : means that a reference should be added here?? A: Done

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R: 6541, 5: not sure what (vertical . . . thermal) means. A: Typing mistake corrected

R: 6542, 7: looks as if an altitude is missing here: “Izana station (m a.s.l.)” Also consistent notation should be used for the altitude. I suggest that “m” be defined at first use as “m.a.s.l.” and then used for every subsequent example. A: Corrected

R: 6544, 22: are these concentrations 2-min averages? Daily averages? This is important since new particle formation events can cause large temporal fluctuations in concentration on timescales of seconds to minutes. A: Figure 1, the concentrations are monthly medians as mentioned in the figure caption. In the text, concentrations are either yearly or monthly concentrations (as mentioned in the text in each case).

R: 6547, 21: insert “high” before “altitude” A: Done

R: 6550, 4: remove “of” in front of “observed” A: Done

R: 9: remove “?” A: Done

R: 6551, 16: The table referenced here should be Table 3, which is the only one that lists GMDs. However, I find it difficult to make the conclusion that the GMD is lower during the monsoon season, as the table lists this according to wind direction. A: There is indeed an error in the text, and the referenced Table should be Table 2 instead of Table 1. In Table 2, the GMD is given according to the season. The error is now corrected.

R: 23: I suggest that a separate table or row in Table 3 be devoted to the values that are being discussed in this paragraph.

A: We added the following lines to Table 1 and refer to them in the text.

DpN (nm) (day / night) Dry Season Pre Monsoon Monsoon Post Monsoon Nucleation  
15 / 22 18 / 27 Nd / Nd 17 / 22 Aitken 68 / 63 65 / 64 35 / 40 65 / 65 Accumulation 180  
/ 200 150 / 135 130 / 110 150 / Nd

R: 6552, Sec 3.3: In the first paragraph are these percentages referring to nighttime

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observation frequencies? It's not clear, as it is stated earlier in the paragraph that only nighttime data are considered however in the discussion very general statements are made which lead me to believe that overall (day and night) air mass origins are being discussed. A: The frequencies do refer to nighttime backtrajectories, as stated in the text. We now are more clear in our terminology and specify in the section title that it addresses only nighttime conditions, and mention in the text that the nighttime conditions could be regarded as free tropospheric/residual layer conditions for some back trajectories (other than regional). Our goal was primarily to avoid local Valley winds influence to provide larger scale aerosol properties.

R: Overall in this entire section I had to remind myself that the discussion was only focused on nighttime air mass origins and aerosol properties during this special time, which is chosen to correspond to free tropospheric sampling. This is certainly what the title of the section refers to, however in a number of places (e.g., Fig 3 caption) the data are presented without any reference to the fact that they represent free tropospheric air masses. A: Figure 3 caption was also modified and we went through the entire section to avoid the confusion between nighttime and free tropospheric air.

R: Please do go through this section and everywhere where you can confirm to the reader that you are referring to a special population of the sampled aerosol (i.e., free tropospheric air) that should be pointed out. For example, on 6553, line 19, you can state "all \*nighttime\* air masses," etc. A: Done

R: 6554, 10: should be "optical particle counter" A: Done

R: 25: I suggest replacing "nucleation processes" with "new particle formation" since the condensation sink is particularly important in defining the difference between the preand post-monsoon period. Nucleation, which cannot be detected since it occurs at diameters of around 1.5 nm, could be occurring with equal intensity during both of these periods and scavenging of post-nucleation clusters could be the reason why fewer nucleation-mode particles are observed during the pre-monsoon period. Thus

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it's best to focus the discussion on what is observed (that is, NPF). A: We agree, this was a typing mistake.

R: 6563, Table 3: there should be a reference to the text in the caption for all the undefined terms in this table. A: Done.

R: 6564, Fig 1: In my version of the figure the light blue bars are very feint. Is it possible to change this to some other color (e.g., red or green?). A: Done

R: 6565, Fig 2: although obvious from the graph title, still it would be good to use letter (a-d) annotations for the plots as they are referred to using these letters in the caption. Please correct the spelling of “monsoon” in the caption for (b). A: Done

R: 6566, Fig 3: same comment as for Fig 2. Note that for all of these figures, the font size is barely large enough. I recommend a larger size, although (for me) it is still possible for me to read the numbers and words on the plots. Also, I assume that this is for nighttime sampling of free tropospheric air? If so, it should be stated in the caption. Please correct the spelling of “monsoon” in the caption for (b). A: Done

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