

***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.***

**Anonymous Referee #2**

Received and published: 22 June 2010

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

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 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

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is the intention of the authors (to equate evening samples with the free troposphere), then the authors should explicitly state this in the text. 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. 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.

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??

6541, 5: not sure what (vertical . . . thermal) means.

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.

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.

6547, 21: insert “high” before “altitude”

6550, 4: remove “of” in front of “observed”

9: remove “?”

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.

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

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

6554, 10: should be "optical particle counter"

25: I suggest replacing "nucleation processes" with "new particle formation" since the condensation sink is particularly important in defining the difference between the pre- and 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 it's best to focus the discussion on what is observed (that is, NPF).

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

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

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.

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Please correct the spelling of "monsoon" in the caption for (b).

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).

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

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