Atmos. Chem. Phys. Discuss., 11, C5908–C5910, 2011
www.atmos-chem-phys-discuss.net/11/C5908/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "New particle formation infrequently observed in Himalayan foothills – why?" *by* K. Neitola et al.

Anonymous Referee #2

Received and published: 3 July 2011

The paper by Neitola et al. is dealing with a long term data set of aerosol particle size distributions sampled at the High altitude site of the Mukteshwar, India, located at the Himalayan foothill. From this data set, the authors explore the occurrence of new particle formation (NPF), their relation to the local meteorology, origin of air masses, boundary layer évolution and sinks of vapours and particles. Neitola and co-workers showed that NPF occur preferentially during the spring season at the Mukteshwar site, and that this seasonal cycle was presumably controlled by the seasonal evolution of the Planetary Boundary Layer height.

The extend of the data set, together with the location of the sampling site enable the authors to provide unique information on the new particle formation events in this part of Asia. The altitude of the sampling site further provide new insight into the vertical

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extend of these events. Hence, the paper addresses relevant scientific questions within the scope of ACP.

Neitola and co-workers showed that NPF occur preferentially during the spring season at the Mukteshwar site, and that this seasonal cycle is presumably controlled by the seasonal evolution of the Planetary Boundary Layer height. This implicates that new particle formation rarely occur in the lower free troposphere, which is a substantial conclusion.

The sampling methodology and analytical tools are adequate for the study of new particle formation events. The scientific results and conclusions are presented in a clear, concise, and well-structured way.

The paper is of good quality, and I recommend that it is published after the authors have addressed several points:

(1) at high altitude stations, it is frequent that clouds form. The formation of a cloud can significantly change the aerosol particle size distributions, since particles are activated into cloud droplets. How frequent is this phenomenon at the Mukteshkar station ? How is sampling handled in case of cloud formation ? Is the inlet sampling evaporated cloud droplets or only interstitial particles ? (2) One major information is missing on the topography around the station. Is the station on top of a mountain with a steep slope to the sea level altitude or is there a plateau nearby, and if there is , at which altitude ? This information is needed to interpret the simulated heights of the boundary layer above sea level. The topography in the Himalayan region is strongly influencing the atmospheric dynamics (forced convection, valley winds) and these effects should be examined before they conclude on the impact of the boundary layer height evolution of NPF events. (3) The authors mention that they observed some events only after particles have reached a size larger than 10 microns. Since they postulate that most events are Boundary Layer events uplifted to the station, this information would strengthen their hypothesis. I suggest that if they classified these types of events separately and

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examine their statistical occurrence.

Detailed comments

page 13206, lines 13-14 : I am not sure that the time window which was chosen for the calculation of the PM2.5 calculations is adequate. If the sink for condensable vapour is important for the new particle formation event, it is mainly at the onset of the phenomenon, i.e. several hours before they appear at 15 nm. The authors should further argue for their choice if they decide to keep this time window. Page 13206, lines 16-18 : I would tend to argue to the opposite conclusion : if High CS do not inhibit NPF events, than this is a stronger limiting factor than the lack of the nucleating and condensing vapours.

Page 13207, lines 6-8 : again, this can only be speculation as long as there is no information on the nucleating (and growth) vapour concentrations. You may also compare to the link to the CS observed at other altitude sites. Additional altitude cases can be found in Boulon et al. 2010 and Boulon et al. 2011:

New particle formation and ultrafine charged aerosol climatology at a high altitude site in the Alps (Jungfraujoch, 3580 m a.s.l., Switzerland), J. Boulon, K. Sellegri, H. Venzac, D. Picard, E. Weingartner, G. Wehrle, M. Collaud Coen, R. Bütikofer, E. Flückiger, U. Baltensperger, and P. Laj Atmos. Chem. Phys., 10, 9333-9349, 2010

Investigation of nucleation events vertical extent: a long term study at two different altitude sites, J. Boulon, K. Sellegri, M. Hervo, D. Picard, J.-M. Pichon, P. Fréville, and P. Laj, Atmos. Chem. Phys., 11, 5625-5639, 2011

Fig 6 : error bars relative to the standard deviation on the calculated average heights would be helpful to confirm that the spring season BLH is different from the other seasons.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 13193, 2011.