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Discussions

Interactive comment on "Investigation of the mixing layer height derived from ceilometer measurements in the Kathmandu Valley and implications for local air quality" *by* Andrea Mues et al.

Anonymous Referee #1

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A year of mixing height estimates from a ceilometer are analysed and put into context to meteorological conditions observed at the surface. It is then used to enhance interpretation of measured black carbon concentration based on a simple model to calculate fluxes. Interesting results are presented and the impact of different seasons (e.g. Monsoon) and orography is discussed. However, the manuscript lacks some structure in terms some structure to put analysis and findings into a wider context. The introduction is focused on simple boundary layer knowledge, instead it should discuss mechanisms critical for the complex setup of the current study, such as the structure of the valley, predominant wind directions relative to moisture and pollution sources etc.

More literature references should be included to introduce the reader to the state of knowledge on boundary layer dynamics in valley locations and under Monsoon season conditions. This will allow the manuscript to clearly identify where new or contradicting findings are made.

Some more information on the uncertainty of the applied method for mixing height detection, its limitations and data availability should be included. Especially the point of excluding cloudy periods needs to be better explained in the context of the monsoon analysis.

Minor comments: P2, l15 – P3, l10: Very basic, it might be more interesting to reference other studies investigating the PBL to introduce current research in the field. Generally, much more literature references should be discussed in the introduction.

P2, l16: Might be the first study of this kind in Kathmandu Valley, but how about other locations with similar topography?

P4, l31: What type of weather station? Model and manufacturer of radiation sensor, temporal resolution? For all sensors provide sensor height and characteristics of immediate surroundings?

P5, l1: CL31 data also measured to hourly values? What is the original resolution in time and range?

P5, l10: State name of the algorithm.

P5, l25: Provide details on screening methods. How did you determine the cloud is 'within mixing height'? How do you define times with precipitation?

P5, l33: Does BLview have different versions? If so, which version of the software is used in this study?

P6, l5: How is the signal noise determined prior to averaging?

P6, l10: State explicitly: if aerosol load is low, BLview does not report any layer?

P6, l13: repetition with line 9

P6, l15: So BLview does not provide one estimate for mixing height but rather several to choose from? Explain the physical meaning.

P6, l20: At what time resolution is the tracking of layers performed?

P7, l2: Provide reference or reasoning for 'settings fitting best for mixing layer height assessment'

P7, l3: Not quite clear, it is stated that 'best settings' for mixing height detection are used, however, a resolution of 20 m is chosen even though a resolution of 10 m is required as stated in line 3. Check paragraph for consistency. Move whole paragraph to instrumentation section.

P7, l10: Data availability? How many hourly mixing height estimates are obtained within the study period? What are reasons for missing data? If all periods with boundary layers clouds are excluded from the analysis as stated in P5, l25, how representative are measurements during the monsoon season?

P7, l11: Comment on seasonal variations in sunrise and day-length.

P8, l7: What are the mixing height estimates during these 'very stable conditions'? Are those reasonable or is it possible that the detection algorithm has a limit for the lowest detectable height? What is the first range gate where BLview provides layer estimates?

P8, l15: What is the typical cloud base height of monsoon clouds over the region?

P8, l28: It is stated that reduction in solar energy is the dominant cloud effect, what is the physical explanation for the impact by rainfall?

P9, l9: Data availability of black carbon measurements? What data processing and quality control/instrument calibration is applied?

P9, l30: How are these temperatures determined? Include sensors in instrumentation

section.

P9, l35: More references to local dynamic characteristics in the valley should be provided in the introduction to 'set the scene' for this study, i.e. what are the results of previous studies, what are the open research questions?

P10, l20: Discuss local emission sources

P10, l25: Comment on the timing of rainfall during the day.

P11, l10: Comment on the implications of the site locations of the Bode site compared to the urban site. How is this related to timing of emissions? (see line 23: Make discussion on comparison to Puerto et al more consistent.)

P11, l30-10: Some of this should be moved to introduction.

P11, l26: Where is the pollution rose figure? Reference?

P12, l1: mark emission sources in map of Figure 1.

P13, l1: Comment on the validity of these assumptions? Discuss mechanisms in that influence advection and stratification in the valley. Reference relevant literature.

P13, l6: What are the hours used for the calculation? You state here no times with entrainment are used but then black carbon is used during morning hours – line 21. Is that consistent?