

Interactive comment on “Boundary layer evolution over the central Himalayas from Radio Wind Profiler and Model Simulations” by Narendra Singh et al.

Anonymous Referee #2

Received and published: 9 May 2016

Major question: the local (Himalayas Mountains) is a very dry. You can also see this looking to your profile of specific humidity. In this case, the SNR should be very weak, shouldn't? Could you comment this point? Minor questions: Page 1, Line 16: I think that the precision of the instrument did not permit an estimation of the BL with 1 decimal (for instance 439.6 m). Use the closest integer for the average (440 m) and the standard deviation (197 m). Page 2, line 10: I would suggest using potential temperature profile (not virtual potential temperature profile) as you are also using specific humidity. Page 3, line 2: use the word missing instead of lacking Page 3, line 10: contrasting periods: winter and spring? How contrasting are these seasons?! Do you have data at summer period (or stopped at March 2012)? Page 4, line 15: between 0.1 and 6 km.

C1

Figure 1: the vertical scale is height (not altitude since there is 2000 m of amsl plus the vertical profile). Also, it is better to use March 15, 2012 as label for the date. What are the daytime hours?! What are the time zone differences for 06, 08 and 10 UTC? How have the authors computed the height of BL?! (described at page 5)

Page 5, lines 1-6: what are the relations between the description of the entrainment zone and the atypical SNR profile?! I did not completely understand the point raised at those lines. Could the authors clarify this point?! Page 5, line 7-8: what are the times of the radiosondes?! It was written 4 times per day, but I did not find the times (also some description of the radiosonde model used)? Clarify this point. Page 5, lines 10-12: what is the difference between LBL and PBL? Also, there is ML. All of them are referred to the boundary layer height. Clarify this point. Page 5, lines 24-25: FNL from GFS? Both are datasets used for WRF initialization, but they have different structures between them. Clarify this point.

Figure 2: I would suggest making a sign/arrow at sunrise and sunset at the top panel for better visualization of the convective/daytime conditions. Also, Kelvin should be written with capital letter. Why the profiles for virtual potential temperatures were shifted by 2 K? Explain this. The θ_{v} and specific humidity profiles at 622 UTC shows clearly a shallow BL around 200 m. However, for the profile at 1148 (still daytime), the both profile has a stable pattern. Explain this.

Page 7, line 4: what are the differences (besides the months) for the chosen of these 2 contrasting days?! The authors should described them these difference as earlier as possible. Described in terms of sensible heat fluxes (or radiation energy budget values) Page 7, line 7: the profile at 1148 UTC should be convective/daytime instead of stable. Explain why this happen! Page 7, line 20-21: how a BL value around 800-1000 m (derived from the windprofiler) is consistent with an observations of 400-500 m derived from radiosondes?! Explain this point Page 8, Line 6: it is incorrect to say ML height at nighttime period. The authors should say nocturnal or stable boundary layer, not mixed layer (ML). Page 8, lines 20-21: “...ML decreases in depth, but this could

C2

be attributed 20 to the rapid cooling of the surface". At this time (end of the night and near to the sunrise), there is no rapid cooling of the surface, as the NBL is very stable. Clarify this point. Page 8, line 27: It is missing a final point (between ...mixing depth. Errors ...) Page 9, lines 6-7: "... Overall the model and observations are in reasonable agreement during the study period ($r^2 = 0.5$). Is 0.5 a reasonable agreement? What is the physical meaning of a negative value for intercept showed at Figure 7? Also, for Table 2, I suggest to use the integer values for height of BL! There are so many assumptions on the determination of the BL either by RWP or radiosondes that the integer values are a better representation of BL heights. Figure 3: upper panel: the authors should not draw a continuous line amongst the data as there are gaps (no data collected). See the example from end of December and beginning of March. Lower panel: the both scales should be the same, plot the line 1:1 and explain the physical meaning of a negative value for intercept.

Page 10, line 4: potential temperature?! It was used virtual potential temperature for the entire text. I agree to use potential temperature (instead of virtual potential temperature), but it should be along the entire document. Page 12, Lines 9-12: it is very strong the sentence saying that RWP gives the best temporal estimates. If you have a ceilometer and/or a microwave radiometer, you also have very good estimates of the BL heights. By the other hand, these instruments (ceilometer and radiometer) are much more simple to use than a wind profiler. So, I suggest to re-write this sentence. Page 12: Line 29: torrential downpour. Can it be replaced by torrential rain? The line below, I think that it is year long (not yearlong).

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-101, 2016.