Responses to comments from Reviewer 1 (comments in bold italics, responses in regular font):

Rev : The work examines the convective environment in the Indian subcontinent during the pre-monsoon and monsoon seasons using radiosonde and surface flux observations. Such data are highly valuable for this region. The analysis is robust and overall, the paper is well written. However, it lacks clarity at few places that need attention. These are highlighted below.

We thank reviewer for the valuable comments.

Rev : Fig.1 : Are the horizontal lines in left panels LCL?

Horizontal lines in the left panels represent LCL heights for each of the soundings. We apologize for not explaining that in the figure caption. The line colour represents LCL and it is same as that for the corresponding profile. The modified figure is shown below.

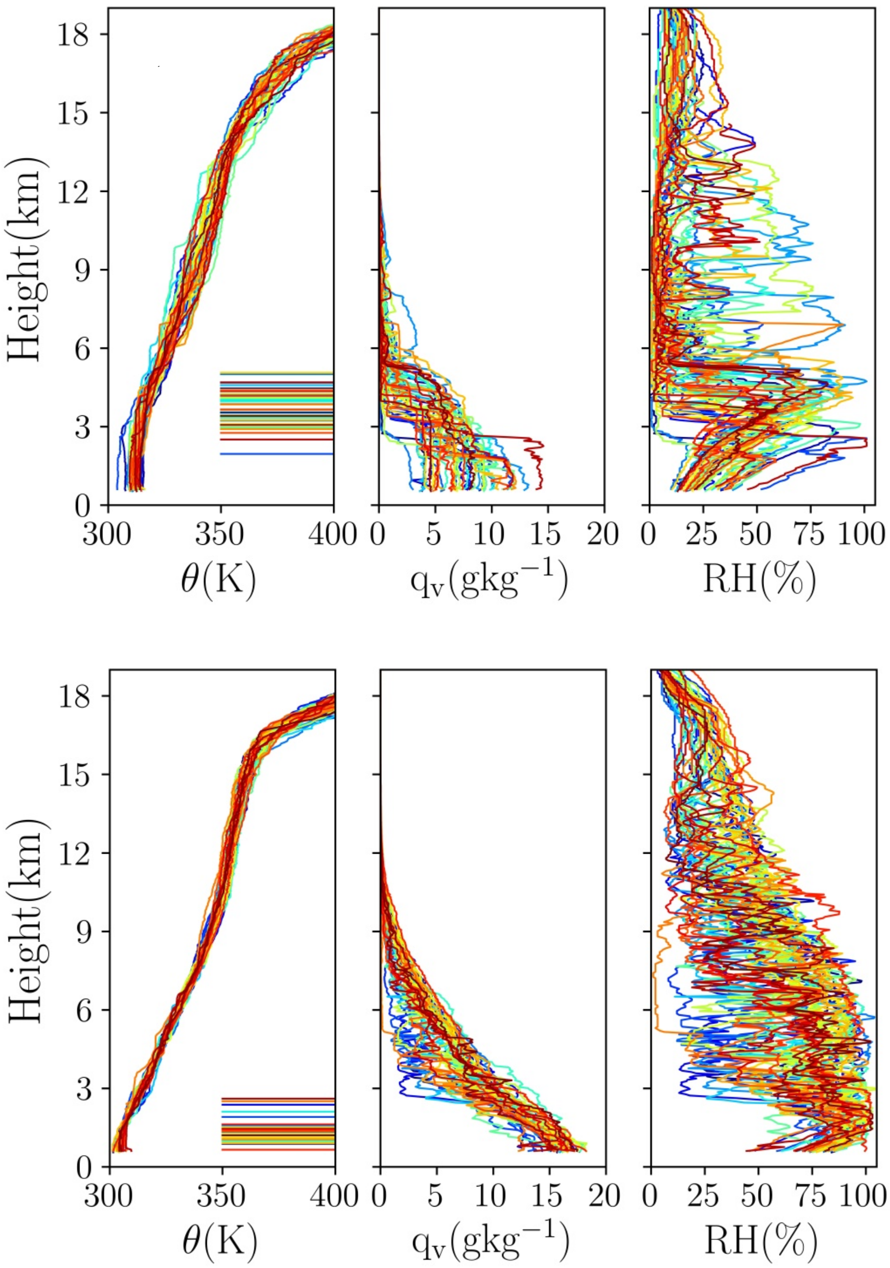

Figure 1: Profiles of potential temperature (θ), water vapour mixing ratio (q_v) and relative humidity (RH) for (upper panels) premonsoon and (lower panels) monsoon soundings. Different colours represent different soundings with a total of 42 soundings for both cases. Horizontal lines in left panels are LCL heights with the same colour as the corresponding profile.

Rev : It's not possible to understand the pre-monsoon vs monsoon difference from these plots. I rather suggest to show mean (and the intra-seasonal spread) profiles or some other means to help following the discussion.

We intend to highlight the following inferences about the premonsoon and monsoon seasons through Figure 1.

- Deeper boundary layer (BL) in premonsoon than monsoon can be identified by the region of constant potential temperature in the lower atmosphere up to 3 km from surface;
- Higher cloud base heights are present for premonsoon clouds and lower cloud base heights characterize monsoon clouds as shown by LCL heights;
- Presence of higher moisture in BL as well as mid-troposphere for monsoon conditions contrasts premonsoon environment that features drier BL and troposphere.
- Premonsoon BL is typically also topped by a strong inversion, which characterize a sudden decrease in RH within a few 100 meters
- Higher relative humidity for monsoon BL with values closer to saturation is evident.
- Well defined tropopause for the monsoon is identified from the sharp gradient of potential temperature at the height of $\cong$16 km

Details of these are discussed in subsections 3.1.1 – 3.1.3.
We feel the dataset is not large enough to present mean and standard deviations for the two sub-sets. We feel the individual profiles are adequate to support the above inferences.

Rev: Are there any major differences in active and break phase of the monsoon?

Retrieving information regarding active and break periods of the monsoon is impossible using the data we have available for this study from a single location. This is because relevant studies concerning monsoon active and break periods (e.g., Pai et al, 2016; Rajeevan et al, 2010) introduces classification based on the weather properties at a larger region, namely the monsoon core region, which covers most of the central India. Our study considers high resolution radiosonde measurements where the data is collected over a single location (Pune, 18^{o} 31′ N, 73^{o} 51′ E) over Indian peninsula and with contrasting local surface forcing. We feel the data cannot be representative of the larger monsoon region. Monsoon is having a significant spatio-temporal variability and classifying such local data for active break conditions may not be appropriate.

Rev : Fig 5 - For low qv case (pre-monsoon 1), CAPE does not show any variation; it starts showing some variation when qv is between 7-14 (pre-monsoon 2 case) and then for the pre-monsoon 3 case, it shows a linear behaviour. Overall, the pattern looks exponential. Does this mean that there is a threshold qv above which CAPE responds to further change in qv? This needs to be clarified.

Yes, we agree. There appears to be a threshold as suggested by the Reviewer. This may possibly suggest the difference between shallow and deeper convection (e.g., congestus). We pointed this out in the revised manuscript.

Rev: How do the two datasets match (e.g. do LCL from the two datasets match). This is important as the conclusions are based on both data sets.

We are not sure what the reviewer is asking here. We hope the information below helps.
The radiosonde measurements for the parcel analysis are from Pune (18° 31′ N, 73° 51′ E) and data for model simulations are from Mehabubnagar (16° 45′ N, 78° 00′ E). Both locations are in the leeside of Western Ghat Mountains in the semi-arid rain-shadow region.

Rev: More details about the numerical experiments are required. From where the boundary conditions are taken? What is the time step?

We expanded the description of the simulations and hope the extended text satisfies the reviewer.

Rev :How are these results useful to understand the aerosol impact? Bringing aerosols further complicate due to forcing and feedback. I suggest to remove the reference of aerosols (last paragraph).

The literature concerning observations of aerosol effects on deep convection is full of claims that mix correlations with causality. The fact that pollution and deeper clouds occur together does not mean that pollution (e.g., as for the premonsoon) causes convection to be become deeper. In other words, one needs to separate effects of pollution from effects of meteorology. We believe that a study like ours that focuses on the meteorology is useful. That said, we do not want to dwell on this aspect and only bring it in the closing paragraph on the paper.

References mentioned above:

Rajeevan et al, 'Active and break spells of the Indian summer monsoon' , J. Earth Syst. Sci. 119, No. 3, June 2010, pp. 229–247

Pai et al, 'Active and Break Events of Indian Summer Monsoon during 1901-2014', Clim. Dyn., vol.46(11); 2016; 3921-3939