Response to Editor's comments

We thank the Editor's comments and constructive suggestions. The corrections made to the manuscript are summarized below along with Editor's comments in italic:

1. *To explain the difference (underestimation) of aerosol AOD and extinction between the model simulations and observations in South Asia, you can look at Pan et al. (2015) to see if there are some additional explanations in this paper. I suggest that you can include Figure R.1 and discussion in the supplement*

   The following discussions regarding the difference (underestimation) of aerosol AOD are now added on Page 11, lines 284-293:
   "Similar underestimation in the modeled AOD compared with the MODIS observations is also found for other months between August 2011 and March 2012 (Fig. S2 in the Supplement). The AOD underestimation is one of the common problems in aerosol model simulations for post-monsoon and winter time periods over the S Asian region. Pan et al. (2015) suggested several possible causes including suppression of the aerosol hygroscopic growth and formation of secondary inorganic aerosol due to low-biased relative humidity in the boundary layer (Feng et al., 2015), omission of nitrate aerosol, and underestimated emissions from agricultural waste burning and biofuel usage. Resolving these differences in AOD is beyond the scope of this paper that intends to identify the vertical location of the biases and investigate the subsequent responses, but certainly deserves further investigation."

   Reference added:
   Feng, Y., M. Cadeddu, V. R. Kotamarthi, R. Renju and C. Suresh Raju, Humidity Bias and Effect on Simulated Aerosol Optical Properties during the Ganges Valley Experiment, submitted to Current Science, in review, 2015.

   Figure R.1 and discussions are also included in the Supplement as Fig. S3. It is referred on page 12 to 13, lines 335-339:
   "Comparison of the standard deviations in the daily extinction profiles (Fig. S3 in the Supplement) and two-sample t-test of daily aerosol extinction time series suggest that the differences between the model calculations and observations (MPL data for Nainital and Kanpur; and CALIPSO data for South Asia) are significant below 2.5 km with p-values less than the significance level of 0.05 (in the Supplement)."

2. *Include Figure R2.1 and discussion in the supplement.*
   Figure R2.1 and discussions are now included in the Supplement as Fig. S2. It is referred on Page 11, lines 284-293, as in the response to the Comment #1 above.

3. *My comments on text: Page 6: L141, L143, "MOZCART"? please check*.

Yes, the chemical module that we used in the study is MOZCART. It is a newly added chemistry mechanism in WRF-Chem. The reference is added on page 6, L141 and L143 as,
"The MOZCART chemistry module (WRF-Chem Version 3.7 User's guide: http:// http://ruc.noaa.gov/wrf/WG11/Users_guide.pdf)".

4. *Page 7: L163. "calculations of optical properties of aerosols assume internal mixing". There is an inconsistency here that should be noted, because GOCART aerosol scheme treat aerosol species as external mixtures (page 6, L143)*.
To clarify, the following is now added on page 7, lines 164-167:
"Calculations of optical properties of aerosols assume internal mixing (Fast et al., 2006) including the Kappa-based hygroscopic growth of aerosol components (Petters and Kreidenweis, 2007), although aerosols are transported as external mixtures."

5. *Page 10 "section 3.2" and "Aerosol extinction profiles" on Page 11, there are formatting problems with the text. please correct*
It is now corrected.

6. *Page 11: What is "i" in equation 1. Vertical levels?*
Yes. The following is now added on page 12, line 308:
"…, *i* denotes the vertical levels from the surface up to 8 km (level *n*) at 0.1 km intervals."

7. *Page 16: L434-436. Since BL cooling is a large term in the heating profile, please explain what cause the BL cooling. Through which physical processes?*
BL cooling calculated by WRF is an accumulated temperature tendency due to boundary layer dynamic processes. In this case, because the simulated aerosol effects reduce the temperature gradient between the land and atmosphere, the surface buoyance production is reduced. It leads to the suppression of the convection in the BL that transports the heat fluxes, causing the cooling. These discussions are now added on page 16, Lines 450,
"Because the simulated aerosol effects reduce the temperature gradient between the land and atmosphere, the surface buoyance production is reduced. It leads to the suppression of the convection in the BL that transports the heat fluxes, causing the cooling."

8. *Figure 5: change scales (color bars) of Figure 5b-d to use finer scales between 0 and -400m.*
It is now revised as suggested as,

(a) Without aerosols (b) Control run

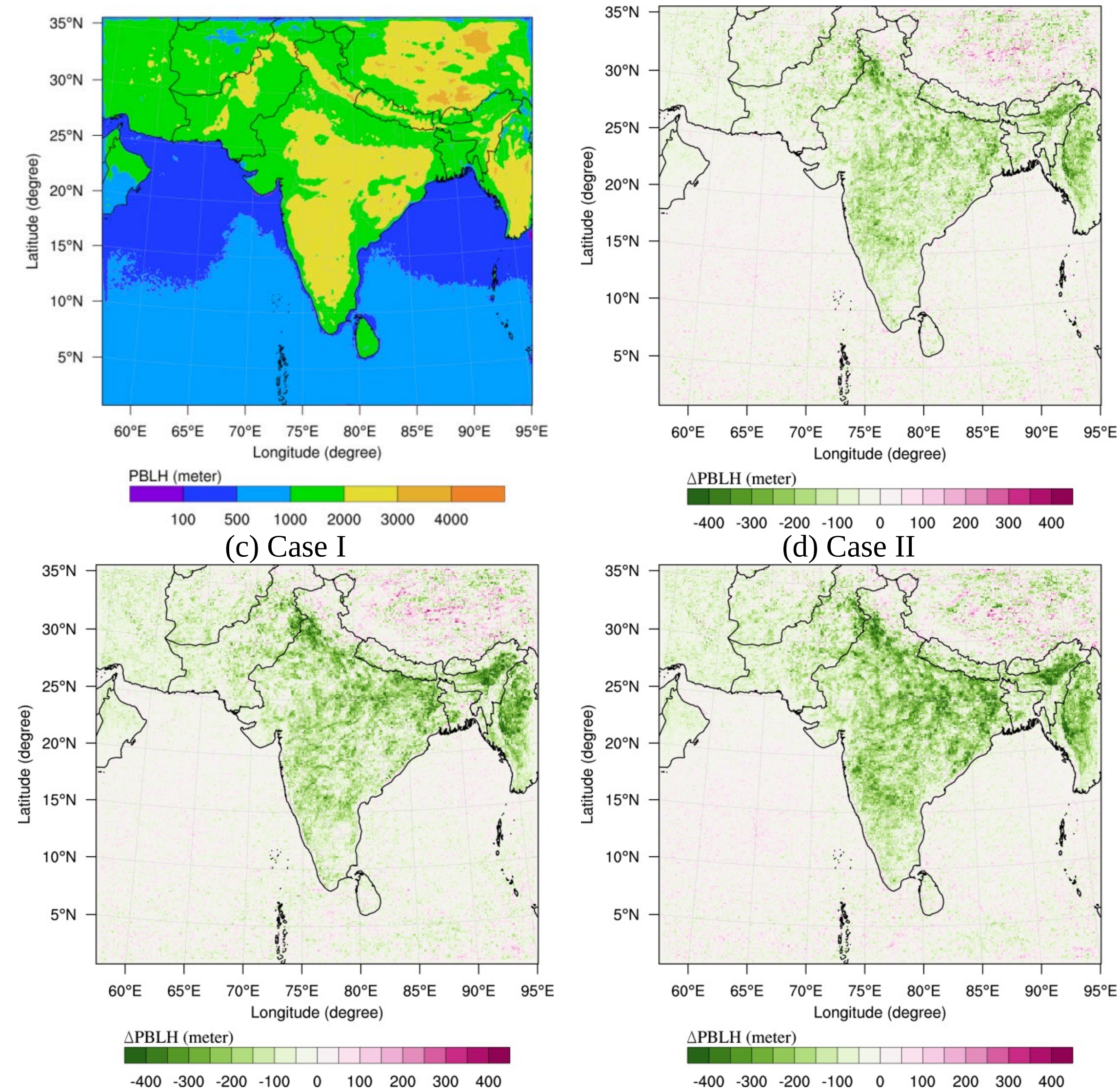

Figure 5. (a) Calculated monthly mean planetary BL height (PBLH) at 1300-1400 local time for March, without aerosols; and estimated changes in PBLH (ΔPBLH) due to aerosols in (b) the control run, (c) Case I, and (d) Case II.