

Interactive comment on “Radiative and thermodynamic responses to aerosol extinction profiles during the pre-monsoon month over South Asia” by Y. Feng et al.

Anonymous Referee #1

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Review of "Radiative and Thermodynamic Responses to Aerosol Extinction Profiles during the Pre-monsoon Month over South Asia" by Feng et al.

The authors have produced a thorough and informative investigation into the observed and modeled AOD and extinction profiles of aerosols over South Asia, and the implications of model underpredictions on thermodynamic and radiative effects. Their results very nicely show the importance of better constraining the vertical profiles of both scattering and absorbing aerosols, and of running regional climate models in support of the global intercomparisons. The paper is well written, the analysis well documented and the figures well chosen and clear. I recommend the paper be published in ACP, after

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minor revisions.

My minor comments to the present manuscript are as follows:

To the first part of the paper, regarding the comparison of models and observations:

- While the authors document significant difference between their model and observations for the chosen time period, it is hard to interpret the results without some knowledge of natural variation in aerosol loading in the region. A brief discussion on this, e.g. including some climatology of AODs from MODIS or AeroNet, would be beneficial to the reader here.
- The authors provide some indication of the uncertainty on the CALIPSO data, but apart from this there is little evaluation of the significance of the differences found between models and data - e.g. in Table 1 and Figure 2. An assertion that a significance test has indeed been performed should be added here.

To the second part, on the radiative and thermodynamic responses to the different aerosol profiles:

- For the results shown in Figures 5, 6 and 7, it is hard to assess whether the differences found are actually due to the changes to the aerosol profiles, or to internal variability in the modelled climate system. While the focus here is on the difference between the extinction profiles, under identical climate conditions, running e.g. three perturbed ensemble members for each profile for the selected month would greatly strengthen the impact of these figures. I would urge the authors to consider this, even if it means spending some extra computational time.
- Page 16915, line 27: "Therefore, the largest warming is calculated for Case I". Given the almost vanishing temperature response over oceans here, and the closeness of the three curves in Figure 3, is this statement statistically valid?