

Interactive comment on “How can aerosols affect the Asian summer monsoon? Assessment during three consecutive pre-monsoon seasons from CALIPSO satellite data” by J. Kuhlmann and J. Quaas

Anonymous Referee #1

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The effect of anthropogenic aerosols on Asian summer monsoon has become an active topic recently. Among such studies this paper is unique in conducting an analysis using satellite retrieval and reanalysis meteorology instead of performing model simulations. The authors have compiled 3-year worthy CALIPSO aerosol profiles during the pre-monsoon season and then calculated aerosol heating, in an attempt to examine the hypothesis of “Elevated Heating Pump” mechanism suggested by Dr. Lau and colleagues. The major finding turns out to be non-supportive to the EHP mechanism, as the authors find that the heating of absorbing aerosols over Tibetan Plateau is not

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significant comparing to that over Ganges and Indus Plains. The research is interesting and the result is refreshing to the heavily model-centric field. However, the authors might want to address several concerns before publication. The following comments might serve the purpose to help the authors to improve their manuscript.

1. Pre-monsoon season: the authors used March-April-May as the pre-monsoon season in their analysis and this is quite different than the April-May duration in most other studies. The authors might want to switch the analysis duration for comparability.

2. Statistics of CALIPSO: the CALIPSO data advances in providing high-resolution vertical profiles of aerosols and clouds. On the other hand, because the thin slice path it suffers in statistical representation of aerosol distribution outside its track. How to assess such representation is still challenging. The authors might want to provide at least the statistics over selected regions, i.e., the variability of ensemble of all track data within these regions. This could be done, e.g., by adding variability measures above Figure 2 among others.

3. Recent studies including Wang et al. (2009; GRL, v.36, L21704) and Levermann et al (2009; PNAS, v. 106, p.20572) suggested alternative views on the aerosol-monsoon influence. The authors might want to compare their findings to these works. Specifically, the quantity and location of aerosol heating estimated in this paper seems quite consistent with Wang's results. This type of analysis might be also useful to address the statistics issue in 2.

3. Reanalysis wind: the authors perhaps noticed that these wind data might not correctly reflect the aerosol forced flow because of a lack of aerosol forcing in the reanalysis model.

4. Certain discussions of the paper suffer from a domain being put too north that does not cover many of the Indian land region and arguments being weighted too heavily on the EHP hypothesis itself. For instance, p.4895, line 15-18, the authors argued that smoking aerosols are less important to the monsoon system, perhaps what they really

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meant was that this would be the case should the EHP was the only mechanism of smoke aerosol to affect monsoon system?

5. In section 5, the discussions of downward or upward radiative fluxes did not always come with corresponding locations (e.g., TOA or surface). In addition, the authors should indicate the limitation in using clear-sky radiative budget to discuss TOA and surface forcing (particularly when dealing with absorbing aerosols) although it is understood that this is perhaps the best usage of satellite retrievals.

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