

## ***Interactive comment on “Spatial distributions and seasonal cycles of aerosol climate effects in India seen in global climate-aerosol model” by S. V. Henriksson et al.***

**Anonymous Referee #4**

Received and published: 30 August 2013

The authors used a climate model with interactive aerosols to conduct a series of equilibrium experiments with the goal of improving the current understanding of aerosol-climate interactions over India and the role of aerosols on the seasonal evolution of regional climate. The topic of aerosol-monsoon interactions has received a lot of attention across the scientific community in the last few years and is widely debated. A number of uncertainties still remain and make the problem challenging. However, the manuscript has a major weakness related to the design of the numerical experiments which I deem very important and needful of a major improvement before the work might be acceptable for ACP.

C6363

The authors use fixed SST in their experiments, despite the atmospheric forcing changes from one experiment to another due to different combinations of aerosols. SST plays a major role in driving the monsoon annual cycle and is an integral component of the monsoon system. Interactive SSTs could for example be obtained by conducting experiments with a mixed-layer model, if a couple model is computationally too expensive. Along this line, the choice of reducing the meridional SST gradient by 0.5K is arbitrary and might not be consistent with the model response to the forcing.

In addition, the authors conduct experiments for 6 years only, of which 5 are averaged in the analysis, which is a very short period. To sample internal variability, simulations should cover at least 20 years.

Furthermore, the same SST distribution is used in a number of different experiments, despite the forcing is different. This is not clearly realistic. Note also that the prescribed SSTs already include part of the forcing by aerosols and thus, assuming linearity, differences between the responses should be better computed.

The discussion of the results is at time confusing and lacks of depth, especially on the mechanisms and processes responsible for the changes shown in the figures. NOABS setting: is SSA set to 1 for all aerosols?

Page 18039, line 25: How do you attribute the warming to the EHP hypothesis? This is just 2-m temperature, and it is not collocated with the largest aerosol forcing. You need to provide more evidence.

The choice of the northern and southern India domains is arbitrary, and not meaningful considering the low resolution of the model. Why do not you show the spatial pattern of the precipitation changes?

---

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 18031, 2013.

C6364