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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sources of black carbon aerosols in South Asia and surrounding regions during the Integrated Campaign for Aerosols, Gases and Radiation Budget (ICARB)" *by* R. Kumar et al.

Anonymous Referee #2

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This manuscript examines black carbon (BC) aerosol concentration in South Asia and contributions from different sectors during the three-month ICARB campaign period. They find that anthropogenic and biomass burning emissions contribute to 70% and 28% of the BC surface concentration on average, and the residential and industrial sectors are major anthropogenic sources in most of the region. In addition, the long-range transport contributes up to 30% of BC in eastern and western India. The model experiment is well designed and the model results are evaluated with observations available. The manuscript is organized in a clear structure and reads well.

However, overall it does not offer much new insights. The authors may attempt to provide a more quantitative breakdown of contributions by different emission sectors to BC surface concentrations over this region. With only three-month simulations, as noted by the authors, I am not sure that it is very useful for that matter, because there are large temporal variations in aerosol emissions and regional meteorology that could affect the distribution and transport of aerosols in this region. I strongly recommend for longer-term simulations for at least a year, and seasonal analysis is needed. In particular for insights on developing mitigation strategies, multiple –year trend analysis of emission sector changes and meteorology changes may be needed.

Another concern is that all the attribution analysis seems to be done for the surface concentrations of BC only. The importance of understanding surface BC distribution is not discussed. Radiative effects of BC are important, but they depend on other BC properties as well, such as vertical distribution, particle size, mixing state, which are not discussed in the paper. It looks like a solid evaluation of BC surface concentrations simulated by WRF-Chem but falls short of scientific focus.

Minor comments:

1. Page 30729, Line 7: first-time use of SD. It needs to be spelt out;

2. Line 13: “70%”;

3. Line 18: “the southern Peninsula”;

4. Line 19: “contributes”

5. Page 30730, lines 6-7: “wet or dry deposition at the surface” reads like wet deposition at the surface?

6. Line 10: “variations”

7. Line 13: “emissions”

8. Line 19: do you mean, atmospheric heating over the elevated Himalayas?

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9. Page 30731, Line 17: first-time use of “BoB”, and “AS”. It needs to be spelt out;
10. Page 30732, line 2: ad “geographical” before “distribution”
11. Page 30735, line 13: why “20 January 2011”
12. Page 30736, line 6: “SD” of observation or model results?
13. Line 7: add “of model results” after SD
14. Page 30737, line 8: “distributions”
15. Line 9: add “at” before “high altitude cleaner sites”
16. Line 10: replace “like right” with “reasonable”

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 30727, 2014.

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