

# ***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 #1**

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### General Comments

The paper of Kumar et al. investigate the relative contribution of black carbon (BC) from different emission sources, sectors and regions to total surface BC concentrations in South Asia and surrounding regions. This is done with WRF-Chem model, evaluated by information from ICARB campaign. While the authors address the topics listed in the paper, it is not immediately clear how significant the results actually are.

First, surface BC concentrations in source regions are closely related to the emissions.

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The relative contributions from different emissions sources and sectors could be inferred by the emissions inventories. It would be helpful if the authors also provide relative contribution from different sources and sectors to total emissions and give a discussion if there exists large difference when compared with current model results.

Second, this study investigates the relative contribution of local versus regional anthropogenic sources. It is confusion why the authors do not provide any information about the meteorology and its implication for regional transport. How will the Indian Monsoon current affect the results? What is the meteorological condition during the modeling period (Mar-May) compared with other seasons?

Last, the increasing trend of emissions in South Asia (also mentioned in the paper) is of great concern. This study is done for the year 2006. Could the results be used to extrapolate the situation in more recent years?

In summary, this paper is generally well written. It describes what they did and is easy to follow along. It is worthy of publication in ACP subject to addressing these and specific comments below.

#### Specific Comments

p. 30729, line 25 – p. 30730, line 9, there are more recent studies (e.g. Wang et al., 2014, Global budget and radiative forcing of black carbon aerosol: Constraints from pole-to-pole (HIPPO) observations across the Pacific and Hodnebrog et al., 2014, How shorter black carbon lifetime alters its climate effect) suggesting shorter lifetime of BC (around 4 days rather than one week), which reduces the direct aerosol effect closer to the lower range of AeroCom Phase II models.

p. 30731, line 17, what is “BoB” And “AS”

p. 30733, line 17-21, does the emission inventory account for the seasonality in emissions? How is emission during Mar-May compared with other seasons?

p. 30736, line 6-7, What is the possible reason for the large differences seen in the

northern coastal BoB? There is also large difference in the southern costal of BoB in Figure 4, any explanation?

p. 30738, line 27 – p. 30739, line 2, there is eastward increase due north of 13°N of BoB in BC-ANT concentrations (not affected by biomass burning) from Figure 5e, any explanation?

p. 30739, line 28-29, it is hard to tell from the figure that southern parts of the AS have higher contribution of transport sector than the northern parts.

p. 30754, the yellow lines for the ship tracks are hard to see in the figure.

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

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