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## ***Interactive comment on “Carbon balance of South Asia constrained by passenger aircraft CO<sub>2</sub> measurements” by P. K. Patra et al.***

**Anonymous Referee #2**

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This paper examines CO<sub>2</sub> fluxes in South Asia using CARIBIC and GLOBALVIEW-CO<sub>2</sub> data and ACTM forward transport model in a 64-region global Bayesian inversion. Forward model simulations of CH<sub>4</sub>, N<sub>2</sub>O and SF<sub>6</sub> are used to check the realism of the ACTM transport. Results suggest a net uptake of 0.37 Pg C/yr by South Asia for 2008. Independent CONTRAIL measurements are used to validate the results. This paper contributes to better quantification of carbon fluxes in a previously poorly constrained region under unique climate conditions. The results have implications about the ecosystem in this region.

Checking the forward model transport using a multi-tracer approach before the inversion is a nice practice. However, without information on the errors of the emission inventories of those other species, it seems difficult to judge if the discrepancies be-

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tween model and observation are largely due to transport or emission. The paper shows better simulations of CH<sub>4</sub>, N<sub>2</sub>O and SF<sub>6</sub> (presumably with better inventories) than CO<sub>2</sub>. It is probably worth mentioning in the paper that “most” of the discrepancies in the CO<sub>2</sub> simulations are due to surface fluxes, although there are still transport errors which affect all the simulations, and this paper attributes all the discrepancies to surface fluxes.

At the bottom of Page 5386, the paragraph starts with “Figure 2 gives the spatial distribution of CO<sub>2</sub> fluxes ...”. There are no further discussions on what the reader is supposed to get from this figure. A sentence or two about Figure 2 before introducing Figure 3 will help.

It is not clear from the text what Figure3b for Arabia is supposed to show.

Page 5382, is it because that ACTM is only coupled to AGCM that the NCEP reanalysis can not be directly used to drive ACTM?

Page 5390 in the middle of the 1st paragraph, “Figure 5 shows comparison of ...”. It should be “Figure 6”.

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 5379, 2011.

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