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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Estimating Asian terrestrial carbon fluxes from CONTRAIL aircraft and surface CO_2 observations for the period 2006 to 2010" *by* H. F. Zhang et al.

Anonymous Referee #1

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The CarbonTracker inversion system is configured for the Asia region. They have used some of the Chinese inland sites and aircraft data from CONTRAIL for constraining the CO2 fluxes from several eco-regions. I believe such efforts are long overdue for the Asian regions. But I am sceptic of the results presented here. The recommended Asian sink is apparently too large. What is more serious that the presentation of results are partial (as always for the CarbonTracker papers), which does not allow the readers to evaluate the quality of inversion. For the sake of completeness for any inversion system, the global total sources and sinks must be tabulated. For example, the CT CO2 for the all NH land sink is given as ∼1.5 PgC/yr in Peylin et al. Now how will

that look like if ∼1.5 PgC/yr sink is assigned to Asia alone? Unless this big picture is clarified, there is no value in discussion the numbers presented in Table 4 for detailed ecoregion. As we know the quality of inversion results depend critically on the forward model transport and since the inversion uses aircraft measurements, exploring vertical profile (both a priori and a posteriori) comparison would greatly benefit the research.

Specific comments: p.27600, l.22 : It feels like "rapid economic growth, steep population expansion" are a source of uncertainty. This cannot be. Text should be more scientific.

p.27600, l.27 : you should attempt to separate natural vs anthropogenic variabilities. in any case variability should be treated separately from estimation uncertainties

p.27602, l.12 : "The latter papers show ..."

p.27602, l.15-25 : delete this para - it is a kind of repetition.

p.27605, l.16 : Gfed3 is available already for quite some years, but not used. Any reason?

p. 27606, l.1-6 : Odd formulation of sentence. Something like "CO2 time series from 9 sites by NOAA..., one site by CSIRO ..." May be site here relevant papers for CRI, GSN etc. sites

p. 27606, l.13 : definition of free troposphere, please.

p. 27606, l.16 : I thought the main reason for not including stratospheric data is that they do not constrain surface fluxes in your assimilation system. If the seasonal cycle is not in line with that for tropospheric data, your model transport should take care of that.

p. 27606, l.25 : Explain why you need to grid contrail data? CTDAS should be ingesting instantaneous measurements.

p. 27609, l.3 : Amplitude means winter-summer values? reformulate the sentence.

p. 27609, l.10ff : I guess these statistics are for a posteriori model and measurements comparison. Such statics are meaningless unless compared in relation with a priori model. Need to discuss both or delete.

p. 27610, l.1-2 : What is the meaning of these number of obs? Can you tell how many of these contain independent piece of information?

p. 27610, l.6 : Don't you need to skip 2006 as spin up?

p. 27610, l.11 : Would be informative to say how much from top 3/4 countries.

p. 27610, l.16 : The numbers are fine as such, but are the % meaningful, the particularly the 9% source in tropical Asia!

p. 27610, l.24 : I thought Valsala et al. discussed intra-seasonal variability, not IAV. Recommend deletion from this sentence and add another sentence by highlighting their novel findings.

p. 27615, section 4.2ff : Needs complete reworking.

Table 3 : I strongly recommend you list the other big region fluxes, even though this paper is about Asia, at the least tabulate the global total land and ocean fluxes by addition of rows. This is mainly because I find the estimated sinks over Asia is too large, and the global balance will give the readers a chance to make their own judgment.

Table 5 : Could you also list the a priori fluxes; biosphere, fossil etc., and a posteriori ecosystem and fire fluxes?

Table 6: I understand this table may be meant for a rough comparison of your results. But sill I will urge you to get the fluxes for your region definition from the cited references. It ok if you do not get a response - worth a try.

Figure 3: These site level CO2 concentration time series do not make any value-add. It is enough as discussed in the text. Please show a priori and a posteriori fluxes time series for the regions separately, as discussed here, for all the inversion cases. May

be then you can compare with other studies too for flux seasonality.

Many of your interpretations may change after you account for the comments on Tables 3-6 and Figures, and the associated texts accordingly. I will be happy to read the revised ms.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 27597, 2013.