

Interactive comment on “Carbon balance of China constrained by CONTRAIL aircraft CO₂ measurements” by F. Jiang et al.

Anonymous Referee #2

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General comments:

This paper studies the terrestrial carbon fluxes in China using a previously established model setup and different data constraints, which lead to two different inversion products, i.e. GLOBALVIEW-CO₂ data based (GV) vs. GLOBALVIEW-CO₂ and CONTRAIL data based (GVCT). In addition, CO₂ measurements at three observational sites in China are used to evaluate the posterior carbon fluxes in a forward model framework. The authors also try to correlate integrated carbon fluxes in large regions with climate factors such as radiation and temperature in an effort to validate their inversion results. It appears that the inversion results are qualitatively correlated with the climate factors, but is less convincing without a thorough quantitative analysis. On the other hand, the inversion method and the data used in this paper are sound in general, however, critical

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screening of the data and discussions of their limitations are clearly missing. Furthermore, the reduction in the posterior uncertainty with the added CONTRAIL data is only 2.2%, which does not support the authors' conclusion that "CONTRAIL data have helped improve the inversion results for China". The manuscript needs a major revision before it can be considered publication.

1) Details on the use of the CONTRAIL data are needed. For example, what are the criteria for screening out polluted profiles near airports? The authors' statement on page 7688, "In view of high pollution near the ground around airports by aircraft emissions, only data measured above 2000m are used" does not give sufficient information for a judgment. Furthermore, how did the authors deal with potential stratospheric influences? Note that stratospheric influences were characterized and filtered out in Sawa et al. 2008 and Niwa et al. 2012.

2) Regarding the CO₂ measurements at three stations in China, why were they not assimilated directly in the inversions? The authors discussed the seasonal and spatial variations of the priors and posterior fluxes, and compared them with Niwa et al. 2012. However, there are clear mismatch between the simulations and the observations for all three stations, which seem to point to late ecosystem carbon sinks.

3) How were the data uncertainties prescribed? Especially in the context of surface (GLOBALVIEW) vs. free troposphere (CONTRAIL).

A few details:

- 1) The unit of CO₂ concentrations should be ppm, not ppmv
- 2) Page 7684, line 17: the magnitude of the uncertainty reductions needs to be clarified
- 3) Page 7688, what periods are the CO₂ measurements at the three sites available

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