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Interactive comment on “Nested atmospheric inversion for the terrestrial carbon sources and sinks in China” by F. Jiang et al.

Anonymous Referee #3

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A study by Jiang et al addresses important issue of the evaluating a trend in China's net terrestrial biosphere fluxes over the last decade. Authors apply inverse model setup similar Transcom-3. The paper largely follows approach and inherits technical details from Deng and Chen 2011. A study has a potential for contributing to top-down and bottom-up synthesis of the regional carbon cycle budget analysis for which RECCAP could serve as most recent example. In this context its publication is justified after improving the analysis and the manuscript. The choice of the prior flux datasets and inversion method are not causing much concern. However several details do require clarifications and revisions, thus the manuscript should be revised to correct the problems, or resubmitted in case revision takes much time. It is recommended to devote ample time for revision given the volume of the required analysis. Several mistypes and omissions indicate that the manuscript has not been thoroughly checked prior to

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Interactive Discussion

Discussion Paper



publication at BGD; checks should be improved in final version

Specific comments

1) Following the text (p 1187) one would assume BVOCs are converted to CO₂ in a matter of a day. On the other hand atmospheric chemistry kinetic mechanisms usually describe that BVOCs end up as CO, not CO₂, after reacting with OH. And it takes some time (1-2 month) to convert CO to CO₂, obviously enough for air to escape from China region. The discussion should be revised accordingly. As emissions of BVOCs along with those of CO serve as a leak of emitted carbon not detectable by CO₂ observing network and inversion, authors are right to consider the question in relation to the China's carbon budget. However, the discussion presented here does not sufficiently reflect recent progress in the treatment of the chemical source of CO₂ in the problem of global atmospheric CO₂ transport.

2) Source of the original data should be cited accurately: p 1181, line 13. "Data of land cover is obtained from <http://lpdaac.usgs.gov> (LP DAAC, 2001)" The land cover classification/legend not shown and reference to data set are not given, need to cite more specifically. p 1182, line 21. Similar problem with fossil fuel emissions dataset, the original reference would be required here. Citation as "the fossil fuel emission field, which is obtained from Carbon Tracker 2010 (<http://carbontracker.noaa.gov>)" is not sufficient.

3) BEPS model setup description used in this study is missing. Details should include model resolution, spin-up, vegetation, soil data, meteorological data, remote sensing data and other parameters which have changed since Chen 1999 publication.

4) Nested TM5 setup for China is different from one for North America (Deng 2011), its description is missing.

5) Interpretation of the results should be more careful. p 1188 Based on comparison with mean flux results by Piao et al authors concluded "these probably imply the in-

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crease of the carbon sink in China in 2000s". The statement is not justified because the techniques used here and in Piao et al are different. Suggest withdrawing the statement.

6) The inversion presented in this study is very similar in transport model resolution and observation dataset being used to the operational and semi-operational inverse model estimates for the same period and region that are reported by Carbontracker, LSCE, MPI-BGC systems. Thus it is important to compare with available fluxes and report range of differences to understand better the range of flux uncertainty stemming from differences in model setups, prior fluxes and region aggregation.

Technical corrections

p 1178 Abstract: "Bayes theory" – Is usually cited as "Bayesian approach"

p 1184 WDCGG Correct writing is: "World Data Centre for Greenhouse Gases"

p 1190 line 8 "BESP" – should it be BEPS? "OPA- PISCES-T" – spaces are not needed.

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