Atmospheric
Chemistry
and Physics
Discussions

ACPD

Interactive comment

Interactive comment on "Differences of the inverted terrestrial ecosystem carbon flux between using GOSAT and OCO-2 XCO$_2$ retrievals" *by* Hengmao Wang et al.

Anonymous Referee #1

Received and published: 31 December 2018

General comments. The authors make contribution to an under-explored topic of understanding differences between the global fluxes estimates based on GOSAT and OCO-2 satellite observations of atmospheric carbon dioxide. By applying same inverse modeling system, same prior fluxes and inverse modeling setup, and using retrievals made with a very similar algorithm, they constructed a good base for comparing performance of the GOSAT and OCO-2 data in application to a problem of quantifying regional carbon fluxes. The study has a potential to contribute to an important problem of understanding the global carbon cycle response to 2015 El-Nino climate anomaly, by providing the alternative views to the phenomenon from the 3 independent observing systems. Although most of important work is already done in this study, more analy-

Printer-friendly version

Discussion paper

sis and possibly more extra model runs are required to arrive at robust conclusions, as there is still inconsistency between global annual terrestrial flux estimates made with different observing systems, that should be addressed and elaborated. The study should benefit from giving authors extra time for making necessary revisions.

Specific comments.

Line 1 Title can be simplified to "Terrestrial ecosystem carbon fluxes estimated using GOSAT and OCO-2 retrievals."

Line 66 OCO-2 observations have lower random noise compared to GOSAT, but it is not related to vertical difference in sensitivity. Generally, SWIR observations by both sensors have flat sensitivity to CO2 from the surface to the upper troposphere, thus citing sizable difference between GOSAT and OCO-2 in sensitivity to lower troposphere concentrations requires elaboration, giving more details. Suggest to replace "higher sensitivity near the surface" by "higher sensitivity to column CO2".

Line 171 It is useful to elaborate on application of scaling factors to carbon flux – are those factors applied to total carbon flux in each grid or separately by each optimized component.

Line 237-240 The differences between net flux for 2015 should be related to different atmospheric CO2 growth rate between ground based (also used used in CT2016), GOSAT and OCO-2 observations. Suggest to add those atmospheric CO2 growth rate estimates to comparison, along with inversion-optimized posterior growth rate for all experiments. If the difference between observed ground-based, GOSAT and OCO-2 growth rates is not as much as appears in the inversion results, the inversion setup should be adjusted to provide sufficient constraint on fluxes, so that the growth rate in the inversion optimized simulation matches the observed growth rate.

Technical corrections

Line 26 Suggest to spell out CT2016 as Carbontracker 2016.

Line 43 Need to add "et al." to Chevallier 2007

Line 54 Note that in Takagi et al 2011 only flux uncertainty and uncertainty reduction are estimated, not the fluxes themselves.

Line 82 Reference to GEOS-Chem adjoint is needed here.

Line 105 Replace "Before used" to "Before being used" or "Before using"

Line 212 Add period in Single et al, 2011

Line 219 Uncertainty is assigned to ocean flux, while it was stated that only terrestrial fluxes are not optimized on Line 209-210. Need to make the text consistent.

Line 256 Change 'priori' to 'prior' here and further in the text.

Line 275 Reference is missing.

Line 523 Suggest correcting "Bron" to "Breon"

———————————————————