

***Interactive comment on “In situ measurement of CO<sub>2</sub> and CH<sub>4</sub> from aircraft over northeast China and comparison with OCO-2 data” by Xiaoyu Sun et al.***

The paper by Xiaoyu Sun et al. describes airborne in situ measurements of two major greenhouse gases (GHGs), CO<sub>2</sub> and CH<sub>4</sub>, in Northeast China on 3 days in August 2018. Using a twin engine turboprop aircraft, GHG mole fractions were sampled between altitudes of 0.6 km – 7 km above a predominantly agricultural area. Three flights, each consisting of spiral-down maneuvers with intermittent constant-altitude segments, were carried out in the morning hours, between 0800 and 1100 local time. The authors provide quasi-instantaneous vertical profiles from these three flights and compare to carbon cycle data assimilation system (Tan-tracker) and OCO-2 profiles. The subject of this manuscript is highly topical and targets the need for high-quality, traceable airborne observations of the main GHGs to tackle uncertainties in the global carbon cycle. I recommend publication after addressing some minor comments.

***General:***

Sect. 2: Have there been any in-flight measurements of the standard gases? Unfortunately it is often not enough to calibrate the instrument before and after the flight, as the ambient conditions during flight induce spectroscopic changes that can only be verified from in-flight online calibration. The instrument may well be stable right before and after the flight, which however does not imply stability under flight conditions. This is presumably also the reason why the authors omitted data associated with rapid vertical movement.

Sect. 4.1: I wonder why the authors refrained from using the co-measured H<sub>2</sub>O mole fractions. To my knowledge the UGGA 915-0011 provides water vapor measurements that are implicitly used to online correct for dilution and broadening effects.

***Specific:***

p. 2, l. 33-35 Please provide a reference for the statement “Accurate measurements of [...]”

p. 5, l. 161 What does the word “reserved” refer to in “[...] data collected and reserved while [...]”

p. 8, l. 219 The authors can only claim this for the 3 days of measurement and the region sampled.

p. 8, l. 228 How many stacked layers reside in the vertical coverage of the aircraft?

p. 8, l. 240 Please be more specific about “[...] but with large differences in values.”