Interactive comment on “A comparison of in-situ aircraft measurements of carbon dioxide to GOSAT data measured over Railroad Valley playa, Nevada, USA” by J. M. Tadic et al.

General comments

This paper describes CO_2 and CH_4 measurements by a CRDS installed on an Alpha jet and by GOSAT above Railroad Valley (RRV). RRV is a dry lake with small local emissions of carbon species and has been used to calibrate various satellites before. The authors compared the measurements from the aircraft and GOSAT. Major revisions are needed before publication because of the following reasons:

(1) The authors should discuss the stratospheric error when vertical profiles of CO_2 are extrapolated to the stratosphere using ACOS a priori. The authors assumed the stratospheric profile of CO_2. It is necessary to estimate the error caused by the stratospheric profile.

(2) The Alpha jet measured the vertical profiles of both CO_2 and CH_4. The authors showed the profiles of CH_4 over RRV. Why did the authors not

discuss the results for the column abundance of CH_4 as well as CO_2? Readers are interested in the comparison of CH_4 obtained from the Alpha jet and GOSAT.

(3) Figures are not referred to in the text properly, and their quality is not sufficient to understand them. Some figures and legends caused misunderstandings.

Specific comments

P. 5644 L25–P. 5645 L11

Commercial CRDS is designed for use in pressurized space. There is some difficulty with taking measurements outside the cabin. The Alpha jet has unpressurized wing pods. It would help the readers if the authors prepared a schematic of the improved CRDS instrument.

P. 5645 L10

How often did the instrument log concentrations of CO_2, CH_4, and H_2O?

P. 5645 L12 CRDS instrument calibration

Do the CO_2 and CH_4 concentrations from CRDS shown here indicate the H_2O-corrected values? The authors should discuss the effect of H_2O on CRDS measurements. If the CRDS has a dehumidification system, the authors could make a note of it.

P. 5645 L14–22

The authors mentioned two types of standard gases of a NOAA ESRL and Scott Marrin, Inc. Are these standards WMO-compliant?

The authors mentioned an assessment of the instrument linearity by using three synthetic standards (Scott Marrin, Inc.). I think that accuracy (~4 ppm for CO_2) of these standard gases is not enough for calibrating the CRDS.

P. 5648 L23

The authors mentioned that profiles obtained by the Alpha jet were acquired to within a few tens of meters off the ground. The referee is not sure whether the authors used in situ ground measurements to synthesize the profiles. It is better to include the ground in situ

measurements to calculate the column-averaged mixing ratios.

P. 5649 L13

The full form AJAX is not specified.

P. 5649 L13

The interpretation of method 2 is not clear. The actual tropopause height can be calculated via coincident radiosonde measurements at RRV. The authors could reconstruct profiles using actual tropopause heights. Were the profiles extrapolated to a constant 388 ppm at a tropopause height of 140 hPa? The referee might have misunderstood that. Furthermore, the bottom panel of figure 6 seems to show something different from that stated in the text.

P. 5649 L23

A plot of the averaging kernels used for comparison with GOSAT would help the reader’s understanding.

P. 5650 L20

The authors mentioned GOSAT's capability to capture synoptic variability. This would be a very interesting point for readers if GOSAT can observe such synoptic variations. However, there is no detailed discussion about this issue. The referee expected further discussion.

Technical comments

P. 5650 L7

filed → filled

P. 5660

Fig. 3 normaln → normal