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Atmospheric Measurement Techniques Discussions

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. Tadić et al.

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Responses to reviewers' comments on the paper:

A comparison of in-situ aircraft measurements of carbon dioxide to GOSAT data measured over Railroad Valley playa, Nevada, USA; Tadic et al.

Reviewer 1

***Asks for a broader perspective on the reported results:

We have added a sentence in the Introduction pointing out that the work provides

an important test of the JPL OCO-2 (Orbiting Carbon Observatory 2, launch planned 2014) analysis algorithm (ACOS 2.9) using current GOSAT data. This point was also made in the original abstract.

***. . .also CH4 mixing ratios were measured. . ...no discussion. . ..blamed on lack of satellite retrievals. . .

The OCO-2 algorithm for the analysis of CH4 columns XCH4 from the GOSAT data was not running at the time this paper was submitted. We considered the CO2 data to be of significant importance that we preferred to present them rather than waiting for the CH4 column analysis to be ready

***. . .observational site was chosen because it is flat. . .. . .

The site was chosen because it is a standard site used for radiance calibrations of satellite instruments. JAXA made ground reflectivity measurements simultaneous with the Railroad Valley campaign and the GOSAT overpasses on the dates for which our data is presented in this paper.

***Two extrapolation methods to higher altitudes are used. . ..

Without going into detail about the technique, we employed 2 very simple extrapolations and then compared the result in XCO2 from the two. We found that the difference in derived CO2 amounted to about 0.5 ppm. Thus the uncertainty introduced by the extrapolation method is apparently on the order of +-0.25 ppm.

***. . .[Vay et al.] is only one regionally restricted example. . ..many more measurements. . ..

We have a direct comparison with Vay from a single coordinated profile flight of the DC-8 and the Alpha Jet. Other of the reviewer's quoted profiles do not serve either to compare directly with our measurements, or to coordinate with any GOSAT overpass. This paper is not meant to review the literature on airborne CO2 measurements which in fact might be appropriate elsewhere.

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. . .CO2 accuracy as a function of ambient H2O. . ..

The greenhouse gas data presented in our paper are corrected for water vapor. Water vapor is measured in a third channel of the Picarro instrument and the data logged by the instrument are corrected and presented as dry mixing ratio. The accuracy of the H2O is sufficient (50 ppm H2O, Crosson ref, see paper) to have no effect on the accuracy of the reported CO2 measurements.

***minor comments/corrections

All of the minor comments/corrections have been handled by adjustment in the final paper text.

Reviewer 2

***Why did the authors not discuss the results for the column abundance of CH4. . .

The OCO-2 algorithm for the analysis of CH4 columns XCH4 from the GOSAT data was not running at the time this paper was submitted. We considered the CO2 data to be of significant importance that we preferred to present them rather than waiting for the CH4 column analysis to be ready

***Commercial CRDS is designed for use. . .

The Picarro CRDS instrument is designed for use in flight at least to altitude of 23 Kft. In flight on the Alpha Jet research platform the instrument operates with its standard parameters of 140 torr cell pressure and about 1 l/min flow. Lab and chamber calibrations we have done bear out the normal operation of the instrument under these conditions. Intake and exhaust are at ambient-atmosphere pressure, however there are no modifications to the instrument itself (except for a reconfiguration of the component 'boxes' to fit into the Alpha jet instrument pod).

***Do the CO2 and CH4 concentrations. . ..H2O-corrected values?

The greenhouse gas data presented in our paper are corrected for water vapor. Water

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vapor is measured in a third channel of the Picarro instrument and the data logged by the instrument are corrected and presented as dry mixing ratio. The accuracy of the H2O is sufficient (50 ppm H2O, Crosson ref, see paper) to have no effect on the accuracy of the reported CO2 measurements.

***. . ..two types of standards etc. . .. . .

We have revised the paper to remove our statement about linearity measurement using Scott Marrin standards. Linearity is known from Crosson (ref, see paper) to be better than 0.1 %. This justifies the use of a WMO standard (ours provided by NOAA ESRL) and a zero standard to calibrate the flight instrument.

*** AJAX

Alpha Jet Atmospheric Experiment

***The interpretation of method 2. . .

Without going into detail about the technique, we employed 2 very simple extrapolations and then compared the result in XCO2 from the two. We found that the difference in derived CO2 amounted to about 0.5 ppm which we feel justifies the use of either extrapolation technique for the purpose of this study.

***minor comments/corrections

All of the minor comments/corrections have been handled by adjustment in the final paper text. Scheme 1 is added according to the request by Reviewer 2.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5641, 2012.