

Interactive comment on “Long-term greenhouse gas measurements from aircraft” by A. Karion et al.

Anonymous Referee #2

Received and published: 14 December 2012

This manuscript describes about a new long-term measurement system for greenhouse gases by aircraft without scientists onboard. The manuscript is written very clearly with a lot of useful information for cavity ring-down spectroscopy (CRDS) on board the aircraft. I recommend the publication of the manuscript in AMT with only minor revisions.

General comments

It is helpful to describe the overall precisions (in your typical averaging time) for CO₂, CH₄ and CO, which are influenced by short-term variation, calibration, water vapor correction and others.

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It is also helpful to mention the response time in CRDS measurement which may mainly depend on the inner volume of plumbing and the flow rate.

Specific comments

Page 7346, line 24, “2-3 psig”, line 26, “1000 millibar (mb)”: Authors should use SI unit.

Page 7347, line 17, What is the difference between a “Normal” critical orifice and that designed for flight?

Page 7348, line 6, “corresponding to three flush volumes of the line”: This value is variable depending on the altitude (outside pressure).

Page 7348, line 14-28, Slower CO₂ and CH₄ response during the transition from wet to dry or dry to wet gases is very interesting for CRDS users. Can you describe the reason? For example, is it due to the adsorption of water vapor on the inner surface of tubing or cavity?

Page 7350, line 2-3, “dramatically improved”: How amount the short-term precision improved?

Page 7351, line 21-25, I cannot understand the essential difference between the correction using “other methods” and “first method”.

Page 7352, line 1-26, As authors mentioned, a long-term drift is analyzer specific. I think it is worthwhile to calculate the sample concentrations by standard values and standard measurements in each flight. Why authors use standard measurements only for the mean temporal drift correction?

Page 7353, line 5, Nara et al., AMT, 5, 2689-2701, 2012 also examined water vapor influence for CRDS.

Page 7358, line 17-20, Could you describe some words for the reason of recent high CO₂ flask?

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Page 7359, line 7-8, Inadequate flushing in standard gas makes higher standard measurements and leads to lower sample concentrations. It is not consistent with positive offsets in Fig. 9a.

Page 7361, line 1-28, What are the advantages to measure water vapor by CRDS compared to Vaisala humidity sensor?

Page 7362, line 12-13, “three large standard tanks”: What is the size of these tanks?

Figure 6, What are indicated by error bars?

Technical corrections

Page 7358, line 4, “Fig. 9, right panel” → “Fig. 9c”.

Figure 5. Legend of the left panel, “Wet to Dry-original” should be “Wet to Dry-updated” and “Wet to Dry-updated” should be “Wet to Dry-original”.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7341, 2012.