

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

### **Anonymous Referee #1**

Received and published: 23 November 2012

### **General comments**

The paper describes the implementation of an automated cavity-ring-down device onboard aircraft for regular monitoring flights over Alaska. CRDS instruments onboard aircraft are still not frequently used and the project represents an important step towards more continuous high-frequency measurements at altitude, in particular in a remote region. The manuscript is well-suited for publication in AMT after some minor revision. It is overall well-written, however, some parts of the methods section are extremely detailed, but not well structured, so the reader gets lost in technicalities. This should be improved during the revision. There are several years of data now from

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this project already, therefore, although this is a technical paper about the instrumentation, I would like to see some measurement examples being presented, such as some vertical profiles for CO, CO<sub>2</sub>, and CH<sub>4</sub>.

## Specific comments

- In general, usage of chemical symbols and tracer names should be harmonized. As well the usage of pressure units.

## Abstract

- The abstract is rather long and detailed. It might benefit from a bit of shortening. ACP permits paragraphs in the abstract, I suggest to start a new paragraph in line 16.
- "AK" behind the name of places can be dropped. It's been made clear at the very beginning of the abstract that the flights take place in Alaska.
- Line 12/19: move the explanation that the instrument is a CRDS analyzer to the first instance the device is mentioned (from line 19 to 12)

## Introduction

- page 7344, line 2: how many aircraft are in operation?
- page 7344, line 16: "in contrast to ..." I find this statement slightly misleading because it implies that the instrument described here would not be suited for campaign-style measurements. But an automated (or semi-automated) instrument would also be desirable for most measurement campaigns for exactly the

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same reasons, as the scientist may not be available at all times and seats for operators are often limited during campaign flights.

- Will these measurements eventually be combined with those over PFA mentioned by Xiong et al., JGR 2010 ?

## Methods

This section has a very long introductory part that would better fit into the actual Introduction (most text in 2.1. on pages 7345/7346 before subsection 2.1.1. ). The division into sub and subsub section is very detailed for 2.1. whereas 2.3. and 2.4. are extremely short and more of a side note. Think about possibilities to streamline and shorten 2.1.1. through 2.1.4 as they are very detailed (e.g. parameter names in log files), but in some passages lack structure.

- How far do the inlet lines reach out from the aircraft and what type of tubing is used?
- page 7345, line 3: It will not be obvious to someone not familiar with the NOAA flask program that "flask package system" is actually a sample collection system. Please state that more clearly.
- page 7345, line 5: why is the ozone monitor excluded. Is there a reference for it? What measurement technique is used?
- page 7345/7346 section 2.1.: please point out some of the special issues when the instrument gets deployed onboard an aircraft as opposed to operation on the ground
- page 7346: please add a brief description of how CRDS works before going into the details of plumbing.

- page 7346, line 21, page 7347 line 7: explain Kynar line and expand OD (or drop it, as OD is the commonly given number anyway)
- page 7346, line 21: convert psi to mbar
- page 7347, line 9: use SI units for pressure only
- page 7347, line 19: what orifice diameter is used in the described setup onboard the aircraft?
- page 7350, line 1: SI units for pressure
- page 7350, line 9: the WMO 2007 scale?
- page 7350, line 10-13: how do these values compare to other instruments used onboard aircraft?
- page 7350, line 15: How many reference tanks are aboard and what are their mixing ratios for respective years; later it is mentioned that there are 3 tanks and the mixing ratios are in the figure, but it is on first mentioning that this information should be given. Perhaps add a table that you can refer to here?
- page 7350, line 23 to page 7351, line 15: try to revise this paragraph, it is difficult to follow the line of thoughts.
- think about skipping subsection 2.5, most of it is self-evident

## Conclusions

Please give a (very brief) outlook of how the data are going to be used / which scientific topics are going to be tackled based on this data.

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## Figures

- Figure 1: remove "the 2012 season is currently underway".

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