Atmospheric Measurement Techniques Discussions

Interactive comment on "Development of a new JMA flask sampling and trace gas measuring system for observation on a cargo aircraft C-130H" *by* K. Tsuboi et al.

Anonymous Referee #1

Received and published: 18 October 2012

This manuscript describes the flask sampling observation system using the cargo aircraft, which takes monthly flight over the western North Pacific region. The authors evaluated the flask sampling method and automated analytical measurements for CO2, CH4, CO, and N2O in the collected flask air samples as well as sample integrity during the storage.

Throughout the manuscript, English is very difficult to follow, even disjointed because of repetitions and some unclear formulations. I feel that the readers will often have problems following the story completely. Furthermore, I suspect that the manuscript does

not contain any useful information for specialists in this field. I cannot recommend this manuscript for the publication in AMT. If the authors intend to resubmit the manuscript, I strongly recommend authors to have their manuscript professionally edited at least. After that, further review process will be required.

General comments:

(1) At this stage, this manuscript clearly does not meet the journal quality standards. Please revise the manuscript with attention to below fundamental points:

I. Authors should prepare the manuscript carefully without unnecessary repetition and redundancy. Especially papers focused on the methodology should be prepared so that the readers can reconstruct the described method.

II. Please give manufacturer's name and location (city, country) in parentheses for instruments used in this work.

III. Author should standardize the term and wording throughout the manuscript (e.g., "concentration" and "mixing ratio", "flask sample analysis system" and "automated analysis system").

(2) Authors made comparison between the flask and the surface continuous measurements to validate the flask sampling method. The authors stated that differences for each trace gas (CO2, CH4, CO) between these two measurements (0.2 ± 0.3 ppm for CO2, -0.7 ± 3.3 ppb for CH4, 2.4 ± 4.1 ppb for CO) are not significant due to the uncertainty of sampling, analysis, and difference in the sampling height. However, the differences and corresponding uncertainties seem to be large for the validation. In other word, these results cannot remove any potential bias within the uncertainty associated with the flask sampling method. Why did the authors choose other method to reduce these uncertainties? For example, comparison with in-situ measurements will remove the uncertainty due to the difference of sampling height. In addition, what about the validation for N2O?

(3) Authors stated that "we report on some specific technical improvement of the laser-based instruments" in the last sentence of Introduction. I could not perceive such technical improvement. Please describe this improvement clearly.

Other comments:

Section 1: Introduction is poorly written and constructed. Authors laid out research background with emphasis on Asia region only based on a small amount of references, dominated by CO2 research. Furthermore, none is mentioned for N2O. Authors should revise Introduction with a sufficient amount of references and mention the need for the observation of CO2, CH4, CO, and N2O. To my knowledge several aircraft observations have been performed including CARIBIC and MOZAIC/IAGOAS as well as CONTRAIL. These works should be referenced properly to explain the advantage of aircraft observation.

Section: 2.1: P7070/L19-L23; These sentences describe the measurement system at MNM station, not for sampling flight. Please edit (the sentences may be moved to section 3.1.).

Section: 2.1: P7071/L5-L8; Sentences describe the flask air sampling. Please move to section 2.2.

Section 3.1: Many description overlap with section 2.1 and 2.2. Please edit and shorten.

Section 3.2: P7076/L2-L3; The conditioning method is already mentioned in the section 2.2.

Section 3.5: This section should be shortened and be merged with section 3.6. Authors inferred the possible isotopic effects on the OA-ICOS measurements for CO and N2O based on the theory for WS-CRDS. Why the same theory can be applied to the OA-ICOS? At least, authors should explain the measurement principle of the OA-ICOS, and subsequently discuss the application of the isotopic correction.

Section 3.6: What is main message to readers in this section? Estimation of the isotopic effects? or measurement comparison? If authors intend to do "to evaluate the whole instrumental bias", the comparison experiments should be done more carefully and described in great detail. For example, calibration for each instrument should be described in detail. Please revise.

Section 4: Any statement in this section should be appeared in previous section (section 3).

Specific comments:

P7071/L11: What is the modification? Please specify it.

P7071/L25: What is the sample flow rate? can obtain constant flow?

P7071/L25: The air sampling was made by manual pumping. Why? There is no available power source?

P7072/L3: Problems on the stability of the trace gases during storage should be explained briefly by citing previous reports especially for CO (e.g., Novelli et al. JGR 2003).

P7072/L11: What is new? If the system is improved from the old one, please give an explanation of the old system and improvements.

P7072/L17: Is the NDIR and VURF installed permanently? If that so, why were these instruments installed while CO2 and CO are measured by WS-CRDS and OA-ICOS. Unnecessary measurements waste valuable sample. Please specify the reason.

P7072/L22: Each analytical instrument seems to have different sample flow length from the flask. Such configuration is usually unpreferred due to possible fractionation of the air sample. Why did you develop the system with such configuration? Please explain.

P7072/L24: Please specify "a special operational program"

P7072/L25: Please define "the main airflow line"

P7072/L28: Please define "a vent line"

P7073/L3: What is the sample dew point?

P7073/L5ff: The subsample flows are substantially lower than those of default flows for the individual instruments. What is the reason for the flow regulation?

P7073/L10: Please give detailed description of the auto pressure controller.

P7073L16: Does the evacuation affect the absorption/desorption balance of CO_2 and CO onto the inner wall of the line?

P7074L1: Please specify the standard gases (balance gas, mixing ratios)

P7074/L21: Matsueda et al. (1996) is not found in the references list.

P7075/L3: Stainless steel flask? The titanium flasks were not used?

P7075/L5: What is the sample quality for N_2O?

P7075/L8-L9: Authors stated that flask samples were also collected at the surface station for the comparison. But in next paragraph authors stated that the flask measurements were compared only with surface continuous measurements. What were the flask samples from the surface station? If the results from the flask measurements are not discussed in the manuscript, the description should be removed.

P7076/L1: What was the water vapor concentration in the dry natural air?

P7076/L9: You did not make the storage test for N_2O?

P7076/L26-L27: What does the sentence mean?

P7080/L21: Nara et al. (2012) reported that the pressure-broadening effects due to the matrix gas variation can be significant impact on the CO_2 and CH_4 measurements by WS-CRDS. Your statement is inconsistent with that by Nara et al. (2012). Please

revise.

P7080/L25: Please describe the calibration gases used for the WS-CRDS and NDIR instruments.

P7081/L2: Please notice the significant digits.

P7083, L17-L21: These sentences should not appear in this section, they should rather be mentioned in Introduction. Please move to the section 1.

Table 1, For CO_2 difference, 0.09 ppm is significant, suggesting analytical bias between the JMA measurement system and "conventional methods". This should be considered carefully in this evaluation.

Table 1, footnote b: what are conventional methods? Please clarify.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7067, 2012.