**Atmospheric Measurement Techniques Discussions**

# *Interactive comment on* "Atmospheric CO$_2$, $\delta$(O$_2$/N$_2$) and $\delta^{13}$CO$_2$ measurements at Jungfraujoch, Switzerland: results from a flask sampling intercomparison program" *by* I. T. van der Laan-Luijkx et al.

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The authors would like to thank both reviewers for their valuable comments on this manuscript. Their input is greatly acknowledged. Below we have addressed the individual remarks by each reviewer.

Reply to referee #1 General comment on terms and definitions: We agree that the use of the term compatibility has not been fully correct in the manuscript. We have updated

this in the text and use compatibility for comparison between laboratories and internal reproducibility for a single laboratory. We have more clearly indicated the scale for $\delta$13CO2 (it was mentioned in footnote 1) and added the scale for CO2 (WMOX2007).

Page 7296, line 21: Indeed we meant internal reproducibility, this has been updated in the text.

Page 7297, line 3: A reference has been inserted (this is actually stated in the same WMO report as the goals).

Page 7297, line 13: We were referring to intercomparison programs including $\delta$(O2/N2), this has been made more clear, by removing this sentence.

Page 7302, line 5: This has been changed in the text, to state more clearly with the corrected terms as described above.

Page 7302, line 11: 2.7 sigma includes 99.31% of the data (if normally distributed). We choose a value in between 2.5 sigma (which would include 98.76%) and 3 (which would include 99.73%). 1.9 sigma includes only 94.26% of the data. A sentence has been included to explain more in detail the concept of an exclusive filter.

Page 7302, line 27: We have changed this so that we state the differences within the WMO goals and not deviations from the average.

Page 7303, line 17: Corrected (trends instead of trend).

Page 7304, lines 8-14: The text has been changed accordingly (see also above).

Page 7305, line 20: We have excluded the outliers of the fit using the 2.7 sigma filter to obtain trends and seasonalities. For the comparison (the differences) we have not excluded these differences. In the text we also included the improved trend estimate for UBE using more strict filter.

Page 7306, lines 10-13: Changed accordingly (see above).

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Interactive Discussion

Discussion Paper

Page 7308, line 1: Changed accordingly.

Page 7308, line 19-22: We do not know the cause of the mentioned offset. One of the changes made was e.g. the change in the setup for MPI.

Reply to referee #2

Page 7297, line 3: A reference has been inserted (this is actually stated in the same WMO report as the goals).

Page 7297, line 5: A reference has been inserted.

Page 7297, line 14: This sentence has been removed.

Page 7298, line 3: LT is indeed local time, it is the standard format by Copernicus.

Page 7299, Flask sampling (line 15-27): The text has been modified to clarify these issues. We refer to the PhD thesis of C. Uglietti for more details, including schematics.

Page 7300, line 3-4: This is done with a relief valve (included in the text) and the pumps as specified.

Page 7300, line 4: Changed accordingly.

Page 7300, line 6-11: We have not quantified the pressure effects. We have added a clarification about the transport of the MPI flasks.

Page 7301, line 12: It is indeed liquid air (80% N2 and 20% O2).

Page 7301-7302, CO2, first paragraph (line19-26/1-6): We have added an example to clarify. The flasks identified as invalid had very high CO2 and very low $\delta$(O2/N2) concentrations. Or e.g. we knew of problems in the laboratory, or flasks were e.g. not filled correctly.

Page 7302, line 9-12: The fits are a combination of a linear trend plus seasonal harmonic components (and not two individual fits). This has been changed in the text, to make it more clear. See also answer to referee 1.

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Page 7302, line 16-18: In this paper we study the interlaboratory compatibility, so removing bad values of one laboratory based on the measurements of the other two laboratories, would compromise the values we obtain for the average biases. Therefore we did not do this. The systematic biases are included in the results sections as well as in Table 2.

Page 7303, line 3-14: The setup was changed in order to fill the flasks already at their filling pressure instead of pressurizing the MPI flasks at the end. We have added this information to the text in section 2.3. With the suggestion in this comment we have changed the manuscripts on this issue.

Page 7303, last paragraph: The global average trend has been included.

Page 7304, line 26-27: Since UBE differs a lot from the other two laboratories, it is most likely that this bias reveals a problem. We have added this in the text and state that it needs further study.

Page 7305, first line: This is the same as what is written in the text.

Page 7305, line 2-5: We agree and have changed these percentages, so they state the values between the WMO limits, instead of the differences to the average values. We have changed this also for $CO_2$ and $\delta13CO_2$ (see also answer to referee 1, page 7302, line 27).

Page 7305, line 5-7: We have added some extra information in the text on this issue.

Page 7305, line 9: With the suggestion in this comment we have changed the manuscripts on this issue.

Page 7305, line 14 to the end of paragraph page 7306: We have included a value for the global average trend.

Page 7306, line 20: See answer to comment on page 7302, line 9-12.

Page 7307, line 2-3: Changed accordingly.

Page 7307, line 16: Changed accordingly.

Page 7308, line 3-4: Changed accordingly.

Page 7308, line 5-10: We have included some results from the "sausage" program (see section 3.4).

Page 7308, line 14-15: We have chosen to include the data from the "sausage" program, since it is more relevant here, because it also concerns flask sampling.

Page 7308, line 20-22: We added a sentence here.

Page 7315: Table 2: We agree that the differences between the periods are important to show, but we prefer to keep also the average over the total period.

On figure 1, 3, 5: see answer to comment on page 7302, line 9-12.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7293, 2012.

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