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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new CF-IRMS system for the quantification of the stable isotopes of carbon monoxide from ice cores and small air samples" *by* Z. Wang and J. E. Mak

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The paper presents an analytical method for stable isotope measurements on CO from ice core air. Whereas the method is strongly based on the one published by Mak and Wang in 1998, the present manuscript presents much more informative data and tests on the method than the original one, and it extends the method to the analysis of ice air samples. Therefore, the manuscript is sufficiently novel to be published in AMT, and it fully fits in the scope of the journal.

I suggest that three issues are improved before the paper can be accepted for publication in AMT.

1) The description of blanks, the discussion of the relevant data in the tables and the correction for blanks in the derivation of the final concentration and isotope values.

2) Don't you want to say at least a few sentences about the scientific significance of the ice air results? I do not suggest a full interpretation, but at least some remarks on what you see there. For example: How do the isotope values in the ice compare to the annual average in Antarctica? Heavier or lighter? Does it go in the same direction as expected from the gravitational signal, or opposite? How large is the shift compared e.g. to the d15N of N2, which should be a good proxy for the gravitational effect in d13C of CO, since it has the same masses. A few words would make this paper much more interesting than just presenting reproducibility.

3) There are (too) many spelling and language errors throughout the manuscript, at least from page 2692 on, which the authors should correct. I note several of them below, but I strongly recommend the authors to perform a thorough language check!

Ad 1) Please describe in detail what the different blanks are the "analytical blank", the "system blank", the Schütze blank" and the "ice blank"

page 2694, l5 ff: Please describe the data in table 3 in more detail. What is the average isotopic composition? How is this used to correct samples? What about the dependence on the gas amount (or extraction time)? It would have been useful to perform one test with 100 ml only but extended time to be able to differentiate between sample amount and extraction time. If you have data, please show them.

page 2694, l15 ff: please specify: after the ice was flushed with zero air for a few times??? What is really done? Can the blank be decreased even further? Discuss the data in table 4, including the isotope data. How is this blank taken into account in the calculation of the final delta value? And variations of this blank (factor 2 in table 4)? Why is the d18O value from the "dark" experiment significantly lighter than the rest (but the amount and d13C) are not significantly higher? What would you actually expect from photochemical production? Please discuss the table better!

page 2697, section 3.3: Please show how the blank contamination is accounted for in the calculation of the ice core data. there may be two different blanks here, the ice blank and the Schütze blank. How sensitive are the results to these blanks?

I suggest that the tables are listed in the order they are used in the text, and I think this is 3-4-1-2

ad 3)

p2692

l6: and attaching THEM

l16: which informs of the NEED FOR replacement

l18: helium AT A flow rate

l21: loaded ON, or INJCTED into .... AT A helium flow

l22: what means from back inlet of GC? please clarify and correct language

l28: based on A calibration gas

p2693

l1 delete "results"

l3: It is nowhere actually specified what this "new cryogenic vacuum system" actually does. I can read it between the lines around line 10, and I think understand it, but please clarify how it works.

l11: what means the sample is "processed" for 5 min? I think this relates to the last point.

l15/16: please correct language "...is used..."

l22 ff: Do you have a reference for permeability of CO through membranes?

l 27: correct language and specify what is really meant "...simple with the dilution process...."

p2694

l12: tests BASED

l13: A high ice blank

l16 ff. Please write clearly what is meant. "The is blank was subjected to light tests" is not really precise, I think. <also following sentence: Sample environment with and without light???

p2695:

l2: immersed in A cooling bath

l4: in A hot water bath held at A temperature

l5: remove "occluded", when it has been removed it is not longer occluded

l15: is derived FROM the

l16 in THE cryogenic

l18: delete "of the measurements"

page 2696:

l2: tion GAS

l7: Air samples WERE collected

l8, rewrite sentence

l11: with THE conventional

l12: AliquotS of THE remaining samples

l14 FF: write down the average and standard deviation for the dual inlet and con flow results, either in the text or in table 1. Please also report the usually assigned error for a "full" dual inlet measurement, not only the MS error, this is comparing apples and pears. Also mention that the sample from Mauna Loa can be used to assess the linearity of the system, since this sample is isotopically far away form the others.

l22/23 isotope ratios ARE shown in TABLE 2

l26 indicate THAT

p2697

l3: A new analysis technique for SIMULTANEOUS stable isotope ratio ( ) MEASUREMENTS...

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 2689, 2009.