

Response to comments submitted by Reviewer #1

Dear Reviewers, Dear Editor,

Thank you very much for your detailed, encouraging and constructive feedbacks on our manuscript titled “**Radiocarbon analysis of stratospheric CO₂ retrieved from AirCore sampling**”. We have revised our manuscript based on the comments and suggestions made by the reviewers. Through this letter we specifically address (Authors Comments (AC) in normal fonts) to your comments and question (shown in *italic fonts*).

Thanking you,

Sincerely,

Dipayan Paul, Huilin Chen, Henk A. Been, Rigel Kivi, Harro A. J. Meijer

Specific comments:

1) Figure 1 b) shows the vertical concentration profiles of CO₂ and CH₄. The bottom and the top part of the profiles match quite well whereas the profiles differ for the altitude range between 5 km and 13 km. Can you comment on the cause of the variability?

AC: Note that these two profiles were made on two different days, and the differences between 5 km and 13 km most likely due to a change in air mass.

2) A correction of the AirCore profile is performed and is used for the analysis in the paper. However, the correction method itself is referenced to a following paper in preparation (Chen et al.). Perhaps a very short description of the correction method here would be helpful for the reader to follow.

AC: We have added a short description in the revised version “The correction takes advantage of the fact that the CO concentration of stratospheric air is low (~15 ppb or ~0.2% of the CO concentration of the fill air). We derive a good approximate of the percentage of the fill air and the stratospheric air based on the measured CO concentration of the mixture of the stratospheric air and the fill air”

3) The SAS sampler comprises of a series of six connected stainless steel tubings which limit the resolution at which the $\Delta 14C$ can be determined from the stratospheric air sample. Is it possible to increase the resolution by dividing the sample air into further tubing (helpful for seasons with lower tropopause levels)? May be you can discuss on the advantages or disadvantages of doing this?

AC: Using the same AirCore described in this study, dividing the stratospheric part into more than six sections is certainly possible, but that would reduce the amount of available carbon from CO₂. This would

have detrimental effect on the measurement uncertainty. Unless the volume of the stratospheric air sample is increased further, e.g., by using a larger diameter AirCore tubing, it would not be advisable to make more than 6 sections.

Technical comments:

Page 2: Line 12, I would include “(half-life ($t_{1/2}$) = 5730 ± 40 years)”

AC: Added

Page 3: Line 13, I would replace “fills itself with atmospheric air” with “fills itself with air from different layers of the atmosphere.”

AC: Rephrased to “fills itself with air from its surrounding”.

Page 3: Line 15, I would modify “after the AirCore has landed and is recovered.”

AC: we added “and is recovered”.

Page 3: Line 26, I would include “(at Standard Temperature and Pressure (STP))

AC: Added

Page 3: Line 31, I would mention the dates here “profiles collected on July 15 and 16, 2014 were preserved...”

AC: Rephrased. It now reads as “...out of which two stratospheric air profiles (collected on July 15, 2014 and July 16, 2014) were preserved for radiocarbon...”.

Page 4: Line 17, please mention the full form of “sccm (standard cubic centimeters per minute)”

AC: Added

Page 5: Line 26, I would mention the formula of Magnesium perchlorate “(Mg(ClO₄)₂)” here

AC: Added

Page 5: Line 28, I would write “_g C” together as “_gC” and “mg C” as “mgC” and please check the rest of the manuscript for this and change accordingly.

AC: Changed

Page 7: Line 24, at the altitude “where” the sample was collected.

AC: Added

Page 10: Line 29, from the AirCore “is” moved into the SAS through...

AC: Added