

Interactive comment on “Mean age of stratospheric air derived from AirCore observations” by Andreas Engel et al.

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This paper describes new measurements of CO₂, CH₄ and CO taken using the AirCore technique from two midlatitude sites over several years. These measurements are also used to estimate the mean age of air in the stratosphere in order to extend the mean age time series in the northern midlatitudes. Precise, vertical profile measurements of these trace gases in the stratosphere are rare and valuable for diagnosing the stratospheric circulation. The AirCore technique is a cost-effective means of obtaining these measurements, yet there are many details to consider and this paper is very thorough in describing how the measurements were obtained.

The topic is appropriate for ACP and I would recommend publication with consideration of the minor comments listed below.

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Minor comments

Pg. 1, line 20: change “from” to “with”

Pg. 2, line 6: change to “parcel”

Pg. 2, line 8: change “to” to “with”

Pg. 4, line 5: remove “and” before “an”

Pg. 5, lines 14-15: Change sentence to something like “The tubes are joined by solder and light weight adaptors.”

Pg. 5, line 17: “. . .tube is open ended.”

Pg. 6, line 13: change “stronger” to “more”

Pg. 6, line 14: “. . .is in the wider tube.”

Pg. 7, lines 8-9: “. . .for up to 6 hours, which also allowed the instrument to remain heated. . .”

Pg. 7, line 15-16: “. . .allows two lines, which are needed to connect the AirCore for the analysis, to be flushed with a standard. . .”

Pg. 9, line 7: change to “assumption”

Pg. 9, line 10: change to “descend”

Pg. 10, lines 17-18: “. . .will also take into account. . .”

Pg. 11, line 1: add “the” before “starting”

Pg. 11, lines 13-14: “. . .air small, the FG had mixing ratios close to those expected. . .”

Pg. 11, line 15: add comma after “PG”

Pg. 11, line 20: change “where” to “were”

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Figures 5-7 and 8-10: would be nice to have these figures side by side to easily compare the features.

Pg. 14, line 11: “In particular, rather small. . .”

Pg. 14, line 29: replace “has been” with “was”

Pg. 14, line 32: “. . .on May 25, which reached a higher. . .”

Pg. 15, line 10: remove “measurement”

Pg. 15, line 11: add “in” after “Timmins”

Pg. 15, line 16: You mention the thermal tropopause here, it might be nice to show this on either a separate plot or combined with one of Figure 8-10. Same with Figure 5-7. And what temperature data did you use?

Pg. 16, line 5: should be consistent with the units here, either pressure altitude or pressure

Figures 5-11: what about error bars on the profiles? It might make it too hard to see features on plots with many profiles but it would be nice to see how the uncertainty in the measurement varies with altitude and from flight to flight. Uncertainty on the mean age profiles would be nice to see as well.

Pg. 17, line 16: change “decrease” to “increase”

Pg. 18, line 32: the Ray et al. (2014) paper seems more relevant to cite here

Pg. 19, line 6: change “using” to “use”

Pg. 19, line 10: “. . .that for CH₄. . .”

Pg. 19, line 14: “. . .further performed the first observations from the. . .”

Pg. 20, line 18: change “content” to “context”

Figure 3 caption: change to “flown”. Also, may want to put some indication in this

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figure of which part of the time series is the lowest vs. highest altitude sample since it's not totally obvious from a quick glance. Maybe also label the white spaces as PG to indicate the push gas measurement and if there is a region where some of the FG is measured that would be interesting as well.

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