

Comment on amt-2021-254

Anonymous Referee #2

Referee comment on "Fill dynamics and sample mixing in the AirCore" by Pieter Tans,
Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-254-RC2>, 2021

This paper describes the development history of AirCores over several decades as well as the processes occurring within the AirCore during and after filling this air sampling device, alongside several illustrative applied examples. Since their invention and first peer-reviewed publication in 2010, AirCores have increasingly gained popularity in the international atmospheric science community due to their simplicity, cost-effectiveness, accessibility, and of course also because they provide a unique way of deriving vertical profiles of trace gases from the ground to the middle atmosphere. The content of this manuscript has however been a crucial piece of the AirCore concept missing from the literature so far. As it is a method-focused paper I would therefore consider it to address relevant scientific questions within the scope of AMT, while it does present novel concepts in the sense that this is so far unpublished content.

While I certainly think that this work should be published, my main concerns at this stage are two-fold:

1. The style and structure of writing. This manuscript is written in a very readable way, but in some places does unfortunately deviate rather substantially from expectation for a scientific publication in a peer-reviewed journal. Three examples for this are the lack of an overview of the current literature in the Introduction, the complete absence of any conclusions (let alone a dedicated section), and the lack of an open access repository link for the code that is described and referred to so often in this manuscript.
2. The lack of coauthors. Some of the main findings of this work have clearly been gained by collaborative efforts, yet there is only a single author. Can you ascertain that everyone involved in the development of these concepts has agreed not get the recognition of their contribution through coauthorship?

Here are also some more specific (and in most cases minor) points:

p1, 10: The usage of the word "we" here and elsewhere is somewhat strange for a manuscript with a single author.

p1, l16: An introduction is expected to also give an overview of the state of the art for a given topic, which is not the case at all here.

p1, l26: Consider making this a numbered equation so as to help the reader finding it, especially since you refer to it again later in the manuscript.

p1, l32: Please give affiliations or other means of identifying these two, as well as other people named in the manuscript.

p1, l32 - p2, l39: Please provide details of the analytical methods used, as well as more quantitative evidence of the results of those tests.

P2, l59: This should be cited as Moore et al. (2014).

P2, l67: Also at 0 degrees C?

p3, l74-75: Please define "capillary effects".

p3, l95-96: This is a good example for my second main concern, i.e. that some of the main findings of this work have clearly been gained by collaborative efforts, yet there is only a single author.

p3, l101-102: Consider explaining why the use of the molecular weight of dry air would be appropriate here. Atmospheric humidity is not negligible, especially near the ground.

p4, l108: Please quantify "very nearly".

p4, l112-114: Consider merging the two sentences.

p4, l112-113: But isn't viscosity (and therefore the volume flow) still dependent on gas density as detailed in the approximation in l110?

p4, l122: According to l99 that has been the assumption already.

p5, l151: Please use a consistent unit for temperature throughout the manuscript.

p5, l164 & 167: Neither Berg (2004) nor Berg et al. (2004) are listed in the references.

p8, l236: Please give more details on what is shown. Some of this description is currently hidden in the main text. This is also the case for other figures.

p8, l238: Consider stating "near the tropopause".

p11, l321: Please quantify "minuscule".

p24, l620: It seems astonishing that the manuscript made it into ACPD while such a crucial bit was still missing.