

Atmos. Meas. Tech. Discuss., referee comment RC1
<https://doi.org/10.5194/amt-2021-135-RC1>, 2021
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Comment on amt-2021-135

Anonymous Referee #1

Referee comment on "An unmanned aerial vehicle sampling platform for atmospheric water vapor isotopes in polar environments" by Kevin S. Rozmiarek et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-135-RC1>, 2021

The paper contributes valuable to the ongoing evolution of using UAV/UAS in environmental science. Some minor to major revisions are suggested:

- Introduction: The study is well motivated and hypothesized. The implications of in-situ vs. extractive measurements should be discussed.
- Line 113: The mentioned normalization to Standard Light Antarctic Precipitation is not explained
- If fig. 1 is a general presentation of the EastGRIP project then please at the reference.
- Line 153 to 157: This is a typical but not helpful assessment of an airborne system, as the mentioned problems can easily be solved without substantial additional cost. Choosing the right platform is a complex process taking many aspects into account, often non-scientific reasons like funding and access to knowledge. Addressing the relevant aspects is necessary to establish better rational based approaches rather than today often seen intuitive choices.
- The chosen platform should be described with all components, normal procedures and limitations as the paper title focusses on the technical part of the overall system. Please clear some inconsistencies in numbers (text vs. app. C vs. Black Swift Technologies homepage, e.g. payload mass.).
- 2.4.1: Can you please add a system diagram to fig. 3?
- 2.4.1: Was the payload leak tested in low temperature conditions and mechanical vibrations (inflight conditions)?
- 2.4.1: Did the choice of components and materials take into account a potential corruption of the air samples?
- Line 186: I don't understand the half sentence "yielding appr. 50 flasks ...". I guess a time reference is missing?
- Line 199ff: I guess the temperature and humidity of the undisturbed air at the position of the UAV is meant? Please add a description of the sensor installation, as this is essential for a later discussion.
- Line 207ff: "Flasks ... opening a single port on the flask." Does this mean that the

Picarro-System sucks air out of the flasks, which reduces the pressure inside? If yes, is there an influence on the isotopic result because of condensation?

- Line 209ff: I guess you have experiences in appropriate flushing and filling times. Can you please explain this a bit more detailed or cite a proper reference?
- 2.5: Are pressure differences between flasks and Picarro system an issue?
- 2.6: The trials described in this section make the most of the possible, which is much more than often seen. I suggest discussing the difference between airborne and stationary samplings (e.g. fluxes?). Standard deviation and root mean square lead to the same result, but have other constraints. So I suggest to be careful presenting 1 sigma values.
- Make sure, that sec 2.4 and 2.8 do not double each other.
- Line 347: As altitude maintaining power setting you normally do not use "idle".
- Line 376: Time reference (e.g. UTC)?
- Fig 7.: The overlaid periodic changes in temperature and humidity correspond to the heading of the UAV. As the installation is not described (comment X.) nor it is clear if the airspeed or the ground speed is commanded by the autopilot it cannot be excluded that an improper installation and/or data correction leads to this result. At this point I do not agree with the options described in line 434ff as better sensors cannot heal improper installations.
- Line 582: Acknowledgements

- Does the paper address relevant scientific questions within the scope of AMT? - Yes.
- Does the paper present novel concepts, ideas, tools, or data? - Yes.
- Are substantial conclusions reached? - Yes.
- Are the results sufficient to support the interpretations and conclusions? - In principle yes, see comments.
- Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? - Not yet, see comments.
- Do the authors give proper credit to related work and clearly indicate their own new/original contribution? - Yes, mind comment 3.
- Does the title clearly reflect the contents of the paper? Yes, see comment 4 and 5.
- Does the abstract provide a concise and complete summary? - Yes, but you should insert operational experiences and limitations, and planned steps head.
- Is the overall presentation well structured and clear? - Yes.
- Is the language fluent and precise? - Yes.
- Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? - No findings.
- Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? - No, see comments.
- Are the number and quality of references appropriate? - No. Several references are not mentioned in the paper, e.g. Sturm et al. 2010 and Steig et al. 2013). Please remove or insert into the text.
- Is the amount and quality of supplementary material appropriate? Nearly, see comment 4.

All the best!