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Atmospheric Measurement Techniques Discussions

Interactive comment on "A UAV-based active AirCore system for accurate measurements of greenhouse gases" *by* Truls Andersen et al.

Anonymous Referee #1

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General

This paper reports the development of active Aircore sampling from a UAV. This is potentially a very powerful new method of tackling a wide variety of important problems, such as measuring the flux from a gas leak, or quantifying the emissions from a large power station, cattle feedlot or wetland. The subject of the paper fully falls in the scope of AMT. The method is thoroughly explained, with good detail to allow replication by another team. The field testing is detailed and interesting. Thus the paper should be published.

That said, I have some specific points.

Specific Points.

Page 1. Introduction. This is very long winded, more suited to a thesis than a paper on measurement methodology. While I agree that some introduction is needed, maybe it would help readers if the wide ranging discussion on page 1 and page 2 up to line 22 was shortened considerably. It would be better to use the introduction to explain why measurement in the boundary layer is so valuable for CO2 and methane, and also potentially for other species, for example in pollution events. This is done briefly on P3 L13 on, but could be expanded. Active Aircore is a very powerful concept – say why it will be important.

P5 L 18 and 20. The 'box' – maybe give the box a name? – "Aircore box". You have another box later – "Analysis box" – and it's best not to get them muddled.

P6 L11. Relative humidity measurement. This seems to be a problem. Can you suggest a way around it, perhaps by relocating the sensor? It is important to have RH while sampling is taking place.

P6 Fig 1. – maybe move this figure a bit earlier, say into P5? – it would have been helpful from the start of the description.

P6 L20 – say clearly the CRDS at the landing ground of the UAV. It's a nice advantage of the method.

P7 L13 – is there a way you can test with undried air?

P8 L14 – in contrast to a FREE flying balloon. A tethered balloon doesn't have this problem. There are various ways to sample up to 400m – UAV aircore as here, UAV pulling up tube, free balloon, tethered balloon with tube, tethered balloon with active aircore. This method is good, but most of the others (except free balloon) have advantages too.

P9 L12 – $\frac{3}{4}$ ways into the water vapour 'dip' ?rise?

P11 L10. Are there any plans to test this against measurements at a really high tower? Cabauw for example?

P12 L3 – maybe ‘low’ shrubs – every plant is significant! P12 L14 – wind malfunction: pity. Such things always happen, but knowing the wind might help in the interpretation of the results!

P12 L16 – the paper reports a single day’s experiments. This is fair enough as the paper is mostly about the method, but it would be nice to have a second trial. Maybe by the time the review process is complete it may be possible to add results from a second set of flights?

P14 and earlier – all the figures in my print out are very fuzzy and hard to read. They look like low resolution screen grabs? Maybe it is my system but if possible could some attention be paid to making the figures sharp and clear? Fig 7 is especially fuzzy and hard to read.

P18 Section 3.3.2. Also P19 L17. This is really interesting and it is a pity the RH and 60m wind measurements are missing. Maybe the discussion could be extended? Well worth repeating the flights, and doing some back trajectory work.

Conclusion

This is an important report of a valuable new technique. The paper should be published with minor revisions.

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