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Atmospheric Measurement Techniques Discussions

Interactive comment on "Simultaneous multicopter-based air sampling and sensing of meteorological variables" *by* Caroline Brosy et al.

Anonymous Referee #3

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This manuscript describes a novel approach to measuring methane profiles in the surface layer using a ground-based instrument, a long ∼70m sampling tube, and an unmanned aerial vehicle (UAV). The UAV was also equipped with meteorological sensors to measure temperature and humidity, and wind measurements are calculated based on multicopter in-flight data (pitch, roll, and yaw). With a few exceptions, the methane and wind measurements are in good agreement with EC station, tower, lidar and sonar measurements. The manuscript is generally well-written and should be published in AMT, once the following comments, in addition to those of the first two reviewers, have been fully addressed.

First, based on the placement of the temperature and humidity sensors (on the arm of the multicoptor below one rotor; Fig. 1), it is very likely that these meteorological measurements were negatively impacted by rotor-wash. Indeed, the discontinuities

in the potential temperature profiles at UAV sampling locations (Fig. 8) support this idea. I suggest placing the meteorological sensors closer to the methane inlet and away from the rotors. At the very least, this flaw in the method should be openly discussed and addressed in future studies. The authors should also comment on why the humidity data obtained from this sensor was not presented. Ideally, the authors could demonstrate using laboratory tests that the current flying geometry and sampling strategies do not adversely affect the either the methane measurements or the wind estimates.

The interpretation of the methane concentration gradients rely heavily on the interpretation of the meteorological conditions and changes in the surface layer with time. As a result, it would be helpful for figures 7 and 8 to show the local time, as well as UTC time.

The discussion on L25-30 is difficult to follow and should be re-written.

Finally, as noted in the manuscript, a more powerful UAV with a larger payload would enable longer profiles by ground-based gas spectrometer. Given a UAV with a larger payload, could the authors comment on what is the maximum altitude that could be reasonably sampled using this method, either due to prolonged residence time in the tubing, flow restrictions or other logistical concerns?

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