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Atmospheric Measurement Techniques Discussions

Interactive comment on "Towards accurate and practical drone-based wind measurements with an ultrasonic anemometer" *by* William Thielicke et al.

Anonymous Referee #1

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The paper "Towards accurate and practical drone-based wind measurementswith an ultrasonic anemometer" by Thielicke et al describes a custom UAV platform set up for wind measurements. This platform has is a light (weight <5kg) quad-copter with relatively long flight time (endurance >45min). The platform equipped with either one of two ultrasonic anemometers (Trisonica and Windmaster) was tested in various enviroments (wind tunel, open air, turbulent flow behind a wind turbine) and validated with reference measurements (anemometers, wind lidars). Results show

The paper is very well organized as well as written. In particular, I applaud Authors for a concise, yet extensive and up-to-date review of UAV-based wind measurement attempts with discussion of techniques used and their findings. The discussion of results is well organized and narrative is clear. In my opinion paper's finding are well

supported by the data and analysis and I suggest minor revision of the paper.

Major Comments:

The key shortcoming, in my opinion, is that the paper is some parts if not achieving its full potential. The authors put a lot of effort to quantify performance of their system in turbulent environments. On the other hand, little attention is on relatively undisturbed flow within PBL. One solution would be to include comparison between UAV based measurements and wind lidar (Section 3.4) at altitude where flow is less disturbed by trees, buildings and other obstacles (100m?).

When considering wind field in general meteorological context, we tend to separate horizontal and vertical wind components, because they are differentiated by typical values as well are relevant processes. Typically vertical wind velocity is 1-2 orders of magnitude smaller than horizontal wind velocity. What is a bias when measuring in atti mode vs hoover? In my opinion, some discussion of errors in horizontal and vertical wind components, separately, would be of interest to the community.

My understanding is that Trisonica was tested in wind tunnel only. However, it would be interesting to see validation of the two sensors in realistic conditions, including turbulent and relatively undisturbed flows.

Authors claim that Optokopter is bettern than COST plaftorms because its endurance is longer. I understand that it may translate into statistics of measured variables, but the manuscript fails, in my opinion, to recognize that advantage. What do I need 45 min flight? Why not 20min? Some discussion of a measurement duration (e.g. how long do I need to measure at single 'point' to get the most accurate data) would be of interest.

Finally, what are lessons learned and how they translate into other platforms. One message I get is that Windmaster is better than Trisonica (only in wind tunnel, but that likely propagates into realistic flows). Assuming that I do not want to buy Optokopter

(or commission it for my measurements), how can I perform more accurate wind measurements with my platform of choice.

Minor Comments:

Sections 3.2, 3.3, - which anemometer was used? Trisonica or Windmaster? I'd expect the latter but I did not find this information in the text.

I'd suggest combining Figures 14, 15 and 16 into single figure with 3 panels.

I'd suggest combining Figures 18, 19 and 20 into single figure with 3 panels.

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