

Reviewer #2 Response

The aim of this manuscript is to investigate the ability of small uncrewed aerial systems (UAS) to measure the 3 dimensional wind vector with enough accuracy to derive turbulent fluxes. The method by which the 3D wind vector is calculated is described in detail and is shown to perform well when compared to a co-located sonic anemometer. Additionally, a case study showing the applicability of the method is shown.

Overall, the manuscript is well written and devoid of any obvious errors in the presented methodology. Thus I have relatively few comments. With a few clarifications and additions, I think the manuscript would be suitable for publication.

General Comments

- Given that most of the analysis is centered around optimal fits of field data, which is inherently noisy, it would be informative to include some analysis of the uncertainty of these fits and the sensitivity of the final wind estimation to these uncertainties. This would also help to alleviate typical concerns about optimal fits not being based on physical principals.

Specific Comments

- The manuscript alludes to the fact that the wind-vane mode used in previous experiments was activated, but I don't see that explicitly stated anywhere.
- For the profiling UAS in the case study, are the same coefficients determined while hovering being used to estimate wind while ascending/descending? Bell et. al. (2020) showed that different coefficients are likely needed for an ascending UAS using a more rudimentary method for wind estimation. Would you expect the same here?
- Was there any correction necessary to match up the UAS and sonic time series? If so, how was this done?
- Were the winds from the sonic and UAS rotated into the mean wind independently of each other? In other words, was the sonic mean wind direction used to rotate to sonic winds, and vice versa? Or was one system used to determine the rotation for both?
- Though small, there does seem to be a consistent bias in wind direction in Fig 11. Would the bias be attributable to GPS errors? Was there a magnetometer calibration for the flight site?

Technical Comments (representative, not comprehensive)

- I recommend replacing 'unmanned aerial systems' with the more inclusive 'uncrewed aerial systems' or 'remotely piloted aircraft systems'

- The way the axis labels on the figures are formatted could cause some confusion at first. For example, on Fig 4 “revolutions / s⁻¹” could be interpreted as “revolutions per s⁻¹” instead of “revolutions with units of s⁻¹”.
- Colorbars should be included on Figs 5 and 6.
- On Fig 7, it may be informative to also plot the differences of the time series.
- On Fig 11, the errorbars are pretty difficult to see since they line up with the grid lines. It may be worth putting the cap on the end of the error bars to make them more visible.