The manuscript presented by Wildman and Weltz proposes a new method for estimating horizontal and vertical components of wind velocity, and respective time fluctuations. This area of research is critical for enabling new capabilities for increasing the spatiotemporal resolution of key observations in the lower atmosphere. However, additional validation is required to support the claims sustained by the authors. Therefore, I will withhold my recommendation for publication until the comments I have provided below are addressed by the authors.

The model presented in Eqs. (4) – (6) should be described as a point mass model instead of a rigid body model as it only accounts for translational forces and accelerations. A rigid body model account for sUAS rotational dynamics as well.

The authors assume gyroscopic terms to be small. To verify this assumption, the authors need to include a time history plot for each gyroscopic term.

In addition to reasons mentioned in line 89, absolute thrust can be influenced by the performance of GPS and barometer measurements, which are both used for hovering at a fixed height.

In Section 2.4, the authors mention employing the methods proposed by Weltz and Wildmann (2022) to calibrate curves for estimating wind velocity components in the body reference frame. However, curve fitting results are provided only for w_b in Section 4.2.3. The u_b and v_b calibration results need to be presented as well for completeness.

With regards to assertion made in line 199 about optimality, an optimal fit is not always a good fit. The data scatter shown in Figure 6 is quite high, which minimizes the value of using a nonlinear model for relating forces to airspeed. The authors should compare the residual error from linear and nonlinear fits to justify the curve fitting formulation described in Eq (11).

In Section 4.3, the authors state that variance of the lateral and vertical wind components is a better parameter for evaluating the performance of the wind estimation retrieval. This approach is not sensible as two signals with different mean values can have a similar variance.

In Section 4.3, It is not clear why the authors argue that it is more meaningful to rotate UAS and sonic anemometer wind observation into a wind reference frame. As shown in Figure 8, doing so makes it difficult to validate estimates of u, v, and w, as well as respective time fluctuations, u', v', and w'. Additionally, validation of resolved turbulence scales need to be performed in a N-E reference frame.

The conclusions made in this manuscript are largely unsupported unless a meaningful validation of wind velocity components u, v, and w, as well as respective time fluctuations, u', v', and w' are demonstrated with respect to an inertial reference frame.