

Review of egusphere-2026-4631: “Derivation of the multi-Doppler 3D wind field during the 2023 WesCon-WOEST campaign in southern England” by Thompson et al.

Recommendation: Accept pending Major Revision

Summary: I support the eventual publication of this work given the novelty of the 3D wind dataset, but I’m concerned that the w retrievals are too erroneous (or dubious) for many applications. I think this limitation of the dataset should be plainly acknowledged, or that additional evidence be produced demonstrating the accuracy of the w retrievals, which would likely require repeating the multi-Doppler retrievals with more sophisticated methods.

Major Comments

The primary motivation for this multi-Doppler retrieval dataset is “to provide physically-plausible estimates of updraft strength and sizes to constrain sub-km NWP simulations”. I’m not convinced the accuracy of the w retrievals meets this standard. Based on the results shown, w retrievals seem to rarely exceed magnitudes of 5 m s^{-1} , which is not very large for the 1-km analysis grid spacing. In the comparison with flight data (Fig. 8), the retrieved w entirely fail to capture the stronger drafts. I agree that the spatiotemporal mismatch between the retrievals and flight data likely explains part of the discrepancy, but in any case, there’s little evidence here or elsewhere in the paper that the w is retrieved with enough fidelity to help guide the development of sub-km NWP simulations. Even “plausible” estimates of updraft strength and size (L432–433) would not constitute an independent (i.e., empirical) benchmark for simulated updrafts.

I believe the weak w retrievals largely arise from lacking low-level radial velocity coverage (implied by relatively high radar base elevation angles of 1.0 or 1.5 degrees). As demonstrated in Shapiro et al. (2009) and Potvin et al. (2012), a vorticity constraint can substantially improve w retrievals in this scenario. The paper notes that the “vorticity constraint in PyDDA requires a single system motion, which is not straightforward to derive for the size of our domain and in the context of scattered convection, and is therefore not considered here.” I expect that imposing the vorticity constraint, even with locally erroneous domain-constant pattern translation velocity estimates, would have substantially improved the w retrievals. Neglecting this constraint substantially reduces the value of what could otherwise be a highly impactful multi-Doppler retrieval dataset.

I’m also concerned about the lack of advection correction given the long (10-min) radar volume periods. Failing to account for the nonsimultaneity of radar observations will inevitably produce severe vertical misalignments of wind field features in many cases, substantially degrading all

three retrieved wind components. Even a crude, domain-constant pattern translational velocity estimate is much better than assuming stationarity.

I recognize that repeating all of the multi-Doppler retrievals may not be practical in the short term. If the authors choose not to repeat the retrievals at this time, I believe the limitations of the retrieval methodology and the dataset should be clearly acknowledged in the paper.

Minor Comments

Fig. 1: Please also show multi-Doppler coverage nearer the ground. This would provide important context for the quality of retrievals that can be achieved.

Fig 1: Extraneous heading on panel 1.

Fig. 7: ‘3D wind’ y-labels are incorrect

Fig. 9: A log y-axis would be more appropriate since some of the most important differences are in the histogram tails.

Line 258: *wind_{ol}* undefined

L312–313: Remember to add the data DOI!

Fig. 6: Errant colorbar label on (c)

L348–349: “reduced observation of low wind speeds” → “underestimation of low-level wind speeds”?

L349: “addition of local observations rapidly improves the statistics” – please expand on this

Fig. 12: Colorbar for w is incorrect.

Wording / grammar / typos

There are too many wording/grammar errors to document all of them, and they can anyway be detected with any grammar tool. The most recurring issue is run-on sentences where a comma is used in place of a semicolon or the beginning of a new sentence.