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Interactive comment on "Investigation of observational error sources in multi Doppler radar vertical air motion retrievals: Impacts and possible solutions" *by* Mariko Oue et al.

Anonymous Referee #1

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The manuscript is very well written and understandable. It shows a sensitivity analysis of the multi radar Doppler variational vertical wind velocity retrieval technique based on a simulated convective event as a function of the number of radar involved and their position, radar scan strategy and time sampling. Although most of the technical aspects are described by words or using citations, perhaps the Authors could evaluate to describe some parts in more formal details e.g. by adding appendix for example to describe the coupling of WRF outputs and electromagnetic simulations of backscattering cross section used in the manuscript. I recommend for publication after some minor revisions.

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Discussion paper

Main comments 1. Reflectivity weighted mean velocity: I am wondering if its calculation depends by the assumption made on the parameterization of the particle size distribution within the numerical weather model used. For example, if you assume two different WRF run one using a microphysical schemes 1 and a second independent run using a microphysical schemes 2 which is different by the previous scheme and assume that both microphysical schemes are constrained by the same mixing ratios for a given WRF grid point. Would you obtain two different reflectivity weighted mean velocity for the two assumed microphysical schemes? Am I right? Although I understand that within an OSSE scheme is not necessary reproduce the true (unknown) Doppler velocity from WRF outputs for a single radar, I would suggest the Authors to add some comments in this aspect. Is it worth performing a sensitivity test with respect to the particle size distribution assumption to understand if your simulated velocity fields are consistent with what we expect during actual observations?

2 In the advection correction section when you state: "The high temporal resolution WRF output allows us to evaluate the impact of advection and evolution of the cloud field during the time period needed to complete the radar network VCP." I am wondering if the 0.5 km horizontal resolution-WRF you are using resolves the processes involved within a time gap of 20 s or if 20s is just the time sampling used to write out the simulations. Later on when you state on pag 15: "...the number of coherent updrafts structures show little sensitivity to the VCP time. This can be attributed to the fact that the number of updraft coherent structures does not change within the 5 min required to complete all sampling strategies". Can it be attributed to the fact that you are not resolving processes at very short time scales although you have an output at such scales?

3. It would be probably nice to add a table in the paper that summarize the results quantitatively (e.g. RMS).

Minor: - page 5, lines 1-10: items 1-4: I am wondering if the gridding procedure (spherical to Cartesian) is introducing some errors and if the Authors took them into account.

Which is the interpolation method used? Is interpolation in step 3 really needed or it is something done for facilitating gradients calculations?

- page 5 line 13 and hereafter: maybe is "equivalent radar reflectivity factor".

- Eq. 1. It is not clear if you are applying the weights only in the horizontal plane or not. In other words, I was expecting that polar to Cartesian conversion was applied in 3D and not in 2D as Eq. 1 is suggesting. Please clarify.

Pag 12, line 17, "The corresponding plots for the latest model output (12:19:40 UTC) used to forward simulate the highest elevations of the 2-min VCP are shown in Fig. 3 (middle row)." Middle row of figure 3 shows 12:19:00 and not 12:19:40.

Pag 12 Advection correction section. What happen when you intercept the bright band in the advection correction scheme?

Fig4. May be I would add a third and fourth row of panels showing the differences between the various scenarios and the original one.

Figure 5. labels a, b,c, d, e are missing. Upper left panel: "2 min" is missing for the dark grey line