EGUsphere, referee comment RC2
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Comment on egusphere-2022-346

Anonymous Referee #2

Referee comment on "Optimizing radar scan strategies for tracking isolated deep convection using observing system simulation experiments" by Mariko Oue et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-346-RC2, 2022

The manuscript presents a discussion about scan strategies during measurement campaigns, aimed at optimizing the sampling of convective storms and the retrieval of updrafts intensity. The paper is in general well written, with appropriate scientific background and clear illustrations. One concern I had reading this manuscript is that besides the main topic (scan strategies), there are a couple of side topics (use of VIL for tracking, polluted vs. unpolluted convection simulation) which distract from the main topic. In my opinion, the authors should try to focus on the main topic and remove other topics that are not strictly necessary to the scope, and being treated only superficially, are not scientifically meaningful. For example, the conclusion that cell tracking works better with the use of the VIL only relies on the fact that VIL-based tracking has the largest total number of cells detected (fig. 2). Anyway, a serious comparison of different variables used for cell tracking should consider more statistical indicators and real data, e.g. to evaluate realistically the impact of false alarms, etc.

I understand the intention of discussing the polluted vs. unpolluted cases to highlight the need for accuracy in the retrieval of vertical velocity. But for the scope of scan strategies, it may be enough to briefly report the ranges of vertical velocities simulated in different environments and refer to a separate (future) work specifically devoted to this analysis.

About the main topic, I confess that from the title I had higher expectations. I would have expected a discussion about a possible objective methodology to adaptively optimize the scan strategies of several radars to minimize some cost function (e.g., the RMSE of vertical velocity if the aim is to study the updrafts). Instead, the cases treated are quite specific and hardly applicable to the set up of a generic campaign. In fact, basically one specific cell, at a given distance, or anyway equidistant from several radars in a network (fig. 9) is considered. What about if the cell location is not equidistant from all the radars? The ranges from the individual radars will change, e.g. it will not be possible to sample the cell with just 14deg azimuth sector if the cell is closer. What would be convenient in this case? Increase the azimuthal spacing of the RHI scans or decrease the temporal sampling for example? Which radar should perform a volume scan, and which should do a RHI

scan? I would have expected to find answers to this kind of questions.

Having said that, the results presented are certainly useful for the specific set up of the planned measurement campaign in Texas. In this case, I recommend revising the paper (in particular, title/abstract) to make it clear that you're talking about a specific application. Otherwise, if the authors want to deal with the topic from a more general perspective (as the current title may suggest, at least to me), a major revision is needed, with a more comprehensive analysis of this (complex) problem and a clear organization of the material (also dropping all the unnecessary discussion about side topics).

MINOR COMMENTS

- Introduction: among previous work on scan strategy optimization, it would be worth adding at least a reference about the Collaborative and Adaptive Sensing of the Atmosphere (CASA) project, e.g.: Mclaughlin, David J., et al. "Distributed collaborative adaptive sensing (DCAS) for improved detection, understanding, and prediction of atmospheric hazards." Proc. American Meteorological Society Annual Meeting. 2005.
- Line 595: "the total beam" -> "the total number of beams"?
- Lines 151-159: it's not clear the difference and the goal of the scans named "1-min RHI" and "2-min SEC". Please explain better the difference between the two and why you need to split 0-45 and 45-90 the single RHI scans. Lines 336-339 later do not help clarifying.
- Table 1: why do you consider a different beam width (0.9deg) for the volume scan compared to the RHI scans (1.0deg)? I suppose this is to emulate NEXRAD's VCP, but why it is necessary? Shouldn't the comparison be valid for a generic radar? From the title and abstract I though the study aimed at a generic theoretical evaluation of scan strategies, but from these settings it looks like the goal is more specific and concerns the combination of NEXRAD and ARM radars. This should be mentioned more clearly in the abstract/intro.
- Figure 1 is mentioned for the first time after figure 8 (at line 302). Check figure order and corresponding references in the text.
- Figure 3: units of VIL is kg/m2, but dB is used here. You may use a logarithmic scale for the x-axis, but keeping the correct measurement units.
- Figure 4: what is the height of the freezing level for this case?
- Figure 5: I would expect to see some positive Zdr above the freezing level corresponding to the strongest updraft… Maybe the average over the 40 dBZ area masks the Zdr columns (if present)?
- Figure 10: the meaning of the colored arrows (and why they are repeated at different ranges) should be explained.