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Comment on amt-2022-302

Anonymous Referee #1

Referee comment on "Doppler power spectrum processing methods for vertical sensing 94 GHz solid-state PD millimeter-wavelength cloud radar" by Hai Lin et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-302-RC1>, 2023

Review of the manuscript "Doppler power spectrum processing methods for a vertical sensing 94 GHz millimeter-wavelength cloud radar" by Hai Lin et al.

The manuscript presents a processing chain of a W-band radar. The processing chain includes several stages: (a) noise level estimation, (b) signal detection including spatial and temporal filtering for improved sensitivity, (c) dealiasing based on dual pulse repetition frequency. The described routines are applied to measurements from the vertically pointed W-band radar developed by the authors.

The manuscript has a number of weaknesses. Here are the major ones:

- The lengthy introduction section covers irrelevant details of general cloud research but contains absolutely nothing about the actual problem addressed in the manuscript. The introduction must include a general overview of problems in the data processing, literature review on this topic, and explain which of these problems are solved in the study. In the current status, the motivation of the manuscript is not defined.
- The manuscript describes already existing methods slightly fine-tuned for the presented radar system. In my opinion, there is a severe lack of novelty in the manuscript. (1) In the section 3 the authors apply the segment method developed decades ago, the only difference is that the method is applied not just to a spectrum in a single range bin but to several range bins. It is hard to consider this as a novel approach. Also, it is not clear why the authors try to solve the noise estimation topic at all, since with modern computers there is absolutely no problem in applying the Hildebrand-Sekhon algorithm in real time. (2) In the section 4, the authors suggest using a time-space filter to improve sensitivity. Such filters, however, have been routinely applied for decades (e.g. Clothiaux et al. 1995 JAOT, Marchand et al. 2008 JAOT). The performance of the authors new filter is very close to the Gaussian one. For a single presented case study (which is hard to consider as statistically significant), FAR and MDR are nearly the same (just a few % difference). (3) In the section 5 the aliasing problem is solved by

applying the dual pulse repetition frequency technique which has also been used for decades. Authors themselves give a long list of references. The spectral dealiasing is also not a new thing (e.g. Kuehler et al. 2017, Maahn and Kollias 2012).

Taking into account the two above-mentioned items, I, unfortunately, cannot recommend the manuscript for publication and suggest a rejection.