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Discussions

Interactive comment on "A robust low-level cloud and clutter discrimination method for ground-based millimeter-wavelength cloud radar" *by* Xiaoyu Hu et al.

Anonymous Referee #1

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Referee #1 Comments (RC): The article amt-2020-230 entitles 'A robust low-level cloud and clutter discrimination method for ground-based millimeter-wavelength cloud radar' by Xiaoyu Hu, Jinming Ge, et al., (2020).

General Comment: The research article mainly uses the measurements of ground-based 35-GHz cloud radar. The authors propose a clutter or biota discrimination method under the presence of low-level clouds. A Multi-dimensional PDF approach effectively has been utilized for Cloud and Clutter identification. Further, the obtained PDFs are used to train the AI-/ML-based Bayesian classifier for the classification mask generation. The scientific results and conclusions presented in a clear, concise, and

well-structured way with number and quality of figures/tables, appropriate use of the English language. However, one specific primary concern is as below:

Specific Major Concern:

Authors mainly showcase shallow layer clouds' persistently long presence whose flat horizontal cloud base was found using collocated ceilometers based cloud base observation (fig 8-10). Moreover, all the presented cloud and clutter discrimination cases have more apparent boundary discrimination between clutter and cloud, the meteorological target. Fig. 8 is a broken cumulus case, but the cloud base is elevated above 1.5 km, just above the clutter. Please include few shallow convective cloud cases surrounded by dense biota/insect clutter and cloud base having biota (near similar to authors fig 4, but here cloud is not weak because it possesses strong dBZ values above 10). The reason for asking it because It is interesting to see the performance of the proposed method under a dense clutter crowded the broken cumuli with duration may be less than a few minutes (e.g., see referred Luke et al., (2008) & Kalapureddy et al., AMT,(2018) within Fig 13-14 and A3).

For the better flow of the manuscript, immediately after Sec 3.3's Bayesian method, the method's functional performance can start directly with Sec. 3.4 by shifting the First Para in Pg.10 suitably after ending part of line number 217 (i.e.,'….near-surface in Figure 7c).'

All figures from 7-11 need to modify and extend the height (y-axis) up to 3.6 km as per multi-dimensional PDFs maximum height discussed with figures (5-6) and the probability of detecting height with figure 12e.

Page 12, Line 53 & Fig.10: How the precipitating drizzle droplets kept as clouds? Is it done manually or taken care of through the spatial filter? Because initially stated (at line no. 119), the non-cloud meteorological targets need to remove with the low-level atmosphere for the created PDFs' better accuracy to characterize cloud from clutters.

Minor technical corrections:

1. Pg2 Line no. 37: modify the sentence '…..of ground-based millimeter-wavelength cloud radars (MMCR) being………..'? This inclusion is the prerequisite for the Pg3 Line no. 48, an acronym MMCR? 2. Pg6 Ln114: '….the flat cloud boundary around 4.5 …' it is not flat but slant. 3. Pg7 Ln146 & (Fig 4e): '…..the height of maximum (Z' x V') up to 500 m above (below) the peak ….. ' In fact, it is five range gate spacing (of each 30 or 25 m) from the peak (see Fig 4e there are 11 dots between two red dots that is spread in 300 m height (3100-2800). Please check it? 4. Fig.4: (a) what is the reason not extending the identified black dots bottom and top portion of the melting layer before 20:24-20:27 LT (where high LDR at ∼3 km with yellow backdrop seen)? 5. Fig.4 caption needs to recheck, especially correctness with 2nd line '…..Black dots and gray shading area in the left panels…..' unable to locate the gray shading in left panel except with (b) due to noise (may be removed by the NER with dBZ). 6. Pg11 Ln225: Please provide clarity on the used '…spatial filter with 'five range bins in vertical' do you mean with respect to 'height' and 'five range bins in the horizontal' do you mean 'concerning time'?? 7. Pg11 Ln239 end: delete 'is also'. 8. Pg 12 Ln250 & 267: it is confusing to read …lower SW values (below 0.4 m2 s-2) & higher SW values (around 0.3 m2 s-2). 9. Typo with Equation 4 where ',' read as FN'. 10. Pg 13 Ln283: modify sentence for completeness '……small portions of the data that overlaps.' 11. Pg 13 Ln289: I agree with the statement '….less fluctuating with time (Fig. 12d) and ' but not for height (Fig.12e) where PD shows significant changes above 2 km, especially in the cold season after 3.2 km altitude. 12. Fig. 11 caption should have mentioned the reason for missing the lidar cloud base.

Please also note the supplement to this comment:
https://amt.copernicus.org/preprints/amt-2020-230/amt-2020-230-RC1-supplement.pdf