

## ***Interactive comment on “Detection of the freezing level with polarimetric weather radar” by Daniel Sanchez-Rivas and Miguel Angel Rico-Ramirez***

**Anonymous Referee #1**

Received and published: 23 October 2020

This paper describes a melting layer detection technique from vertical Profiles (VP) and quasi-vertical profiles (QVP) from polarimetric radar observations. Examples are given from a C-band operational weather radar in SE England. Apart from Zh, Zdr, phi\_dp, and rho\_hv, the technique includes mean Doppler velocity and the gradient of the vertical Doppler velocity.

The paper can be published in AMT but it needs to be written in a more coherent manner. Sentences don't follow each other in some cases, and more clarification is needed in some cases. I give some examples below:

1. At the end of Intro, insert a paragraph outlining what this paper is trying to achieve and how the paper is structured.

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2. Line 95: By Doppler velocity, do they mean the mean radial component?
3. Line 115: What does 'visible signatures' mean? Can you quantify?
4. Line 128: The authors say "Based on the profiles of vertical velocity [V ], we propose a new variable: [gradV ]." - What about spectral width? Is this available from routine scans?
5. Figure 2: For the VP plots on the left side, the y-axis should go from 0 to 8 km to be consistent with the QVP plots. What about panel (j)? Why is the 0 to 1 km omitted?
6. Line 144: Define 'normalised' at this point.
7. Line 147: should 'estimate' be 'detect'?
8. Line 148: What does 'enhancements that the ML bring-up into the variables' mean?
9. Line 154: By 'elevation' do they mean 'altitude a.g.l'?
10. Lines 156-159: Grammar needs to be improved, and also the text is ambiguous; the sentence doesn't make much sense.
11. Lines 163: convective events are associated with different microphysical processes so ML doesn't apply.
12. Line 168: Doesn't the radar perform 'bird-bath' scans routinely?
13. Line 168: The sentence beginning 'Hence the Zdr ..' requires much more clarification.
14. Section 3 is verbose, not very technical and not well-written at all. Please rewrite. Also explain clearly why the peaks in Zh, Zdr and rho\_hv are at different heights above ground level and explain the difference between BB and ML.
15. Line 237: Once again, explicitly say how the normalisation is performed.
16. Explain how equations (2) and (3) were derived. If published elsewhere, then insert

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reference for the derivations.

17. Line 267: Explain/justify why the second derivative was chosen.
18. Line 293: "QVPs and VPs of Zh, as these variables measure similar properties of the raindrops" What does this mean?
19. Line 303: What does "resides on relative low values of reflectivity" mean?
20. What is the purpose of Section 5.1 if only the Z comparisons are given? It's not clear how it is relevant to the rest of the paper.
21. Regarding Fig. 9: What does 'FL estimated' represent exactly, that is in relation to the radar BB (peaks in all the variables), and the 0 deg C isotherm level?
22. What about attenuation corrections needed for Zh and Zdr? Were these applied?

These are some of the comments. Considerable amount of revision is needed

Please also note the supplement to this comment:

<https://amt.copernicus.org/preprints/amt-2020-375/amt-2020-375-RC1-supplement.pdf>

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