

This paper describes a melting layer detection technique from vertical Profiles (VPs) and quasi-vertical profiles from polarimetric radar observations. Examples are given from a C-band operational weather radar in SE England. Apart from Z_h , Z_{dr} , Φ_{dp} , and ρ_{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.
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.'?
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 Z_{dr} ..' 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 Z_h , Z_{dr} and ρ_{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 reference for the derivations.
17. Line 267: Explain/justify why the second derivative was chosen.
18. Line 293: "QVPs and VPs of Z_h , 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 Z_h and Z_{dr} ? Were these applied?

These are some of the comments. 'Major' revision is recommended.

