

Interactive comment on “Improved fuzzy logic method to distinguish between meteorological and non-meteorological echoes using C-band polarimetric radar data” by Shuai Zhang et al.

Anonymous Referee #1

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This paper proposes an improved version of the MeteSignal algorithm, introduced by Krause (2016), which separates meteorological (MET) and non-meteorological (NMET) echoes through dual-polarization radar features. The manuscript is structured into four sections: after a description of the MetSignal technique, the authors faced some impairments, related to the use of Doppler velocity, to the decrease of correlation coefficient in the region of ground clutter and anomalous propagation, to the accuracy of polarimetric variables in the weak signal region and to the melting layer region. For each of such issues, they proposed some improvements and adjustments that converge in a new version of the algorithm, labeled as MetSignal_noise. The latter, according to the results presented in Tab. 5, proved to be more efficient in the classification of MET

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and NMET signals.

As a general comment, the paper can be considered of interest for operational radar meteorology field and seems adequate to the audience of Atmospheric Measurement Techniques journal, although it lacks in originality (nothing of really new is proposed). The methods used to improve MetSignal algorithm are decent and, in general, efficiently described.

However, the paper has been written with a style barely adequate for a scientific International Journal. Therefore, my first suggestion is to perform a formal revision of the entire manuscript and to pay more attention to the punctuation and to the English grammar. In this respect, the sentences at Lines 53-58, 92-94 and 191-194 need to be rephrased more clearly. Moreover, I suggest to reduce the number of Figures: as an example, Fig. 10 can be aggregated to Fig. 7 or Fig. 2.

Other issues, described in the following specific comments, need to be addressed by the authors.

- Method (Lines 97-99). It is not clear how the authors determined the preset thresholds (0.8 for warm season and 0.7 for cold season). Please provide a clarification and add some details in the revised manuscript.

- Method (Lines 112-117). The authors stated that a set of post-processing rules have been applied to adjust the classification results. I suggest to perform a sensitivity analysis to demonstrate the impact of such rules on the classification accuracy. What happens to the results of Tab. 5 if you do not apply the post-processing?

- Method (Line 198): I have some doubts about the criterion used to identify the melting layer. The latter, in this work, is defined as the region above 2.5 km. However, melting layer altitude can vary significantly from one meteorological event to another, because it is related to the freezing level height. Therefore, in my opinion, the authors must adopt a more objective criterion to detect melting layer in the training events. In this

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respect, a careful analysis of horizontal reflectivity vertical profiles may be very useful. As the light of such remark, an update of Fig. 10 and, therefore, of Fig. 11, is needed.

- Method and Evaluation: I think that the authors should quantitatively assess the impact of the single impairments faced out in the Method section. In other words, I suggest to expand Tab. 5 and to present the results according to different scenarios: for example, what happens if you do not take into account the adjustment for Melting Layer Region in your algorithm?

- Evaluation. The authors must provide some clarifications about the contents of Table 5. How did you determine the classification accuracy percentage of MetSignal and MetSignal_noise algorithms? I assume you used the contingency table approach. This is an important point to clarify. Moreover, the performance of the two methods shall be evaluated with respect to more than one statistical score.

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