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Atmospheric Measurement Techniques Discussions

Interactive comment on "Detecting the Melting Layer with a Micro Rain Radar Using a Neural Network Approach" *by* Maren Brast and Piet Markmann

Anonymous Referee #2

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The paper describes a technique for automated detection of the melting level in the atmosphere with a 24-GHz radar. This technique is indeed of great importance, e.g., for meteorological research and air safety. The paper is nicely written and its contents be understood easily. The new detection technique seems to be powerful and superior to prior approaches. It should be published, but I would like to see some important additional information in the manuscript:

General issues: In general, neural networks are used to solve problems which are too complex to be understood in a straight forward way. Also, neural networks are often applied when a solution is necessary but information about the underlying process is

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Discussion paper

irrelevant and/or not necessary. But for application in science, the functionality of any method must be traceable. Concerning the current paper, the authors should make an additional effort to lay open the interiors of the trained neural network that was used for melting layer detection. This could be done by publishing computer code or by giving a graphical representation of their neural network in the paper.

Specific issues:

- Which criteria have been applied when defining the vertical extent of the melting layer by eye?

- Discussion of the limits of the approach (starting p.9 line 13ff) is a bit confusing. The authors discuss that limitation arise in convective systems in which droplets are transported upwards. Figure 5 does not show such extreme conditions at Hohenpeißenberg. A radiosonde launched close to Munich at 12UTC of 31-08-2017 shows a melting level at around 4000m a.s.l.:

http://weather.uwyo.edu/cgi-bin/sounding?region=europe&TYPE=TEXT%3ALIST&YEAR=2017&MONTH=08&FROM=311

The misdetections of melting events must hence be intrinsic to the method rather than being a result of a complex meteorological situation. Isn't it more probable that the algorithm reacts sensitive to vertical changes in terminal fall velocity at the edges of the skewed fall streaks of rain droplets?

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