AMTD

Interactive
comment

Interactive comment on "Combined use of volume radar observations and high-resolution numerical weather predictions to estimate precipitation at the ground: methodology and proof of concept" *by* Tony Le Bastard et al.

Anonymous Referee #1

Received and published: 18 June 2019

This paper presents an initial proof of concept of a new way to tackle the issue of the retrieval of the vertical profile of reflectivity (VPR), an important step in the radar estimation of precipitation on the ground. The method essentially consists in using the VPR estimated from the model which is most similar to the VPR observed from the radar at any given radar range gate. Currently, most operational VPR estimation methods provide a single VPR that is applied to the whole radar domain. The presented method outperforms the status quo mainly by providing an spatialized VPR and by being able to provide information of the VPR at low altitudes that are not observable by the

radar. Those characteristics ensure that the new method provides better performance particularly in situations where there is a large variability of the melting layer height within the radar domain or there is poor visibility of the radar at low altitudes. The paper covers and important topic, has significant novelty and it is well written. Therefore I recommend its publication provided some minor issues are addressed.

General comments:

1. As it is presented the method is rather complex and computationally expensive. The authors should provide an estimation of the computational cost and discuss its implications on its operational implementation.

2. The method is highly dependent on the performance of the NWP. However I can imagine situations where the forecast of quantitative precipitation by the model performs poorly, particularly in convective situations where the model may have difficulties in forecasting the right air temperature and generating convective cells. I understand that this paper is basically a proof of concept and that more analysis has to be carried out but I would appreciate a discussion of the possible limitations of the presented methodology and some suggestions on how to tackle them. For example, what to do when no VPR from the model is similar enough to the radar estimated VPR? What are the consequences of having a very poorly sampled observed VPR? That is a situation that may happen regularly in areas where the radar has poor visibility such as in the mountains.

Specific comments:

Page 2 Line 3 – I would change backscattered power by backscattered signal since the phase also plays and important role in modern radars.

Page 2 Line 24 - . . . NWP models . . .

Page 3 Line 16 - . . . between 0 and $3°$)

Page 3 Line 17 - raw elevation scans . . .

Page 3 Line 19 – (Figueras i Ventura and Tabary, 2013)

Page 3 Line 20 – . . . on a regular Cartesian grid . . .

Page 6 Line 20 – Assuming that the iso-0°C isotherm of the model at the radar range gate location is essentially correct is a strong constraint of the method since the position of the air mass can be shifted by several kilometres or the temperature may not be forecasted correctly. This should be highlighted and discussed in more detail.

Page 7 Line 28 - . . . For the purpose of this study, . . .

Page 13 Line 36 – The name of the first author is repeated twice (Georgiou S.)

Fig. 12 and Fig. 13 – The reference to those two figures in the text have been swapped.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-166, 2019.