

Atmos. Meas. Tech. Discuss., referee comment RC2  
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## Comment on amt-2022-8

Anonymous Referee #2

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Referee comment on "Sensitivity analysis of attenuation in convective rainfall at X-band frequency using the mountain reference technique" by Guy Delrieu et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-8-RC2>, 2022

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In this study, the authors address the impact of attenuation in rain on the radial profiles of radar reflectivity at X band. Five different equations parameterized by the radar miscalibration error  $dC$ , radome attenuation  $PIA_0$ , the error in the path-integrated attenuation  $PIA_m$  estimated from the mountain radar signal, and the multipliers  $a_{AZ}$  and  $a_{AK}$  in the power-law  $A - Z$  and  $A - K_{DP}$  relations are used to retrieve the unbiased radial profile of  $Z$ . Four of these equations are nonpolarimetric and three of them are constrained by  $PIA_m$  whereas the fourth is a classic Hitschfeld-Bordan solution which is very unstable for higher values of  $PIA_m$ . The four unknown parameters are varied in different combinations within certain ranges and the combination which yields the best match between 5 radial profiles of retrieved  $Z$  is considered a solution for all four parameters. The authors found that the estimated values of  $a_{AZ}$  and  $a_{AK}$  using their approach are consistent with the corresponding values derived from the simulations based on the DSD measurements and claimed this as a feasibility test of the method.

It is difficult to read this manuscript. There are too many parameters and equations. For example, I had hard time to realize that  $PIA_0$  and  $PIA_m$  are identical to  $AF(r_0)$  and  $AF(r_m)$  expressed in a logarithmic scale. Equation (3.1) for the cost function is not understandable and requires more explanation. I guess that most of the readers (including myself) may not be familiar with the LHS technique and the Nash-Sutcliffe Efficiency (NSF) measure of the difference between two radial profiles of  $Z$ . These have to be defined and explained in a more detail as well as the terms OPS and NOPS.

It is not clear what is the ultimate purpose of the effort – more accurate QPE in the mountainous areas? Is there intention to estimate rain rate from corrected radial profiles of  $Z$ ? It is well known that  $Z$ -based rainfall algorithms are not optimal and the methodologies based on  $K_{DP}$  and  $A$  demonstrate much better performance, particularly at X band. It looks like using ZPHI-like retrievals of the radial profile of specific attenuation  $A$  and the  $R(A)$  relations is a more efficient and economic way to quantify rainfall. Moreover, the authors have benefit of determining the variable parameter  $a = A/K_{DP}$  because they can directly measure the path-integrated attenuation  $PIA_m$  using radar echoes from the

mountains in their area along with a total span of differential phase  $\Delta\Phi_{DP}$  over the propagation path.