Comment on amt-2020-468
Anonymous Referee #3


The paper presents some preliminary findings to assess the potential of W-band vertically pointing radar observations for improving fog forecast via data assimilation. The authors focus on studying errors associated with the background profiles and the forward operator. The other reviewers have already commented upon the former (I have similar comments). I will focus on the latter. I find the simulations with the forward operator quite confused. First a Gamma modified PSD is introduced; this has 4 free parameters (the authors do not mention any correlation between parameters). They then introduce other 2 parameters C and X (I do not know really why?). For some reason then they study the variability of a profile with alpha, nu and N_0 but they forget completely Lambda (i.e. the characteristic fog size). Why?

Fig.4: all units in the y-axis are wrong. Not sure how useful is Fig.4, particularly the bottom panel. If N_0 changes then there is just an amplification (not sure the figure is actually right, it looks like the maximum of the blue line is different from the orange one). Similarly simulating reflectivities changing N_0 is trivial and should not be plotted (Fig 5, right panel), doubling N_0 just add 3 dB. On the other hand the change of alpha nu and Lambda should be better investigated accounting for the possible relationship between the different parameters (It is not enough to change only one parameter at a time).

Line 405-410: I am not convinced that some of the big differences we see in Fig.6 can be attributed to non sphericity. Where is the freezing level in this scene? Also instead of "isotropic particles" use "spherical particles".

Fig8: not sure about the cluster of points bove 500 m. Is that fog? If so why you are cutting the plots at 1km?

Tab1: Range for HATPRO (0 to 10 km) => it does not make any sense to specify a range for a radiometer

Fig1, caption: I do not see 11:00 UTC but 10:20 UTC in the plots.