

We thank Reviewer #1 for his/her constructive comments.
Our responses are given below in red.

Please explain the subscript i in Equation (1).

We added “subscript i denotes the index of the model profile in the vicinity of the observed profile of reflectivity”

In the bias correction method, the bias is given by $b = Z^o - Z^{PO}$, However the innovation is defined as $Z^o - H(x)$ in the cost function J_{PO} . The authors need to show the histogram (or mean error) of the bias corrected innovation.

The Bayesian retrieval is not variational, and therefore $Z^o - H(x)$ cannot be defined as an innovation. The fact that we introduced J_{PO} as a cost function was misleading in the first version of the paper. J_{PO} is a weight associated to each column i in the vicinity of the radar. It is a function of the difference between observed and simulated RASTA reflectivities. The text “~~the cost function in equation 2~~” has been modified by “*in equation 2*”.

The bias correction was not calculated using $Z^o - H(x)$. Indeed, grid-to-grid comparisons require a perfect spatial and temporal match between observations and forecasts, which is rarely the case for high-resolution NWP models, and especially when convective systems are considered. By construction, the Bayesian retrieval allows to shift a pattern that was well simulated by the model, but at a wrong location. In order to remove positional errors, which are not gaussian, from the bias correction, it has been decided to define the bias by $b = Z^o - Z^{PO}$, instead of $Z^o - H(x)$.

The histogram and mean error of the bias-corrected reflectivity pseudo-observations are now shown in Figure 3. We added some explanations in the text in section 3.2:

“The effect of the bias correction is shown in Figure 3, in which Contoured Frequency by Altitude Diagram (CFAD) of the differences between the observed reflectivity and the bias-corrected reflectivity pseudo-observations are shown for a σ_o of 2 dB. The new bias is indicated by the black line. Figure 3 demonstrates that, after applying the bias correction in Equation 2, the residual bias is close to 0 dB except above an altitude of approximately 10 km, which is probably due to the smaller number of points used to calculate the bias correction. As explained by Janisková (2015), the use of additional predictors, such as temperature or hydrometeor contents, could lead to an improvement in the bias correction at higher altitude.”

Please explain the notation of ro_q and r_m_q in Figure 3

We changed the two notations for r_o and r_m in Figures 3 and 10 (now Figures 4 and 11). r_o denotes in-flight water vapour mixing ratio measurements. r_m is always the water vapour mixing ratio from the model.

In Figure 4, r_m denotes the water vapor mixing ratio retrieved using the 1DBayesian method. The red curve indicates the standard deviation errors (and biases on the left panel) between r_o and r_m . Similarly, the black curve indicates the standard deviation errors (and biases) between r_o and water vapour mixing ratio from the background.

In Figure 11, r_m indicates the water vapour mixing ratio from the analyses.