Referring to the symmetric error model in satellite all-sky assimilation, this manuscript reveals the error structure of radar reflectivity as a function of symmetric rain rate, and rationally optimizes the observation error distribution based on this model. The PDF of the reflectivity departure normalized by the symmetric rain rate becomes more Gaussian compared with the PDF normalized by the original standard deviation. In addition, the effects of the predictors from different observational sources on this model are compared, which provides potential referable points for the rational estimation of observational errors in the radar data assimilation.

Major comments

1. For satellite assimilation, departures (or bias) mean O minus B (OMB), where B is calculated from the background using the observation operator in the DA model. However, the B obtained in this manuscript is calculated using the Unified Post-Processor (UPP) software package, so this B may differ from the B in the DA model. Please check the specific operator and provide an explanation.

2. Rain rates from other sources (e.g., the FY-4A QPE hourly rainfall product) have also been selected as predictors for this radar symmetric error model. However, satellite and radar are two observations of different character and perspective, please add an explanation of the rationale for this way.

3. Line 157-158: This manuscript needs to provide a description of the quality control algorithm for 'misses and false simulations', which determines the Quality of the later presentations on 'any-reflectivity' and 'both-reflectivity' analyses.

4. For the assimilation system, the symmetric error model serves to estimate the observation error at different observation points and does not change the value of the OMB, whereas the Gaussianity of Figures 10 and 11 changed. Please explain why the normalization is done by "symmetric rainrates"? Does this operation consider both the observation error and the OMB?

5. In describing the predictors for the radar symmetric error model, this manuscript has given the equal weight to the rain rate simulated by the model and the rain rate calculated from radar observations. Is it likely that the radar observations will be more accurate than the background? Please add an explanation of assigning the weights in this way.

Minor comments:

1. Line 124: The formula number is missing.

2. Line 180: Please add the strategy and time resolution for calculating r_{model}. In addition, the rain rate is an instantaneous variable, while the precipitation output from the WRF is an accumulated variable, and the rain rate calculated from it is an average value, please add an explanation of not using the reflectivity output directly from the WRF.

3. Line 248: Remove the ‘the’ before ‘the Figure 7c shows that’.

4. Line 307: Replace ‘more Gaussian’ with ‘and results in a PDF distribution that is closer to the standard Gaussian distribution’.

5. It is necessary to label the sample sizes for CMPAS rainfall, FY-4A rainfall, and the 10 times logarithmic rain rates in Figure 11.