Review of *"Potential use of radar slant-linear depolarization for measuring rainfall microphysics"* by Huang *et al*.

This manuscript evaluates the potential of slant-linear depolarization ratio (SLDR) for retrieving rainfall microphysical properties using single-transmit, dual-receive millimeter-wave radars. The authors use T-matrix scattering calculations, synthetic drop size distributions (DSDs), and measured disdrometer spectra to compare retrievals using reflectivity alone with those using reflectivity and SLDR. The results show that adding SLDR improves the simulated retrievals of characteristic drop size and rain rate.

The paper provides useful insights into the potential application of slant-polarized cloud radars to rainfall measurements. It is well written and makes a valuable contribution to the radar and cloud physics community by motivating new observational strategies. Before publication, I recommend that the authors provide more detail on the methods and observational datasets. My detailed comments are provided below.

Major Comments

1. My main comment is the description of the methods and observational datasets. The authors use both synthetic normalized-gamma DSDs and observed DSDs to evaluate the retrieval algorithm, the characteristics of these datasets need to be presented more clearly. I suggest adding figures comparing the DSD spectra and their variability across the datasets, together with distributions of key quantities such as mass-weighted mean diameter and rain rate. This would help readers understand how well the synthetic ensemble represents the observed rainfall conditions.
2. The improvement differs among the observed DSD datasets. For example, the mean-diameter RMSE ratio is 0.34 for EPFL HyMeX but 0.62 for Nanjing. Figure 4 does not explain these differences. Please include representative retrieved-versus-true comparisons for the observed DSDs and examine the absolute errors and biases across drop-size or rain-rate ranges. This would show whether SLDR is useful across the sampled rainfall conditions or whether most of the improvement comes from particular DSD regimes.

Minor comments

Lines 117–140: Please add some details on the scattering calculation. Specifically, please explain the diameter integration range and resolution of the DSD, axis-ratio relation assumption, fall-speed relation etc.

Line 175: Same as the previous comment. It would be helpful to specify the axis ration relations (i.e. equations) used here.

Figure 4a: Please specify varied μ parameters.

Lines 125–127: Please provide the normalized-gamma DSD equation and define the normalized intercept parameter and its units. This would make the synthetic DSD generation easier to reproduce.

Lines 148–149: MedARE is introduced as an evaluation metric, but its results are not presented. Please report these values or remove the reference to this metric.

Lines 150–161: Please confirm that the data are split before noise augmentation and clarify how SLDR noise is handled in the validation subset.

Figure 4b and Lines 247–249: Please check the consistency of the fixed-shape gamma rain-rate RMSE ratio, which is shown as 0.33 in the figure but reported as 0.34 in the text.

Lines 255–256: Please include the units of the Nanjing rain-rate RMSE values, 1.95 and 1.49, and distinguish these linear-space errors from the logarithmic errors.