Comments on "Observed relationship between drop size distribution and environmental properties in eastern Japan" by Unuma

General comments

This study focuses on the relationship between the drop size distribution (DSD) of convective clouds and environmental properties in eastern Japan. It conducts research using multiple observational data and analysis methods. The topic holds significant scientific importance and contributes positively to understanding precipitation processes and mechanisms. The research content is comprehensive, the methods are reasonable, and the data are abundant. However, there is still room for improvement. With revisions and refinements, it has the potential for publication.

Major Comments

1. Lines 116–118: The four parameters discussed here are central to the manuscript's analysis. While the authors cite relevant literature, further clarification is warranted. Specifically, the manuscript should explicitly outline the calculation methods for these variables and elaborate on their physical significance within the context of this study. This addition would enhance reproducibility and help readers interpret the results more effectively.
2. DSD Data Sources and Uncertainties: The drop size distribution (DSD) is derived from both radar retrievals and ground-based disdrometer measurements. To strengthen the validity of the findings, the authors should:
   - Address whether comparative analyses were conducted between the radar and disdrometer datasets to assess consistency or discrepancies.
   - Discuss potential uncertainties inherent in radar-based retrievals (e.g., calibration errors, resolution limitations) and their implications for the DSD estimates.
3. Figures 7 and 8 (Relationships and Causality):

- While these figures illustrate associations between environmental parameters and shape parameters, the strength of the correlations remains unclear. Incorporating statistical analyses (e.g., correlation coefficients, p-values, or confidence intervals) would quantitatively substantiate these relationships.
- The discussion should explicitly acknowledge that correlation does not imply causation. For instance, the observed trends could be influenced by unaccounted variables or confounding factors. Revising the text to temper causal language and highlight the exploratory nature of these relationships would improve scientific rigor.