

Revisiting the Z-R Relationship Using Long-term Radar Reflectivity over the Entire South Korea Region in a Bayesian Perspective

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요 지

A fixed Z-R relationship approach, such as the Marshall-Palmer relationship, for an entire year and for different seasons can be problematic in cases where the relationship varies spatially and temporally throughout a region. From this perspective, this study explores the use of long-term radar reflectivity for South Korea to obtain a nationwide calibrated Z-R relationship and the associated uncertainties within a Bayesian regression framework. This study also investigates seasonal differences in the Z-R relationship and their roles in reducing systematic error. Distinct differences in the Z-R parameters in space are identified, and more importantly, an inverse relationship between the parameters is clearly identified with distinct regimes based on the seasons. A spatially structured pattern in the parameters exists, particularly parameter α for the wet season and parameter β for the dry season. A pronounced region of high values during the wet and dry seasons may be partially associated with storm movements in that season. Finally, the radar rainfall estimates through the calibrated Z-R relationship are compared with the existing Z-R relationships for estimating stratiform rainfall and convective rainfall. Overall, the radar rainfall fields based on the proposed modeling procedure are similar to the observed rainfall fields, whereas the radar rainfall fields obtained from the existing Marshall-Palmer Z-R relationship show a systematic underestimation. The obtained Z-R relationships are validated by testing the predictions on unseen radar-gauge pairs in the year 2018, in the context of cross-validation. The cross-validation results are largely similar to those in the calibration process, suggesting that the derived Z-R relationships fit the radar-gauge pairs reasonably well.

Keywords : *Z-R Relationship, Bayesian regression, Radar rainfall, Uncertainty*

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