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Comparison of Microphysical Characteristics between the Southern Korean Peninsula and Oklahoma Using Two-Dimensional Video Disdrometer Data

Abstract

Regional and climatological differences determine and significantly affect precipitation microphysics. In this study, the microphysical processes of precipitation between the southern Korean Peninsula (KOR) and Norman, Oklahoma, United States (OKL) has been compared and investigated using long-term ground observations from two-dimensional video disdrometers (2DVD). Through the framework of scaling RSDs, analysis of the raindrop size distributions (RSD) as well as moments from the two regions were conducted. Results reveal that concentration of small (large) drops were higher (smaller) in KOR than in OKL. The KOR RSDs tend to have higher characteristic number concentration (N'_0) and small characteristic diameters (D'_m) compared to OKL RSDs. Further analysis revealed that for both the KOR and OKL RSDs, N'_0 increases with increasing D'_m at lower Z, while reversing at higher Z. Using scattering simulations, rainfall estimation relationships between rainfall rate R and radar variables were retrieved at S-, C- and X-band wavelengths. Results show that for the same R and the same wavelength, KOR RSDs showed relatively small horizontal reflectivity and specific differential phase shift when compared to OKL RSDs. However, at S-band, the specific attenuation for both regions were similar. This indicates the advantage of using specific attenuation for rainfall estimation at S-band.

Keywords

raindrop size distribution, cloud microphysics, rainfall estimation

Reference

Bang, W., Lee, G., Ryzhkov, A., Schuur, T., & Sunny Lim, K.-S. (2020). Comparison of microphysical characteristics between the southern Korean Peninsula and Oklahoma using two-dimensional video disdrometer data. *Journal of Hydrometeorology*, *21*(11), 2675–2690. https://doi.org/10.1175/jhm-d-20-0087.1