SEMINAR

專題演講

國立中央大學 太空科學與工程學系

Department of Space Science and Engineering, National Central University

Time

Wednesday, May 14, 2025
14:00 – 15:00

Place

健雄館(科四館)

S4-810 教室
Room S4-810,
Chien-Shiung Building

Vertical Wind Effect on Slope and Shape Parameters of Gamma Drop Size Distribution

CHAO-HSIN CHEN(陳朝信)

PhD student of Department of Space Science and Engineering

Approximate equations for slope Λ and shape μ parameters of the gamma raindrop size distribution (DSD) are derived from theoretical considerations on the basis of the reflectivity-weighted mean terminal velocity V_T and Doppler spectral width σ_p of the raindrop echoes. These approximate equations are then corrected to reduce the error by using the long-term ground-based disdrometer measurements. We applied these equations on the VHF-radar measurements (i.e., reflectivity-weighted mean fall velocity and Doppler spectral width) to estimate μ and Λ aloft. The effects of the vertical wind velocity on the VHF radar-estimated μ-Λ and σ_p-V_T values are investigated.

The result shows that there is a tendency for the μ and Λ values to increase with an increase of the upward wind velocity. In addition, the terminal velocity and the spread of the DSD estimated from the precipitation echoes are strongly related to the vertical air velocity. The stronger the upward vertical air velocity is, the larger the terminal velocity and the smaller the spread of the DSD will be. The dependence of the estimated μ and Λ values on the vertical wind velocity is very likely caused by the updraft that can support and carry away the smaller raindrops in the original drop size distribution in the radar volume. Consequently, the DSDs aloft are truncated and the corresponding μ and Λ values estimated from the radar returns tend to be larger. To confirm this assertion, we intentionally truncate disdrometer-measured DSDs at small drop size end and calculate corresponding μ and Λ values. The results show that the distribution patterns of the μ-Λ scatter diagrams of the truncated DSDs bear strong resemblance to those of the radar observations, both of which are very different from those obtained on the ground.