

T-28 Aircraft Image Probe Data Processing: Hail Storm Uncertainty and Radar Coupling

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The armored T-28 aircraft obtained in-situ imaging probe observations in hailstorms over multiple field projects. The T-28 is unique in its ability to sample hailstorms containing particles up to 3 inches in diameter. Particle size distributions derived from the imaging probe observations are invaluable for comparison with the CSU-CHILL S-band polarimetric radar. Images from the T-28 Hail Spectrometer are typically processed using one-dimensional (1D) size information; however, an instrument upgrade enabled two-dimensional (2D) sizing capabilities for multiple field projects. Particle size distributions from 14 flights that include both 1D and 2D Hail Spectrometer processing are analyzed. Consistently, 1D processing results in larger maximum particle sizes and lower concentrations of small particles. Review of 2D images shows that the typical 1D processing method overestimates particle sizes due to noise and coincidence effects; therefore, the 2D processing methodology should be used for creating particle size distributions. Reflectivity calculated using the 2D particle size distribution is substantially lower than reflectivity calculated using the 1D particle size distribution. Hence, more water inclusion is necessary to match the CSU-CHILL radar observations.