Quantitative Interpretation of Polarimetric Radar Observations of Hail

James Klinman¹, Andrew Detwiler¹, David Delene¹, Patrick Kennedy², Ivan Arias²,

V. Chandrasekar², Aaron Bansemer³, Andrew Heymsfield³

¹Univeristy of North Dakota, ²Colorado State University, ³National Center for Atmospheric Science

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Introduction & Background

- Comparison of observed polarimetric radar signatures with in situ microphysical observations from storms containing hail.
- Improving ability to relate polarimetric radar returns to storm microphysical conditions and hail properties.
- Dataset comes from collaborations including the T28 aircraft operated by South Dakota School of Technology and Mines and the CSU-CHILL radar operated by Colorado State University during a series of field projects between

Example PSD Used in Radar Calculations



particle size (PSD), only Hail Spectrometer (Hail-2D) data was recorded for time interval. This interval contained particles up to 4.0 cm leading to a peak in reflectivity in the calculated and observed

the years 1989-2003.

The T28 aircraft recorded variables such as liquid water content and temperature. In the initial case discussed here,



liquid water content peaked around 1.5 g/m³, and the temperature was around -5°C. Under these conditions, hail stones of diameter 1 to 2 cm or more are likely to be in a spongy growth mode with possible shedding.

Radar Reflectivity for Initial Case

0.00) KM X-AXIS= 90.0 DEG AS OF 10/08/23) 22 JUNE 2000 T28 CHILL CAPP: Early (southern) part of track: grid filled ~0018:18 UTC

Aircraft track on 2000/06/23 during time 00:13:00 period 00:23:00. Pilot took a sharp turn just before

Calculating Radar Variables

Using PSDs along with a range of values for ice density and axis ratio, T-matrix calculations are used determine radar reflectivity and are under development to determine differential reflectivity, linear depolarization ratio, and the correlation coefficient. All three plots are from 2000/06/23 just past midnight UTC.







Uncertainty and Quality Assurance





Future Objectives

• The decrease in concentration observed in the five smallest HVPS channels matches the decrease seen in the corresponding Hail Spectrometer channels. • The different sizing methods highlight uncertainty in maximum particle size and concentration. • Xsize allin is preferred since it is reliable, simple, and is consistent with the sizing method used in earlier data.

of individual Example particle in viewer development. Additions to the System for OAP Data Analysis (SODA) individual generate particle images that are matched with their respective characteristics.

- Finish assuring data quality.
- Automate identification of useful periods of data and the processing of all useful T28 and CHILL data.
- Efficiently analyze the large amount of data.

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