Assessing Hail Characteristics over the Sierras de Córdoba Mountains in Argentina: A Comparative Analysis of X-

and C-Band Data from RELAMPAGO-CACTI



BACKGROUND: The results of theoretical and observational analysis of 3 IOPs of interest within SESA during RELAMPAGO-CACTI (2018-19) indicate the need for a more advanced tool of hail classification algorithm built on the principles thresholds (Z, Z_{DR} , ρ) designed for distinguishing between two categories of hail: small (D < 2.5 cm) and large (2.5 cm < D < 5 cm)

METHODS:

1. Ground validation: analvsis of polarimetric signatures in hailstorms producing hail of different sizes has been performed using the data collected by DOW 7. COW, and ground truth available. Three hail-bearing storms (IOP4 20181110, IOP14 20181205, and IOP17 20181214) were examined.



- 2. 2D T-matrix scattering calculations for various convective storm conditions, differing by the horizontal shape and the type of precipitation, are considered (e.g., rain and hail with hailstones of different diameters, dry, spongy or coated with liquid water)
- Next calculations. 3.

Combining dual-wavelength analysis, scattering simulations, and microphysical modeling, we can gain insights into hydrometeor processes in South America's extreme precipitation systems, distinguishing between small and large hail...



NEXT:

- Extended polarimetric analysis for smaller or larger particles in rain, dry hail, and hail containing liquid water (Z_H-Z_{DR}, Z-p_{hv}, Z_{DR} -p_{hv}, Z-K_{DP}, and Z_{DR} - K_{DP} , Δ_{λ} Z_{H} , Δ_{λ} Z_{DR} , Δ_{λ} K_{DP} , Δ_{λ} Z_{H} - Δ_{λ} Z_{DR} Δ_{1} Z_{DR}): different scattering response as result of resonance scattering effects for large particles, at slightly different sizes for the two wavelengths.
- Differences in Z_H and Z_{DR} between the C- and Xband frequencies will be denoted as Δ , where P is the polarimetric radar variable of interest.
- More exploration of the scattering properties of different hailstone shapes, densities, orientations, size distributions, and liquid water contents.
- The results will be a preliminary step toward understanding the informative content of dualfrequency signatures for small vs. large hail in SESA during RELAMPAGO-CACTI to improve single-wavelength polarimetric hail identification and characterization techniques at these radar wavelengths.

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ACKNOWLEDGMENTS:

The authors would like to thank:

1. National Science Foundation (grant number AGS-191100)

