Introduction

While evaluating a new Hail Size Detection Algorithm (HSDA) it was found that significant overlap of polarimetric variables existed for different hail size categories. The major question was whether this overlap was truth or if combined radar sampling and report matching schemes contributed to the overlap.

In 2014, the WSR-88D was upgraded to include the Supplemental Adaptive Intra-Volume Low-level Scan (SAILS), which inserts an additional 0.5° scan halfway through the volume when the radar operates in VCP 12/212.

Data & Methods

966 SHAVE reports
• w/in 120 km SAILS
• 352 no hail
• 325 small hail (D < 25.4 mm)
• 233 large hail (25.4 ≤ D < 50.8 mm)
• 56 giant hail (D ≥ 50.8 mm)

Discussed in 5 sections
• Point Match (453 reports)
• Window Match (462 reports)

Discussion

The results illustrate the difficulty in evaluating polarimetric variables and derived algorithms due to poor temporal sampling of both radar and ground truth. The use of SAILS tilts in point matching reveals large shifts in the distributions of the polarimetric variables—the largest being for giant hail and ZDR. Shifts are also present in window searching and in bulk statistics combining all tilts; the resulting distributions reveal the limitations of window searches. Thus, it seems that the temporal resolution of a typical WSR-88D volume (~5 minutes) is insufficient to accurately capture hail fall (especially for larger hail sizes) precisely, even when compared to a high spatial resolution data set such as SHAVE. Thus what may be needed to accurately describe distributions of polarimetric variables with observations is faster volume updates, more temporally precise hail reports or both.

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Bulk Results

• Impact of SAILS and matching methodology depends on hail size category
• Most noticeable shift when including SAILS is in ZDR for point matching
• Window searches with broader distributions than point matches
• Search strategies result in little impact to skill scores, further investigation into HSDA needed

SAILS Matching Comparison: Window Match (462 reports)

• Compared to point matching, generally wider distributions

SAILS Matching Comparison: Point Match (453 reports)

• Only reports which matched to SAILS tilts when SAILS was included for point matching
• Largest shifts in distributions are for giant hail

HSDA Skill
Without SAILS: Hit Rate* = 0.459
With SAILS: Hit Rate* = 0.468

Point Hit Rate* = 0.516

*Used strict scoring, thus the point match of a giant hail report MUST be in a match pixel of giant hail

Window Hit Rate* = 0.483

*Used strict scoring, thus the point match of a giant hail report MUST be in a match pixel of giant hail