Impacts of Super-Resolution Data on NWS Warning Decision Making

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1. Introduction

- Build 10 upgrades to WSR-88D radar network in 2008
  - Improved data from legacy to super-resolution (Fig. 1)

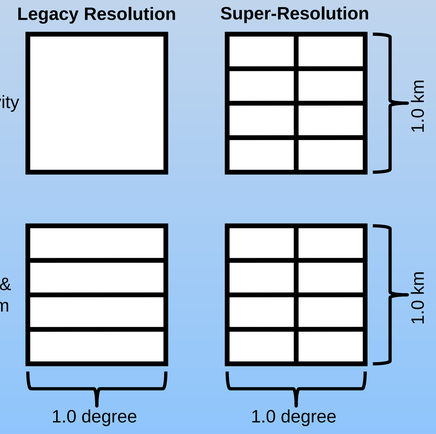

Figure 1. Differences in bins between legacy and super-resolution reflectivity, Doppler velocity, and spectrum width products; modified from Wood et al. (2009, Fig. 2).

  - Expected improvements:
    - More detailed storm features (Fig. 3)
    - Storm identification at farther ranges
    - Better warning decision making
    - Increased lead time
  - Super-resolution requires a narrower effective beamwidth
    - Reduced from 1.39 degrees to 1.03 degrees
    - Achieved through oversampling and data windowing (Fig. 2) (Torres and Curtis, 2007)

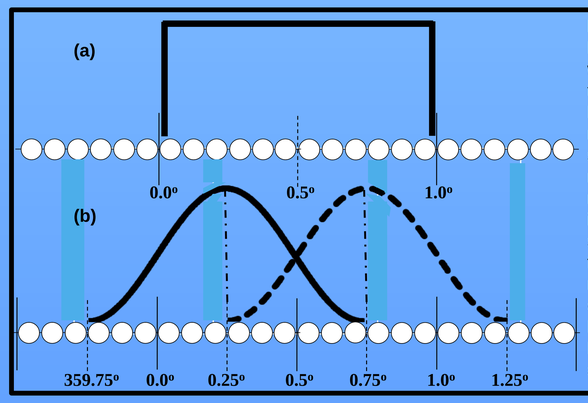

Figure 2. Examples of windowing techniques used. For (a) legacy resolution, for a single 1.0 degree radial sample, the rectangular window is used. For (b) super-resolution, for two 0.5 degree radial examples, either the von Hann or the Blackman windows are used.

2. The Survey

- Developed to determine NWS warning forecasters' understanding and use of super-resolution data.
- Randomly selected from each WFO in each of the six NWS regions
- 12% response rate with equal representation based on number of forecasters in the region.
- >80% had at least 3 years experience
- >60% had at least 10 years experience

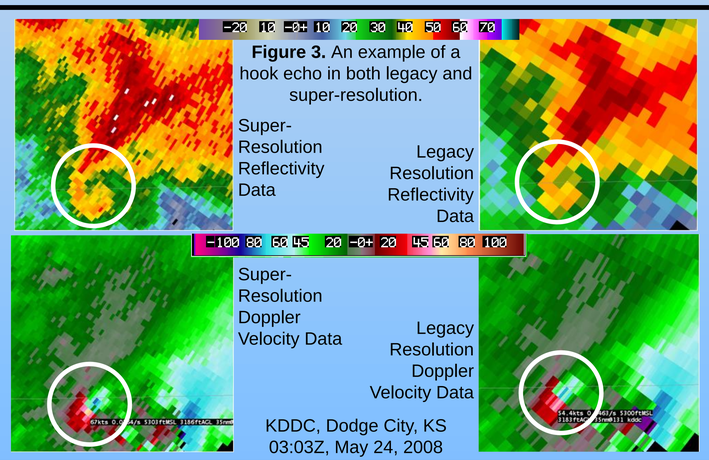

Figure 3. An example of a hook echo in both legacy and super-resolution.

3. Results: Understanding of Super-Resolution Data

- 90% took the WDTB training on Build 10, 80% of which were required
- Super-resolution has higher statistical error than legacy resolution
  - ➢ 60% believe otherwise
- Algorithms do not ingest super-resolution data
  - ➢ 30% believe algorithms do
- Super-resolution produced on split-cut levels
  - ➢ 30% believe it is produced on all VCP levels
- 90% have used both legacy and super-resolution
- 85% believe the benefits outweigh the costs

If you have any additional questions or comments and I'm not here, feel free to stop me in the hallway or contact me at jmvogel512@gmail.com.

4. Results: Interpretations of Super-Resolution Data

Table 1. Distribution of responses for effects of super-resolution data on: (a) if storm features are more easily identifiable and (b) if storm features are seen at farther ranges.

(a)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/a	No Answer
Hook Echoes	0%	2%	4%	32%	38%	6%	18%
BWER	0%	4%	14%	32%	26%	6%	18%
Gust Fronts / Boundaries	0%	2%	4%	26%	50%	0%	18%
Mesocyclones / TVS	0%	2%	6%	42%	28%	4%	18%

(b)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/a	No Answer
Hook Echoes	0%	8%	12%	40%	8%	6%	26%
BWER	0%	10%	16%	30%	8%	10%	26%
Gust Fronts / Boundaries	0%	6%	26%	32%	4%	6%	26%
Mesocyclones / TVS	0%	10%	20%	32%	6%	6%	26%

- Storm features identification and identification at farther ranges were impacted immediately (Table 1)
- Forecaster identified examples where super-resolution improved identification:
  - Rear and forward flank down drafts
  - Reflectivity notches associated with mesovortices
- Too early to determine impacts on lead time and FAR

5. Conclusions & Future Work

- Previous studies suggest improvements in storm feature identification and warning decision making
- Those surveyed agree, but too early to tell on lead time and FAR
- Surprising results with understanding of technical aspects
  - Not detrimental, could impact forecaster calibration time to super-resolution
- More responses would be desirable
- Another year may allow for more data:
  - New cases and opinions on super-resolution
  - How lead time and false alarm rate are impacted

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