Dual-Pol Assessment of Spring 2011 Central/Southern Plains Large Hail Events: A Warning Decision-Maker's Perspective

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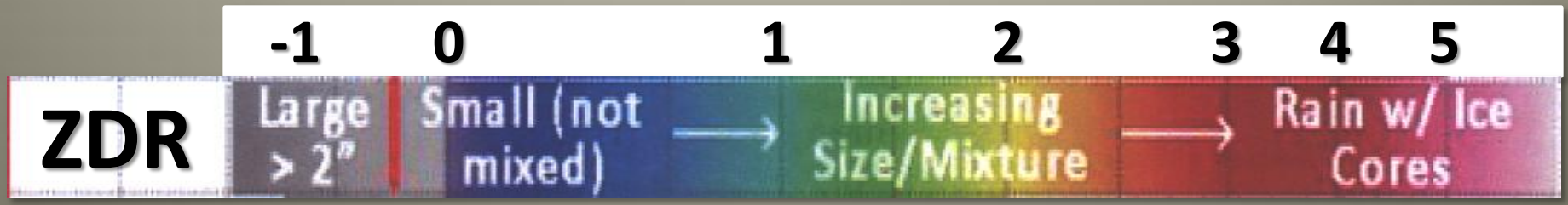
Objectives

- **Demonstrate Dual-Pol utility in assessing large hail (≥ golfballs) from warning decision-maker's standpoint.**
  - Base Reflectivity (Z)
  - Differential Reflectivity (ZDR)
  - Correlation Coefficient (CC)
  - Specific Differential Phase (KDP) unavailable ☹
- **Are base reflectivity radar products needed anymore now that Dual Pol has arrived?**

Differential Reflectivity (ZDR)

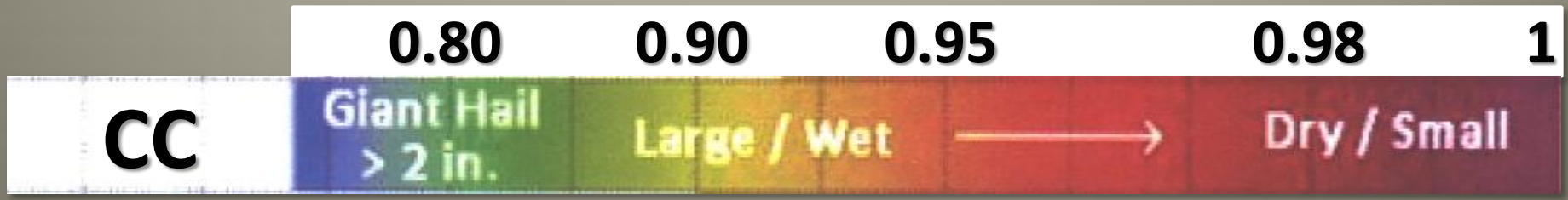
- ***Shape*** **of dominant hydrometeors (Z_h-Z_v)**
  - **Hail…ZDR near zero**
    - Hail tumbles, looks spherical
    - ***HOWEVER***…melting hail < 1” may look like giant rain drop…large positive ZDR
- **Characteristics of Large Hail ≥ Golfballs:**
  - **ZDR often negative** (mie scattering)



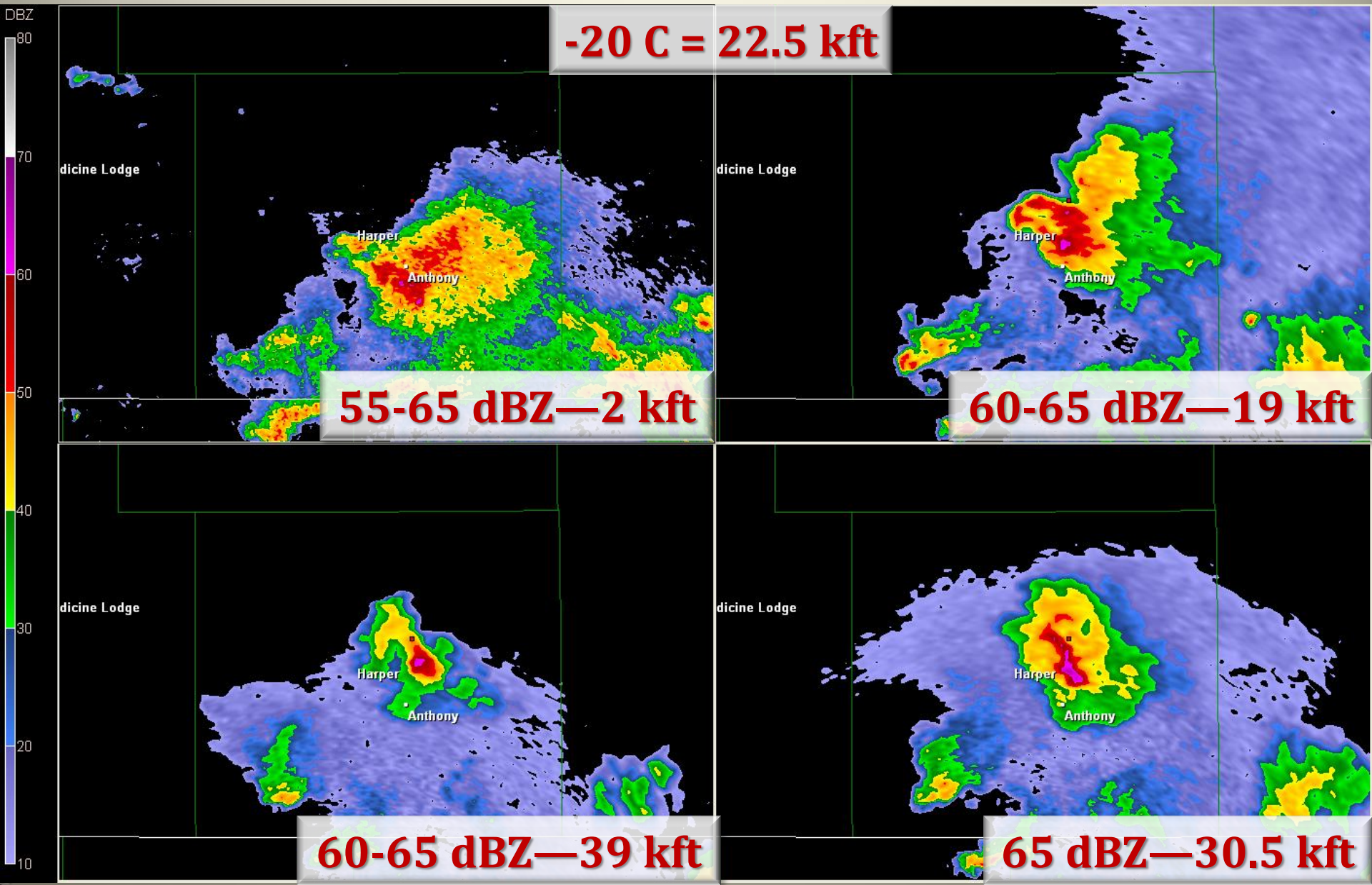
Correlation Coefficient (CC)

- ***Uniformity*** **of hydrometeors**
  - ***Uniform*** objects…small rain drops, dry/small hail:
    - **High CC…0.97-1.00**
  - ***Non-uniform*** objects…large hail, large/wet snowflakes, non-meteorological targets:
    - **Low CC…< 0.90**

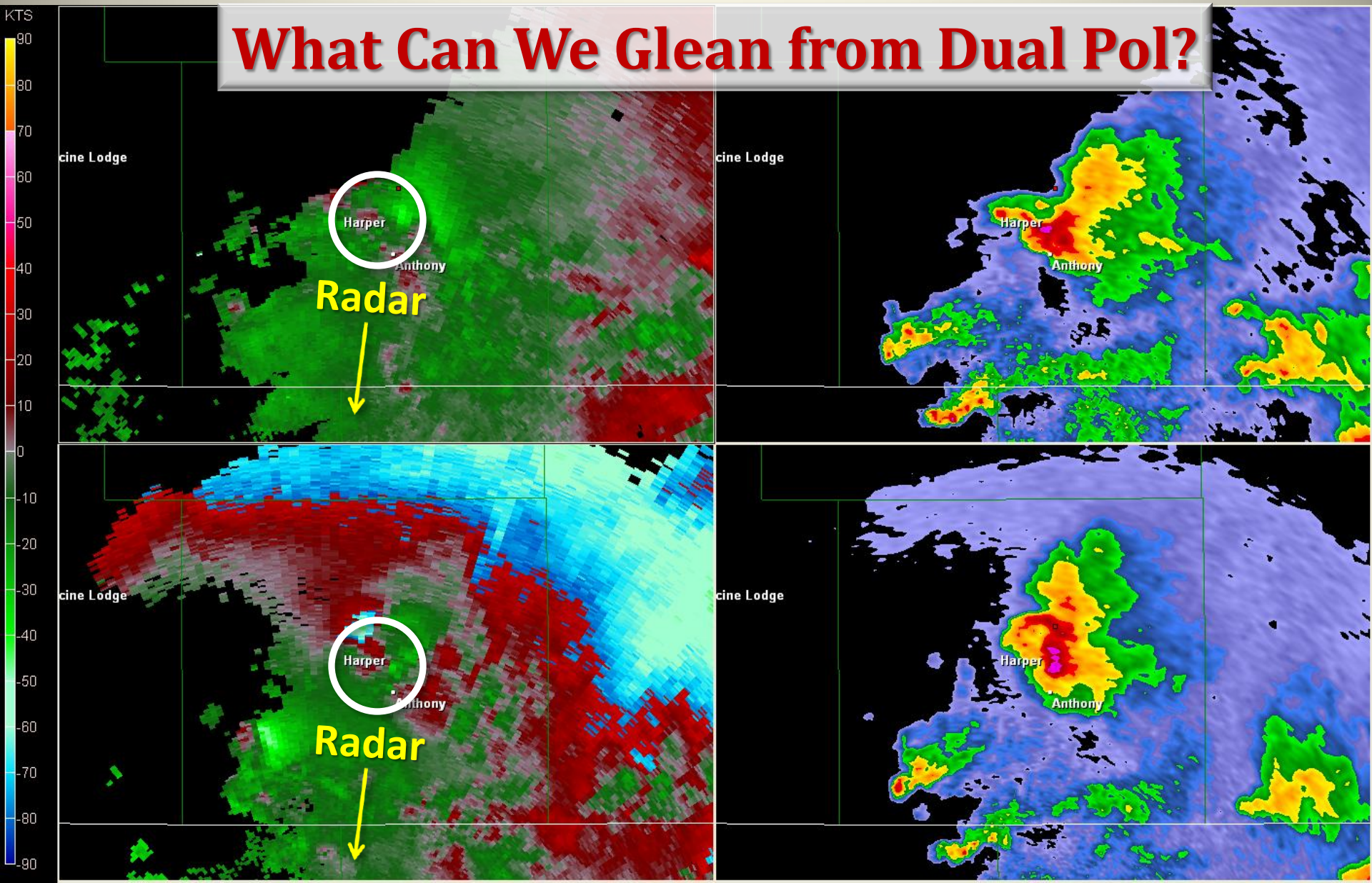
- **Characteristics of Large Hail ≥ Golfballs:**
  - **Very low CC…0.70-0.85 (mie scattering)**



South-Central KS—April 9, 2011—0118z



South-Central KS—April 9, 2011—0118z



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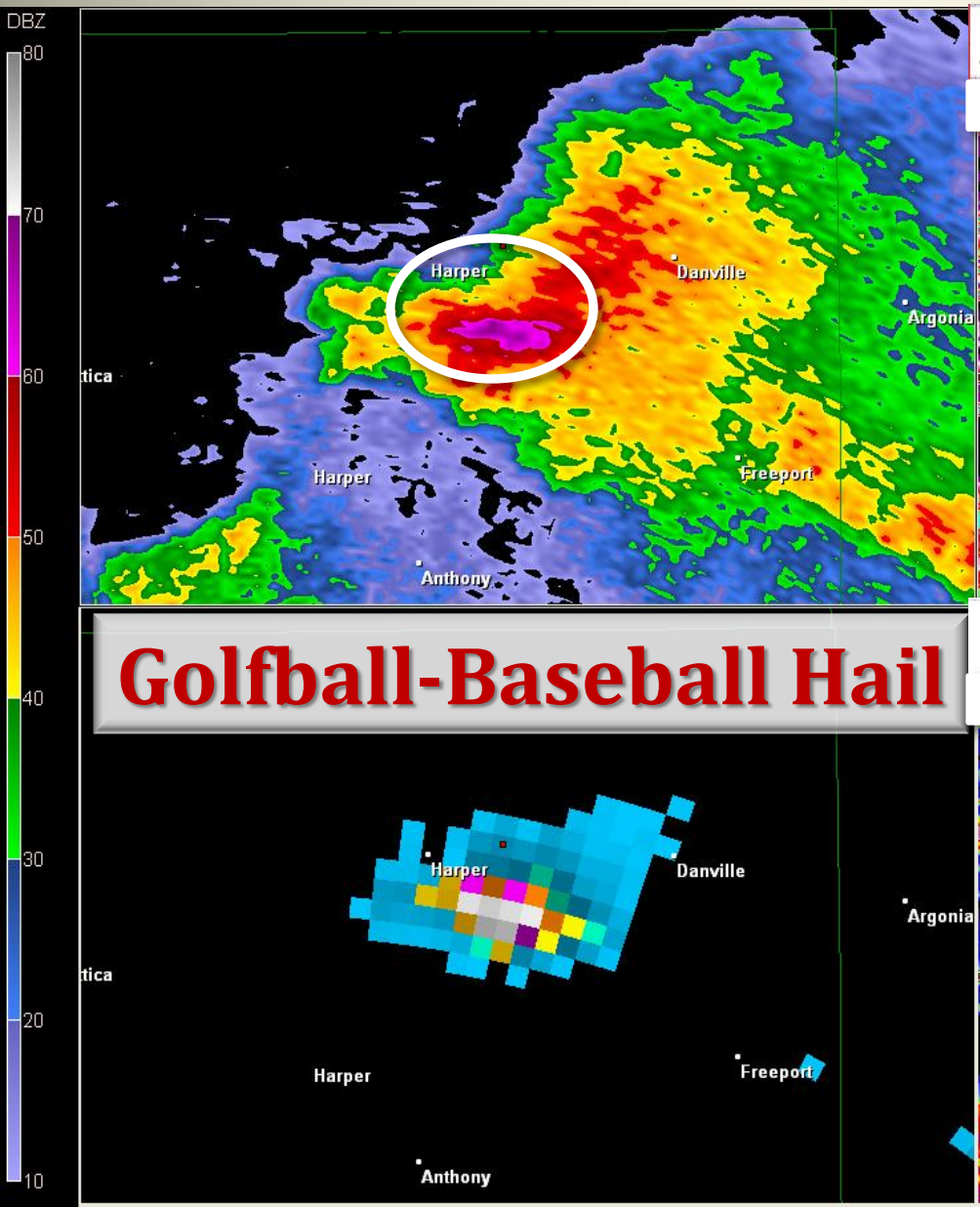
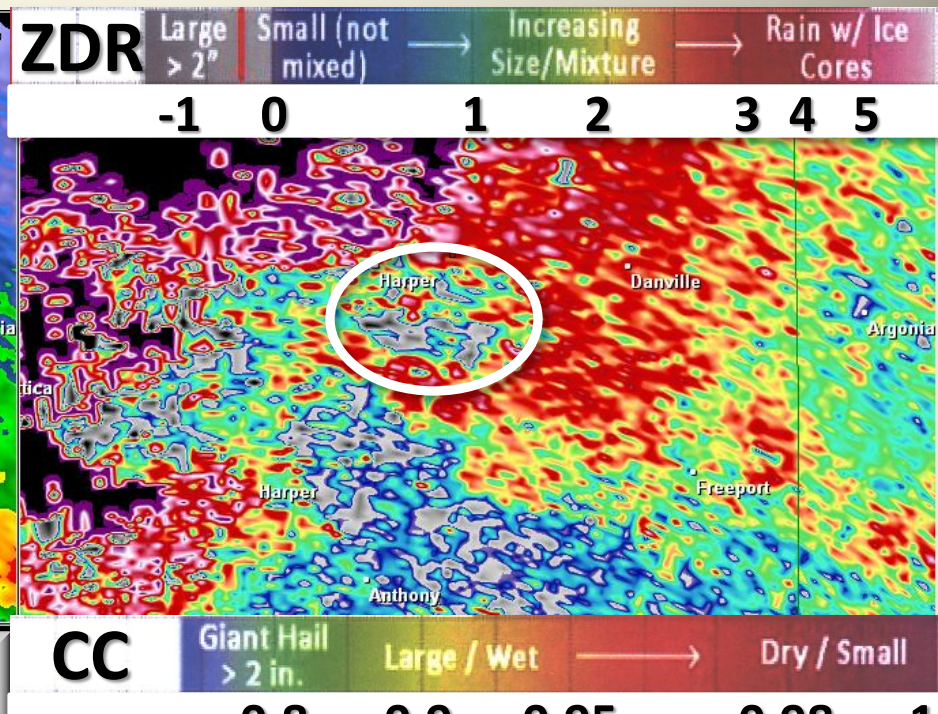
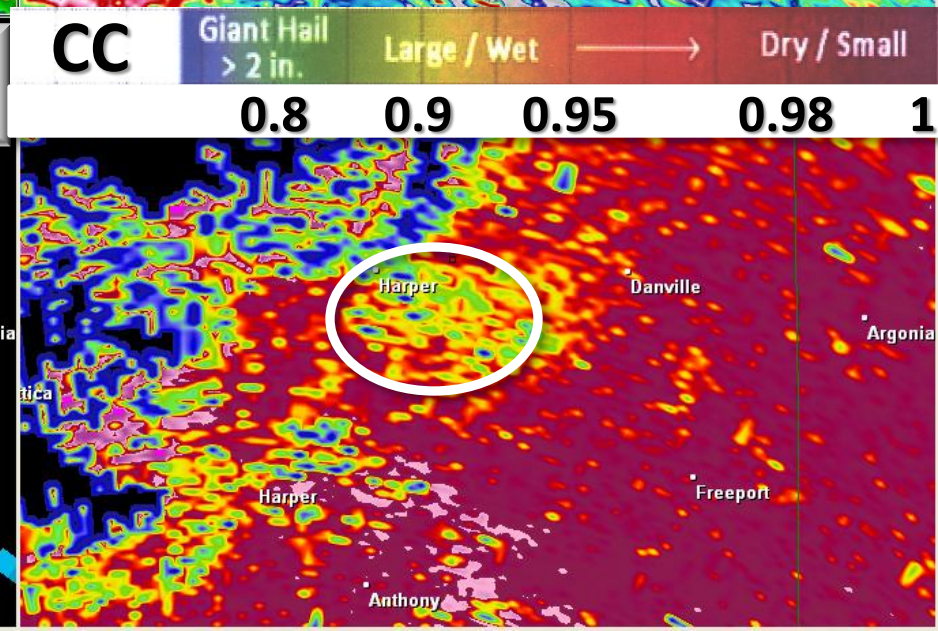
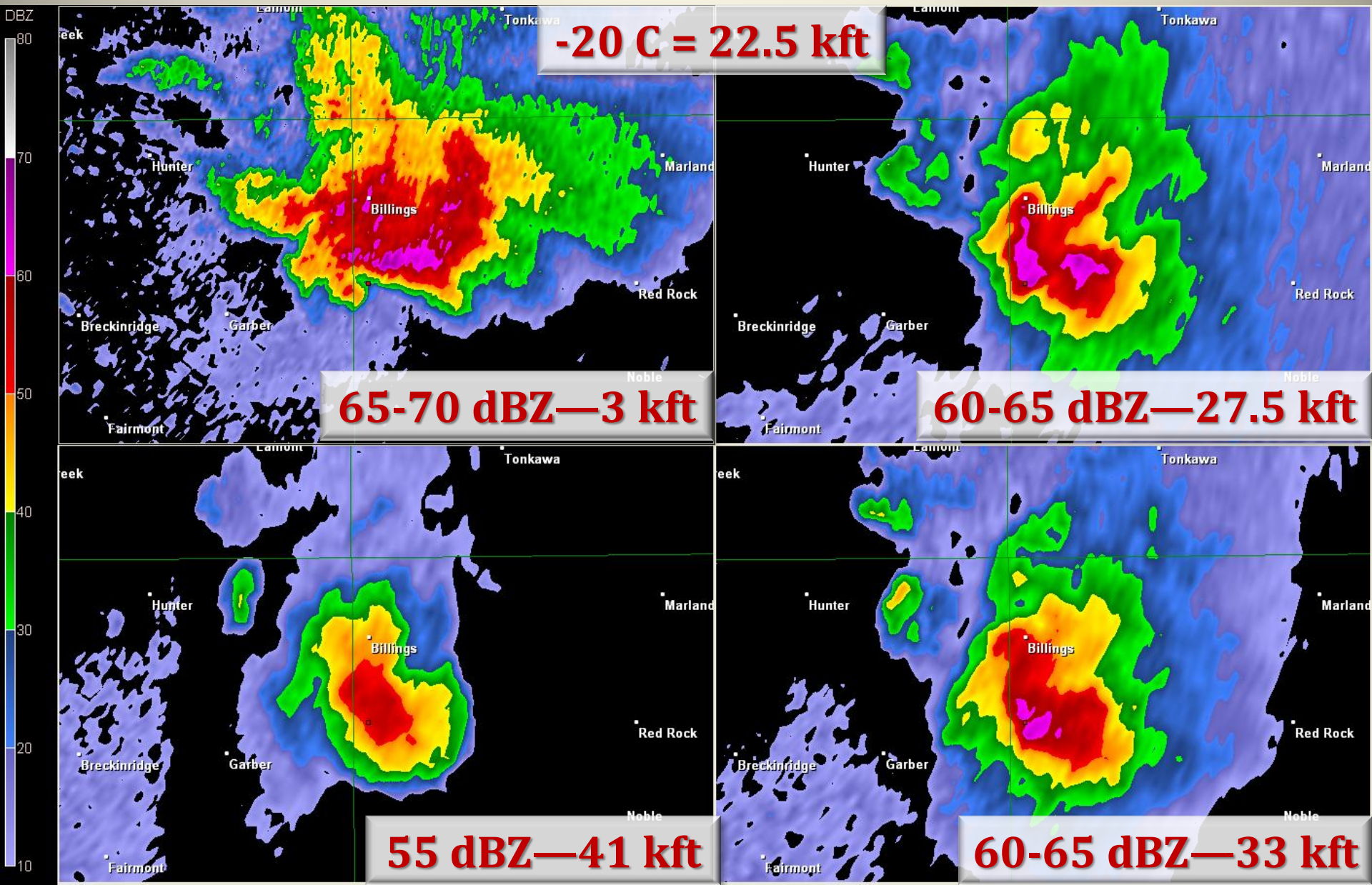


Golfball-Baseball Hail





North-Central OK—April 8, 2011—2343z



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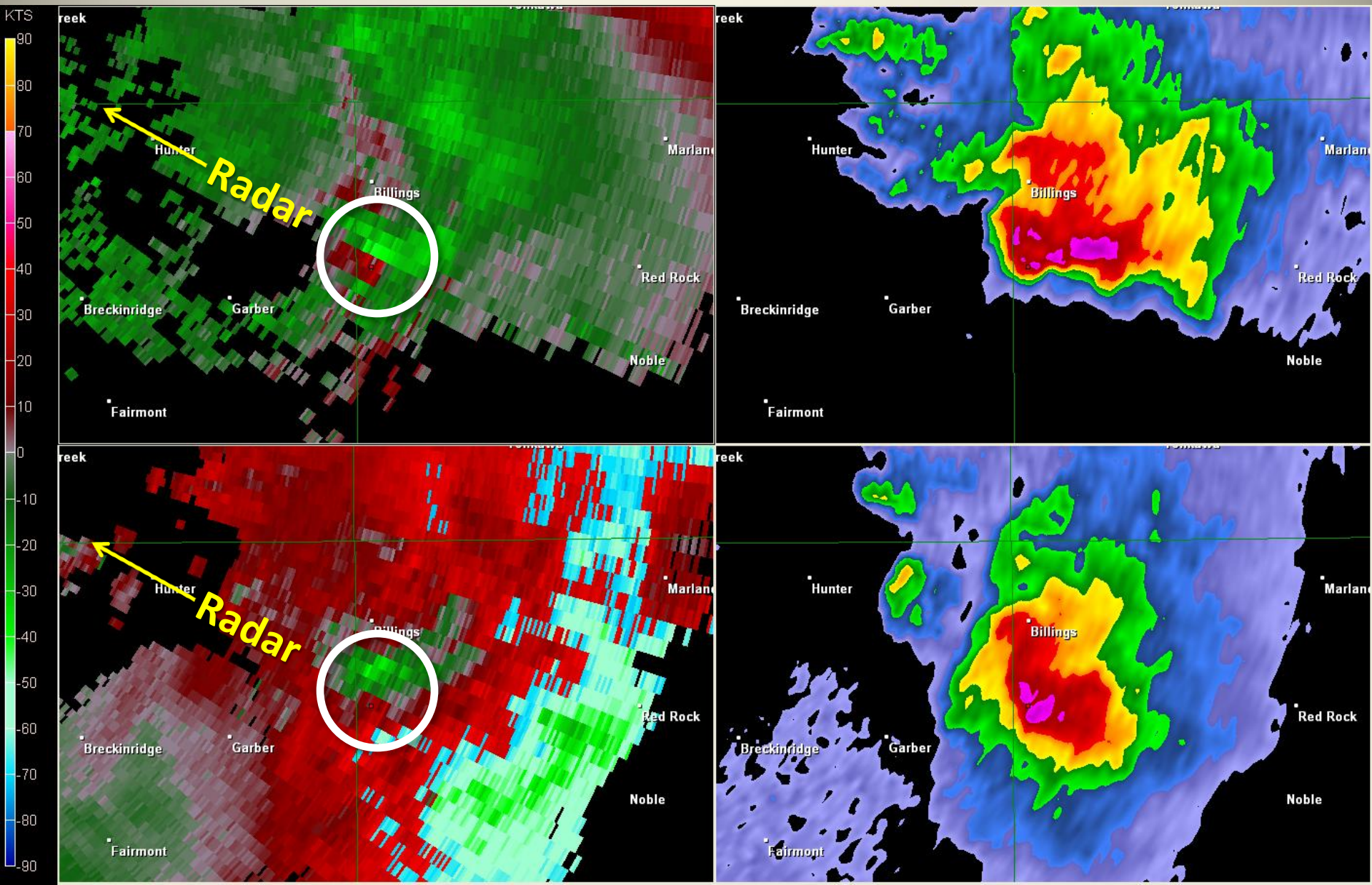

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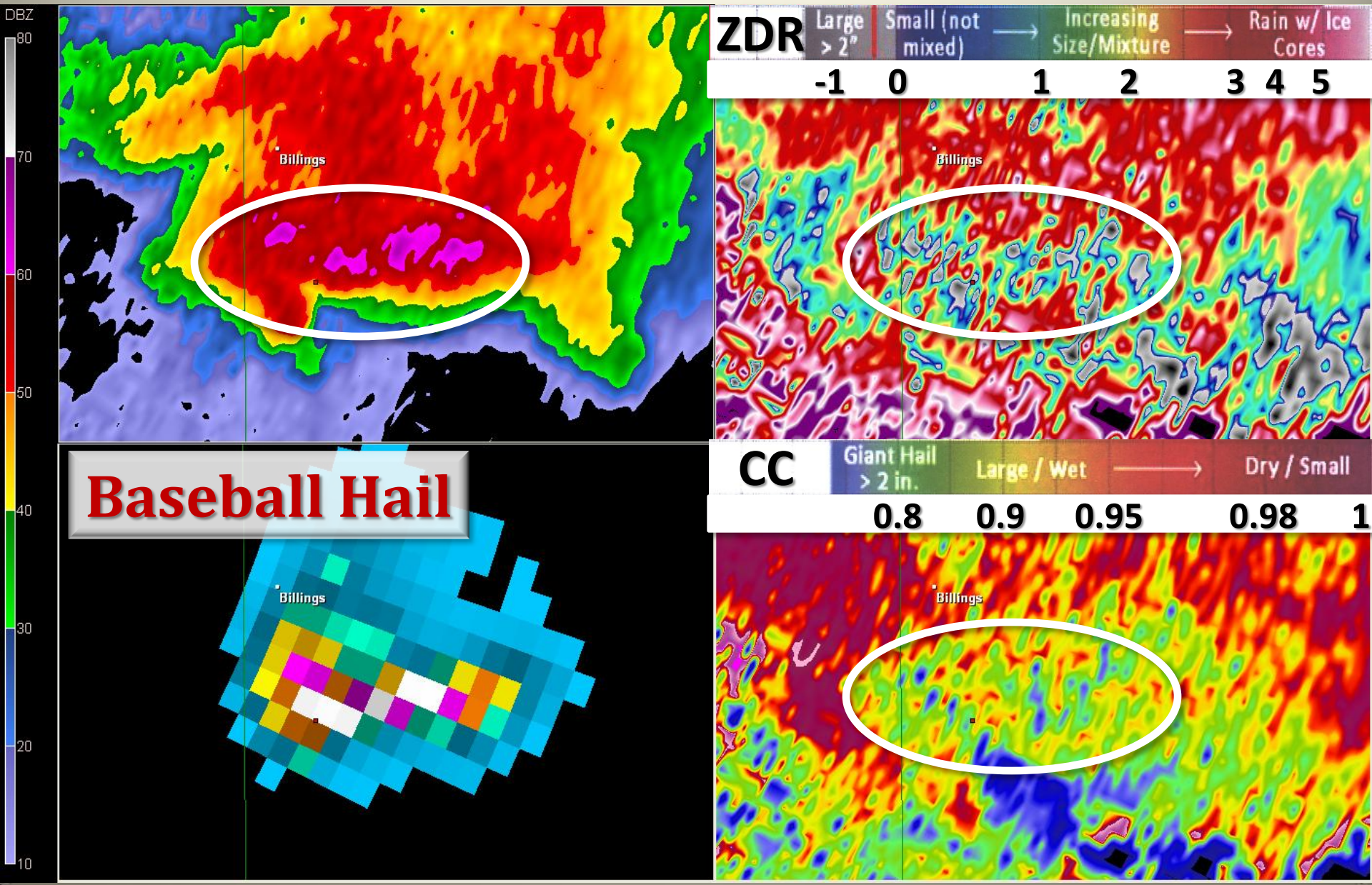
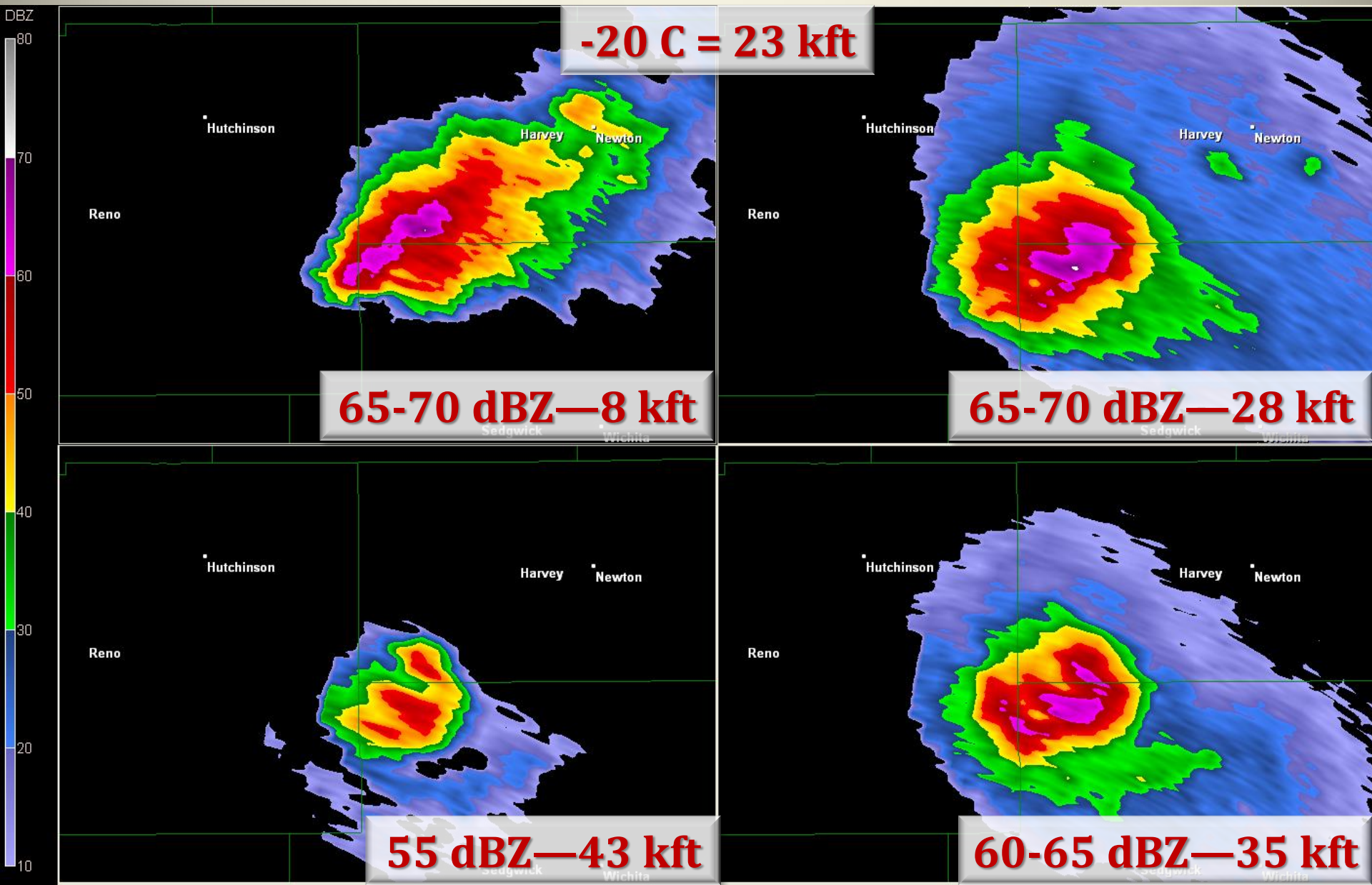
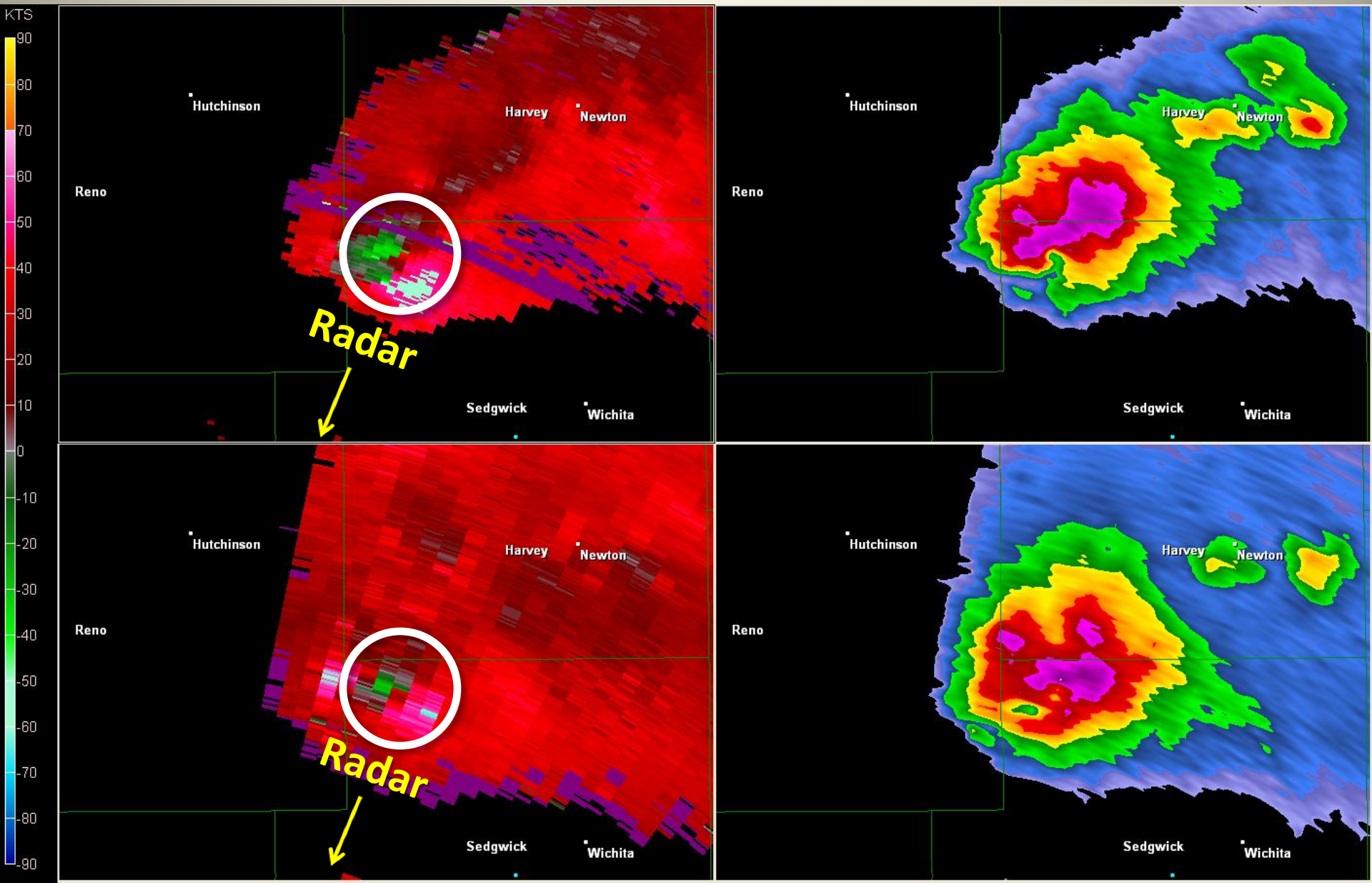


South-Central KS—June 9, 2011—2327z



South-Central KS—June 9, 2011—2327z



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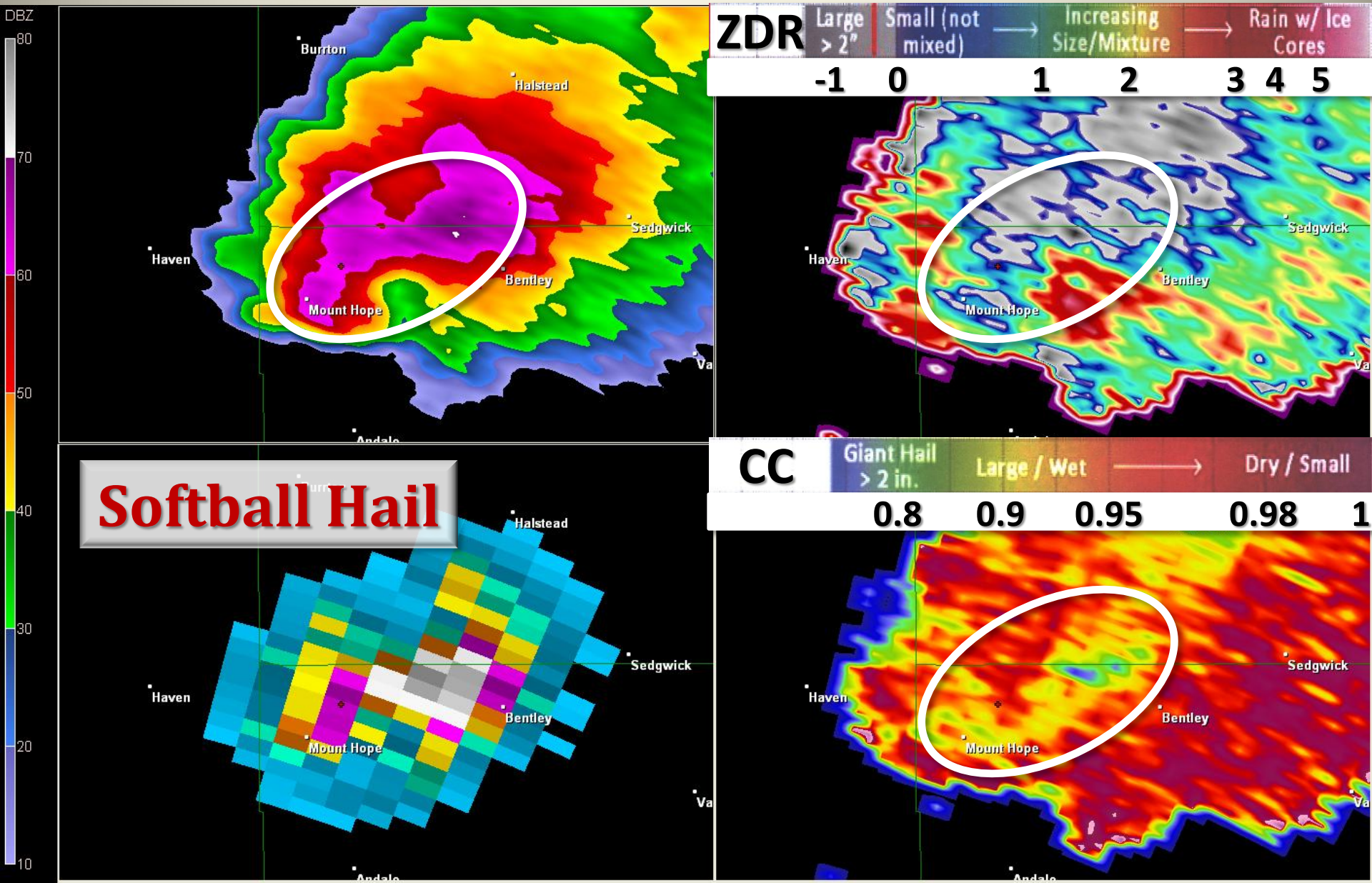
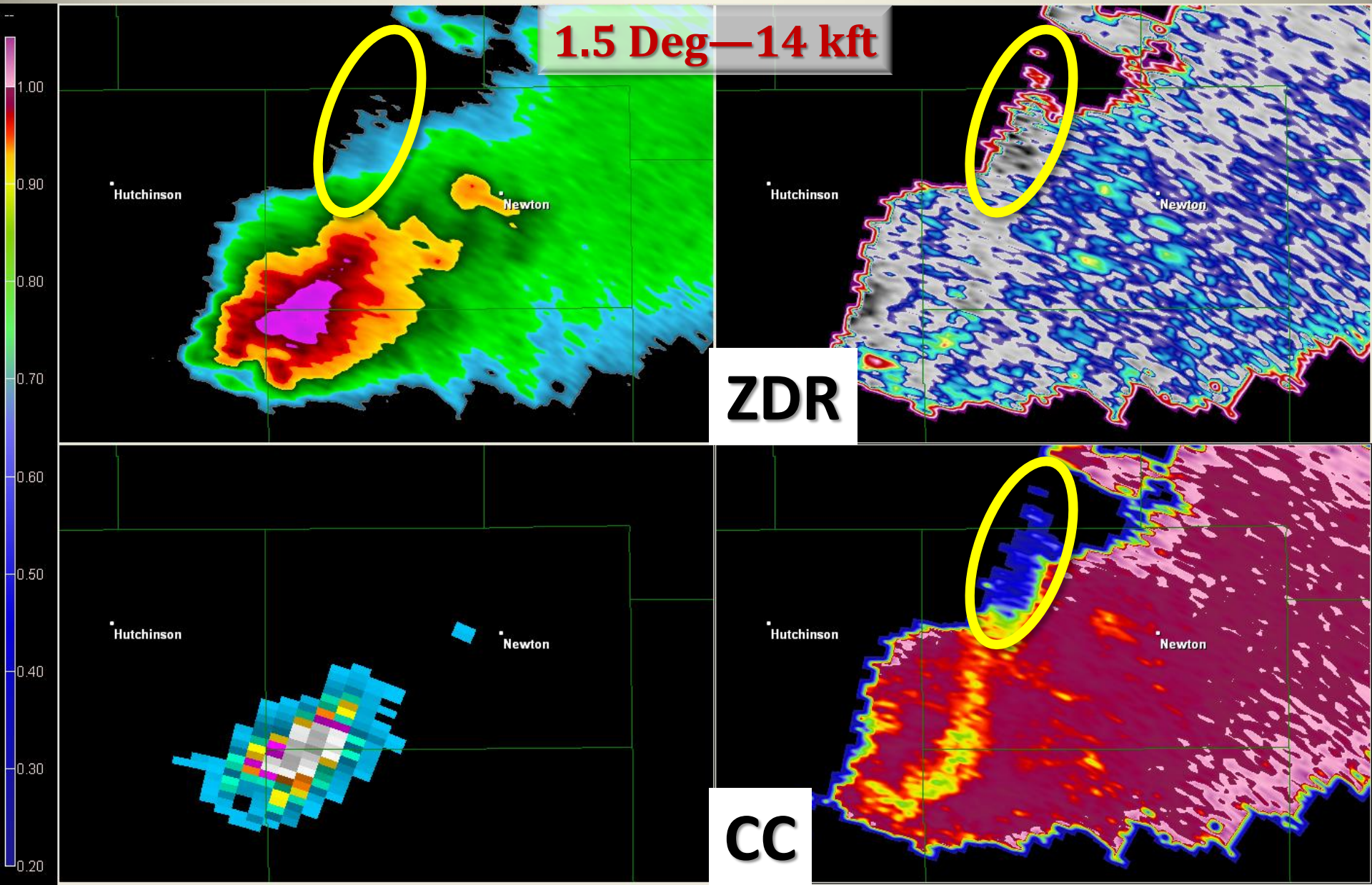
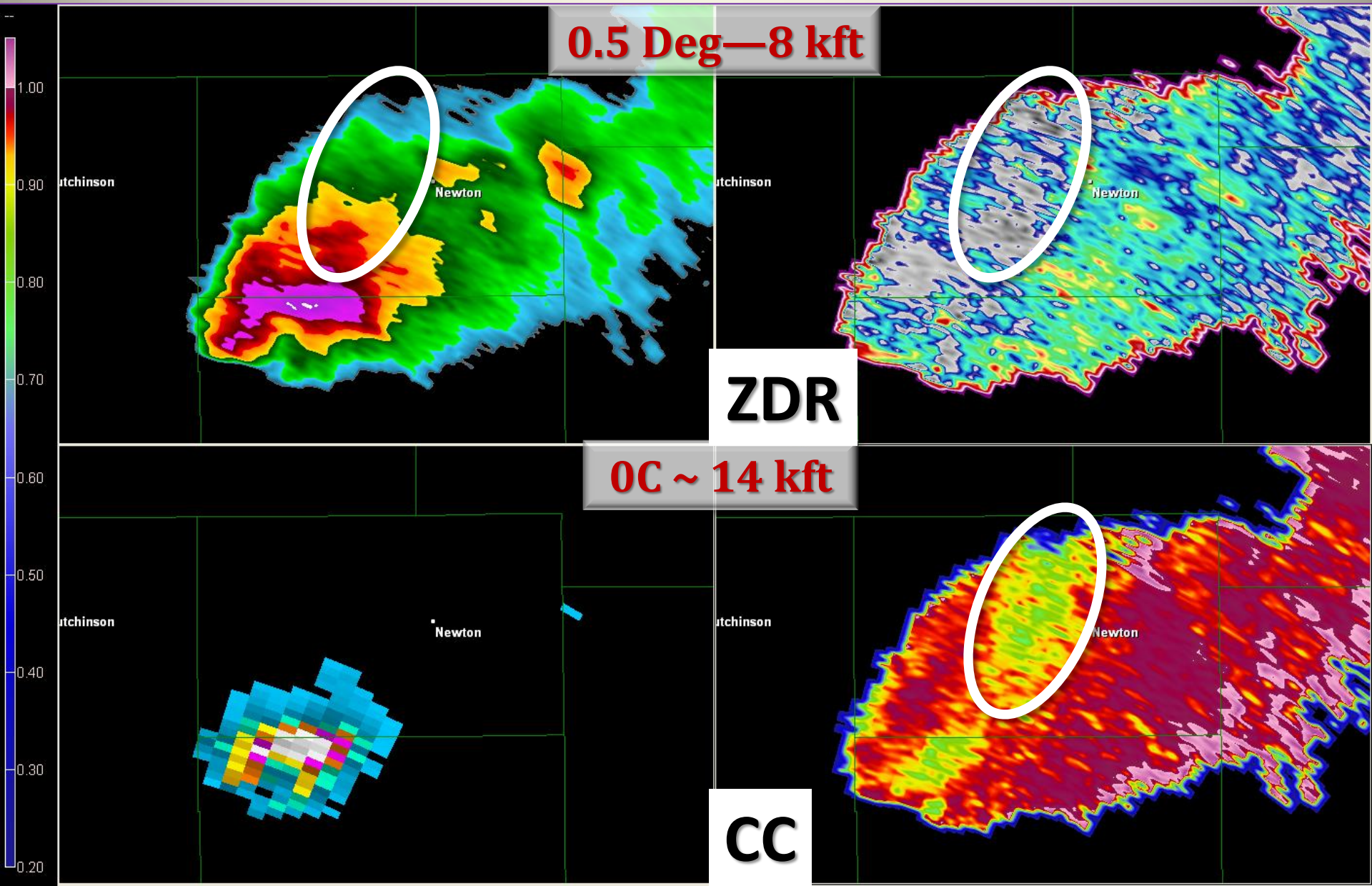


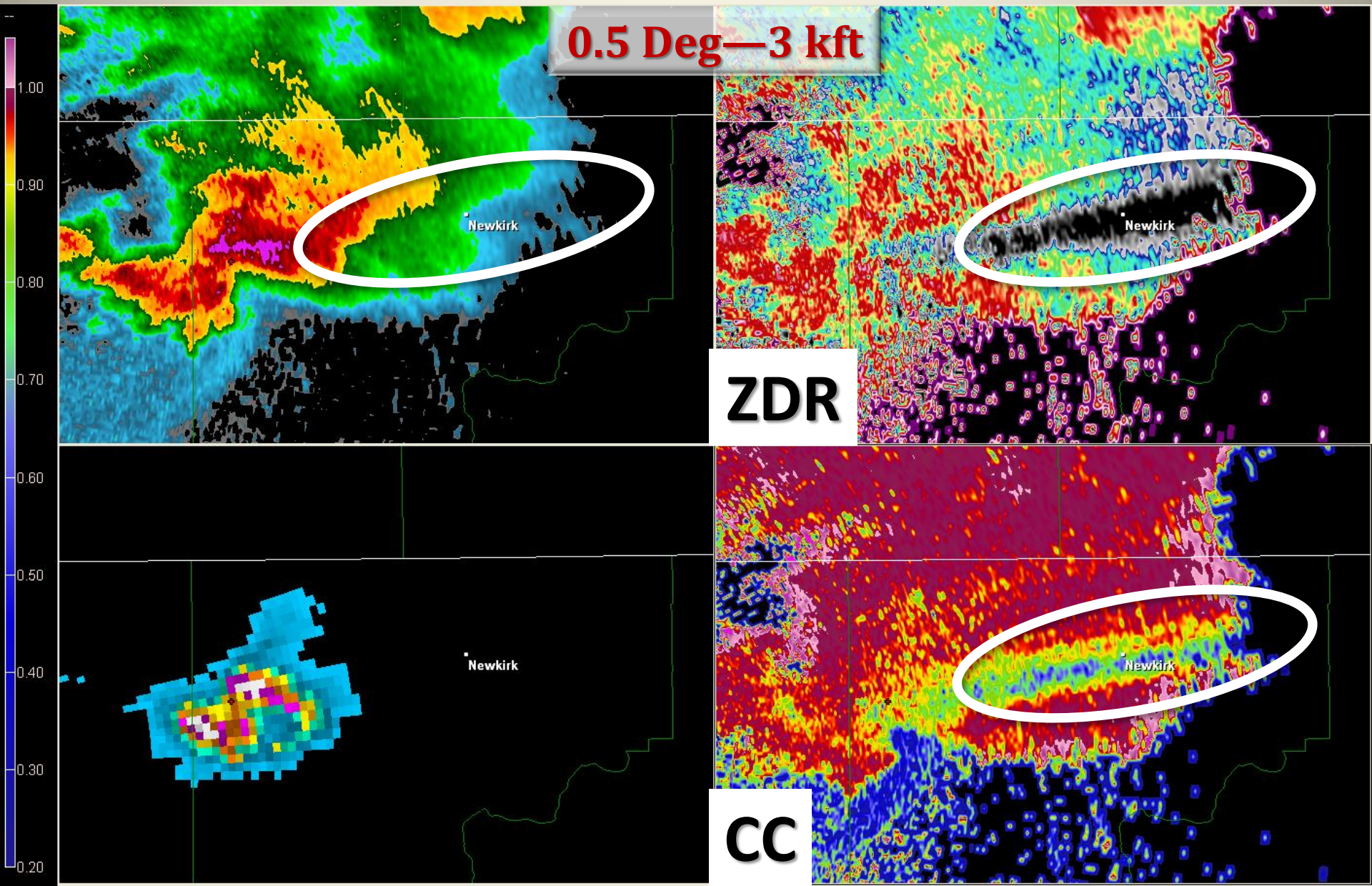
Three-Body Scatter Spike (TBSS) Detection



Non-Uniform Beam Filling



Non-Uniform Beam Filling



Conclusions

- **Is Dual Pol useful in assessing large hail?**
  - ***YES!***
  - Great tool for radar operator and/or statement writer:
    - Character of hail (melting, small, large, etc) and location
  - Better at close range

- **Are base reflectivity products still needed?**
  - ***YES!***
  - ***MUST*** be "first line of defense."
  - Dual Pol ***MUST*** be used in ***context*** with base reflectivity, storm structure, conceptual model.

Bottom line: Dual Pol can only be used to supplement current base reflectivity products, NOT replace them.

Future Research?

- **Can ZDR/CC differentiate between 2" hail and 4" hail and larger?**

- **Winter season performance?**
  - Rain/snow lines
  - Wet vs. dry snow
  - Melting level
  - Sleet/mixed precipitation