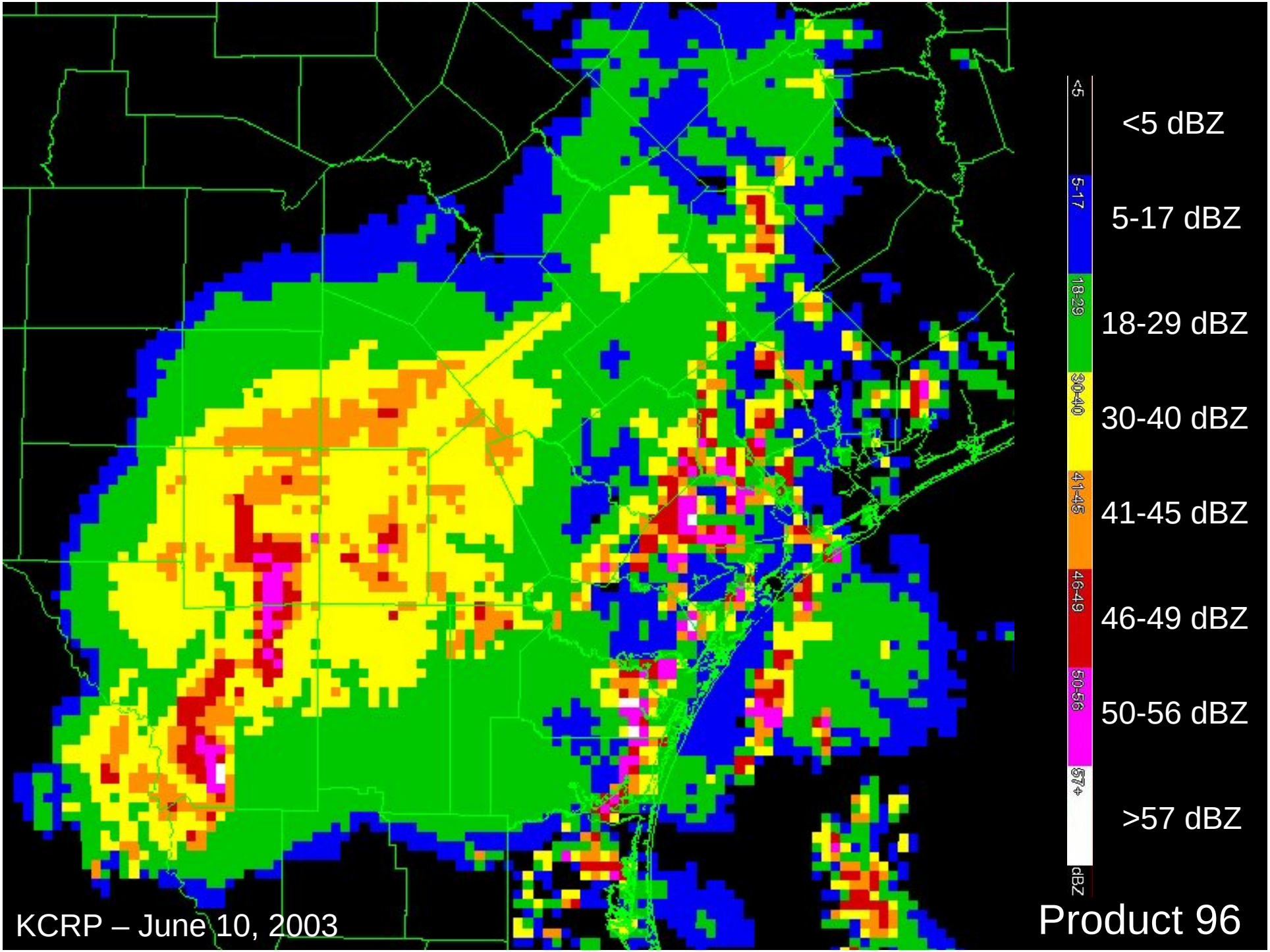
Correcting AP mitigation within Composite Reflectivity Products

Leaving precipitation returns alone while maintaining the current ability of the AP mitigation algorithm

- AP mitigation within ORPG CRPs has always produced a negative side effect of reducing reflectivity intensities in regions of precipitation by as much as 15 dbZ.

- The erroneous reduction in reflectivity magnitudes is a systematic problem – existing regardless of type of precipitation system, geographic location, or season.

- This has prompted the removal of AP-edited CRPs from the display system of the FAA's Weather and Radar Processor (WARP) used at Air Route Traffic Control Centers.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57+
dBZ
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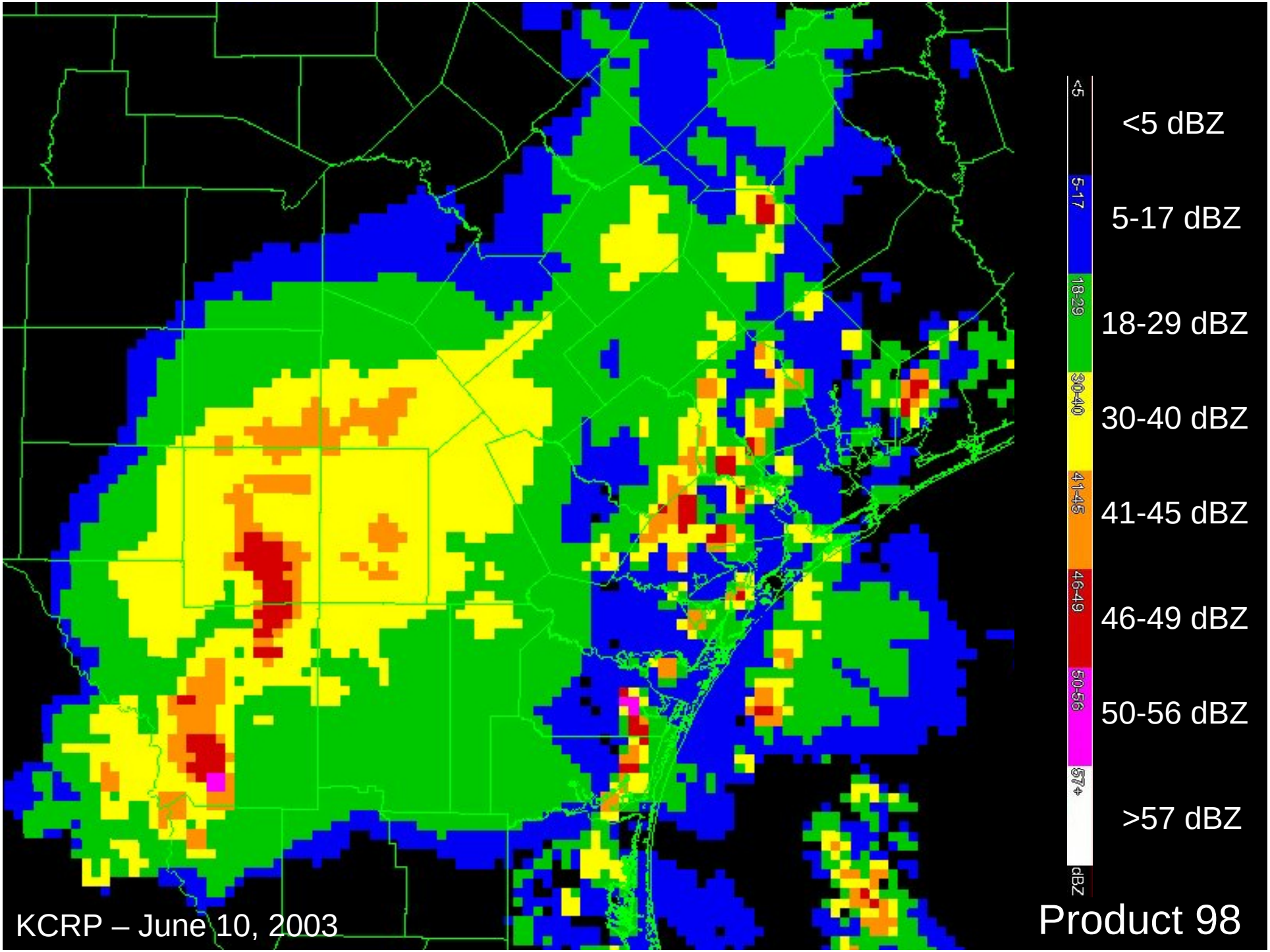
30-40 dBZ
41-45 dBZ
46-49 dBZ
50-56 dBZ
>57 dBZ
KCRP – June 10, 2003
Product 96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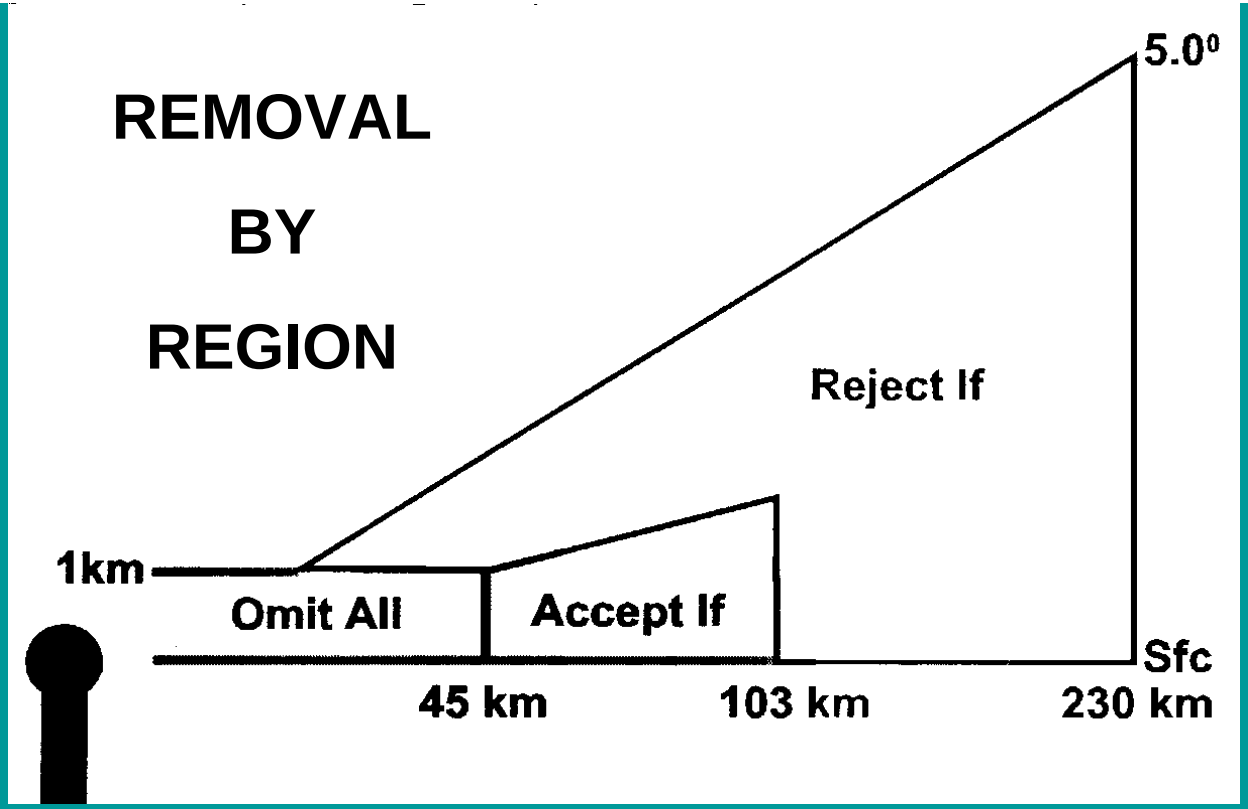
46-49 dBZ
50-56 dBZ
>57 dBZ
KCRP – June 10, 2003
Product 98

AP identification assumes clutter return is primarily from a stationary scatterer. Thus

- Low (near zero) radial velocity and,
- Small spectrum width

Mitigation of AP in a radar volume

- removal by region
- removal by extension



The AP technique is applied in separate regions surrounding a radar based on range and elevation scan.

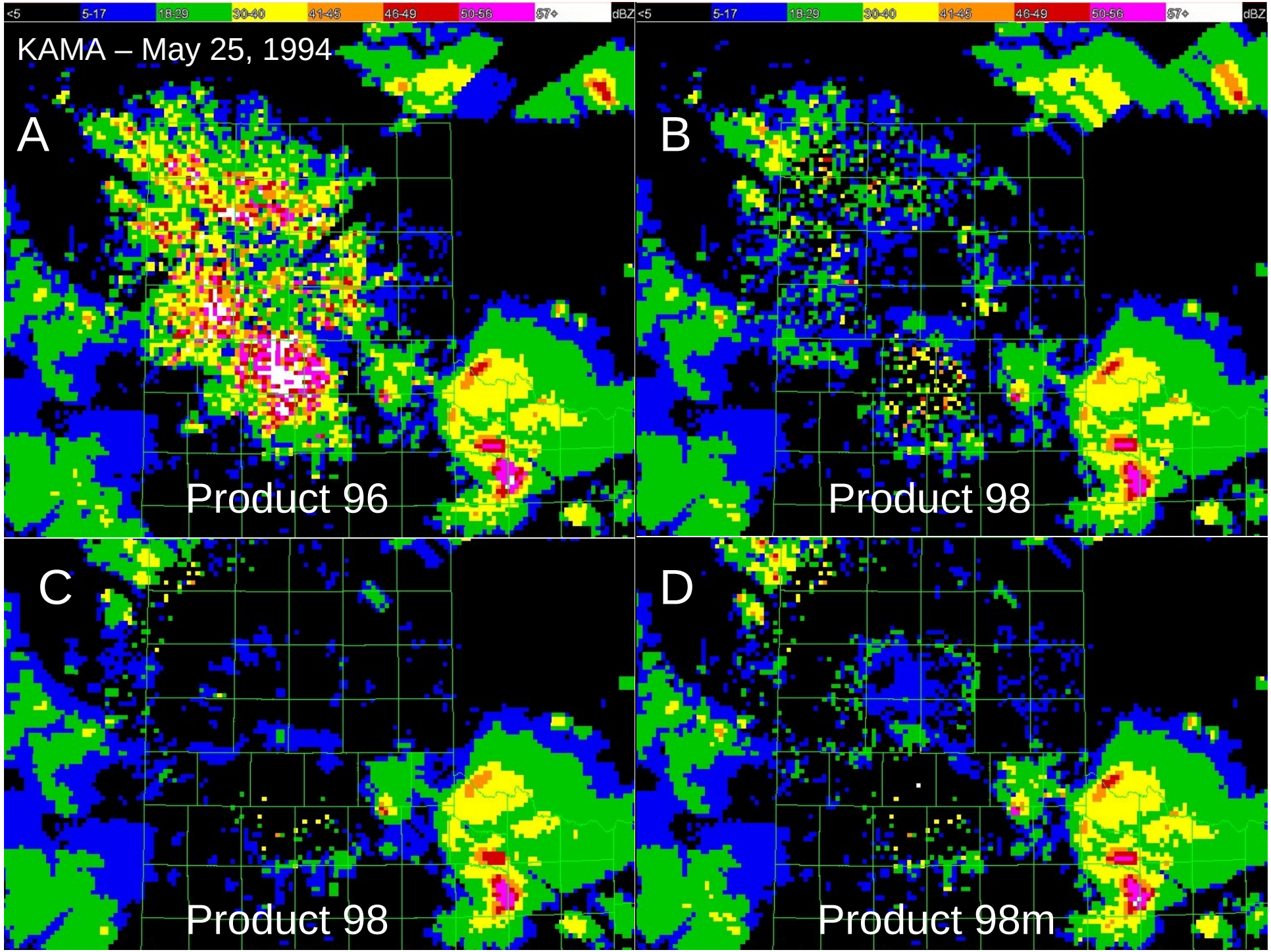
The threshold of velocity and spectrum width below which reflectivity returns are designated as AP can be modified using an adaptable parameter set.

Removal By Extension

- An analysis window surrounding a single range data bin is constructed. A simple quotient (Q) of the number of non-AP data bins out of the total number being considered is computed.

- If Q >= 90%, invoke median filter
  (i.e. precipitation returns are smoothed)

- If Q < 90%, set range gate data value to AP
  * - this was found to be a crucial aspect of AP removal in Smalley and Bennett (2001)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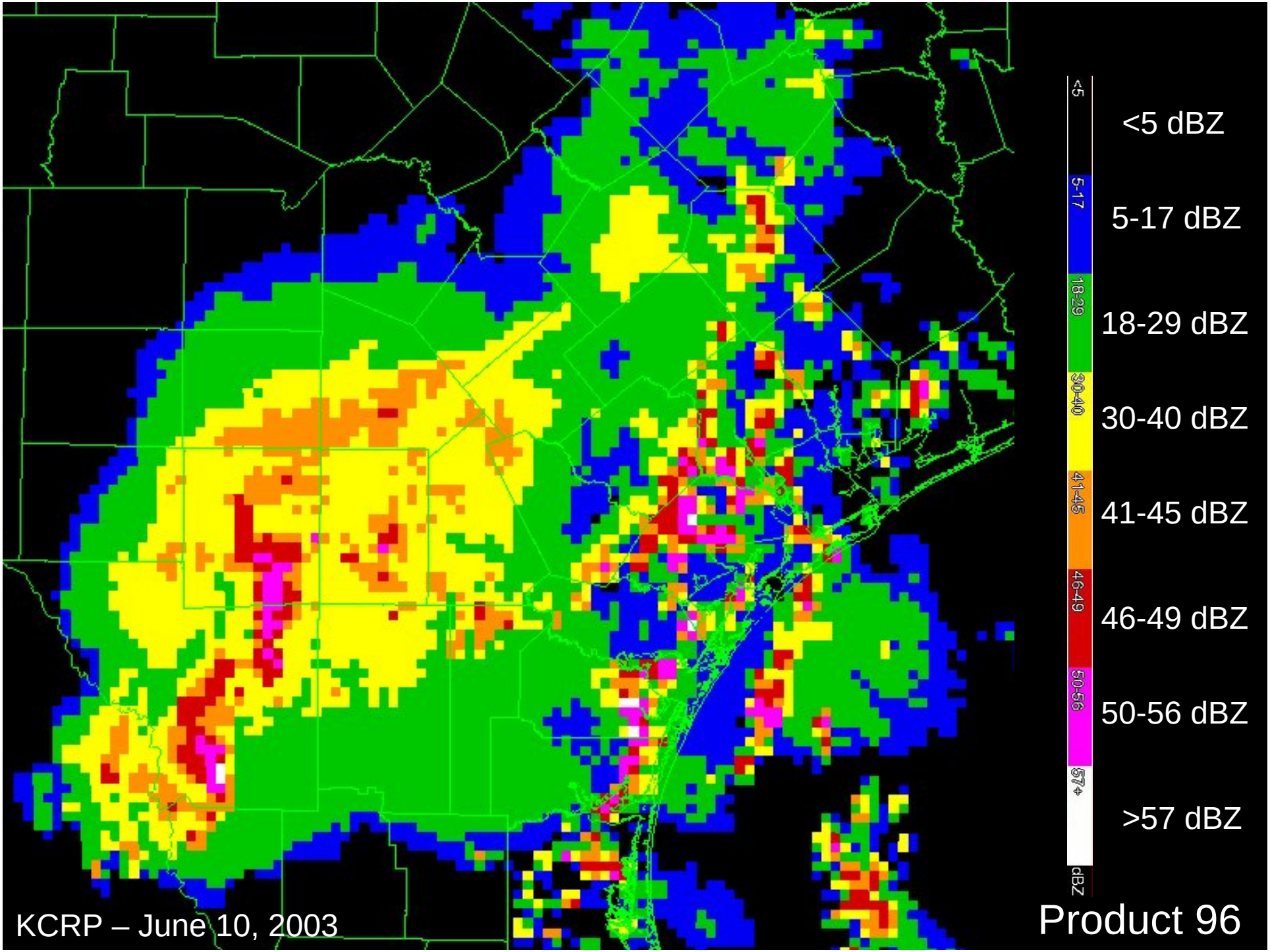
KAMA – May 25, 1994
A
Product 96
B
Product 98
C
Product 98
D
Product 98m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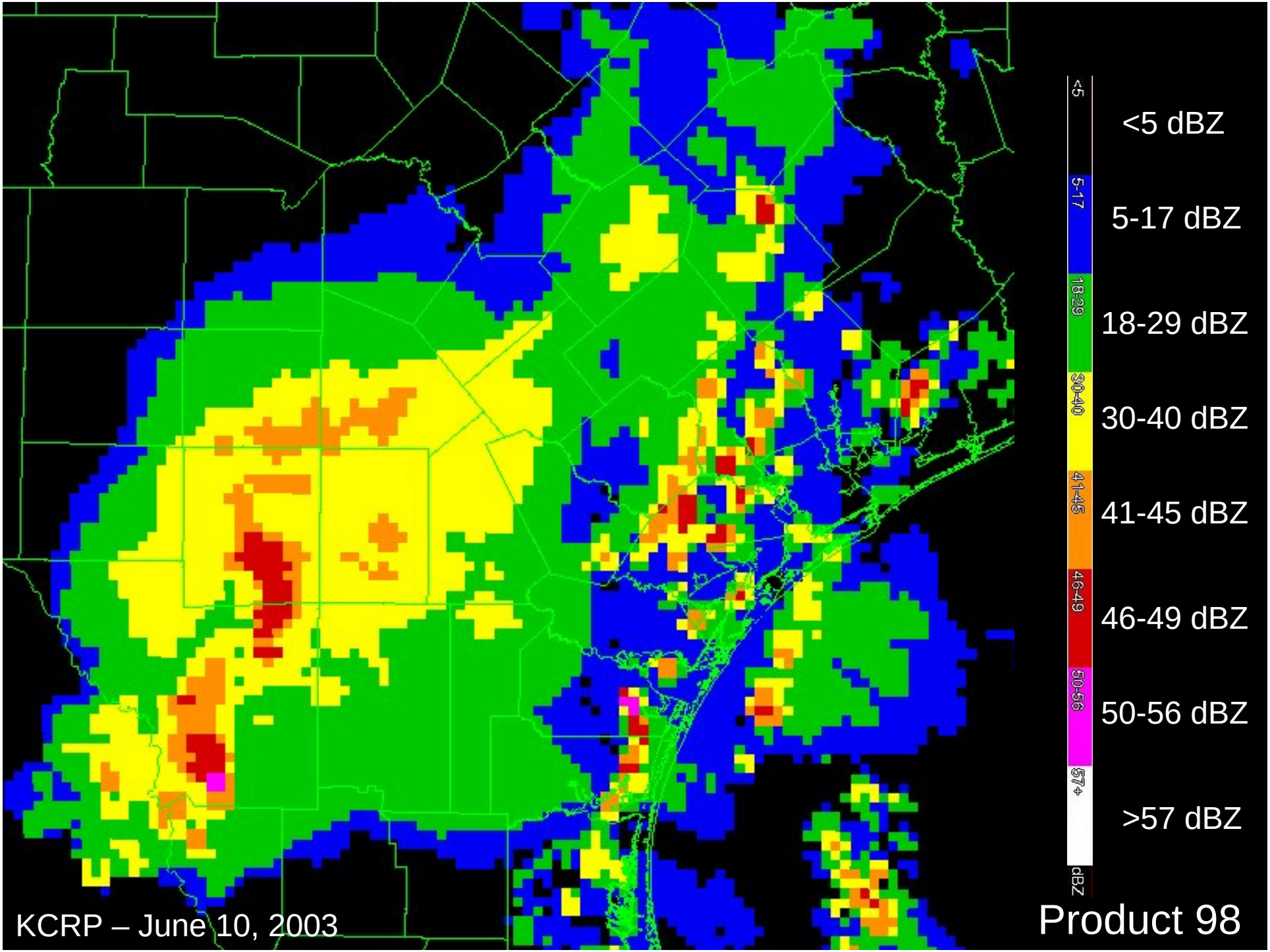
46-49 dBZ
50-56 dBZ
>57 dBZ
KCRP – June 10, 2003
Product 96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dBZ
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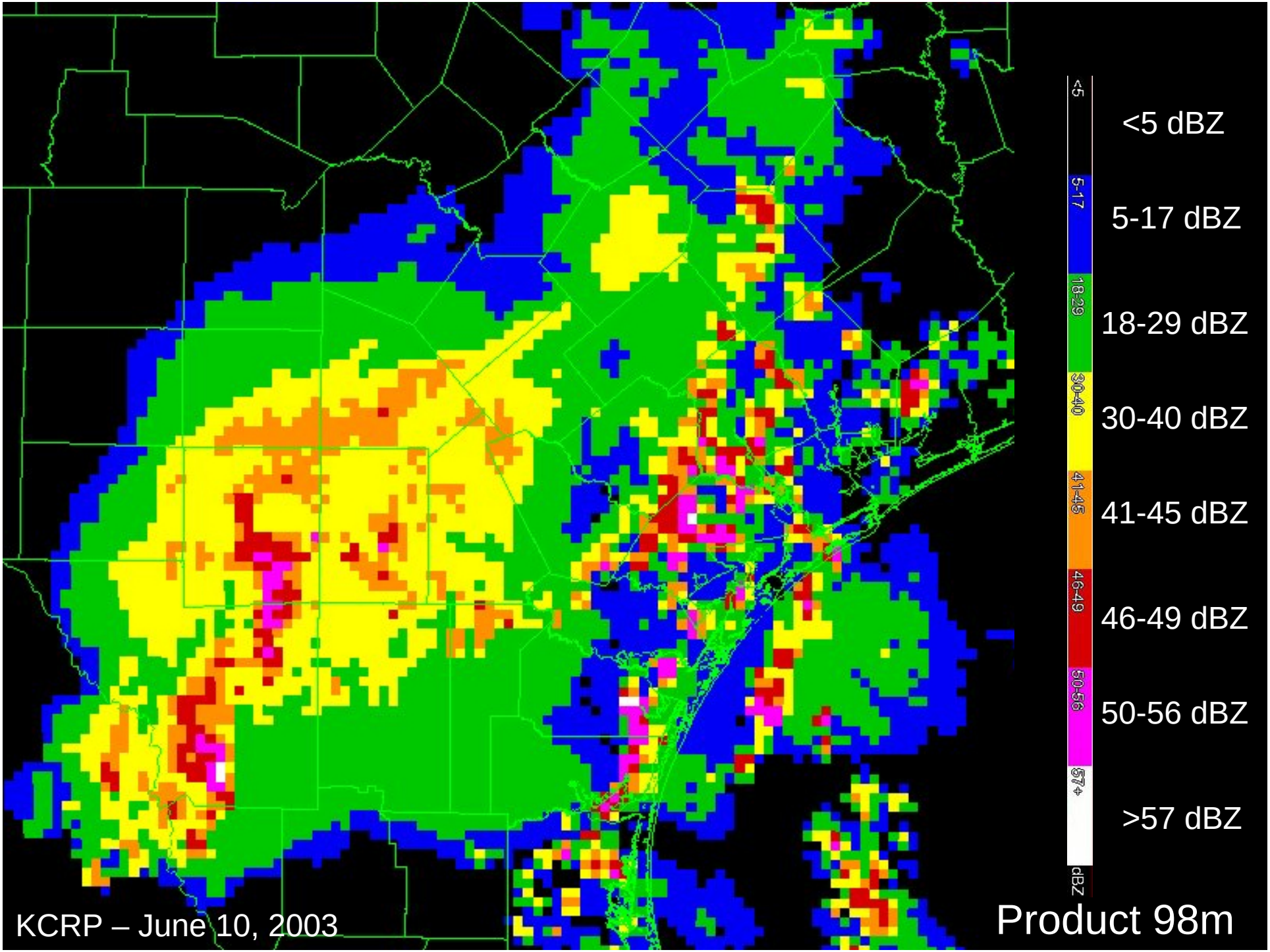
50-56 dBZ
>57 dBZ
KCRP – June 10, 2003
Product 98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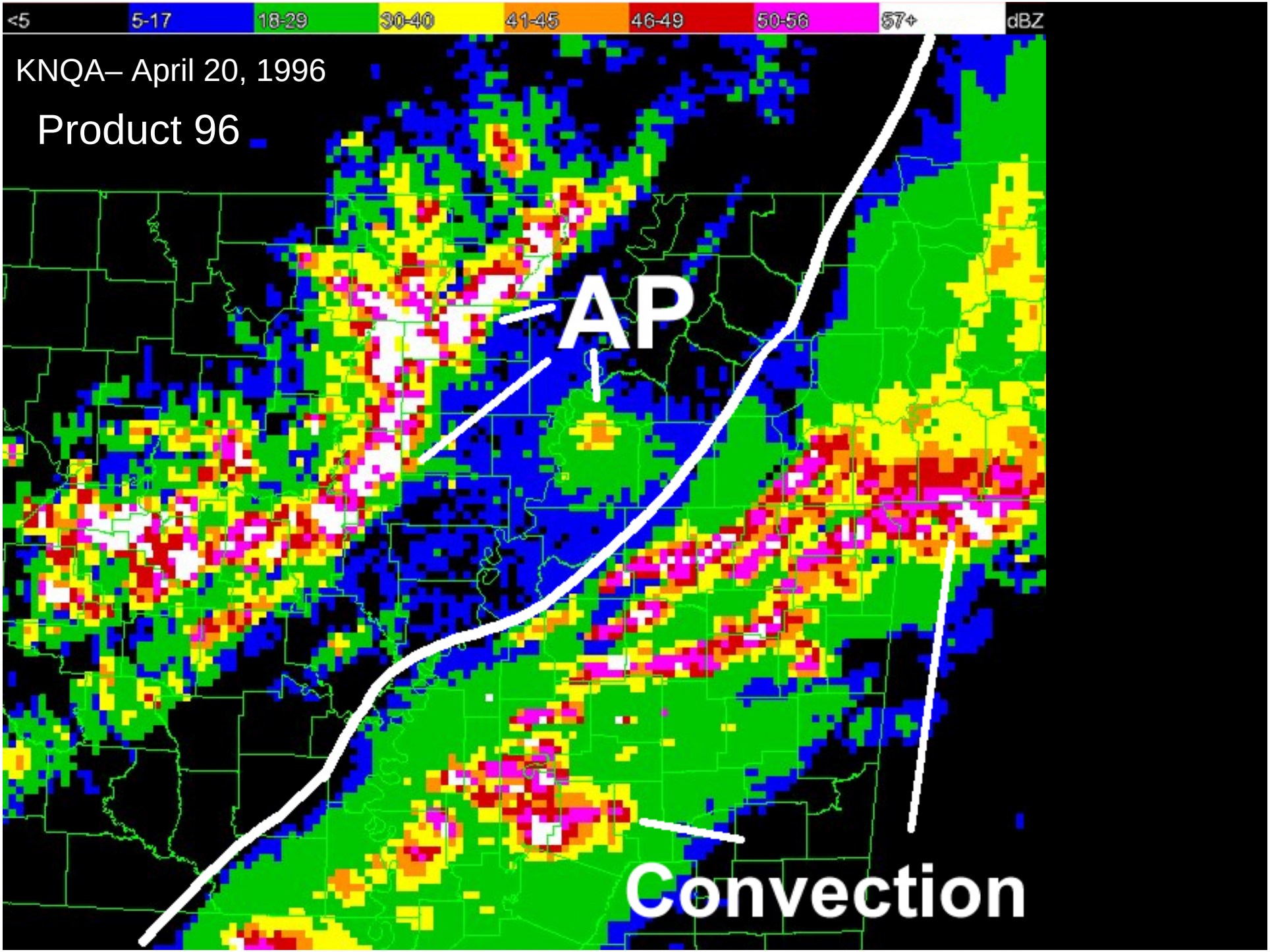
>57 dBZ
KCRP – June 10, 2003
Product 98m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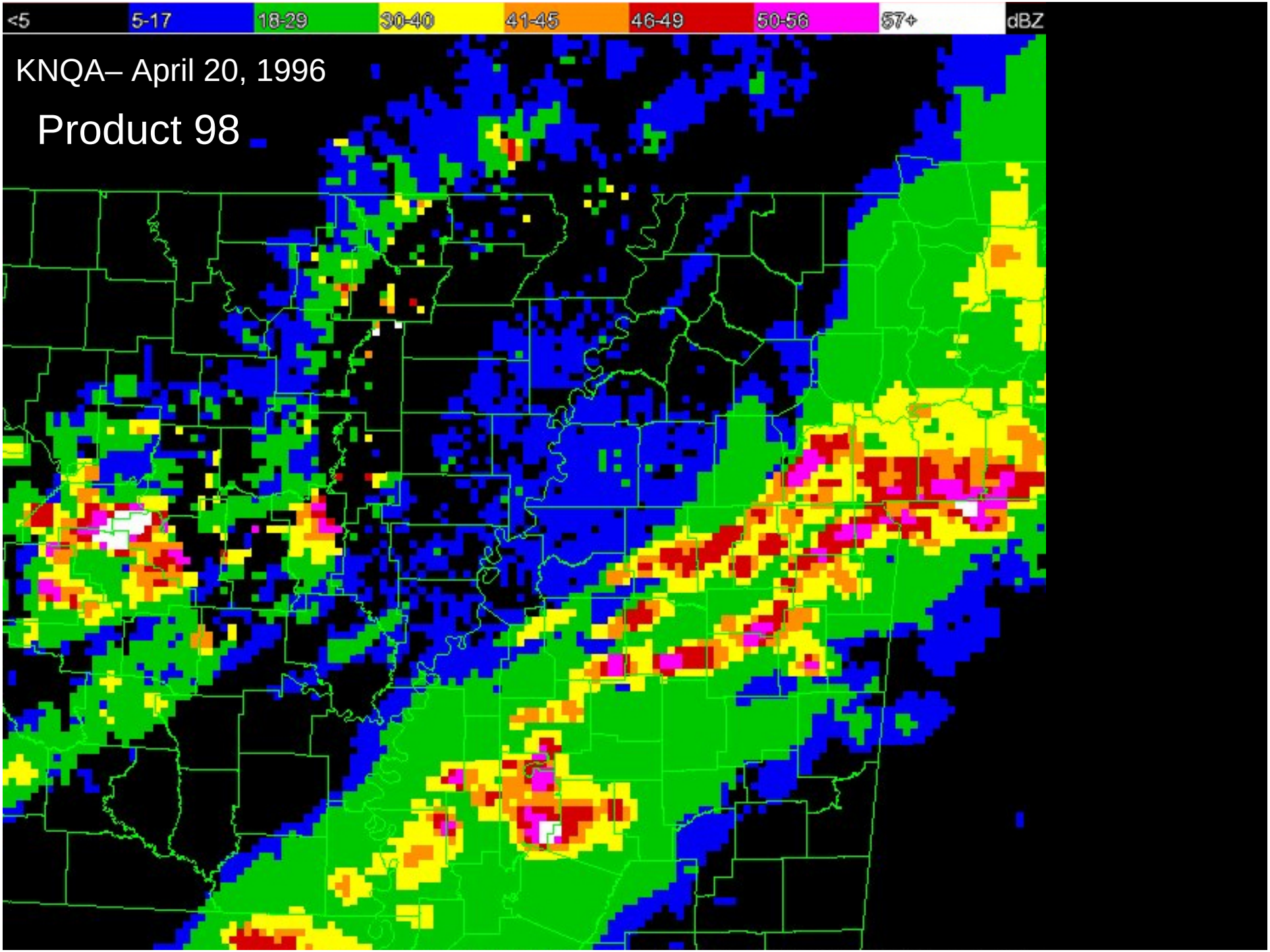
dBZ
KNQA– April 20, 1996
Product 96
AP
Convection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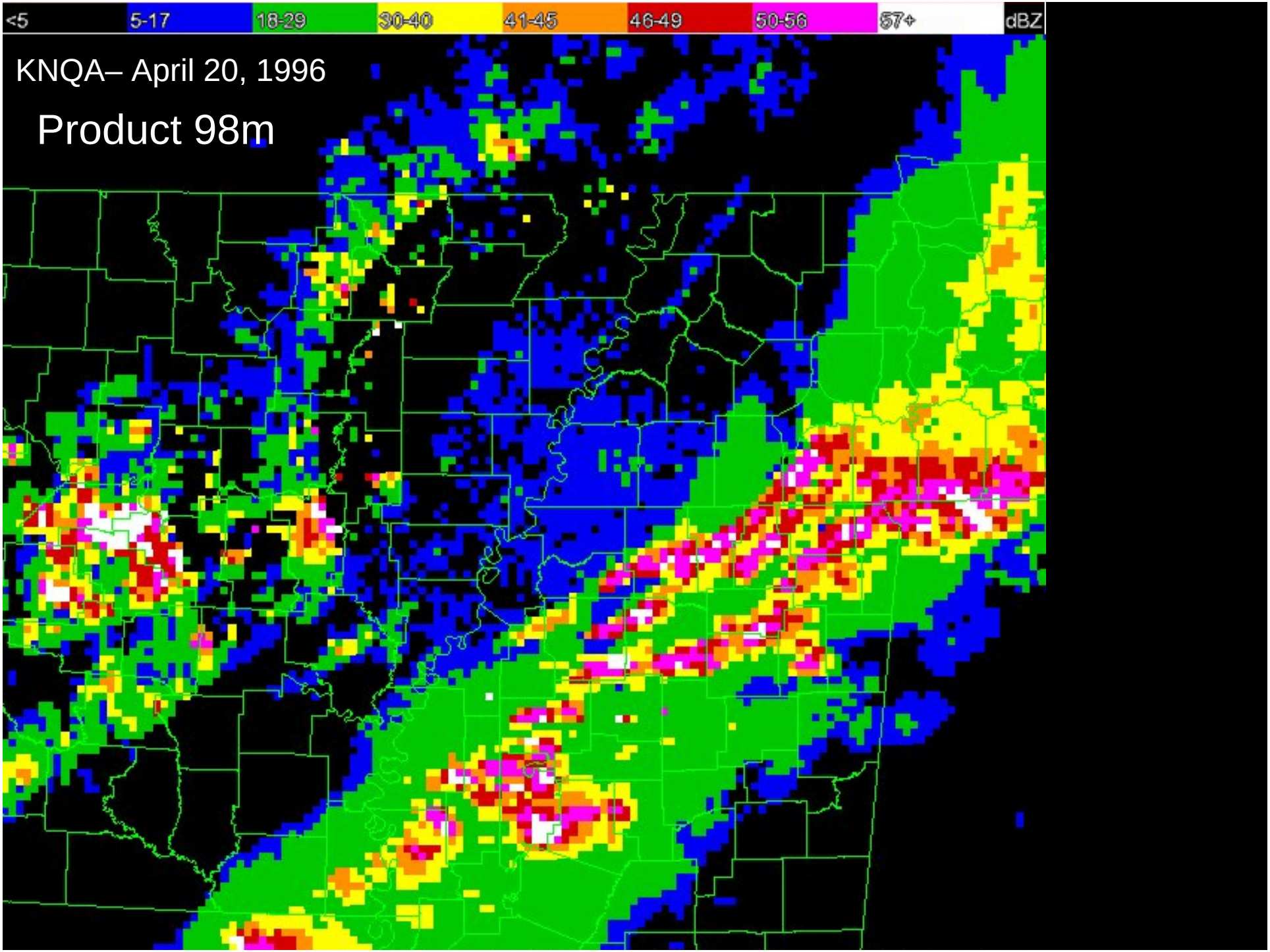
KNQA– April 20, 1996
Product 98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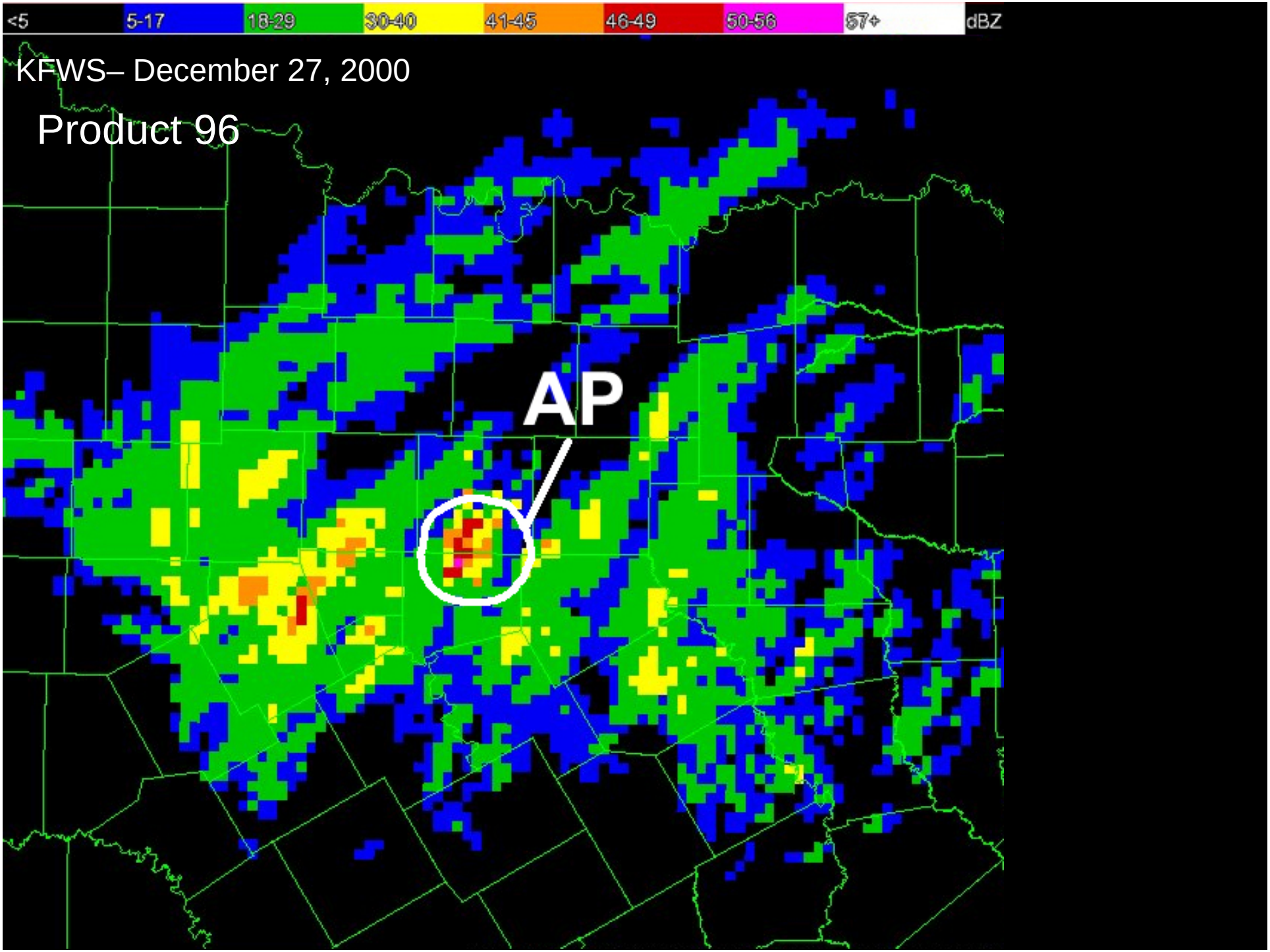
KNQA– April 20, 1996
Product 98m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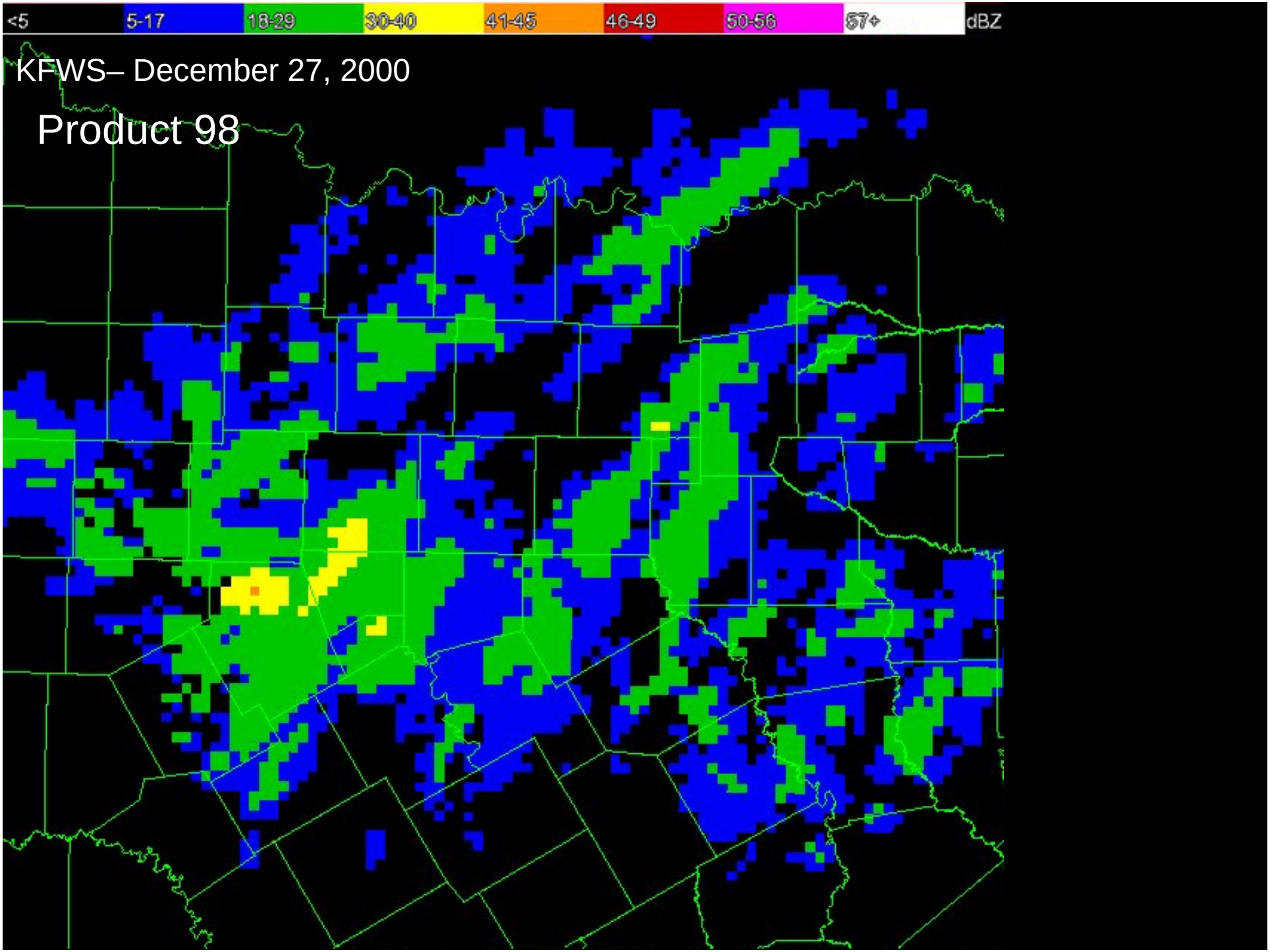
dBZ
KFWS– December 27, 2000
Product 96
AP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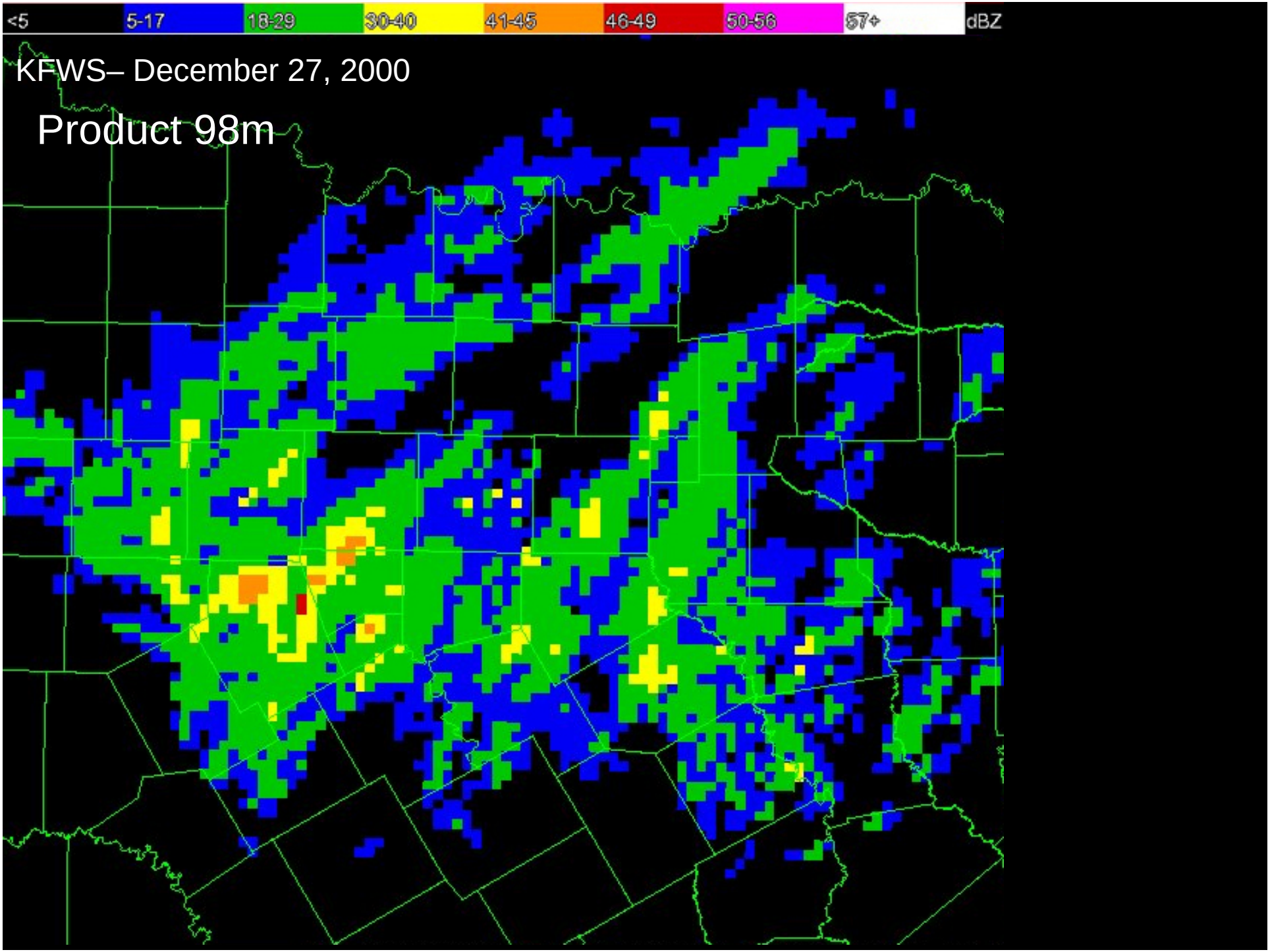
dBZ
KFWS– December 27, 2000
Product 98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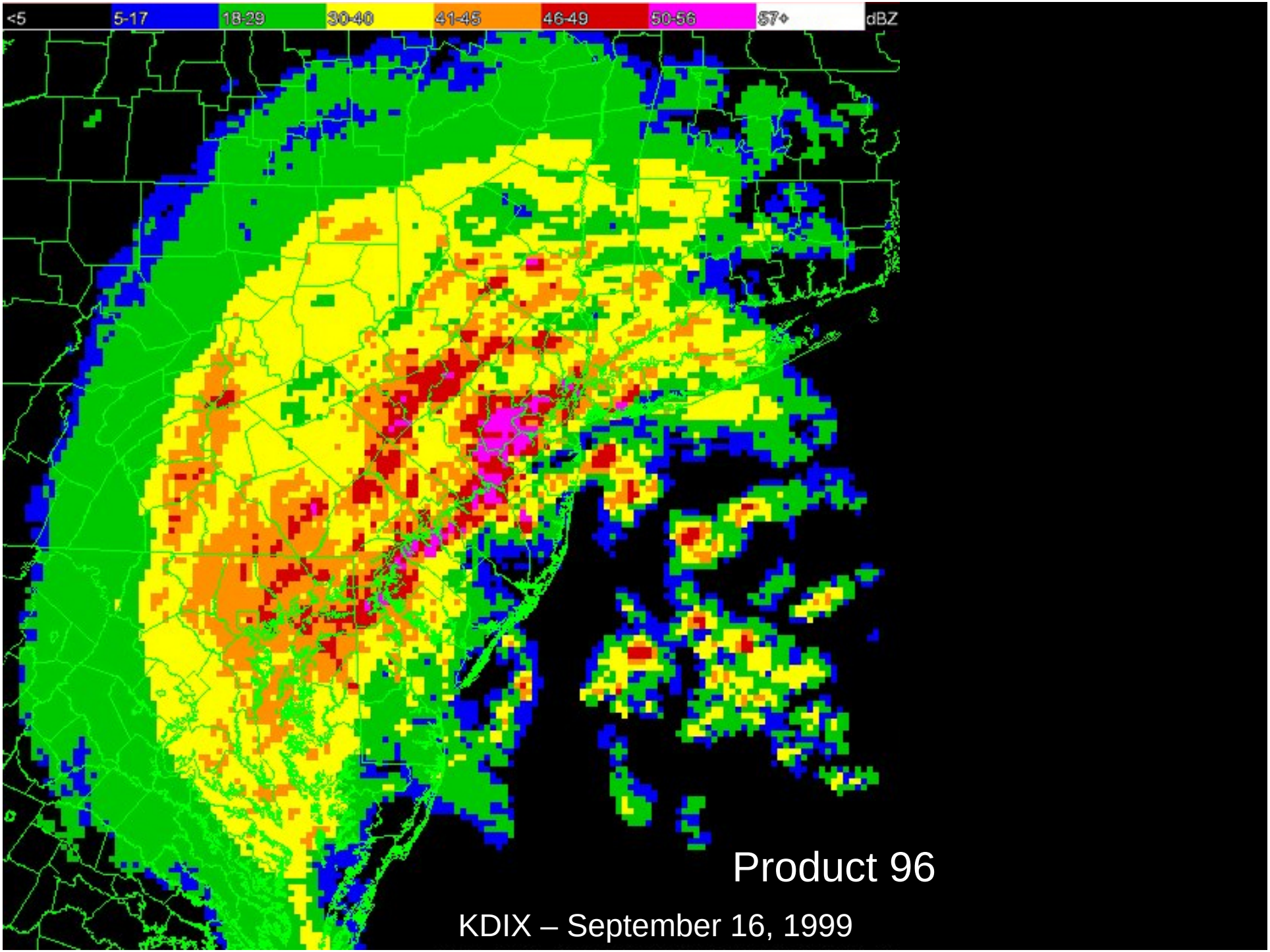
dBZ
KFWS– December 27, 2000
Product 98m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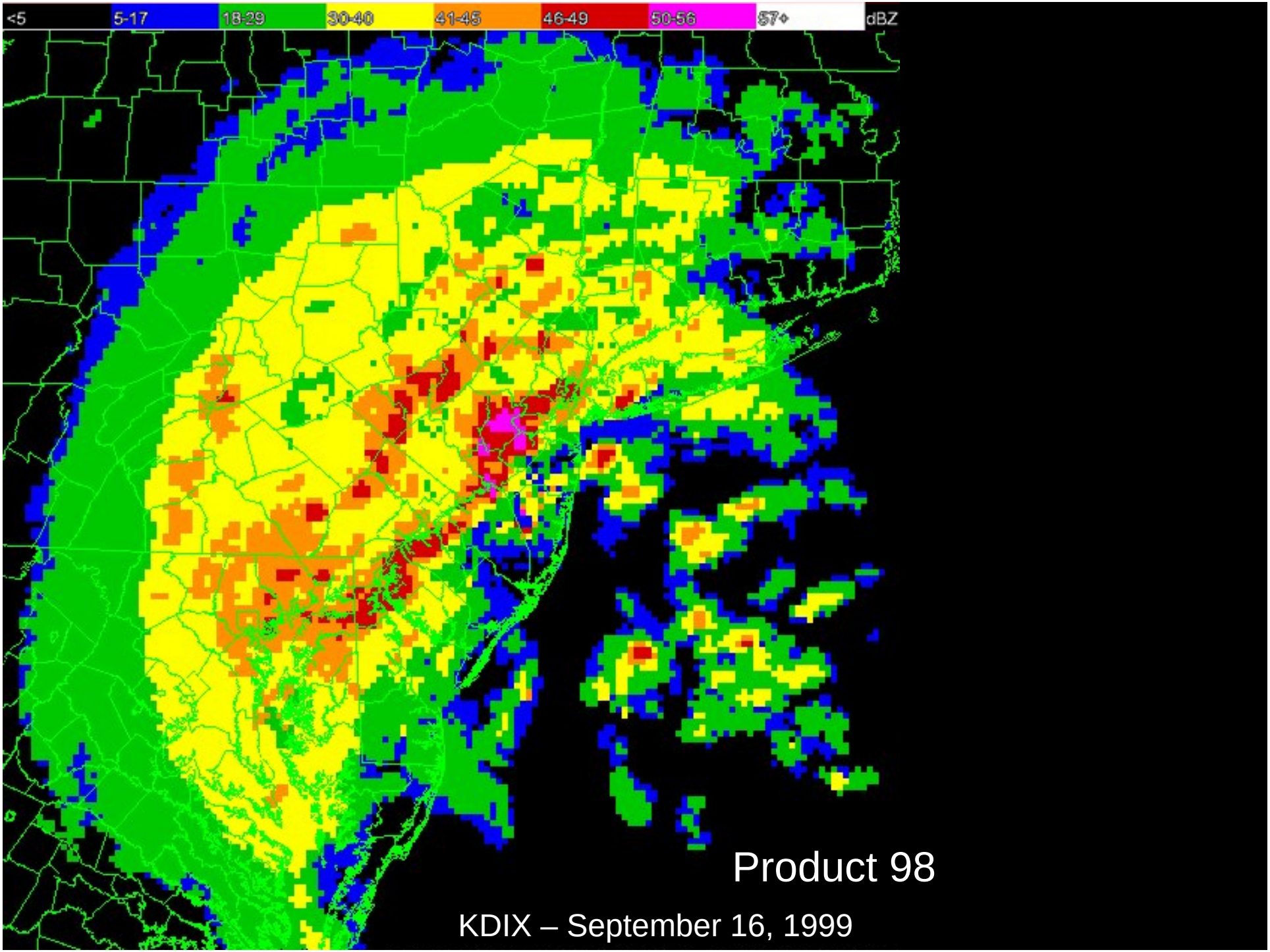
dBZ
Product 96
KDIX – September 16, 1999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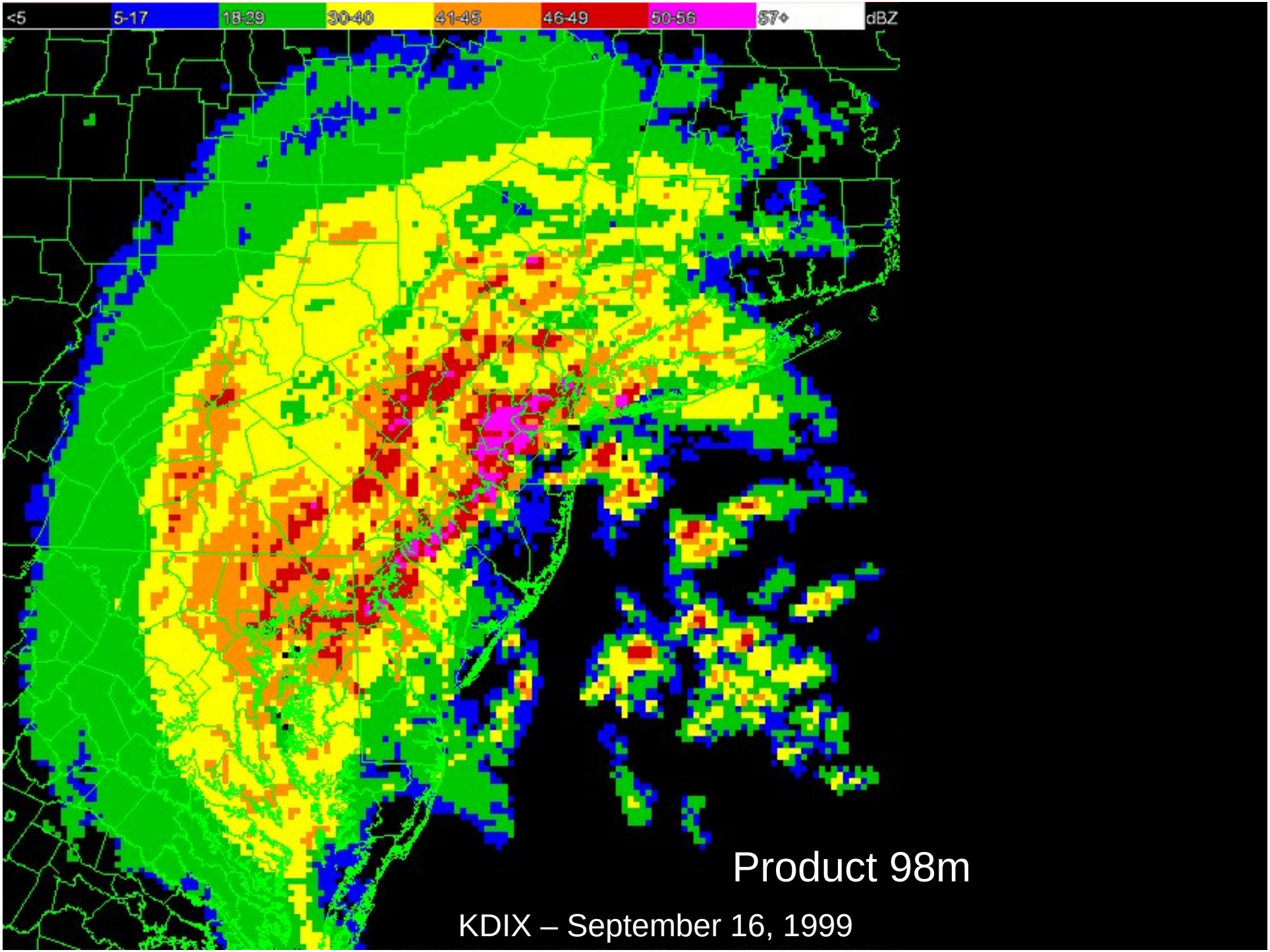
KDIX – September 16, 1999


<5
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18-29
30-40
41-45
46-49
50-56
57+
dBZ
Product 98m
KDIX – September 16, 1999

ORPG code a3148a.ftn within src/cpc101/lib005

```
6           IF( NUM_VALID_PNTS .GT. 1 ) THEN
C
C***            IF RATIO OF VALID POINTS (NON-CLUTTER) TO NUMBER OF POINTS
C***            (CLUTTER AND NON_CLUTTER) IS GREATER THAN THRESHOLD, FIND
C***            MEDIAN VALUE.
C
                RATIO = FLOAT(NUM_VALID_PNTS)/NUM_PNTS
                IF( RATIO .GE. ADPGDMEDIAN_L ) THEN
C                   CALL A3148B__HEAP_SORT( POINTS, NUM_VALID_PNTS )
C                   CALL A3148C__FIND_MEDIAN_VALUE( POINTS,
C     1                                             NUM_VALID_PNTS,
C     2                                             MEDIAN_VALUE )
                ELSE

C
C***               NOT ENOUGH GOOD POINTS.  SET REFLECTIVITY TO CLUTTER
C***               VALUE.
C
                   MEDIAN_VALUE = CLUTTER_FLAG
                POST_FILTER( RNG_BIN, RADIAL ) = MEDIAN_VALUE
                END IF
C                POST_FILTER( RNG_BIN, RADIAL ) = MEDIAN_VALUE
            END IF
-------------------------------------------------------------------------
6           IF( NUM_VALID_PNTS .GT. 1 ) THEN
C
C***            IF RATIO OF VALID POINTS (NON-CLUTTER) TO NUMBER OF POINTS
C***            (CLUTTER AND NON_CLUTTER) IS LESS THAN THRESHOLD, SET
C***            REFLECTIVITY TO CLUTTER VALUE.
C
                RATIO = FLOAT(NUM_VALID_PNTS)/NUM_PNTS
      IF( RATIO .LT. ADPGDMEDIAN_L ) POST_FILTER( RNG_BIN, RADIAL ) = CLUTTER_FLAG
            END IF
```

Q →

If Q>= 90%

Set data bin to AP