High-Resolution Data

[½ Degree Azimuth, ¼ KM Range]

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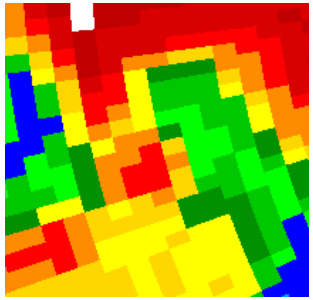
3/31/04

BENEFITS

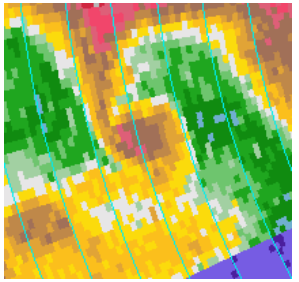
- Double Range for Detection of small tornadoes from 120km to 240 km
- Better Resolution; Increase coverage for small tornadoes by 80%
- Increase Probability of Detection/Reduce False Alarms

Improve Angular and Range Resolution

Better Detail on Structure of Tornadoes

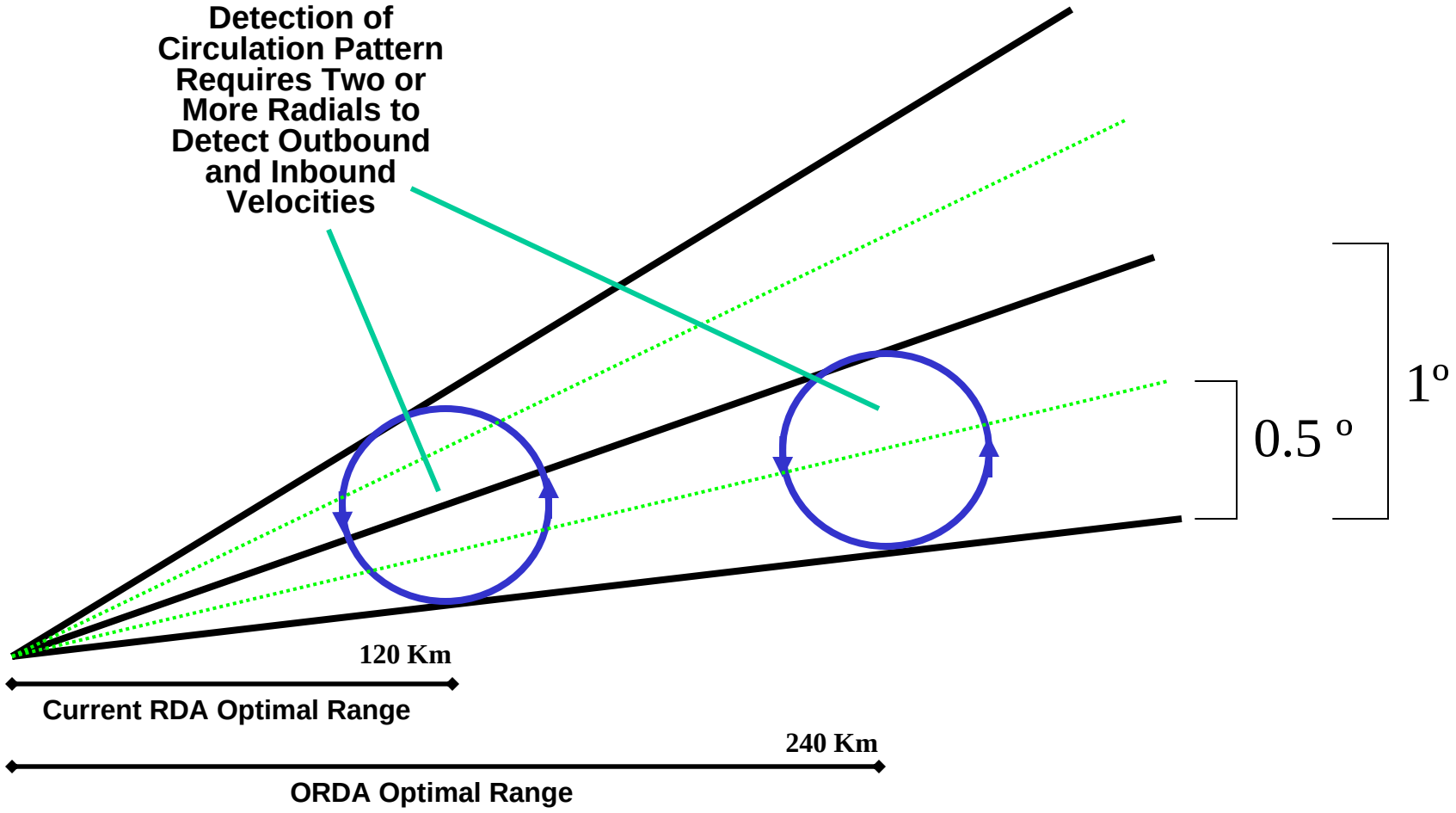


Current Reflectivity: 1.0o x 1.0 km



ORDA Reflectivity: 0.5o x 0.25 km

Beam Width Data Resolution of 0.5° vs 1.0° Improves Detection of Small Tornado Parent Circulation Patterns (<= 4 km) Within 120 km Range and Extends Detection Capability to a Range of 240 km



Original Strategy

- Begin Deployment of ORDA September 04
- Reallocate ORDA resources upon ORDA Development completion
- Perform RDA portion of high-resolution for Build 7
- Leverage off work done by NSSL on RPG
- Coordinate with Display Systems developers for additional reflectivity and velocity base data displays

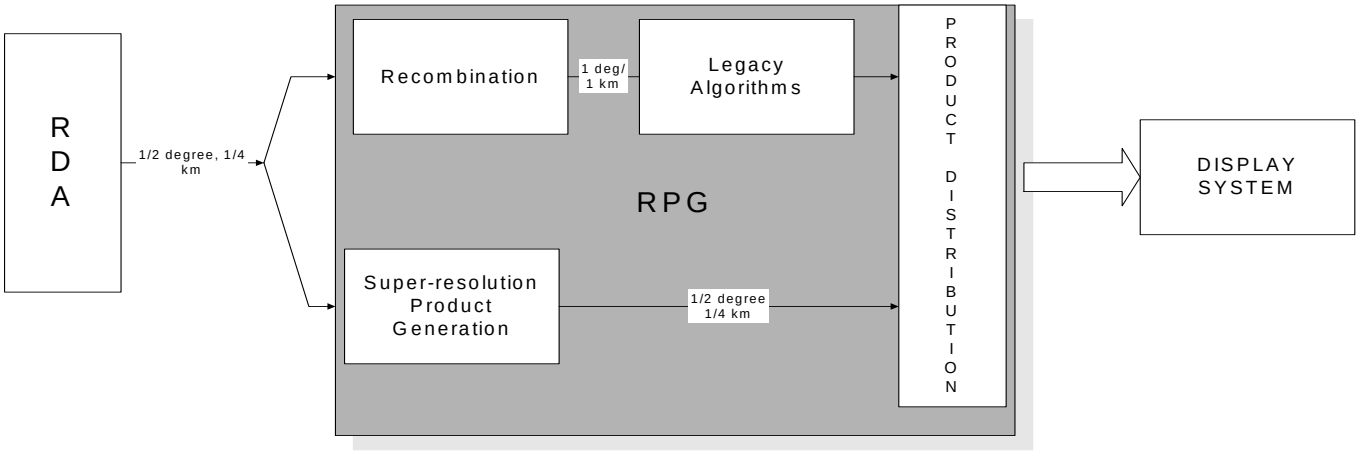
Schedule/Resource Issues

- ORDA Schedule has slipped approximately five months
  - ORDA resources for High-Res development still committed to ORDA
  - Not prudent to deploy ORDA and Super-Res simultaneously (even if Super-Res was ready)
  - Other Significant Issues
    - Technical
    - Coordination with other systems

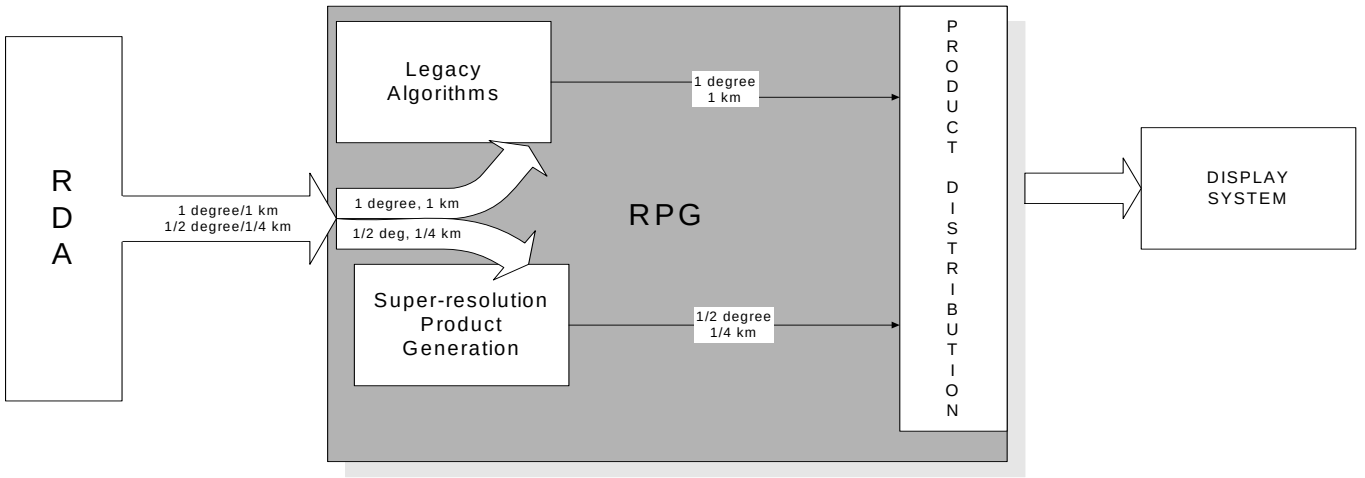
Technical Issues

- Must retain Legacy Resolution (1 deg, 1 km Refl) for legacy algorithms and until data quality improvement techniques (whitening) come online
- Two Potential Solutions
  - Sending High Resolution datastream between ORDA – ORPG and “recombining” the data to produce legacy resolution datastream at the ORPG
  - Sending Dual Resolution datastreams between ORDA - ORPG (high and legacy resolutions)

Recombination



Generate Legacy and High-Resolution



Recombining High Resolution Data at the RPG

Source: NSSL

Advantages

- Minimizes wideband bandwidth: only hi-res data sent to RPG
- Most changes needed at RPG have been implemented and tested in prototype

Disadvantages

- Recombined basedata differs slightly from legacy-res data
- Examined legacy algorithm (SCIT, Hail, Meso, TDA) results exhibit some differences
- Increases computational requirements of RPG

Producing Dual-Stream Data at the RDA

Source: NSSL

Advantages

- Legacy datastream is retained thus eliminating data and algorithm discrepancies of recombined data

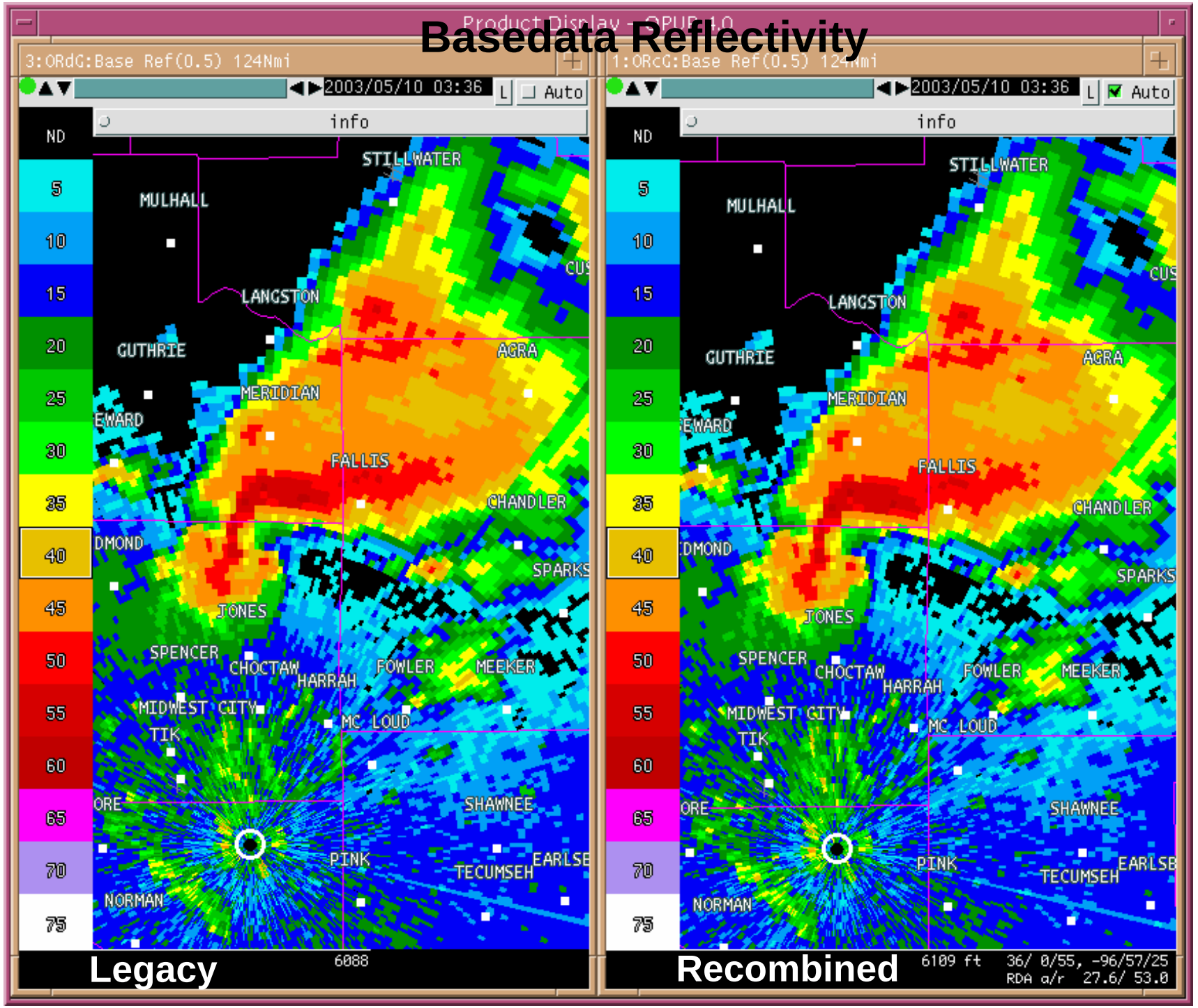
Disadvantages

- Increased bandwidth due to dual streams (4x vs 3x current level)
- Uses more computing resources on RDA
- Development to produce and output dual streams on RVP8
- Changes to processing are more complicated because both streams of processing need to be updated
- Software engineering resource contention
- Handling Batch Mode requires further analysis

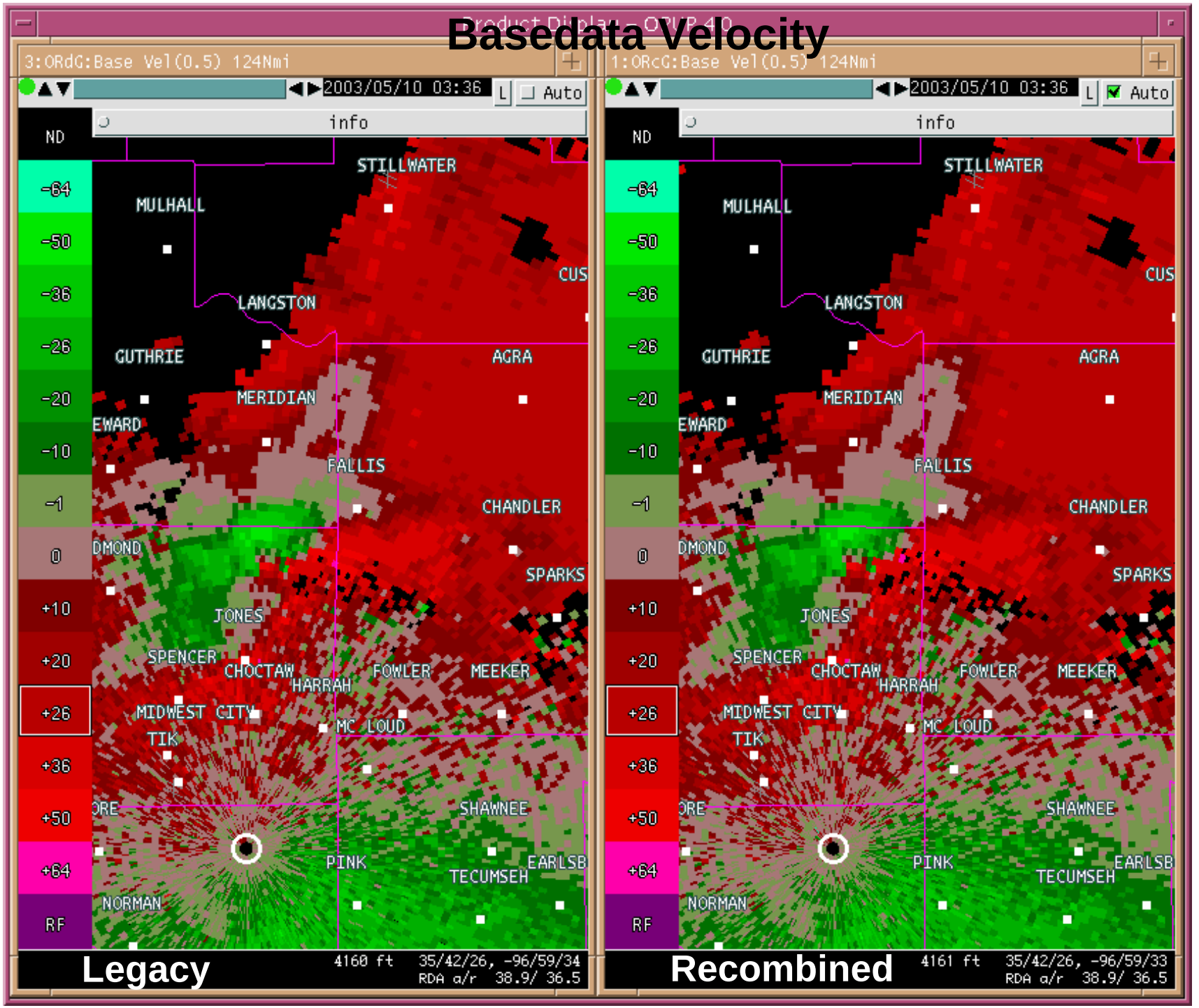
NSSL Recombination Analysis

- NSSL examined human derived Mesocyclone characteristics from Legacy and Recombined Basedata
  - Final statistics not available
  - Results are showing very little difference
  - Mesocyclone diameters are the same
  - Mean peak rotational velocities are same most of the time
    - Extremely rare to see more than 0.5 m/s discrepancy

Basedata Reflectivity



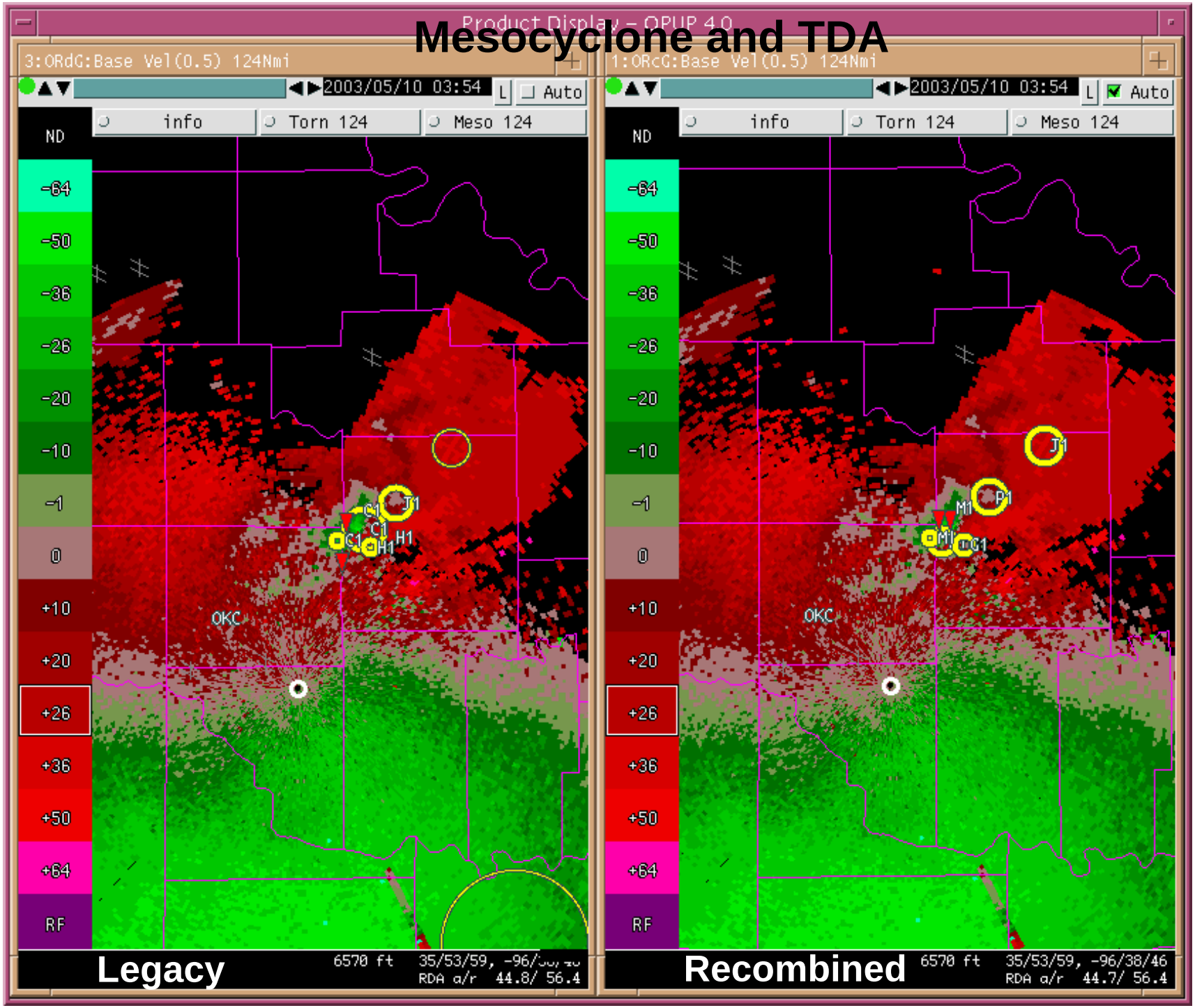
Basedata Velocity



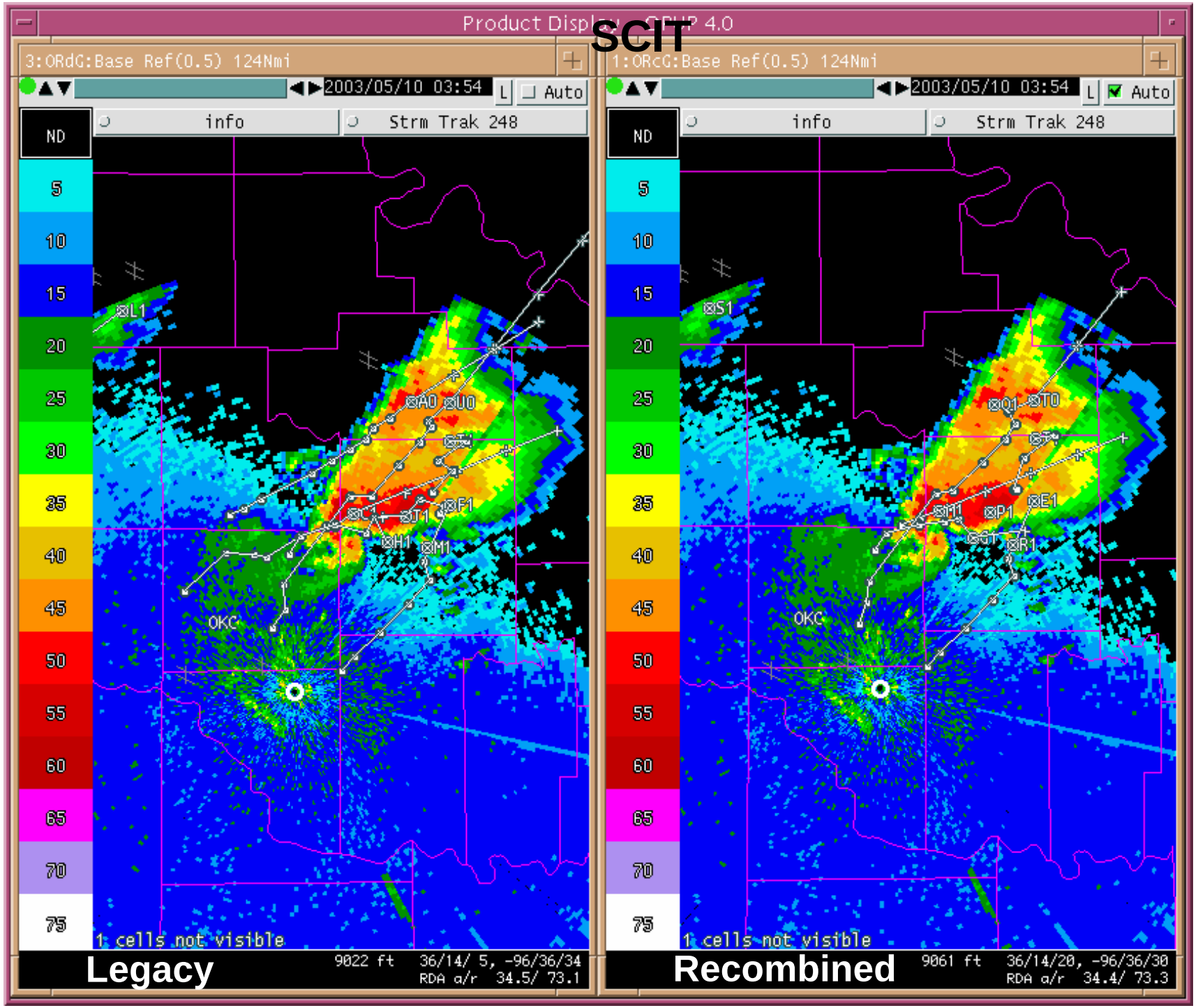
NSSL Recombination Analysis (cont.)

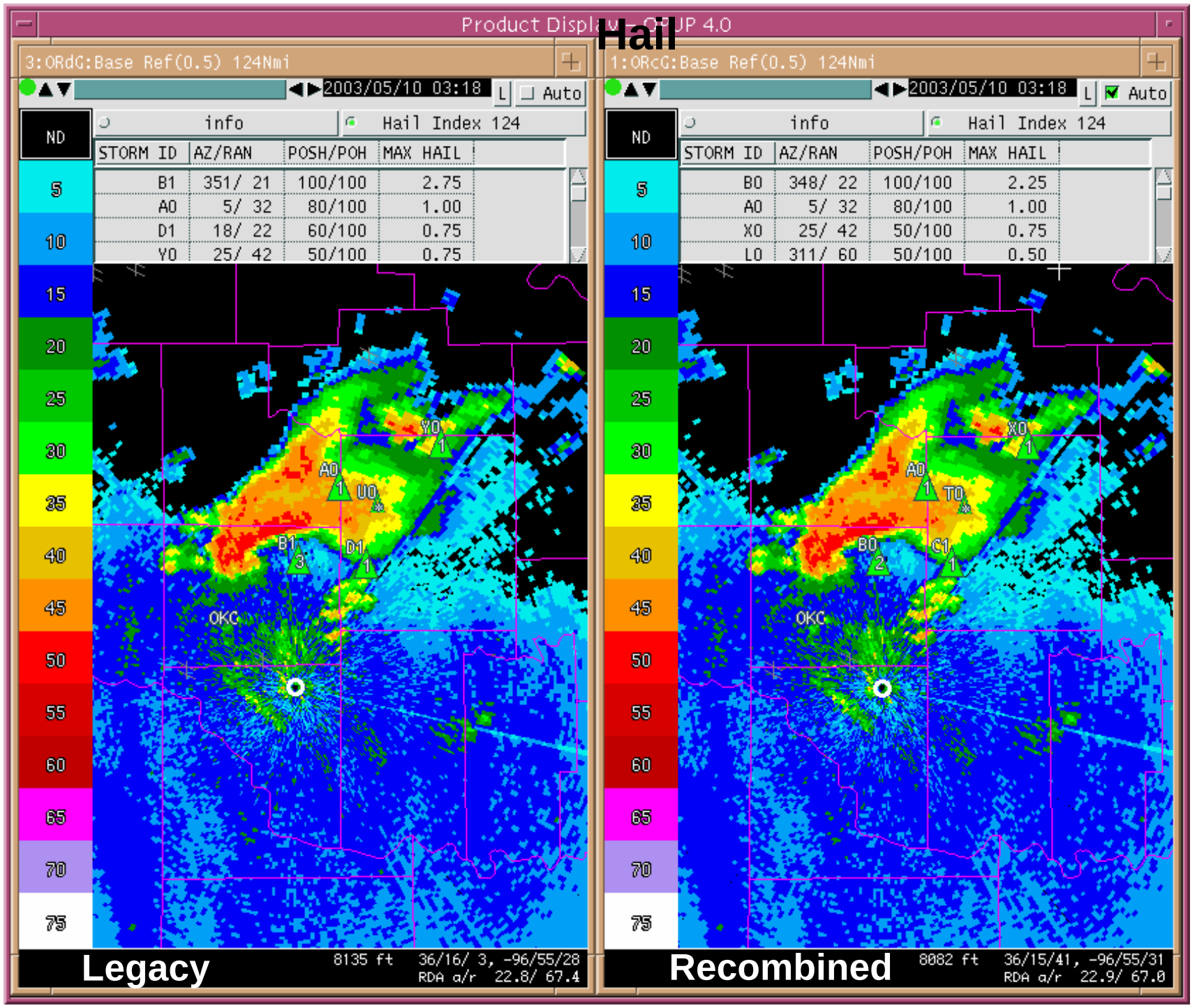
- Legacy Algorithm Performance
  - Currently have examined only one case (May 9th-10th, 2003)
  - SCIT, HDA, Mesocyclone, TDA
  - Differences in algorithm results are seen
    - Above algorithms are heuristic in design and appear to be highly sensitive to slight changes in the basedata
  - Will be examining three other data cases from 2003 and assessing algorithm performance to determine if differences are meteorologically significant
  - May need to collect additional datasets this year

Mesocyclone and TDA



SCIT


Product Display - GRUE 4.0
3:ORdG:Base Ref(0.5) 124Nmi
2003/05/10 03:54
Auto
info
Strm Trak 248
ND
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
OKC
1 cells not visible
Legacy
9022 ft
36/14/ 5, -96/36/34
RDA a/r 34.5/ 73.1
1:ORcG:Base Ref(0.5) 124Nmi
2003/05/10 03:54
Auto
info
Strm Trak 248
OKC
1 cells not visible
Recombined
9061 ft
36/14/20, -96/36/30
RDA a/r 34.4/ 73.3


Hail
Product Display - GR UP 4.0
3:ORdG:Base Ref(0.5) 124Nmi
2003/05/10 03:18
L
Auto
ND
info
Hail Index 124
STORM ID | AZ/RAN | POSH/POH | MAX HAIL
B1 | 351/ 21 | 100/100 | 2.75
A0 | 5/ 32 | 80/100 | 1.00
D1 | 18/ 22 | 60/100 | 0.75
Y0 | 25/ 42 | 50/100 | 0.75
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
OKC
8135 ft
36/16/ 3, -96/55/28
RDA a/r 22.8/ 67.4
Legacy
1:ORcG:Base Ref(0.5) 124Nmi
2003/05/10 03:18
L
Auto
ND
info
Hail Index 124
STORM ID | AZ/RAN | POSH/POH | MAX HAIL
B0 | 348/ 22 | 100/100 | 2.25
A0 | 5/ 32 | 80/100 | 1.00
X0 | 25/ 42 | 50/100 | 0.75
L0 | 311/ 60 | 50/100 | 0.50
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
OKC
8082 ft
36/15/41, -96/55/31
RDA a/r 22.9/ 67.0
Recombined

NSSL Recombination Analysis (cont.)

- Recombination will require …
  - Implementation of the ORDA
  - The scheduled CPU hardware upgrade for the RPG
  - Reflectivity data be passed to the RPG on Doppler cuts
  - Noise threshold information be passed to the RPG

Next Steps

- NSSL Tasked to continue data gathering and analysis
- Phased Tasking for ORDA developers to support High-Res
- Radar Working Group to Establish Coordinated Plan
- Utilize NWS PPBS Process