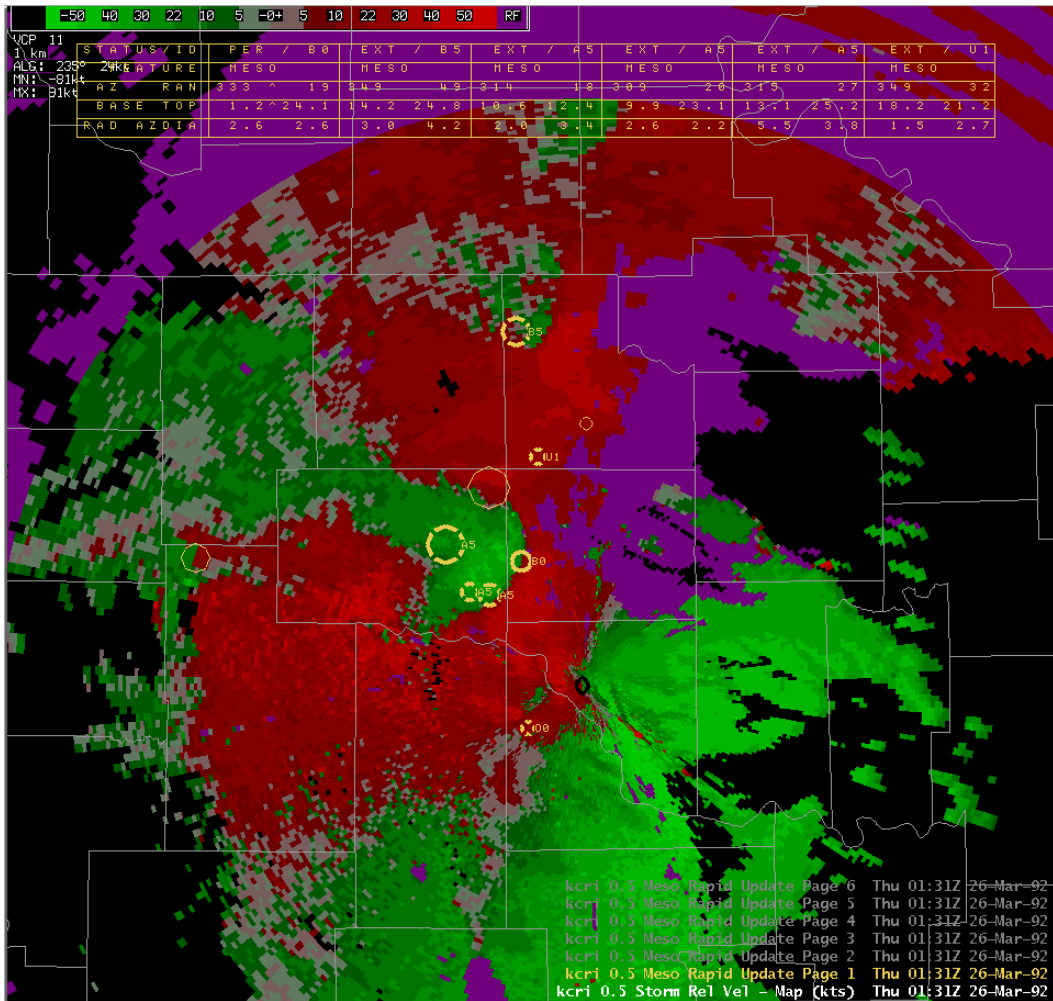


# RPG Build 4

## Training



**Presented by the  
Warning Decision Training Branch**

## Overview

RPG build updates continue on a six month delivery schedule, with RPG Build 4 deployment beginning in late September, 2003. Each RPG build has a blend of new science, upgrades to existing products or algorithms, as well as fixes. Features such as new products associated with each RPG build will become available for display and request to NWS forecasters at the AWIPS workstation. The timing of AWIPS implementation of new RPG products will vary, dependent upon the contents and deployment schedule of subsequent AWIPS builds.

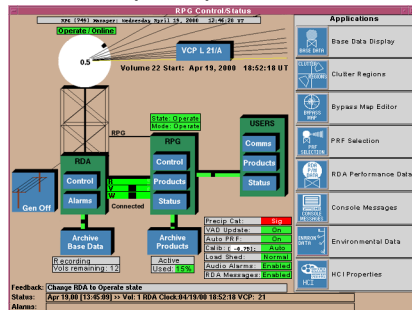
This document will present highlights of the operationally relevant changes with RPG Build 4. Some of these changes will be apparent at the RPG Human Computer Interface (HCI). However, the ability to see other changes relies on upgrades to the AWIPS software which will be implemented in later AWIPS builds.

The following features of RPG Build 4 will be presented in this document:

1. Mesocyclone Rapid Update Algorithm\*
2. Changes to the RPG Product Generation Table
3. Enhanced Echo Tops\*
4. The removal of several legacy products, with impacts to
  - a. Selectable Product Parameters window
  - b. Product alert pairing choices
5. Precipitation Processing System corrections
  - a. Truncation error correction
  - b. Changes to allow for faster update rates of new VCPs

\*AWIPS must have Operational Build (OB) 2 or later to display these products

The Electronic Performance Support System (EPSS) has been updated to support the Build 4 changes that are apparent on the RPG Human Computer Interface (HCI).



## Electronic Performance Support System (EPSS)



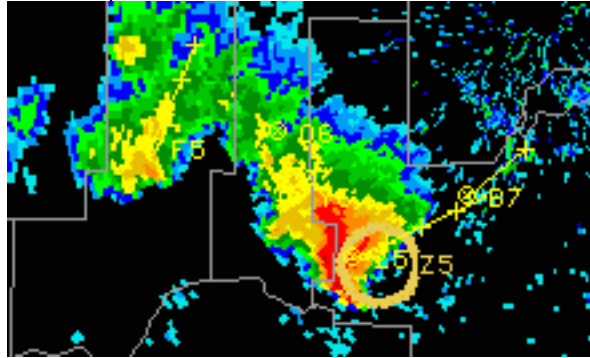
The Mesocyclone Rapid Update (MRU) Algorithm is **not** a replacement for the Mesocyclone Algorithm. Recall that the Mesocyclone Algorithm generates a Mesocyclone product and attribute table, both of which are available **at the end of each volume scan**. Even though a potential circulation may have been detected midway through the volume scan, the results (mesocyclones, 3D correlated shears, or uncorrelated shears) are not available to forecasters until the end of the volume scan.

***Mesocyclone Rapid Update (MRU) provides Mesocyclone Algorithm results, and generates a product, for each elevation angle during a volume scan.*** The MRU information for any given elevation angle is based on the elevations that have been completed thus far in the current volume scan.

The MRU uses the Mesocyclone and Storm Cell Identification and Tracking (SCIT) Algorithm output from the previous volume scan, such as identified

## 1. Mesocyclone Rapid Update (MRU) Algorithm

features and their storm motion. For example, a MESO has been identified for a particular volume scan. The average motion of all SCIT storm cells from that volume scan is applied to the identified MESO in order to extrapolate the position of that MESO to the subsequent volume scan.



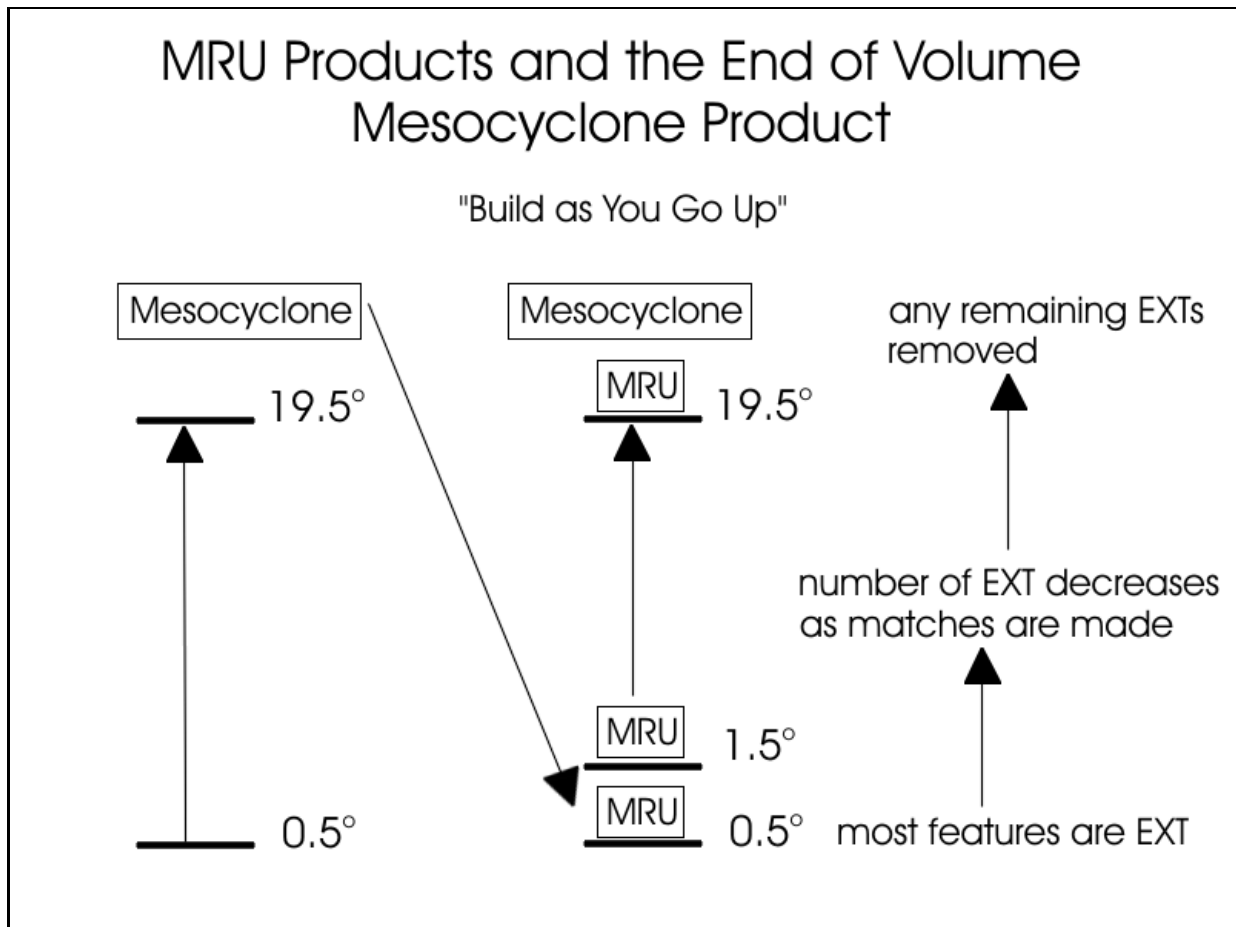
**Figure 1.** Mesocyclone Algorithm and SCIT results overlaid on Base Reflectivity.

For each elevation angle of the current volume scan, MRU attempts to match newly identified features to features identified from the previous volume scan. The MRU product is then generated for each elevation angle of the current volume scan.

The MRU is scheduled for AWIPS OB2, with deployment beginning in August 2003.

#### Relationship Between MRU and Mesocyclone Products

Figure 2 illustrates the relationship between the elevation-based MRU products and the end of volume scan Mesocyclone product. The features identified by the end of volume scan Mesocyclone product are given extrapolated positions and passed to the MRU at the beginning of the subsequent volume scan. As the MRU processes elevation angles, these features will have the status of Extrapolated until a match is made. At the end of the volume scan, any remaining features with extrapolated status (i.e. no match has occurred) will be removed.



**Figure 2.** Relationship between elevation-based MRUs and end of volume scan Mesocyclone product.

Extrapolated positions of features identified from the previous volume scan are determined using the average motion of all cells identified by the SCIT Algorithm. For the current volume scan, the extrapolated position of each previous feature is matched to the closest current feature within a search radius defined by the SCIT Algorithm.

If there is a match, the current feature initially inherits the attributes of the previous feature. These attributes include:

- Storm ID
- Strength Attributes:
  - Feature type (MESO, 3D SHR, or UNC SHR)

## Matching Features

If there is a match

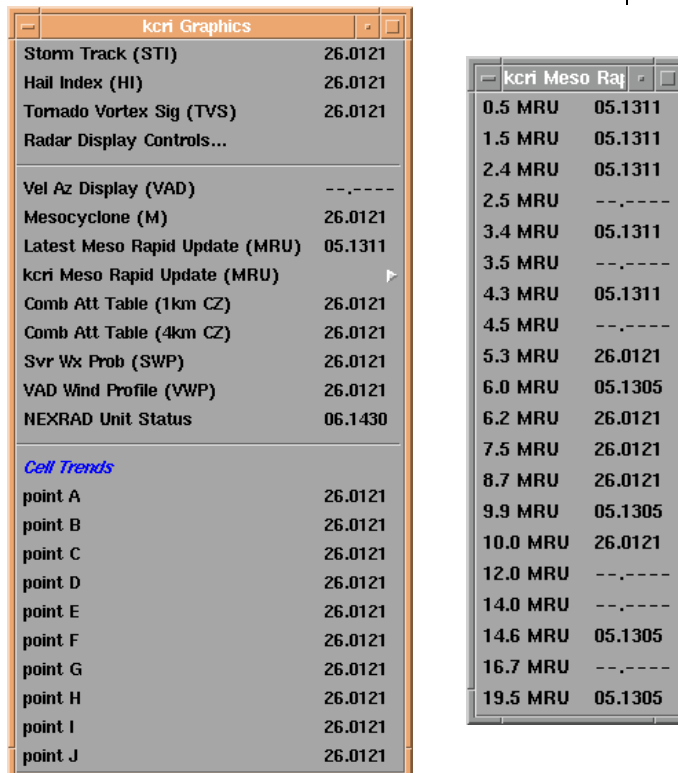
	<ul style="list-style-type: none"> <li>• Maximum tangential shear</li> <li>• Radial and azimuthal diameter (DIAM RAD AZ) and height of the max shear (HGT)</li> <li>• Position Attributes: <ul style="list-style-type: none"> <li>• Base azimuth, range (AZRAN) and height</li> <li>• Top height</li> </ul> </li> </ul>
<i>Increasing (INC) vs. Persistent (PER)</i>	<p>As the current and additional elevation angles are processed, the inherited attributes may change. If the max shear and/or the feature type increases (e.g. 3D SHR to MESO), the feature status is Increasing (INC). The max shear and/or feature type will then be updated to the current volume scan value and will be denoted with a ^ symbol in the MRU attribute table.</p> <p>Sampling issues such as the size of the circulation with respect to beamwidth can affect feature classification. The transition of a feature from a 3D SHR to a MESO can occur as a result of sampling (e.g. symmetry of 2D circulations has improved) and <b><i>does not always mean that the circulation has really intensified.</i></b></p> <p>If the max shear and the feature type have not increased, the feature status is Persistent (PER).</p>
If there isn't a match	<p>At the beginning of each volume scan, all MESOs, 3D SHRs, and UNC SHRs from the previous volume scan Mesocyclone Algorithm are passed to the MRU. These features' status will be extrapolated (EXT) until there is a match (once matched, status will be PER or INC). The number of EXT features will typically be higher near the beginning of a volume scan, then decrease as additional elevations are processed and more matches are made. At the end of the volume scan, any remaining EXT features are removed.</p>

If a 3D feature is newly identified in the current volume scan, but cannot be matched to a feature in the previous volume scan, its status is New (NEW).

*The AWIPS workstation images in this document were captured from a pre-deployment version of the OB2 software. Though no significant changes to the deployment version of the software are expected, there may be some differences.*

The Mesocyclone Rapid Update (MRU) product is a new elevation-based product with Build 4. The MRU can be displayed by selecting a particular elevation angle, or by selecting the “latest MRU” (Figure 3). The “latest MRU” option will result in a display that will automatically update as new elevation angles of the MRU arrive.

### Mesocyclone Rapid Update (MRU) Product



**Figure 3.** The menu structure to display the MRU. From the KXXX Graphics Menu, there are two options for MRU display, a particular elevation angle or the latest MRU. The latest MRU option will result in a display that will automatically update as new elevation angle MRUs arrive.

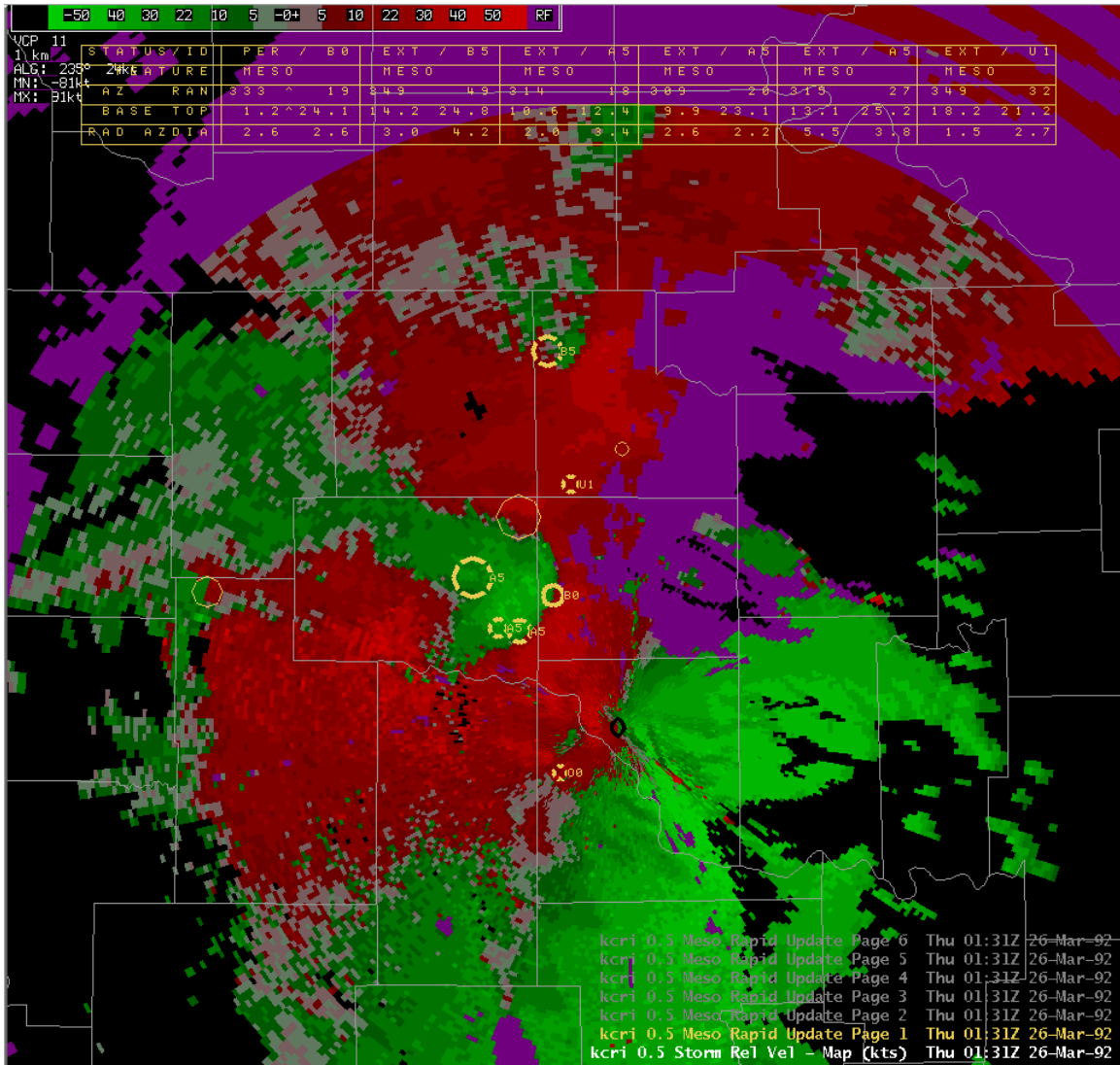
The MRU graphical product uses the familiar MESO (thick circle) and 3D SHR (thin circle) symbols. The size of the circle is proportional to the average of the radial and azimuthal feature diameters, just as with the end of volume scan Mesocyclone product. If the feature status is INC, PER, or NEW, the circle outline will be solid. If the feature status is EXT, the circle outline will be dashed.

As with the end of volume scan Mesocyclone product, the MRU graphical product can be displayed as an overlay to other products from the same volume scan. In Figure 4, the 0.5° MRU is overlaid with the 0.5° SRM. In this example the elevation angles match, but this is not a requirement. The MRU can be overlaid with products from different elevations, provided that the volume scan times match.

In Figure 4, note that the overall appearance of the MRU is similar to the end of volume scan Mesocyclone product. For example, the attribute table has multiple pages, with MESOs, then 3D SHRs listed. The primary difference is that the circles for EXT features are dashed.

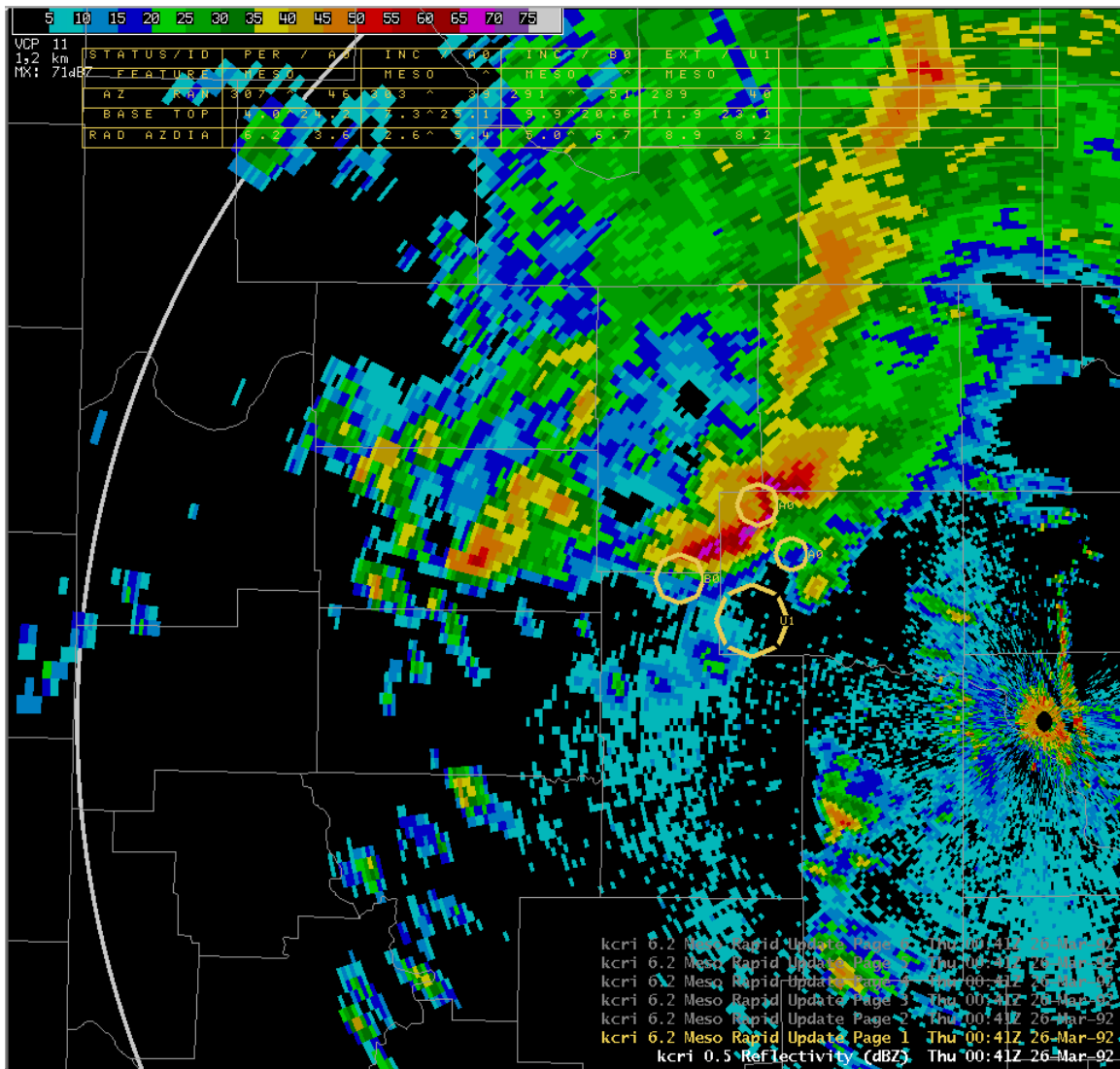
In Figure 4, several of the MESOs have the status EXT. This is to be expected for the lower elevations of a new volume scan, as the MRU has not yet processed the elevations needed to match an EXT MESO or 3D SHR.





**Figure 4.** A 0.5° SRM with 0.5° MRU overlaid. Note that the status of the majority of the mesos is EXT for extrapolated. The matching to features from the previous volume scan will improve as additional elevations are processed.

As the MRU continues to process additional angles in the volume scan, more matches will be made. In Figure 5, the 6.0° MRU is overlaid with the 0.5° Base Reflectivity. Note that the elevation angles do not match, just the volume scan time.



**Figure 5.** A 0.5° Base Reflectivity with 6.2° MRU overlaid. Note that of the four features, three are matched (INC or PER) with solid circles, while one remains unmatched (EXT) with a dashed circle.

### MRU Graphic Attribute Table

Also similar to the end of volume scan Mesocyclone product, the MRU has an associated graphical attribute table. This table has attribute information for each identified storm that has a MESO or 3D SHR.

The MRU Graphical Attribute Table in Table 1 provides examples of some of the four possible status types for an identified feature. This is the information from the Attribute Table in Figure 5. Note that

the maximum tangential shear value is not listed on the Graphical Attribute Table. It is available on the MRU Alphanumeric product.

**Table 1: Example of MRU Graphic Attribute Table**

STATUS/ID	PER / A0	INC / A0	INC / B0	EXT / U1
FEATURE	MESO	MESO ^	MESO ^	MESO
AZ RAN	307 46	303 ^ 39	291 ^ 51	289 40
BASE TOP	4.0 24.2	7.3 ^ 25.1	9.9 ^ 20.6	11.9 23.1
RAD AZDIA	6.2 3.6	2.6 ^ 5.4	5.0 ^ 6.7	8.9 8.2

In Table 1, storm A0 has two MESOs identified; one is persistent (PER) and the other is increasing (INC). Note that the attribute information for the PER MESO at 307°/46 nm has no ^ symbols. This indicates that the attribute information is all from the previous volume scan.

For the INC MESO at 303°/39 nm, note that the attributes have the ^ symbol next to them. This indicates that all of these attributes have been updated with current volume scan information. The INC status means that the shear and/or the feature type has increased since the previous volume scan. Since the MESO has the ^ symbol next to it and the feature is INC, the feature type has increased to MESO during the current volume scan.

In Table 1, storm U1 has a MESO that is extrapolated (EXT). The MRU has not yet matched this previous volume scan feature with current volume scan data. Note that the attribute information has no ^ symbols since it is from the previous volume scan.

The MRU Alphanumeric Product provides storm attribute information similar to the Graphic

**MRU Alphanumeric Product**

Attribute Table, with the addition of Uncorrelated Shears and the Shear value. At the AWIPS text window, the product name is WSRMRUXXX.

Text 1: WSRMRUCRI

File Edit Options Version Tools Scripts Products Help

AFOS Browser Load History WMO Search Enter Editor ☐ Accum ☒ Update Obs Clear

AFOS Cmd: WMO TTAai CCCC: AWIPS ID:

Message Date: Apr 22 1996 00:58:24

MESOCYCLONE RAPID UPDATE

RADAR ID: 520 DATE: 04/22/1996 TIME: 00:58:24 ELEV: 4.3 deg

FEATURE STATUS	STORM ID	FEATURE TYPE	BASE kft	TOP kft	AZRAN deg-nm	HGT kft	DIAM(NM) RAD AZ	SHEAR (e-3/s)
INC	- A5	MESO	5.0^	24.8^	133/ 53^	5.0^	4.6^ 3.4	31^
EXT	- P7	MESO	10.4	15.7	107/ 55	10.4	1.5 2.2	27
INC	- P7	MESO ^	6.0^	25.3^	110/ 60^	12.1^	2.7^ 4.5	20^
EXT	- T7	MESO	12.3	23.6	279/ 60	12.3	7.2 5.9	7
EXT	- P7	MESO	5.6	25.3	108/ 59	5.6	1.6 5.1	7
EXT	- Q7	MESO	14.4	25.2	230/ 47	21.5	5.9 6.0	7
INC	- Q7	MESO ^	9.8^	25.9^	232/ 50^	25.9^	1.3^ 2.7	7^
PER	- Z7	MESO	9.7^	14.0	147/ 21^	14.0	1.3 2.2	10
PER	- Z2	MESO	12.3^	23.6	266/ 26^	16.8	1.9 2.5	10
NEW	- T7	MESO ^	13.2^	25.5^	274/ 64^	25.5^	3.2^ 6.2	7^

MESOCYCLONE RAPID UPDATE

RADAR ID: 520 DATE: 04/22/1996 TIME: 00:58:24 ELEV: 4.3 deg

FEATURE STATUS	STORM ID	FEATURE TYPE	BASE kft	TOP kft	AZRAN deg-nm	HGT kft	DIAM(NM) RAD AZ	SHEAR (e-3/s)
EXT	- I4	3DC SHR	14.0	24.5	135/ 49	19.9	1.8 5.2	7
EXT	- D3	UNC SHR	6.8	6.8	250/ 35	6.8	3.1 4.9	8
EXT	- R2	UNC SHR	13.9	13.9	010/ 71	13.9	2.3 6.3	4
PER	- I4	UNC SHR	13.4^	13.4^	135/ 47^	13.0	1.6 4.4	6

Figure 6. Alphanumeric MRU product.

In Figure 6, the MRU alphanumeric product has the output for a 4.3° MRU product. The features are displayed in groups of ten, and ordered by feature type.

Note that storm A5 has a MESO whose status is INC. There is a ^ symbol next to the shear value, but not the type (MESO). This means that this feature was a MESO during the previous volume, but its shear value has increased. The storm P7 also has a MESO with INC status. In this case, both the feature type and the shear have increased since

the previous volume scan, since both have ^ symbols next to them.

The graphical (Table 1) and alphanumeric (Figure 6) attribute tables essentially offer a comparison of previous vs. current volume scan information. The design philosophy of the MRU is to provide the attribute information for the current or previous volume scan, dependent on which has the higher strength (shear and/or feature type). The ^ symbol denotes attribute information that has been updated to the current volume scan.

- Any feature that has a status of INC will show the updated attributes for the current volume scan, indicated by the ^ symbol. An INC feature with a MESO ^ as its feature type means the feature has just increased to MESO status within the current volume scan. ***This increase in status does not necessarily mean that the circulation has intensified.*** Better symmetry of 2D circulations due to radar sampling can also result in the change in status from 3D SHR to MESO.
- A feature that is PER has been matched from the previous volume scan, but its attributes have not been updated. They will be updated for the current volume scan only if any of the strength attributes has increased. If the strength attributes stay the same or decrease, you will continue to see the attributes from the previous volume scan.

One might expect that the output for the highest elevation MRU product would be identical to the end of volume scan Mesocyclone product. However, there may be differences due to the design philosophy of the MRU. The MRU is designed to display the “worst case scenario” until the end of volume scan Mesocyclone product is generated.

## Significance of ^ Symbol

## MRU Design Philosophy

If the feature type and/or the max shear has **increased** for a volume scan, the MRU depicts its new value, which is then displayed in the end of volume scan Mesocyclone product as well. For example, if a 3D SHR has increased to a MESO, MRU will denote this by MESO ^, and the end of volume scan Mesocyclone product will depict it as a MESO as well.

However, if the feature type and/or the max shear has **decreased** for a volume scan, the MRU will continue to display the higher value from the previous volume scan. The feature type and/or shear will only be downgraded on the end of volume scan Mesocyclone product. For example, if a feature has decreased from MESO to 3D SHR, it will be depicted as a MESO on the 19.5° MRU, but as a 3D SHR on the end of volume scan Mesocyclone product.

#### MRU One Time Request

Another feature of RPG Build 4 is a change to the RPG Product Generation Table. This change, presented starting on page 18, has a particularly important impact on access to the MRU product. The AWIPS One Time Request screen for MRU has an option for obtaining the lowest “n” elevation angles with a single request. In Figure 7, the lowest six elevations have been selected.

Note that Figure 7 depicts a One Time Request via the dedicated line. There is an AWIPS software problem if this type of request (multiple angles with a single request) is made via a dial line. If a single request is sent for multiple angles, AWIPS will disconnect the dial line as soon as the first of the requested products arrives from the RPG. This error will not be corrected with AWIPS OB2.

**Dedicated - One Time Request**

Repeat count: 1      RPG: KCRI

Product: Rapid Update Mesocyclone (MRU)

Priority: Low

Request Interval: 1

Elevation(s):

- ☐ All
- ☒ Lowest 'n' 6
- ☐ Selected 0.5

Time: ☒ Current ☐ Latest ☐ Selected

Selected time: Current      Change...

Send      Close

**Figure 7.** AWIPS request window for the MRU product. Note the option to select the lowest “n” elevations, which will provide multiple elevations of the MRU from a single request.

There is another special consideration for a single one time request for multiple angles. Only the “current” time can be selected for this type of request. See Figure 7.

The MRU product can be placed on an RPS list with options similar to the One Time Request. The elevations specified can be all, a specific angle, or the lowest “n”. In Figure 8, all three options are dis-

MRU RPS List

played when adding the MRU to the RPS list. Note that the option for the lowest six elevations has been selected. Figure 9 shows the resultant RPS list entries.

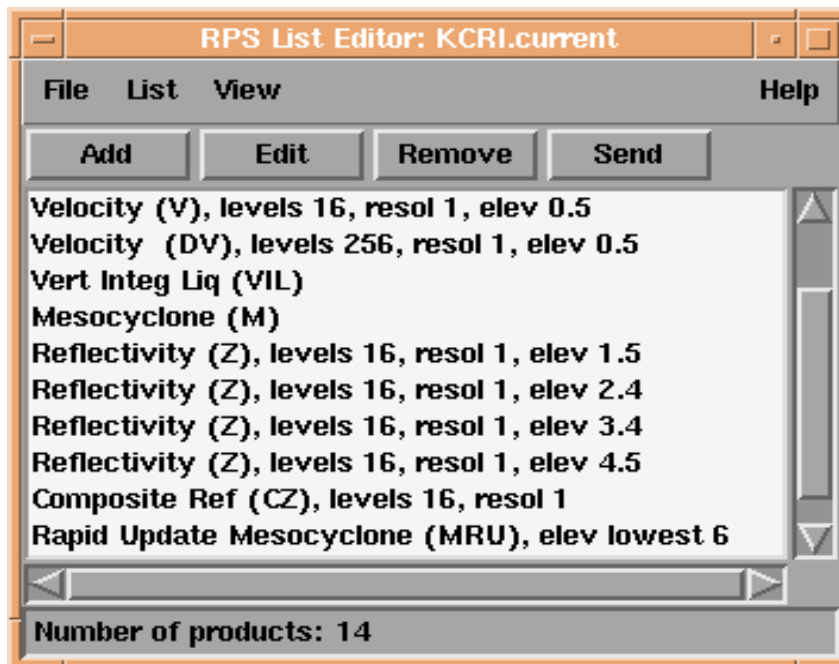
The image shows a software dialog box titled "Add Product". It contains several configuration fields:

- Product:** A dropdown menu showing "Rapid Update Mesocyclone (MRU)".
- Priority:** A dropdown menu showing "Low".
- Request Interval:** A numeric input field with the value "1".
- Elevation(s):** A section with three radio button options:
  - ☐ All
  - ☒ Lowest 'n' (with a numeric input field showing "6")
  - ☐ Selected (with a numeric input field showing "0.5")
- At the bottom are "OK" and "Cancel" buttons.

**Figure 8.** Example of the window to add the MRU product to an RPS list. Note that options for all or the lowest "n" elevations allow for multiple elevations of the MRU from a single RPS entry.

This single entry in the RPS list still counts as multiple products for overall sizing of the RPS list. For example, the RPS list in Figure 9 shows a total of 14 products. On AWIPS, the MRU entry for the lowest 6 elevations is considered to be a single product. However, once this list is submitted to the RPG, this entry will count as 6 products. If the limit for that list is exceeded, the list will be truncated from the bottom up.





**Figure 9.** Example of the MRU product as part of an RPS list. Note the lowest six elevations will be generated from a single RPS list entry.

The best use of the MRU will likely result from generating the minimum number of the lowest “n” elevations that is sufficient to assess potential circulations early in the volume scan. The optimal choice for “n” will likely change from event to event, and is dependent on a number of considerations.

If storms are at a short range from the RDA, mesocyclone detection may require numerous elevation angles.

If storms are at mid ranges, the lowest “n” elevations of the MRU that may be preferable will depend on the VCP and the depth of the storm.

If storms are at long range, the ability of the Mesocyclone Algorithm to detect a circulation is minimized. The detections possible for the MRU would be impacted in the same way.

## Considerations for Use of MRU

### *Range of storms*

*Depth of storms*

In addition to the range, the depth of storms would also impact the best choice for the lowest “n” elevations.

## 2. RPG Product Generation Table

The MRU will be the first product with the option of obtaining the lowest “n” elevations via a One-Time Request or a single entry on an RPS List. In the future, this option will likely be available for new products, such as the Rapid Update for the Tornado Detection Algorithm (TDA).

New VCPs are planned for implementation beginning with RPG Build 5 (March 2004). VCP 12 will be the first new VCP and will have elevation angles different from any of the legacy VCPs. Thus, the optimal “lowest n elevations” of products will vary from one VCP to the next. For example, the lowest four angles for the legacy VCPs are:

- 0.5°, 1.5°, 2.4°, 3.4°

The lowest four angles for the upcoming VCP 12 are:

- 0.5°, 0.9°, 1.3°, 1.8°

With the legacy Product Generation Tables, the use of -4 to specify the lowest 4 elevation angles would have significantly different results for VCP 12 vs. any of the legacy VCPs.

In anticipation of these changes, the RPG Product Generation Tables have been updated in Build 4 to allow for the generation of all elevations **at or below a specific angle**. In the previous example, specifying all angles at or below 3.5° would result in the generation of:

- 0.5°, 1.5°, 2.4°, 3.4° for the legacy VCPs
- 0.5°, 0.9°, 1.3°, 1.8°, 2.4°, and 3.1° for VCP 12

RPG Product Generation Tables identify which products will be generated routinely, determine distribution of products to non-associated users, identify products for Level III Archive, and define on-line storage times. There are three Generation Tables that affect operations:

1. Current Table
2. Adaptation Mode A Table
3. Adaptation Mode B Table

The Current Table is being actively used for product generation each volume scan. It may be edited as needed to adjust product generation to meet operational needs.

The Adaptation Tables are automatically loaded and become the current table whenever there is a mode change. For example, when there is an automatic switch from a Clear Air Mode VCP (Mode B) to Precipitation Mode VCP 21 (Mode A), the Adaptation Mode A Table becomes the current table. The contents of the Adaptation Tables are specified by the Adaptable Parameters Handbook and have a ROC level of change authority. The Adaptation Tables cannot be edited at the local site.

In the legacy design of the Product Generation Tables, the choice of angles for elevation-based products could be set up in one of two ways:

1. a particular elevation slice
  - e.g. 0.5 will result in generation of the 0.5° elevation product
2. a given number of the lowest elevation angles
  - e.g. -4 would result in the generation of the lowest 4 elevation angles.

Purpose of the RPG  
Product Generation Tables

Legacy Options for  
Specifying the Elevations  
to be Generated

## Warning Decision Training Branch

The screenshot shows the 'RPG Product Generation Table Editor' window. It has a menu bar with 'Close', 'Save', and 'Undo'. Below the menu bar are radio buttons for 'Table: Current', 'Precip (A)', 'Clear Air (B)', and 'Maintenance'. Below that are radio buttons for 'Replace Current Table with: Precip Mode (A)', 'Clear Air Mode (B)', and 'Maintenance Mode'. There is a 'Search:' text box and 'Sort by:' radio buttons for 'Product Code', 'Product MNE', and 'Description'. The main table has columns: MNE, Code, Gen, Arc, Sto, (mins), Elev/Cut (s), and Product Description. The table contains 31 rows of data for various products like Base Reflectivity, Base Velocity, and Base Spectrum Width. The last row is 'USP 31' for 'User Selectable Storm Total Precipitation: 16 level/1.1 nm'. Below the table, it says 'This product has no extra parameters'.

MNE	Code	Gen	Arc	Sto	(mins)	Elev/Cut (s)	Product Description
R	16	0	0	0	0	<∞ 0	Base Reflectivity: 8 level/0.54 nm
R	17	0	0	0	0	<∞ 0	Base Reflectivity: 8 level/1.1 nm
R	18	0	0	0	0	<∞ 0	Base Reflectivity: 8 level/2.2 nm
R	19	1	-1	1	180	<∞ -4	Base Reflectivity: 16 level/0.54 nm
R	20	1	-1	1	180	<∞ -3	Base Reflectivity: 16 level/1.1 nm
R	21	0	0	0	0	<∞ 0	Base Reflectivity: 16 level/2.2 nm
V	22	0	0	0	0	<∞ 0	Base Velocity: 8 level/0.13 nm
V	23	0	0	0	0	<∞ 0	Base Velocity: 8 level/0.27 nm
V	24	0	0	0	0	<∞ 0	Base Velocity: 8 level/0.54 nm
V	25	1	-1	1	180	<∞ -1	Base Velocity: 16 level/0.13 nm
V	26	0	0	0	0	<∞ 0	Base Velocity: 16 level/0.27 nm
V	27	1	-1	1	180	<∞ -4	Base Velocity: 16 level/0.54 nm
SW	28	1	-1	1	180	<∞ -1	Base Spectrum Width: 8 level/0.13 nm
SW	29	0	0	0	0	<∞ 0	Base Spectrum Width: 8 level/0.27 nm
SW	30	1	-1	1	180	<∞ -4	Base Spectrum Width: 8 level/0.54 nm
USP	31	1	0	1	180	<∞	User Selectable Storm Total Precipitation: 16 level/1.1 nm

This product has no extra parameters

**Figure 10.** Current Product Generation Table. Note the entries for Base Reflectivity 16 data level products use the legacy feature where a negative whole number denotes the lowest “n” elevations.

In Figure 10, the entries reflect the legacy entry option for the lowest “n” elevations. For example, for Base Reflectivity, 16 data levels, .54 nm resolution, the lowest four elevations are required for Level III Archive. Thus there is a -4 in the Cut(s) column with the Elevation box unchecked, resulting in the generation of the lowest four elevations of that product.

With RPG Build 4, the Product Generation Table design retains the legacy options, but also allows the operator to specify the generation of all elevations below a particular angle.

The angles to be generated are specified in the Elev/Cut(s) columns. If a product is not selected for generation, there will be a zero in the Cut(s) column and the Elevation box will be grayed out.

For products selected for generation, the default value in the Cut(s) column will be initially displayed. To edit the default, the range of values that can be used represent different options.

The range of values for this option are -1 to -20. Note that these are integer values (no decimals). This option provides the legacy feature where the lowest “n” elevations is represented by -n. In Figure 10, the -4 for Base Reflectivity, 16 data levels, .54 nm resolution will result in the generation of the lowest four elevations.

The range of values appropriate for the specific cut option is -1.0 to 45.0. Note that these are decimals to the tenth, allowing for specific elevation angles. An entry in this range will sensitize the Elevation blue box.

To generate a product for a single specified elevation angle, enter that angle (in decimal format from -1.0 to 45.0) and leave the Elevation blue box **unchecked**. In Figure 11, the product with an elevation angle closest to 4.3° Base Reflectivity (8 levels/2.2 nm) would be generated.

This option shares the same range of cut values as for a single specific elevation, -1.0 to 45.0. To generate a product at the desired angle and for all elevations below that angle, **check the blue box**. In Figure 11, all angles at or below 4.3° of Base Reflectivity (8 levels/1.1 nm) would be generated.

Build 4 Options for Specifying the Elevations to be Generated

*Lowest Number of Elevation Cuts*

*Specific Elevation Cut*

*All Elevations At or Below a Specific Elevation Cut*

R	16	0	0	0	0	<input type="checkbox"/>	<=	0	Base Reflectivity: 8 level/0.54 nm
R	17	1	0	1	30	<input checked="" type="checkbox"/>	<=	4.3	Base Reflectivity: 8 level/1.1 nm
R	18	1	0	1	180	<input type="checkbox"/>	<=	4.3	Base Reflectivity: 8 level/2.2 nm
R	19	1	-1	1	180	<input type="checkbox"/>	<=	-4	Base Reflectivity: 16 level/0.54 nm
R	20	1	0	1	180	<input type="checkbox"/>	<=	-3	Base Reflectivity: 16 level/1.1 nm

Figure 11. A selected angle, 4.3°, checked vs. unchecked.

## Warning Decision Training Branch

For RPG Build 4, it may be desirable to use the option of all elevations at or below a specific elevation cut on the Current Product Generation Table for the MRU product.

RPG Product Generation Table Editor

Close Save Undo Table: ☒ Current ☐ Precip (A) ☐ Clear Air (B) ☐ Maintenance

Replace Current Table with: ☐ Precip Mode (A) ☐ Clear Air Mode (B) ☐ Maintenance Mode

Search: Sort by: ☒ Product Code ☐ Product MNE ☐ Description

MNE	Code	Gen	Arc	Sto	(mins)	Elev/Cut (s)	Product Description
LRM	90	1	0	1	180	<---	Layer Composite Reflectivity (Layer 3 Maximum): 8 level/2.2 nm
DBV	93	0	0	0	0	<---	ITWS Digital Velocity Product: 256 level/0.54 nm
DR	94	0	0	0	0	<---	Base Reflectivity Data Array Product: 256 level/0.54 nm
CRE	95	0	0	0	0	<---	Composite Reflectivity Edited for AP: 8 level/0.54 nm
CRE	96	0	0	0	0	<---	Composite Reflectivity Edited for AP: 8 level/2.2 nm
CRE	97	0	0	0	0	<---	Composite Reflectivity Edited for AP: 16 level/0.54 nm
CRE	98	0	0	0	0	<---	Composite Reflectivity Edited for AP: 16 level/2.2 nm
DV	99	0	0	0	0	<---	Base Velocity Data Array Product: 256 level/0.13 nm
CLR	132	1	0	1	180	-1	Clutter Likelihood Reflectivity: 11 level/0.54 nm
CLD	133	1	0	1	180	-1	Clutter Likelihood Doppler: 12 level/0.54 nm
DVL	134	0	0	0	0	<---	High Resolution Digital VIL: 256 level/0.54 nm
EET	135	1	0	1	180	<---	Enhanced Echo Tops: 71 level/0.54 nm
SO	136	1	0	1	180	<---	Superob: NCEP Winds Model Initialization
ULR	137	0	0	0	0	<---	User Selectable Layer Composite Reflectivity (Maximum)
DSP	138	1	0	1	180	<---	Digital Storm Total Rainfall Accumulation: 256 level/1.1 nm
MRU	139	1	0	1	180	10.0	Mesocyclone Rapid Update

This product has no extra parameters

**Figure 12.** Current Product Generation Table. Note the entries for the MRU allow for the generation of all elevations at or below 10°.

In Figure 12, note that for the MRU, there is a positive 10.0 and the box is checked in the Elev/Cuts column. This will result in the generation of all MRUs at or below 10.0°.

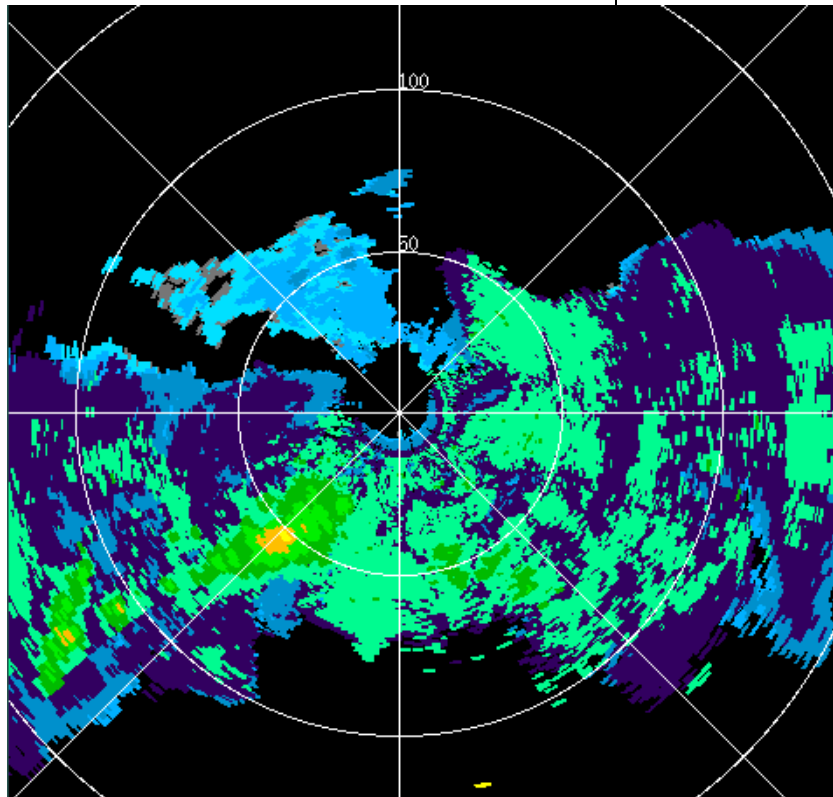
MRU in the Mode A  
Adaptation Product  
Generation List

In the Mode A Adaptation Product Generation List, the Elev/Cut(s) entry for the MRU will be 45.0 with the box checked. This will allow for the generation of all the angles of the MRU product and thus will be the initial condition for the current list when there is a change from Mode B to Mode A.

The generation of all elevations of the MRU can have an impact on the storage of the total suite of products at the RPG. During the RPG Build 4 Beta Test it was determined that without generating any MRUs, about 6 hours of products were stored at the RPG. On the other hand, when all the elevation angles of the MRU were generated, about 4 hours of products were stored at the RPG.

The Enhanced Echo Top (EET) product is not a replacement for the legacy ET. It is sponsored by the FAA and designed to support the FAA mission. The EET has a finer vertical resolution compared to the legacy ET, which results in less of the “stair-step” appearance. The EET employs linear interpolation of reflectivity values to assign heights at 1000 ft increments. The horizontal resolution is also finer, with a polar grid of  $1^\circ$  by 1 km (.54 nm).

### 3. Enhanced Echo Tops



**Figure 13.** Enhanced Echo Tops product

The EET product has a smoother appearance than the legacy ET product. For the EET, an echo top is defined as the height of the 10 dBZ echo, compared to 18.3 dBZ for the legacy ET product.

Display and request of the EET is planned for AWIPS OB3, with deployment expected to begin in February 2004.

## 4. Product Removal

By agreement from all three agencies, several seldom used legacy products have been removed from the RPG. Removal of these products frees resources for product generation, as well as pre-build release testing.

The products removed are

1. Echo Tops Contour
2. Composite Reflectivity Contour
3. Combined Shear Contour
4. Combined Moment
5. Weak Echo Region
6. Spectrum Width Cross Section

The removal of these products has two areas at the RPG that are impacted, the Selectable Product Parameters Window and the Product Alert Pairing.

Impact on Selectable  
Product Parameters  
Window

A consequence of the removal of the contour products is a change in the Selectable Product Parameters Window. Figure 14 and Figure 15 demonstrate the difference from Pre-Build 4 and Build 4. In this example, the product parameter selected is the data levels for the STP.

Impact on Product Alert  
Pairing

These seldom used products were available for alert pairing. Thus some adjustment to product



-----INSTRUCTIONS-----  
Permissible value range is from 0.0 to 25.4 inches in multiples of 0.1. The value entered represents the minimum value of the data level.

Code	Current (inches)
1	ND
2	> 0.0
3	>= 0.3
4	>= 0.6
5	>= 1.0
6	>= 1.5
7	>= 2.0
8	>= 2.5

Code	Current (inches)
9	>= 3.0
10	>= 4.0
11	>= 5.0
12	>= 6.0
13	>= 8.0
14	>= 10.0
15	>= 12.0
16	>= 15.0

Figure 14. Pre-Build 4 Edit Selectable Product Parameters window with Contour Product as a category.

-----INSTRUCTIONS-----  
Permissible value range is from 0.0 to 25.4 inches in multiples of 0.1. The value entered represents the minimum value of the data level.

Code	Current (inches)
1	ND
2	> 0.0
3	>= 0.3
4	>= 0.6
5	>= 1.0
6	>= 1.5
7	>= 2.0
8	>= 2.5

Code	Current (inches)
9	>= 3.0
10	>= 4.0
11	>= 5.0
12	>= 6.0
13	>= 8.0
14	>= 10.0
15	>= 12.0
16	>= 15.0

Figure 15. Build 4 Edit Selectable Product Parameters window with Contour Product missing as a category.

alert pairing may be needed. Figure 16 shows the Alert Threshold Editor window. If any of these six removed products were paired to an alert, an alternate product will need to be selected.

Category	Units	Min	Max	Th1	Th2	Th3	Th4	Th5	Th6	Paired Product
Velocity	kts	0	246	15	25	35	45	50	60	[44] - SWV Severe Weather (Veloci
Composite Refl	dBZ	-32	95	20	30	40	50	60	70	[38] - CR Composite Reflectivity:
Echo Tops	kft	0	70	30	40	50	60			[41] - ET Echo Tops: 16 level/2.2
SVR Wx Prob	%	0	100	30	40	50	60	70		[47] - SWP Severe Weather Probabi
VIL	kg/m2	0	80	35	40	45	50	55	65	[57] - VIL Vertically Integrated

Figure 16. The Alert Threshold Editor window. If any of the six products that have been removed were paired to an alert, an alternate product will need to be selected.

## **5. Precipitation Processing System Corrections**

### **Truncation error correction**

The process of accumulating rainfall in the Precipitation Processing System (PPS) includes a slight truncation error, which can have a cumulative effect and cause underestimates of rainfall. The problem is most significant for sustained, light precipitation events and is most apparent on hourly-based products (One Hour, Three Hour, and User Selectable Precipitation, and the Digital Precipitation Array).

A correction to this problem is included in RPG Build 4, with more accurate hourly products during long duration light rainfall events to be expected.

### **Changes to allow for faster update rates of new VCPs**

The first new VCP is scheduled for RPG Build 5, deployed beginning in March, 2004. It will be called VCP 12 and will complete the volume scan in 4.1 minutes, a faster update rate than any of the legacy VCPs. The PPS has been adjusted to allow for this faster rate once it has been implemented.

### **Summary**

This document provides an overview of the operationally relevant impacts of RPG Build 4. Some of the RPG Build 4 changes are apparent at the RPG HCI, while others will not be apparent until the fielding of subsequent AWIPS Builds.