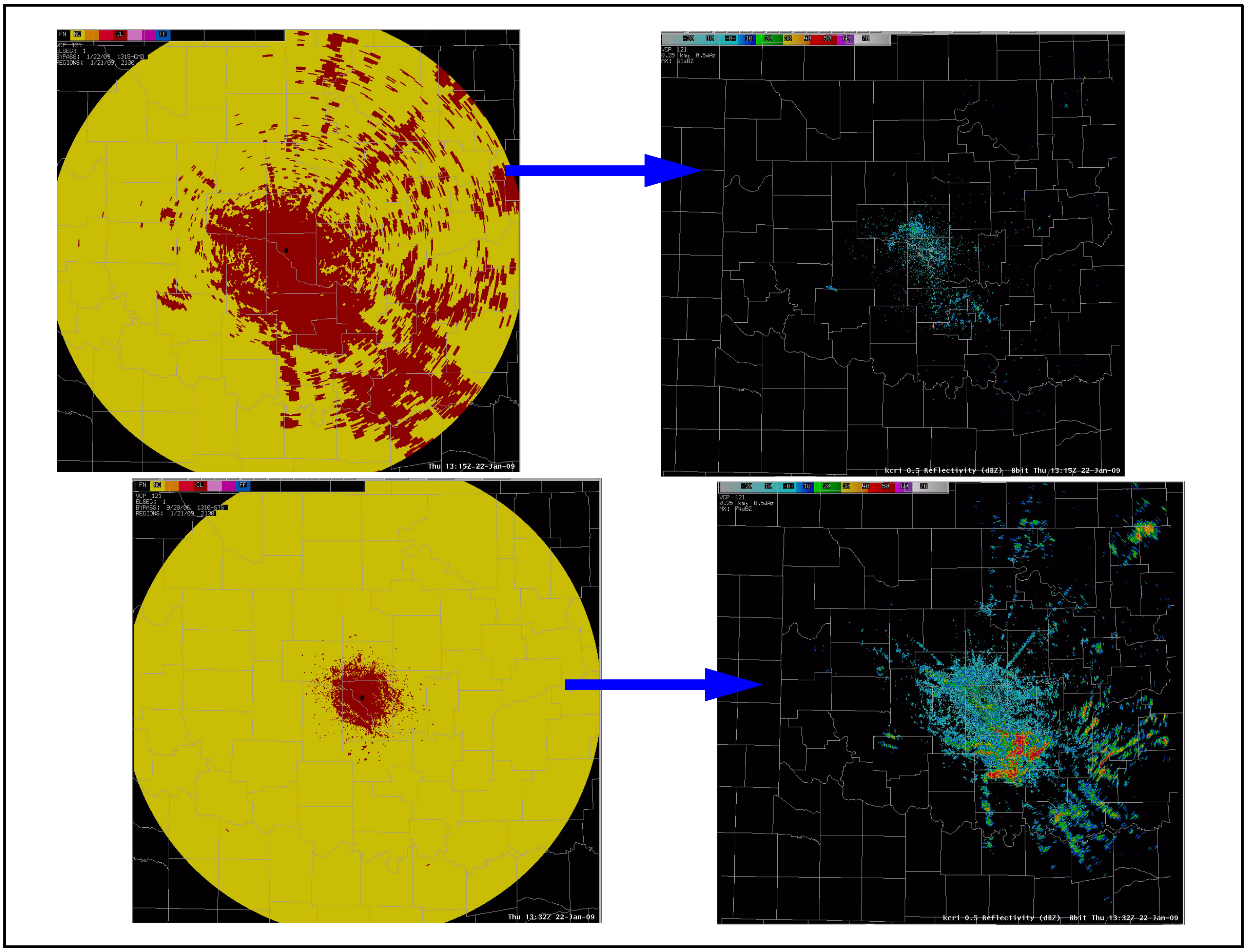
RDA/RPG Build 11.0

Training



Presented by the

Warning Decision Training Branch

Version: 0905

Overview

RDA/RPG Build 11.0 upgrades software at both the RDA and RPG and this document presents the associated operational changes. The most significant Build 11.0 change is the Clutter Mitigation Decision (CMD) algorithm at the RDA and the associated updates of the RPG HCI windows.

The Build 11.0 changes at both the RDA and the RPG may affect Unit Radar Committee (URC) decision making. Coordination among URC members with respect to how Build 11.0 impacts URC protocols is encouraged.

The information presented in this document reflects the pre-deployment state of knowledge of the operational impacts of Build 11.0.

Electronic Performance Support System (EPSS)

The Electronic Performance Support System (EPSS) has been updated to support the Build 11.0 changes that are apparent at the RPG HCI and the RDA HCI. Launching the EPSS displays an initial selection screen that allows operators to choose either the RPG EPSS or the RDA EPSS. The RDA EPSS, like its RPG counterpart, provides HCI navigation assistance and specific guidance for selected (RDA) tasks.

RDA/RPG Build 11.0 Operational Impacts

The following RDA/RPG Build 11.0 operational changes are presented in this document:

- Clutter Mitigation Decision (CMD) Algorithm
- Addressing false RDA alarms when switching to/from VCP 31
- Improvements to the Mesocyclone Detection Algorithm (MDA)
- Removal of rarely used products

- Velocity Azimuth Display (VAD) slant range parameter reset to default value of 30 km

Objectives

1. Identify the clutter suppression management and data quality benefits that CMD provides.
2. Identify why the CMD clutter identification technique is better than the “SNR/Clutter Power Removed” technique.
3. Identify examples of moving ground targets that CMD cannot detect.
4. Identify why CMD is preferable to All Bins clutter suppression for the detection of AP clutter.
5. Identify why CMD is particularly beneficial for the SZ-2 VCPs.
6. Identify the Build 11.0 performance improvement for the MDA.

Clutter Mitigation Decision (CMD) Algorithm

The Clutter Mitigation Decision (CMD) algorithm offers significant improvement to the management of ***both*** normal and Anomalous Propagation (AP) clutter suppression. CMD identifies the location of clutter targets ***in real time*** on a bin by bin basis (a real time Bypass Map). For range bins identified by CMD for clutter suppression, the Gaussian Model Adaptive Processing (GMAP) technique performs the signal reduction. CMD does ***not*** change the ***amount*** of returned power that is removed.

Pre-Build 11.0 Management of Clutter Suppression

Prior to Build 11.0, clutter suppression has been managed with two different approaches, depending on the persistence of the clutter return.

- Normal clutter, present nearly all the time, has been addressed using a Bypass Map. Generated off-line, Bypass Maps identified the location of this persistent form of clutter return.

- AP clutter, which is transient in space and time, has been addressed by filtering ***every*** range bin (All Bins) within a defined geographic area.

Normal (Persistent) Clutter and Bypass Maps

Normal clutter is present during most atmospheric conditions and has been addressed by applying clutter filter Bypass Maps. For each of the five clutter filter elevation segments (Figure 1), a clutter filter Bypass Map identifies the geographic location of ground clutter targets ***seen by the radar when the map was generated***.

The quality of any Bypass Map is ***totally*** dependent on the atmospheric conditions at the time the map was generated. Likewise, the quality of clutter filtering using a Bypass Map depends on the similarity of the current atmospheric conditions to those present when that Bypass Map was generated. These “static” Bypass Maps should be regenerated ***at least*** seasonally to remain representative.

AP-Induced (Transient) Clutter and All Bins

AP clutter occurs during superrefractive atmospheric conditions. The resultant clutter return is usually confined to the lower elevations, often radially oriented and changes significantly in location over time. For each of the five clutter filter elevation segments, AP clutter has been addressed by defining a region (azimuth to azimuth and range to range) that encompasses the AP clutter, then selecting All Bins suppression for that region. All Bins does just what the name implies - clutter suppression is applied to ***every*** range bin, regardless of the ***actual*** clutter contamination coverage, within the defined region.

Management of Clutter Suppression with CMD

With Build 11.0, a new clutter management technique, CMD, is available. Every volume scan,

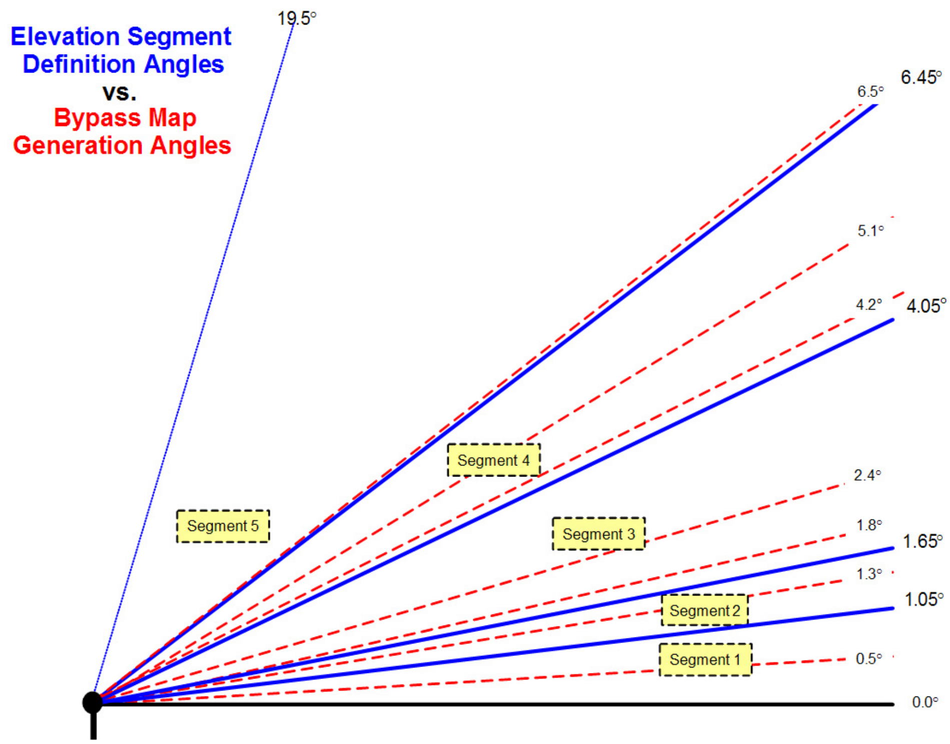


Figure 1. The 5 clutter elevation segments (bounded by blue lines) and default static Bypass Map generation angles. For all VCPs except 31, the Split Cuts fall within segments 1 and 2.

CMD identifies the clutter return and generates Bypass Maps for the Split Cut elevations. Instead of a static Bypass Map that is used for long periods of time, CMD generates a ***new*** Bypass Map ***each*** volume scan. Not only is normal clutter identified by the CMD Bypass Maps, AP clutter is ***also*** identified. This "dynamic" Bypass Map generation by CMD addresses both types of clutter ***much*** more effectively than the Pre-Build 11.0 manual process. Since CMD executes in real time, you can think of it as ***just in time*** clutter suppression!

In Figure 2, Clutter Filter Control (CFC) products depict the locations (red) where CMD has detected clutter. During a one hour period in the morning, a weak inversion has broken over the area. The image on the left is at the beginning of the hour when significant AP clutter is present.

The image on the right is at the end of the hour when the inversion is gone. This example demonstrates CMD's ability to detect both normal and AP clutter in real time.

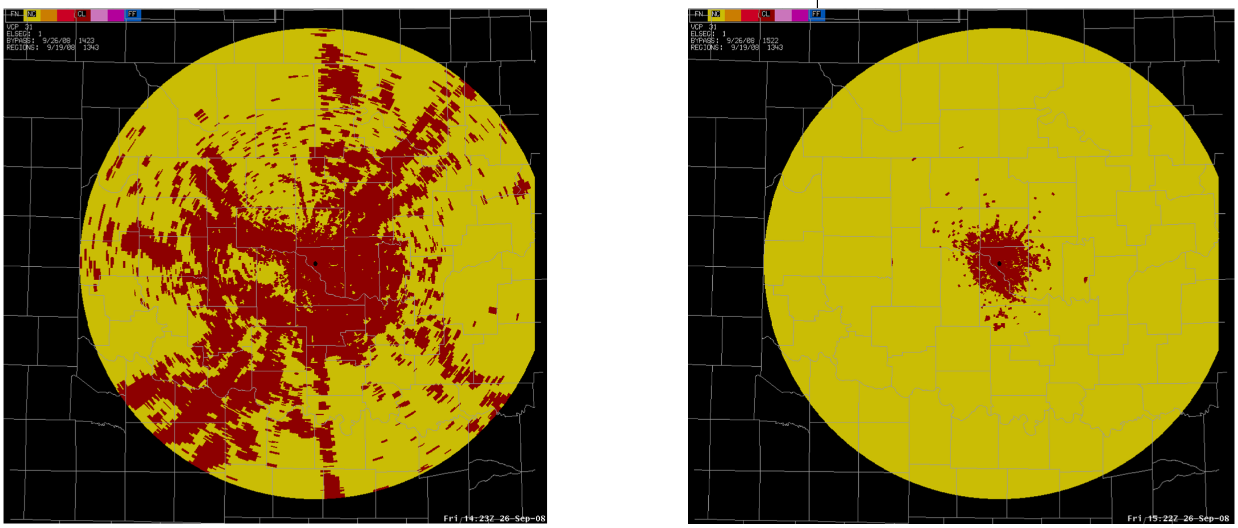


Figure 2. CFC products with clutter detection based on CMD at the beginning (left) and end (right) of a one hour period while an inversion has broken.

CMD on Split Cuts Only

Generation of dynamic Bypass Maps by CMD is available ***only*** for the Split Cut elevations, which (except for VCP 31) fall within elevation segments 1 and 2 (Figure 1). Thus GMAP applies filtering based on the CMD generated dynamic Bypass Maps in the Split Cuts, with previously generated static Bypass Maps used for the higher elevations.

In Figure 3, an early morning inversion with clear skies and AP is underway, VCP 121 is current, and CMD is On. The CFC products for elevation segments 1 (upper left) and 2 (upper right) show the dynamic CMD generated Bypass Maps. The CFC product for elevation segment 3 (lower left) shows the static Bypass Map. The lowest elevation Reflectivity product (lower right) shows only clear air return. The AP clutter has been removed.

All VCPs Except 31

For all the VCPs except 31, the Split Cuts fall within elevation segments 1 and 2. So for all the

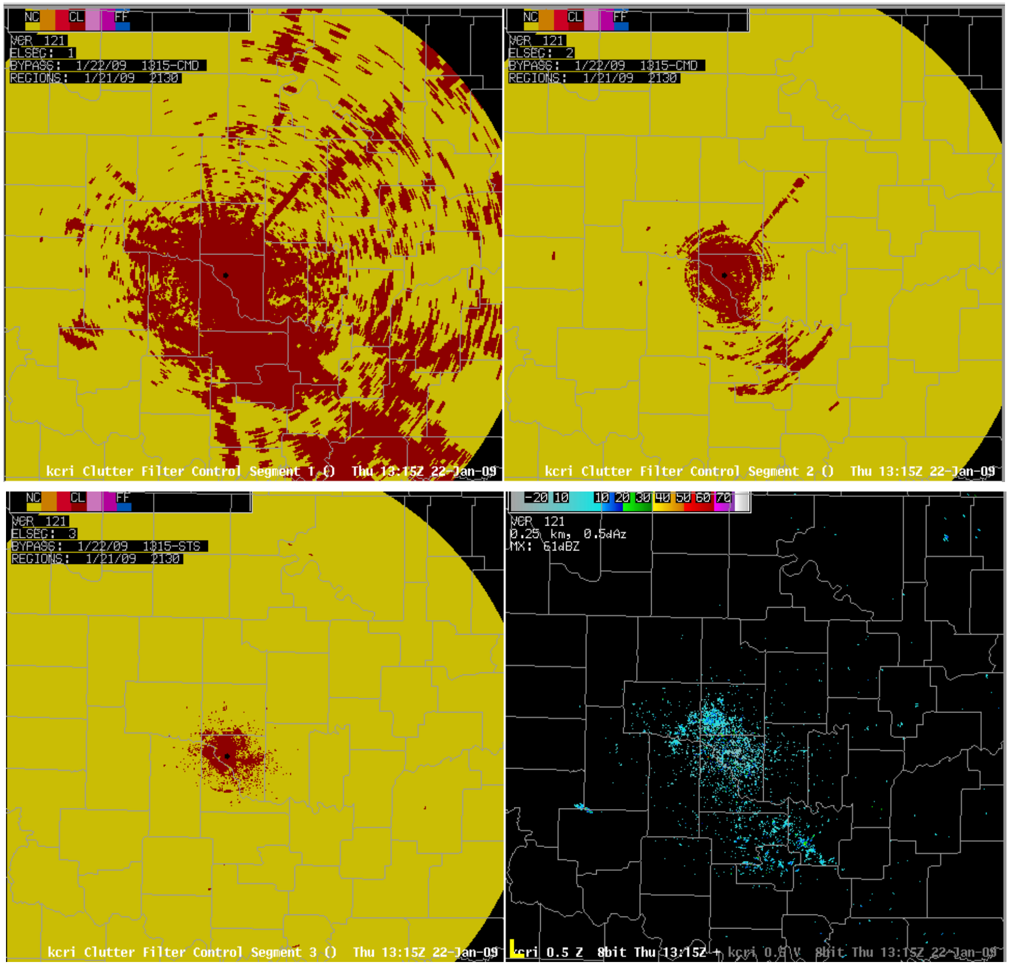


Figure 3. CFC products for elevation segments 1 (upper left), 2 (upper right), and 3 (lower left) and the lowest elevation Reflectivity. AP is occurring while CMD is On and there is no clutter contamination in the base data.

VCPs except 31, CMD generates dynamic Bypass Maps for elevation segments 1 and 2, while static Bypass Maps are used for elevation segments 3, 4 and 5.

VCP 31

For VCP 31, Split Cut processing occurs on angles 0.5°, 1.5° and 2.5°. This means that CMD generates dynamic Bypass Maps for elevation segments 1, 2 and 3, with static Bypass Maps used for elevation segment 4 (VCP 31 has no angles in segment 5!).

Angles Used to Generate CMD Dynamic Bypass Maps

The specific angles used by CMD for generating the dynamic Bypass Maps are VCP dependent. There are differences with respect to the elevation angles that fall within the clutter elevation segments. Table 1 presents these differences. Only VCPs 12 and 212 have 2 angles that fall within elevation segment 1 (0.5° and 0.9°). For VCP 12 and 212, the dynamic Bypass Map generated by CMD for 0.5° is ***also*** applied to the 0.9° elevation.

Table 1: VCP Angles Used by CMD Within Elevation Segments

Elevation Segment	VCPs 12 and 212	VCP 31	All Other VCPs
1	0.5° and 0.9°	0.5°	0.5°
2	1.3°	1.5°	1.5°
3	No Split Cut angles	2.5°	No Split Cut angles

How CMD Identifies Clutter

The CMD algorithm uses ***both*** reflectivity and signal phase information from the Surveillance scan. CMD is more effective at discriminating clutter from meteorological targets than the “SNR/Clutter Power Removed” method (see “Generating Static Bypass Maps” on page 12). CMD is a fuzzy logic technique that uses three variables, known as feature fields. These fields are Reflectivity Texture, Reflectivity Spin, and Clutter Phase Alignment (CPA).

Reflectivity Texture and Spin

The Texture feature looks at a segment of reflectivity along a radial to determine the variation of the values. Clutter does ***not*** have the smooth reflectivity gradients of meteorological returns. High texture values imply areas of clutter. The Spin feature is a measure of how often the reflectivity gradient changes sign along the radial. Clutter also has higher Spin values compared to meteorological returns.

Clutter Phase Alignment (CPA)

CPA is a measure of the consistency of the phase changes from the collection of returned pulses assigned to a particular range bin. For clutter, the returned signal phases are highly consistent, while signal phases for weather are less consistent. The more clutter there is in the returned signal, the closer CPA gets to 1. As the amount of clutter in the returned signal decreases (or the amount of weather increases), CPA gets lower.

CMD Better Discriminates Clutter

The Texture and Spin features along with CPA are ***particularly*** effective at preserving meteorological targets that happen to have low velocity and spectrum width, such as stratiform rain. When All Bins clutter filtering is applied to a large area of stratiform rain, there is often significant signal removal. Even with stratiform rain, a CMD generated dynamic Bypass Map is ***much*** less likely to identify weather targets for clutter filtering, resulting in better quality reflectivity and rainfall products.

When CMD is Enabled

When enabled, the CMD algorithm executes every volume scan to identify clutter and build a Bypass Map for each of the Split Cut elevation segments, based on the lowest Surveillance scan. For the remaining scans (Doppler and/or Surveillance) in the elevation segment, GMAP clutter filtering is applied to the bins identified by the dynamic CMD Bypass Map.

CMD On

Figure 4 displays the base data quality with CMD turned On during a significant AP clutter event. Only clear air returns from moving targets remain in the Reflectivity and Velocity products. It is important that CMD identifies AP clutter for removal on a bin by bin basis. If All Bins had been applied in this case, clutter suppression would have been performed on every range bin over a very large area.

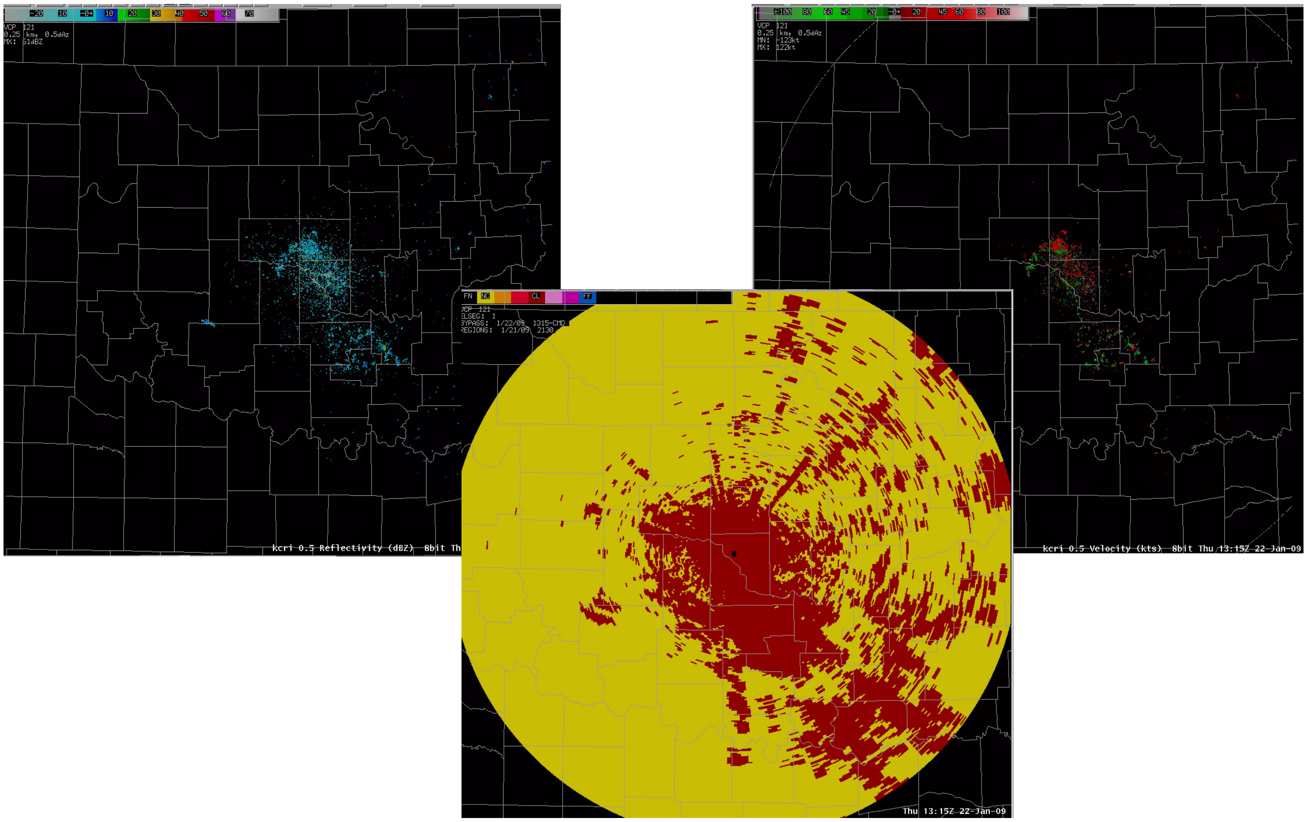


Figure 4. Lowest elevation reflectivity (upper left), velocity (upper right), and the CFC for elevation segment 1. These products show CMD's benefit, especially when strong AP is present.

When CMD is Disabled

There is no expected ***operational*** reason to do so, but CMD can be disabled from the RPG HCI main page (Figure 5). If CMD is disabled, the ***existing*** static Bypass Maps for ***all five*** elevation segments would then be used for clutter filtering. All Bins would also have to be ***manually*** applied to address AP clutter.

CMD Off

In Figure 6, CMD has been turned Off while significant AP clutter is present. The CFC product depicts the use of the static Bypass Map for elevation segment 1 and the resultant AP clutter is widespread on the Reflectivity and Velocity products.

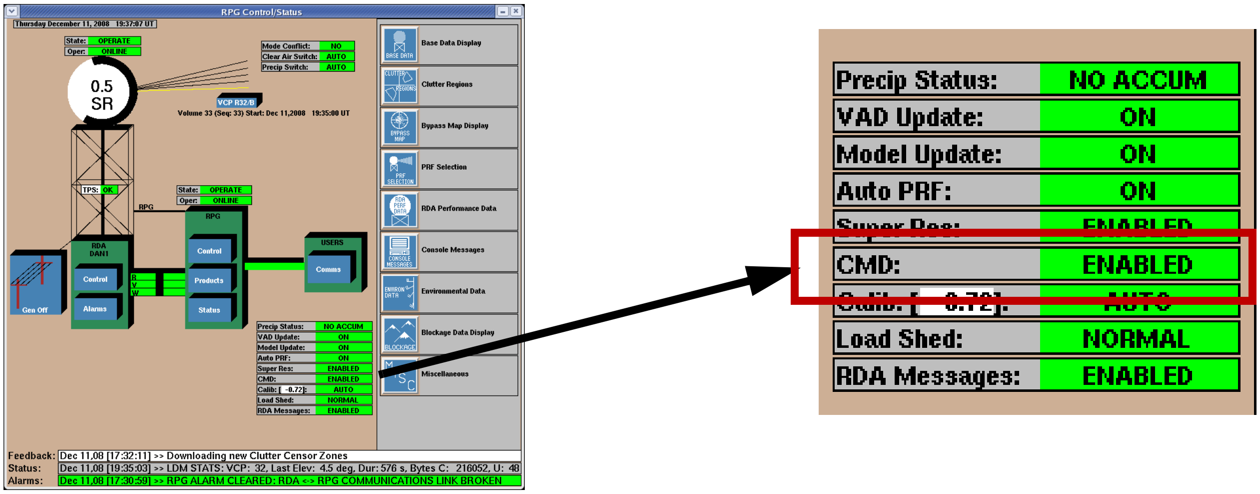


Figure 5. Build 11.0 RPG HCI main page. Note the CMD toggle button.

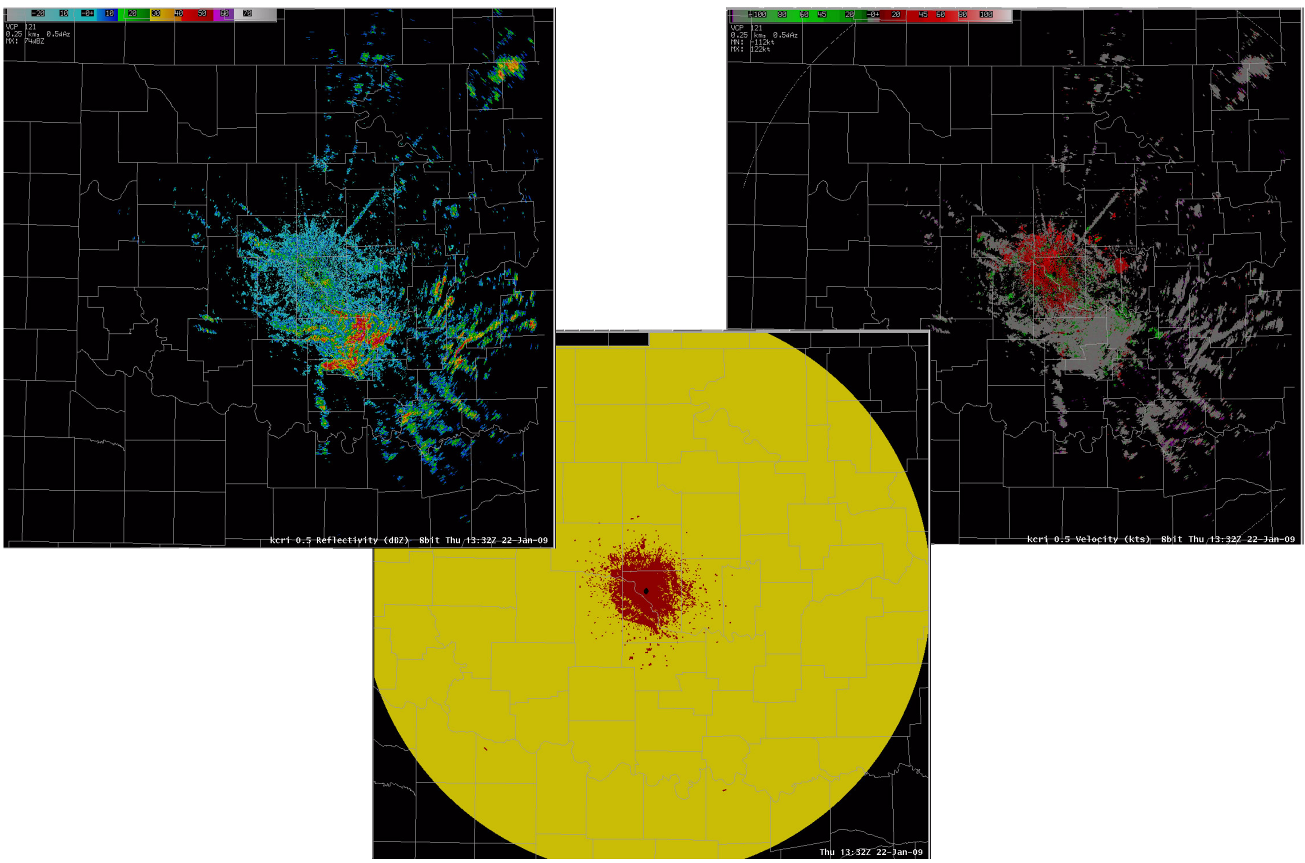
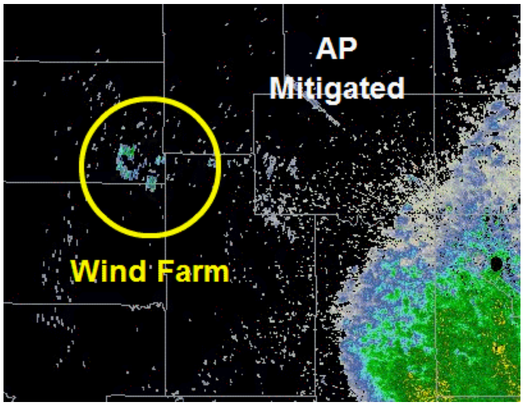


Figure 6. Lowest elevation reflectivity (upper left), velocity (upper right), and the CFC for elevation segment 1. These products show the impact of turning CMD Off while strong AP is present.

If It's Moving, It's Not Clutter

CMD is designed to identify stationary ***ground*** clutter. CMD will ***not*** mitigate contamination from moving ground targets such as wind turbines or traffic on highways (Figure 7). Work is underway to identify the characteristics of the returned signal from wind turbines. If the wind turbine signal is sufficiently different from weather signals, it may be possible to remove it. Research is ongoing in this area of radar data quality. Also, ROC outreach efforts are underway to coordinate with wind farm developers before wind turbines are sited.



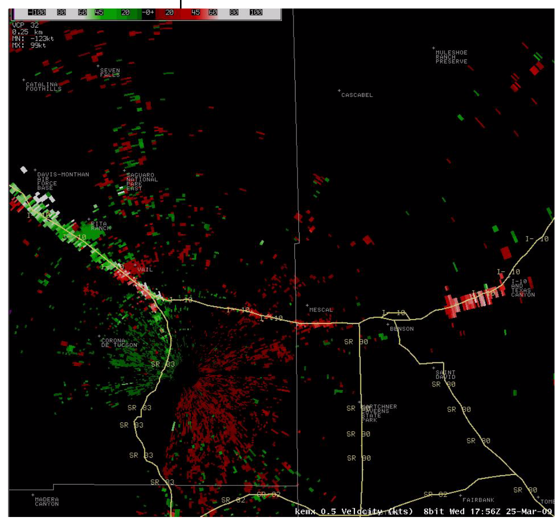


Figure 7. CMD only identifies ground clutter. It cannot identify moving targets such as wind turbines (left) and traffic on highways (right).

The Bloom

There is one condition that occurs frequently and is sometimes confused with clutter, but is also the result of moving targets. An increase in weak returns near the radar frequently occurs after sunset. The intensity of this "bloom" is proportional to the strength of any temperature inversion. Though CMD will remove any ground targets encountered by the beam, it will ***not*** remove returns from associated ***moving*** scatterers such as biological targets and particulates.

In Figure 8, the bloom is occurring at Sacramento, CA. The Reflectivity and Velocity products on the left were filtered by CMD, while the products on the right were filtered using All Bins everywhere. In either case, there is no AP clutter present, verified by the extensive non-zero velocities. The extensive coverage of weak reflectivities is the result of moving scatterers close to the ground.

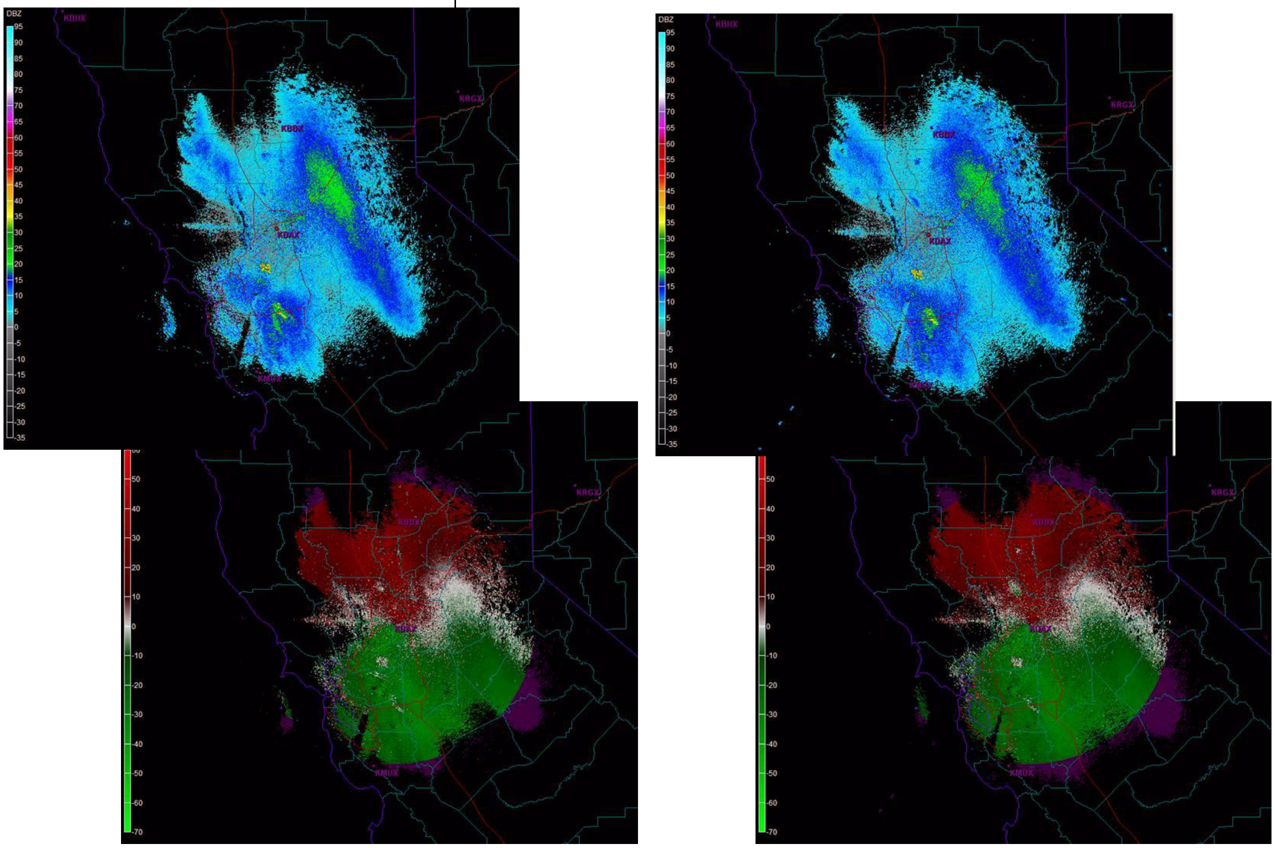


Figure 8. The “bloom” composed of clear air return from moving scatterers that the radar beam encounters at night. The reflectivity and velocity on the left were filtered by CMD, while the reflectivity and velocity on the right were filtered using All Bins everywhere.

Generating Static Bypass Maps

Generating new ***static*** Bypass Maps is ***one*** process for ***all*** five elevation segments. The “SNR/Clutter Power Returned” (returned power only) technique has been used for many years and is still available for all five elevation segments. However, the CMD algorithm is ***also*** available for offline generation of static Bypass Maps for all five segments (Figure 9).

The CMD algorithm is ***recommended*** for generating ***static*** Bypass Maps. Since CMD uses reflectivity and signal phase information, it does a better job of discriminating clutter from meteorological returns and it does ***not*** require setting threshold values.

The “SNR/Clutter Power Removed” technique compares the unfiltered returned power to the filtered returned power for each range bin. If the difference between these two signals is greater than the Clutter Threshold, the range bin is flagged as containing clutter. Note that this technique does ***not*** include signal phase information.

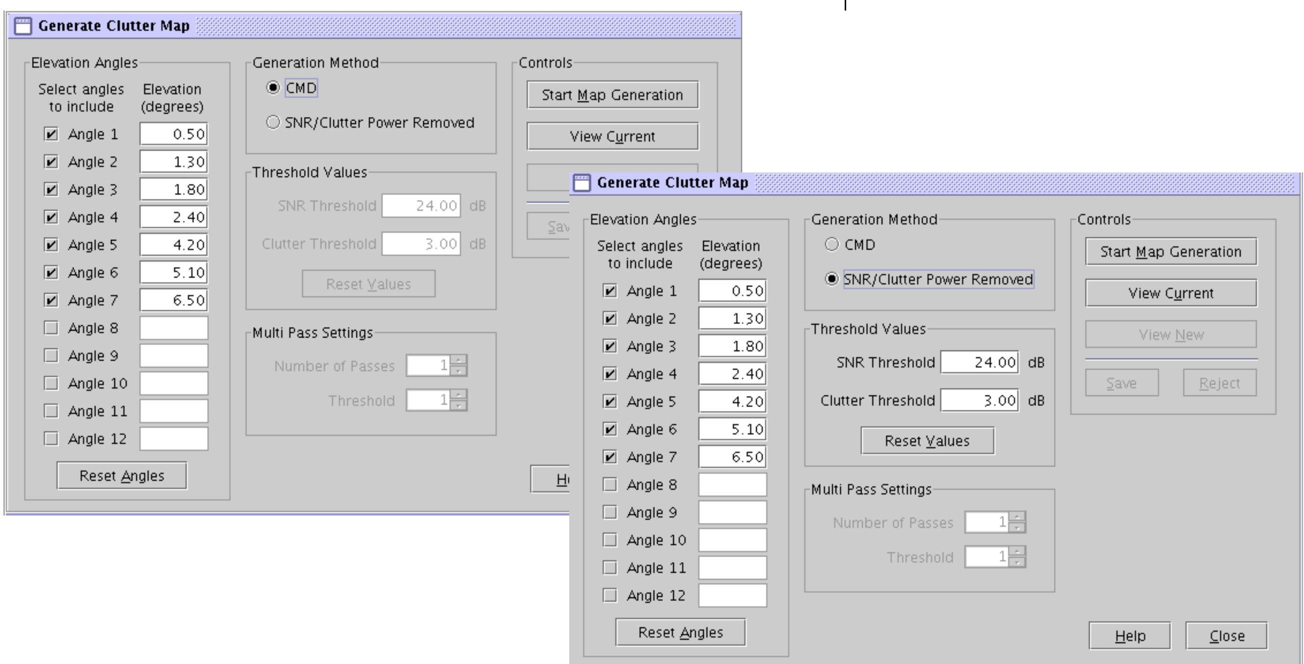


Figure 9. Build 11.0 RDA HCI Bypass Map Generation window, with two different methods for generating Bypass Maps. CMD (left) is the recommended method.

Static Bypass Maps are used for the upper elevation segments for long periods of time for normal clutter targets ***only***. It remains important to generate these maps seasonally and under the appropriate atmospheric conditions. Static Bypass Maps are best generated ***only*** when normal clutter targets are present, and no precipitation or abnormal beam propagation is occurring. The quality of clutter filtering with static Bypass Maps is dependent on how well current conditions match those that were present when the maps were generated.

Best Practice: Generating Static Bypass Maps

The best quality static Bypass Maps often result from a meteorologist and a technician working together, whether at the RDA shelter or from the MSCF in the office. The technician has the necessary password to access the Bypass Map Generation window (Figure 10). The technician can select CMD as the generation method, then "Start Map Generation".

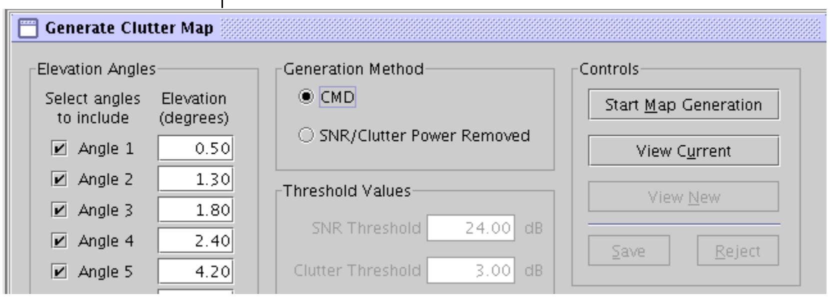


Figure 10. Build 11.0 RDA HCI Bypass Map Generation window, with map viewing options in the upper right.

The newly generated maps can then be inspected using the "View New" button. The meteorologist can inspect the maps to ensure that they are representative of the local terrain before they are saved.

Implementing New Static Bypass Maps

Once new Static Bypass Maps have been generated at the RDA, it is necessary to verify their implementation at the RPG HCI. For each clutter regions file that has been defined, verify that the Bypass Map is in control everywhere as Region 1 for ***all five*** elevation segments (Figure 11).

Missed Clutter Detections Within Terrain

A number of the Build 11.0 Beta Test sites were chosen because terrain presents an ongoing clutter suppression challenge. The Build 11.0 Beta Test revealed that CMD sometimes misses isolated bins of clutter. These isolated bins are distributed within areas of terrain clutter. Since the beam propagation changes with time, these bins of

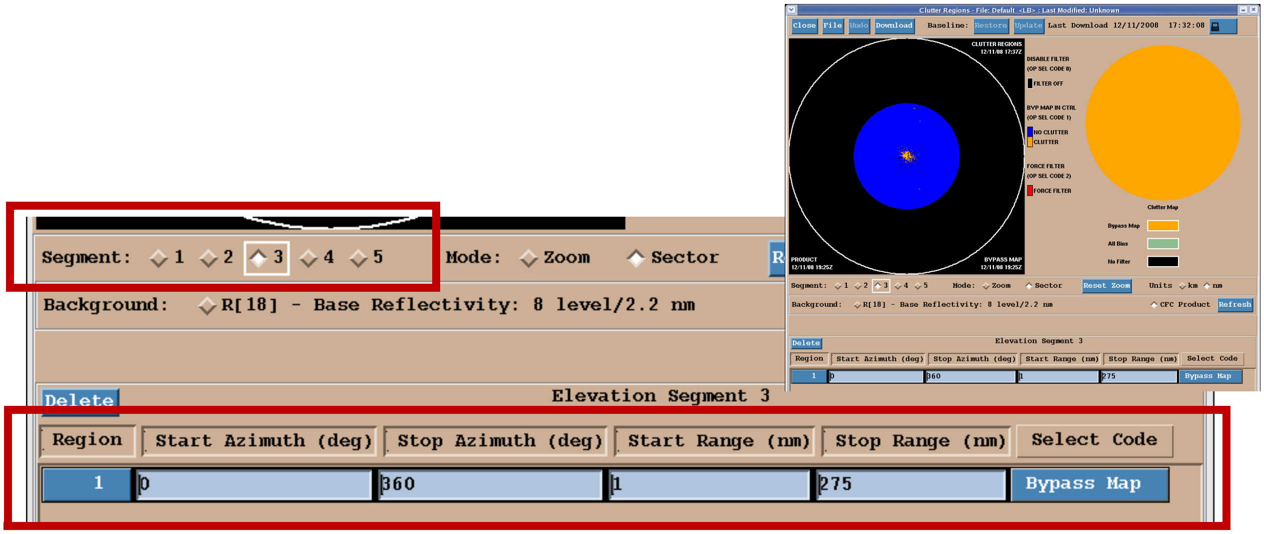


Figure 11. Each defined clutter regions file should have the Bypass Map in control everywhere as Region 1 for all five elevation segments.

undetected clutter often “flicker” when looking at a time lapse of base data, particularly reflectivity.

Figure 12 shows reflectivity data from Tucson, AZ. The lower left image is an overall display, while the other images are zoomed in on areas where isolated discrete bins depict clutter contamination not detected by CMD within an area of terrain.

As of this writing, the cause is known to be partially related to Super Resolution processing and CMD. Corrections are being investigated and tested. An updated version of CMD is expected to be part of RDA Build 11.1, released Summer of 2009.

CMD Missed Detections Strategy

If there are areas of isolated missed detections with CMD, small clutter regions applying All Bins can be built to address them.

1. Create a new clutter regions file that has the Bypass Map in control everywhere for all five elevation segments.

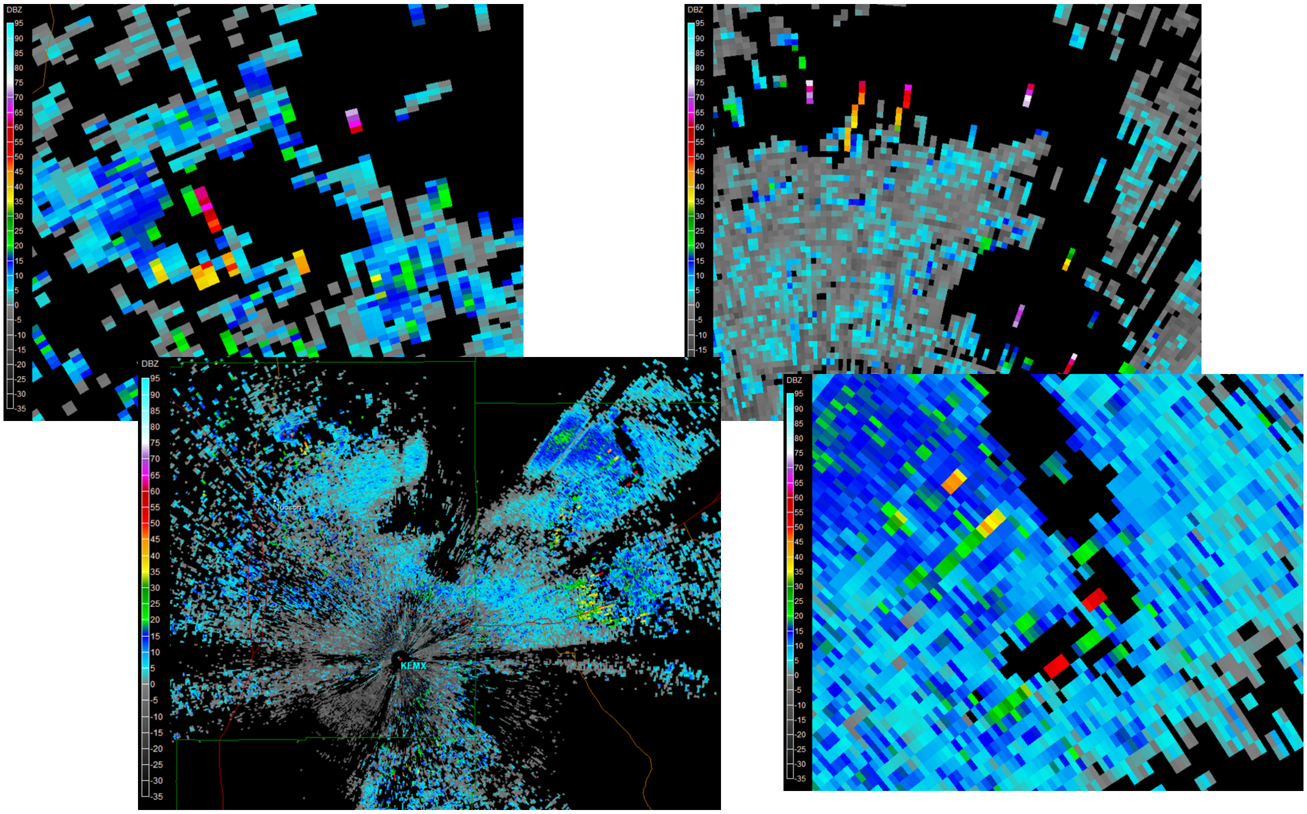


Figure 12. Examples of missed terrain clutter from Tucson during the Build 11.0 Beta Test

2. For each of the appropriate elevation segments, add small clutter regions of All Bins that capture the areas of the missed detections.

For your WSR-88D, this new file ***functions*** as the “Default” file. It is recommended that this file be stored with a name such as “CMD Local”. This file is intended to be used at all times with CMD.

Figure 13 is a CFC product depicting the “CMD Local” clutter file from Tucson, AZ. The Bypass Map is in control for the yellow and red area, and the red depicts where CMD has identified clutter for the particular volume scan. The blue areas are the regions of All Bins to address the isolated missed detections.

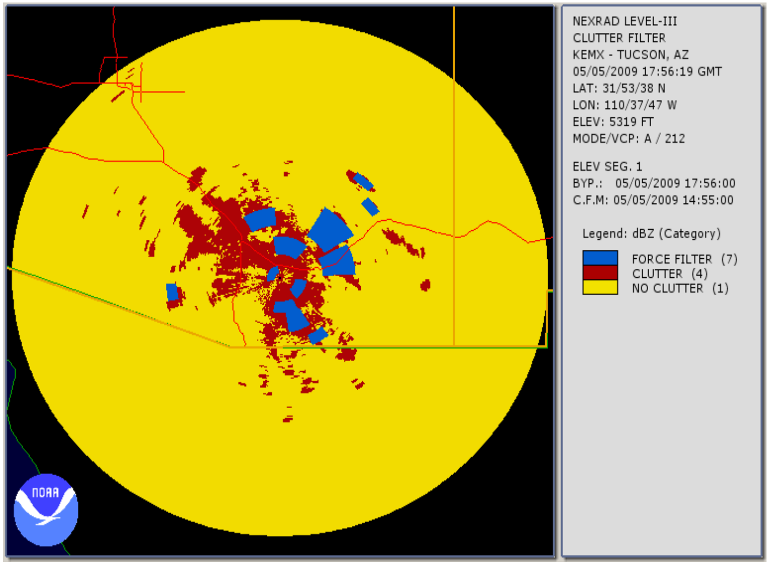


Figure 13. Example of the “CMD Local” clutter regions file used at Tucson to address CMD missed detections in their CWA.

Figure 14 has additional examples of these site specific clutter regions files, “CMD Local”, from Albuquerque, NM and Sacramento, CA.

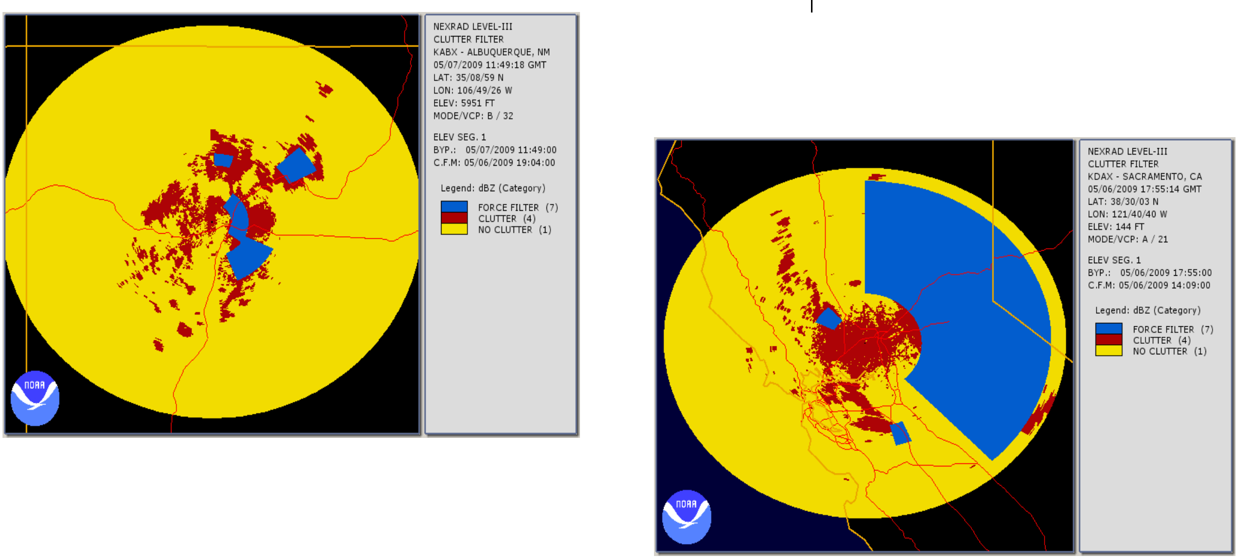


Figure 14. .Examples of the “CMD Local” clutter regions files developed at Albuquerque (left) and Sacramento (right) to address CMD missed detections in their CWA.

CMD and All Bins

Both CMD dynamic Bypass Maps and All Bins identify the ***location*** of clutter that needs to be filtered. For the identified bins, the ***amount*** of signal removal is controlled by GMAP, which has ***not*** changed with Build 11.0. Even when weather and

AP are mixed, CMD does a better job of discriminating between the two, and it does so on a ***bin by bin*** basis.

The Build 11.0 software still allows you to download clutter regions files from the RPG. If a file with All Bins in effect is downloaded, All Bins ***will take precedence*** over CMD for the defined geographic area. If a file with All Bins in effect ***everywhere*** is downloaded, the impact is as if CMD had been ***disabled***.

If You Do *Not* Use a “CMD Local” File

If it is ***not*** necessary to generate a “CMD Local” file, the already stored “Default” file is the one to use. To ensure that CMD’s dynamic Bypass Map applies over the entire display, it is important to routinely check (CFC product) that the Default clutter regions file (Figure 15) is the last one downloaded. The Default file has the Bypass Map in control everywhere. This allows for the full application of CMD generated Bypass Maps.

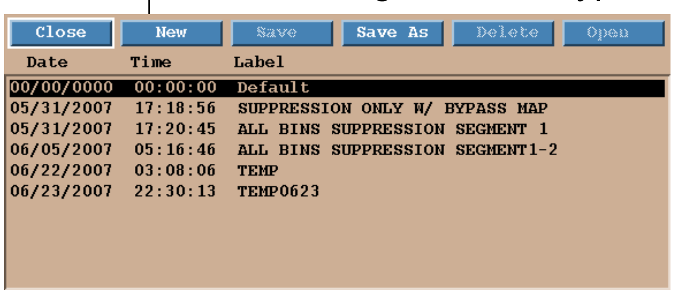


Figure 15. Clutter regions Default file.

If You *Do* Use a “CMD Local” File

If a “CMD Local” file has been developed for your site, it will give you the best results from CMD. This “CMD Local” file is used ***instead of*** the already stored “Default” file. It is important to routinely check (CFC product) that the “CMD Local” clutter regions file (examples in Figure 13 and Figure 14) is the last one downloaded.

CMD Better Than All Bins for AP Clutter

Since AP clutter is usually confined to the Split Cut elevations, CMD offers a convenient way to avoid manually “chasing the AP”. CMD will build Bypass Maps every volume scan that will identify the AP clutter ***bin by bin***, resulting in better data quality than the more harsh All Bins approach.

CMD and the SZ-2 VCPS

VCPs 211, 221, and 212 all use the SZ-2 Range Unfolding algorithm for the Split Cut elevations. SZ-2 Range Unfolding is able to recover a significant amount of overlaid Doppler data with a dramatic reduction in range folding. However, applying All Bins over large areas while using an SZ-2 VCP degrades the quality of the Doppler data. CMD is superior to All Bins for any type of clutter problem. CMD is especially beneficial with the SZ-2 VCPs because it identifies clutter on a ***bin by bin*** basis.

Some software changes have been made to encourage the use of CMD instead of All Bins when using the SZ-2 VCPs.

1. ***When CMD is enabled*** and an SZ-2 VCP is downloaded, the “Default” clutter regions file is ***automatically*** downloaded from the RPG. This ensures that All Bins is not applied anywhere.
   - If your office is using a “CMD Local” clutter regions file, it will be ***overwritten*** by the “Default” file. Once the SZ-2 VCP is running, it will ***then*** be necessary to download your “CMD Local” file.
2. ***If CMD has been disabled*** and an SZ-2 VCP is downloaded, CMD will be enabled and the “Default” file will ***also*** be downloaded along with the SZ-2 VCP. A pop-up window (Figure 16) will remind you that CMD will be enabled if you choose to download the SZ-2 VCP.

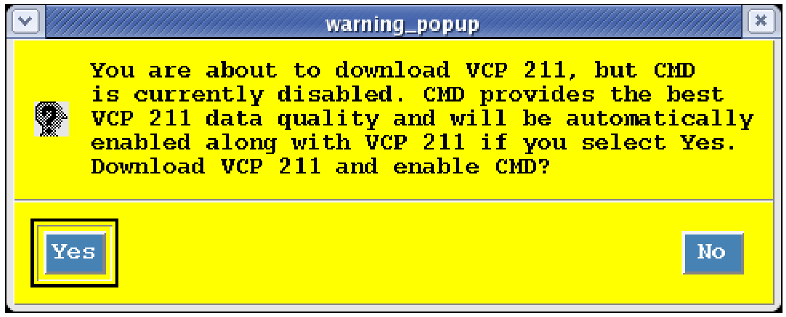


Figure 16. When downloading an SZ-2 VCP with CMD disabled, this reminder that CMD will be enabled along with the SZ-2 VCP will display in a pop-up window.

- If your office is using a "CMD Local" clutter regions file, it will be ***overwritten*** by the "Default" file. Once CMD is enabled and the SZ-2 VCP is running, it will ***then*** be necessary to download your "CMD Local" file.

Impacts of CMD on RPG HCI Windows

There are changes to some of the windows (Clutter Regions, Clutter Bypass Map Display, and RPG Status) at the RPG HCI to provide information about the use of CMD.

While CMD is enabled, ***one*** file is built for ***each*** volume scan at the RDA with the clutter filtering information for ***all 5*** elevation segments. For any given volume scan, CMD processing generates dynamic Bypass Maps for the Split Cut elevations, while static Bypass Maps are used for the higher elevations.

To populate the Clutter Regions and Clutter Bypass Map Display windows at the RPG, this Bypass Map file is sent from the RDA each volume scan. This is accompanied with a status message, "RDA Clutter Filter Bypass Map is Available" (Figure 17).

This RDA Bypass Map file has ***one*** time stamp, even though it is composed of maps that were just updated (dynamic Bypass Maps) and maps that

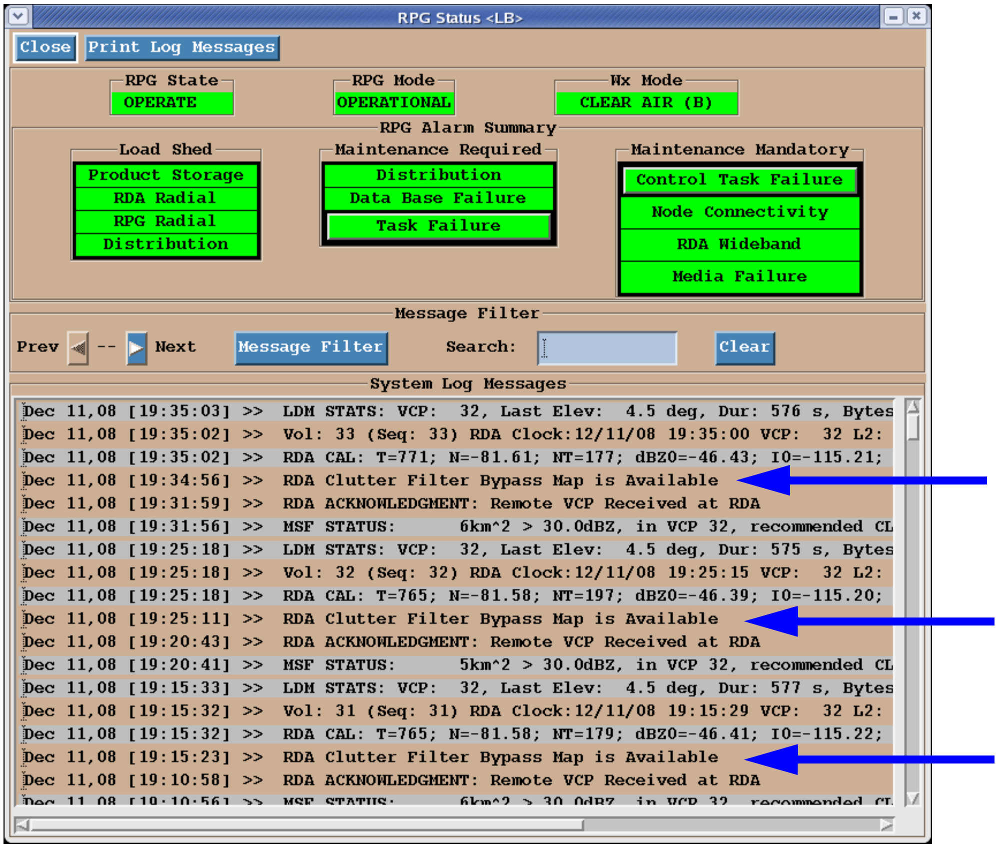


Figure 17. RPG Status window when CMD is enabled and a Bypass Map file is sent from the RDA each volume scan.

were generated some time ago (static Bypass Maps). This creates some potentially confusing information on the RPG HCI windows.

Clutter Regions Window

One of the options at the Clutter Regions window is to display the CFC product for each elevation segment, reflecting the type of clutter filtering currently applied at the RDA. The following example was collected while in VCP 32.

When CMD is enabled, “CMD” appears with the date and time in the lower right of the product display area for elevation segments 1 and 2, along with the dynamic Bypass Map (Figure 18).

When the ***static*** Bypass Maps are displayed, there is no “CMD” in the lower right, but the ***same*** date

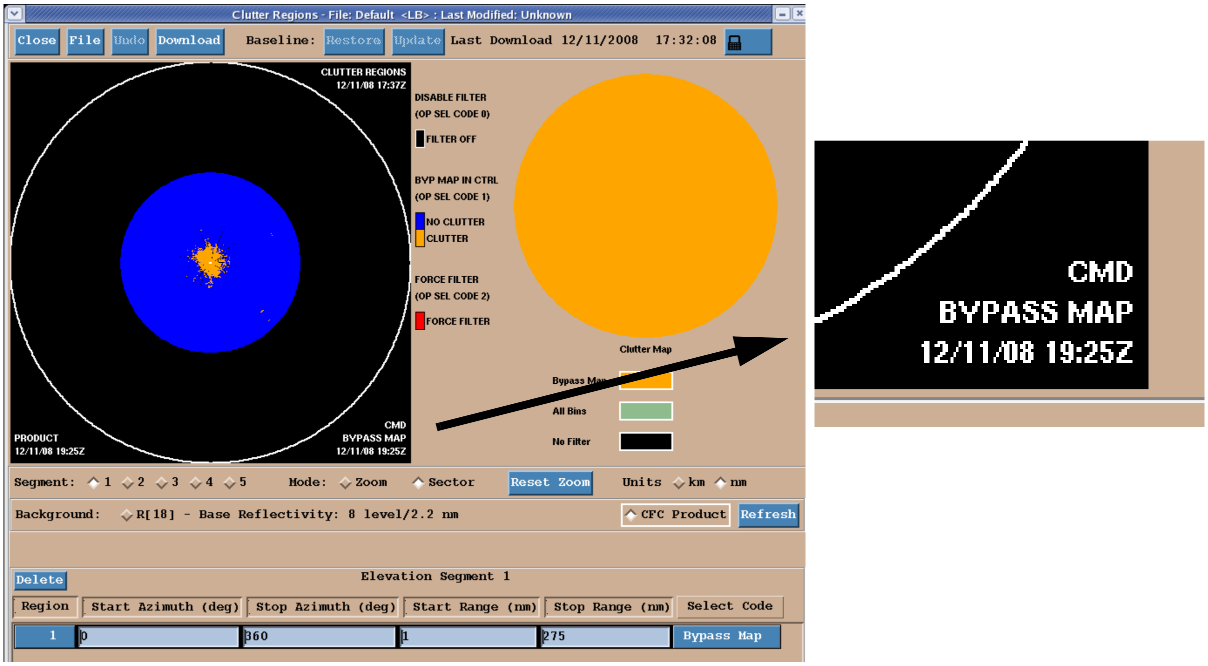
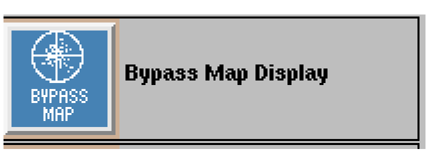


Figure 18. Clutter Regions window with the CFC product for elevation segment 1 displayed. Note the CMD label on the lower right of the product area.

and time for elevation segments 3, 4, and 5. Though the content of the static Bypass Maps has not changed, the date and time will reflect the previous volume scan (Figure 19). This is because the information for ***all 5*** segments is contained in ***one*** file sent from the RDA each volume scan.

In both Figure 18 and Figure 19, there are additional data/time labels on the CFC product. The label in the lower left is the CFC product time, while the label in the upper right is the last time that a clutter regions file was downloaded from the RPG to the RDA.

Clutter Bypass Map Display Window



The Bypass Map Display window is accessed from the RPG HCI main page by selecting the Bypass Map Display applications button.

The Bypass Map Display window displays the Bypass Map for each of the 5 elevation segments. There is a single generation time at the top of the

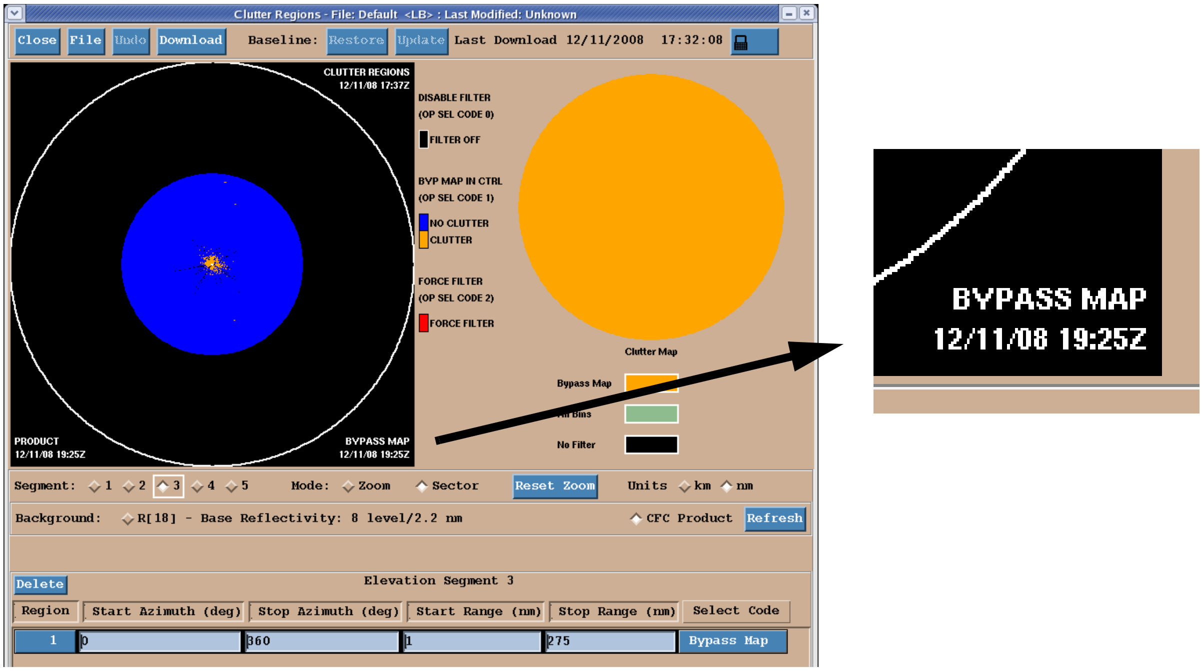


Figure 19. Clutter Regions window with the CFC product for elevation segment 3 displayed. Note there is no CMD label on the lower right of the product area.

window. As with the CFC product on the Clutter Regions window, this date and time will be the same for all 5 elevation segments. If CMD is enabled, the date and time of the previous volume scan will be displayed. If CMD is disabled, the date and time that the static Bypass Maps were last generated will be displayed (Figure 20).

CMD Implementation Recommendations

After Build 11.0 has been installed, please perform the following steps to ensure the best results from CMD.

1. As soon as atmospheric conditions are appropriate, run ***new static*** Bypass Maps using CMD for all 5 elevation segments. This step should be repeated ***at least*** seasonally.
2. At the RPG HCI, check saved clutter regions files to ensure that the Bypass Map is in control everywhere in Region 1 for elevation segments 3, 4 and 5.

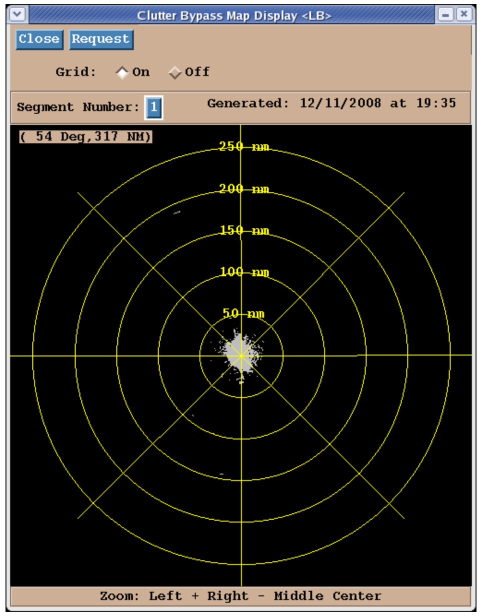


Figure 20. Clutter Bypass Map Display window.

3. If there are areas of isolated undetected terrain clutter in the base data, create a "CMD Local" file to serve as the local Default. See "CMD Missed Detections Strategy" on page 15.

4. If you do ***not*** use a "CMD Local" file, download the Default clutter regions file from the RPG, which puts the Bypass Map in control everywhere. Keep CMD enabled and periodically check that the Default file is the most recently downloaded clutter regions file.

5. If you ***do*** use a "CMD Local" file, this clutter regions file with the Bypass Map in control plus the necessary All Bins areas serves as the Default file. Keep CMD enabled and periodically check that this site specific file is the most recently downloaded clutter regions file.

CMD and Dual Pol...Stay Tuned!

The Dual Pol contractor is developing the RDA hardware and software based on RDA Build 10.0, which does ***not*** include CMD!

As of this writing, the plan is to deploy Dual Pol (Build 12.0) without CMD and restore it as part of Build 13.0. For any particular site, Build 13.0 is scheduled to follow the Dual Pol installation from a few months up to a year. In this interim, the office procedures used to manage clutter filtering ***before*** CMD will have to be reinstated!

Addressing False RDA Alarms When Switching to/from VCP 31

VCP 31 is the only long pulse VCP. Switching to or from VCP 31 also includes an adjustment to the pulse width and a recalibration. There have been some problems with this transition. Build 11.0 addresses false “Modulator Switch Failure” alarms by changing the transition process. As of this writing, it is not known if this change will address other problems switching to or from VCP 31.

Long pulses result in higher sensitivity for VCP 31, making it useful for very light precipitation, especially snow or freezing drizzle. Offices are encouraged to use VCP 31 when conditions warrant, such as a freezing drizzle event (Figure 21).

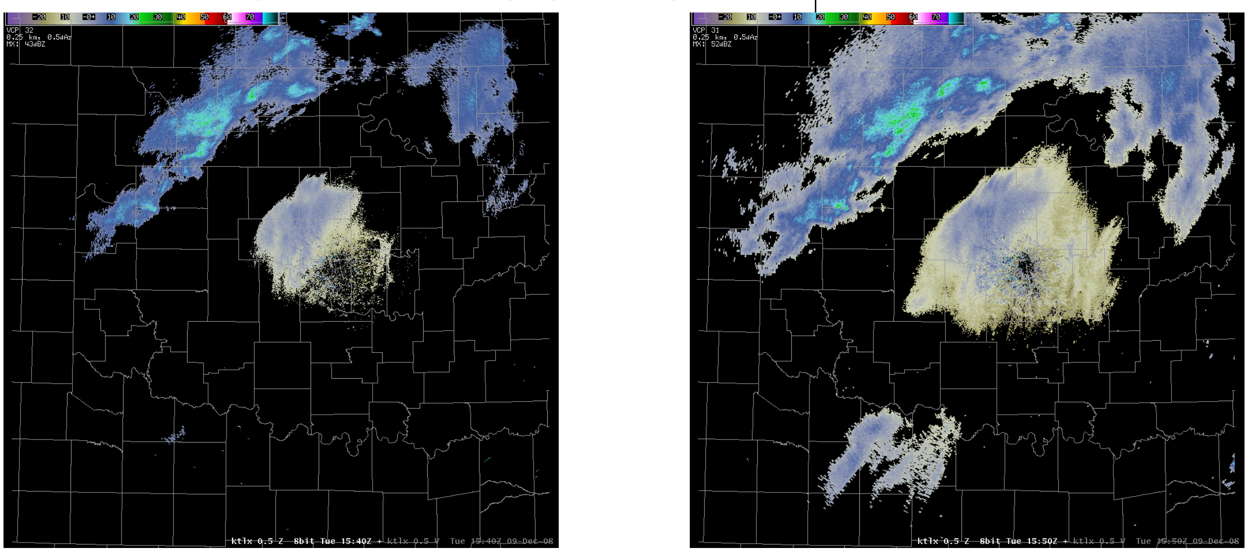


Figure 21. The WFO switched from VCP 32 (left) to VCP 31 (right) during a freezing drizzle event. The increased sensitivity of VCP 31 reveals more light precipitation.

Improvements to the Mesocyclone Detection Algorithm (MDA)

The MDA was designed to detect a wide range of circulations, with a resultant greater sensitivity compared to the legacy Mesocyclone algorithm. MDA has always had a greater number of detections in areas of little or no meteorological significance. A combination of fixes and logic changes to the Build 11 version of MDA results in fewer detections in insignificant areas.

The Build 11.0 MDA checks each detected circulation against the cells that have been identified by the Storm Cell Identification and Tracking (SCIT) algorithm. ***Any*** MDA circulation that is not within 20 km of a SCIT identified cell is discarded. This eliminates MDA detections in areas of weak signal (Figure 22).

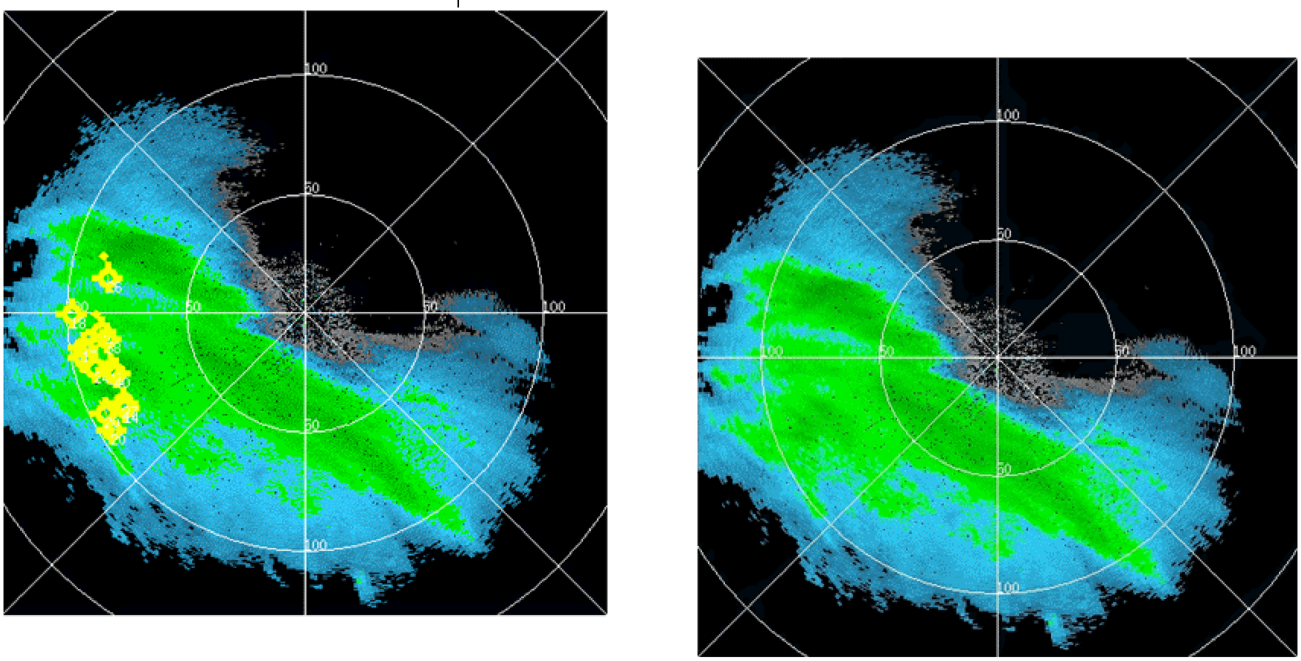


Figure 22. Reduction in the number of insignificant MDA circulations. On the left are detections from the pre-Build 11.0 version of MDA, with the Build 11.0 version on the right.

Removal of Rarely Used Products

Based on a 2006 product survey conducted by the ROC, a number of products were identified as rarely used and with low performance ratings. The following products are removed from the RPG with Build 11.0:

- Combined Shear (CS)
- Severe Weather Probability (SWP)
- Severe Weather Reflectivity (SWR)

- Severe Weather Velocity (SWV)
- Severe Weather Spectrum Width (SWW)
- Severe Weather Shear (SWS)

VAD Slant Range Reset to Default of 30 km

The Velocity Azimuth Display (VAD) algorithm computes wind speed and direction for a series of MSL heights. The specific heights analyzed by the VAD are determined by the VAD Wind Profile (VWP) product. For each wind computation, the VAD algorithm selects an elevation angle/slant range pair that achieves the desired height. If there are sufficient scatterers at that elevation angle/slant range, a wind speed and direction is computed.

The VAD algorithm uses a slant range parameter to guide the selection of the elevation angle for any given height. The default slant range is 30 km or 16.2 nm. For any particular height, the elevation angle that is closest to the slant range is used to compute the wind. In the example in Figure 23, 0.5° at a slant range of 12 nm would be used for 2000 ft, 1.5° at a slant range of 10 nm would be used for 3000 ft, and 1.5° at a slant range of 16 nm would be used for 4000 ft.

The VAD slant range parameter is editable. The decision to adjust the slant range is based on improving access to scatterers. For example, on a cold, clear day, a short slant range is more likely to capture the available scatterers at low levels. On a muggy summer day, a longer slant range helps to avoid residual clutter at low levels.

Unfortunately, it is easy to set this parameter for a given condition, and then forget to set it back at a later time. The VAD slant range will be set to the

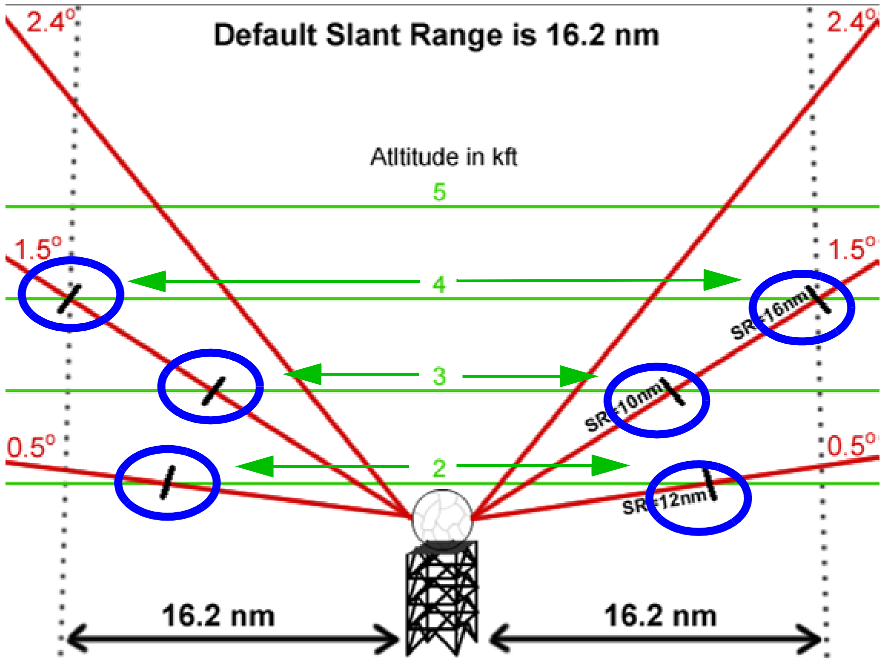


Figure 23. Using the elevation angle closest to 16.2 nm, 0.5° at 12 nm is used for 2000 ft, while 1.5° at 10 nm is used for 3000 ft, and 1.5° at 16 nm is used for 4000 ft.

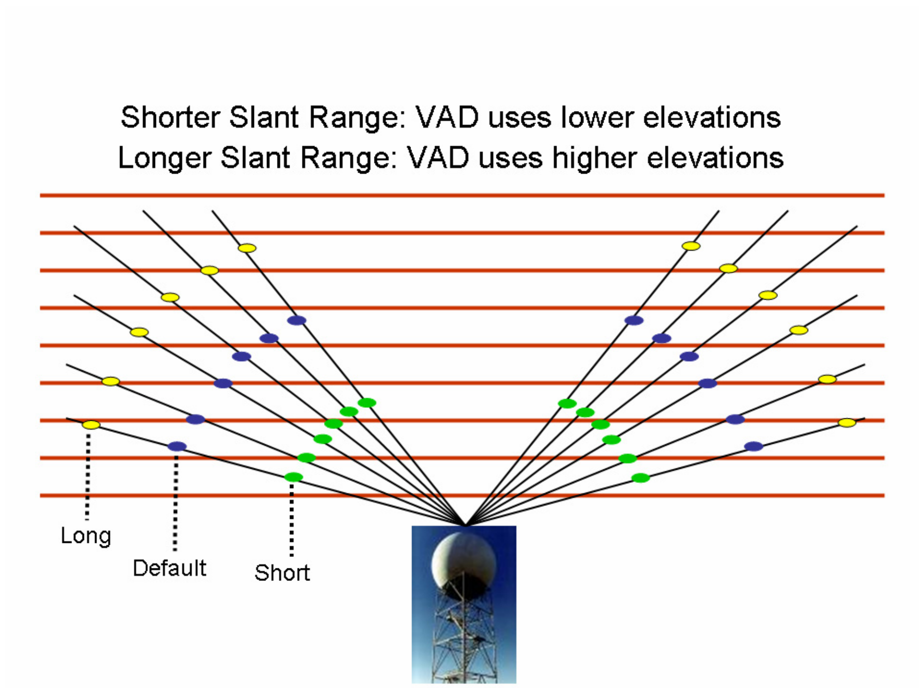


Figure 24. Impacts of using a shorter vs. longer VAD slant range.

default value of 30 km with the installation of Build 11.0 and with the installation of subsequent builds. However, it remains editable and can be changed as needed in between software build upgrades.

Summary

This document presents the pre-deployment state of knowledge of the operational impacts of RDA/RPG Build 11.0. The most significant impact of this build is the implementation of the CMD algorithm.