Automated Volume Scan Evaluation and Termination (AVSET) FAQs

Question: What is WSR-88D AVSET?
Response: In a nutshell, the RDA will calculate the echo area above 18dBZ at elevations over 5 degrees and gracefully terminate the volume scan one tilt after when the area is less than threshold.

The following table shows the effect AVSET could have on the current VCPs. The pink filled elevations are potentially removed by AVSET. The blue filled times are estimated volume scan times assuming that elevation completes.

AVSET – Potential VS time (sec) and % reduction

	121				12, 212							11, 211							21, 221						
	Elev.	121			Elev.	12			212			Elev.	11			211			Elev.	21			221		
Cut #	(deg)	sec	sum	%	(deg)	sec	sum	%	sec	sum	%	(deg)	sec	sum	%	sec	sum	%	(deg)	sec	sum	%	sec	sum	%
1	0.5	20			0.5	18			18			0.5	20			20			0.5	32			32		
2	0.5	19			0.5	15			22			0.5	19			19			0.5	32			24		
3	0.5	14			0.9	18			18			1.45	19			19			1.45	32			32		
4	0.5	17			0.9	15			22			1.45	19			19			1.45	32			24		
5	1.45	19			1.3	18			18			2.4	23			23			2.4	33			34		
6	1.45	19			1.3	15			22			3.35	21			21			3.35	33			34		
7	1.45	14			1.8	15			15			4.3	21			21			4.3	33			34		
8	1.45	17			2.4	14			14			5.25	21			21			6	33			30		
9	2.4	19			3.1	14			14			6.2	21	193	0.65	21	192	0.65	9.9	26	296	0.85	30	289	0.83
10	2.4	14			4	13			14			7.5	15	208	0.70	15	207	0.70	14.6	26	322	0.93	30	319	0.91
11	2.4	17			5.1	13			13			8.7	15	223	0.75	15	222	0.75	19.5	26	348	1.00	30	349	1.00
12	3.35	17			6.4	13	187	0.74	13	214	0.77	10	15	238	0.80	15	237	0.80			338			334	
13	3.35	14			8	13	200	0.79	13	227	0.81	12	15	253	0.85	15	252	0.85							
14	3.35	17			10	13	213	0.85	13	240	0.86	14	15	268	0.90	15	267	0.90							
15	4.3	23			12.5	13	226	0.90	13	253	0.91	16.7	15	283	0.95	15	282	0.95							
16	4.3	13			15.6	13	239	0.95	13	266	0.95	19.5	15	298	1.00	15	297	1.00							
17	6	18			19.5	13	252	1.00	13	279	1.00			289			289									
18	9.9	13	314	0.92			246			268															
19	14.6	13	327	0.96																					
20	19.5	13	340	1.00																					
		330																							

Question: What is the Purpose of AVSET?
Response: The goal of AVSET is to produce faster volume scan updates. The basic premise of the AVSET function is to terminate the current volume scan after the radar has scanned all the elevations where return exceeds the AVSET thresholds. The volume scan is terminated because there is no operational benefit realized by continuing the execution of the current volume scan, and a new volume scan is begun. The net effect of AVSET is to shorten the elapsed time between data collection on low elevation angles during periods when no significant data are available on the higher elevation tilts. AVSET represents a paradigm shift in operational volume scanning for the WSR-88D. In the past, WSR-88D VCPs have always automatically and continuously scanned predefined elevation angles. This scheme resulted in each VCP having a particular

periodic update cycle that never changed, regardless of the sampled meteorological conditions. The only way to change the update period was to invoke another VCP and accept its elevation scans and periodic update rate.

Question: Does AVSET negatively impact the quality of the base data estimates?
Response: No. There are only two ways to achieve faster VCPs: either rotate the antenna faster or sample fewer elevation angles. If you opt to rotate the antenna faster, data quality (e.g., moment estimate variance, clutter filter performance) can degrade. Fast updating VCPs (e.g., VCP12 and VCP121) are already approaching rotational limits imposed by the WSR-88D data quality requirements.   AVSET does not impact the quality of the base data estimates. The antenna rotation rates, data acquisition schemes, moment estimation methods and data processing techniques do not change with AVSET.

Question: What is the operational benefit of running AVSET?
Response: Reduced volume scan times when there is little or no return aloft near the radar. The amount of volume scan time savings achieved by AVSET depends on the active VCP and the areal and vertical coverage of return. Given the best possible situation, AVSET will terminate the volume scan after completion of the second elevation scan above 5°. Table 1 provides the minimum number of scanning angles, elevation scan times, and shortest VCP durations for four AVSET-controlled VCPs. For reference, Table 2 provides a comparison of AVSET VCP completion times and the average VCP execution times without AVSET for the VCPs listed in Table 1.

AVSET-Controlled Shortest VCP 11		AVSET-Controlled Shortest VCP 12		AVSET-Controlled Shortest VCP 212		AVSET-Controlled Shortest VCP 21	
Elevations	Time (sec)	Elevations	Time (sec)	Elevations	Time (sec)	Elevations	Time (sec)
0.5	19	0.5	17	0.5	17	0.5	32
0.5	19	0.5	14	0.5	21	0.5	32
1.5	18	0.9	17	0.9	17	1.5	32
1.5	19	0.9	14	0.9	21	1.5	32
2.4	22	1.3	17	1.3	17	2.4	32
3.4	20	1.3	14	1.3	21	3.4	32
4.3	20	1.8	15	1.8	15	4.3	32
5.3	21	2.4	14	2.4	14	6.0	32
6.2	21	3.1	14	3.1	14	9.9	25
		4.0	14	4.0	14		
		5.1	14	5.1	14		
		6.4	13	6.4	13		
Scan time	179		177		197		281
Ret/Trans	13		13		13		15
Total Time	**192**		**190**		**210**		**296**

Table 1: AVSET-Controlled VCP Duration in Seconds

NOTE: AVSET will start execution on the first elevation above 5°. The AVSET function will always process one elevation cut above the elevation where the AVSET reflectivity thresholds are not exceeded.

	VCP 11	VCP 12	VCP 212	VCP 21
Standard Average VCP Completion Time (Seconds)	293	256	277	346
Fastest AVSET VCP Completion Time (Seconds)	192	190	210	296
Possible VCP Duration Savings with AVSET (Seconds)	101	66	67	50

Table 2: VCP Completion Times Comparison

Question: How will a user know when AVSET is active? Will there be something on screen to display this?
Response: The state of AVSET will be included in the General Status Message (GSM).

Question: Will end of volume products be produced when AVSET ends a VCP early?
Response: Yes.

Question: What impact does AVSET have on VWP products?
Response: With the current implementation of the vwindpro task, AVSET does occasionally cause missing VWP winds. The ROC has updated the vwindpro task to only use available elevations (based on AVSET termination of the previous volume scan). The limited testing that has been completed so far indicate this new vwindpro task and AVSET-controlled volume scans produced VWP performance equivalent to the VWP performance with standard VCP execution.

Question: Will AVSET affect composite reflectivity products?
Response: With weak return close to the radar and no other return available on upper elevations, we have noted minor difference in the displayed composite reflectivity when ASVET is active. During our testing we performed automated and visual comparisons of elevation-based and volumetric products. Automated comparison of the volume products resulted in a 92% exact (byte-byte) match. Visual comparison of the "mismatched" products revealed that the very small differences (a single to a few display gates) caused the mismatched indications (See figure below for an example). Most of the mismatched gates displayed slightly different values. However, in all of these comparisons the mismatched gates were located within 10 nm radius of the RDA and, in the context of their contribution to the interpretation of the weather event, correspond to operationally insignificant differences in the products.

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- CR Baseline   - CR AVSET

Example Composite Reflectivity Products
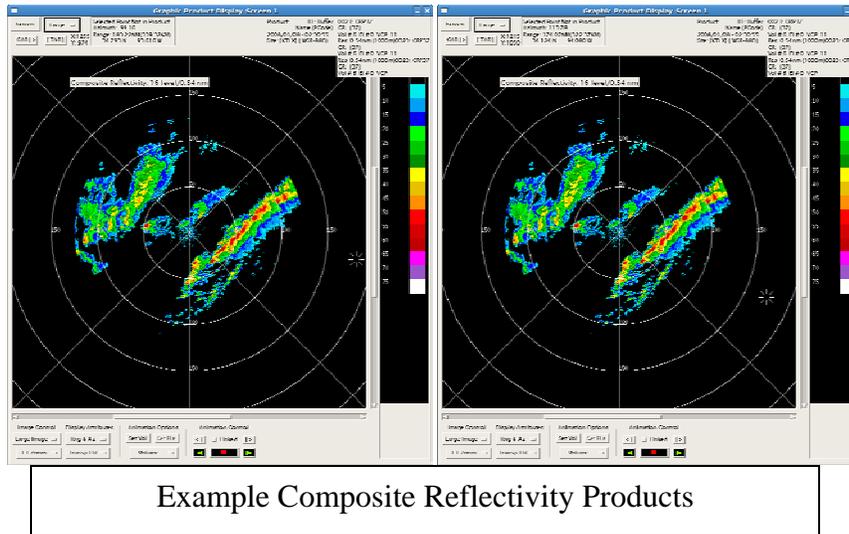
Question: Will AVSET affect SRM products?
Response: AVSET does not affect elevation-based products.

Question: Will AVSET impact the echo tops product?
Response: With very weak return close to the radar, we have noted minor difference in the displayed on the enhanced echo tops products when ASVET is active. During our testing we performed automated and visual comparisons of elevation-based and volumetric products (See figure below for an example). Automated comparison of the volume products resulted in a 92% exact (byte-byte) match. Visual comparison of the "mismatched" products revealed that the very small differences (a single to a few display gates) caused the mismatched indications. Most of the mismatched gates displayed slightly different values. However, in all of these comparisons the mismatched gates were located within 10 nm radius of the RDA and, in the context of their contribution to the interpretation of the weather event, correspond to operationally insignificant differences in the products.

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- EET Baseline
- EET AVSET
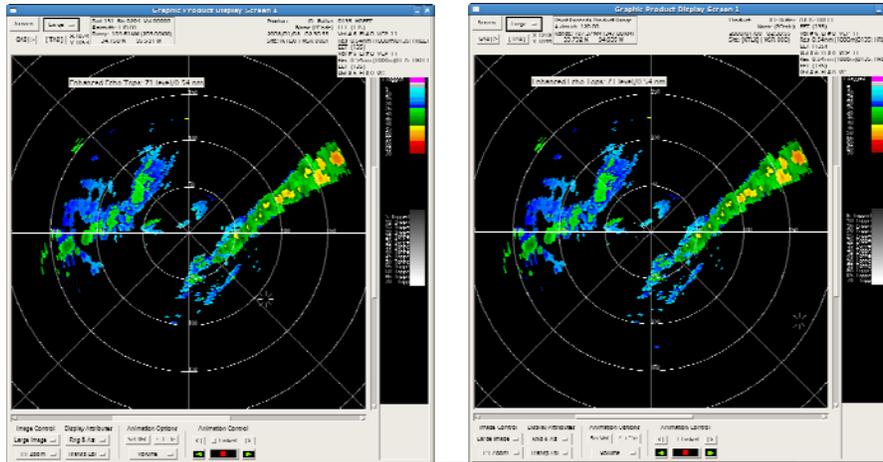
Example Enhanced Echo Tops Products

Question: 80 km² seems like a large area. How will this affect the interrogation of isolated small cell thunderstorm activity?
Response: The typical thunderstorm is approximately 15 miles (24 km) in diameter which results in an area coverage of ~452 km² for the elevation that intersects that core. If we assume a small convective cell only achieves 20% the diameter of a typical thunderstorm cell (90 km²), then this size cell still exceeds the AVSET thresholds.

Question: Will the early termination of volume scan cause bad data ingestion into the NCDC database? Currently if a volume scan is prematurely terminated it is still archived at NCDC causing issues when displaying after download.
Response: No. When AVSET is active, each VCP is terminated "gracefully". This means all the house-keeping information (e.g., last elevation flag, end-of-volume scan flag, etc.,) is included in Level II data.

Question: Do the non-standard volume scan update times negatively impact meteorological interpretation when the data are time lapsed?
Response: Since AVSET usually only changes by one elevation tilt at a time (approx 13 seconds) it is not expected that this would be an operational concern. However, the ROC will work with operational forecasters and WDTB to address this question.

Question: Does AVSET cause any display or storage problems on Agency radar display systems?
Response: AVSET has been available on the ROC test bed radar (KCRI) for the past 11/2 years. Although not executing continuously, AVSET has been active for several significant and routine weather events. During this period the NWS AWIPS, DOD OPUP and FAA WARP systems have all been connected to the test bed. To date there have been no display or storage anomalies noted. We will continue testing with these systems connected to the test bed radar.

Question: Will AVSET cause any display or storage problems on external radar display systems?
Response: We cannot anticipate how all user systems will react. However, the format of the data, names of the products and VCPs do not change when AVSET is operational. Product and Level II data rates can increase up to 30% site in fast VCPs with considerable weather in the area. One reason for having an operational test (see the March 11, 2010 PNS) at 8 sites from July 2010 to January 2011 is to obtain feedback on the operational benefits of AVSET versus any adverse impacts on Agency or external user systems