

General Description Document Mid-Volume Rescan of Low-Level Elevations (MRLE)

Background. The field identified a deficiency in the WSR-88D’s scanning of the mesovortex genesis region (4000 to 8000 ft AGL layer) within Quasi-Linear Convective Systems (QLCS). The current VCP definitions augmented by SAILS (Supplemental Adaptive Intra-Volume Low-Level Scan) do not provide adequate data updates for this layer within 50nm of the RDA. The field requests more frequent “elevated angles” to provide more timely information from the mesovortex genesis layer at close and medium ranges (0 - 50 nm). The forecasters stated that more frequent “elevated angles” will improve radar support for QLCS forecast and warning events.

Solution. Implement Mid-Volume Rescan of Low-Level Elevations (MRLE) Functionality. MRLE is based on the proven SAILS concept, and rescans the lowest “N” elevations (where “N” can either be 1, 2, 3, or 4 elevations) in the middle (by time) of the volume scan. The “middle” of volume scan is determined dynamically due to AVSET. See Figure 1 for an example volume scan definition with MRLE/3.

VCP 12																			
VCP 12 with Mid-Volume Rescan of Low-Level Elevations (MRLE) - 3 Elevations (password VCP)																			
Elev	Wave Form	Surv PRF	Dop PRF	Surv Pulses per Second	Dop Pulses per Second	Surv Pulses per Sweep	Dop Pulses per Sweep	Surv Pulses per Radial	Dop Pulses per Radial	Rotation Rate (DPS)	RPM	Scan Time (Seconds)	SuperResE st SD	Rmax (km)	Rmax (nm)	Vmax (m/s)	Vmax (kts)	Beam Hgt at Rmax (ft)	Cumulative Scan Time
0.5	CS	1		321.89		5400		15		21.459	3.58	17	1.53	466.00	251.46	8.05	15.64	59550	17
0.5	D		5		1013.51		14400		40	25.338	4.22	14	1.38	148.00	79.86	25.34	49.25	8898	32
0.9	CS	1		321.89		5400		15		21.459	3.58	17	1.53	466.00	251.46	8.05	15.64	70223	49
0.9	D		5		1013.51		14400		40	25.338	4.22	14	1.38	148.00	79.86	25.34	49.25	12288	65
1.3	CS	2		350.26		5400		15		23.351	3.89	15	1.53	428.25	231.09	8.76	17.02	70902	80
1.3	D		5		1013.51		14400		40	25.338	4.22	14	1.38	148.00	79.86	25.34	49.25	15677	96
1.8	B	3	5	389.36	1013.51	1080	10440	3	29	27.534	4.59	13	1.63	385.25	207.88	25.34	49.25	71282	111
2.4	B	4	5	446.43	1013.51	1080	10800	3	30	27.533	4.59	13	1.60	336.00	181.31	25.34	49.25	70185	125
3.1	B	5	5	512.8	1013.51	1080	10800	3	30	28.208	4.70	13	1.60	292.51	157.84	25.34	49.25	70105	139
4	B	6	5	602.41	1013.51	1080	10800	3	30	28.918	4.82	12	1.60	249.00	134.36	25.34	49.25	70179	152
5.1	B	7	5	719.39	1013.51	1080	11160	3	31	28.771	4.80	13	1.60	208.51	112.51	25.34	49.25	70062	166
0.5	CS	1		321.89		5400		15		21.459	3.58	17	1.53	466.00	251.46	8.05	15.64	59550	183
0.5	D		5		1013.51		14400		40	25.338	4.22	14	1.38	148.00	79.86	25.34	49.25	8898	199
0.9	CS	1		321.89		5400		15		21.459	3.58	17	1.53	466.00	251.46	8.05	15.64	70223	216
0.9	D		5		1013.51		14400		40	25.338	4.22	14	1.38	148.00	79.86	25.34	49.25	12288	231
1.3	CS	2		350.26		5400		15		23.351	3.89	15	1.53	428.25	231.09	8.76	17.02	70902	248
1.3	D		5		1013.51		14400		40	25.338	4.22	14	1.38	148.00	79.86	25.34	49.25	15677	264
6.4	B	8	5	862.07	1013.51	1080	11520	3	32	28.528	4.75	13	1.60	174.00	93.89	25.34	49.25	70075	277
8	CD		6		1094.89		13680		38	28.813	4.80	12	1.42	137.00	73.93	27.37	53.21	66548	291
10	CD		7		1181.1		14400		40	29.528	4.92	12	1.32	127.00	68.53	29.53	57.40	75785	305
12.5	CD		8		1282.05		15840		44	29.138	4.86	12	1.32	117.00	63.13	32.05	62.30	85994	317
15.6	CD		8		1282.05		15840		44	29.138	4.86	12	1.32	117.00	63.13	32.05	62.30	106139	331
19.5	CD		8		1282.05		15840		44	29.138	4.86	12	1.32	117.00	63.13	32.05	62.30	131046	343

Figure 1: MRLE with 3 Elevations

Proposed Implementation. Based on previous QLCS expert input we propose limiting the rescanning elevations to 0.5°, 0.9°, 1.3° and 1.8° elevations (KLGX = 0.2°, 0.5°, 0.9° and 1.3°). This configuration results in volume scan completion time of ~15 seconds longer than SAILSx3 durations (three elevations equivalent to SAILSx3 and two elevations equivalent to SAILSx2).

The forecaster will have the option to select the desired number of elevations (viz., 1, 2, 3 or 4) similar to current SAILS implementation.

- MRLEx1 = the MRLE function is Disabled and the SAILSx1 function is Enabled
- MRLEx2 = 0.5° and 0.9° elevations
- MRLEx3 = 0.5°, 0.9° and 1.3° elevations
- MRLEx4 = 0.5°, 0.9°, 1.3° and 1.8° elevations

NOTE: For a single elevation, the SAILSx1 is used

MRLE, SAILS, and AVSET are all independent functions. The operator may choose to invoke AVSET and either SAILS or MRLE functions. SAILS and MRLE CANNOT be used together and the software will automatically toggle one off when the other is commanded on. AVSET will operate with both SAILS and MRLE.

The availability of MRLE will be controlled by VCP, within the VCP definition, similar to the implementation of SAILS. MRLE is only allowed for VCP 12, VCP 212 and VCP 215.

MRLE Elevation Data. Base data moments (Z, V and W) and Dual Pol variable data collected on the MRLE supplemental elevations will be included in the Level II data stream for normal distribution. Like SAILS supplemental elevation data, MRLE supplemental elevation data will be used to generate base products DR (#94), DV (#99), SDR (#153), SDV (#154), and SDW (#155), as well as Dual Pol products DZD (#159), DCC (#161), DKD (#163), DHC (#165), MC (#166), SDC (#167), and SDP (#168).

The MRLE elevation base data moments and variables will be segregated from the algorithm data processing stream. Algorithms MUST be configured via task_attr_table in order to receive MRLE scan base data for processing. This design is implemented to ensure algorithms are not required to incorporate this new data. However, by including this new scan in the Level II data stream algorithm developers can enhance/correct/modify their algorithms, if they wish to use the new data input.

The WSR-88D General Status Message (GSM) has been updated to include MRLE status.

Summary: The Mid-Volume Rescan of Low-Level Elevations (MRLE) provides the operator with the flexibility to select the desired number of low-level elevations to rescan each volume scan. By rescanning from 0.5 up through the selected elevation (repeating the lowest “n” elevations) MRLE will provide information about severe weather signatures at or near the surface as well as from the QLCS mesovortex genesis region.

The MRLE function is included as non-operational in RPG Build 18. Testing will continue for the next several months. Assuming MRLE proves valuable to the forecast and warning mission, the ROC will request agency approval to release MRLE as operational in RPG Build 19.