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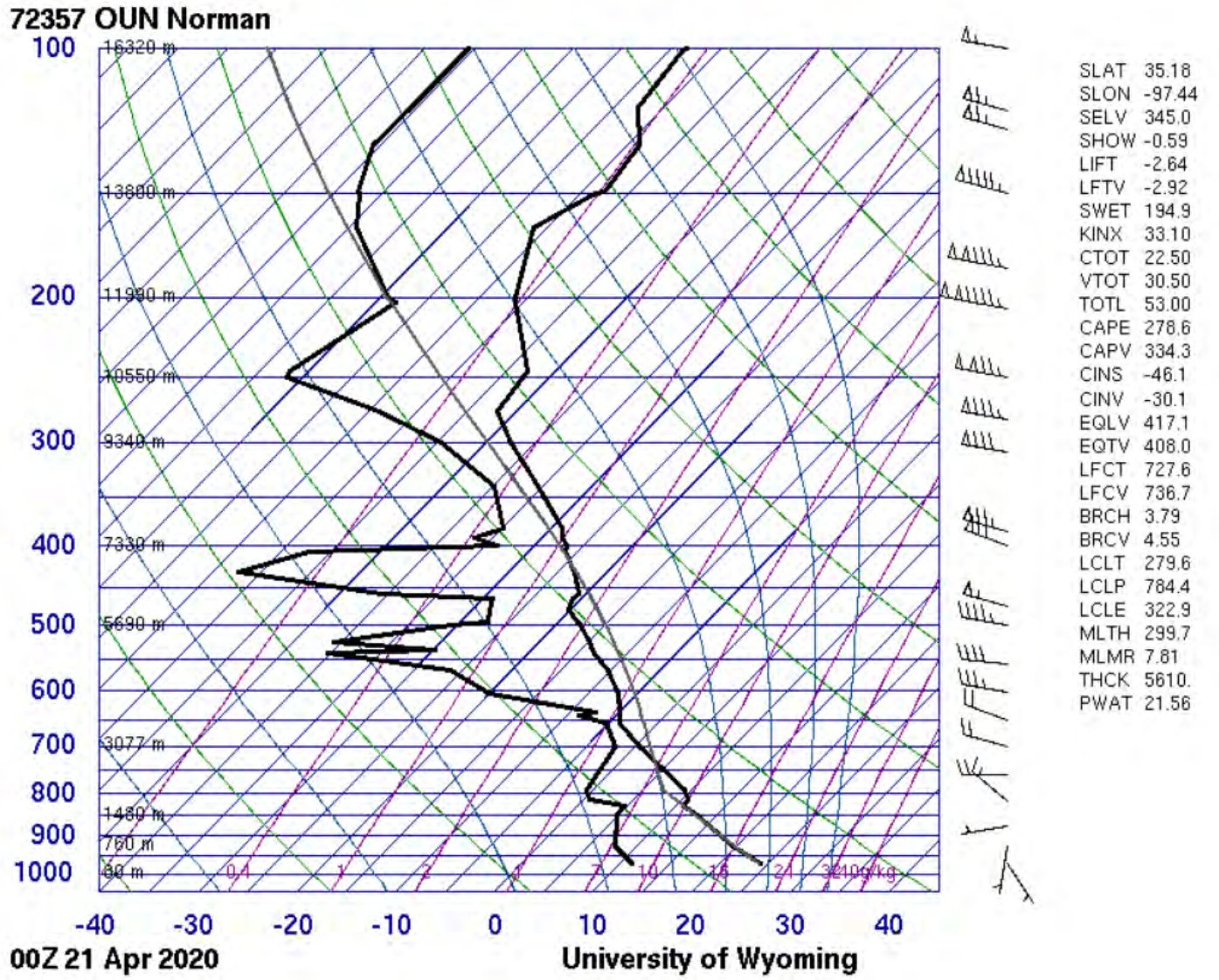
Consolidated Nuclear Security, LLC

For NWSFO Amarillo
April 20, 2020 – Study Of Pre-Lightning Indicators From Radar Data

Steve Kersh
Meteorologist – Electromagnetics Group, Facility Engineering

August 20, 2020

Meteorological Setup for April 20, 2020



Meteorological Setup for April 20, 2020

72357 OUN Norman Observations at 00Z 21 Apr 2020

PRES hPa	HGHT m	TEMP C	DWPT C	RELH %	MIXR g/kg	DRCT deg	SKNT knot	THTA K	THTE K	THTV K
1000.0	80									
970.0	345	24.2	11.2	44	8.68	145	7	299.9	325.8	301.5
941.0	610	21.4	9.0	45	7.73	180	7	299.7	322.8	301.1
925.0	760	19.8	7.8	46	7.22	190	5	299.6	321.1	300.9
908.4	914	18.4	7.2	48	7.06	265	4	299.6	320.7	300.9
876.5	1219	15.5	6.0	53	6.74	260	4	299.7	319.9	300.9
850.0	1480	13.0	5.0	58	6.47	300	5	299.8	319.2	300.9
845.5	1524	12.6	5.0	60	6.49	300	6	299.7	319.2	300.9
828.0	1700	10.8	4.8	66	6.55	306	11	299.7	319.4	300.9
815.2	1829	10.6	1.2	52	5.16	310	15	300.8	316.6	301.8
813.0	1852	10.6	0.6	50	4.94	309	15	301.0	316.1	301.9
792.0	2069	9.4	-0.6	50	4.65	298	15	302.0	316.3	302.9
785.8	2134	8.8	-0.7	51	4.65	295	15	302.1	316.4	302.9
757.0	2438	6.1	-1.1	60	4.68	270	19	302.4	316.8	303.2
729.2	2743	3.4	-1.5	70	4.71	275	19	302.6	317.2	303.5
700.0	3077	0.4	-2.0	84	4.74	285	19	302.9	317.5	303.8
658.0	3571	-3.7	-5.1	90	4.00	289	18	303.7	316.1	304.4
650.8	3658	-4.2	-6.8	82	3.56	290	18	304.1	315.3	304.8
642.0	3765	-4.7	-8.8	73	3.08	288	21	304.7	314.5	305.2
636.0	3839	-4.9	-7.5	82	3.44	287	22	305.3	316.2	305.9
606.0	4218	-6.9	-19.9	35	1.31	281	32	307.2	311.6	307.5
602.2	4267	-7.2	-20.5	34	1.25	280	33	307.4	311.6	307.6
566.0	4748	-10.3	-26.3	26	0.79	276	39	309.3	312.0	309.4
556.5	4877	-11.4	-31.5	17	0.50	275	40	309.4	311.2	309.5
541.0	5094	-13.3	-40.3	8	0.21	276	41	309.7	310.5	309.8
536.0	5165	-13.7	-29.7	25	0.61	277	42	310.1	312.2	310.2
523.0	5351	-14.9	-40.9	9	0.21	278	43	310.8	311.6	310.8
500.0	5690	-17.5	-30.5	31	0.61	280	45	311.6	313.8	311.8
495.0	5765	-18.1	-27.1	45	0.84	281	47	311.8	314.8	312.0
478.0	6025	-20.3	-28.3	49	0.78	284	54	312.2	315.0	312.4
473.4	6096	-20.5	-28.5	49	0.77	285	56	312.8	315.6	313.0
464.0	6245	-20.9	-28.9	49	0.76	286	57	314.1	316.9	314.3
458.0	6341	-20.7	-40.7	15	0.24	286	58	315.6	316.5	315.6
431.0	6788	-23.3	-57.3	3	0.04	288	63	317.8	317.9	317.8
408.0	7187	-26.1	-52.1	7	0.08	289	67	319.2	319.5	319.2
400.0	7330	-26.7	-33.7	52	0.56	290	68	320.2	322.3	320.3
391.0	7494	-27.9	-36.9	42	0.42	287	71	320.7	322.3	320.8
384.2	7620	-28.6	-35.5	51	0.48	285	74	321.4	323.3	321.5
381.0	7679	-28.9	-34.9	56	0.52	285	74	321.8	323.7	321.9
339.0	8503	-35.5	-39.9	64	0.35	282	76	323.7	325.1	323.8
308.7	9144	-40.9	-47.2	50	0.18	280	78	325.0	325.7	325.0

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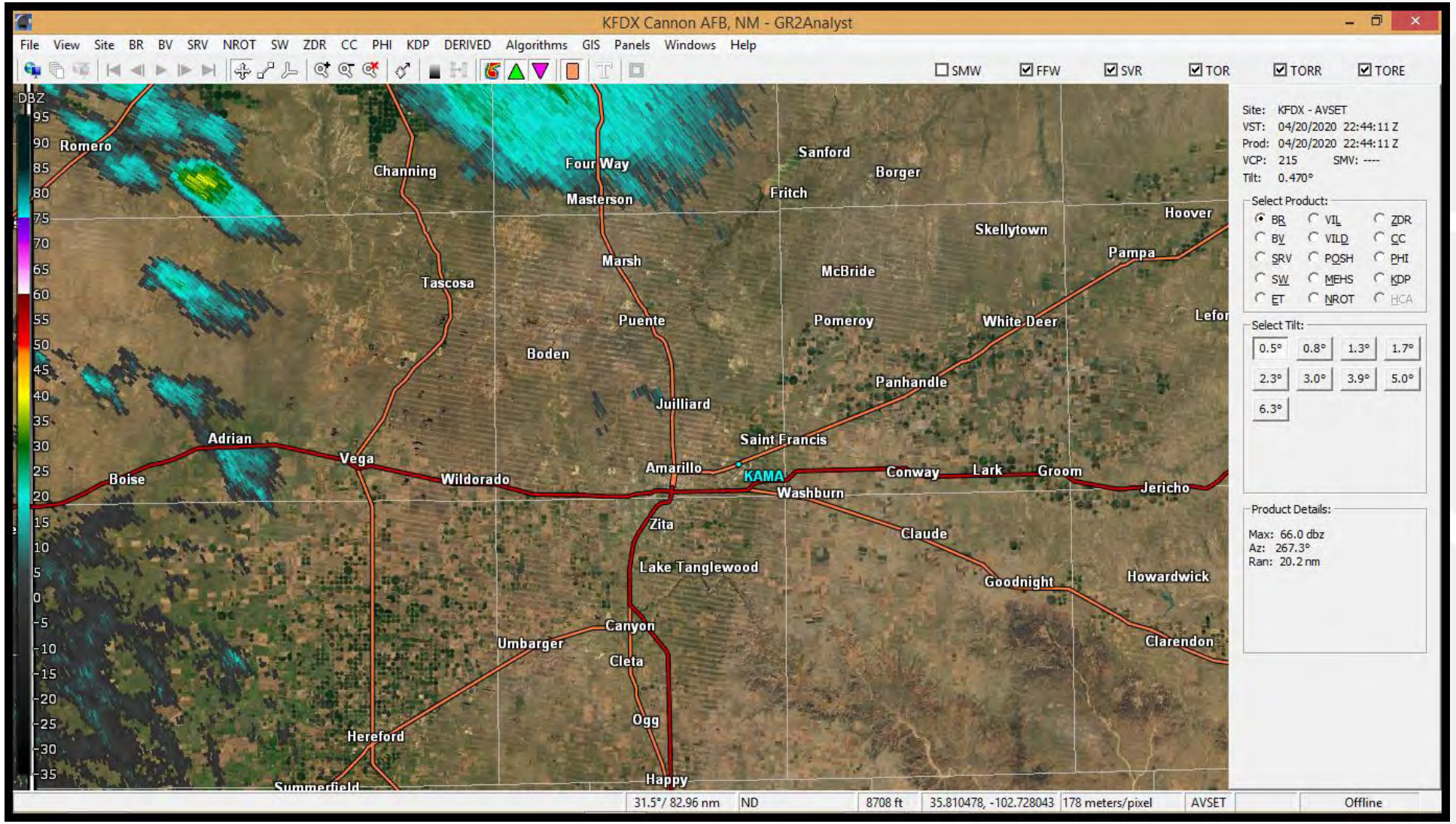
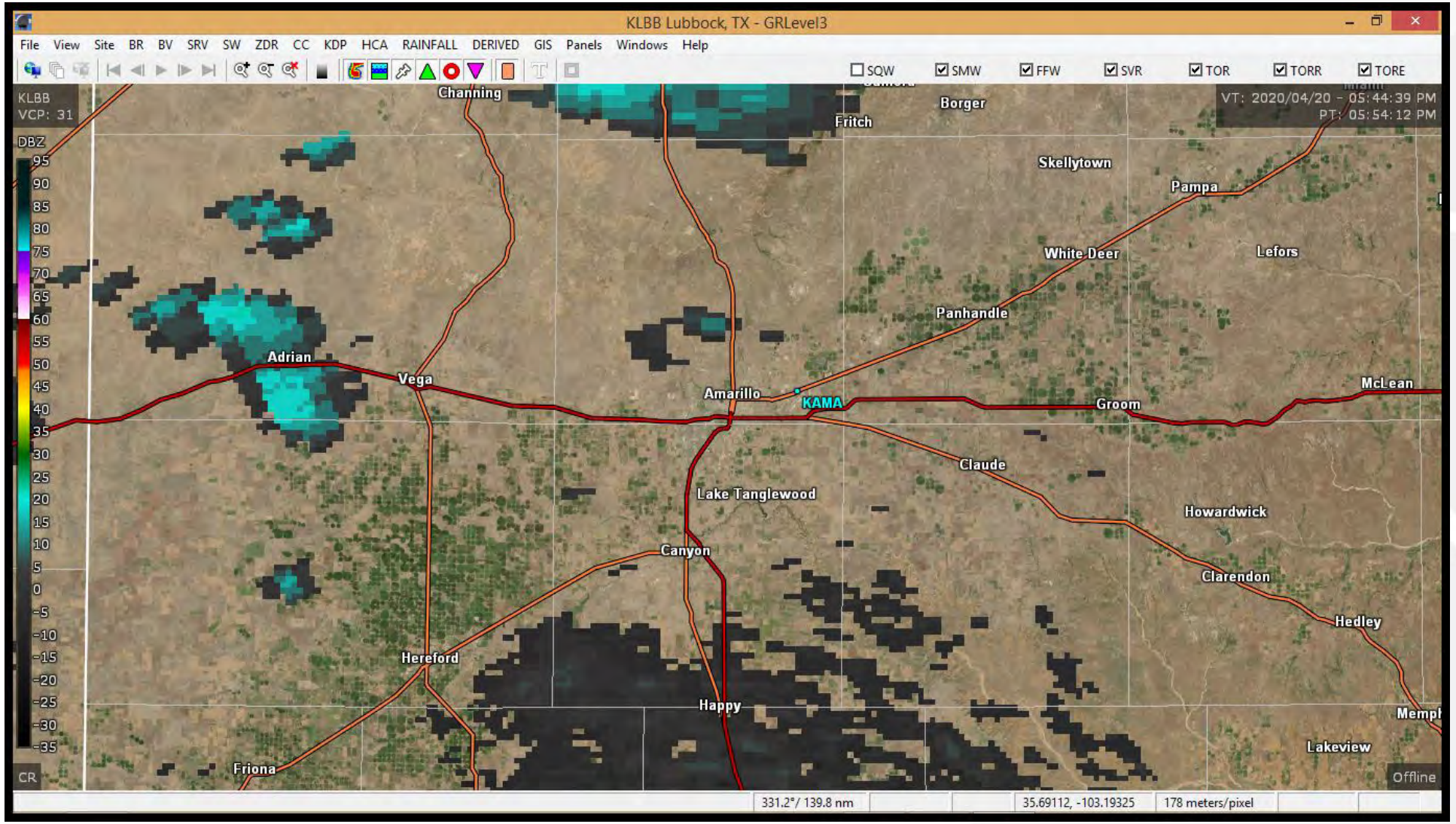
KAMA 88-D – CR Scan – 17:45

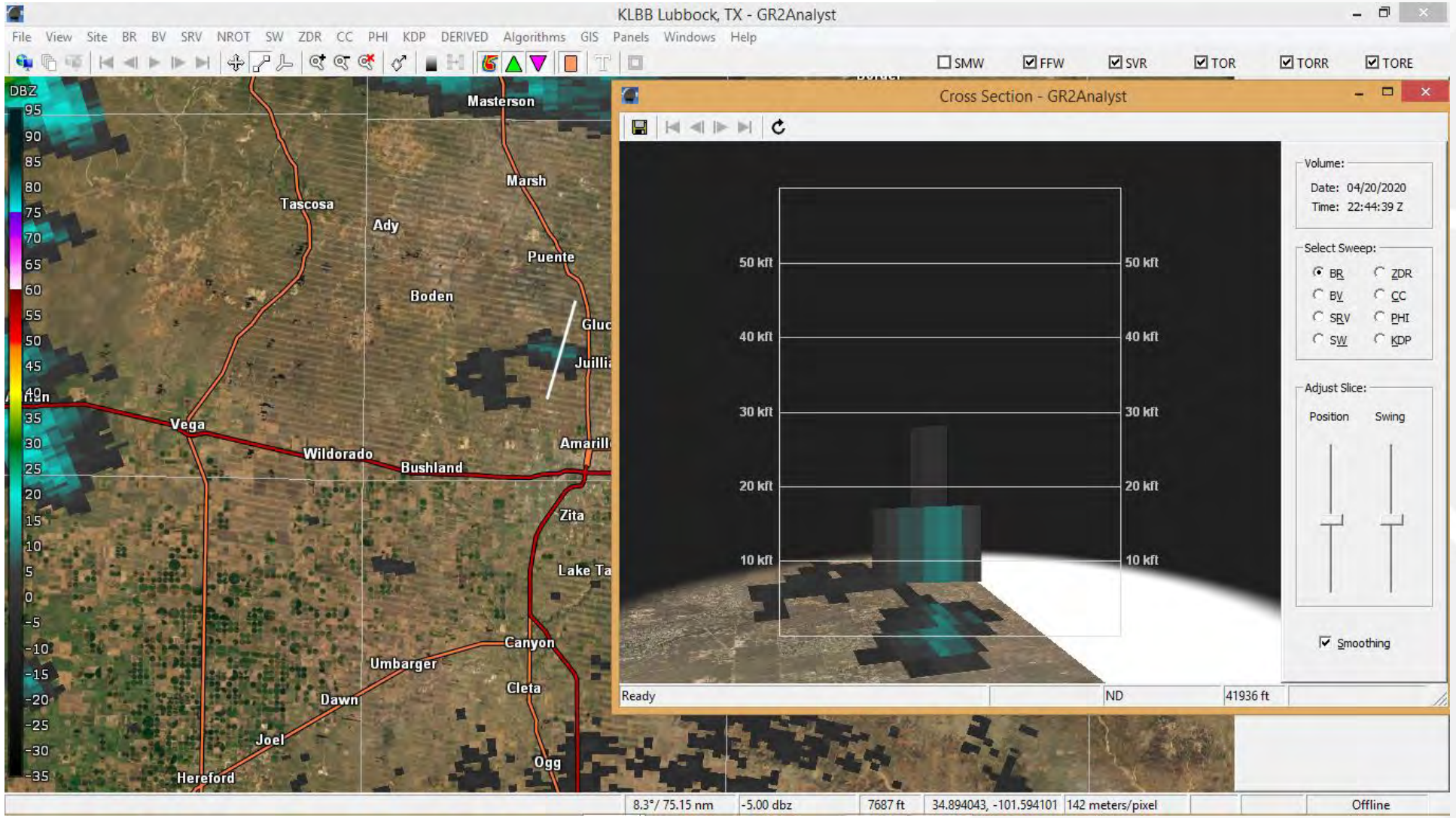
KFDX (Cannon AFB) 88-D – BR Scan – 17:44



KLBB 88-D – CR Scan – 17:44



KLBB 88-D – Cross Section Scan – 17:44



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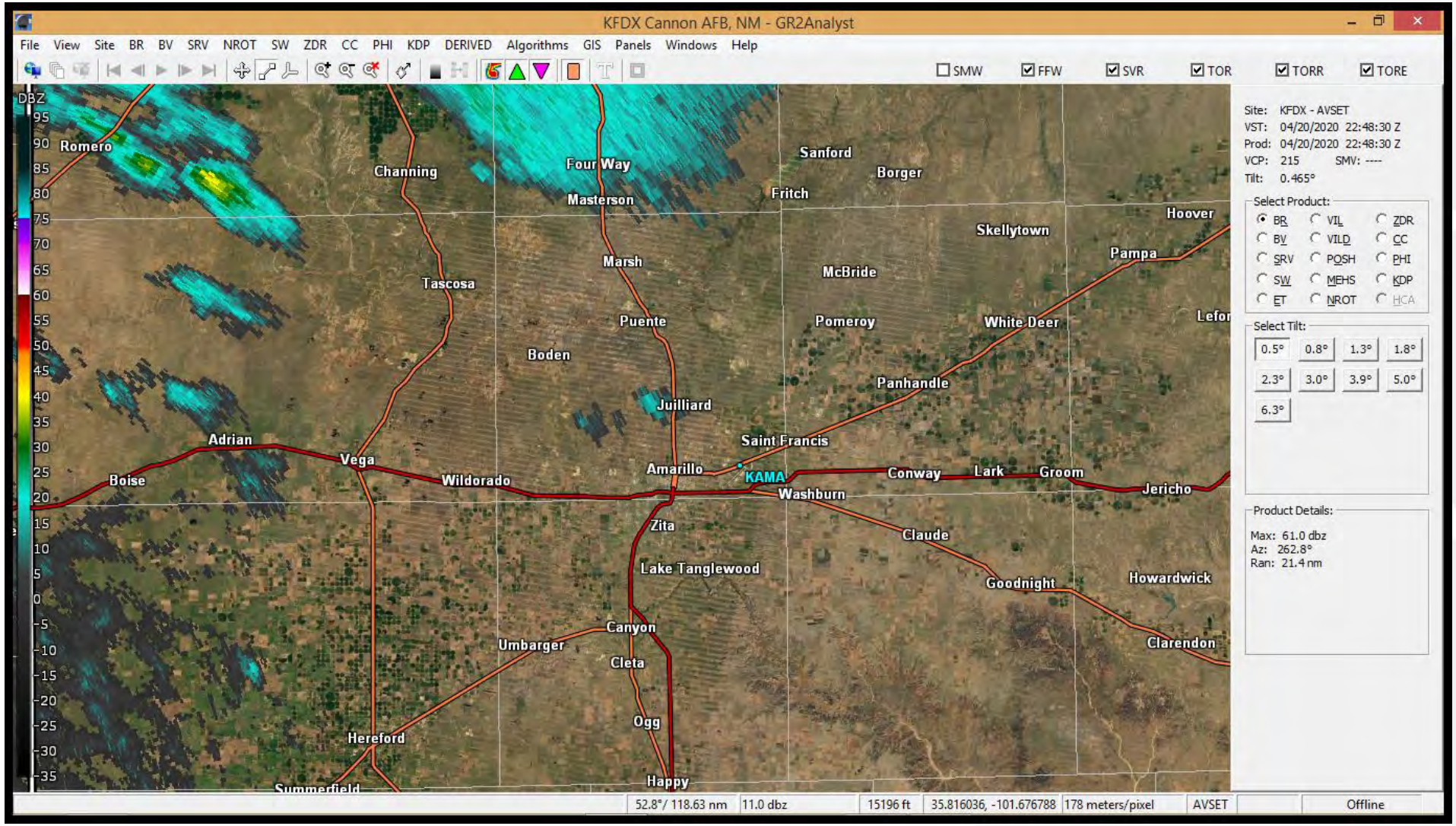
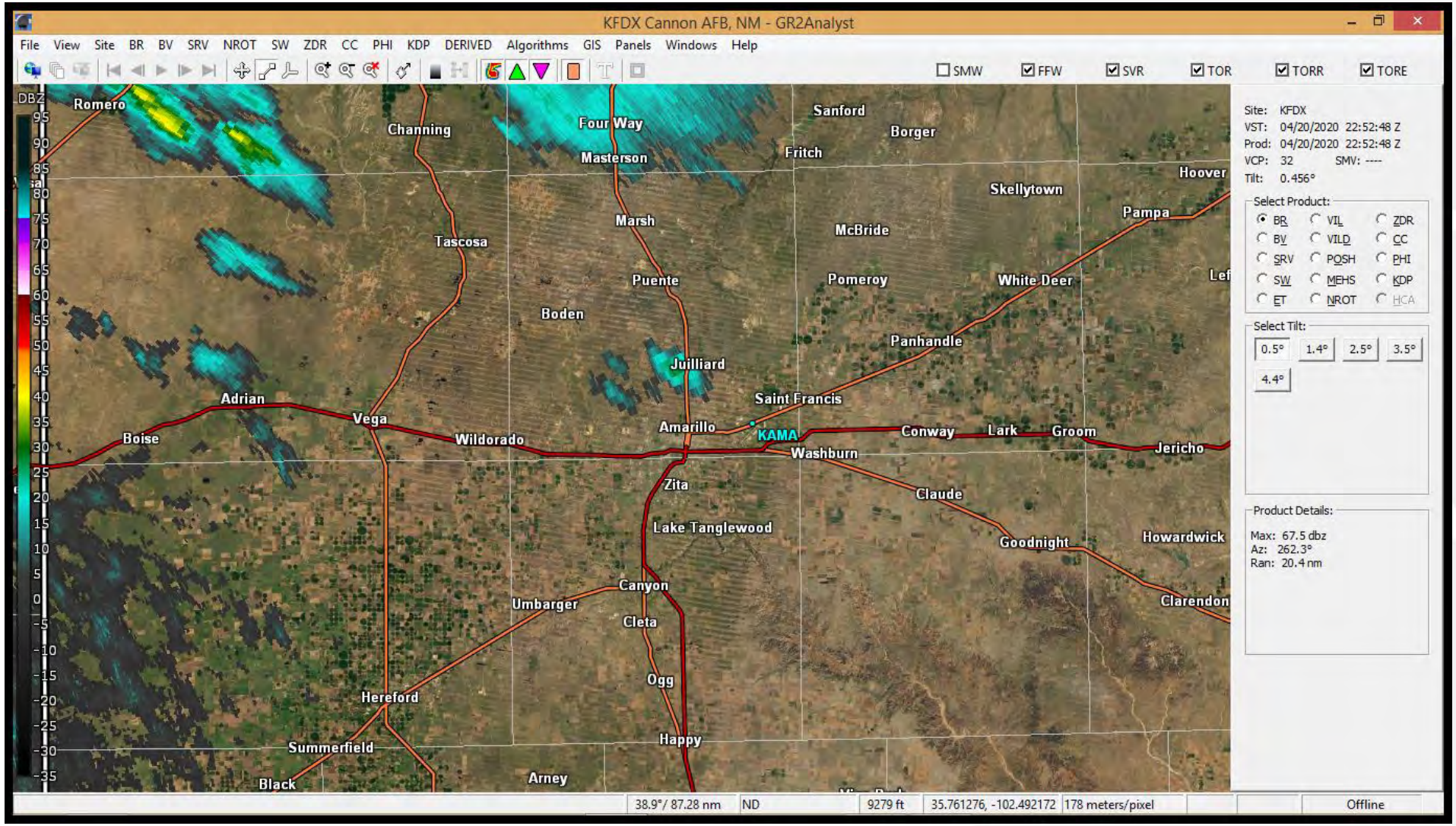
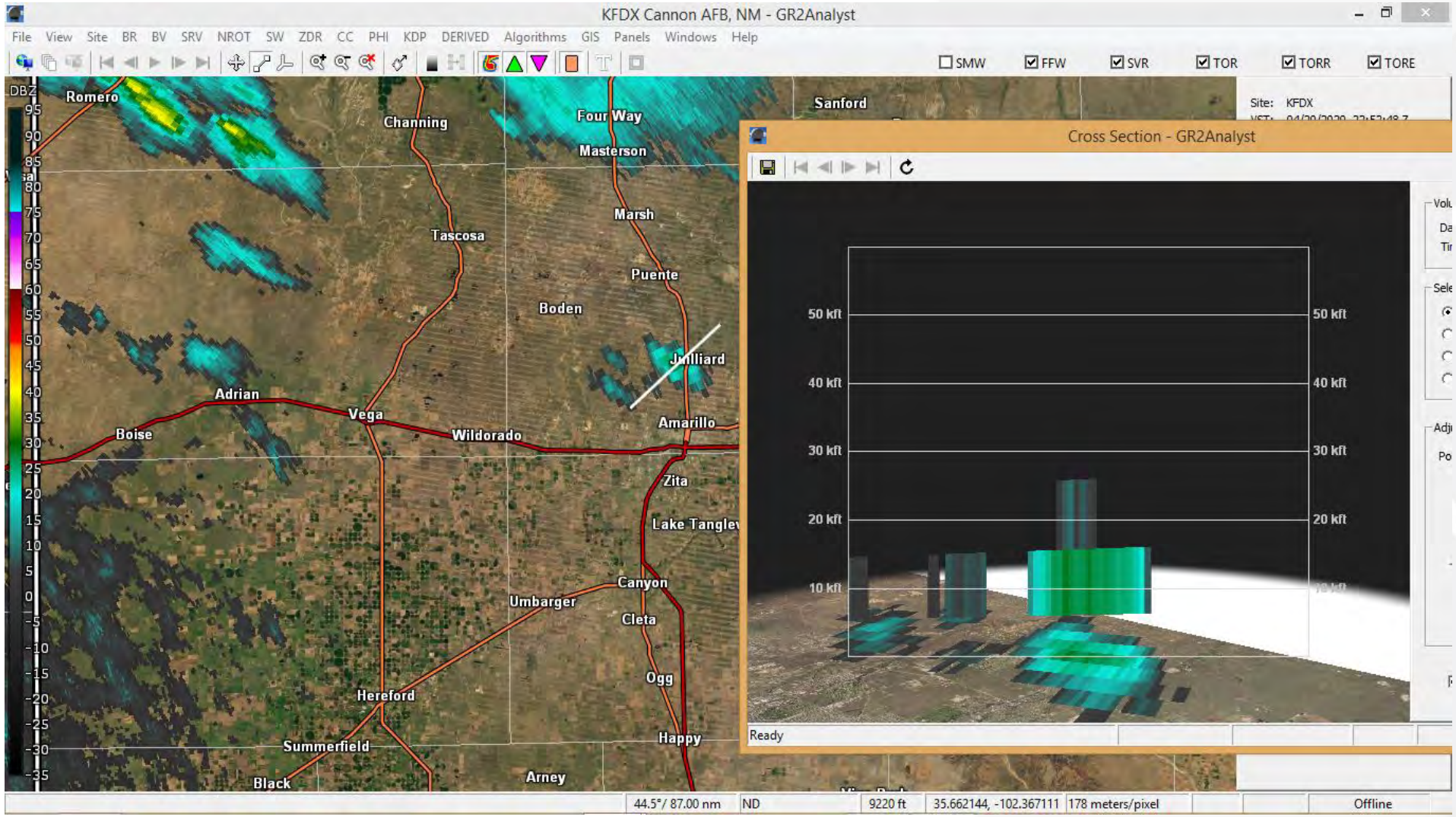


KFDX 88-D – BR Scan – 17:52



KFDX 88-D – Cross Section Scan – 17:52



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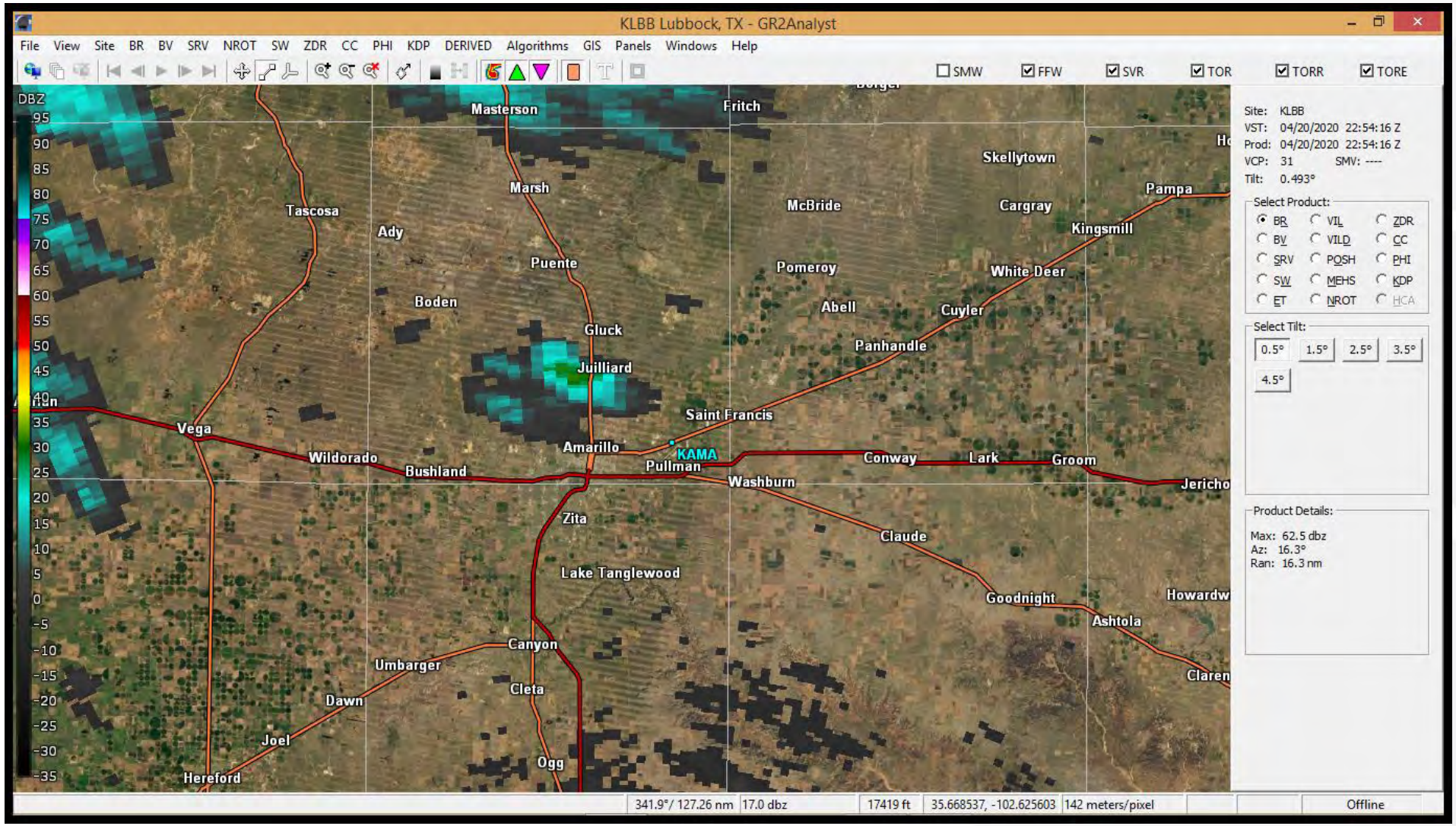
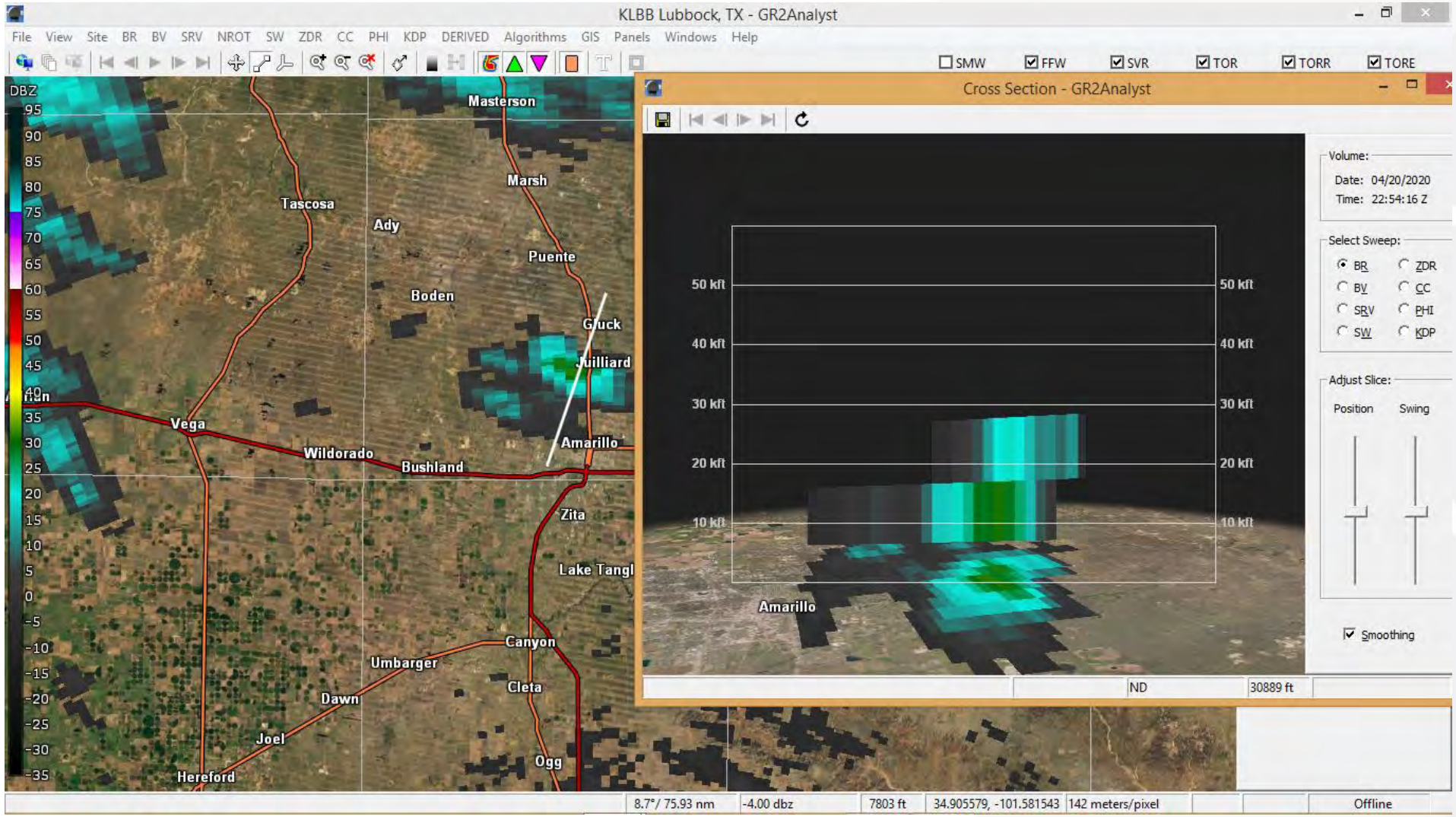
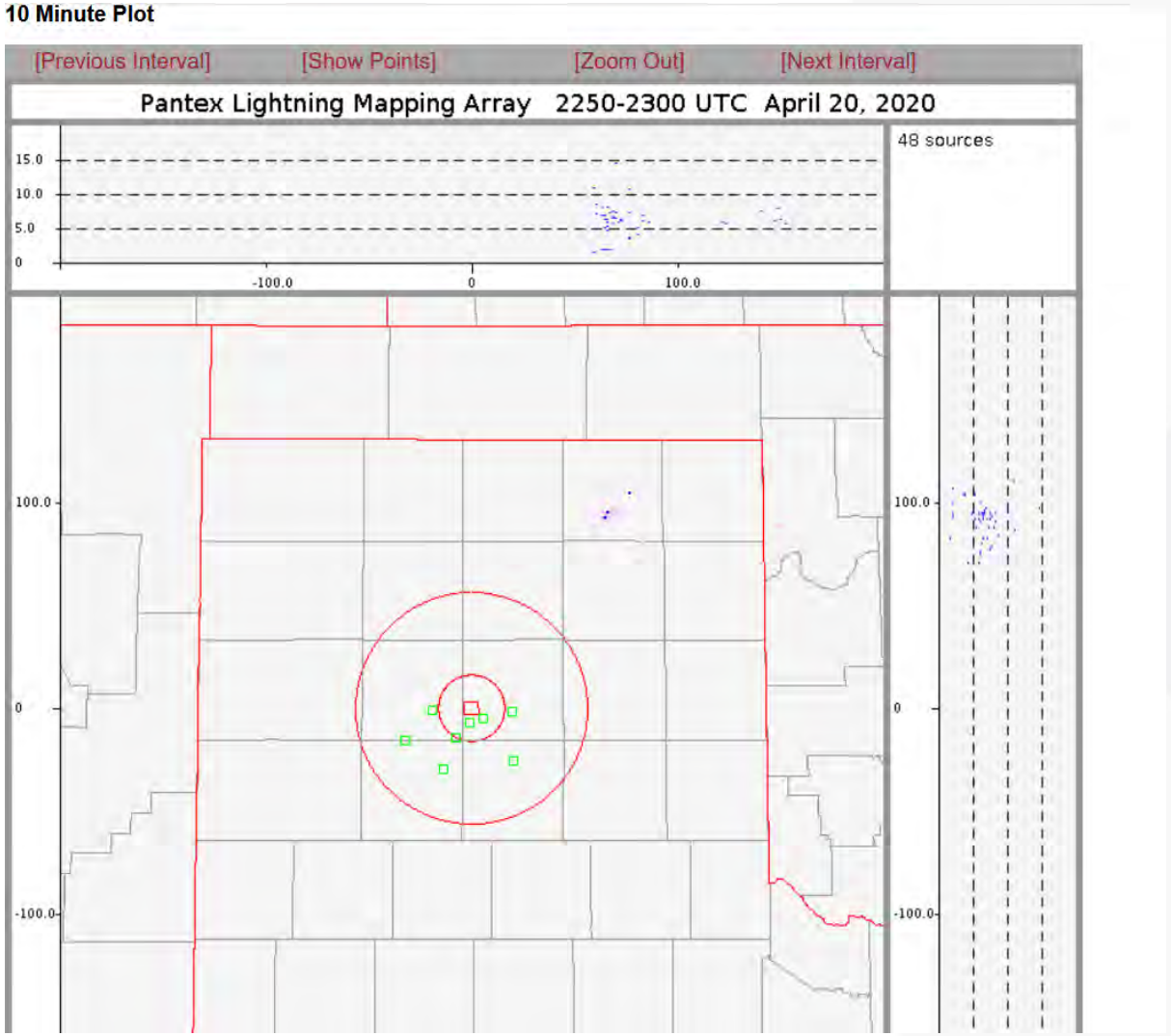


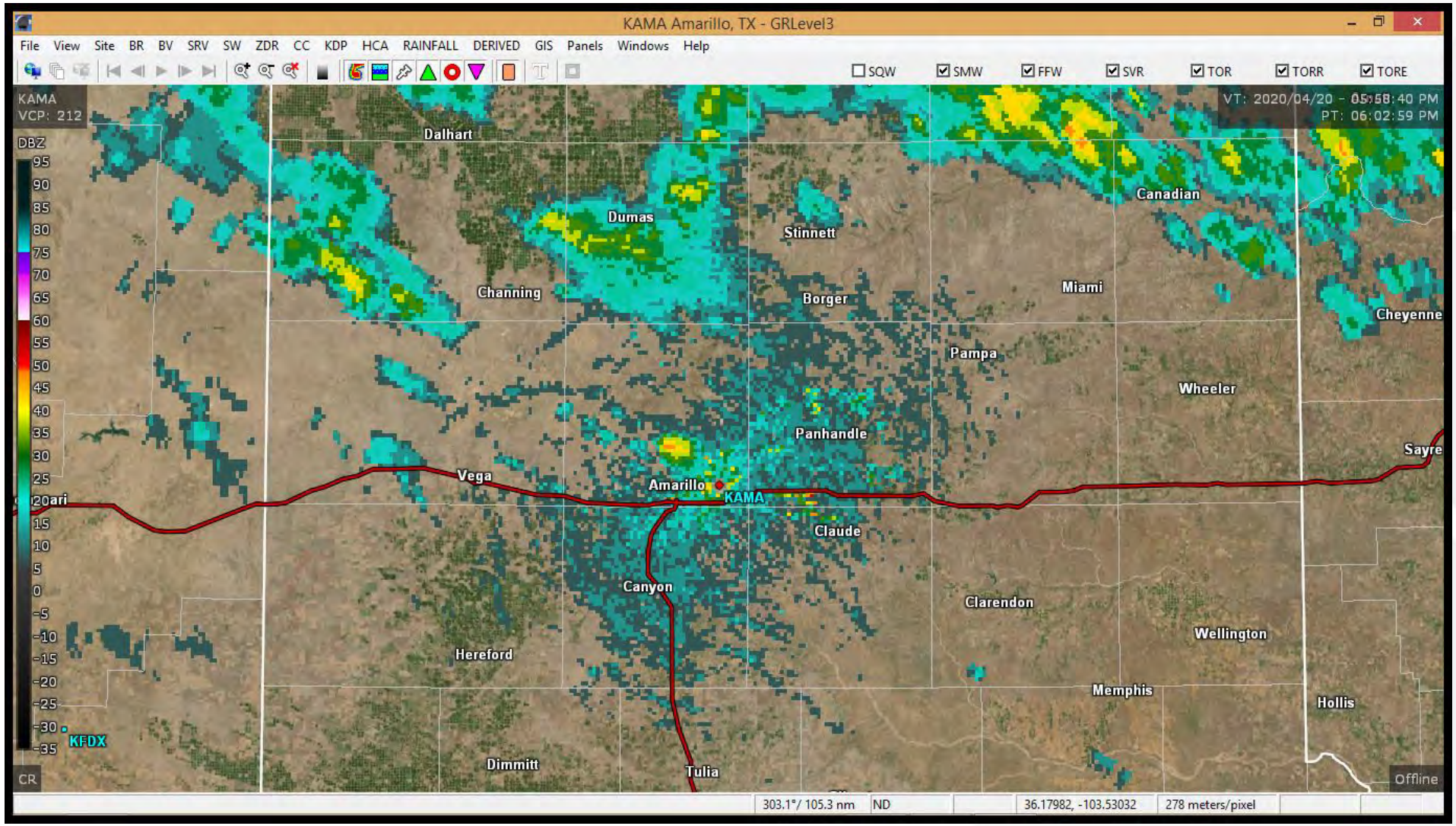
KLBB 88-D – Cross Section Scan – 17:54



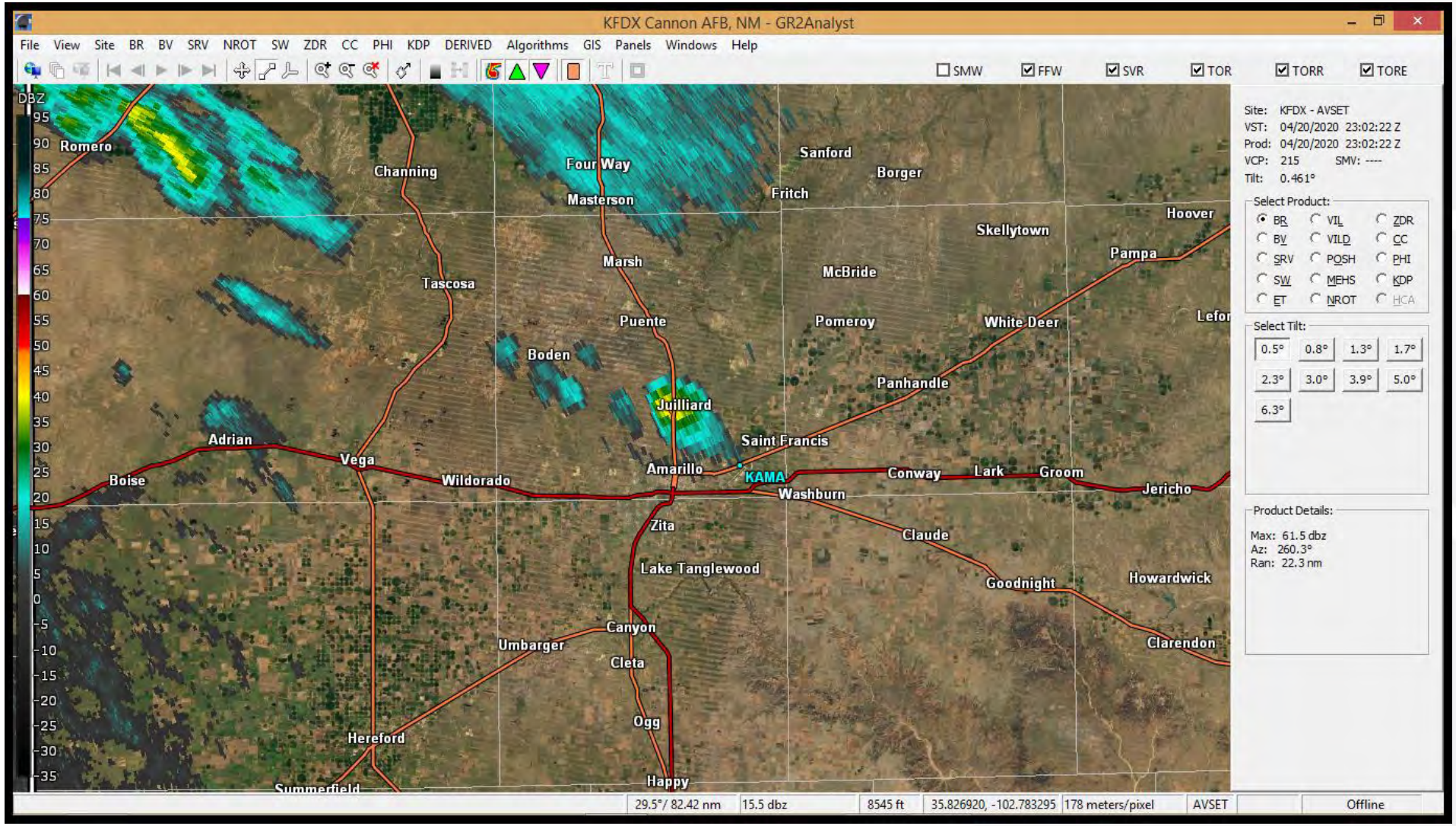
Pantex LMA (Lightning Mapping Array) – 17:50-18:00



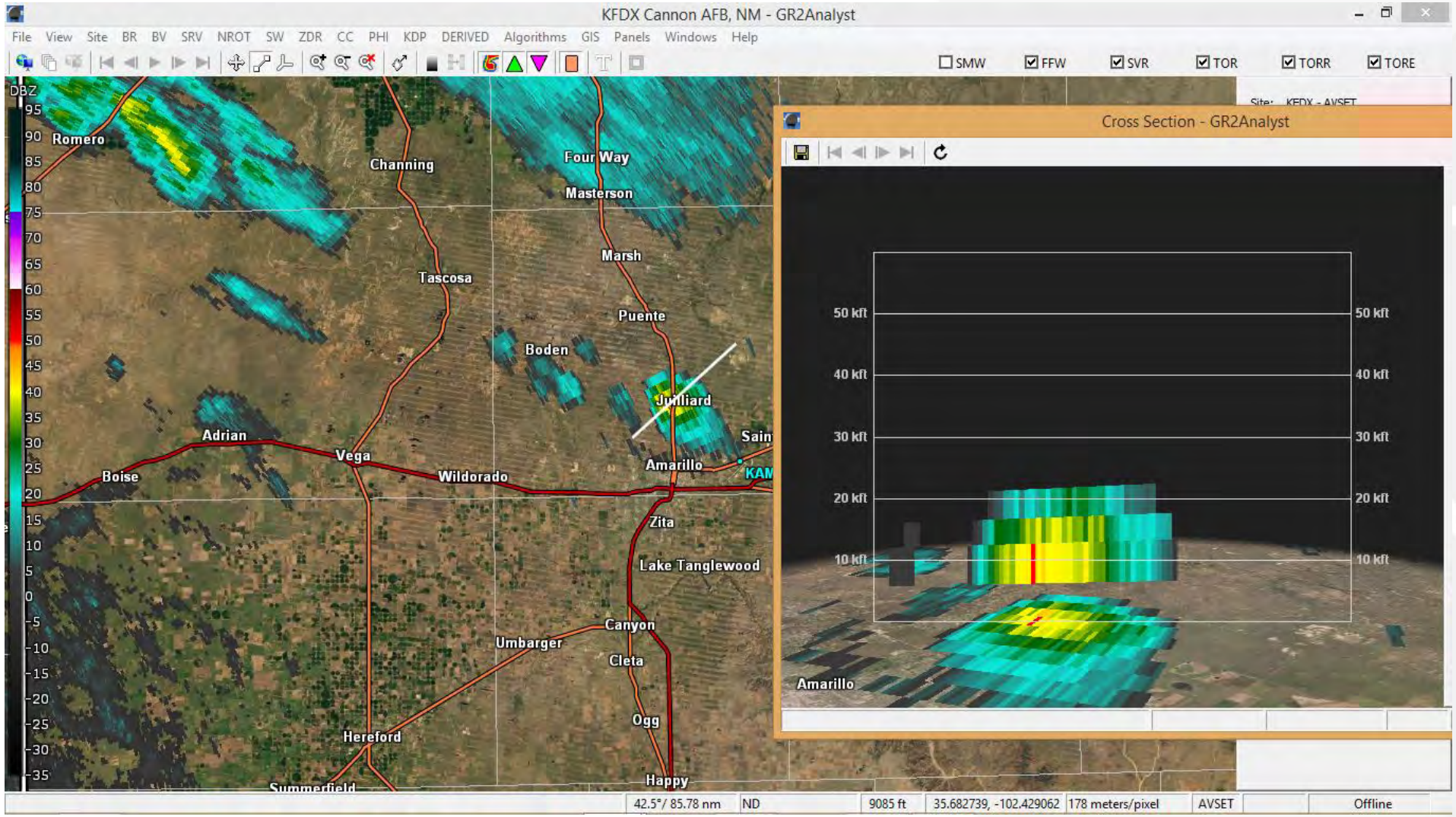
KAMA 88-D – CR Scan – 17:58



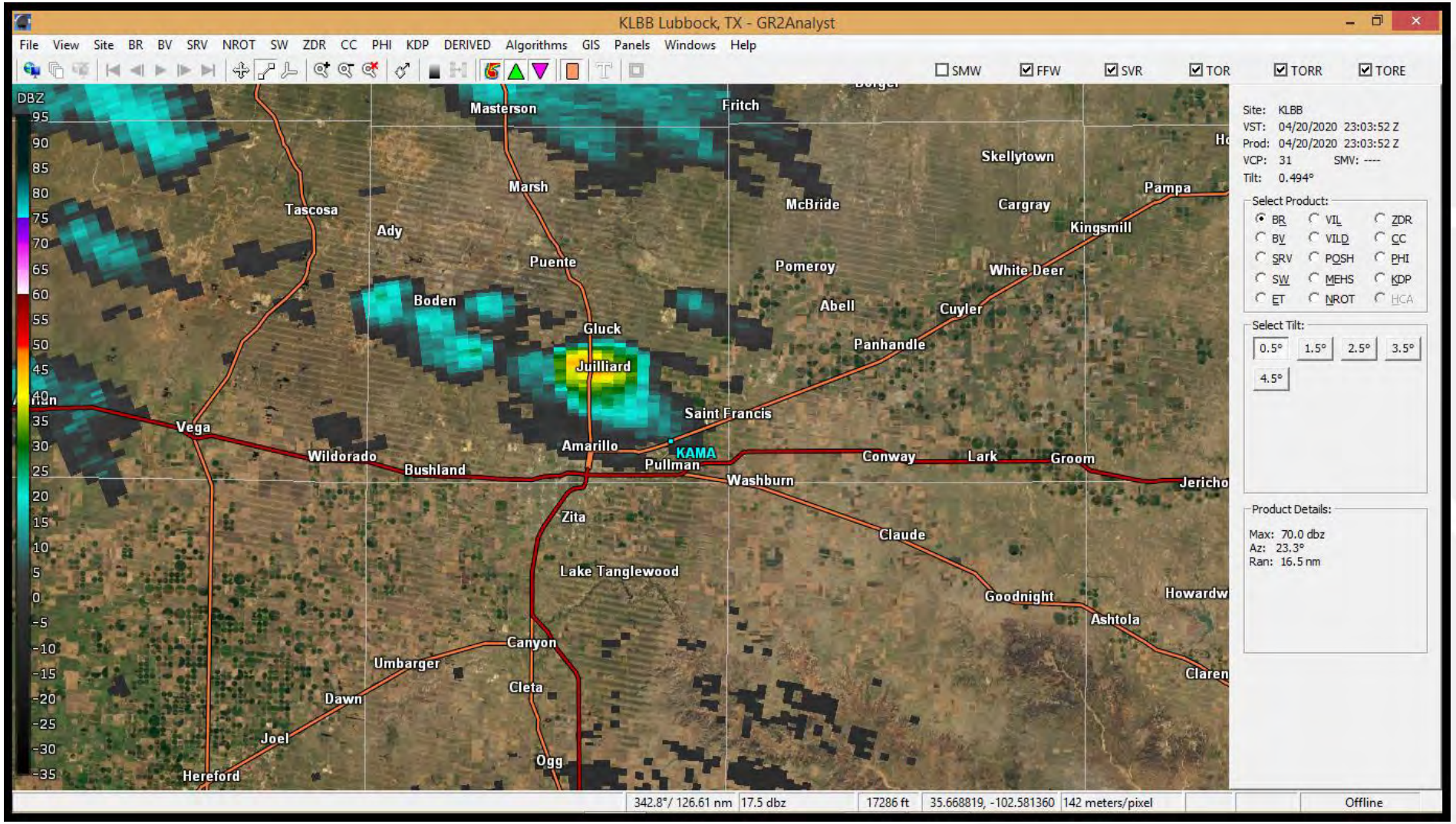
KFDX 88-D – BR Scan – 18:02



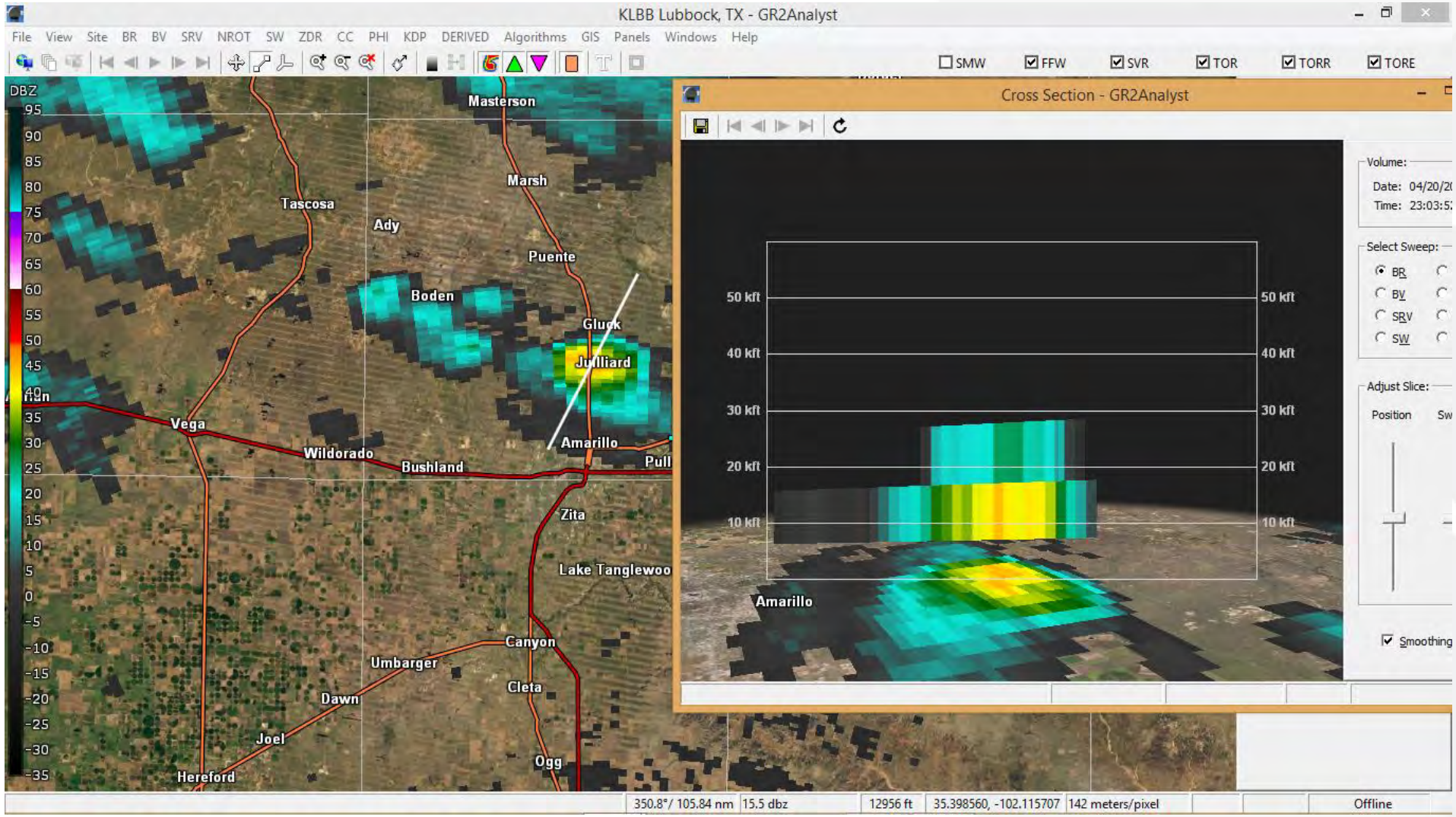
KFDX 88-D – Cross Section Scan – 18:02



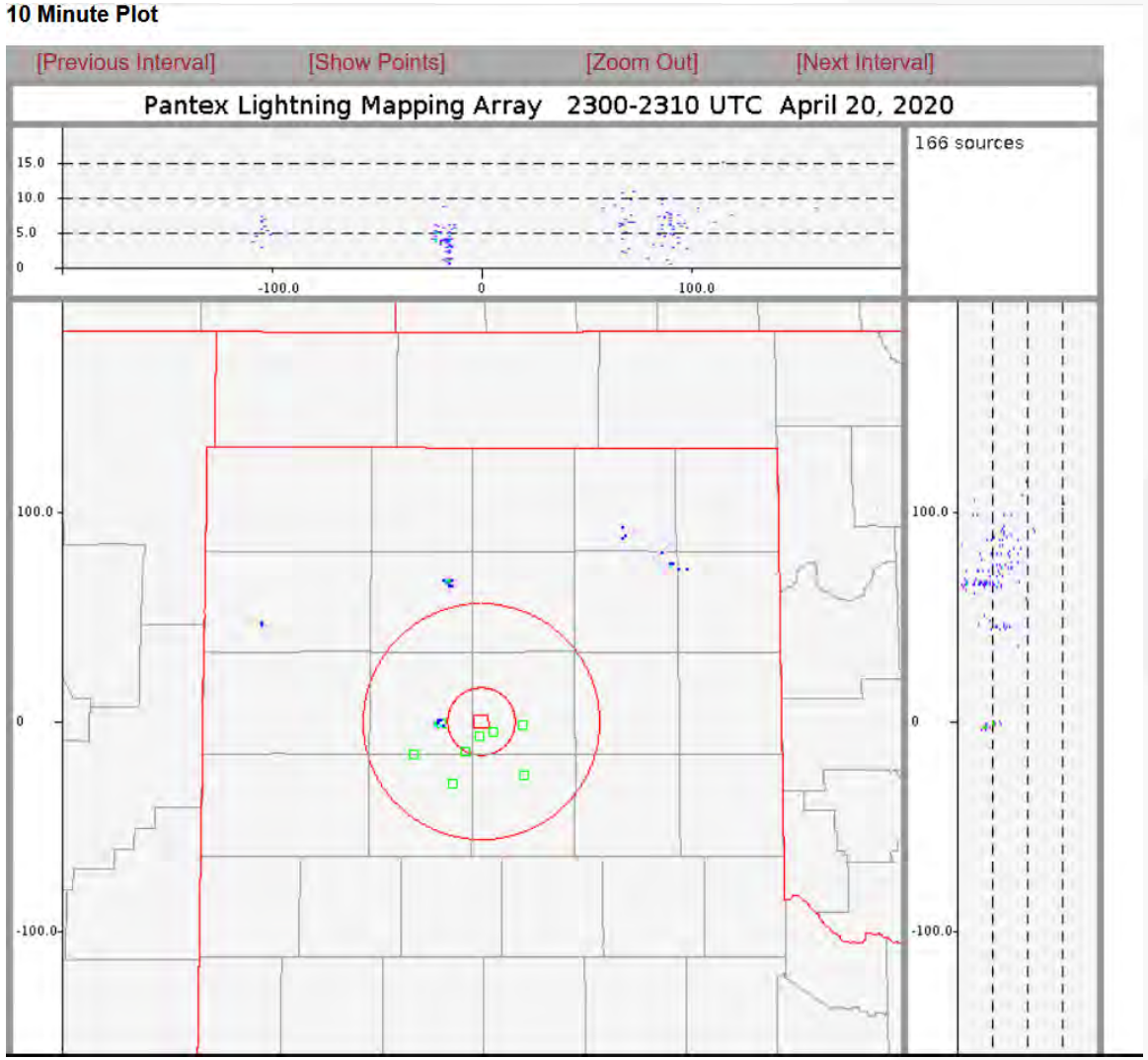
KLBB 88-D – BR Scan – 18:03



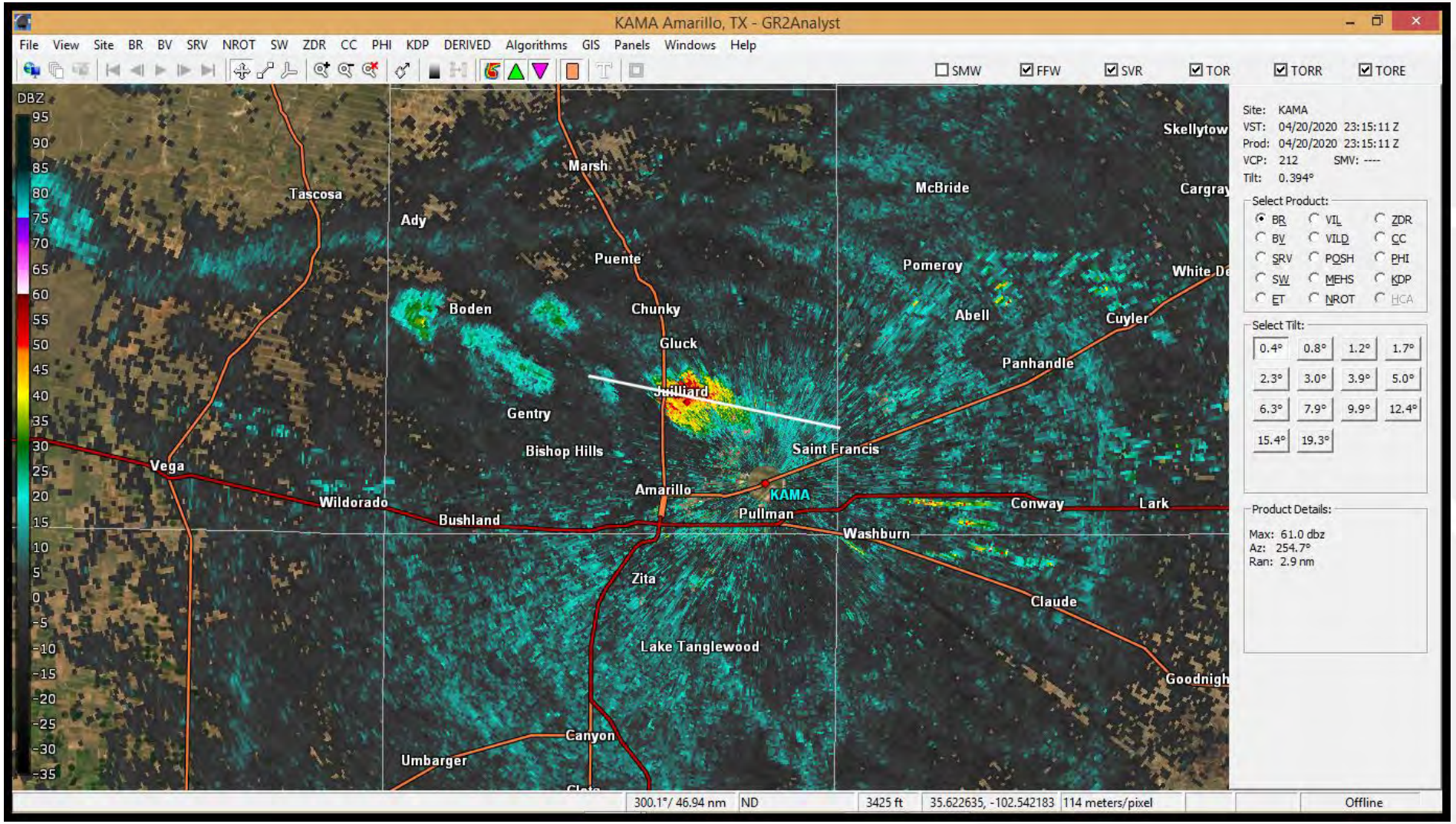
KLBB 88-D – Cross Section Scan – 18:03



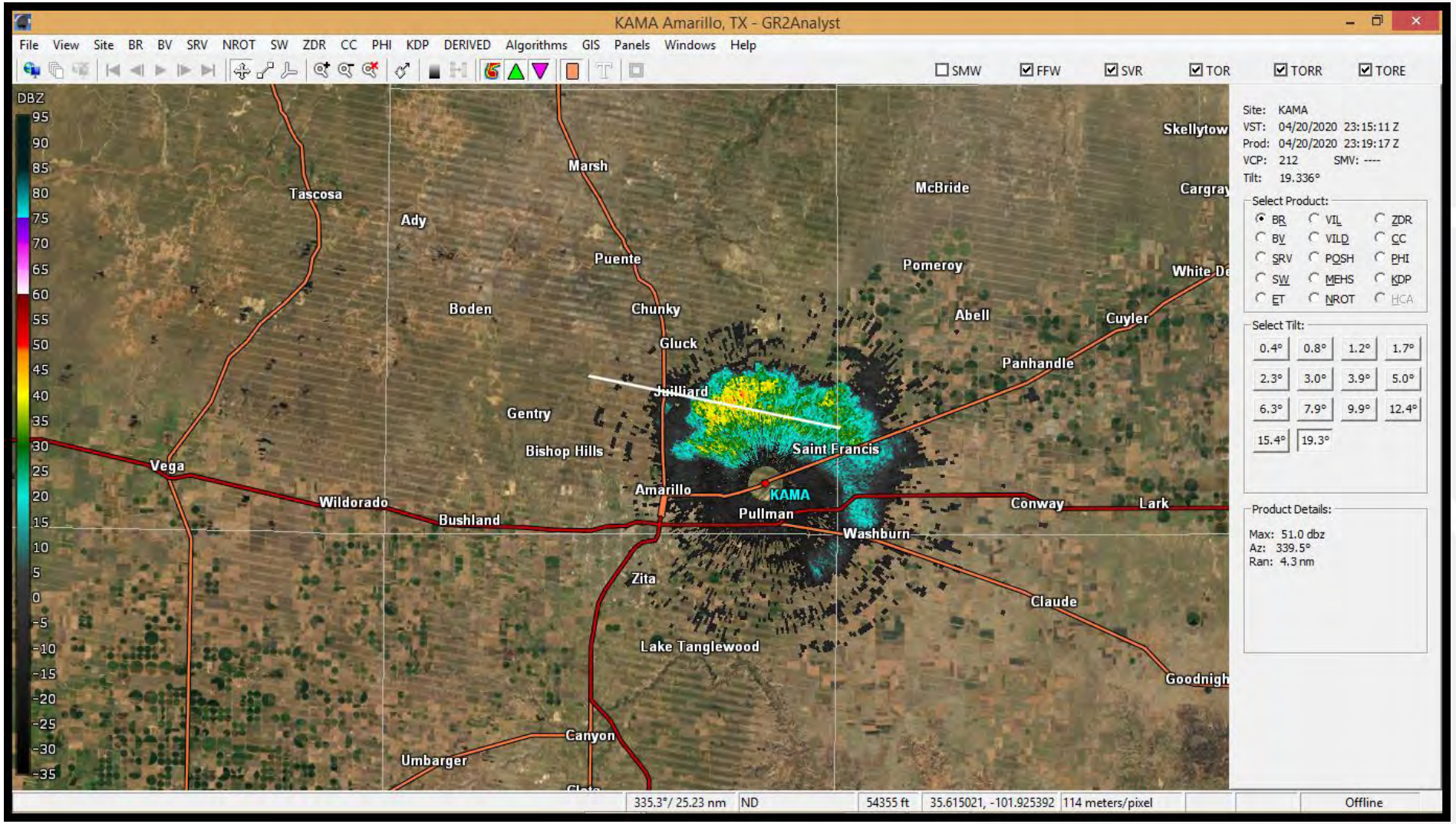
Pantex LMA (Lightning Mapping Array) – 18:00-18:10



KAMA 88-D – BR Scan (0.4 degree tilt) – 18:15



KAMA 88-D – BR Scan (19.5 degree tilt) – 18:15

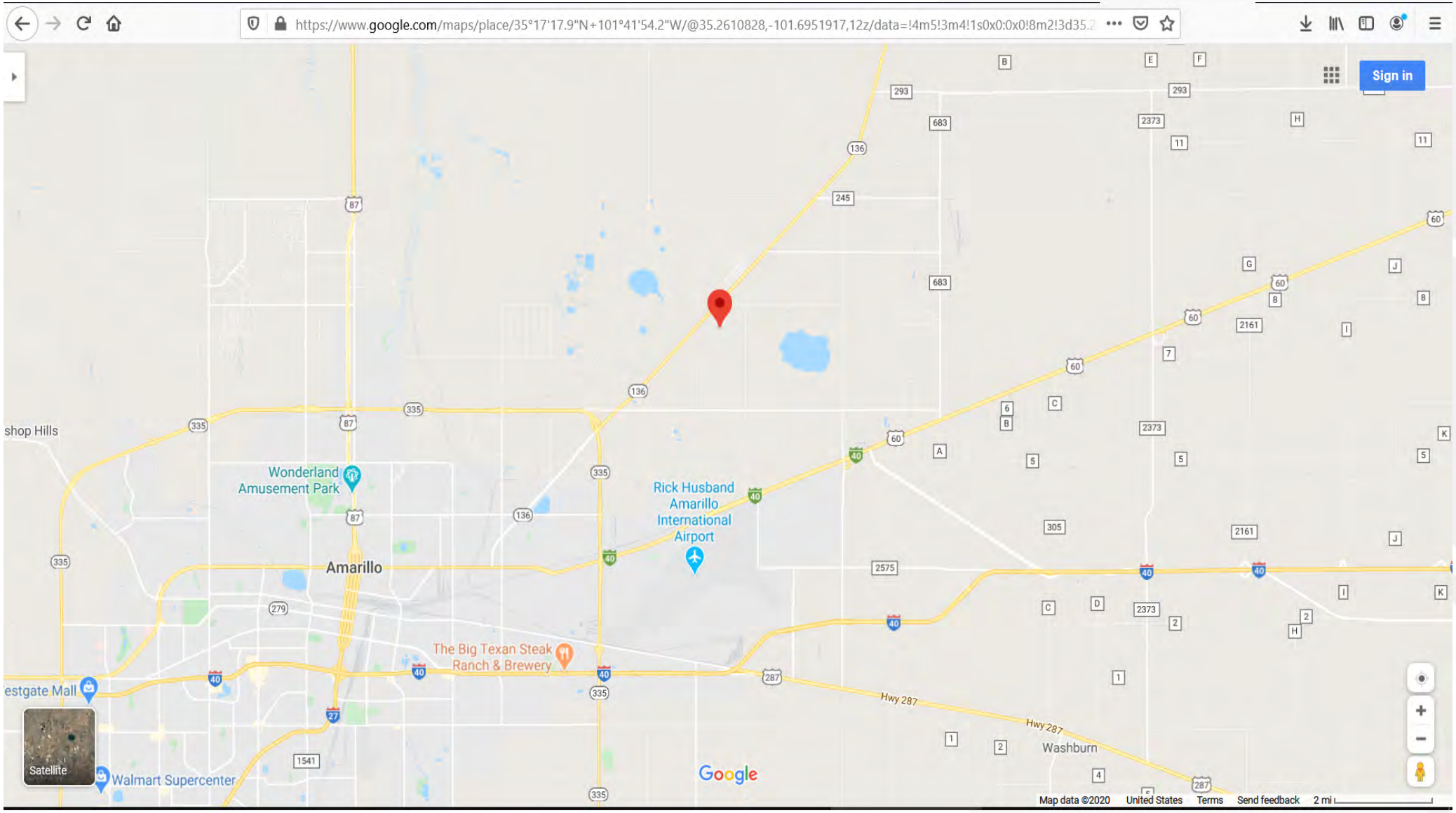


First Intra-Cloud (CC) Strikes Occur At 18:24

Lightning Event List

Date/Time	Latitude	Longitude	Amps	Distance	Bearing (°)
Apr 20, 2020 6:24:45 PM CDT	35.2883	-101.6984	-13653 amps	7.2666 miles	249.9462
Apr 20, 2020 6:24:45 PM CDT	35.2856	-101.6971	-3570 amps	7.2630 miles	248.3934
Apr 20, 2020 6:24:45 PM CDT	35.2863	-101.6961	-6123 amps	7.1934 miles	248.5638

First Intra-Cloud (CC) Strikes Occur at 18:24

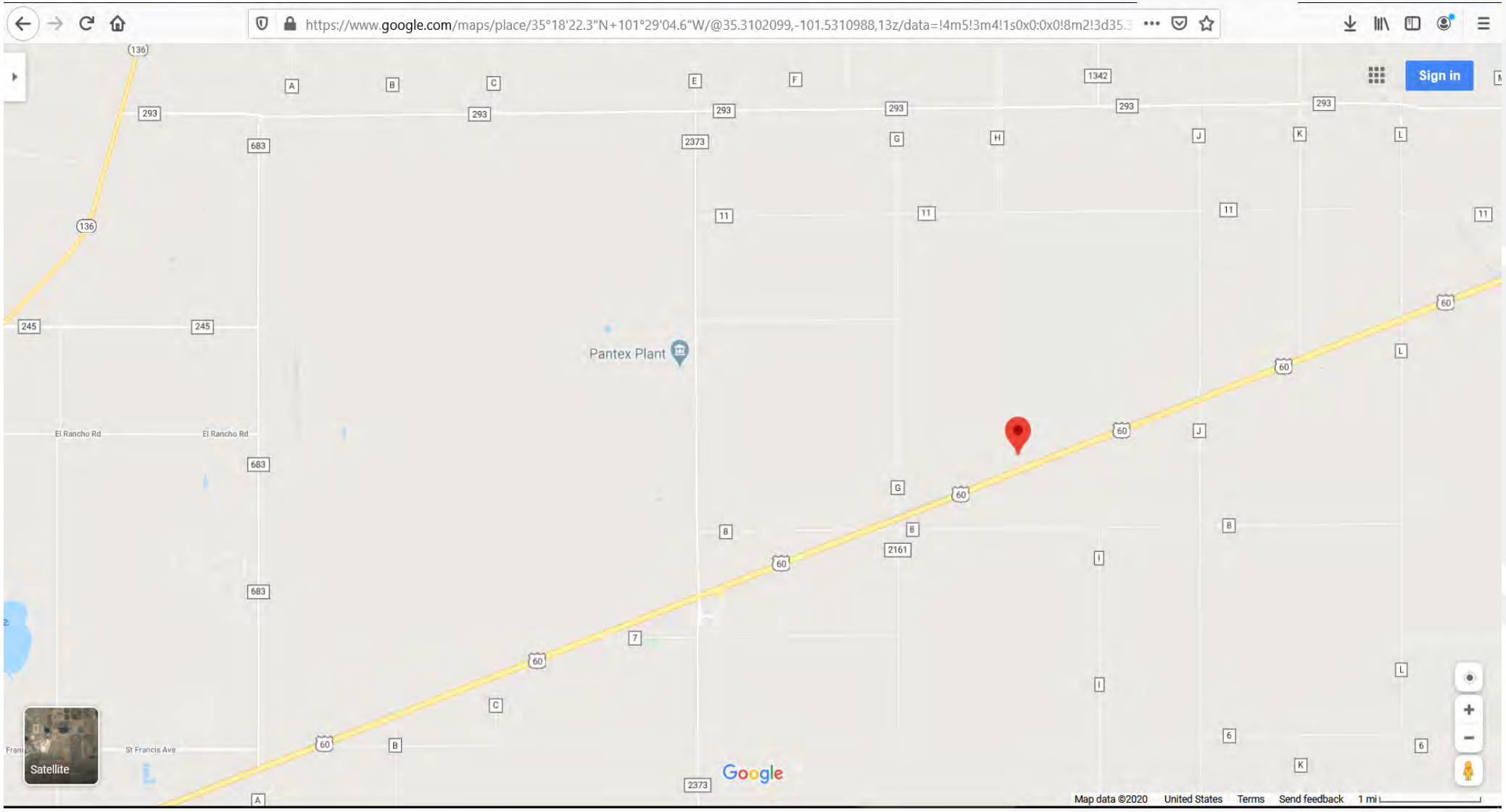


First Cloud-To-Ground (CG) Strike Occurs At 19:01

Lightning Event List

Date/Time	Latitude	Longitude	Amps	Distance	Bearing (°)
Apr 20, 2020 7:01:50 PM CDT	35.3062	-101.4846	-17464 amps	5.3790 miles	103.4711

First Cloud-To-Ground (CG) Strike Occurs at 19:01



Lessons Learned / Summary Of 4/20/20 Storm

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2. The storm appears to have reached a 35-40 dbz threshold around 17:55.

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2. The storm appears to have reached a 35-40 dbz threshold around 17:55.
3. Pantex's LMA detects "flash densities" at 18:05, or 10 minutes later.

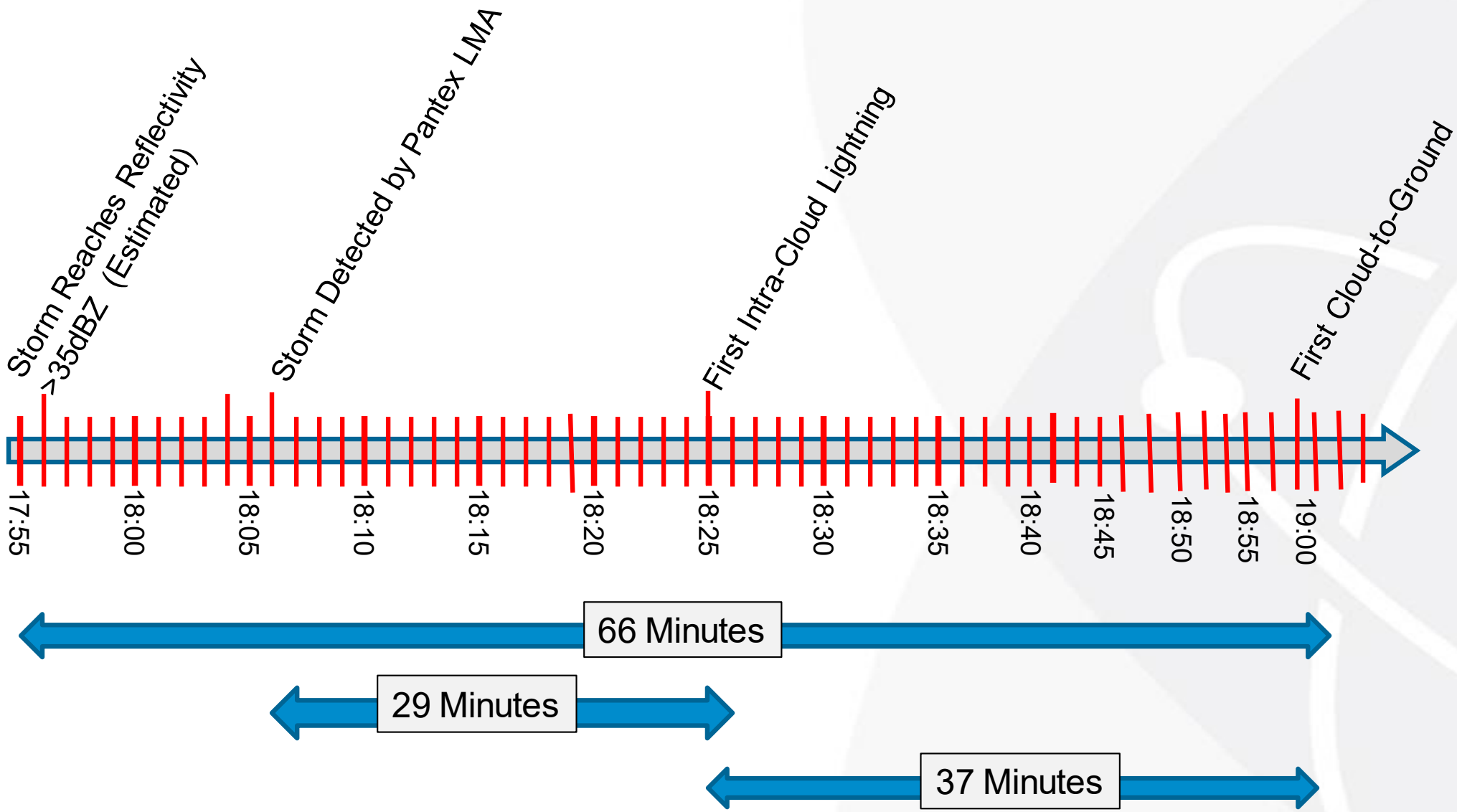
Lessons Learned / Summary Of 4/20/20 Storm

1. The storm developed just north of Amarillo at 17:44
2. The storm appears to have reached a 35-40 dbz threshold around 17:55.
3. Pantex's LMA detects "flash densities" at 18:05, or 10 minutes later.
4. The first intra-cloud, or cloud-to-cloud lightning strikes, are detected by WeatherOps Commander, at 18:24. This was 29 minutes after the 35-40 dbz threshold was reached inside the storm.

Lessons Learned / Summary Of 4/20/20 Storm

5. The first cloud-to-ground lightning strike occurred at 19:01, or 66 minutes after the first 35-40 dbz threshold was reached inside the storm.

Timeline for April 20, 2020 Storm Event



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