
Waushara County, Wisconsin

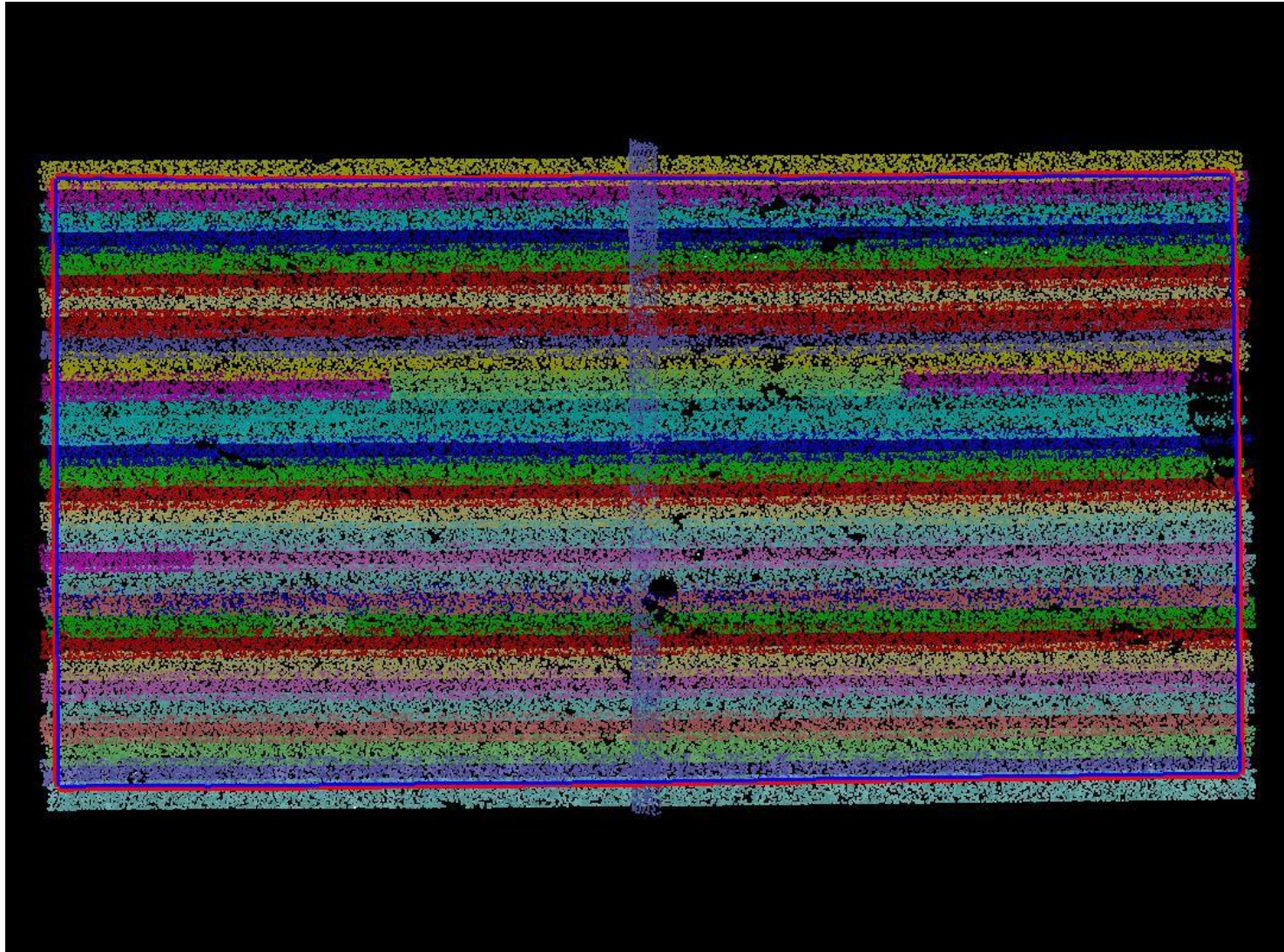
LiDAR Swath QA/QC Report

Report generated on 7/30/2018

This document reports on compliance with the USGS National Geospatial Program LiDAR Base Specification Version 1.2. The complete specification, which also contains a list of abbreviations, acronyms, and a glossary of related terms, can be found [here](#).

1.1 Report on Scope of Collection / Swath Coverage

The purpose of this section is to show the presence and extent of all LiDAR swath data files and to show LiDAR coverage to the extent of a 100-meter buffer of the project boundary.



Blue polygon is project boundary

Red polygon is project boundary buffered by 330 US Survey Feet

1.2 Report on LAS files (Swath Data)

The purpose of this section is to show the LAS format, the presence of waveform data, the GPS time type, the datums, projection and horizontal and vertical units show the projections for the LiDAR swath data.

<u>LAS Format</u>	<u>LAS 1.4</u>
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<u>Waveform Data (WPD file)</u>	<u>No</u>
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<u>GPS Time Type</u>	<u>Adjusted GPS Time</u>
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Datums

<u>EPSG</u>	<u>1116</u>
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<u>Vertical Datum</u>	<u>NAD83 National Spatial Reference System 2011</u>
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<u>EPSG</u>	<u>6360</u>
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<u>Vertical Datum</u>	<u>North American Vertical Datum 1988</u>
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Projection Data

<u>EPSG</u>	<u>6690</u>
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<u>Projection</u>	<u>NAD83(2011) / Wisconsin South (ftUS) + NAVD88 height – Geoid 12B (ftUS)</u>
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<u>Horizontal Unit</u>	<u>US survey foot</u>
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<u>Vertical Unit</u>	<u>US survey foot</u>
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1.3 Report on File Source ID (Swath Data)

The purpose of this section is to report on the File Source ID and Point Source ID values for the LiDAR swath data.

File	File Source ID	Point Source ID
102.las	102	102
103.las	103	103
104.las	104	104
105.las	105	105
106.las	106	106
107.las	107	107
108.las	108	108
109.las	109	109
110.las	110	110
111.las	111	111
112.las	112	112
113.las	113	113
114.las	114	114
117.las	117	117
203.las	203	203
204.las	204	204
205.las	205	205
206.las	206	206
207.las	207	207
208.las	208	208
209.las	209	209
210.las	210	210
211.las	211	211
212.las	212	212
213.las	213	213
214.las	214	214
216.las	216	216
303.las	303	303
304.las	304	304
305.las	305	305
306.las	306	306
307.las	307	307
308.las	308	308
311.las	311	311
313.las	313	313

2.1 Report on Multiple Discrete Returns (Swath Data)

The purpose of this section is to report on the presence and quantities of LiDAR returns in the LAS swath data. Empty return columns can indicate a collection or processing problem dealing with LiDAR return attribute information.

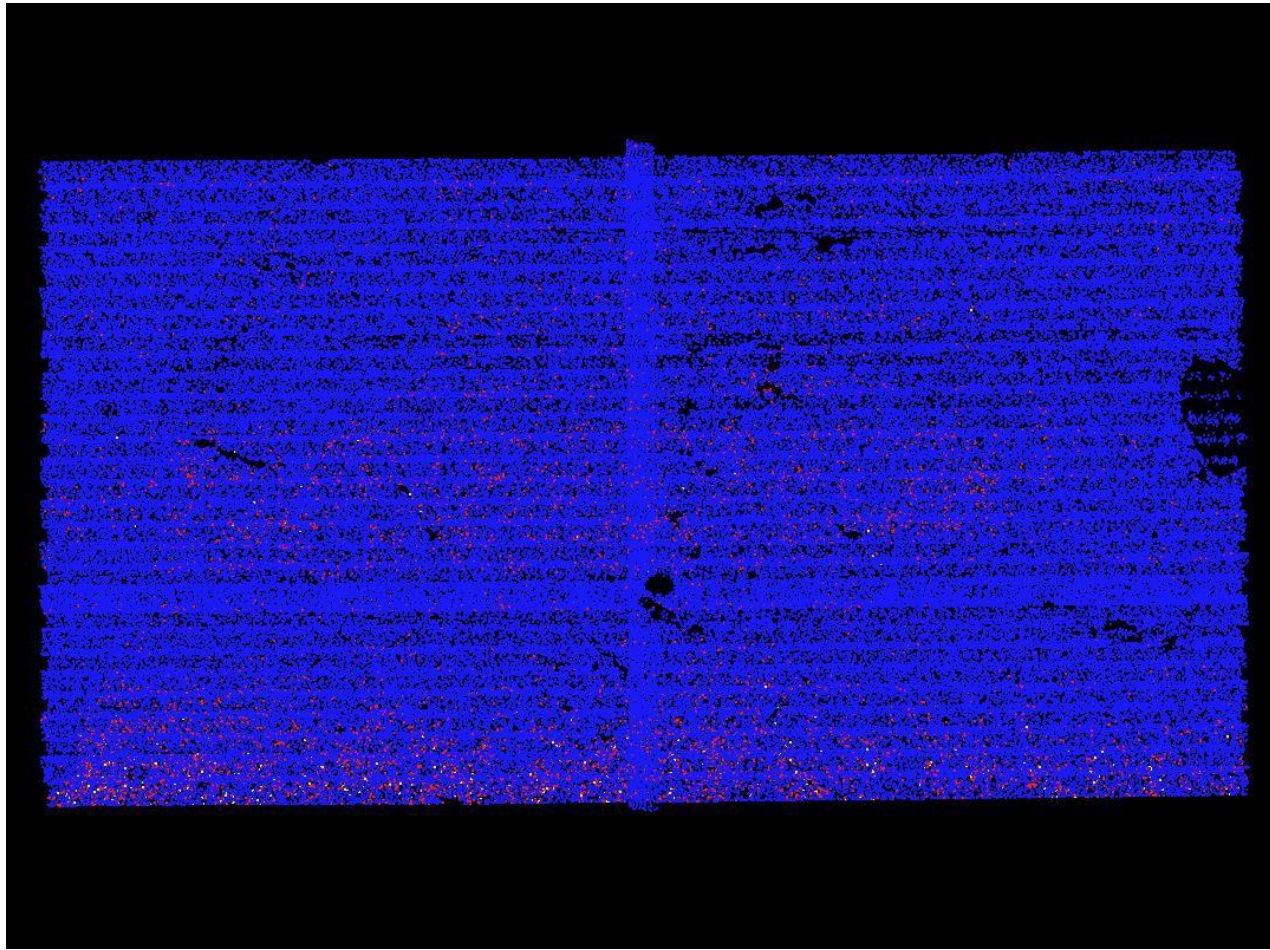
File	First return	Second return	Third return	Other return	Total points
102.las	185,830,533	35,227,466	3,920,581	96,564	225,075,144
103.las	184,225,965	23,582,733	1,483,557	15,464	209,307,719
104.las	187,387,714	17,350,900	650,514	3,050	205,392,178
105.las	184,868,254	9,812,425	136,983	171	194,817,833
106.las	180,738,082	7,310,232	45,755	14	188,094,083
107.las	173,182,852	3,343,168	8,332	00	176,534,352
108.las	164,790,700	2,439,251	3,335	01	167,233,287
109.las	158,327,610	1,395,846	1,302	00	159,724,758
110.las	150,869,291	1,083,345	457	03	151,953,096
111.las	146,366,978	951,117	381	00	147,318,476
112.las	143,188,252	782,233	219	00	143,970,704
113.las	150,927,009	825,707	486	00	151,753,202
114.las	140,985,114	729,063	240	00	141,714,417
117.las	182,659,652	39,148,292	4,991,482	148,396	226,947,822
203.las	165,662,509	2,051,605	1,401	00	167,715,515
204.las	163,051,216	1,360,789	363	00	164,412,368
205.las	158,655,296	1,018,146	168	00	159,673,610
206.las	156,033,270	1,143,914	227	00	157,177,411
207.las	158,472,154	1,651,752	979	00	160,124,885
208.las	159,779,079	2,268,212	9,204	02	162,056,497
209.las	164,401,227	2,735,518	14,048	02	167,150,795
210.las	83,629,268	2,075,509	12,006	03	85,716,786
211.las	80,921,667	2,054,931	18,734	09	82,995,341
212.las	159,016,894	3,698,190	35,802	24	162,750,910
213.las	163,579,266	4,879,831	65,473	91	168,524,661
214.las	166,015,441	6,956,622	140,378	314	173,112,755
216.las	174,383,188	3,325,854	6,778	00	177,715,820
303.las	183,111,506	13,429,958	193,367	196	196,735,027

2.1 Report on Multiple Discrete Returns (Swath Data) - continued

File	First return	Second return	Third return	Other return	Total points
304.las	181,196,634	12,135,610	201,379	443	193,534,066
305.las	176,147,734	12,367,863	167,172	217	188,682,986
306.las	172,012,965	10,284,363	160,586	451	182,458,365
307.las	171,838,871	8,090,838	90,638	102	180,020,449
308.las	32,890,400	1,758,267	27,994	62	34,676,723
311.las	89,457,406	5,552,295	74,889	100	95,084,690
313.las	182,850,449	16,434,165	339,481	635	199,624,730
Total	5,477,454,446	259,256,010	12,804,691	266,314	5,749,781,461

2.1 Report on Multiple Discrete Returns (Swath Data) – All Returns

The purpose of this section is to show a graphic of LiDAR swath data points colored by all returns.



First Second Third Fourth or other

2.2 Report on Intensity Values (Swath Data)

The USGS LiDAR Base Specification Version 1.2 requires: "Intensity values are required for each return. The values are to be recorded in the ".las" files in their native radiometric resolution." The purpose of this section is to report on the presence and quantities of LiDAR intensity in the LAS swath data.

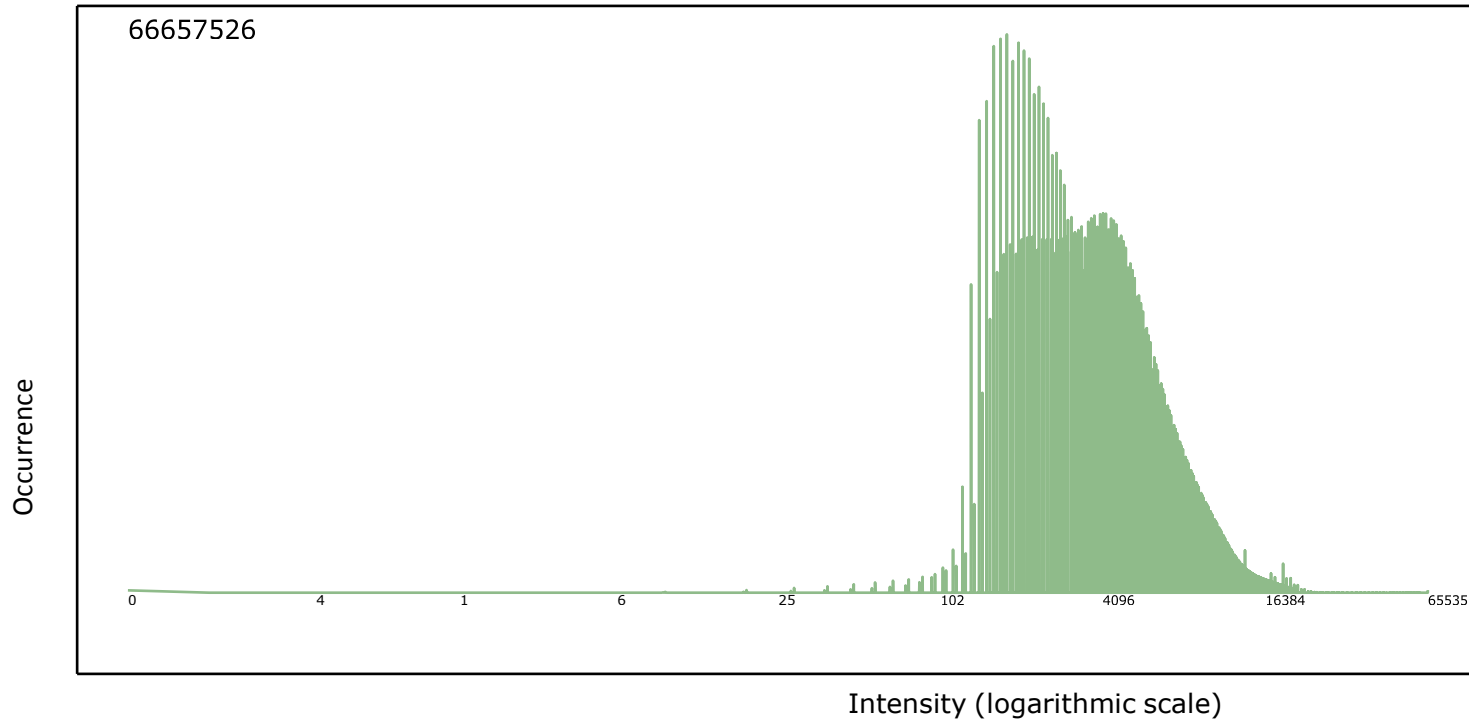
File	Minimum	Maximum	Mean	Median	Mode
102.las	00	65,535	10,283	10,453	13,775
103.las	00	65,535	8,777	9,025	13,775
104.las	00	65,535	7,346	7,327	7,505
105.las	00	65,535	6,028	5,985	5,795
106.las	00	65,535	4,899	4,655	4,085
107.las	00	65,535	4,173	3,908	3,135
108.las	00	65,535	3,803	3,515	2,565
109.las	00	65,535	3,491	3,224	1,995
110.las	00	65,535	3,324	3,028	1,615
111.las	00	65,535	3,234	2,945	1,615
112.las	00	65,535	3,249	3,028	1,425
113.las	00	65,535	3,166	2,850	1,425
114.las	00	65,535	3,163	2,850	1,425
117.las	00	65,535	10,618	10,844	19,063
203.las	00	65,535	3,991	3,610	2,565
204.las	00	65,535	3,700	3,325	2,375
205.las	00	65,535	3,590	3,230	2,185
206.las	95	65,535	3,572	3,230	1,995
207.las	95	65,535	3,669	3,325	1,995
208.las	00	65,535	3,916	3,517	1,995
209.las	00	65,535	4,109	3,712	1,995
210.las	00	65,535	3,935	3,325	1,615
211.las	00	65,535	4,269	3,810	2,090
212.las	00	65,535	4,440	3,895	1,995
213.las	00	65,535	4,578	3,990	2,185
214.las	00	65,535	5,065	4,298	1,805
216.las	00	65,535	4,318	3,990	3,325

2.2 Report on Intensity (Swath Data) - continued

File	Minimum	Maximum	Mean	Median	Mode
303.las	00	65,535	6,173	6,080	6,555
304.las	00	65,535	6,010	5,862	5,795
305.las	00	65,535	5,712	5,415	1,805
306.las	00	65,535	6,004	5,510	4,845
307.las	00	65,535	5,966	5,605	4,845
308.las	00	65,535	6,575	6,350	4,845
311.las	00	65,535	5,470	5,035	1,805
313.las	00	65,535	6,574	6,555	7,505
Average	00	65,535	5,272	4,370	1,805

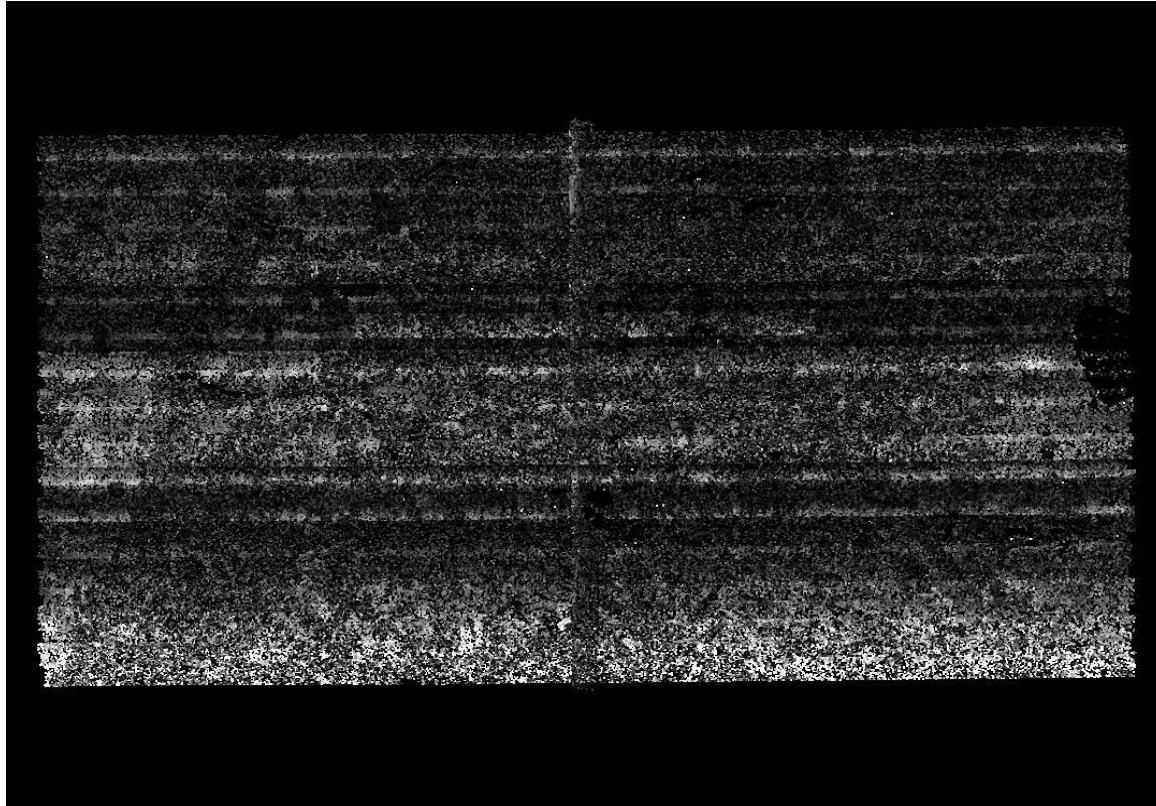
2.2 Report on Intensity Values (Swath Data)

The purpose of this section is to show a frequency distribution chart of intensities throughout all the LiDAR swath files.



2.2 Report on Intensity Values (Swath Data)

The purpose of this section is to show a graphic of LiDAR swath data points colored by intensity.



2.3 Report on Point Density and Nominal Pulse Spacing (NPS) (Swath Data)

The USGS LiDAR Base Specification Version 1.2 states: "An NPS of 2 meters or less is required. Dependent on the local terrain and land cover conditions in the project area, a greater point density may be required on specific projects. Assessment of the NPS will be made against single swath, first-return only data, located within the geometrically usable center portion (typically 90 percent) of each swath, acceptable data voids excluded. NPS will be calculated as the square root of the average area per point. Average along-track and cross-track point spacing should be comparable (within 10 percent)."

The purpose of this section is to report on the LiDAR point density and nominal point spacing by swath file. Averages by swath files (not including overlap), project boundary polygons (including swath overlap), and aggregate project boundary polygons (including swath overlap) are reported.

Units: US Survey Feet

File	Number of First Returns	Area of Swath	Point Density	NPS
102.las	185,830,533	852,827,648	0.218/2.347	2.142/0.653
103.las	184,225,965	860,900,032	0.214/2.303	2.162/0.659
104.las	187,387,714	856,681,280	0.219/2.357	2.138/0.652
105.las	184,868,254	863,877,568	0.214/2.303	2.162/0.659
106.las	180,738,082	854,863,040	0.211/2.271	2.175/0.663
107.las	173,182,852	850,547,392	0.204/2.196	2.216/0.675
108.las	164,790,700	836,237,376	0.197/2.120	2.253/0.687
109.las	158,327,610	836,265,344	0.189/2.034	2.298/0.700
110.las	150,869,291	830,386,944	0.182/1.959	2.346/0.715
111.las	146,366,978	804,384,192	0.182/1.959	2.344/0.714
112.las	143,188,252	806,344,704	0.178/1.916	2.373/0.723
113.las	150,927,009	821,597,824	0.184/1.981	2.333/0.711
114.las	140,985,114	820,895,872	0.172/1.851	2.413/0.735
117.las	182,659,652	853,100,864	0.214/2.303	2.161/0.659
203.las	165,662,509	831,042,432	0.199/2.142	2.240/0.683
204.las	163,051,216	839,698,816	0.194/2.088	2.269/0.692
205.las	158,655,296	820,937,984	0.193/2.077	2.275/0.693
206.las	156,033,270	826,630,528	0.189/2.034	2.302/0.702
207.las	158,472,154	820,523,008	0.193/2.077	2.275/0.693
208.las	159,779,079	829,820,288	0.193/2.077	2.279/0.695
209.las	164,401,227	831,484,864	0.198/2.131	2.249/0.685
210.las	83,629,268	449,831,040	0.186/2.002	2.319/0.707
211.las	80,921,667	415,255,808	0.195/2.099	2.265/0.690
212.las	159,016,894	826,441,024	0.192/2.067	2.280/0.695
213.las	163,579,266	840,560,256	0.195/2.099	2.267/0.691

2.3 Report on Point Density and NPS (Swath Data) - continued

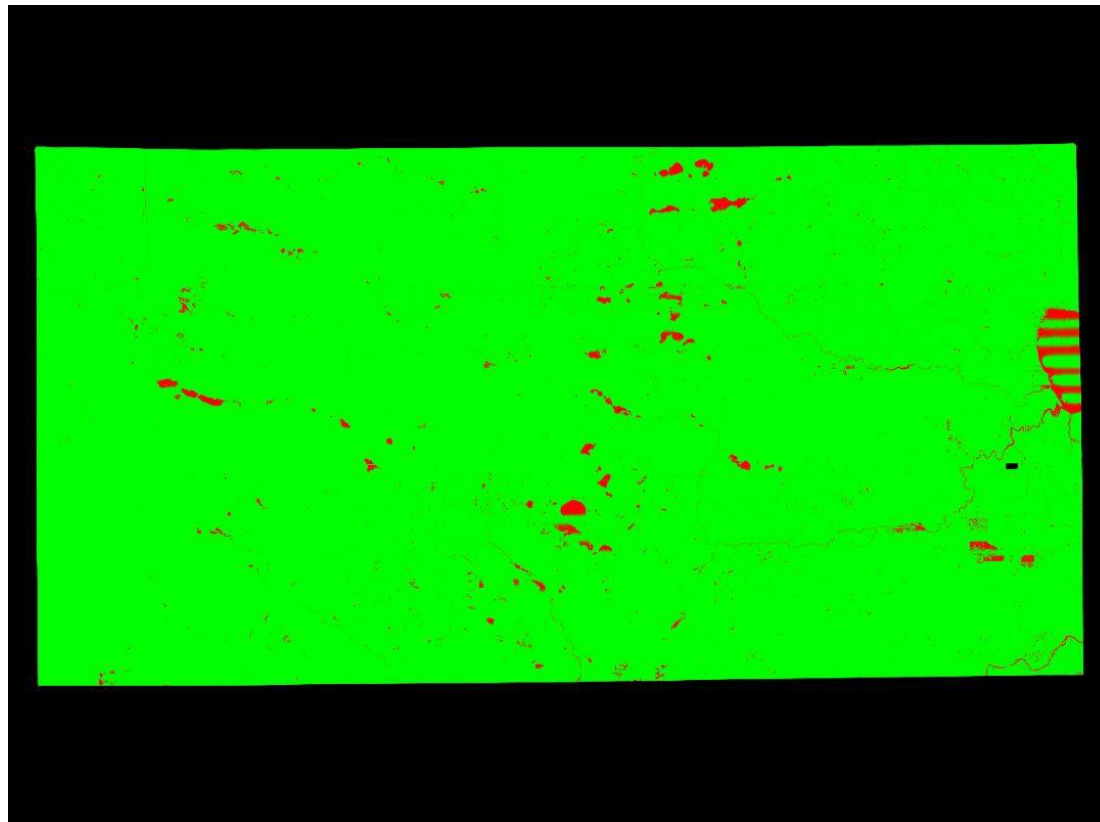
File	Number of First Returns	Area of Swath	Point Density	NPS
214.las	166,015,441	837,194,880	0.198/2.131	2.246/0.685
216.las	174,383,188	837,617,024	0.208/2.239	2.192/0.668
303.las	183,111,506	840,488,896	0.218/2.347	2.142/0.653
304.las	181,196,634	844,920,384	0.214/2.303	2.159/0.658
305.las	176,147,734	822,393,536	0.214/2.303	2.161/0.659
306.las	172,012,965	821,979,328	0.209/2.250	2.186/0.666
307.las	171,838,871	819,960,000	0.210/2.260	2.184/0.666
308.las	32,890,400	149,326,912	0.220/2.368	2.131/0.650
311.las	89,457,406	410,718,016	0.218/2.347	2.143/0.653
313.las	182,850,449	842,137,088	0.217/2.336	2.146/0.654
Average			0.200/2.153 <small>pp Square US Survey Feet/ pp Square Meter</small>	2.235/0.681 <small>US Survey Feet/ Meter</small>
Aggregate	5,071,480,637	18,047,401,891	0.281/3.025 <small>pp Square US Survey Feet/ pp Square Meter</small>	1.886/0.575 <small>US Survey Feet/ Meter</small>

2.3 Report on Data Voids (Swath Data)

The USGS LiDAR Base Specification Version 1.2 states that: "Data voids within a single swath are not acceptable, except in the following circumstances:

- (1) where caused by water bodies.
- (2) where caused by areas of low near infra-red (NIR) reflectivity such as asphalt or composition roofing and
- (3) where appropriately filled-in by another swath."

The purpose of this section is to show graphically where possible LiDAR data voids are located. Data voids can be caused by a lack of coverage at the time of collection, water bodies not reflecting the laser beam back to the receiver, LiDAR occlusions caused by objects above ground like tall buildings, etc. The intention of this test is to isolate the first example of LiDAR data voids. A close inspection must be done on the results to determine if the LiDAR coverage was collected and processed to meet the intended specifications.



2.4 Report on Spatial Distribution Verification

The USGS LiDAR Base Specification Version 1.2 states that: "The spatial distribution of geometrically usable points is expected to be uniform. Although it is understood that LiDAR instruments do not produce regularly gridded points, collections should be planned and executed to produce a first-return point cloud that approaches a regular lattice of points, rather than a collection of widely spaced high density profiles of the terrain. The uniformity of the point density throughout the dataset is important and will be assessed using the following steps:

- (1) Generating a density grid from the data with cell sizes equal to the design NPS times 2, using a radius equal to the design NPS
- (2) Ensuring at least 90 percent of the cells in the grid contain at least one LiDAR point.
- (3) The assessment is to be made against individual (single) swaths, using only the first-return points located within the geometrically usable center portion (typically 90 percent) of each swath.

Excluding acceptable data voids previously identified in this specification.

Swath	Percentage of Cells that Contain ≥ 1
102	97.53%
103	98.13%
104	98.43%
105	98.51%
106	98.16%
107	96.93%
108	95.35%
109	94.29%
110	93.94%
111	90.99%
112	91.82%
113	93.55%
114	92.85%
117	97.17%
203	97.20%
204	96.56%
205	95.52%
206	95.53%
207	95.29%
208	95.98%
209	97.11%
210	92.41%

211	96.10%
212	95.10%
213	96.25%
214	95.98%
216	97.95%
303	97.86%
304	97.71%
305	95.23%
306	94.53%
307	95.17%
308	99.13%
311	97.06%
313	97.40%

Cells containing at least 1 first return LiDAR point(s) = 701,194,237

Cells not containing at least 1 first return LiDAR point(s) = 20,611,624

Percentage of cells in the grid that contain at least 1 first return LiDAR point(s) = 97.14% (Requirement is 90%)

3.1 Report on Vertical Accuracy (Boresighted Data)

A clear and open area can be characterized as a flat highly reflective surface with little to no vegetative coverage with low slope gradients. Examples could be parking-lots, grass fields, etc. Ground that has been plowed or otherwise disturbed is not acceptable. All tested locations should be photographed showing the position of the tripod and the surrounding area ground condition.

The purpose of this section is to report on the fundamental vertical accuracy of the LiDAR data measured against surveyed ground check points.

Point ID	Latitude (Global)	Longitude (Global)	Easting	Northing	Elevation	MSL NAVD88 LIDAR	ΔZ (FT)	ΔZ^2
NVA001	43.99653150	-89.52182633	2094333.068	728055.192	1010.745	1010.5825	0.163	0.026
NVA002	43.98977111	-89.35689755	2137752.908	725882.667	840.349	840.3825	-0.034	0.001
NVA003	44.00306263	-89.17734456	2184958.836	731142.976	838.574	838.468	0.106	0.011
NVA004	44.00506140	-88.98688230	2235062.582	732423.186	782.179	782.1135	0.065	0.004
NVA005	44.04628773	-88.97685781	2237515.613	747482.882	764.352	764.254	0.098	0.010
NVA006	44.05936071	-89.04178067	2220391.408	752045.429	779.739	779.4045	0.335	0.112
NVA007	44.08326374	-89.21550676	2174642.773	760281.579	903.663	903.7315	-0.068	0.005
NVA008	44.06833150	-89.14188009	2194045.155	755028.929	821.143	821.17	-0.027	0.001
NVA009	44.09029452	-89.43555528	2116803.912	762376.884	1045.789	1045.6395	0.149	0.022
NVA010	44.09373566	-89.49709072	2100628.548	763527.848	1144.940	1144.769	0.171	0.029
NVA011	44.06827946	-89.56279415	2083415.215	754150.686	1104.499	1104.4025	0.097	0.009
NVA012	44.12665510	-89.56282278	2083296.123	775431.156	1073.012	1073.026	-0.014	0.000
NVA013	44.12863588	-89.49549277	2100971.393	776253.073	1092.268	1092.287	-0.019	0.000
NVA014	44.13376975	-89.36508385	2135198.779	778358.537	1109.143	1109.028	0.115	0.013
NVA015	44.14445224	-89.25719127	2163490.851	782486.755	967.544	967.4705	0.073	0.005
NVA016	44.14197686	-89.14878074	2191957.421	781856.387	903.855	903.655	0.200	0.040
NVA017	44.10885228	-89.06801904	2213292.657	770008.156	863.851	863.71	0.141	0.020
NVA018	44.14142970	-88.96617017	2239895.583	782198.773	768.431	768.3395	0.091	0.008
NVA019	44.18464697	-88.98667275	2234322.167	797886.779	803.995	803.9305	0.064	0.004
NVA020	44.21359440	-89.03661393	2221099.970	808283.995	867.999	867.931	0.068	0.005

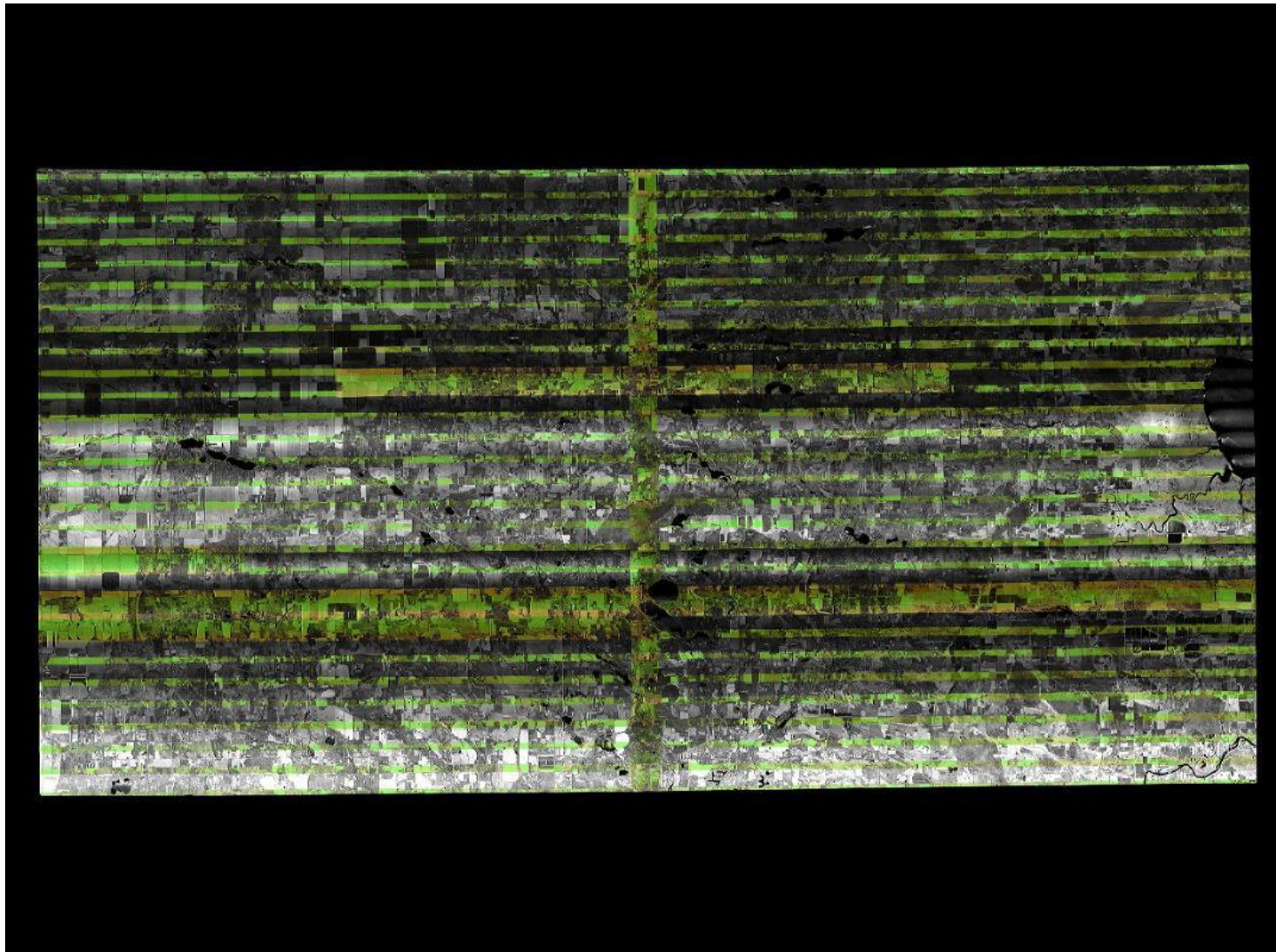
NVA021	44.17571780	-89.08692222	2208060.870	794327.976	878.143	878.001	0.142	0.020
NVA022	44.22843855	-89.13873838	2194268.041	813402.442	919.015	918.985	0.030	0.001
NVA023	44.17120543	-89.25027990	2165217.384	792255.689	949.768	949.785	-0.017	0.000
NVA024	44.21365465	-89.24703243	2165929.719	807738.159	1052.890	1052.779	0.111	0.012
NVA025	44.21384373	-89.31168711	2148976.958	807660.587	1077.193	1077.1545	0.038	0.001
NVA026	44.22837489	-89.36490646	2134982.677	812847.292	1212.161	1211.8765	0.284	0.081
NVA027	44.18130856	-89.33453068	2143082.115	795751.190	1103.817	1103.641	0.176	0.031
NVA028	44.19444491	-89.44621531	2113750.954	800325.901	1130.688	1130.47	0.218	0.048
NVA029	44.20883935	-89.48345919	2103949.961	805510.812	1110.333	1110.446	-0.113	0.013
NVA030	44.22620587	-89.56367585	2082882.223	811721.805	1084.725	1084.667	0.058	0.003
NVA031	44.19224934	-89.56292861	2083142.995	799343.609	1080.030	1080.04	-0.010	0.000
NVA032	44.17049508	-89.46596667	2108626.401	791561.094	1122.716	1122.38	0.336	0.113
NVA033	44.15580670	-89.52216962	2093910.018	786116.931	1099.699	1099.2255	0.474	0.224
NVA034	44.01488786	-89.27551143	2159092.204	735213.933	856.825	856.6	0.225	0.051
NVA035	44.04768455	-89.33837742	2142459.464	747031.813	870.490	870.4345	0.056	0.003
NVA036	44.07577792	-89.24555861	2166770.900	757479.890	895.711	895.7435	-0.033	0.001
NVA037	43.99535411	-88.93959735	2247548.122	729039.494	777.566	777.4125	0.154	0.024
NVA038	44.02679921	-88.90145972	2257432.575	740631.337	821.218	821.197	0.021	0.000
NVA039	44.08955785	-88.89574704	2258632.053	763527.454	756.029	756.0155	0.014	0.000
NVA040	44.21332712	-88.90683563	2255127.304	808606.169	822.571	822.656	-0.085	0.007

	US Survey Feet	Meters	Centimeters	QL2 Requirement (cm)
Z Average	0.10	RMSE:	0.157	0.048
Z Min:	-0.11	* 1.9600	0.308	0.094
Z Max:	0.47			PASS

3.2 Report on Intraswath Relative Accuracy

The USGS LiDAR Base Specification Version 1.2 states that: "Relative accuracy within overlap between adjacent swaths: ≤ 8 cm RMSDz"

The purpose of this section is to show a graphic of the flight line separation raster for all the data processed. This grid/image shows the vertical separation of flight lines by thematically coloring the separation magnitude on a color ramp based on absolute distance. This color thematic rendering is modulated by intensity to show land cover features. If there is no flight line overlap, the raster is displayed as grayscale intensity alone.



1.8.1 Report on FSR per Project (Measurable) - Continued

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1	Area 2	Overlap Area	RMSDz (US Survey Feet/Meter)
102	103	852518751.665	861013548.738	208637440.867	0.202 / 0.062
102	210	35092450.745	37097840.897	20268549.165	0.208 / 0.064
102	117	851636938.153	850835208.516	183792908.633	0.180 / 0.055
107	108	855657044.764	848174815.334	190296451.887	0.203 / 0.062
107	210	58618903.560	62819358.276	9982387.347	0.237 / 0.072
107	106	855657044.764	845314597.103	215155788.604	0.229 / 0.070
112	113	199068449.459	839948926.719	41083607.261	0.262 / 0.080
112	311	184856051.587	356034943.204	164309003.174	0.287 / 0.087
112	111	54273662.433	840339163.802	56864026.528	0.222 / 0.068
204	205	836144225.218	826237173.995	178046917.569	0.200 / 0.061
204	210	35268895.299	33540621.345	19314419.018	0.222 / 0.068
204	203	836301820.862	832212068.896	213282080.494	0.214 / 0.065
209	210	32698907.257	32412372.609	18863379.439	0.258 / 0.079
209	208	831200335.347	830793649.055	177670755.326	0.169 / 0.051
214	210	35932931.244	31663715.149	19742550.354	0.204 / 0.062
214	213	745681950.893	737533058.616	168154474.570	0.172 / 0.052
214	313	736950214.321	729088709.084	187728321.110	0.223 / 0.068
306	210	34527120.894	32726719.188	19448241.076	0.189 / 0.058
306	307	844749629.347	839964961.098	187733968.606	0.180 / 0.055
306	305	843887394.161	842762149.185	202725110.149	0.186 / 0.057
103	210	36616158.637	35407513.222	20316464.832	0.219 / 0.067
103	104	861013548.738	852314928.742	195975236.260	0.184 / 0.056
108	210	37028596.814	35673744.710	19863302.474	0.239 / 0.073
108	109	848174815.334	848272690.971	216518873.559	0.255 / 0.078
108	211	194468375.110	50576631.572	13260780.803	0.268 / 0.082
113	210	38721038.592	36069983.874	19464339.198	0.268 / 0.082
113	114	839948926.719	834095873.300	186351466.441	0.219 / 0.067
113	311	354419023.770	356034943.204	86195695.955	0.287 / 0.087
205	210	31649577.562	27053659.344	19000711.853	0.223 / 0.068
205	206	1652474347.990	1662959570.166	198314932.709	0.210 / 0.064
210	216	34019490.271	33245993.203	19397153.557	0.238 / 0.073
210	307	32759020.968	34376010.464	19104035.826	0.228 / 0.070
210	104	37774242.756	38373593.934	20096895.912	0.236 / 0.072
210	109	28025620.614	34975580.537	17568668.271	0.285 / 0.087

Waushara, WI Swath QC LiDAR QA/QC Report

Adjacent Flight Line 1	Adjacent Flight Line 2	Area 1	Area 2	Overlap Area	RMSDz (US Survey)
210	114	34972903.025	37011101.796	19413106.898	0.246 / 0.075
210	206	34739486.747	32292534.689	18898491.853	0.206 / 0.063
210	303	37185166.317	32956035.421	19669350.321	0.247 / 0.075
210	105	35071090.991	35088673.166	20061751.581	0.243 / 0.074
210	110	29784347.799	29298155.446	16753873.008	0.276 / 0.084
210	117	30807475.045	33577095.125	20318546.033	0.271 / 0.083
210	207	34852901.583	28408158.233	18799433.242	0.219 / 0.067
210	212	29707180.330	25841382.122	17388178.670	0.277 / 0.084
210	304	36747976.911	36553800.711	19683446.507	0.213 / 0.065
210	311	30592349.790	35672837.208	19270072.969	0.271 / 0.083
210	106	37729163.286	34296587.567	19973433.074	0.254 / 0.077
210	111	32757418.443	34452346.178	19154286.158	0.242 / 0.074
210	203	29774451.346	34073787.146	19263844.468	0.230 / 0.070
210	208	32853063.812	33575587.413	18568857.906	0.228 / 0.070
210	213	32085270.453	30564940.212	17332659.469	0.222 / 0.068
210	305	35993725.861	31098362.945	19361682.502	0.200 / 0.061
210	313	33990698.998	33934701.129	19811852.492	0.251 / 0.077
216	114	825002763.823	831905363.039	203736165.773	0.230 / 0.070
216	203	825002763.823	829734452.169	179038750.382	0.190 / 0.058
307	111	839353072.836	840605947.020	193921489.977	0.229 / 0.070
104	105	846776900.559	860345961.817	211934363.452	0.206 / 0.063
109	211	170040376.578	145557771.612	49844708.849	0.236 / 0.072
109	110	848272690.971	835816627.434	187075323.724	0.277 / 0.085
109	212	1696545381.942	1669979691.930	184057862.332	0.278 / 0.085
206	207	830364437.576	829588159.058	178272156.606	0.181 / 0.055
211	110	49807712.599	47865630.344	11428521.087	0.271 / 0.083
211	212	49807712.599	45267011.150	10034978.085	0.273 / 0.083
303	304	841177194.554	848970086.362	208003970.440	0.196 / 0.060
303	313	841177194.554	822020219.365	182508929.412	0.181 / 0.055
308	213	84509808.625	99948926.096	18444829.031	0.194 / 0.059
308	313	85087815.869	82889989.074	24272729.279	0.224 / 0.068
105	106	860355674.321	845314597.103	201524708.693	0.200 / 0.061
110	212	1702476513.312	1677248793.564	1066347887.967	0.255 / 0.078
110	213	1668455714.778	1683768533.192	204083783.698	0.284 / 0.086
304	305	848970086.362	843239489.648	177409730.971	0.180 / 0.055

Waushara, WI Swath QC LiDAR QA/QC Report

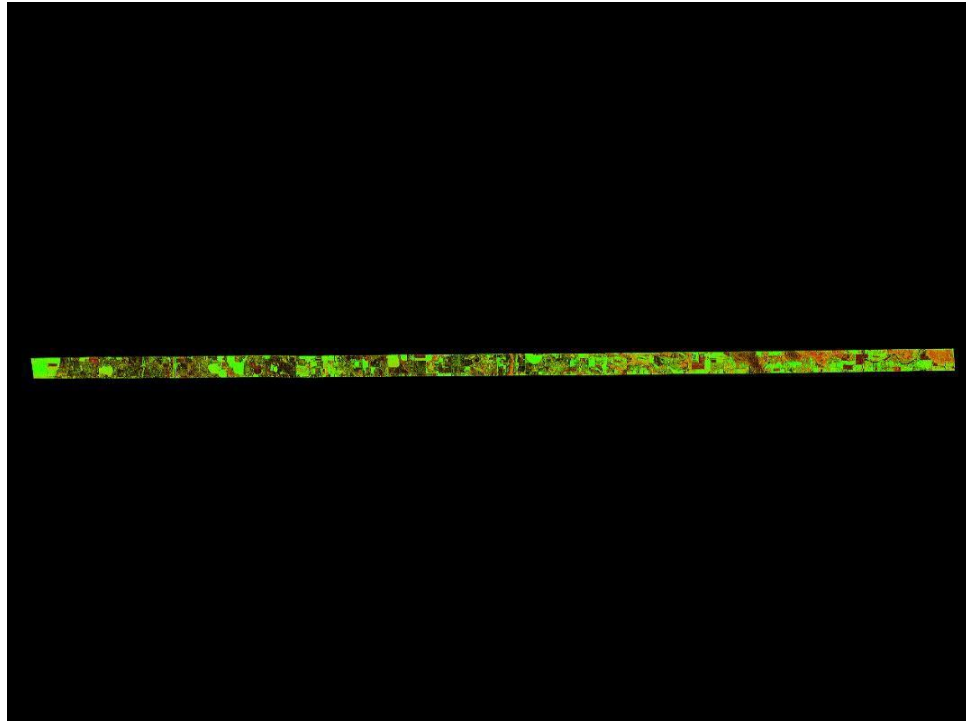
311	111	357075195.585	356471227.181	75462408.858	0.242 / 0.074
304	305	848970086.362	843239489.648	177409730.971	0.180 / 0.055
311	111	357075195.585	356471227.181	75462408.858	0.242 / 0.074

Total **0.215 / 0.066**

3.3 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line

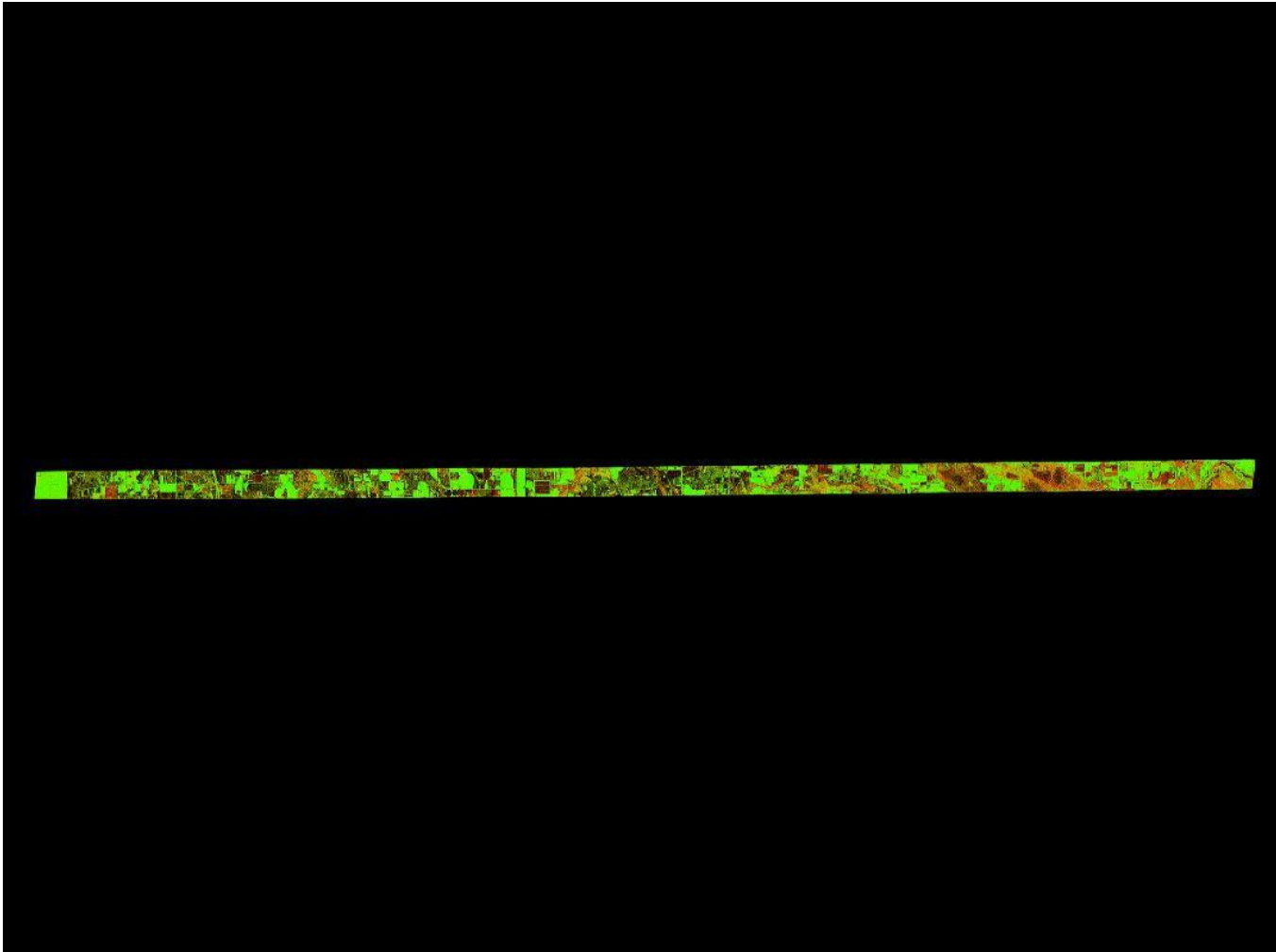
The USGS LiDAR Base Specification Version 1.2 states that: "Relative accuracy within individual swaths: ≤ 7 cm RMSDz."

The purpose of this section is to show a graphic of the relative vertical accuracy within each flight line, individually. This is done by comparing the inbound and outbound scan lines to each other as two separate surfaces and then generating a vertical separation raster from their TIN deltas. This is displayed by thematically coloring the separation magnitude on a color ramp based on absolute distance. Good LiDAR data should have a consistent green coloration across the flight line (perpendicular to flight), ignoring warmer colorations due to above ground surface features. Small color variations are to be expected. The purpose of this test is to find problematic data indicated by warming color variation trends away from the center of the scan line.



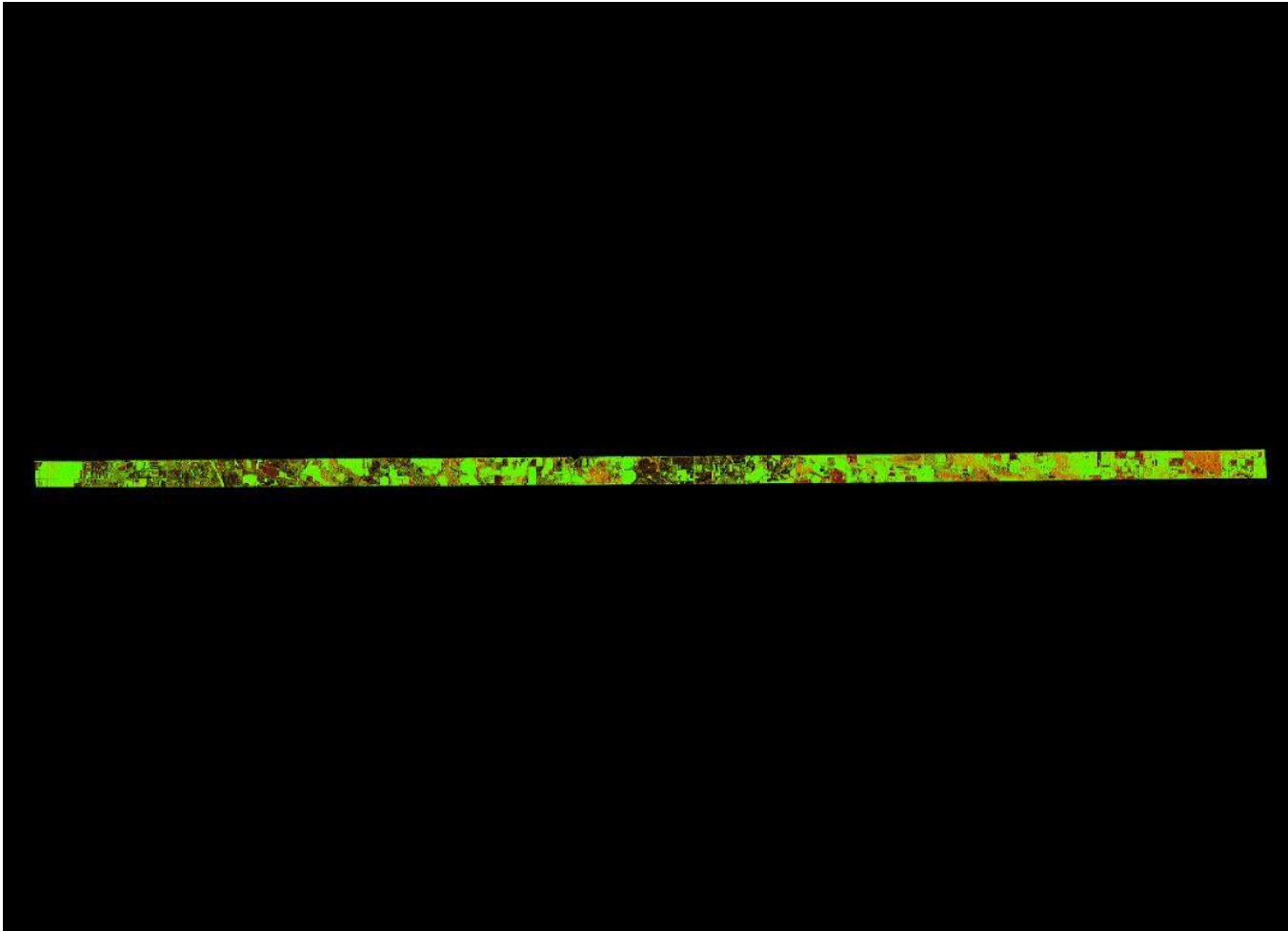
Swath 102

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



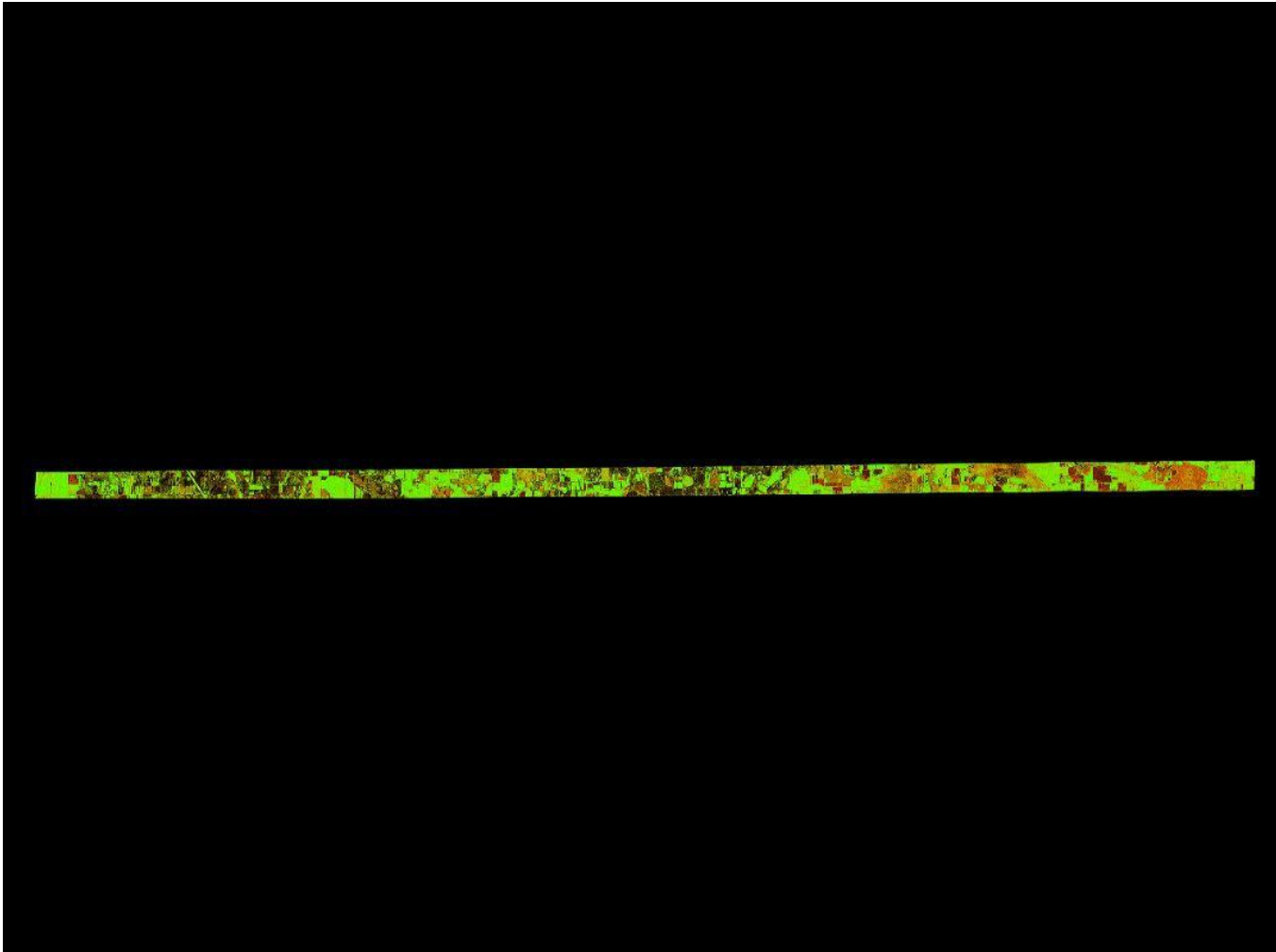
Swath 103

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



Swath 104

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



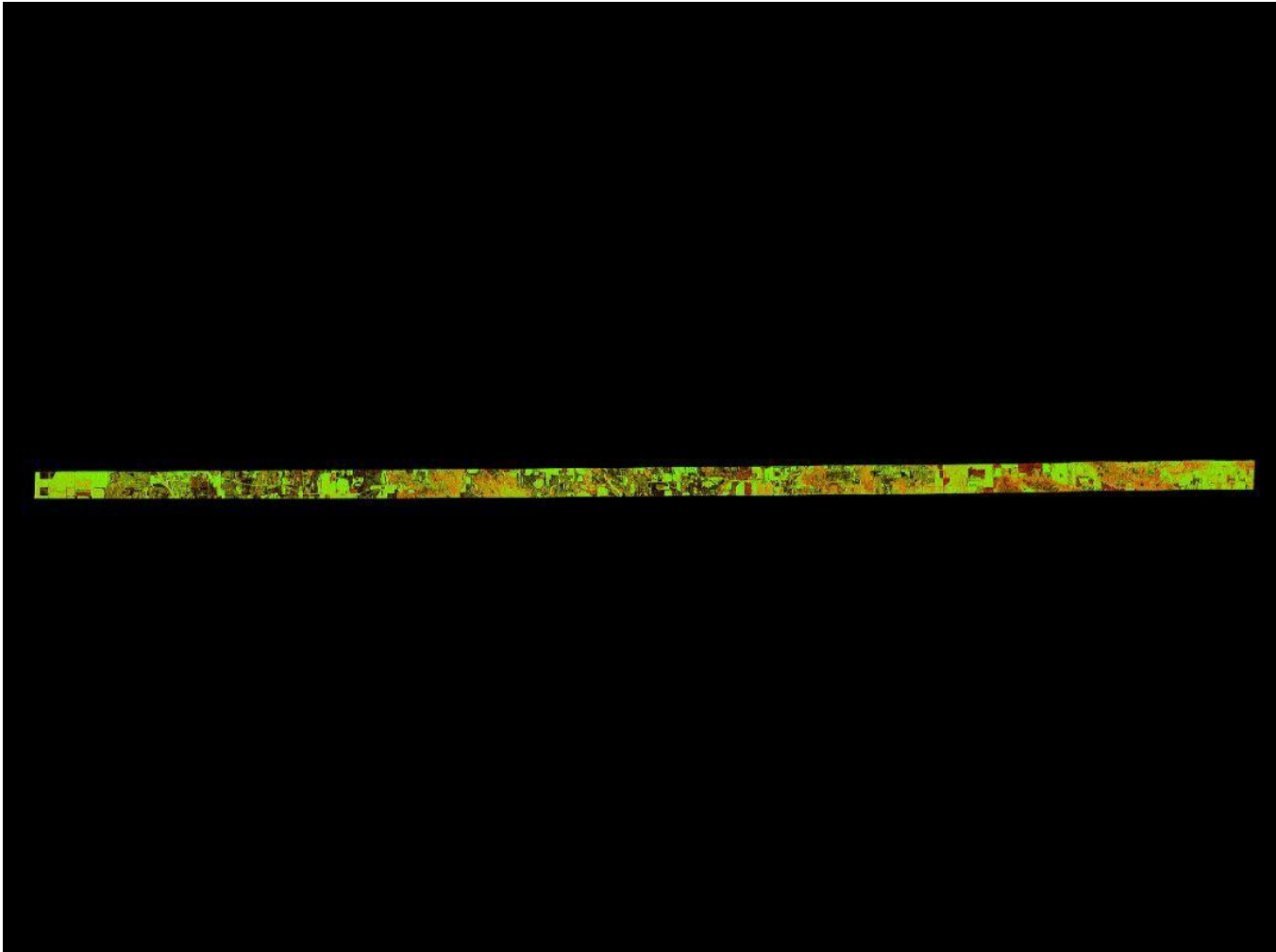
Swath 105

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



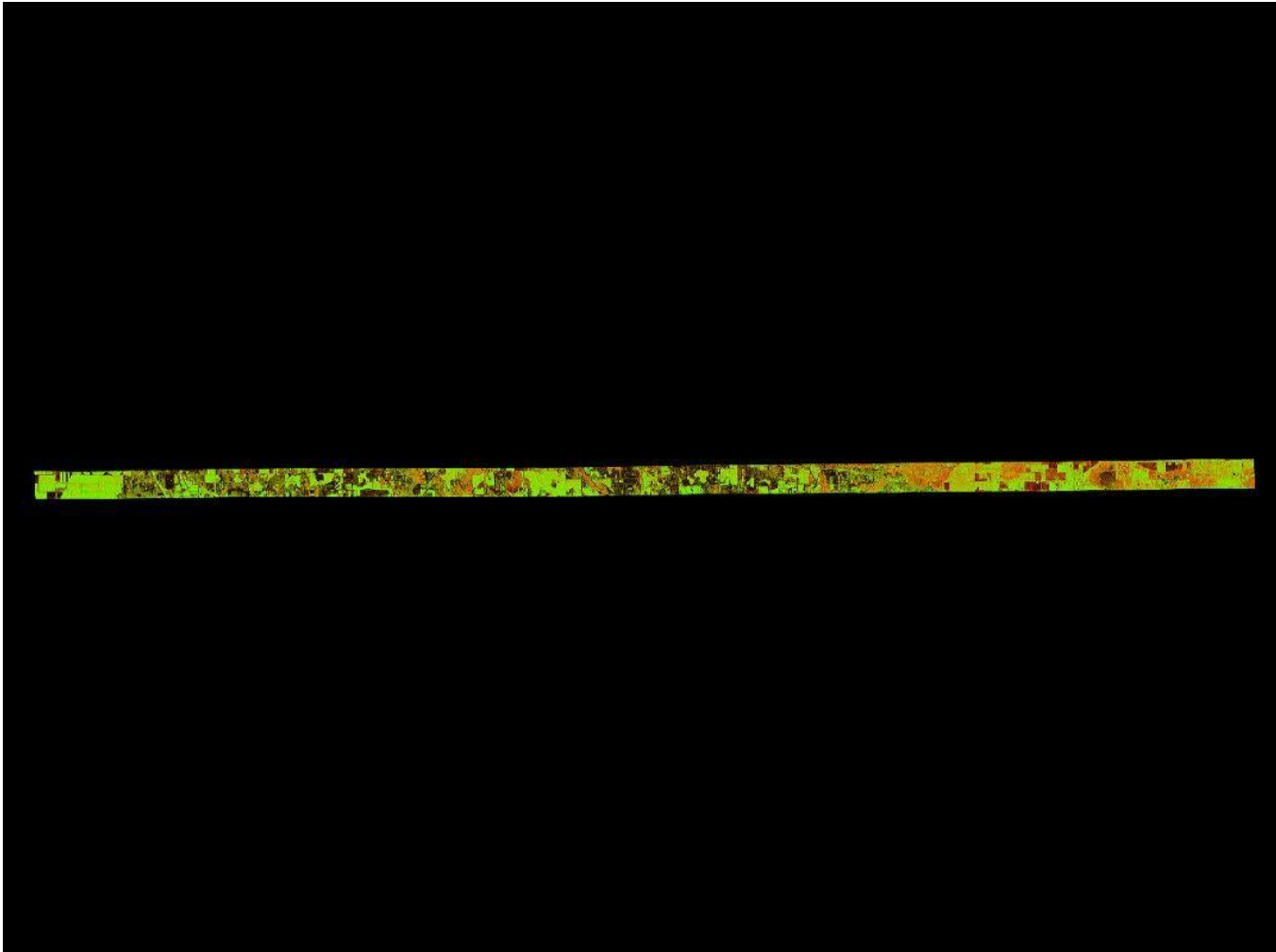
Swath 106

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



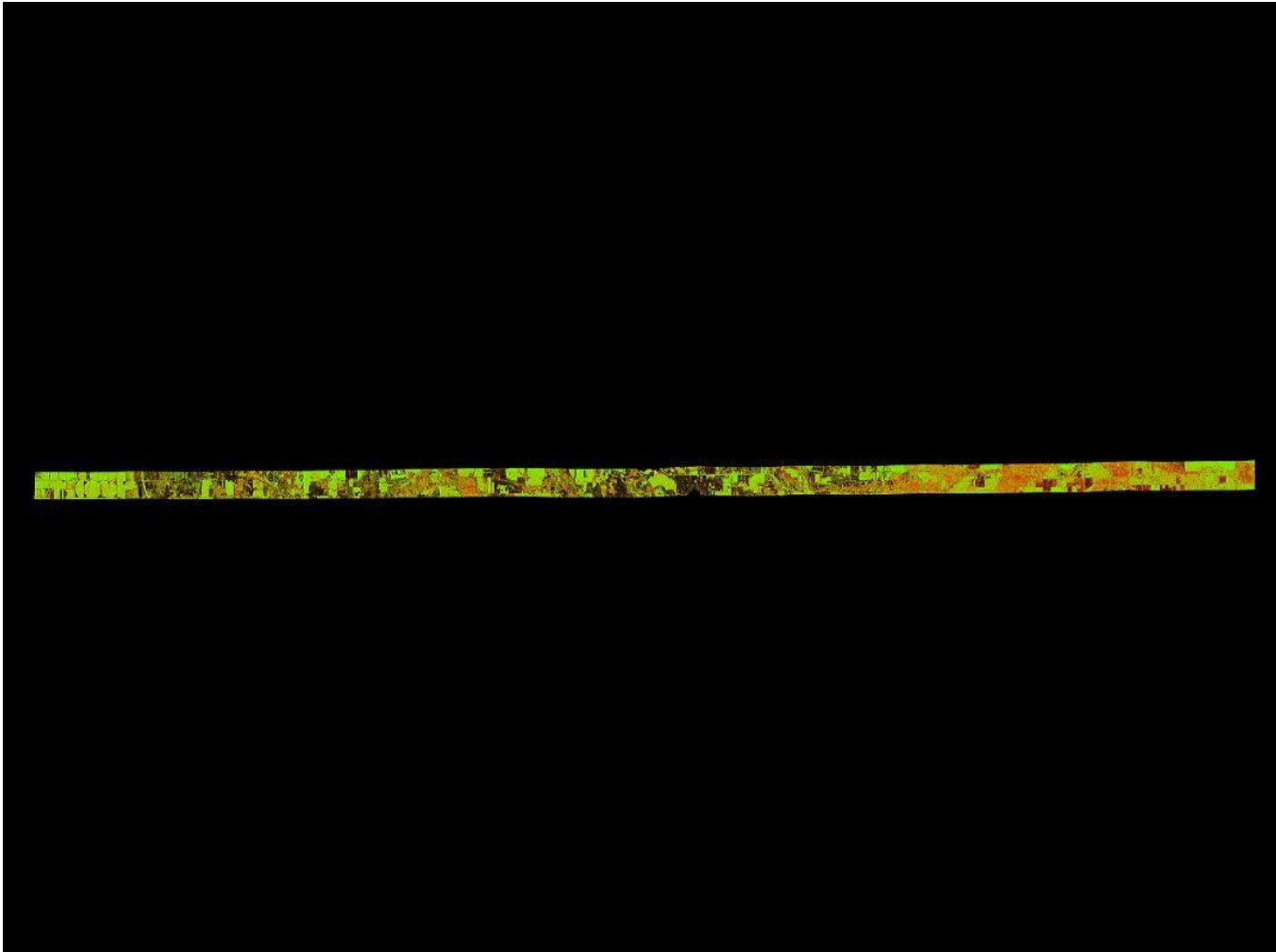
Swath 107

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



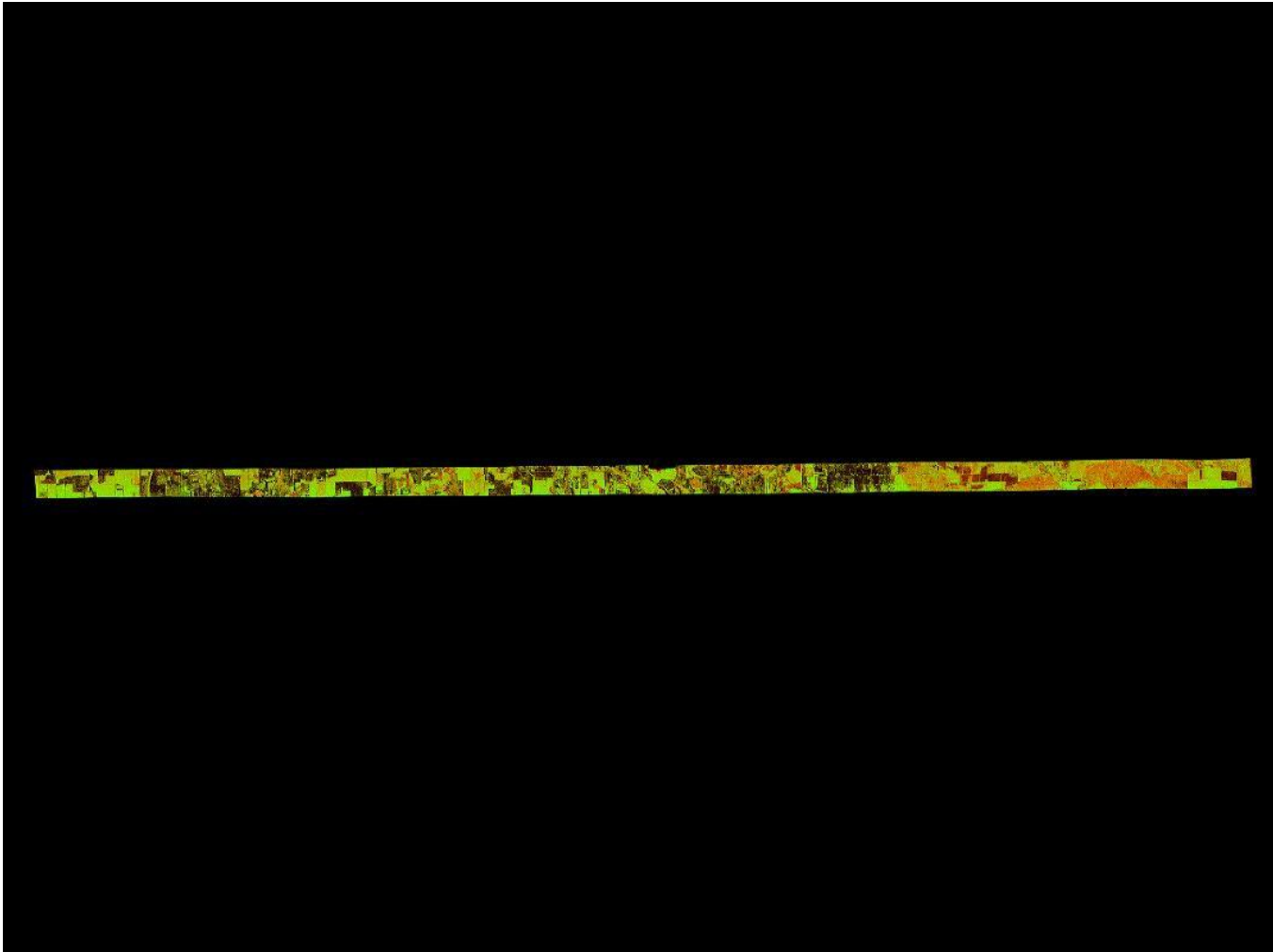
Swath 108

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



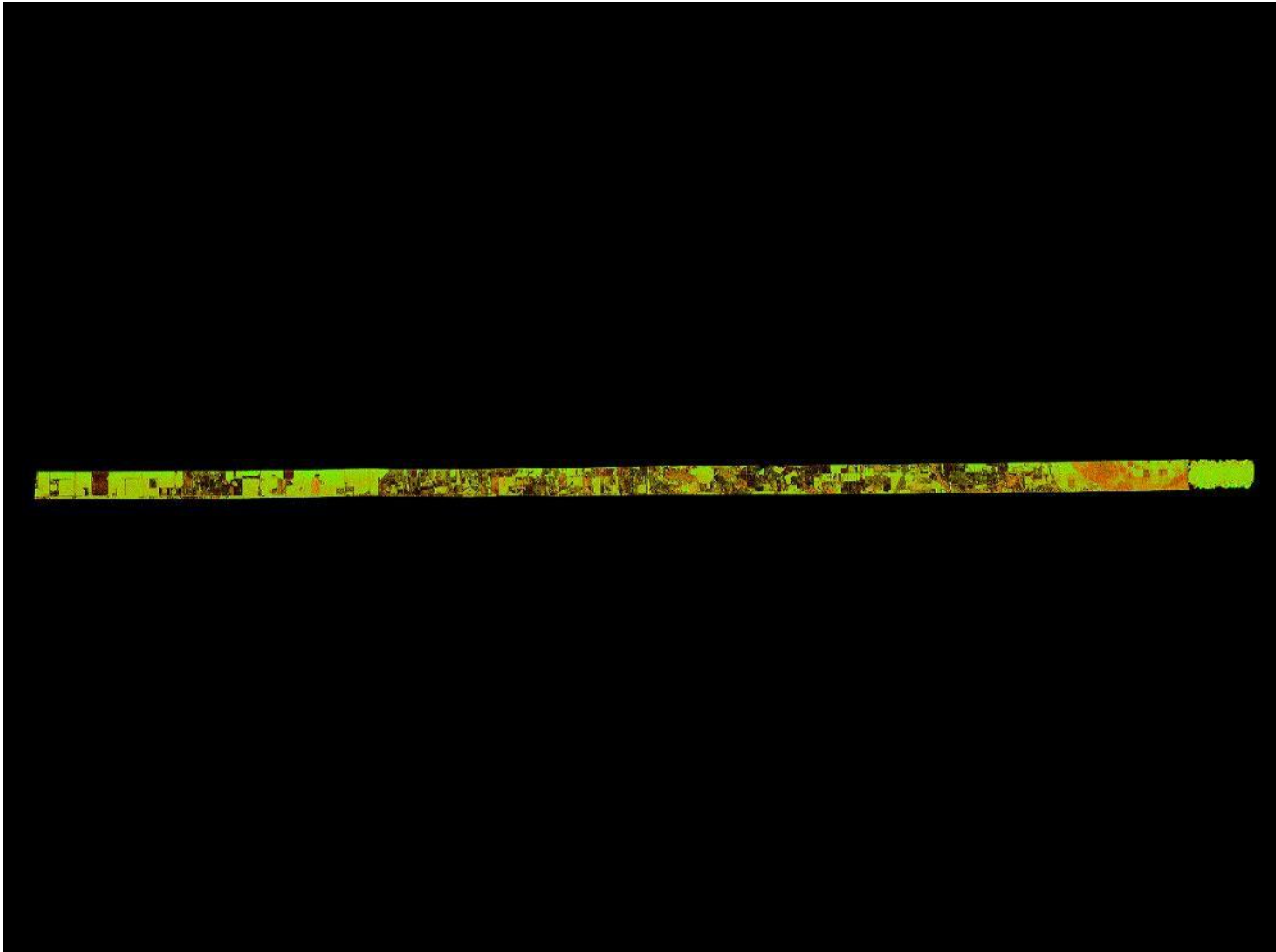
Swath 109

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



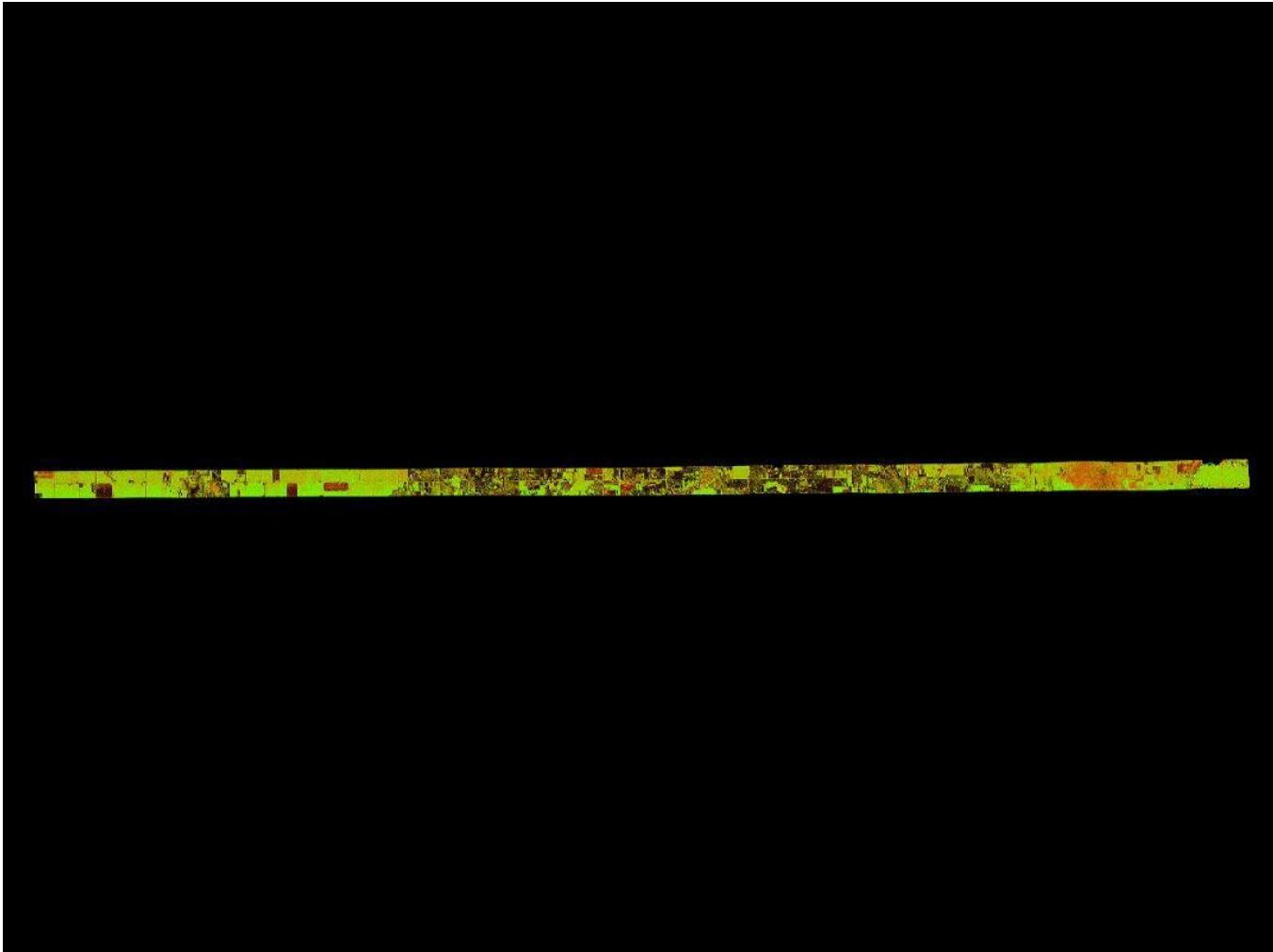
Swath 110

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



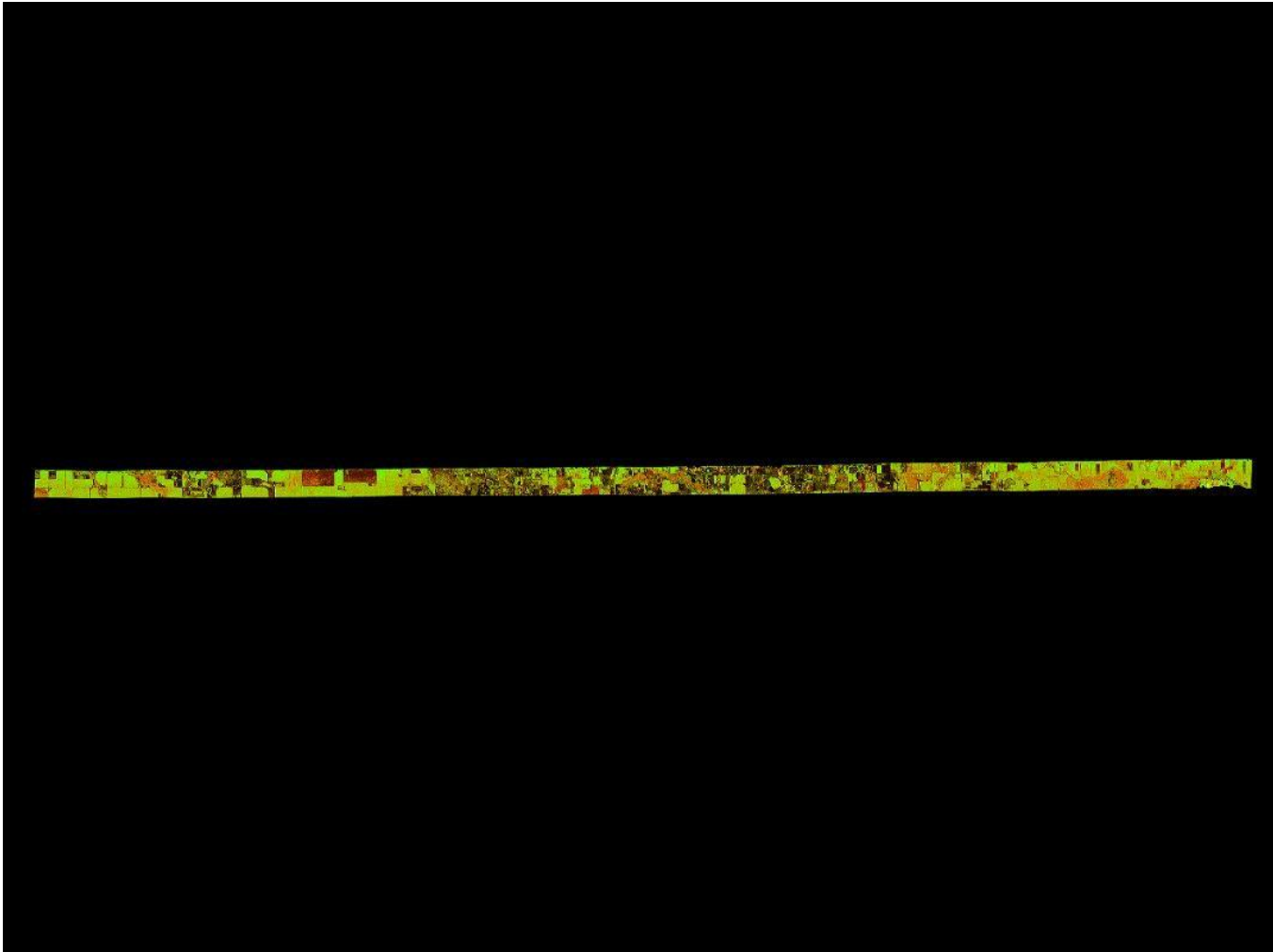
Swath 111

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



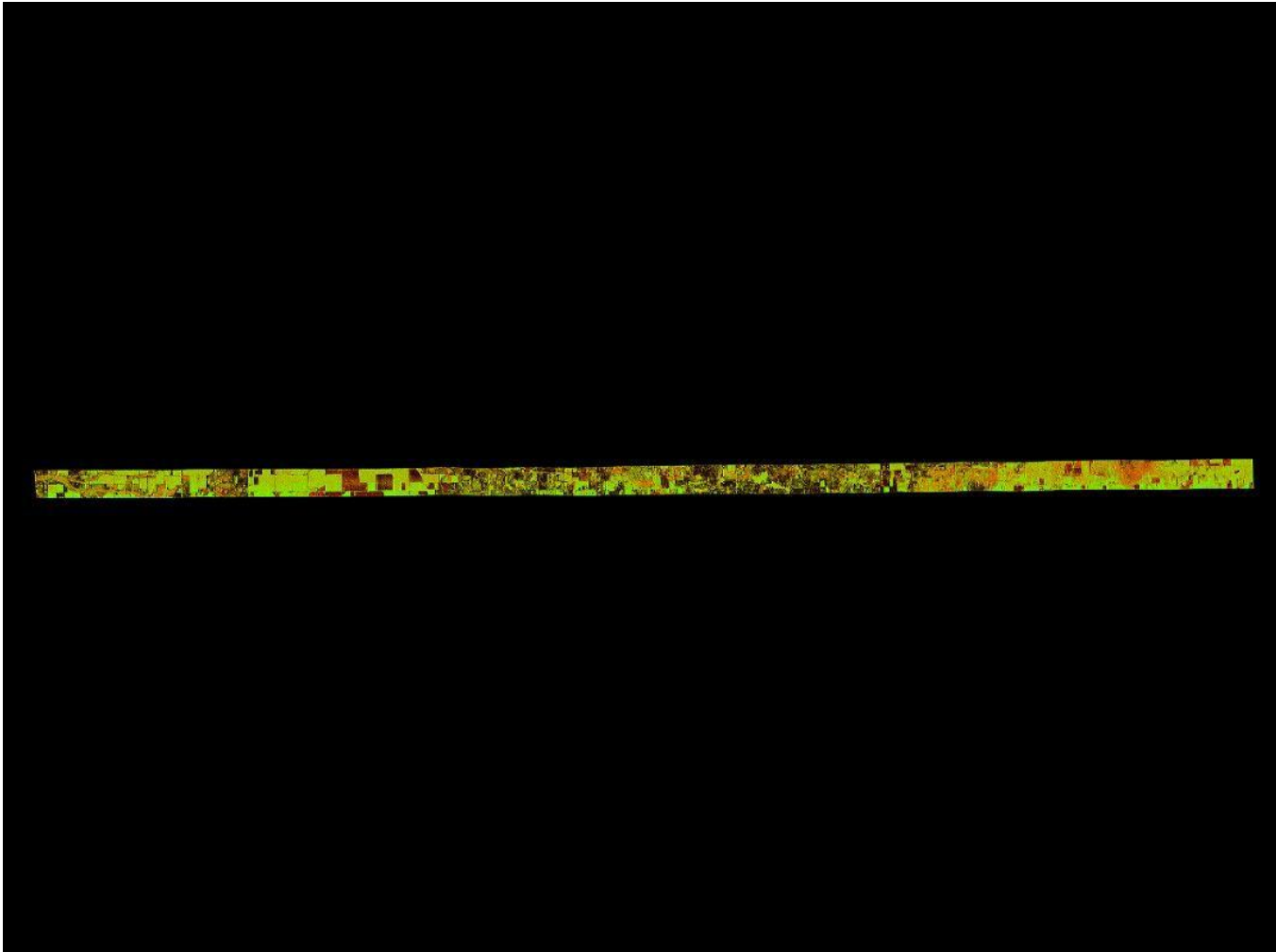
Swath 112

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



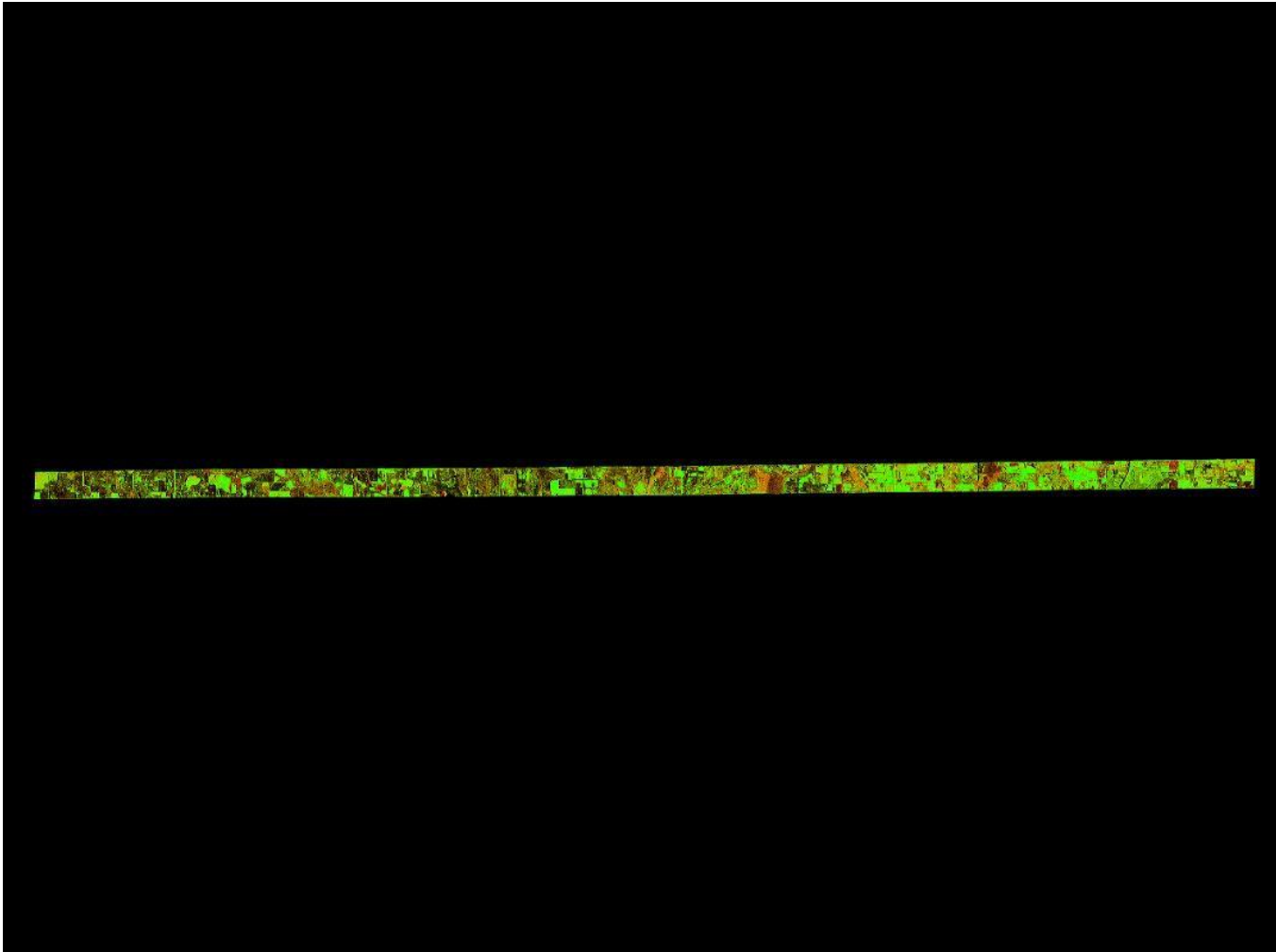
Swath 113

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



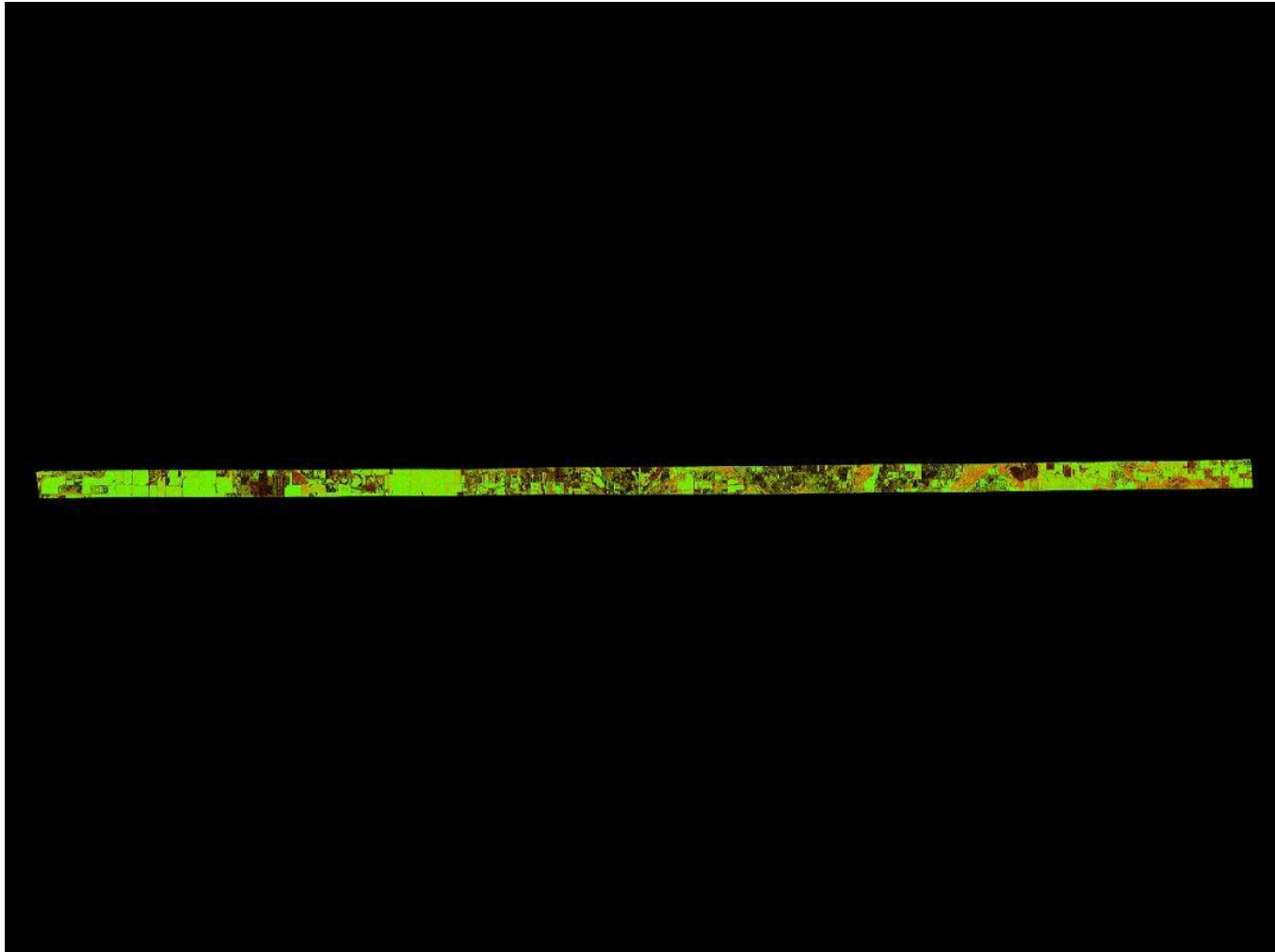
Swath 114

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



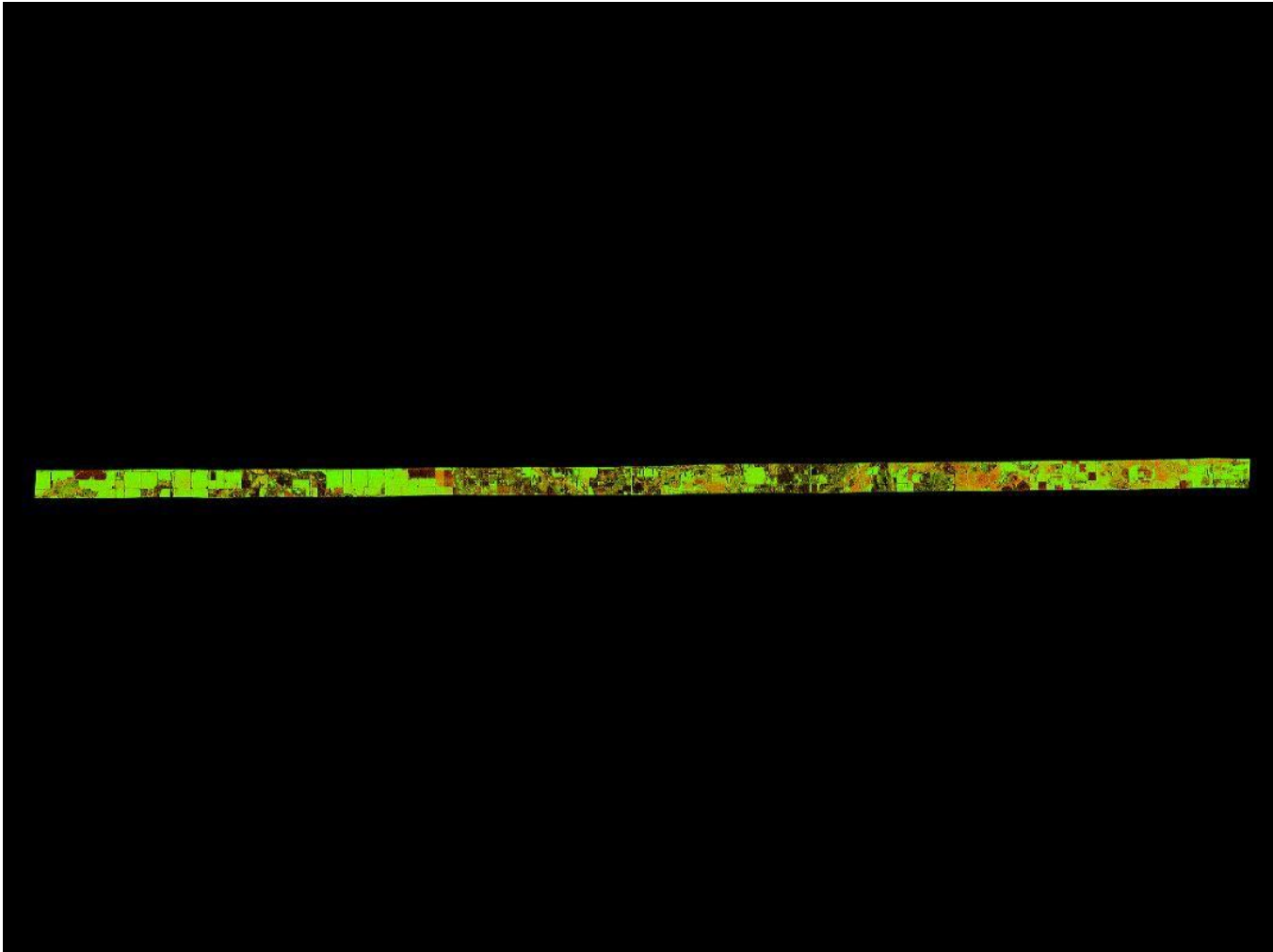
Swath 117

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



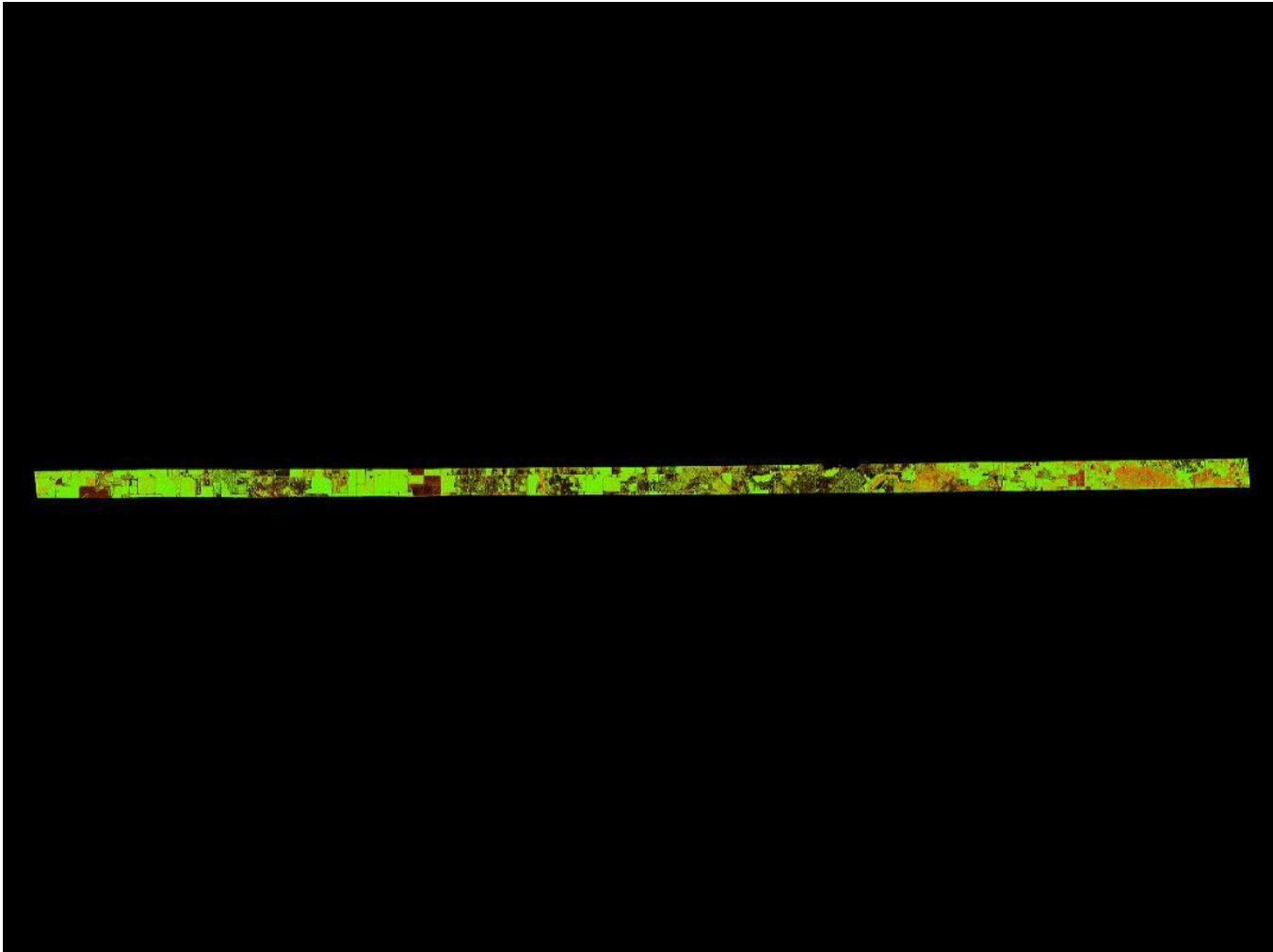
Swath 203

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



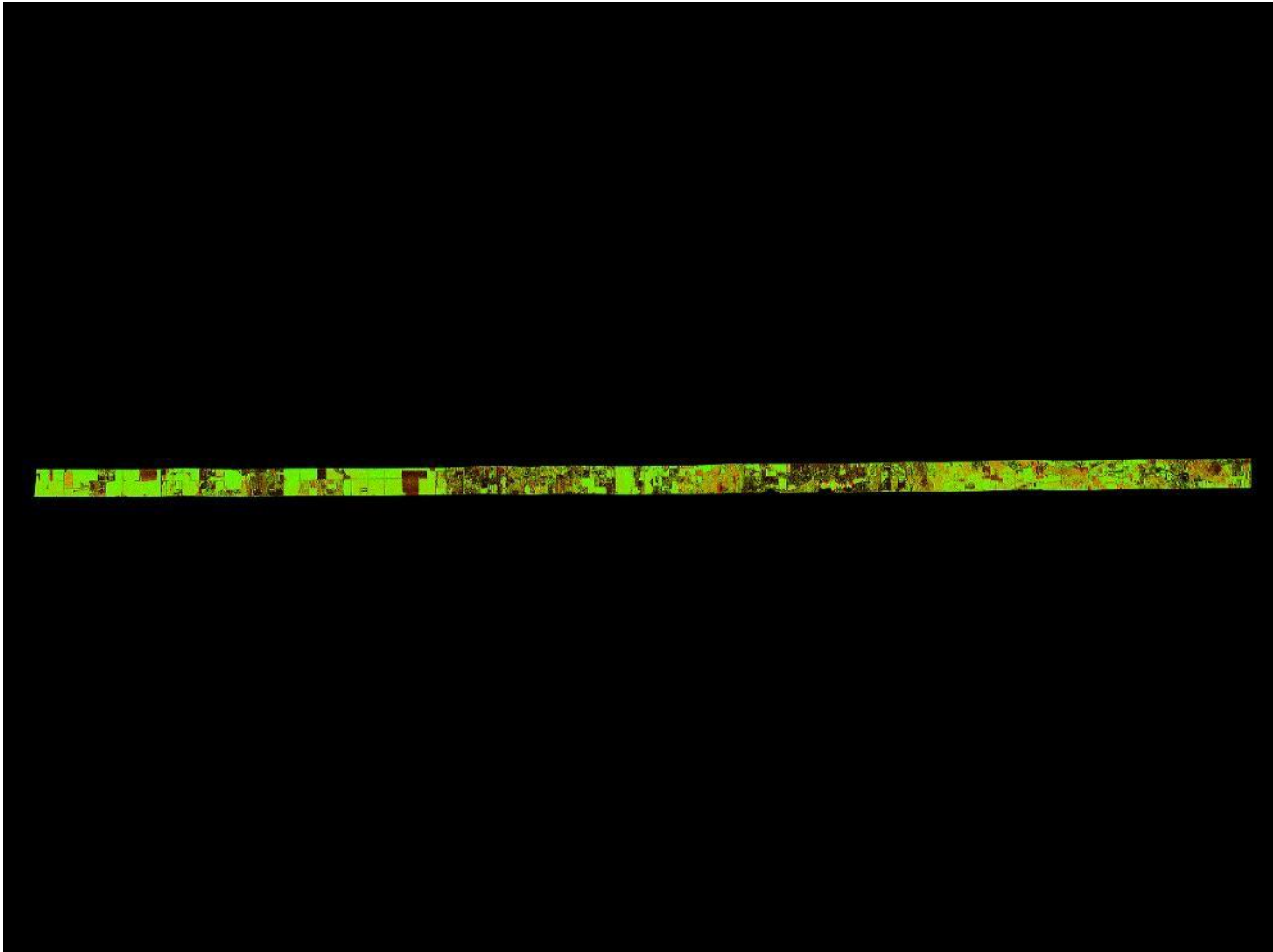
Swath 204

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



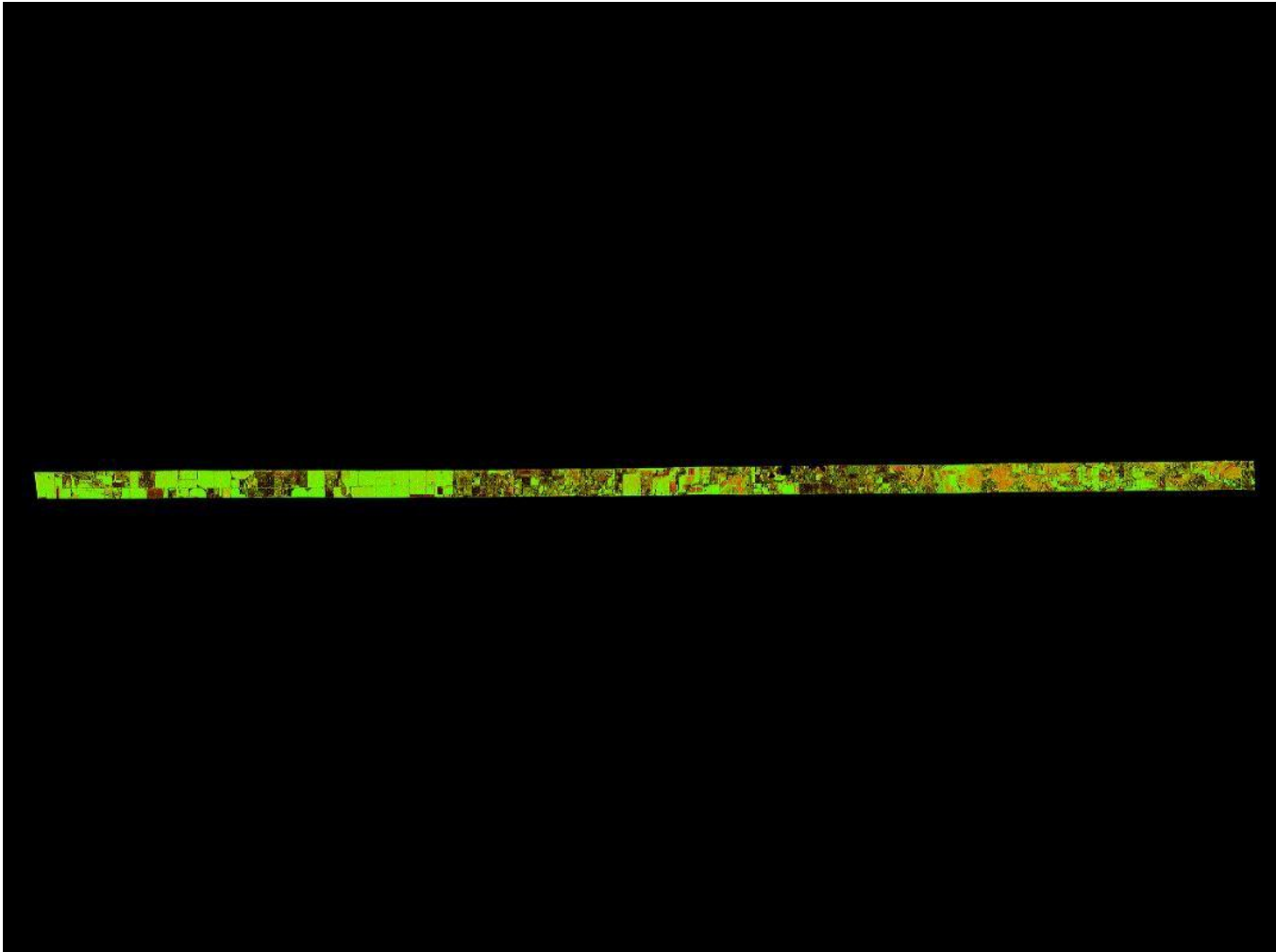
Swath 205

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



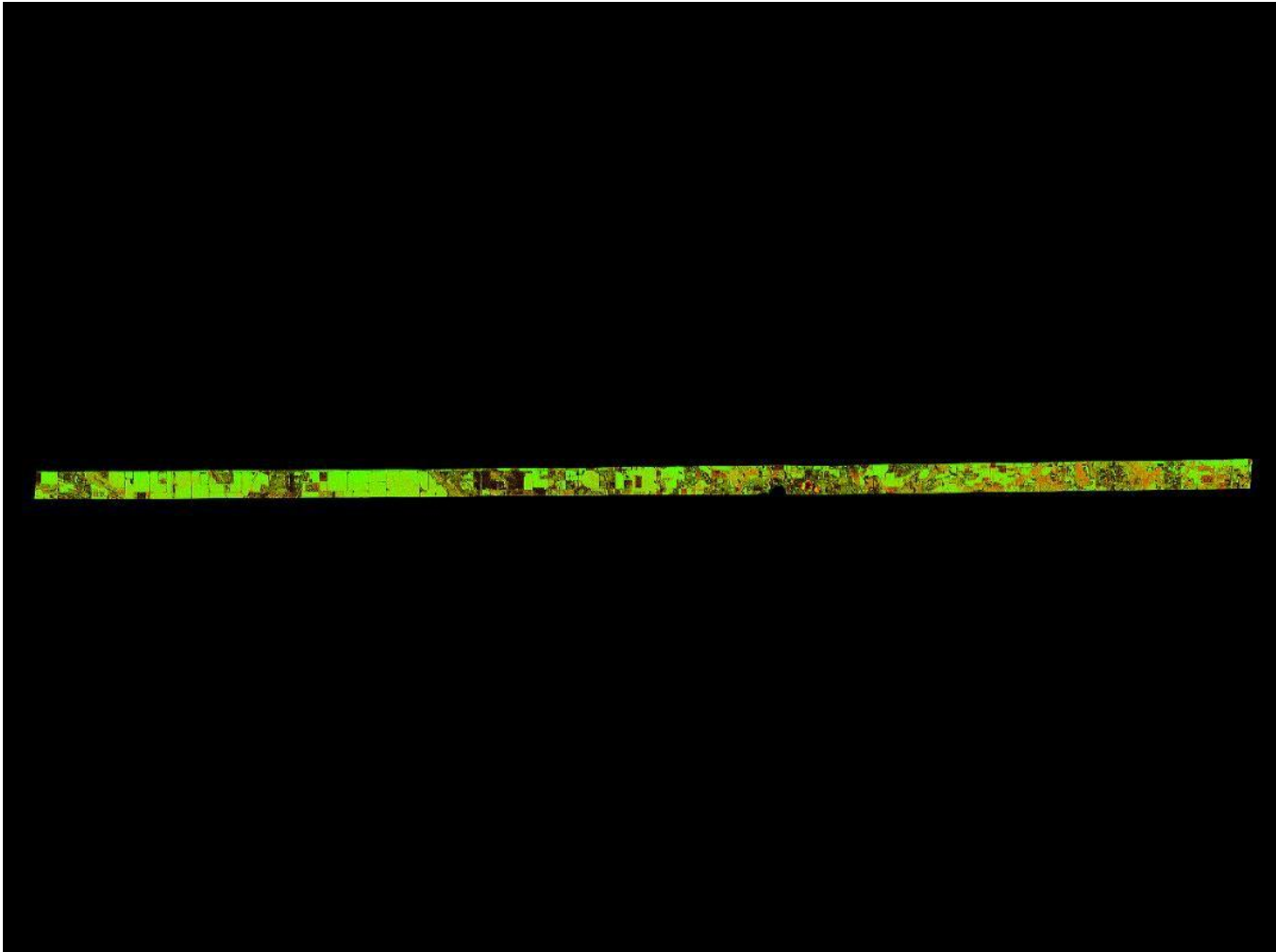
Swath 206

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



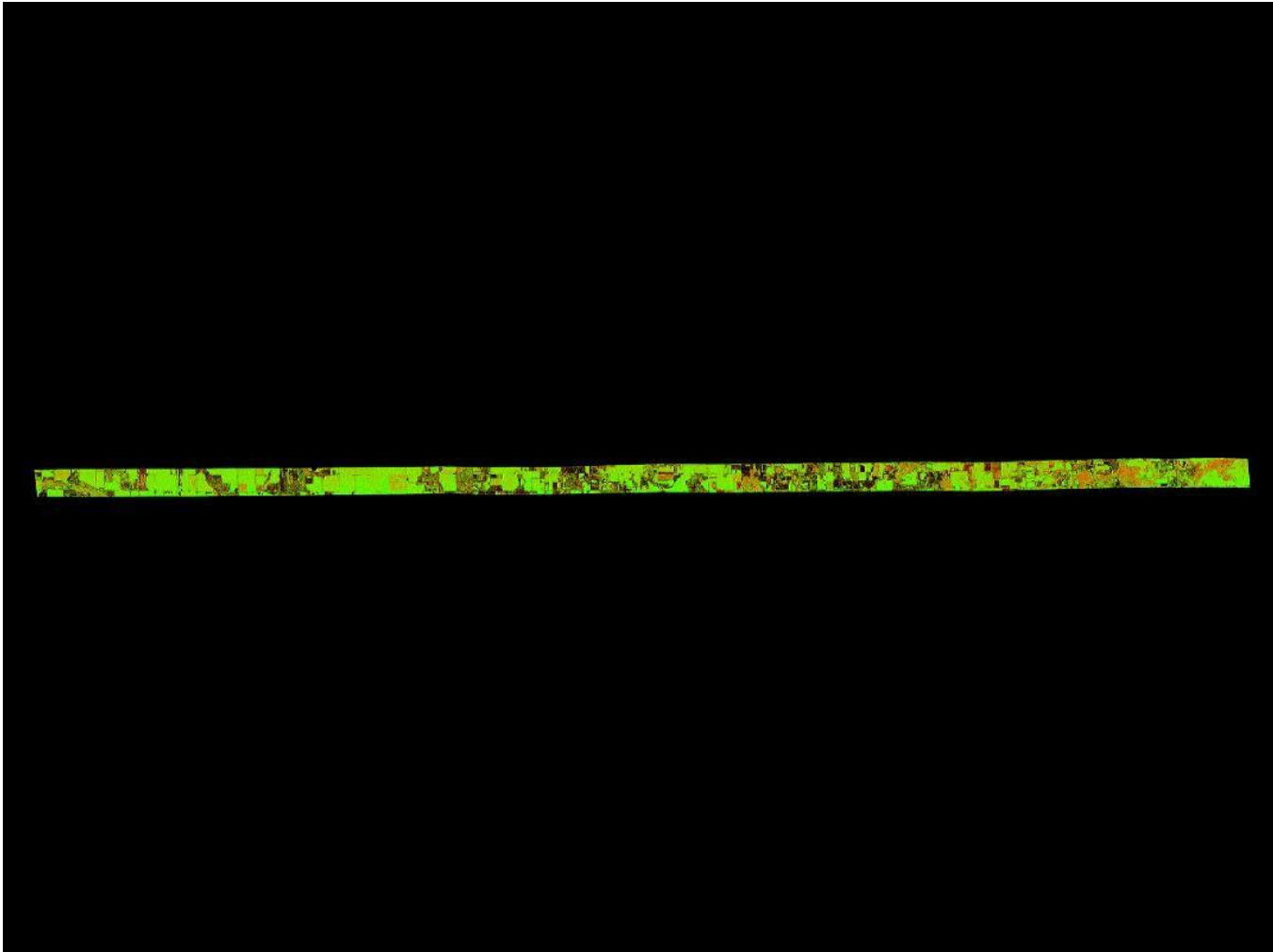
Swath 207

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



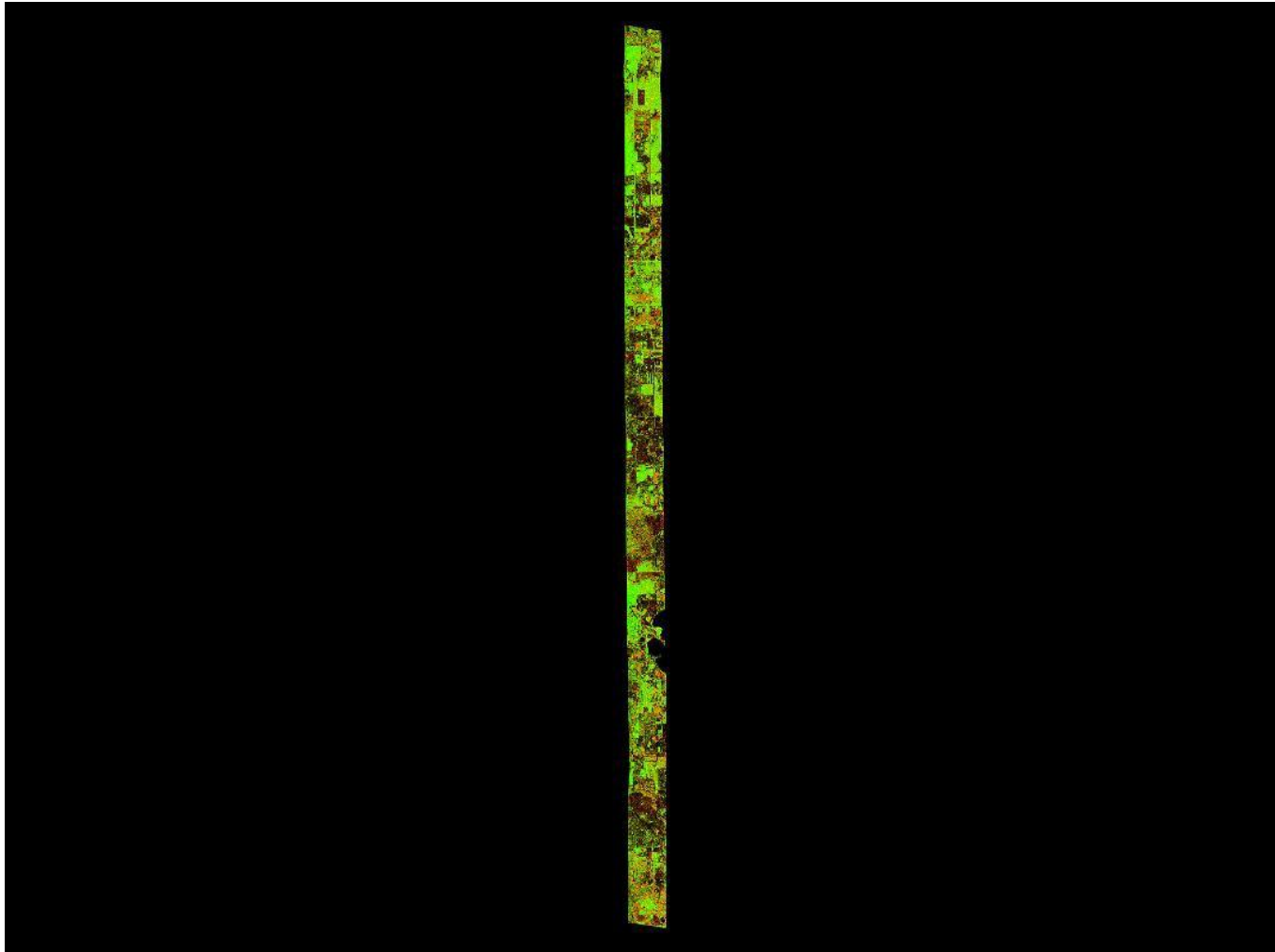
Swath 208

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



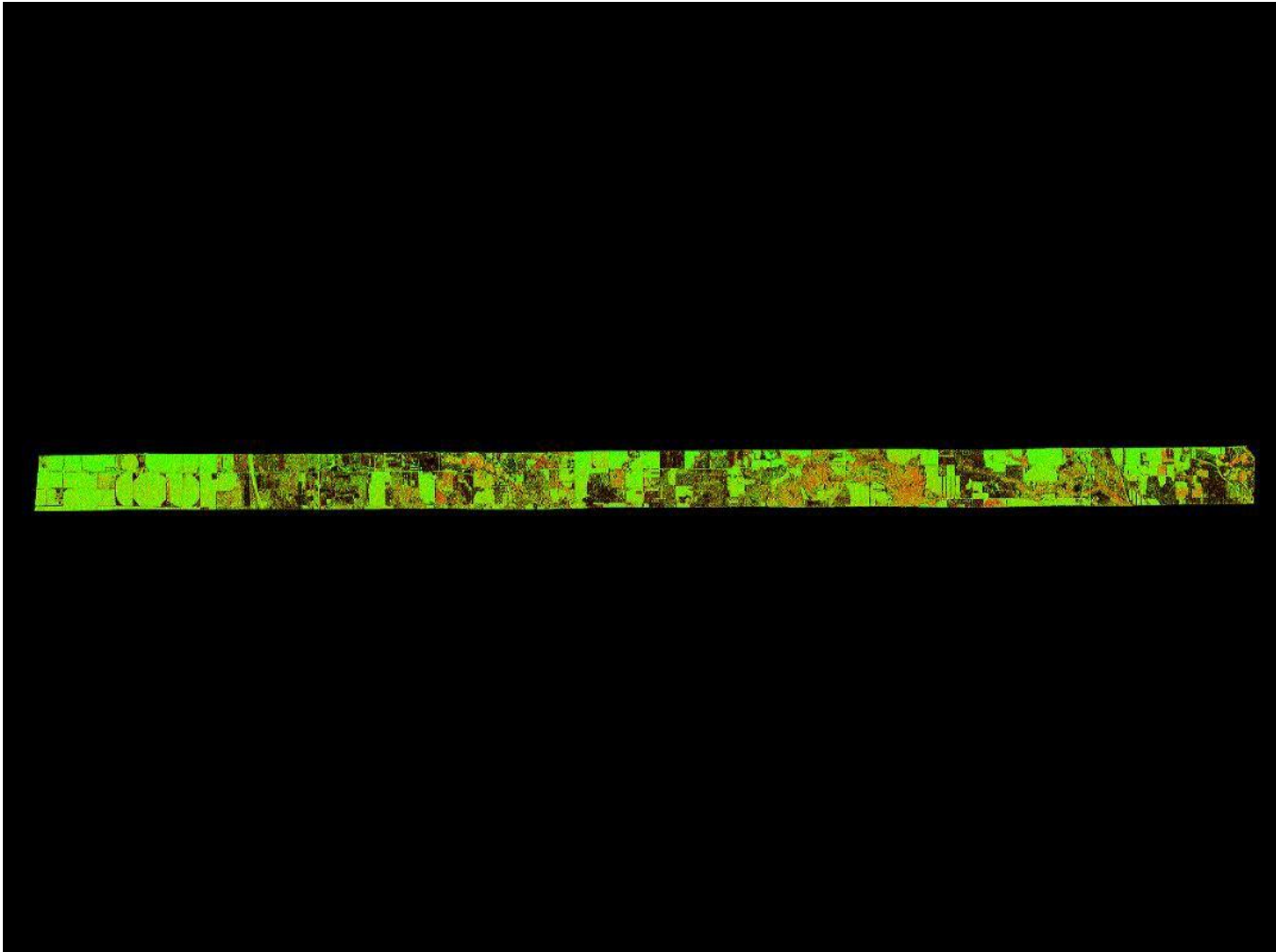
Swath 209

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



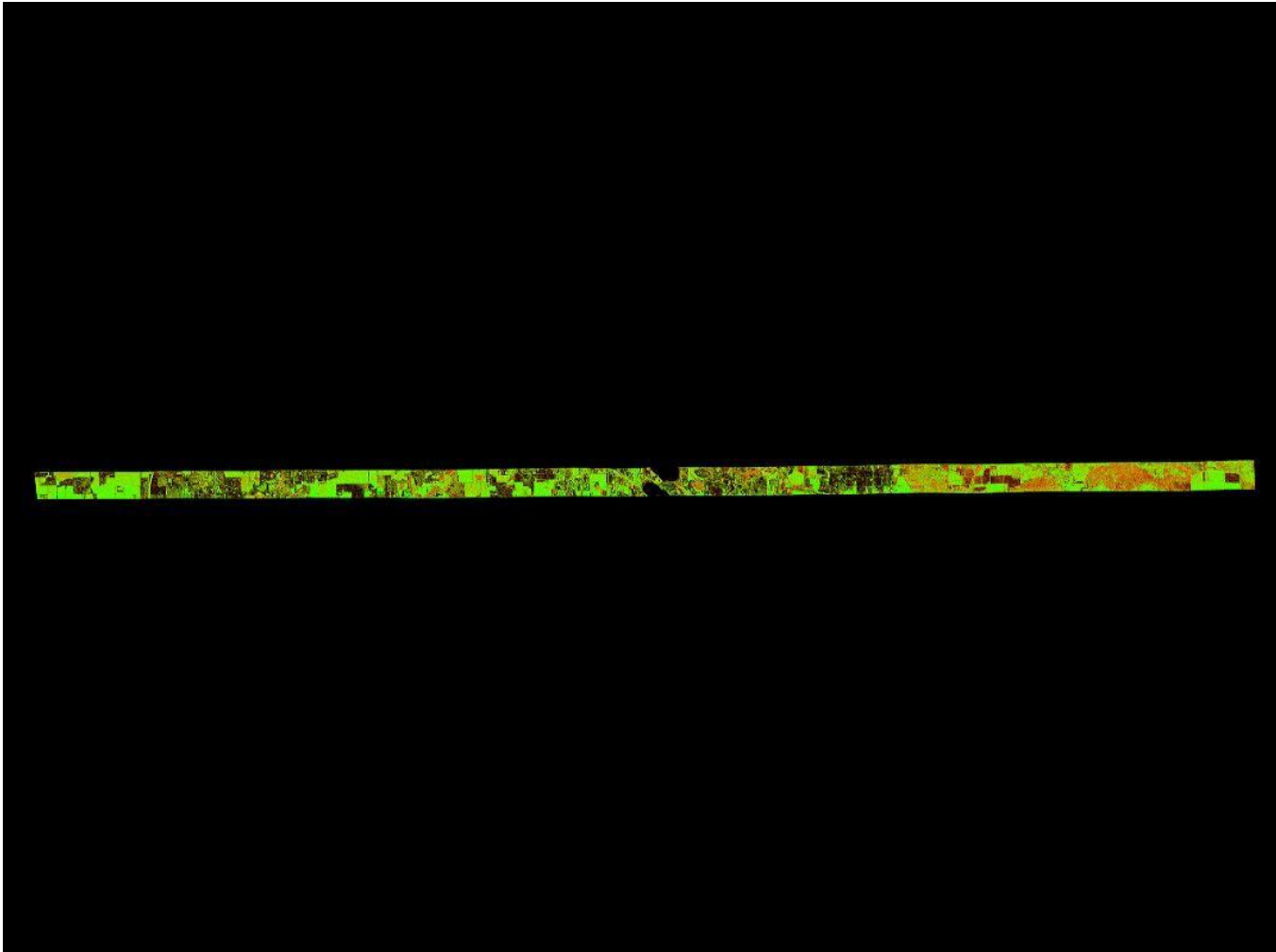
Swath 210

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



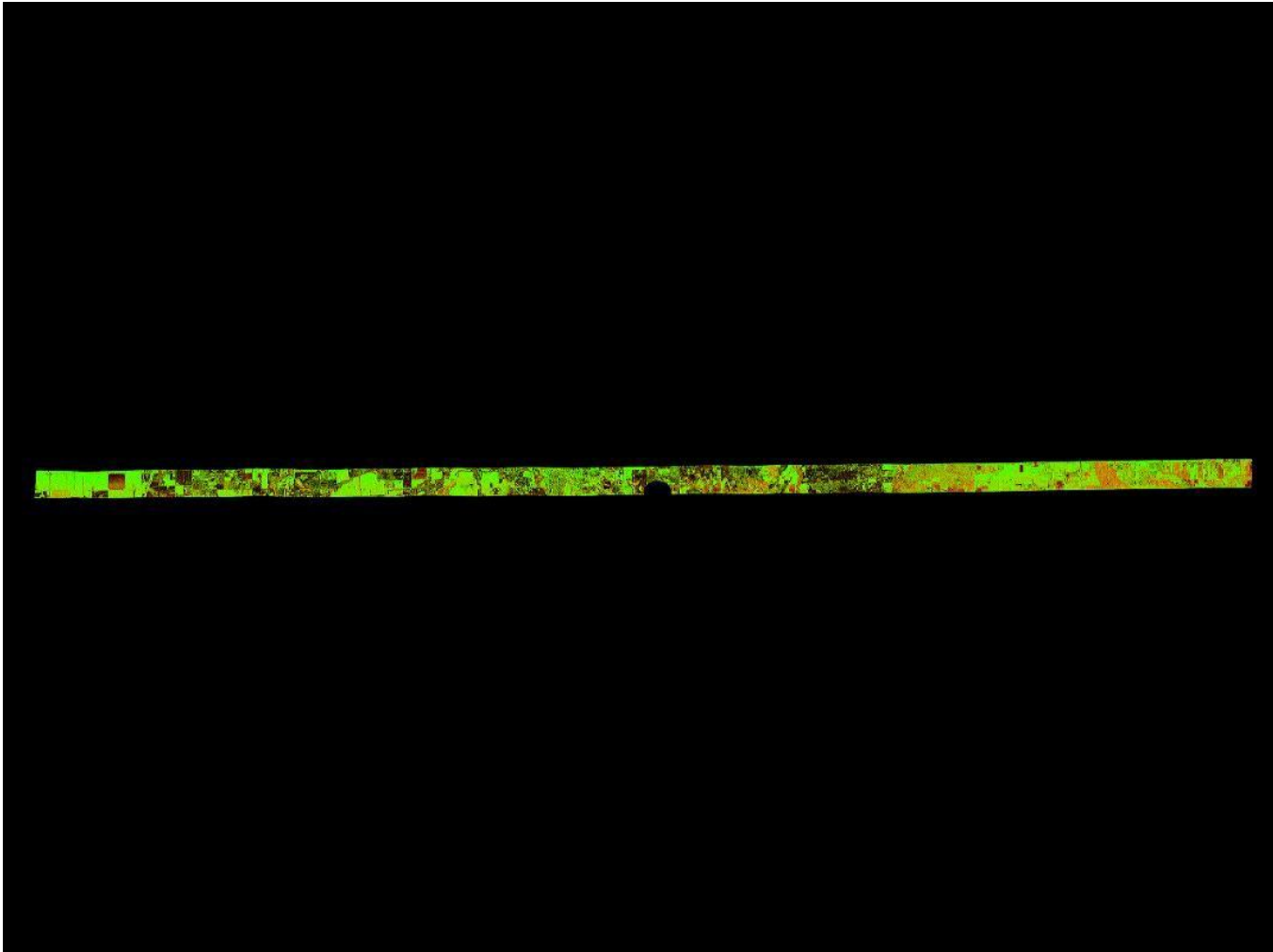
Swath 211

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



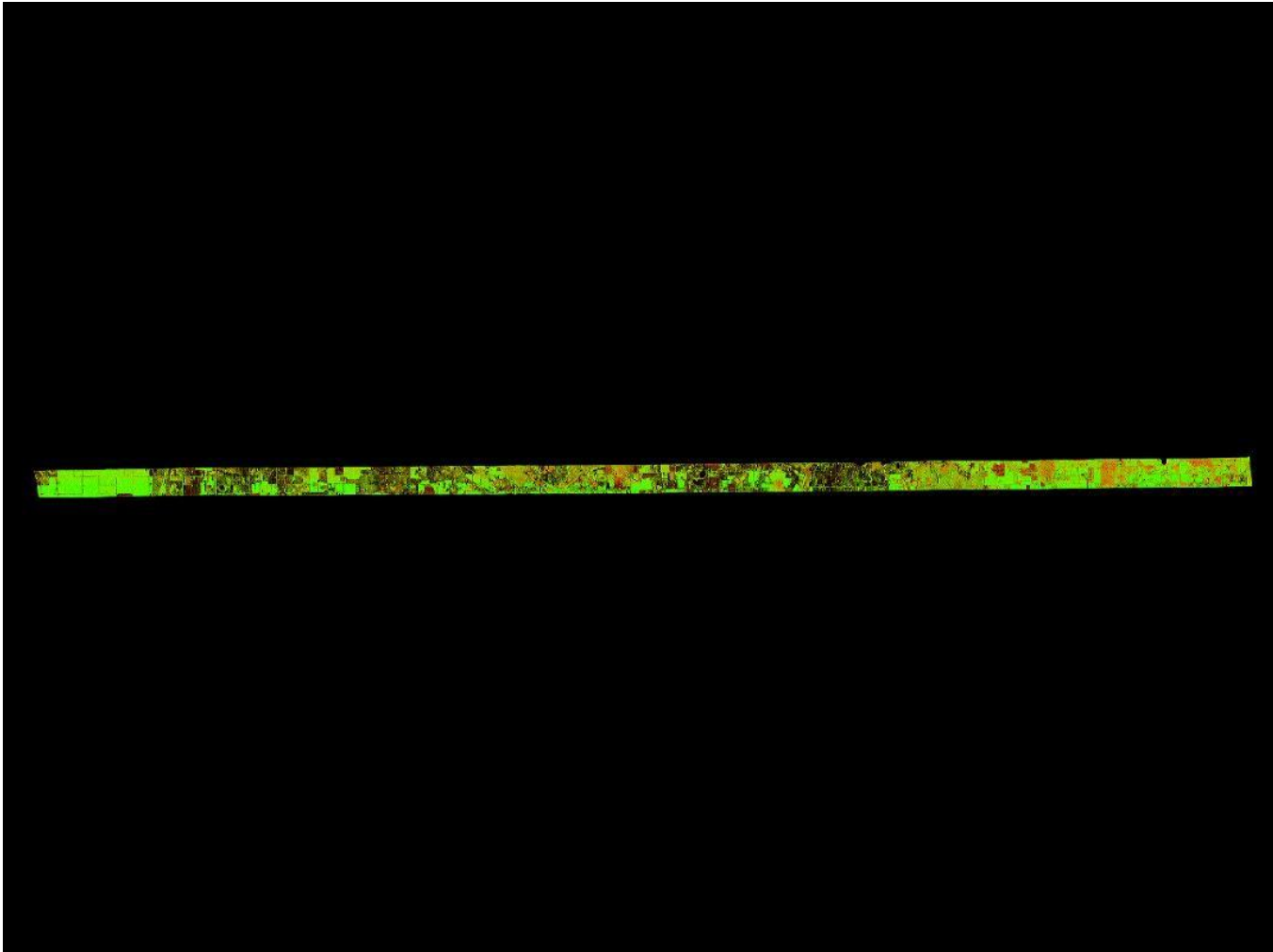
Swath 212

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



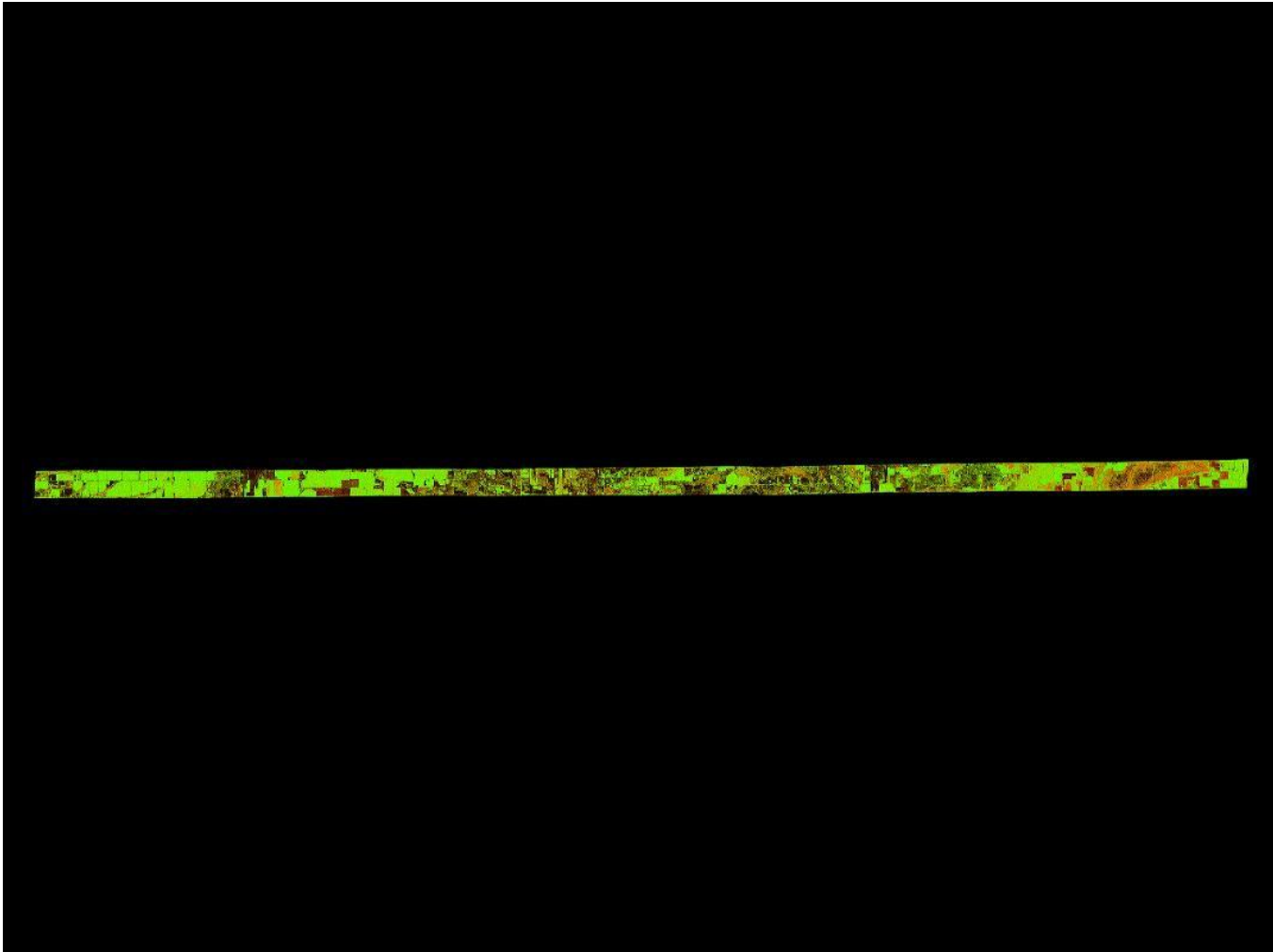
Swath 213

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



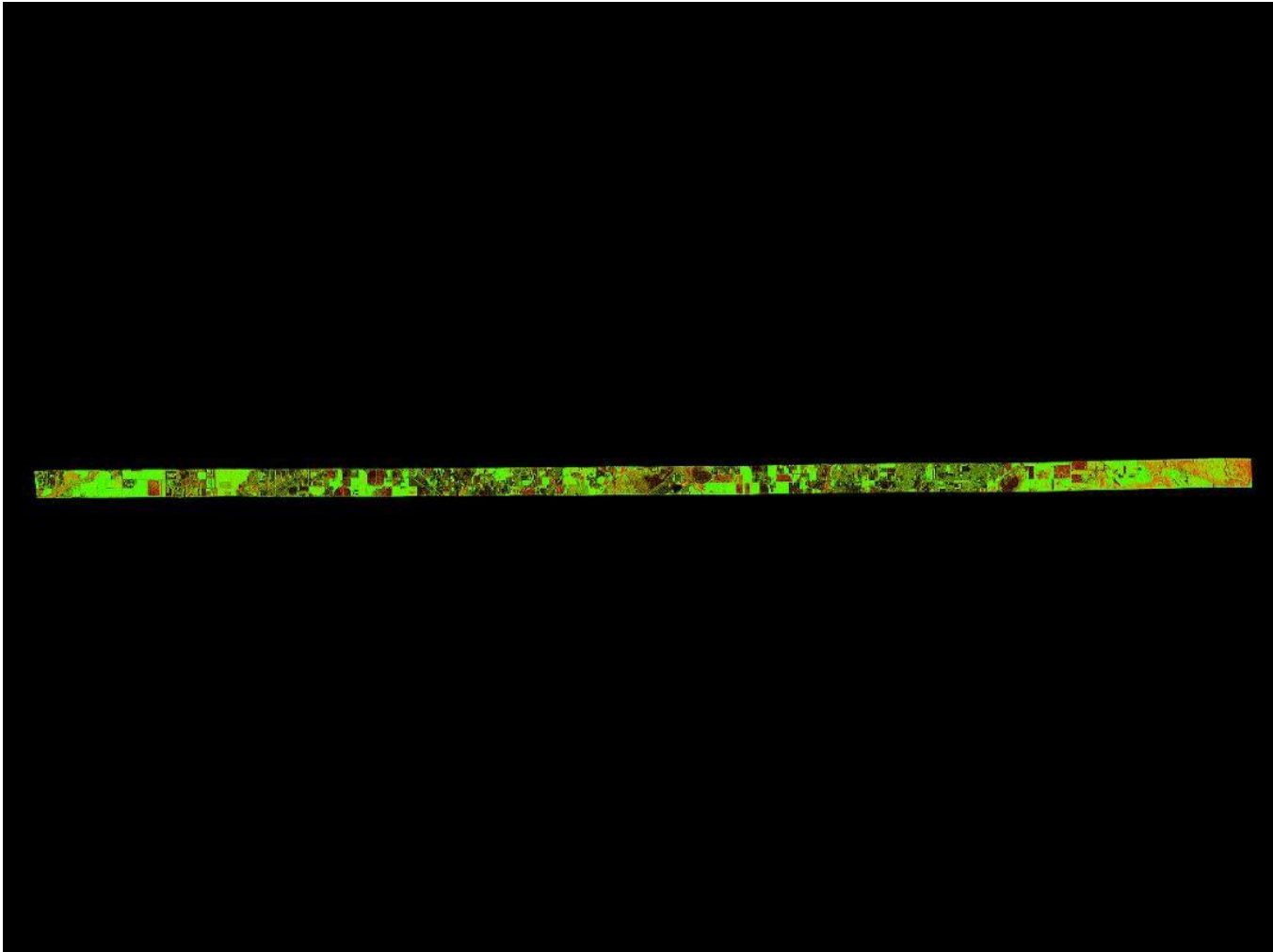
Swath 214

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



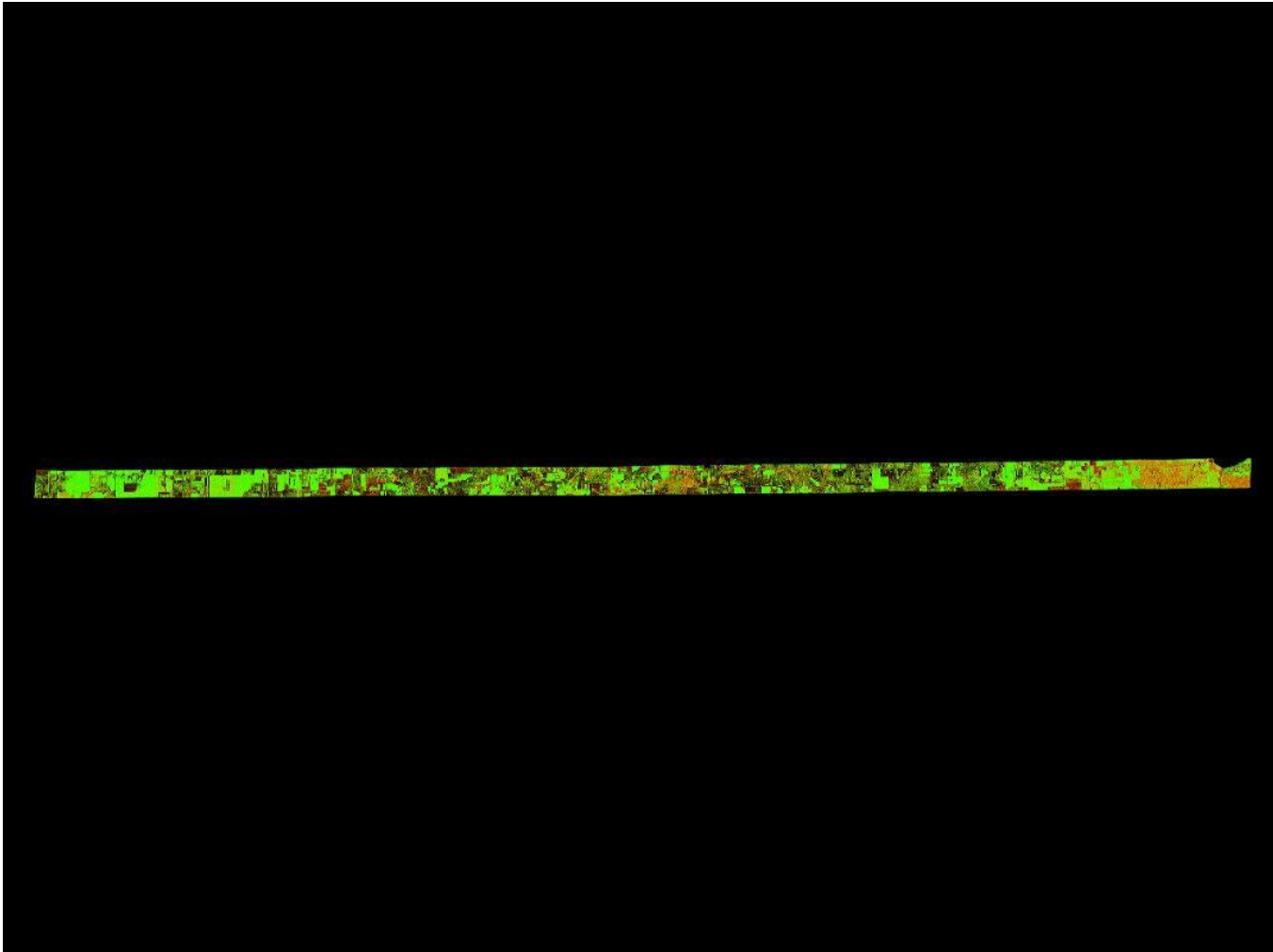
Swath 216

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



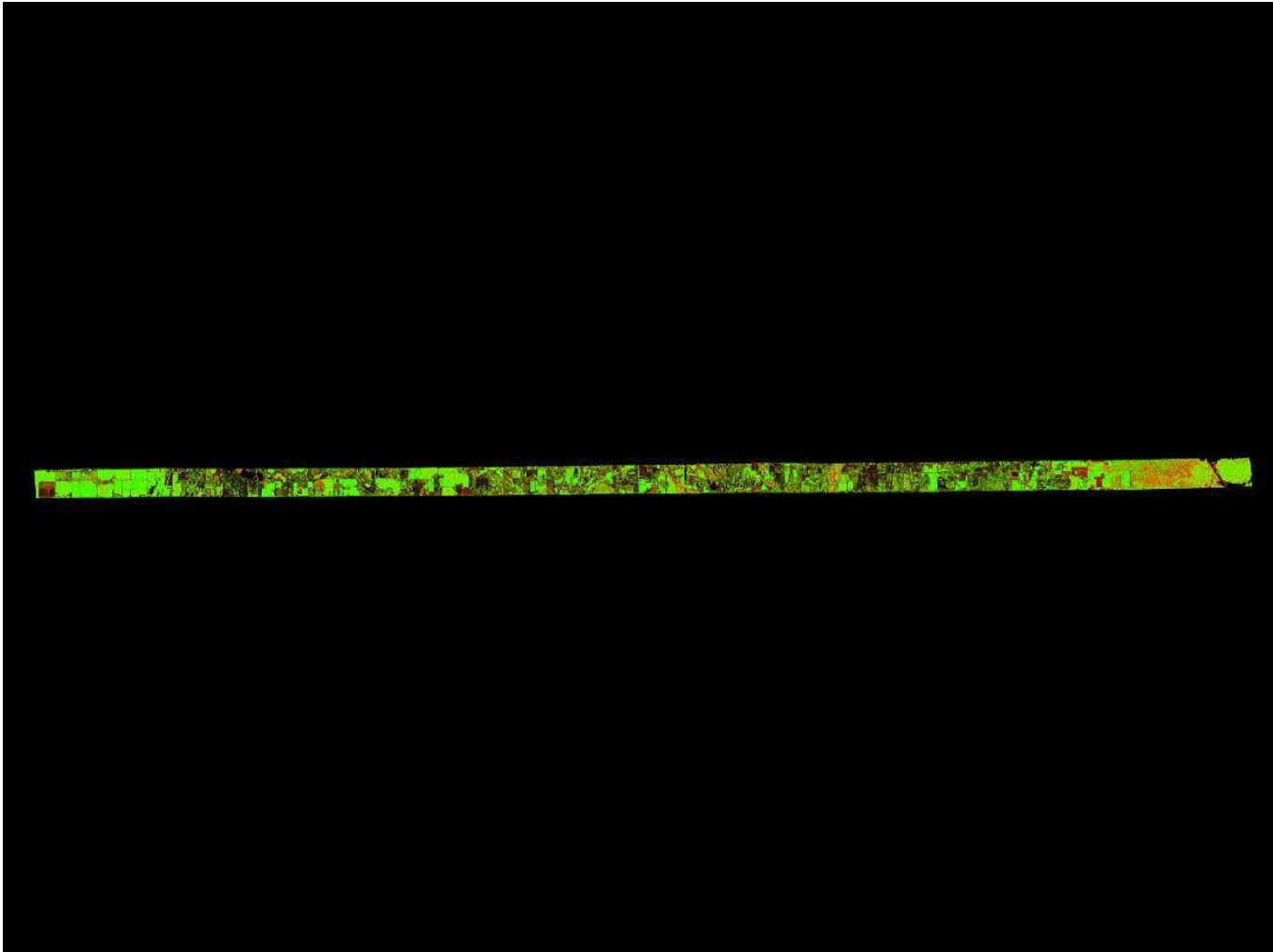
Swath 303

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



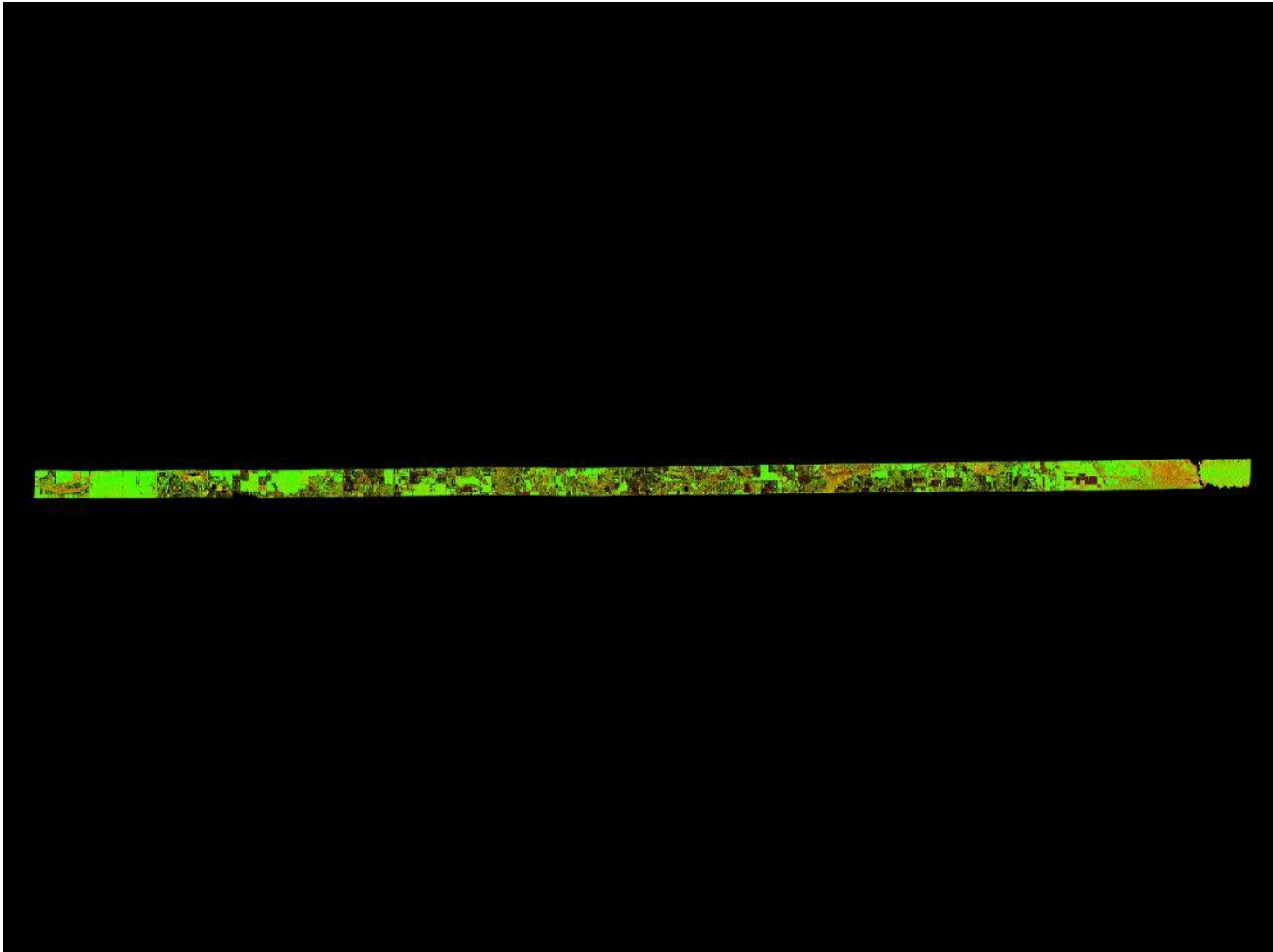
Swath 304

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



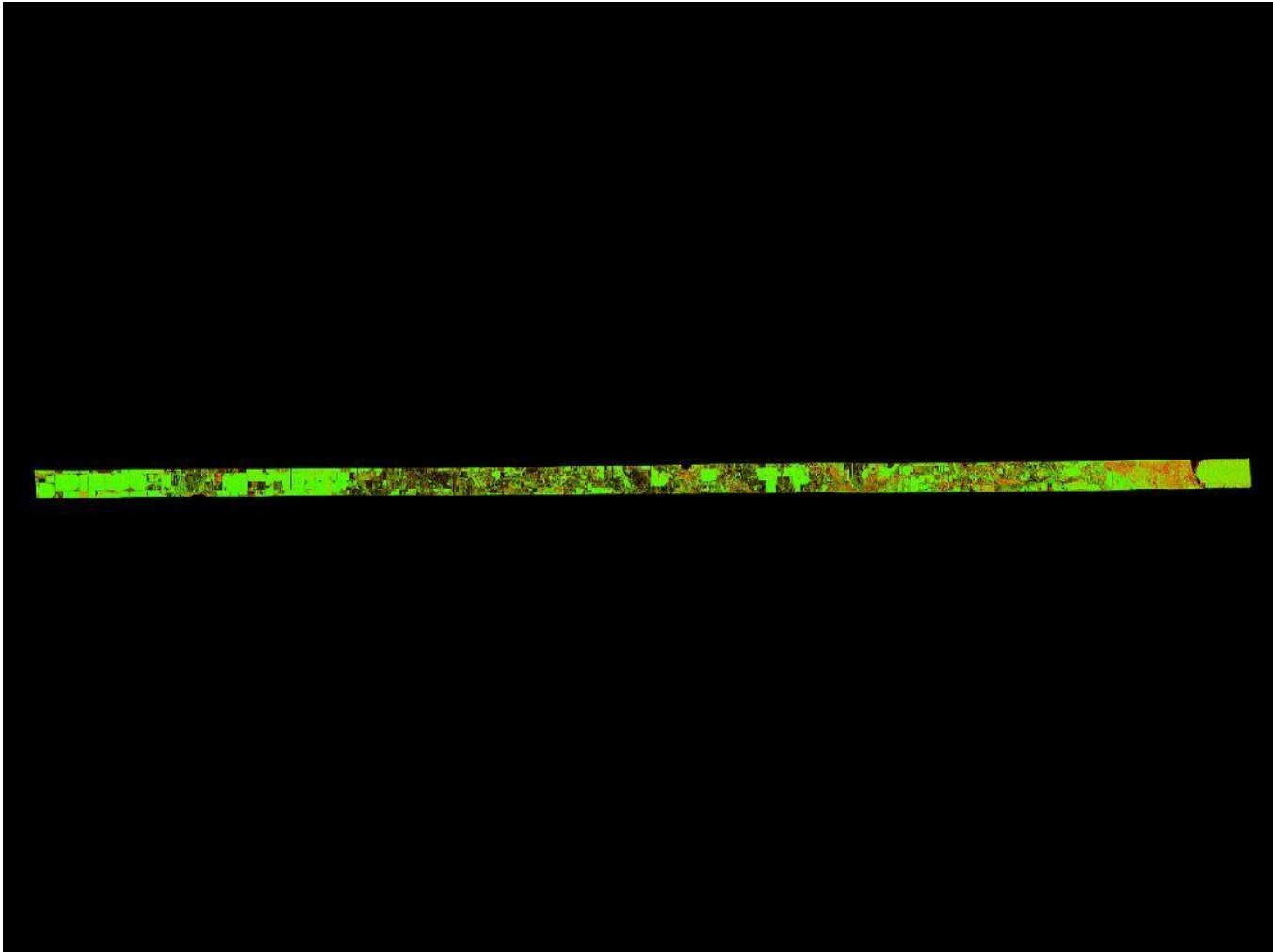
Swath 305

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



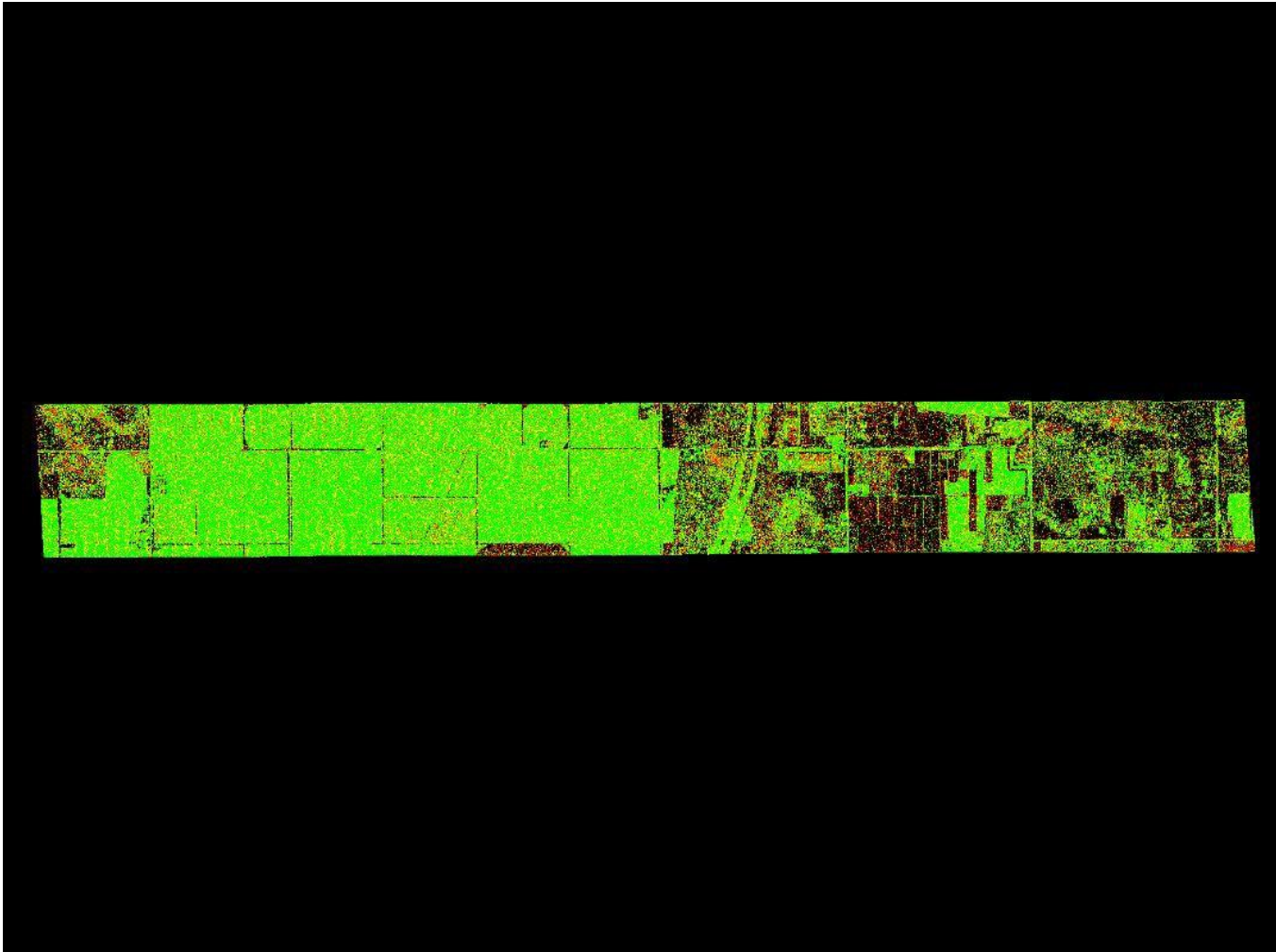
Swath 306

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



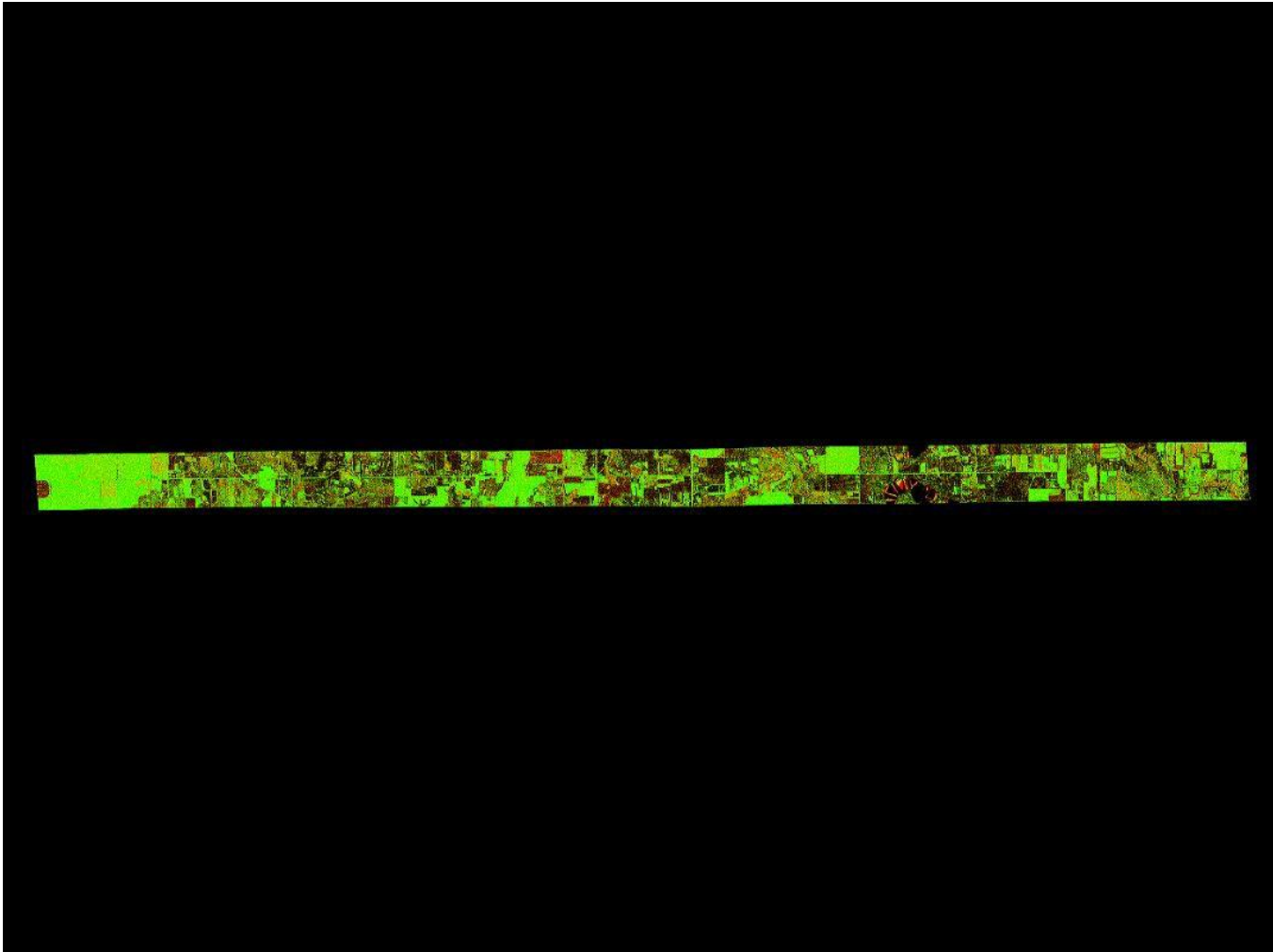
Swath 307

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



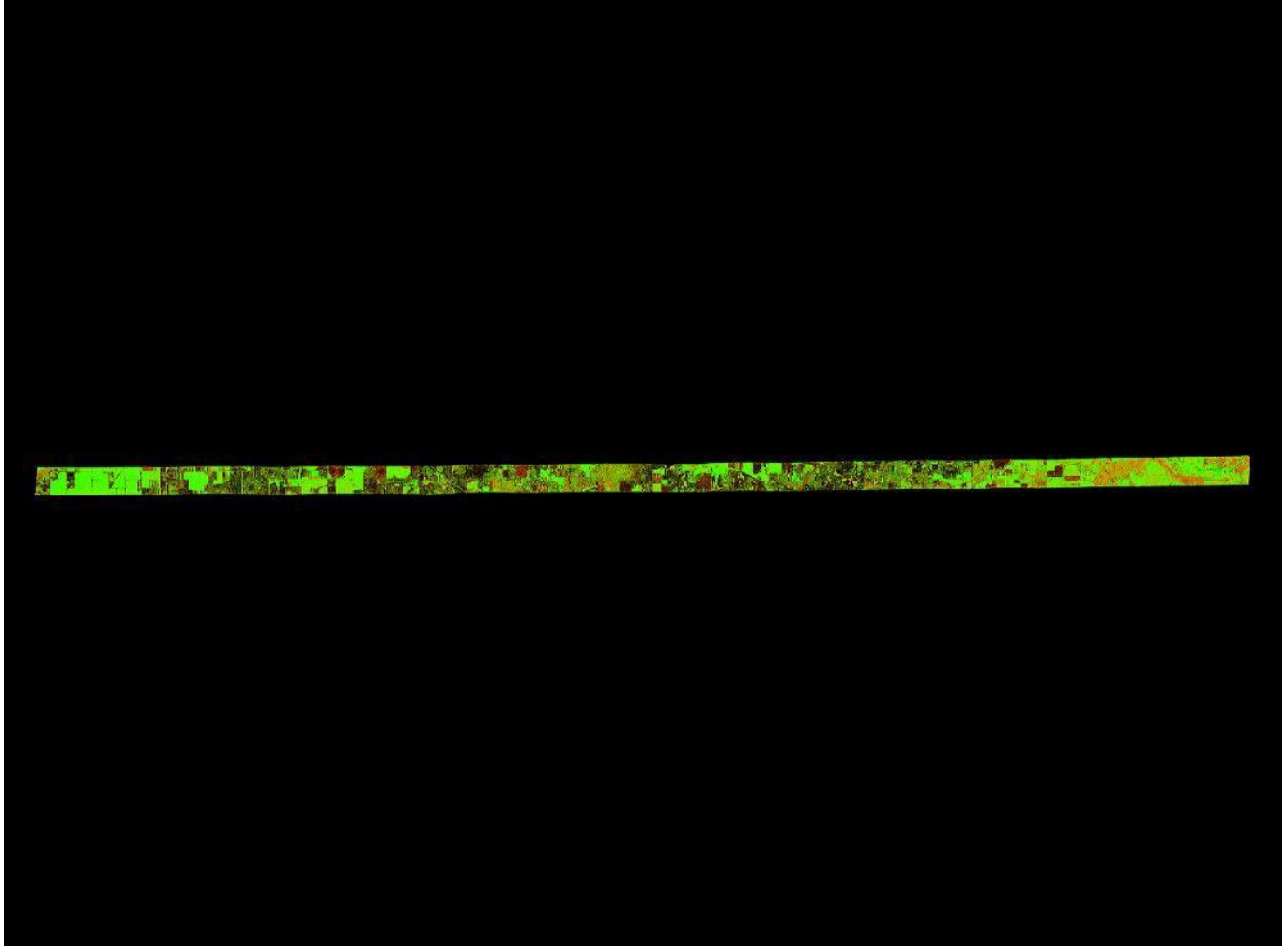
Swath 308

1.8.2 Report on Separation of Scan Direction (Relative Accuracy) per Flight Line



Swath 311

**1.8.2 Report on Separation of Scan Direction
(Relative Accuracy) per Flight Line**



Swath 313