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## Summary



Project	[REDACTED]
Processed	2022-03-17 01:43:21
Camera Model Name(s)	MAVIC2-ENTERPRISE-ADVANCED_4.5_8000x6000 (RGB)
Average Ground Sampling Distance (GSD)	1.83 cm / 0.72 in
Area Covered	undefined

## Quality Check



<b>Images</b>	median of 33030 keypoints per image	
<b>Dataset</b>	1206 out of 1207 images calibrated (99%), all images enabled	
<b>Camera Optimization</b>	9.53% relative difference between initial and optimized internal camera parameters	
<b>Matching</b>	median of 11000.3 matches per calibrated image	
<b>Georeferencing</b>	no, no 3D GCP	

## Preview



Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

# Calibration Details



Number of Calibrated Images	1206 out of 1207
Number of Geolocated Images	1207 out of 1207

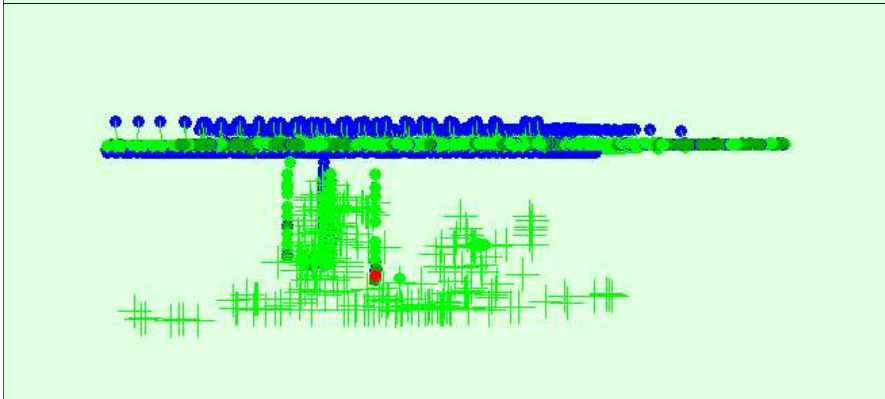
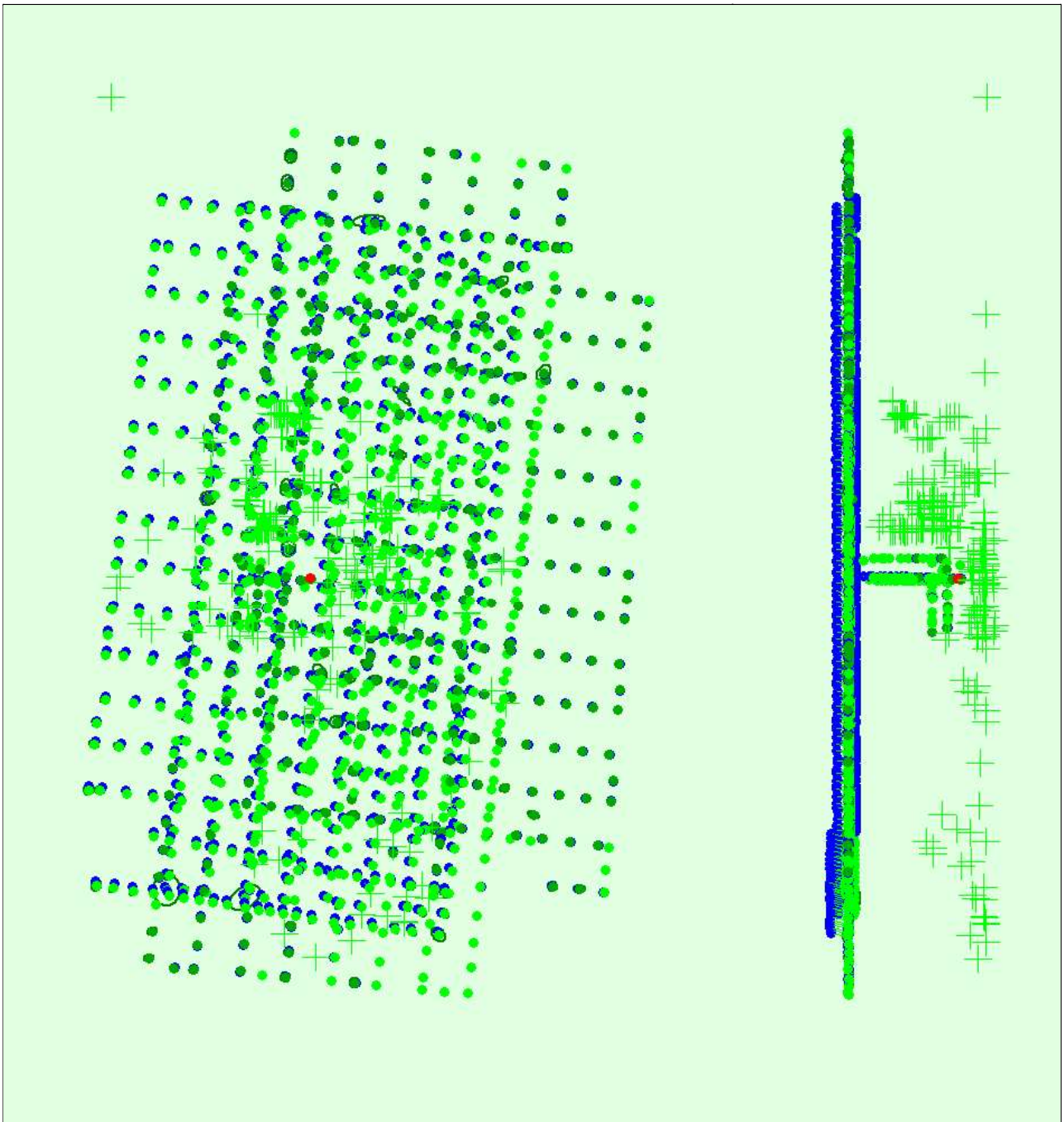
## ? Initial Image Positions



Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

## ? Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 50x magnified

Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane). Red dots indicate disabled or uncalibrated images. Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

### ? Absolute camera position and orientation uncertainties



X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
------	------	------	----------------	--------------	----------------

Mean	0.039	0.040	0.034	0.025	0.023	0.018
Sigma	0.019	0.018	0.014	0.010	0.009	0.008

## Overlap



Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint matches is also sufficient for these areas (see Figure 5 for keypoint matches).

## Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	13477085
Number of 3D Points for Bundle Block Adjustment	4949626
Mean Reprojection Error [pixels]	0.194

## Internal Camera Parameters

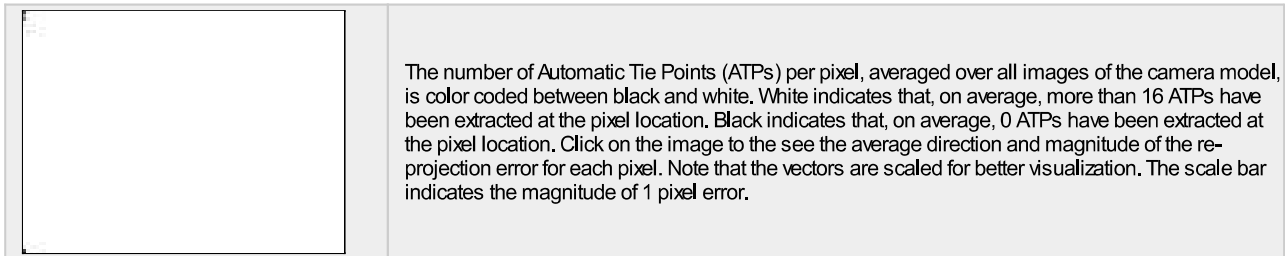
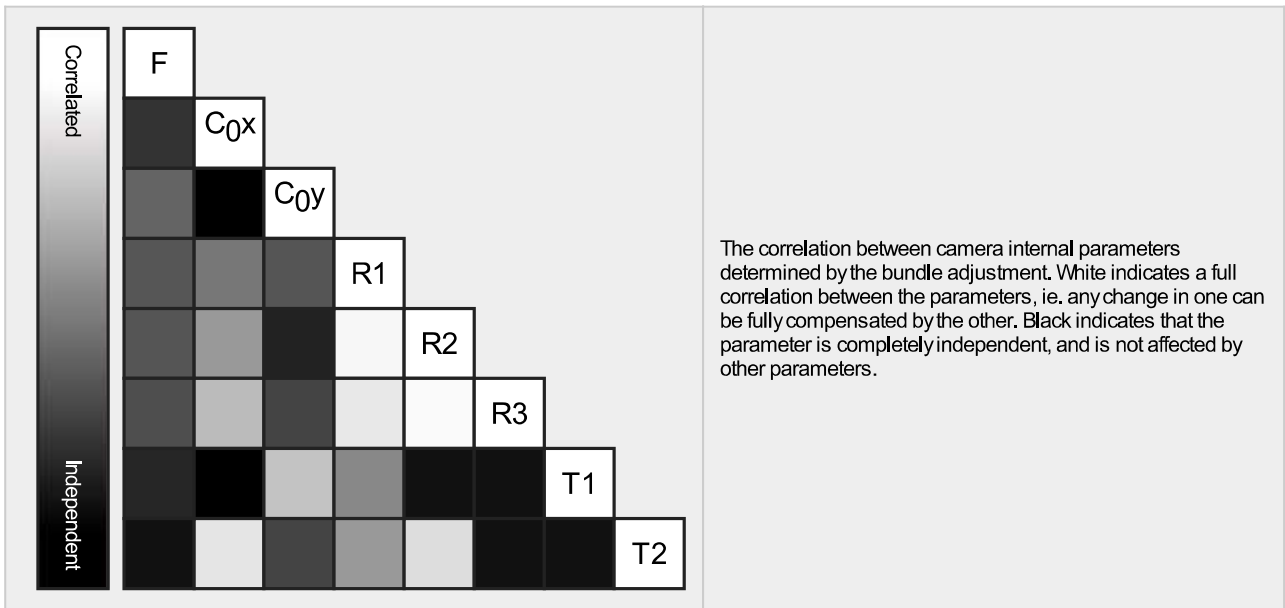
MAVIC2-ENTERPRISE-ADVANCED\_4.5\_8000x6000 (RGB). Sensor Dimensions: 6.563 [mm] x 4.922 [mm]



EXIF ID: MAVIC2-ENTERPRISE-ADVANCED\_4.5\_8000x6000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	6538.690 [pixel] 5.364 [mm]	3905.580 [pixel] 3.204 [mm]	2967.060 [pixel] 2.434 [mm]	-0.007	-0.006	-0.023	-0.000	-0.001
Optimized Values	5915.511 [pixel] 4.853 [mm]	3910.089 [pixel] 3.207 [mm]	2989.925 [pixel] 2.453 [mm]	-0.003	0.007	-0.029	0.000	-0.001

Uncertainties (Sigma)	0.477 [pixel] 0.000 [mm]	0.435 [pixel] 0.000 [mm]	0.395 [pixel] 0.000 [mm]	0.000	0.001	0.001	0.000	0.000
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### 2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	33030	11000
Mn	18470	37
Max	60732	25117
Mean	32865	11175

### 3D Points from 2D Keypoint Matches

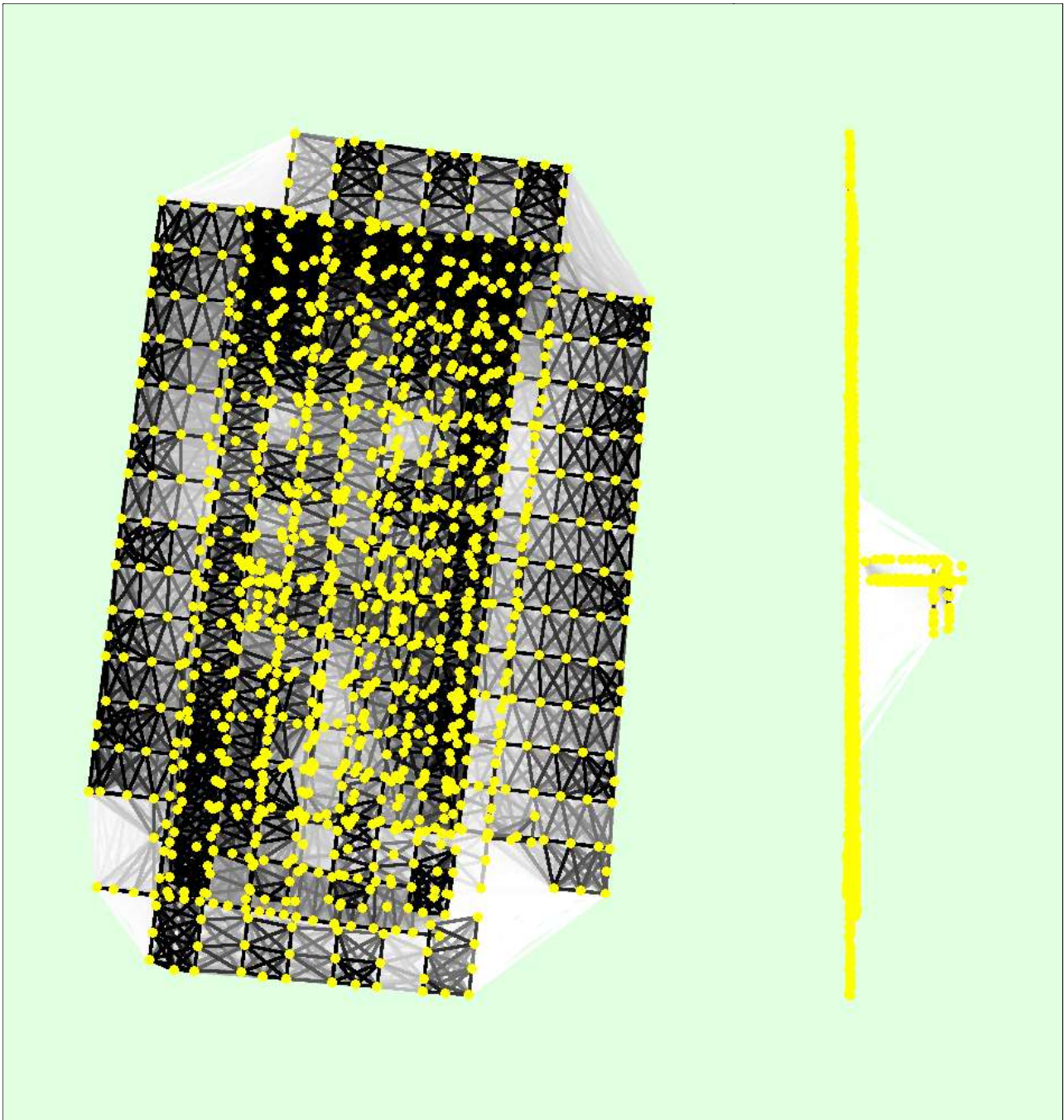
	Number of 3D Points Observed
In 2 Images	3607360
In 3 Images	677669
In 4 Images	264660
In 5 Images	136230
In 6 Images	79154
In 7 Images	48819
In 8 Images	32860
In 9 Images	23202
In 10 Images	16980
In 11 Images	12538
In 12 Images	9677
In 13 Images	6977
In 14 Images	5429
In 15 Images	4432
In 16 Images	3509
In 17 Images	2909
In 18 Images	2358
In 19 Images	1941
In 20 Images	1632

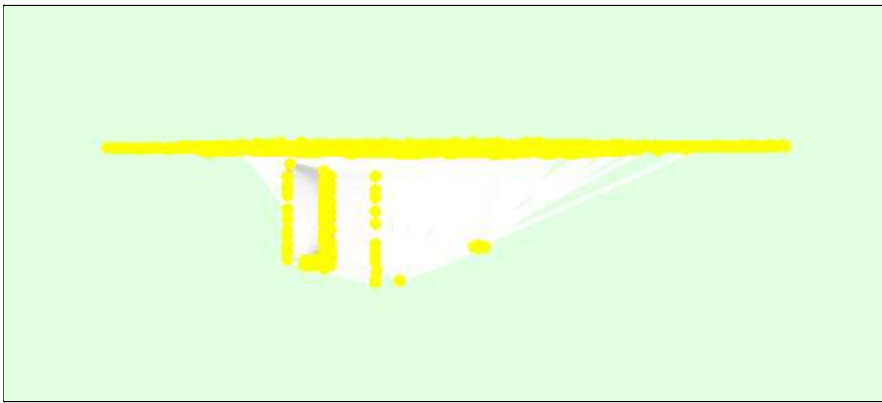
In 21 Images	1396
In 22 Images	1218
In 23 Images	1026
In 24 Images	911
In 25 Images	762
In 26 Images	699
In 27 Images	625
In 28 Images	508
In 29 Images	443
In 30 Images	419
In 31 Images	338
In 32 Images	319
In 33 Images	298
In 34 Images	257
In 35 Images	224
In 36 Images	187
In 37 Images	173
In 38 Images	148
In 39 Images	133
In 40 Images	113
In 41 Images	119
In 42 Images	98
In 43 Images	76
In 44 Images	87
In 45 Images	60
In 46 Images	55
In 47 Images	44
In 48 Images	63
In 49 Images	39
In 50 Images	28
In 51 Images	35
In 52 Images	44
In 53 Images	23
In 54 Images	21
In 55 Images	26
In 56 Images	27
In 57 Images	22
In 58 Images	18
In 59 Images	20
In 60 Images	12
In 61 Images	8
In 62 Images	12
In 63 Images	19
In 64 Images	8
In 65 Images	9
In 66 Images	10
In 67 Images	15
In 68 Images	11
In 69 Images	5
In 70 Images	5
In 71 Images	5
In 72 Images	9
In 73 Images	7
In 74 Images	11
In 75 Images	3
In 76 Images	2
In 77 Images	1
In 78 Images	4
In 79 Images	2

In 80 Images	3
In 81 Images	3
In 82 Images	6
In 83 Images	1
In 84 Images	5
In 86 Images	3
In 87 Images	1
In 88 Images	1
In 89 Images	1
In 91 Images	2
In 94 Images	1
In 95 Images	1
In 96 Images	1
In 105 Images	1

## 2D Keypoint Matches

1





Number of matches 25 222 444 666 888 1111 1333 1555 1777 2000

Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

## Manual Tie Points



MTP Name	Projection Error [pixel]	Verified/Marked
mtp1	1.343	11 / 11
mtp2	2.363	10 / 10
mtp3	0.976	9 / 9
mtp4	1.719	13 / 13
mtp5	0.591	3 / 3
mtp6	0.640	4 / 4
mtp7	1.201	5 / 5
mtp8	2.273	4 / 4
mtp9	0.244	3 / 3
mtp10	1.135	3 / 3
mtp11	0.778	3 / 3
mtp12	2.460	3 / 3
mtp13	2.582	8 / 8
mtp14	1.306	5 / 5
mtp15	1.878	5 / 5
mtp16	5.751	3 / 3
mtp17	2.493	6 / 6
mtp18	1.172	3 / 3
mtp19	3.036	5 / 5
mtp20	1.852	3 / 3
mtp21	1.103	5 / 5
mtp22	6.193	3 / 3
mtp23	4.255	3 / 3
mtp24	4.684	4 / 4
mtp25	1.740	3 / 3
mtp26	3.954	5 / 5
mtp27	3.895	3 / 3
mtp28	3.498	4 / 4
mtp29	1.186	3 / 4
mtp30	3.948	4 / 7
mtp31	4.153	3 / 3
mtp32	4.333	2 / 3
mtp34	1.611	7 / 7
mtp35	0.754	4 / 4
mtp36	1.396	4 / 4
mtp37	1.066	4 / 4
mtp38	0.989	7 / 7
mtp39	1.319	10 / 10



mtp40	1.127	6 / 6
mtp41	1.395	3 / 3
mtp42	5.314	5 / 5
mtp43	1.581	3 / 3
mtp44	1.655	4 / 4
mtp45	2.454	6 / 6
mtp46	0.693	3 / 3
mtp47	0.116	3 / 3
mtp48	2.273	3 / 3
mtp49	1.157	3 / 3
mtp50	0.678	5 / 5
mtp51	0.915	4 / 4
mtp52	1.589	3 / 3
mtp53	1.086	8 / 8
mtp54	2.822	9 / 9
mtp55	0.425	3 / 3
mtp56	4.301	3 / 3
mtp57	0.467	4 / 4
mtp58	4.094	3 / 3
mtp59	1.186	5 / 5
mtp60	2.261	3 / 3
mtp61	1.549	4 / 4
mtp62	0.482	3 / 3
mtp63	0.482	3 / 3
mtp64	0.734	4 / 4
mtp65	0.842	3 / 3
mtp66	0.835	4 / 4
mtp67	1.183	3 / 3
mtp68	0.682	3 / 3
mtp69	1.977	4 / 4
mtp70	0.677	5 / 5
mtp71	0.893	3 / 3
mtp72	2.007	4 / 4
mtp73	2.046	7 / 7
mtp74	0.634	3 / 3
mtp75	1.981	3 / 3
mtp76	0.571	4 / 4
mtp77	1.781	5 / 5
mtp78	2.567	7 / 7
mtp79	0.674	3 / 3
mtp80	1.873	4 / 4
mtp81	0.825	4 / 4
mtp82	1.335	3 / 3
mtp83	1.128	3 / 3
mtp84	1.697	3 / 3
mtp85	1.652	3 / 3
mtp86	1.805	3 / 3
mtp87	0.440	3 / 3
mtp88	1.574	5 / 5
mtp89	1.461	3 / 3
mtp90	1.157	4 / 4
mtp91	0.402	3 / 3
mtp92	2.901	3 / 3
mtp93	1.814	4 / 4
mtp94	4.021	3 / 3
mtp95	2.259	5 / 5
mtp96	0.673	5 / 5
mtp97	2.321	3 / 3
mtp98	1.896	3 / 4

mtp99	4.140	3 / 3
mtp100	0.530	3 / 3
mtp101	2.148	3 / 4
mtp102	2.326	9 / 9
mtp103	2.673	8 / 8
mtp104	4.490	8 / 8
mtp105	9.506	3 / 3
mtp106	4.709	3 / 3
mtp107	2.951	3 / 3
mtp108	2.807	3 / 3
mtp109	1.145	3 / 3
mtp110	0.373	2 / 2
mtp111	1.057	3 / 3
mtp112	1.217	3 / 3
mtp113	2.181	3 / 3
mtp115	9.084	3 / 3
mtp116	1.779	3 / 3
mtp117	1.781	4 / 4
mtp118	4.917	3 / 3
mtp119	2.027	7 / 7
mtp121	1.112	9 / 9
mtp122	1.094	8 / 8
mtp123	0.432	4 / 4
mtp124	0.373	2 / 2
mtp125	1.637	2 / 2
mtp126	0.420	2 / 2
mtp127	2.882	6 / 6
mtp128	0.306	4 / 4
mtp129	1.836	5 / 5
mtp130	0.111	2 / 2
mtp131	0.529	3 / 3
mtp132	1.458	9 / 9
mtp133	1.810	5 / 5
mtp134	1.059	2 / 3
mtp135	2.163	3 / 3
mtp136	0.973	3 / 3
mtp137	1.743	4 / 4
mtp138	1.777	4 / 4
mtp139	4.102	12 / 12
mtp140	1.824	3 / 3
mtp141	3.639	3 / 3
mtp142	0.950	3 / 3
mtp143	4.909	3 / 4
mtp144	7.315	5 / 5
mtp145	3.754	5 / 5
mtp146	7.985	10 / 10
mtp147	5.275	5 / 5
mtp148	1.600	4 / 5
mtp149	5.601	4 / 4
mtp150	3.943	3 / 3
mtp151	1.346	3 / 3
mtp152	1.535	3 / 3
mtp153	7.545	3 / 3
mtp154	7.044	4 / 5
mtp155	10.073	4 / 4
mtp156	2.620	2 / 3
mtp157	5.707	4 / 4
mtp158	5.119	5 / 5
mtp159	0.951	4 / 4

mtp160	3.983	4 / 4
mtp161	2.089	3 / 3
mtp162	1.731	22 / 22
mtp163	2.457	10 / 10
mtp164	1.217	18 / 18
mtp165	0.465	3 / 3
mtp166	1.598	4 / 4
mtp167	0.366	5 / 5
mtp168	0.803	3 / 3
mtp169	1.162	9 / 9
mtp170	0.657	3 / 3
mtp171	0.789	3 / 3
mtp172	2.586	9 / 9
mtp173	2.334	3 / 3
mtp174	2.122	3 / 3
mtp175	1.855	4 / 4
mtp176	0.745	3 / 3
mtp177	4.668	3 / 3
mtp178	0.981	12 / 12
mtp179	1.237	3 / 3
mtp180	1.875	3 / 3
mtp181	0.446	3 / 3
mtp182	1.396	11 / 14
mtp183	1.776	3 / 3
mtp184	2.048	6 / 6
mtp185	1.999	3 / 3
mtp186	5.174	4 / 4
mtp187	2.183	3 / 3
mtp188	0.015	2 / 2
mtp189	2.240	4 / 4
mtp190	2.040	4 / 4
mtp192	1.113	3 / 4
mtp193	2.083	8 / 9
mtp194	1.384	4 / 5
mtp195	1.229	5 / 5
mtp196	0.276	3 / 4
mtp197	7.678	5 / 5
mtp198	0.314	2 / 3
mtp199	0.448	3 / 3
mtp200	1.022	3 / 3
mtp201	1.686	3 / 3
mtp202	0.797	3 / 3
mtp203	0.222	4 / 4
mtp204	5.587	2 / 3
mtp205	5.828	4 / 4
mtp206	7.081	3 / 3
mtp207	0.615	3 / 3
mtp208	1.076	4 / 4
mtp209	1.330	3 / 3
mtp210	0.630	3 / 3
mtp211	0.959	3 / 3
mtp212	0.571	2 / 3
mtp213	1.007	3 / 3
mtp214	1.102	10 / 10
mtp215	3.868	15 / 16
mtp216	1.374	2 / 3
mtp217	1.824	4 / 4
mtp218	1.598	3 / 3
mtp219	2.357	4 / 4

mtp220	0.232	2 / 3
mtp221	1.781	3 / 3
mtp222	1.349	7 / 7
mtp223	0.352	5 / 5
mtp224	2.804	4 / 4
mtp225	0.614	3 / 3
mtp226	2.125	5 / 5
mtp227	1.614	5 / 5
mtp228	1.087	7 / 7
mtp229	1.553	4 / 4
mtp230	2.654	8 / 8
mtp231	1.320	3 / 3
mtp232	2.111	4 / 4
mtp233	1.826	5 / 5
mtp234	1.686	4 / 4
mtp235	10.667	4 / 4
mtp236	4.338	4 / 4
mtp237	1.478	5 / 5
mtp238	2.582	4 / 4
mtp239	0.812	3 / 3
mtp240	1.874	4 / 4
mtp241	1.019	3 / 3
mtp242	1.438	3 / 3
mtp243	1.644	11 / 11
mtp244	2.515	3 / 3
mtp245	0.622	3 / 3
mtp246	3.685	3 / 3
mtp247	8.563	2 / 3
mtp248	1.032	3 / 3
mtp249	0.534	4 / 4
mtp250	0.229	3 / 3
mtp251	1.280	4 / 4
mtp252	1.258	5 / 5
mtp253	2.158	5 / 5
mtp254	2.224	5 / 5
mtp255	1.341	5 / 5
mtp256	0.494	3 / 3
mtp257	1.443	4 / 4
mtp258	1.314	3 / 4
mtp259	3.242	5 / 5
mtp260	1.344	6 / 6
mtp261	0.769	5 / 5
mtp262	0.595	4 / 4
mtp263	1.917	5 / 5
mtp264	0.814	17 / 17
mtp265	1.728	6 / 6
mtp266	3.414	3 / 4
mtp267	1.046	4 / 4
mtp268	1.512	4 / 4
mtp269	1.722	7 / 7
mtp270	1.509	5 / 5
mtp271	1.705	6 / 6
mtp272	2.197	5 / 5
mtp273	2.496	8 / 8
mtp274	1.391	4 / 4
mtp275	1.013	3 / 3
mtp276	1.595	5 / 5
mtp277	2.659	5 / 5
mtp278	2.322	3 / 4

mtp279	4.352	5 / 5
mtp280	3.702	5 / 5
mtp281	1.434	6 / 6
mtp282	2.176	9 / 9
mtp283	3.541	4 / 4
mtp284	1.619	3 / 3
mtp285	6.272	4 / 4
mtp286	2.565	15 / 15
mtp287	1.832	2 / 3
mtp288	1.416	4 / 4

Projection errors for manual tie points. The last column counts the number of images where the manual tie point has been automatically verified vs. manually marked.

## Geolocation Details

### ? Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.00	0.00	0.00
-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	2.39	0.00	23.95
-3.00	0.00	60.78	21.32	20.64
0.00	3.00	36.83	72.06	18.36
3.00	6.00	0.00	6.61	0.00
6.00	9.00	0.00	0.00	0.00
9.00	12.00	0.00	0.00	25.88
12.00	15.00	0.00	0.00	11.17
15.00	-	0.00	0.00	0.00
<b>Mean [m]</b>		-0.739645	1.271731	3.428120
<b>Sigma [m]</b>		1.403095	1.260664	6.511246
<b>RMS Error [m]</b>		1.586111	1.790691	7.358555

Min Error and Max Error represent geolocation error intervals between -1.5 and 1.5 times the maximum accuracy of all the images. Columns X, Y, Z show the percentage of images with geolocation errors within the predefined error intervals. The geolocation error is the difference between the initial and computed image positions. Note that the image geolocation errors do not correspond to the accuracy of the observed 3D points.

### ? Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	85.18	73.32	31.24
[-2.00, 2.00]	94.64	82.10	74.69
[-3.00, 3.00]	97.72	88.03	81.19
<b>Mean of Geolocation Accuracy [m]</b>	3.056112	3.056112	6.112929
<b>Sigma of Geolocation Accuracy [m]</b>	2.431281	2.431281	4.861679

Images X, Y, Z represent the percentage of images with a relative geolocation error in X, Y, Z.

Geolocation Orientational Variance	RMS [degree]
Omega	1.383
Phi	4.330
Kappa	15.870

# Initial Processing Details



## System Information



Hardware	CPU: AMD Ryzen 9 5950X 16-Core Processor RAM: 128GB GPU: NVIDIA GeForce GTX 1650 (Driver: 30.0.14.7168)
Operating System	Windows 10 Pro, 64-bit

## Coordinate Systems



Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 32N (EGM96 Geoid)

## Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 0.5
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, no

# Point Cloud Densification details



## Processing Options



Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	Low (Fast)
Minimum Number of Matches	4
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: High Resolution Color Balancing: no
LOD	Generated: no
Advanced: 3D Textured Mesh Settings	Sample Density Divider: 1
Advanced: Image Groups	group1
Advanced: Use Processing Area	yes
Advanced: Use Annotations	yes
Time for Point Cloud Densification	03h:53m:02s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	01h:30m:05s

## Results



Number of Generated Tiles	3
Number of 3D Densified Points	42834883
Average Density (per m <sup>3</sup> )	99.41