

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	100%_mgeom_mgcp_8
Processed	2021-04-30 20:05:58
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.58 cm / 0.23 in

Quality Check



Images	median of 24911 keypoints per image	
Dataset	1073 out of 1074 images calibrated (99%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 171.735 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.321 m	

Calibration Details



Number of Calibrated Images	1073 out of 1074
Number of Geolocated Images	0 out of 1074

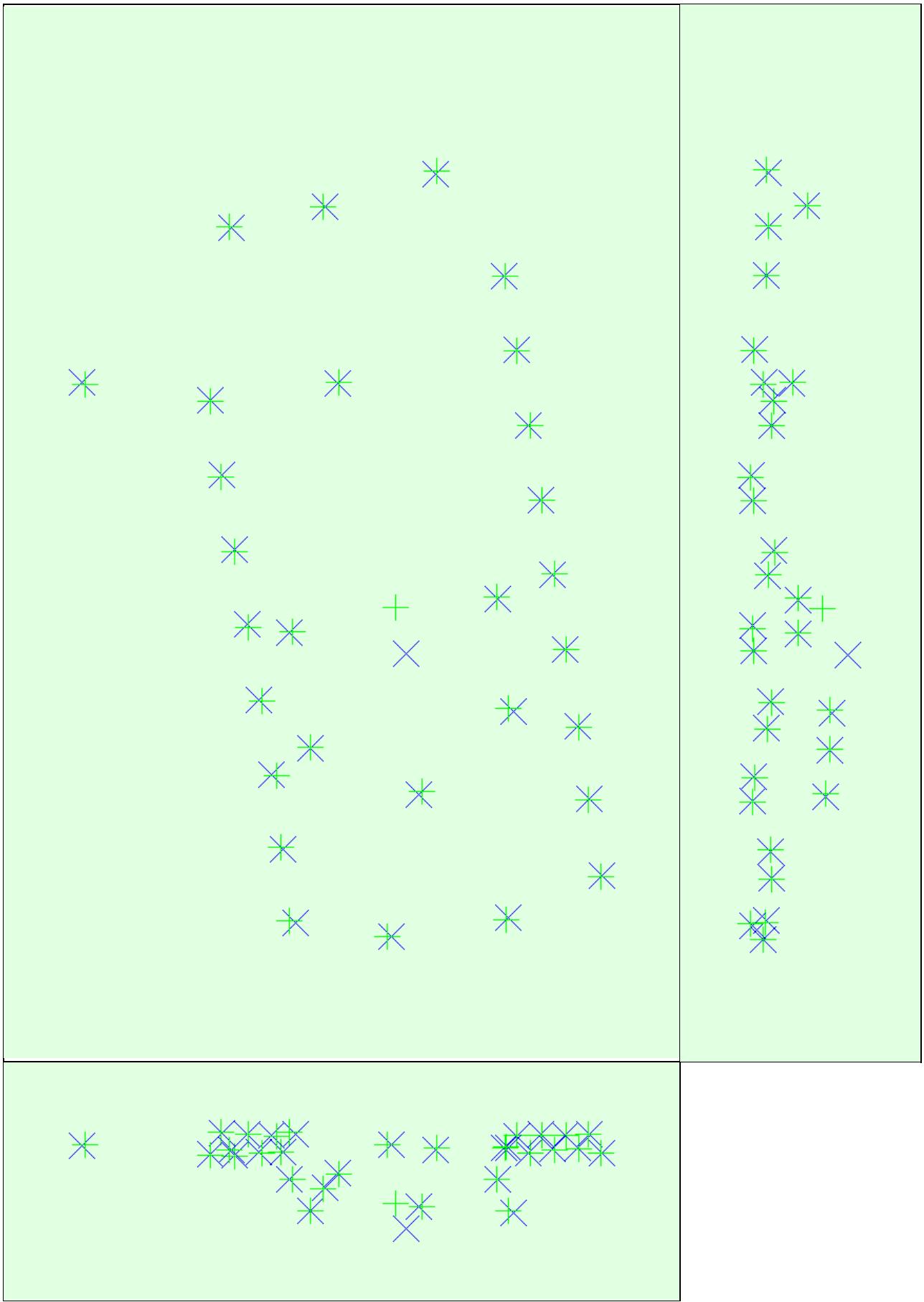
Initial Image Positions



The preview is not generated for images without geolocation.

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.

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.004	0.123	0.015	0.059
Sigma	0.001	0.001	0.001	0.316	0.004	0.302

Bundle Block Adjustment Details



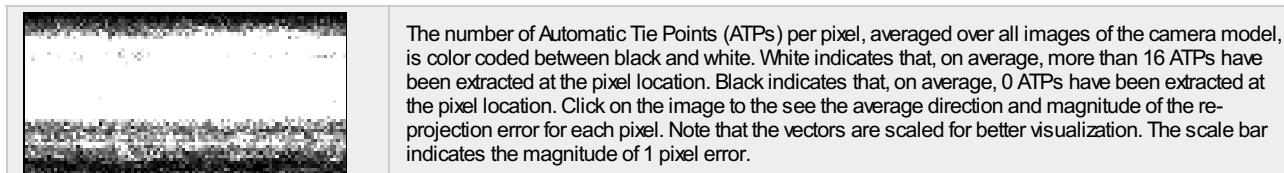
Number of 2D Keypoint Observations for Bundle Block Adjustment	185666
Number of 3D Points for Bundle Block Adjustment	22306
Mean Reprojection Error [pixels]	0.604

💡 Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



💡 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24911	172
Mn	15697	23
Max	30913	314
Mean	24236	173

💡 3D Points from 2D Keypoint Matches



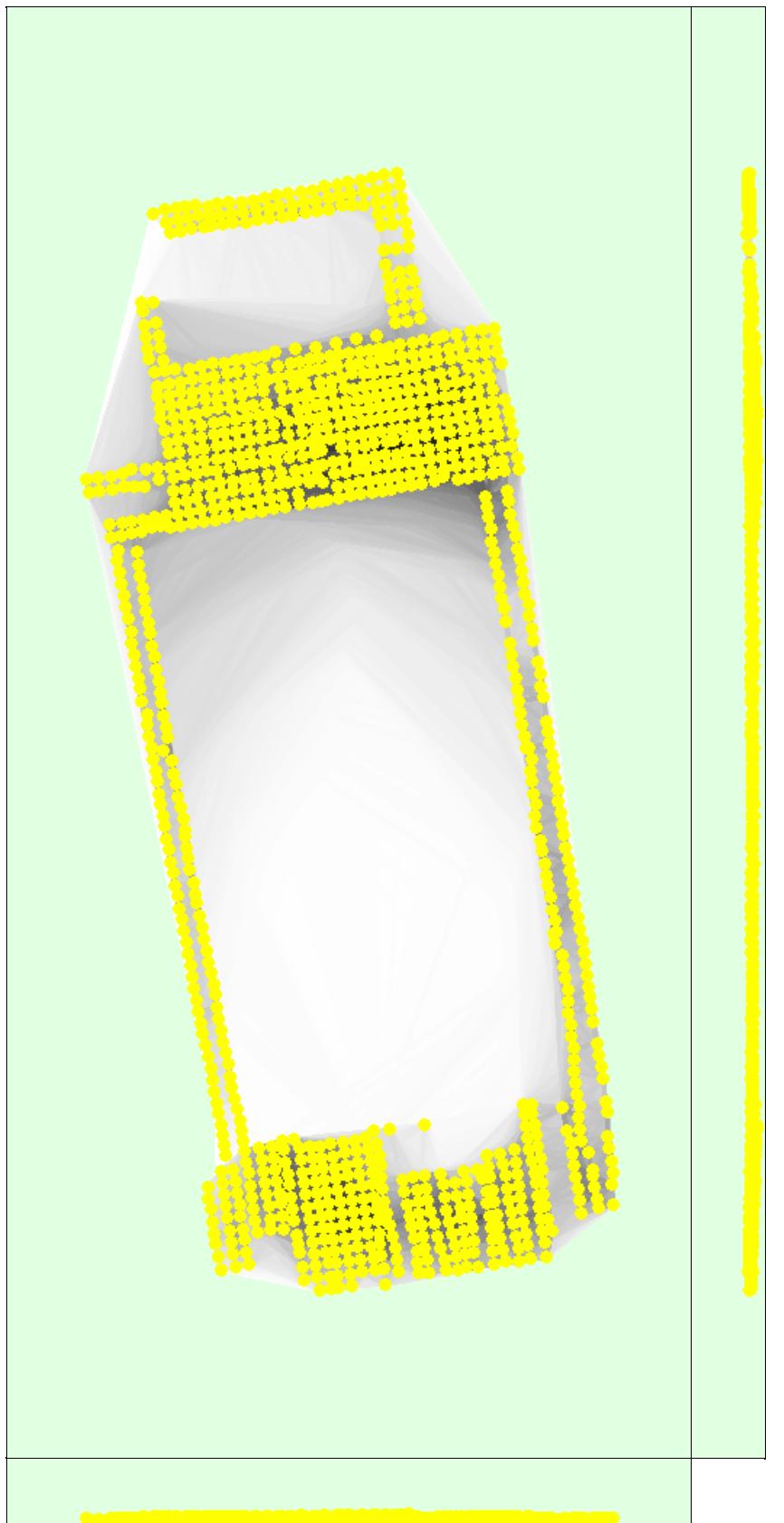
	Number of 3D Points Observed
In 2 Images	7168
In 3 Images	5348
In 4 Images	2989
In 5 Images	1537
In 6 Images	892
In 7 Images	609
In 8 Images	457
In 9 Images	368
In 10 Images	274
In 11 Images	236
In 12 Images	186
In 13 Images	183
In 14 Images	152
In 15 Images	109
In 16 Images	118
In 17 Images	86
In 18 Images	75
In 19 Images	64

In 20 Images	57
In 21 Images	64
In 22 Images	74
In 23 Images	49
In 24 Images	38
In 25 Images	47
In 26 Images	40
In 27 Images	31
In 28 Images	37
In 29 Images	32
In 30 Images	24
In 31 Images	27
In 32 Images	30
In 33 Images	29
In 34 Images	23
In 35 Images	22
In 36 Images	17
In 37 Images	25
In 38 Images	26
In 39 Images	22
In 40 Images	20
In 41 Images	24
In 42 Images	13
In 43 Images	15
In 44 Images	13
In 45 Images	16
In 46 Images	16
In 47 Images	21
In 48 Images	15
In 49 Images	15
In 50 Images	11
In 51 Images	18
In 52 Images	15
In 53 Images	13
In 54 Images	14
In 55 Images	13
In 56 Images	12
In 57 Images	7
In 58 Images	15
In 59 Images	6
In 60 Images	9
In 61 Images	11
In 62 Images	13
In 63 Images	7
In 64 Images	7
In 65 Images	5
In 66 Images	6
In 67 Images	8
In 68 Images	7
In 69 Images	5
In 70 Images	10
In 71 Images	9
In 72 Images	13
In 73 Images	6
In 74 Images	4
In 75 Images	5
In 76 Images	9
In 77 Images	5
In 78 Images	2

In 79 Images	9
In 80 Images	3
In 81 Images	6
In 82 Images	4
In 83 Images	6
In 84 Images	1
In 85 Images	6
In 86 Images	2
In 87 Images	7
In 88 Images	1
In 89 Images	3
In 90 Images	3
In 91 Images	2
In 92 Images	4
In 93 Images	4
In 94 Images	2
In 95 Images	3
In 96 Images	4
In 97 Images	3
In 98 Images	1
In 99 Images	1
In 100 Images	3
In 101 Images	4
In 102 Images	2
In 103 Images	4
In 104 Images	3
In 105 Images	1
In 106 Images	2
In 107 Images	1
In 108 Images	2
In 109 Images	2
In 110 Images	3
In 112 Images	3
In 113 Images	4
In 114 Images	4
In 116 Images	1
In 117 Images	3
In 118 Images	3
In 119 Images	3
In 121 Images	5
In 122 Images	3
In 124 Images	2
In 125 Images	1
In 127 Images	1
In 128 Images	2
In 129 Images	1
In 130 Images	2
In 131 Images	3
In 132 Images	1
In 134 Images	3
In 135 Images	1
In 136 Images	1
In 137 Images	2
In 138 Images	1
In 141 Images	1
In 143 Images	4
In 144 Images	2
In 145 Images	1
In 146 Images	1

In 147 Images	1
In 148 Images	2
In 149 Images	3
In 150 Images	3
In 151 Images	2
In 152 Images	3
In 153 Images	1
In 154 Images	3
In 157 Images	3
In 159 Images	1
In 165 Images	2
In 168 Images	1
In 170 Images	1
In 171 Images	1
In 172 Images	1
In 173 Images	1
In 174 Images	2
In 175 Images	1
In 176 Images	1
In 179 Images	1
In 181 Images	1
In 182 Images	1
In 183 Images	3
In 184 Images	1
In 188 Images	1
In 189 Images	1
In 190 Images	2
In 191 Images	1
In 192 Images	2
In 195 Images	3
In 204 Images	1
In 208 Images	3
In 209 Images	2
In 212 Images	1
In 214 Images	2
In 215 Images	1
In 217 Images	1
In 218 Images	1
In 219 Images	1
In 220 Images	3
In 223 Images	1
In 224 Images	1
In 226 Images	1
In 228 Images	1
In 229 Images	1
In 232 Images	2
In 234 Images	1
In 239 Images	1
In 240 Images	1
In 241 Images	1
In 246 Images	1
In 251 Images	1
In 252 Images	1
In 253 Images	2
In 256 Images	1
In 259 Images	1
In 260 Images	1
In 261 Images	1
In 262 Images	2

In 263 Images	1
In 267 Images	1
In 274 Images	1
In 278 Images	1
In 280 Images	1
In 286 Images	1
In 287 Images	1
In 288 Images	1
In 289 Images	1
In 290 Images	1
In 294 Images	1
In 300 Images	1
In 301 Images	2
In 304 Images	1
In 307 Images	1
In 310 Images	1
In 321 Images	1
In 323 Images	1
In 327 Images	1
In 337 Images	1
In 343 Images	1
In 347 Images	1
In 352 Images	1
In 356 Images	1
In 357 Images	1
In 370 Images	1
In 371 Images	1
In 379 Images	1
In 381 Images	1
In 387 Images	1
In 388 Images	1
In 395 Images	1
In 402 Images	1
In 406 Images	1
In 408 Images	1
In 409 Images	1
In 410 Images	2
In 412 Images	1
In 416 Images	1
In 423 Images	1
In 424 Images	1
In 427 Images	1
In 432 Images	1
In 436 Images	2
In 442 Images	1
In 443 Images	2
In 445 Images	1
In 451 Images	1
In 456 Images	1
In 460 Images	1
In 480 Images	1
In 487 Images	1
In 500 Images	1
In 508 Images	1
In 514 Images	1



Number of matches

25 25 41 62 83 104 125 146 167 188

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.

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.083	0.144	-0.001	5.745	8/8
20 (3D)	0.020/ 0.020	0.025	0.133	0.076	7.417	8/8
21 (3D)	0.020/ 0.020	0.090	0.125	-0.061	6.916	8/8
24 (3D)	0.020/ 0.020	-0.043	-0.014	0.028	1.847	8/8
6 (3D)	0.020/ 0.020	-0.084	0.011	0.034	3.360	8/8
7 (3D)	0.020/ 0.020	-0.059	-0.011	0.041	2.381	8/8
8 (3D)	0.020/ 0.020	-0.065	-0.002	0.044	2.448	8/8
9 (3D)	0.020/ 0.020	-0.067	0.009	-0.002	6.758	8/8
10 (3D)	0.020/ 0.020	-0.033	0.019	0.049	4.591	8/8
26 (3D)	0.020/ 0.020	0.272	-0.158	-0.160	3.144	8/8
27 (3D)	0.020/ 0.020	-0.222	-0.216	-0.040	1.466	8/8
14 (3D)	0.020/ 0.020	0.262	0.013	-0.009	5.345	8/8
16 (3D)	0.020/ 0.020	0.160	-0.142	0.004	7.071	7/7
28 (3D)	0.020/ 0.020	0.012	-0.117	0.014	2.072	8/8
17 (3D)	0.020/ 0.020	-0.327	0.062	0.042	4.940	8/8
18 (3D)	0.020/ 0.020	-0.170	0.111	0.060	6.979	8/8
4 (3D)	0.020/ 0.020	-0.047	0.007	-0.041	2.216	8/8
5 (3D)	0.020/ 0.020	-0.032	0.023	-0.028	3.709	8/8
22 (3D)	0.020/ 0.020	-0.011	0.079	0.063	3.165	8/8
1 (3D)	0.020/ 0.020	0.124	-0.074	-0.023	5.672	8/8
2 (3D)	0.020/ 0.020	0.097	-0.025	0.049	1.542	8/8
3 (3D)	0.020/ 0.020	-0.038	-0.167	-0.092	6.225	8/8
13 (3D)	0.020/ 0.020	0.137	0.138	-0.021	11.387	8/8
30 (3D)	0.020/ 0.020	0.614	-2.769	-1.498	1.441	8/8
29 (3D)	0.020/ 0.020	-0.210	-0.077	0.031	1.732	8/8
23 (3D)	0.020/ 0.020	-0.205	0.162	-0.057	3.427	8/8
25 (3D)	0.020/ 0.020	0.020	-0.094	0.007	1.019	8/8
11 (3D)	0.020/ 0.020	0.049	0.029	0.011	2.620	8/8
12 (3D)	0.020/ 0.020	0.061	0.074	-0.003	2.219	8/8
15 (3D)	0.020/ 0.020	0.335	-0.084	-0.092	7.301	8/8
Mean [m]		0.018701	-0.093699	-0.052541		
Sigma [m]		0.183502	0.506385	0.273341		
RMS Error [m]		0.184452	0.514981	0.278345		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	04h:49m:41s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	20m:38s

Results



Number of Processed Clusters	7
Number of Generated Tiles	1
Number of 3D Densified Points	6645582
Average Density (per m ³)	3398.11

Quality Report



Generated with Pix4DDiscovery version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	100%_ugem_mgcp_2
Processed	2021-04-07 18:27:11
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.69 cm / 0.27 in
Time for Initial Processing (without report)	05h:31m:32s

Quality Check



Images	median of 24911 keypoints per image	
Dataset	1074 out of 1074 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 6947.79 matches per calibrated image	
Georeferencing	yes, 29 GCPs (29 3D), mean RMS error = 0.169 m	

Calibration Details



Number of Calibrated Images	1074 out of 1074
Number of Geolocated Images	0 out of 1074

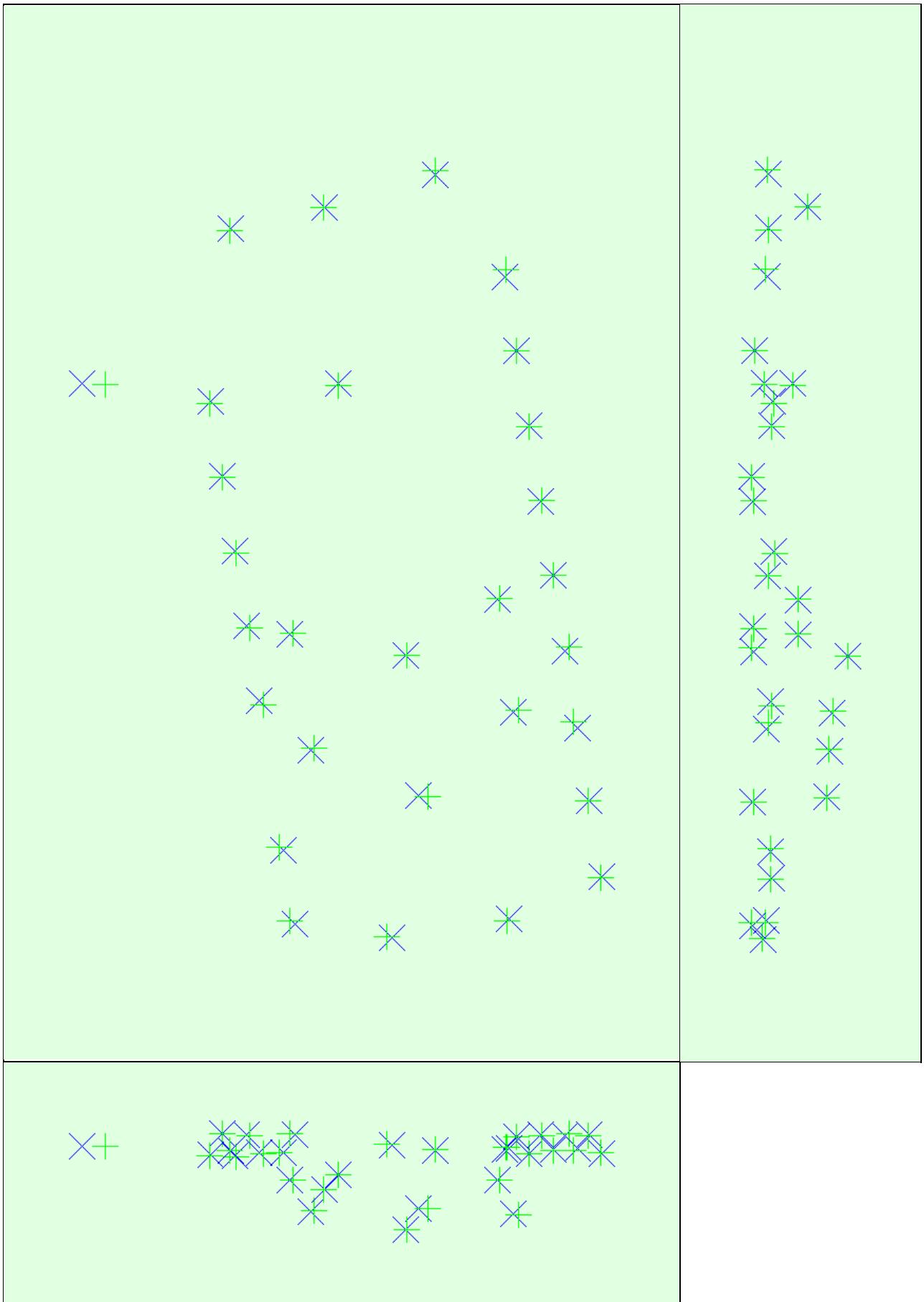
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

⚠ Absolute camera position and orientation uncertainties

i

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.004	0.115	0.014	0.055
Sigma	0.001	0.001	0.000	0.317	0.003	0.263

Bundle Block Adjustment Details

i

Number of 2D Keypoint Observations for Bundle Block Adjustment	7348522
Number of 3D Points for Bundle Block Adjustment	3115812
Mean Reprojection Error [pixels]	0.487

⚠ Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.

	The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.
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⚠ 2D Keypoints Table

i

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24911	6948
Mn	15697	519
Max	30913	9720
Mean	24235	6842

⚠ 3D Points from 2D Keypoint Matches

i

	Number of 3D Points Observed
In 2 Images	2725264
In 3 Images	228674
In 4 Images	70080
In 5 Images	31797
In 6 Images	17246
In 7 Images	10400
In 8 Images	6856
In 9 Images	4683
In 10 Images	3406
In 11 Images	2500
In 12 Images	1951
In 13 Images	1622
In 14 Images	1288
In 15 Images	1061
In 16 Images	955
In 17 Images	668
In 18 Images	652
In 19 Images	543

In 20 Images	455
In 21 Images	416
In 22 Images	337
In 23 Images	300
In 24 Images	291
In 25 Images	273
In 26 Images	240
In 27 Images	206
In 28 Images	188
In 29 Images	174
In 30 Images	167
In 31 Images	147
In 32 Images	139
In 33 Images	118
In 34 Images	115
In 35 Images	132
In 36 Images	101
In 37 Images	103
In 38 Images	85
In 39 Images	78
In 40 Images	91
In 41 Images	77
In 42 Images	66
In 43 Images	59
In 44 Images	74
In 45 Images	58
In 46 Images	45
In 47 Images	52
In 48 Images	59
In 49 Images	41
In 50 Images	42
In 51 Images	45
In 52 Images	31
In 53 Images	34
In 54 Images	49
In 55 Images	35
In 56 Images	29
In 57 Images	32
In 58 Images	20
In 59 Images	32
In 60 Images	29
In 61 Images	26
In 62 Images	33
In 63 Images	31
In 64 Images	18
In 65 Images	16
In 66 Images	15
In 67 Images	21
In 68 Images	14
In 69 Images	20
In 70 Images	25
In 71 Images	12
In 72 Images	9
In 73 Images	16
In 74 Images	20
In 75 Images	21
In 76 Images	13
In 77 Images	13
In 78 Images	14

In 79 Images	12
In 80 Images	11
In 81 Images	9
In 82 Images	9
In 83 Images	20
In 84 Images	9
In 85 Images	14
In 86 Images	7
In 87 Images	15
In 88 Images	12
In 89 Images	10
In 90 Images	6
In 91 Images	7
In 92 Images	15
In 93 Images	8
In 94 Images	13
In 95 Images	8
In 96 Images	7
In 97 Images	6
In 98 Images	8
In 99 Images	13
In 100 Images	11
In 101 Images	9
In 102 Images	6
In 103 Images	11
In 104 Images	7
In 105 Images	7
In 106 Images	8
In 107 Images	6
In 108 Images	4
In 109 Images	5
In 110 Images	8
In 111 Images	3
In 112 Images	5
In 113 Images	7
In 114 Images	2
In 115 Images	4
In 116 Images	6
In 117 Images	6
In 118 Images	5
In 119 Images	9
In 120 Images	3
In 121 Images	5
In 122 Images	5
In 123 Images	5
In 124 Images	5
In 125 Images	3
In 126 Images	2
In 127 Images	3
In 128 Images	5
In 129 Images	3
In 130 Images	4
In 131 Images	3
In 132 Images	5
In 133 Images	4
In 135 Images	4
In 136 Images	5
In 137 Images	6
In 138 Images	1

In 139 Images	2
In 140 Images	4
In 141 Images	6
In 142 Images	4
In 144 Images	2
In 145 Images	5
In 146 Images	3
In 147 Images	3
In 148 Images	4
In 149 Images	4
In 150 Images	2
In 152 Images	1
In 153 Images	2
In 154 Images	3
In 156 Images	3
In 157 Images	5
In 158 Images	2
In 159 Images	4
In 160 Images	1
In 161 Images	1
In 162 Images	5
In 163 Images	5
In 164 Images	3
In 165 Images	2
In 166 Images	2
In 168 Images	1
In 170 Images	1
In 171 Images	1
In 173 Images	6
In 174 Images	3
In 175 Images	3
In 176 Images	1
In 178 Images	2
In 179 Images	3
In 180 Images	1
In 181 Images	2
In 183 Images	1
In 186 Images	1
In 187 Images	3
In 188 Images	1
In 190 Images	6
In 191 Images	1
In 193 Images	1
In 194 Images	2
In 195 Images	1
In 196 Images	1
In 198 Images	2
In 199 Images	1
In 200 Images	2
In 201 Images	5
In 202 Images	2
In 203 Images	3
In 204 Images	3
In 206 Images	2
In 207 Images	1
In 209 Images	2
In 210 Images	3
In 211 Images	1
In 212 Images	1

In 213 Images	3
In 214 Images	4
In 215 Images	1
In 216 Images	1
In 218 Images	1
In 219 Images	4
In 220 Images	2
In 222 Images	2
In 223 Images	2
In 225 Images	2
In 229 Images	1
In 230 Images	2
In 233 Images	3
In 235 Images	2
In 236 Images	1
In 237 Images	1
In 238 Images	1
In 240 Images	1
In 241 Images	2
In 242 Images	1
In 244 Images	1
In 245 Images	2
In 247 Images	2
In 248 Images	1
In 250 Images	2
In 251 Images	4
In 252 Images	2
In 253 Images	1
In 255 Images	1
In 258 Images	3
In 260 Images	1
In 261 Images	2
In 263 Images	2
In 264 Images	1
In 267 Images	2
In 269 Images	1
In 270 Images	2
In 272 Images	1
In 274 Images	1
In 275 Images	1
In 276 Images	1
In 277 Images	1
In 278 Images	1
In 281 Images	3
In 283 Images	1
In 285 Images	2
In 286 Images	1
In 288 Images	1
In 289 Images	1
In 291 Images	2
In 293 Images	1
In 295 Images	1
In 296 Images	1
In 297 Images	3
In 298 Images	2
In 301 Images	2
In 302 Images	1
In 304 Images	2
In 311 Images	1

In 312 Images	1
In 313 Images	1
In 314 Images	1
In 315 Images	1
In 317 Images	1
In 318 Images	2
In 322 Images	1
In 323 Images	1
In 325 Images	3
In 326 Images	1
In 328 Images	2
In 329 Images	2
In 332 Images	1
In 333 Images	1
In 334 Images	1
In 338 Images	2
In 339 Images	1
In 340 Images	1
In 344 Images	2
In 345 Images	1
In 347 Images	1
In 349 Images	2
In 350 Images	1
In 351 Images	1
In 353 Images	1
In 355 Images	1
In 359 Images	1
In 360 Images	1
In 366 Images	3
In 370 Images	1
In 371 Images	1
In 372 Images	1
In 373 Images	2
In 374 Images	1
In 376 Images	1
In 379 Images	1
In 380 Images	1
In 382 Images	1
In 383 Images	3
In 387 Images	2
In 388 Images	1
In 392 Images	1
In 394 Images	1
In 397 Images	2
In 398 Images	1
In 404 Images	2
In 406 Images	1
In 407 Images	1
In 410 Images	1
In 418 Images	1
In 421 Images	1
In 424 Images	2
In 427 Images	2
In 430 Images	1
In 433 Images	1
In 435 Images	2
In 439 Images	1
In 440 Images	2
In 442 Images	2

In 443 Images	1
In 444 Images	1
In 450 Images	2
In 456 Images	1
In 458 Images	1
In 460 Images	1
In 462 Images	1
In 464 Images	1
In 467 Images	1
In 474 Images	1
In 477 Images	1
In 482 Images	1
In 484 Images	1
In 489 Images	1
In 490 Images	1
In 509 Images	1
In 576 Images	1
In 577 Images	1

 **2D Keypoint Matches**



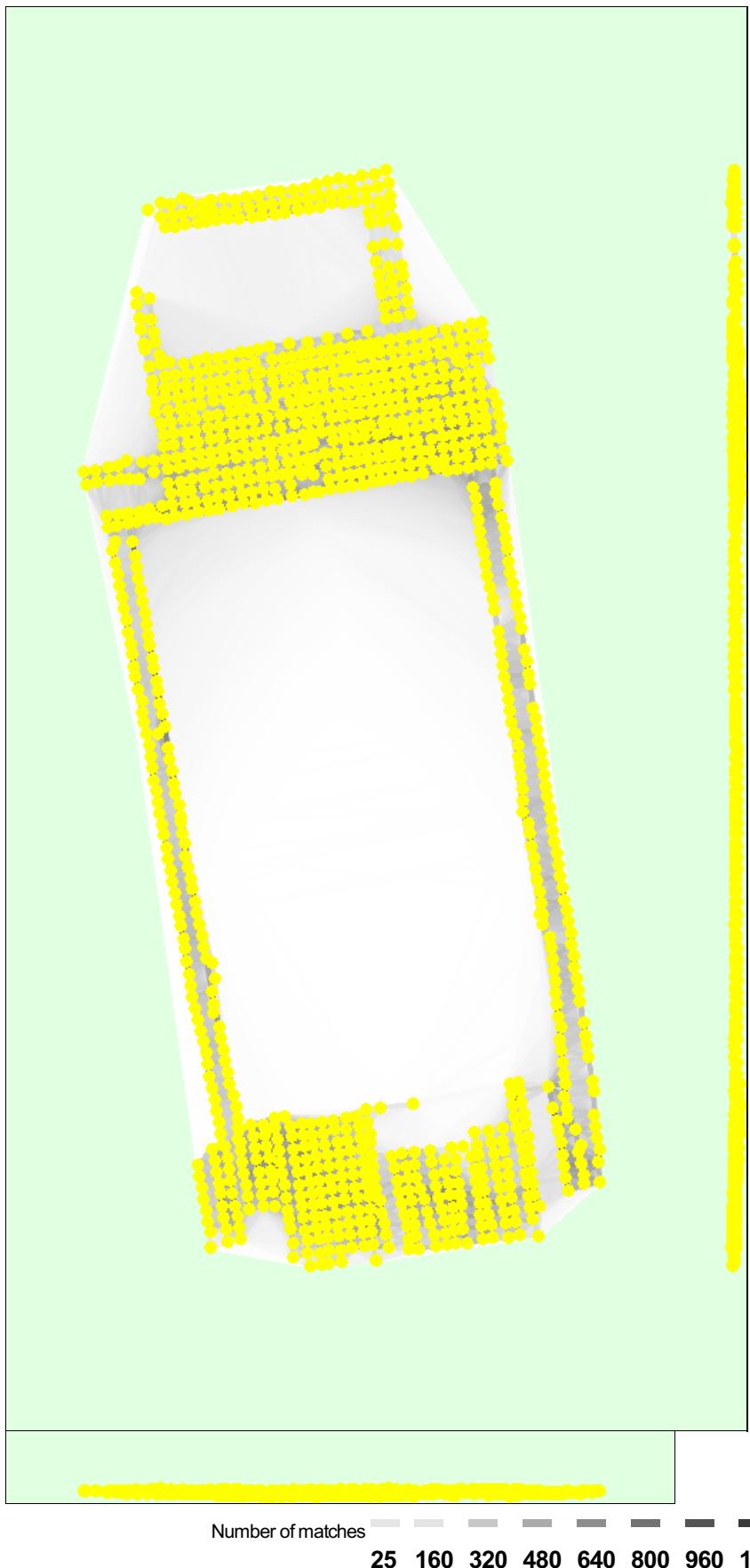


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.154	0.155	0.014	1.891	2/2
20 (3D)	0.020/ 0.020	-0.088	0.160	0.050	3.366	3/3
21 (3D)	0.020/ 0.020	-0.015	0.115	0.027	13.222	4/4
24 (3D)	0.020/ 0.020	0.010	0.064	0.018	0.622	2/2
6 (3D)	0.020/ 0.020	-0.029	0.016	0.041	3.794	4/4
7 (3D)	0.020/ 0.020	-0.016	-0.026	0.055	0.864	2/2
8 (3D)	0.020/ 0.020	-0.021	-0.020	0.052	1.673	4/4
9 (3D)	0.020/ 0.020	-0.222	-0.213	-0.138	2.301	2/2
10 (3D)	0.020/ 0.020	0.251	-0.331	0.086	1.642	2/2
26 (3D)	0.020/ 0.020	-0.317	-0.129	0.003	0.066	2/2
27 (3D)	0.020/ 0.020	-0.534	0.049	0.043	0.110	2/2
14 (3D)	0.020/ 0.020	0.281	-0.044	-0.031	3.191	3/3
16 (3D)	0.020/ 0.020	0.274	-0.183	-0.022	2.901	3/4
28 (3D)	0.020/ 0.020	-0.184	-0.110	-0.059	1.057	2/2
17 (3D)	0.020/ 0.020	0.000	0.000	0.000	-1.000	1/2
18 (3D)	0.020/ 0.020	-0.252	0.254	0.051	1.750	3/3
4 (3D)	0.020/ 0.020	-0.061	-0.385	-0.104	1.929	2/2
5 (3D)	0.020/ 0.020	-0.026	0.006	0.008	6.561	2/2
22 (3D)	0.020/ 0.020	0.031	0.119	0.026	5.787	4/4
1 (3D)	0.020/ 0.020	0.067	0.092	0.007	2.010	2/2
2 (3D)	0.020/ 0.020	0.093	-0.039	0.026	2.552	2/2
3 (3D)	0.020/ 0.020	0.045	-0.229	-0.033	2.387	2/2
13 (3D)	0.020/ 0.020	0.112	0.124	-0.036	8.738	3/3
30 (3D)	0.020/ 0.020	-0.015	0.014	0.016	2.987	2/2
29 (3D)	0.020/ 0.020	-0.241	-0.042	0.021	2.288	2/2
23 (3D)	0.020/ 0.020	-1.402	0.065	-0.011	2.754	2/2
25 (3D)	0.020/ 0.020	-0.149	-0.050	0.008	0.234	2/2
11 (3D)	0.020/ 0.020	0.070	0.042	0.007	0.122	2/2
12 (3D)	0.020/ 0.020	0.090	0.087	-0.026	3.084	3/3
15 (3D)	0.020/ 0.020	0.345	-0.147	-0.066	3.097	3/3
Mean [m]		-0.070961	-0.020207	0.001150		
Sigma [m]		0.313322	0.146474	0.048290		
RMS Error [m]		0.321257	0.147862	0.048304		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.5671)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options



Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	01h:34m:59s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	20m:51s

Results



Number of Processed Clusters	15
Number of Generated Tiles	1
Number of 3D Densified Points	7085390
Average Density (per m ³)	3213.98

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	100%_ugeom_mgcp_8
Processed	2021-05-05 07:16:01
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.71 cm / 0.28 in
Time for Initial Processing (without report)	06h:07m:51s

Quality Check



Images	median of 24911 keypoints per image	
Dataset	1074 out of 1074 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 6949.27 matches per calibrated image	
Georeferencing	yes, 29 GCPs (29 3D), mean RMS error = 0.337 m	

Calibration Details



Number of Calibrated Images	1074 out of 1074
Number of Geolocated Images	0 out of 1074

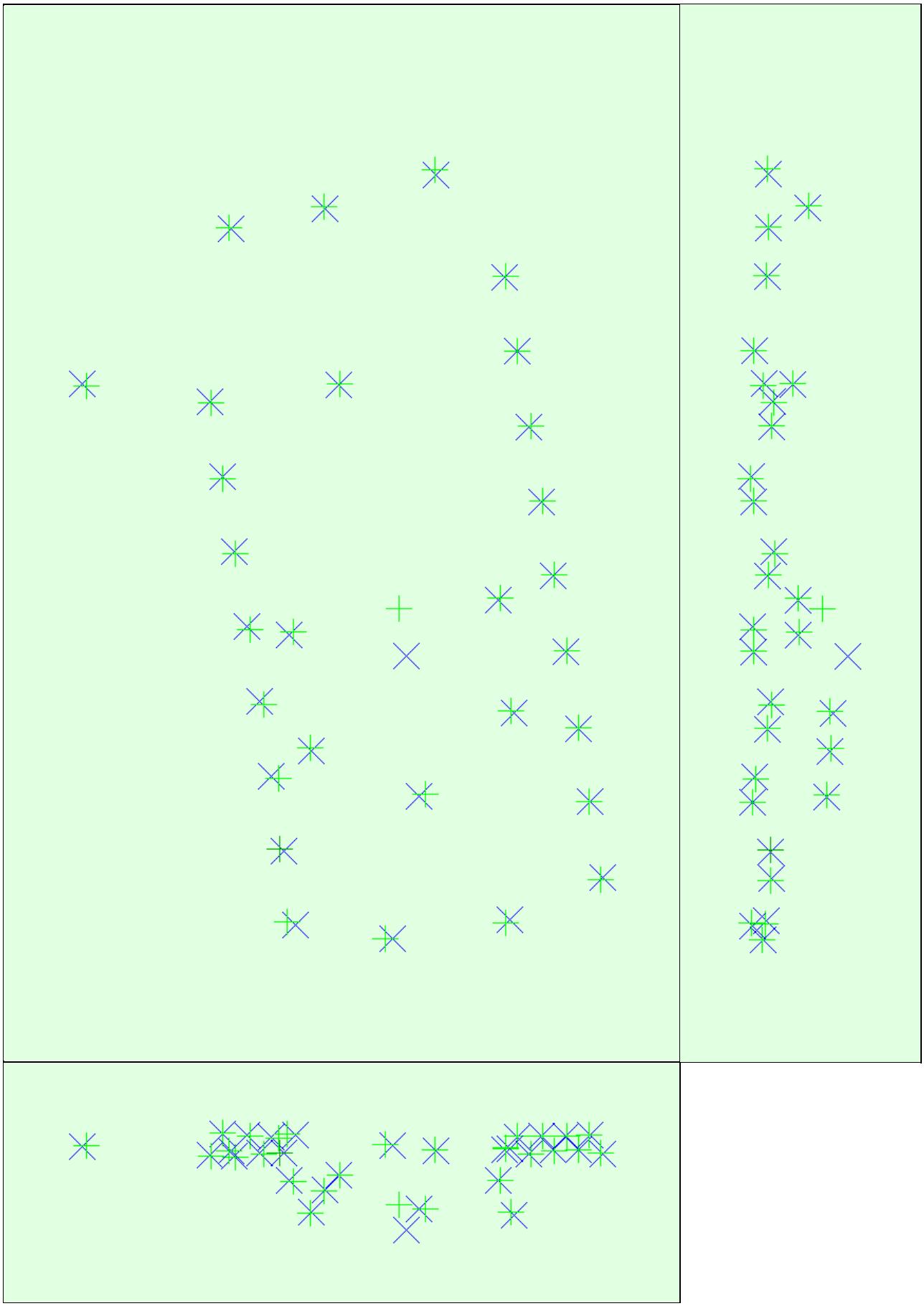
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

⚠ Absolute camera position and orientation uncertainties

i

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.004	0.113	0.014	0.058
Sigma	0.001	0.001	0.001	0.250	0.003	0.325

Bundle Block Adjustment Details

i

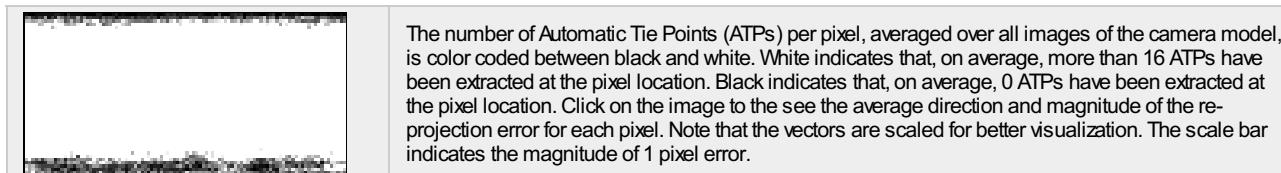
Number of 2D Keypoint Observations for Bundle Block Adjustment	7232832
Number of 3D Points for Bundle Block Adjustment	3068533
Mean Reprojection Error [pixels]	0.487

⚠ Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



⚠ 2D Keypoints Table

i

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24911	6949
Mn	15697	620
Max	30913	9578
Mean	24235	6734

⚠ 3D Points from 2D Keypoint Matches

i

	Number of 3D Points Observed
In 2 Images	2686249
In 3 Images	224942
In 4 Images	68209
In 5 Images	30713
In 6 Images	16747
In 7 Images	9928
In 8 Images	6626
In 9 Images	4588
In 10 Images	3483
In 11 Images	2506
In 12 Images	1903
In 13 Images	1566
In 14 Images	1155
In 15 Images	1055
In 16 Images	861
In 17 Images	712
In 18 Images	625
In 19 Images	585

In 20 Images	471
In 21 Images	400
In 22 Images	348
In 23 Images	276
In 24 Images	275
In 25 Images	283
In 26 Images	236
In 27 Images	207
In 28 Images	189
In 29 Images	163
In 30 Images	165
In 31 Images	133
In 32 Images	132
In 33 Images	115
In 34 Images	128
In 35 Images	105
In 36 Images	102
In 37 Images	81
In 38 Images	101
In 39 Images	83
In 40 Images	80
In 41 Images	78
In 42 Images	65
In 43 Images	51
In 44 Images	55
In 45 Images	57
In 46 Images	44
In 47 Images	52
In 48 Images	54
In 49 Images	43
In 50 Images	42
In 51 Images	33
In 52 Images	34
In 53 Images	37
In 54 Images	47
In 55 Images	28
In 56 Images	39
In 57 Images	32
In 58 Images	28
In 59 Images	36
In 60 Images	22
In 61 Images	26
In 62 Images	26
In 63 Images	17
In 64 Images	26
In 65 Images	34
In 66 Images	22
In 67 Images	23
In 68 Images	17
In 69 Images	21
In 70 Images	18
In 71 Images	15
In 72 Images	17
In 73 Images	18
In 74 Images	18
In 75 Images	15
In 76 Images	12
In 77 Images	17
In 78 Images	17

In 79 Images	12
In 80 Images	8
In 81 Images	11
In 82 Images	14
In 83 Images	6
In 84 Images	10
In 85 Images	8
In 86 Images	12
In 87 Images	11
In 88 Images	14
In 89 Images	13
In 90 Images	14
In 91 Images	12
In 92 Images	13
In 93 Images	3
In 94 Images	11
In 95 Images	9
In 96 Images	8
In 97 Images	9
In 98 Images	6
In 99 Images	6
In 100 Images	10
In 101 Images	9
In 102 Images	6
In 103 Images	12
In 104 Images	9
In 105 Images	4
In 106 Images	3
In 107 Images	5
In 108 Images	2
In 109 Images	4
In 110 Images	6
In 111 Images	4
In 112 Images	2
In 113 Images	6
In 114 Images	7
In 115 Images	7
In 116 Images	9
In 117 Images	6
In 118 Images	3
In 119 Images	4
In 120 Images	3
In 121 Images	4
In 122 Images	3
In 123 Images	6
In 124 Images	5
In 125 Images	7
In 126 Images	10
In 127 Images	3
In 128 Images	3
In 129 Images	4
In 130 Images	1
In 131 Images	7
In 132 Images	3
In 133 Images	3
In 134 Images	3
In 135 Images	1
In 136 Images	1
In 137 Images	3

In 138 Images	7
In 139 Images	1
In 140 Images	6
In 141 Images	6
In 142 Images	2
In 143 Images	4
In 144 Images	3
In 145 Images	3
In 146 Images	5
In 147 Images	4
In 148 Images	6
In 149 Images	2
In 150 Images	4
In 151 Images	3
In 152 Images	1
In 154 Images	5
In 155 Images	2
In 156 Images	2
In 157 Images	1
In 158 Images	3
In 159 Images	4
In 160 Images	3
In 161 Images	1
In 162 Images	5
In 164 Images	4
In 165 Images	1
In 166 Images	1
In 167 Images	1
In 168 Images	1
In 169 Images	2
In 171 Images	1
In 172 Images	2
In 173 Images	3
In 174 Images	1
In 175 Images	2
In 176 Images	3
In 177 Images	1
In 178 Images	2
In 179 Images	3
In 180 Images	1
In 181 Images	5
In 182 Images	3
In 183 Images	1
In 184 Images	3
In 185 Images	1
In 186 Images	3
In 187 Images	2
In 188 Images	1
In 189 Images	3
In 190 Images	1
In 191 Images	1
In 192 Images	1
In 193 Images	3
In 194 Images	2
In 195 Images	3
In 196 Images	2
In 197 Images	1
In 198 Images	2
In 200 Images	2

In 201 Images	3
In 202 Images	2
In 203 Images	2
In 204 Images	1
In 205 Images	2
In 206 Images	3
In 207 Images	3
In 209 Images	2
In 210 Images	1
In 211 Images	1
In 212 Images	1
In 213 Images	6
In 214 Images	1
In 215 Images	1
In 216 Images	4
In 217 Images	1
In 218 Images	1
In 220 Images	2
In 221 Images	2
In 222 Images	3
In 223 Images	1
In 224 Images	1
In 225 Images	2
In 226 Images	2
In 227 Images	2
In 231 Images	1
In 233 Images	1
In 235 Images	2
In 236 Images	2
In 237 Images	2
In 239 Images	3
In 241 Images	1
In 242 Images	2
In 243 Images	1
In 245 Images	2
In 246 Images	1
In 248 Images	1
In 249 Images	1
In 251 Images	2
In 252 Images	3
In 253 Images	2
In 254 Images	2
In 256 Images	1
In 258 Images	2
In 259 Images	3
In 261 Images	2
In 262 Images	1
In 263 Images	3
In 264 Images	1
In 265 Images	1
In 267 Images	1
In 268 Images	2
In 269 Images	1
In 274 Images	2
In 275 Images	1
In 276 Images	1
In 277 Images	1
In 278 Images	1
In 279 Images	2

In 281 Images	3
In 285 Images	1
In 286 Images	1
In 287 Images	1
In 288 Images	2
In 290 Images	1
In 292 Images	1
In 293 Images	2
In 295 Images	4
In 296 Images	1
In 297 Images	2
In 298 Images	2
In 301 Images	1
In 304 Images	1
In 306 Images	2
In 310 Images	1
In 311 Images	1
In 313 Images	1
In 314 Images	2
In 315 Images	1
In 316 Images	1
In 317 Images	1
In 318 Images	1
In 320 Images	1
In 325 Images	1
In 326 Images	1
In 327 Images	3
In 328 Images	1
In 329 Images	1
In 330 Images	1
In 332 Images	1
In 333 Images	2
In 337 Images	1
In 338 Images	2
In 340 Images	2
In 347 Images	2
In 348 Images	1
In 350 Images	1
In 351 Images	2
In 352 Images	1
In 354 Images	2
In 355 Images	2
In 356 Images	1
In 360 Images	1
In 361 Images	1
In 363 Images	1
In 368 Images	1
In 370 Images	1
In 374 Images	3
In 375 Images	1
In 377 Images	1
In 380 Images	1
In 381 Images	1
In 383 Images	1
In 384 Images	1
In 386 Images	1
In 388 Images	2
In 389 Images	2
In 391 Images	1

In 393 Images	1
In 395 Images	1
In 397 Images	1
In 402 Images	1
In 404 Images	1
In 407 Images	2
In 420 Images	1
In 421 Images	1
In 424 Images	1
In 425 Images	1
In 427 Images	1
In 430 Images	1
In 435 Images	2
In 441 Images	1
In 443 Images	1
In 444 Images	1
In 445 Images	1
In 450 Images	1
In 454 Images	1
In 455 Images	2
In 459 Images	1
In 463 Images	1
In 464 Images	1
In 466 Images	1
In 473 Images	1
In 474 Images	1
In 483 Images	1
In 489 Images	1
In 574 Images	1
In 580 Images	1

 **2D Keypoint Matches**



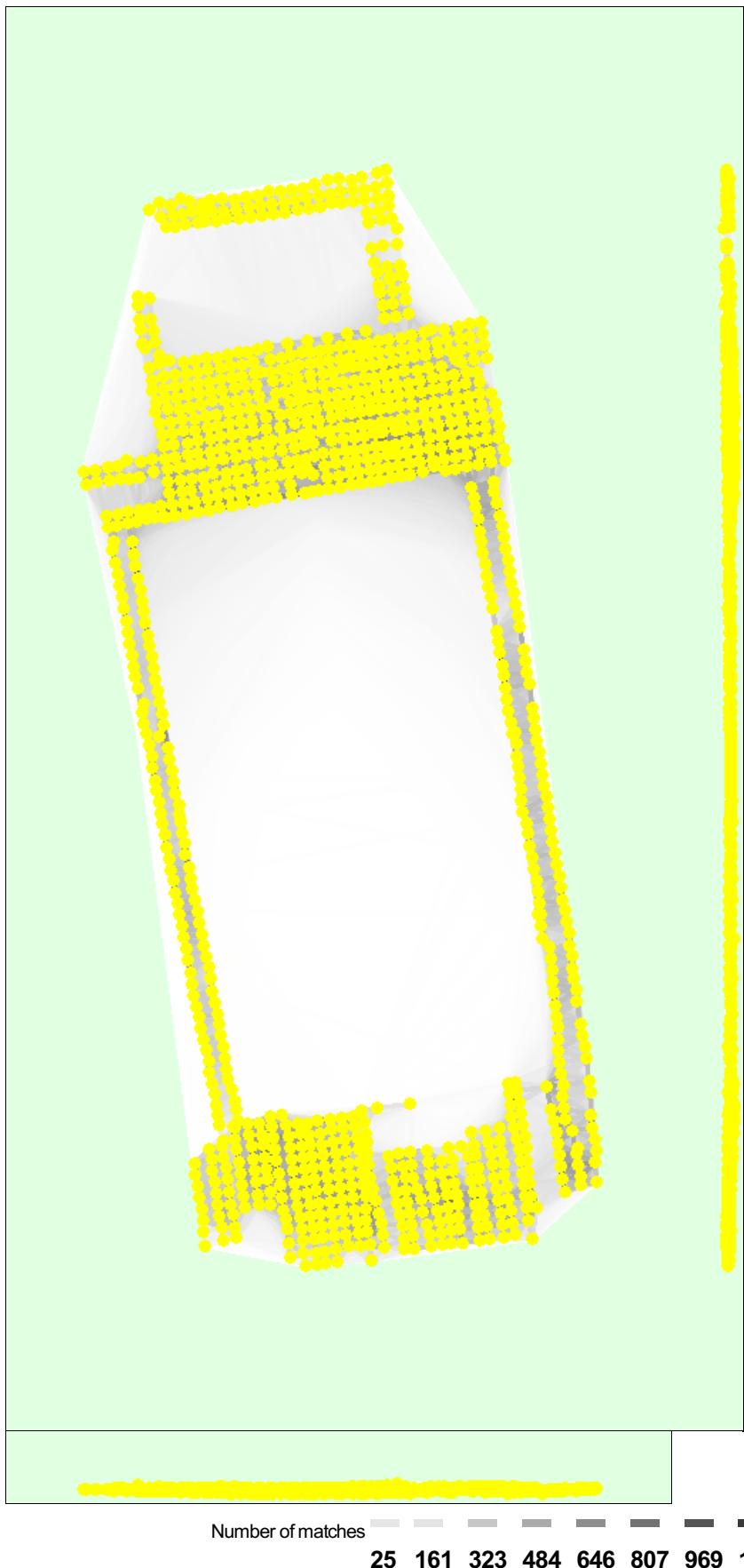


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.169	0.186	0.017	4.838	8/8
20 (3D)	0.020/ 0.020	-0.051	0.139	0.089	7.288	8/8
21 (3D)	0.020/ 0.020	0.017	0.124	-0.043	8.606	8/8
24 (3D)	0.020/ 0.020	-0.068	-0.031	0.016	1.840	8/8
6 (3D)	0.020/ 0.020	-0.077	-0.062	0.019	3.464	8/8
7 (3D)	0.020/ 0.020	-0.059	-0.065	0.023	2.756	8/8
8 (3D)	0.020/ 0.020	-0.063	-0.060	0.046	3.677	8/8
9 (3D)	0.020/ 0.020	-0.049	-0.047	-0.007	5.047	8/8
10 (3D)	0.020/ 0.020	-0.014	-0.026	0.037	4.788	8/8
26 (3D)	0.020/ 0.020	0.181	-0.131	-0.144	3.276	8/8
27 (3D)	0.020/ 0.020	-0.360	-0.171	0.003	1.834	8/8
14 (3D)	0.020/ 0.020	0.420	0.002	-0.036	6.117	8/8
16 (3D)	0.020/ 0.020	0.219	-0.167	0.016	9.579	4/8
28 (3D)	0.020/ 0.020	0.074	-0.182	0.015	2.210	8/8
17 (3D)	0.020/ 0.020	-0.459	0.139	0.098	4.081	8/8
18 (3D)	0.020/ 0.020	-0.279	0.187	0.088	10.507	8/8
4 (3D)	0.020/ 0.020	-0.035	-0.045	-0.065	2.612	8/8
5 (3D)	0.020/ 0.020	-0.022	-0.044	-0.037	4.194	8/8
22 (3D)	0.020/ 0.020	-0.047	0.064	0.051	2.150	8/8
1 (3D)	0.020/ 0.020	0.115	-0.117	-0.004	7.516	8/8
2 (3D)	0.020/ 0.020	0.054	-0.067	0.089	3.441	8/8
3 (3D)	0.020/ 0.020	0.064	-0.292	-0.034	8.379	8/8
13 (3D)	0.020/ 0.020	0.227	0.180	-0.067	13.270	8/8
30 (3D)	0.020/ 0.020	0.477	-2.777	-1.468	1.567	8/8
29 (3D)	0.020/ 0.020	-0.219	-0.150	0.027	1.618	8/8
23 (3D)	0.020/ 0.020	-0.239	0.156	-0.073	2.964	8/8
25 (3D)	0.020/ 0.020	-0.146	-0.144	0.014	0.927	8/8
11 (3D)	0.020/ 0.020	0.084	0.025	-0.015	4.071	8/8
12 (3D)	0.020/ 0.020	0.099	0.112	-0.036	2.777	8/8
15 (3D)	0.020/ 0.020	0.506	-0.188	-0.092	4.188	8/8
Mean [m]		-0.001226	-0.113369	-0.051279		
Sigma [m]		0.218687	0.519265	0.273545		
RMS Error [m]		0.218690	0.531496	0.278310		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options



Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	47m:19s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	23m:35s

Results



Number of Processed Clusters	30
Number of Generated Tiles	1
Number of 3D Densified Points	5001910
Average Density (per m ³)	4072.31

Quality Report



Generated with Pix4Dmapper version 4.6.4

! **Important:** Click on the different icons for:

- ?** Help to analyze the results in the Quality Report
- i** Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	100%_ug geom_ugcp
Processed	2021-02-28 02:34:51
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	undefined
Time for Initial Processing (without report)	11h:08m:30s

Quality Check



? Images	median of 24911 keypoints per image	
? Dataset	1074 out of 1074 images calibrated (100%), all images enabled	
? Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
? Matching	median of 193.138 matches per calibrated image	
? Georeferencing	no, no 3D GCP	

Calibration Details



Number of Calibrated Images	1074 out of 1074
Number of Geolocated Images	0 out of 1074

? Initial Image Positions



The preview is not generated for images without geolocation.

? Computed Image/GCPs/Manual Tie Points Positions



The preview is not generated for images without geolocation.

Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	209575
Number of 3D Points for Bundle Block Adjustment	23609
Mean Reprojection Error [pixels]	0.598

? Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24911	193
Mn	15696	40
Max	30912	328
Mean	24234	195

3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	7015
In 3 Images	5972
In 4 Images	3228
In 5 Images	1644
In 6 Images	1031
In 7 Images	665
In 8 Images	474
In 9 Images	392
In 10 Images	288
In 11 Images	246
In 12 Images	194
In 13 Images	148
In 14 Images	152
In 15 Images	122
In 16 Images	103
In 17 Images	82
In 18 Images	98
In 19 Images	78
In 20 Images	66
In 21 Images	65
In 22 Images	77
In 23 Images	50
In 24 Images	53
In 25 Images	43
In 26 Images	45
In 27 Images	51
In 28 Images	36
In 29 Images	39
In 30 Images	34
In 31 Images	23
In 32 Images	24
In 33 Images	40
In 34 Images	32
In 35 Images	27
In 36 Images	29
In 37 Images	21
In 38 Images	30
In 39 Images	32
In 40 Images	26
In 41 Images	20

In 42 Images	20
In 43 Images	21
In 44 Images	24
In 45 Images	13
In 46 Images	12
In 47 Images	22
In 48 Images	26
In 49 Images	14
In 50 Images	11
In 51 Images	9
In 52 Images	14
In 53 Images	12
In 54 Images	14
In 55 Images	8
In 56 Images	17
In 57 Images	12
In 58 Images	11
In 59 Images	11
In 60 Images	10
In 61 Images	9
In 62 Images	12
In 63 Images	8
In 64 Images	15
In 65 Images	6
In 66 Images	8
In 67 Images	11
In 68 Images	9
In 69 Images	12
In 70 Images	6
In 71 Images	8
In 72 Images	8
In 73 Images	6
In 74 Images	10
In 75 Images	7
In 76 Images	4
In 77 Images	5
In 78 Images	4
In 79 Images	6
In 80 Images	1
In 81 Images	4
In 82 Images	3
In 83 Images	4
In 84 Images	3
In 85 Images	5
In 86 Images	2
In 87 Images	5
In 88 Images	4
In 89 Images	4
In 90 Images	4
In 91 Images	5
In 92 Images	9
In 93 Images	5
In 94 Images	5
In 95 Images	3
In 96 Images	2
In 97 Images	6
In 98 Images	3
In 99 Images	9
In 100 Images	2

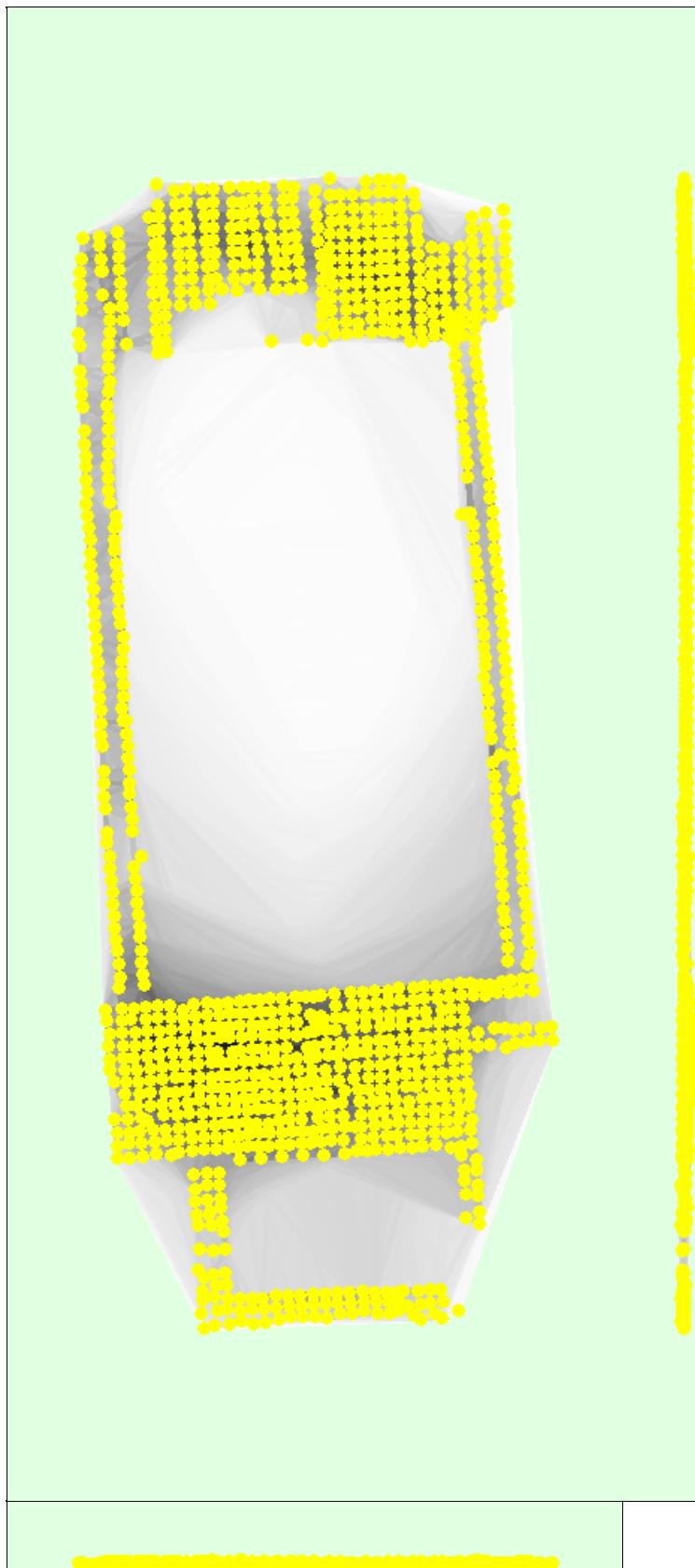
In 101 Images	4
In 102 Images	4
In 103 Images	4
In 104 Images	5
In 105 Images	2
In 106 Images	3
In 107 Images	3
In 108 Images	3
In 109 Images	3
In 110 Images	1
In 111 Images	3
In 112 Images	3
In 113 Images	4
In 114 Images	2
In 115 Images	2
In 116 Images	2
In 118 Images	3
In 119 Images	1
In 120 Images	2
In 121 Images	2
In 122 Images	2
In 123 Images	2
In 124 Images	4
In 125 Images	5
In 126 Images	4
In 127 Images	2
In 128 Images	3
In 129 Images	1
In 130 Images	2
In 131 Images	2
In 132 Images	3
In 133 Images	5
In 134 Images	3
In 135 Images	3
In 136 Images	2
In 137 Images	3
In 139 Images	4
In 140 Images	1
In 141 Images	1
In 142 Images	3
In 143 Images	1
In 145 Images	2
In 147 Images	4
In 148 Images	2
In 150 Images	2
In 151 Images	1
In 152 Images	3
In 153 Images	1
In 154 Images	2
In 155 Images	2
In 156 Images	3
In 157 Images	1
In 158 Images	2
In 161 Images	2
In 162 Images	1
In 163 Images	1
In 165 Images	2
In 167 Images	2
In 168 Images	2

In 169 Images	2
In 172 Images	1
In 174 Images	1
In 175 Images	1
In 176 Images	1
In 177 Images	2
In 179 Images	1
In 181 Images	2
In 185 Images	2
In 186 Images	2
In 187 Images	1
In 188 Images	2
In 189 Images	1
In 190 Images	1
In 194 Images	1
In 197 Images	2
In 198 Images	1
In 200 Images	3
In 202 Images	1
In 203 Images	2
In 204 Images	1
In 207 Images	2
In 208 Images	1
In 211 Images	1
In 212 Images	2
In 213 Images	2
In 214 Images	2
In 216 Images	2
In 222 Images	1
In 224 Images	3
In 225 Images	1
In 227 Images	1
In 228 Images	2
In 231 Images	1
In 237 Images	2
In 239 Images	2
In 245 Images	1
In 248 Images	2
In 250 Images	2
In 251 Images	1
In 252 Images	1
In 254 Images	1
In 255 Images	1
In 260 Images	1
In 263 Images	1
In 264 Images	1
In 265 Images	3
In 273 Images	1
In 274 Images	1
In 275 Images	1
In 280 Images	1
In 285 Images	1
In 286 Images	1
In 287 Images	1
In 288 Images	1
In 290 Images	2
In 291 Images	1
In 294 Images	1
In 297 Images	1

In 298 Images	1
In 300 Images	1
In 302 Images	2
In 303 Images	1
In 306 Images	2
In 314 Images	1
In 321 Images	1
In 323 Images	1
In 326 Images	1
In 327 Images	2
In 328 Images	1
In 329 Images	1
In 331 Images	1
In 337 Images	2
In 338 Images	1
In 342 Images	1
In 345 Images	1
In 351 Images	1
In 352 Images	2
In 363 Images	1
In 371 Images	1
In 377 Images	1
In 379 Images	1
In 383 Images	1
In 386 Images	1
In 388 Images	1
In 389 Images	1
In 392 Images	1
In 393 Images	1
In 394 Images	1
In 395 Images	1
In 396 Images	2
In 397 Images	1
In 406 Images	1
In 408 Images	1
In 423 Images	1
In 428 Images	1
In 430 Images	1
In 441 Images	1
In 442 Images	1
In 443 Images	1
In 445 Images	1
In 448 Images	1
In 456 Images	1
In 464 Images	2
In 473 Images	1
In 475 Images	1
In 484 Images	1
In 489 Images	1
In 490 Images	1
In 502 Images	1
In 584 Images	2

 **2D Keypoint Matches**





Number of matches

25	25	46	69	92	115	138	161	184	208
----	----	----	----	----	-----	-----	-----	-----	-----

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.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i5-4670K CPU @ 3.40GHz RAM: 16GB GPU: NVIDIA GeForce GTX 770 (Driver: 27.21.14.5671)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Output Coordinate System	Arbitrary (m)
--------------------------	---------------

Processing Options



Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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:15m:24s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	49m:48s

Results



Number of Processed Clusters	19
Number of Generated Tiles	1
Number of 3D Densified Points	7143462
Average Density (per m ³)	24.13

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	25%_mgeom_mgcp_8
Processed	2021-05-12 13:47:06
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.89 cm / 0.35 in
Time for Initial Processing (without report)	22m:53s

Quality Check



Images	median of 24957 keypoints per image	
Dataset	268 out of 268 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 193.856 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.082 m	

Calibration Details



Number of Calibrated Images	268 out of 268
Number of Geolocated Images	0 out of 268

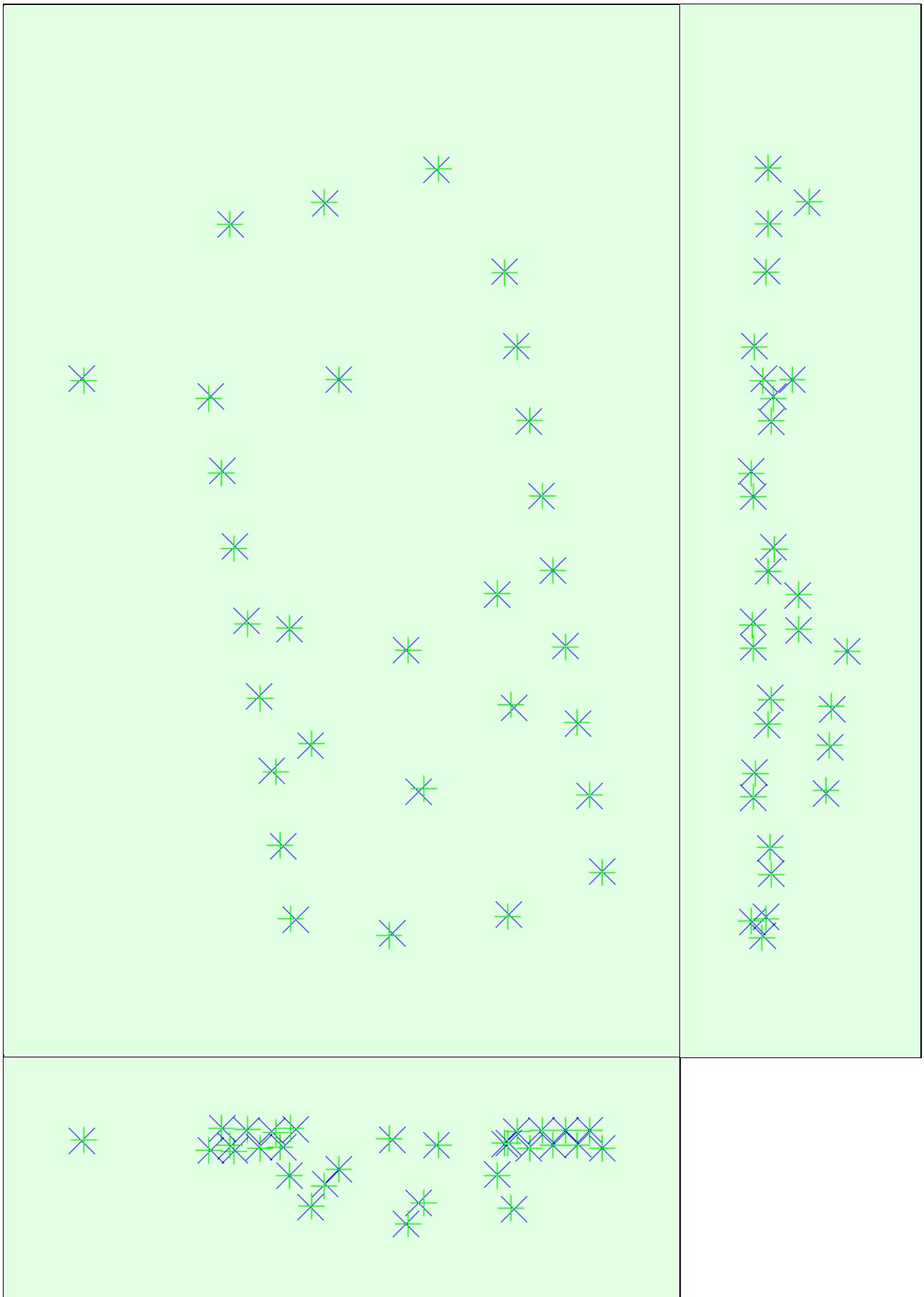
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.005	0.005	0.004	0.120	0.019	0.049
Sigma	0.001	0.002	0.001	0.226	0.005	0.248

Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	52727
Number of 3D Points for Bundle Block Adjustment	12231
Mean Reprojection Error [pixels]	0.529

💡 Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to see the average direction and magnitude of the reprojection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

💡 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24957	194
Mn	16023	44
Max	30554	349
Mean	24240	197

💡 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	8139
In 3 Images	1820
In 4 Images	611
In 5 Images	300
In 6 Images	226
In 7 Images	149
In 8 Images	115
In 9 Images	98
In 10 Images	87
In 11 Images	68
In 12 Images	51
In 13 Images	39
In 14 Images	33
In 15 Images	36
In 16 Images	32
In 17 Images	22
In 18 Images	18
In 19 Images	17
In 20 Images	20
In 21 Images	13
In 22 Images	14

In 23 Images	16
In 24 Images	23
In 25 Images	14
In 26 Images	12
In 27 Images	15
In 28 Images	5
In 29 Images	8
In 30 Images	9
In 31 Images	5
In 32 Images	8
In 33 Images	7
In 34 Images	6
In 35 Images	3
In 36 Images	9
In 37 Images	7
In 38 Images	4
In 39 Images	7
In 40 Images	3
In 42 Images	7
In 44 Images	4
In 45 Images	1
In 46 Images	8
In 47 Images	2
In 48 Images	5
In 49 Images	1
In 50 Images	3
In 51 Images	2
In 52 Images	4
In 53 Images	5
In 54 Images	5
In 55 Images	7
In 56 Images	5
In 57 Images	4
In 58 Images	2
In 59 Images	4
In 60 Images	1
In 61 Images	3
In 62 Images	1
In 63 Images	2
In 64 Images	2
In 65 Images	3
In 66 Images	2
In 68 Images	2
In 70 Images	2
In 71 Images	2
In 73 Images	2
In 75 Images	1
In 76 Images	2
In 77 Images	1
In 78 Images	2
In 79 Images	2
In 80 Images	3
In 81 Images	1
In 82 Images	2
In 83 Images	2
In 84 Images	3
In 85 Images	2
In 86 Images	3
In 87 Images	4

In 88 Images	1
In 89 Images	2
In 91 Images	2
In 92 Images	1
In 94 Images	1
In 95 Images	1
In 96 Images	1
In 97 Images	2
In 98 Images	1
In 100 Images	5
In 101 Images	1
In 103 Images	2
In 104 Images	1
In 105 Images	2
In 108 Images	1
In 109 Images	1
In 111 Images	1
In 112 Images	2
In 113 Images	1
In 114 Images	2
In 115 Images	3
In 116 Images	1
In 117 Images	1
In 119 Images	1
In 121 Images	1
In 123 Images	1
In 131 Images	1
In 132 Images	1
In 136 Images	1
In 159 Images	1

 **2D Keypoint Matches**



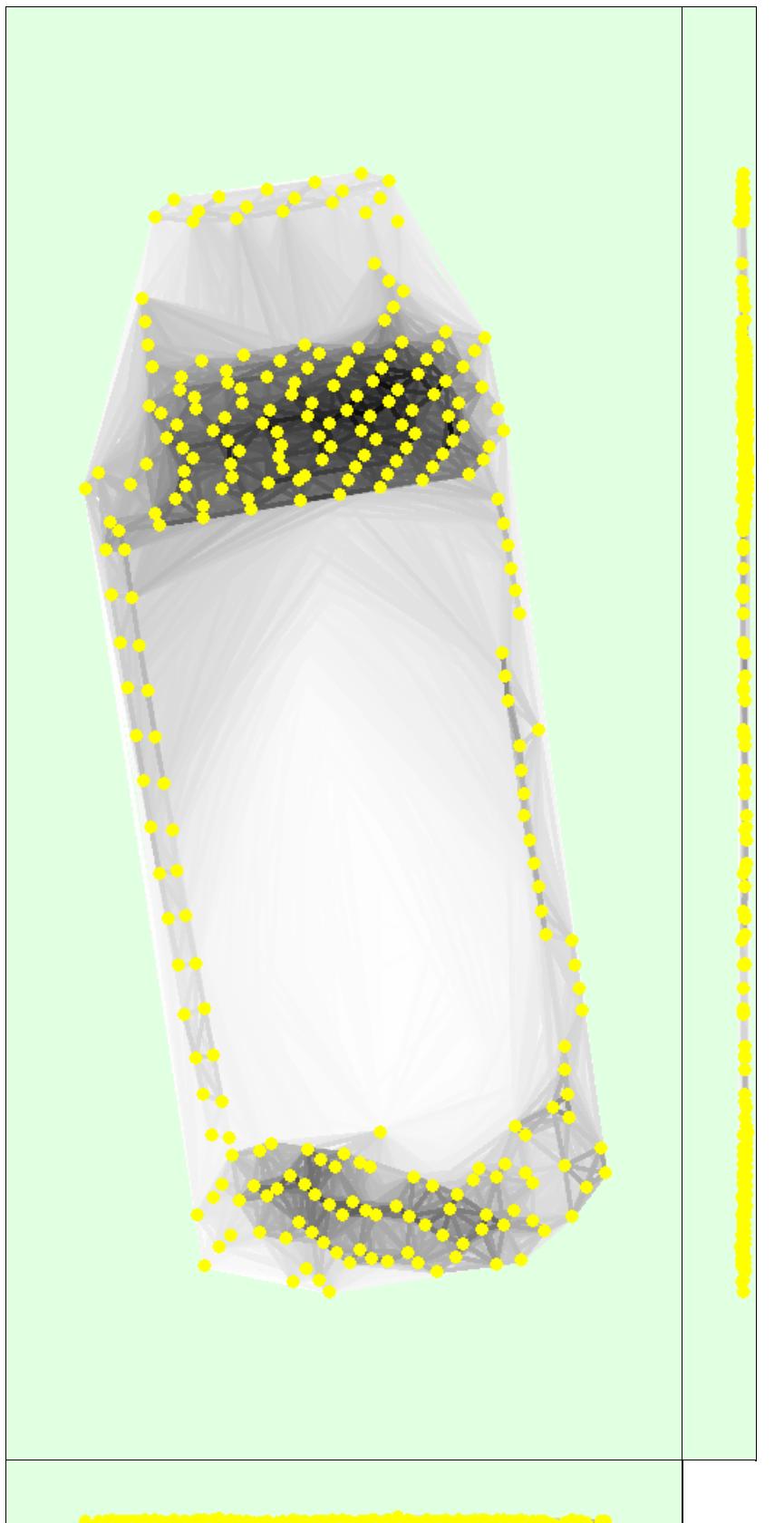


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.037	0.168	-0.006	3.427	4 / 4
20 (3D)	0.020/ 0.020	0.026	0.107	0.046	8.374	5 / 5
21 (3D)	0.020/ 0.020	0.047	0.094	-0.019	4.870	3 / 3
24 (3D)	0.020/ 0.020	-0.017	0.011	0.008	1.723	8 / 8
6 (3D)	0.020/ 0.020	-0.060	-0.063	0.000	3.354	5 / 5
7 (3D)	0.020/ 0.020	-0.045	-0.047	0.008	1.058	5 / 5
8 (3D)	0.020/ 0.020	-0.009	-0.027	0.042	2.875	5 / 5
9 (3D)	0.020/ 0.020	-0.021	0.040	0.009	2.996	6 / 6
10 (3D)	0.020/ 0.020	0.067	-0.025	0.056	2.427	5 / 5
26 (3D)	0.020/ 0.020	0.129	-0.184	-0.092	1.493	7 / 7
27 (3D)	0.020/ 0.020	-0.302	-0.143	-0.001	2.477	6 / 6
14 (3D)	0.020/ 0.020	0.188	0.134	-0.044	5.663	8 / 8
16 (3D)	0.020/ 0.020	0.175	-0.066	-0.009	11.306	8 / 8
28 (3D)	0.020/ 0.020	-0.030	-0.117	-0.035	2.714	7 / 7
17 (3D)	0.020/ 0.020	-0.296	0.057	0.050	3.891	4 / 4
18 (3D)	0.020/ 0.020	-0.087	0.131	0.043	5.728	3 / 3
4 (3D)	0.020/ 0.020	-0.008	0.033	-0.026	2.943	8 / 8
5 (3D)	0.020/ 0.020	-0.009	0.029	-0.004	3.403	3 / 3
22 (3D)	0.020/ 0.020	0.083	0.102	0.026	4.159	8 / 8
1 (3D)	0.020/ 0.020	0.068	0.003	-0.024	2.101	4 / 4
2 (3D)	0.020/ 0.020	0.046	-0.048	0.100	2.692	8 / 8
3 (3D)	0.020/ 0.020	-0.150	-0.069	-0.014	5.763	8 / 8
13 (3D)	0.020/ 0.020	0.065	0.136	-0.017	5.677	8 / 8
30 (3D)	0.020/ 0.020	-0.103	-0.020	-0.011	2.344	8 / 8
29 (3D)	0.020/ 0.020	0.003	-0.069	0.037	1.348	8 / 8
23 (3D)	0.020/ 0.020	-0.078	0.102	-0.089	3.637	8 / 8
25 (3D)	0.020/ 0.020	-0.005	-0.103	0.019	1.705	8 / 8
11 (3D)	0.020/ 0.020	0.022	-0.089	-0.001	3.535	5 / 5
12 (3D)	0.020/ 0.020	-0.017	0.019	-0.003	2.208	6 / 6
15 (3D)	0.020/ 0.020	0.267	-0.074	-0.049	3.423	8 / 8
Mean [m]		-0.002987	0.000658	-0.000043		
Sigma [m]		0.117598	0.090533	0.040126		
RMS Error [m]		0.117636	0.090535	0.040126		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	30m:39s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	06m:55s

Results



Number of Processed Clusters	3
Number of Generated Tiles	1
Number of 3D Densified Points	2171970
Average Density (per m ³)	1459.3

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	25%_ugeom_mgcp_8
Processed	2021-05-12 14:47:43
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.99 cm / 0.39 in
Time for Initial Processing (without report)	20m:49s

Quality Check



Images	median of 24957 keypoints per image	
Dataset	268 out of 268 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 4557.74 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.07 m	

Calibration Details



Number of Calibrated Images	268 out of 268
Number of Geolocated Images	0 out of 268

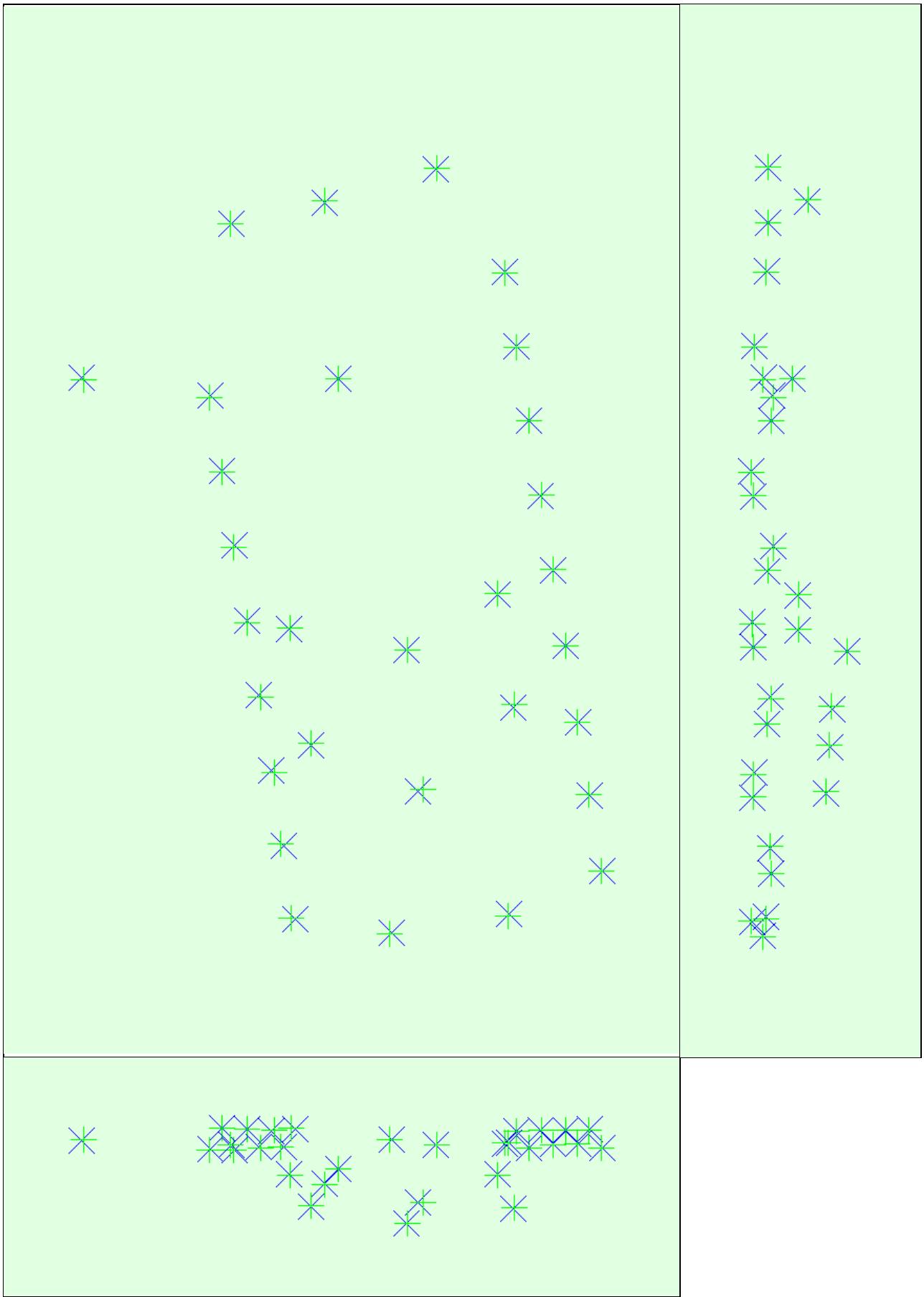
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.003	0.101	0.015	0.040
Sigma	0.001	0.001	0.001	0.202	0.003	0.248

Bundle Block Adjustment Details



Number of 2D Keypoint Observations for Bundle Block Adjustment	1150363
Number of 3D Points for Bundle Block Adjustment	483186
Mean Reprojection Error [pixels]	0.476

💡 Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to see the average direction and magnitude of the reprojection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

💡 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24957	4558
Mn	16023	856
Max	30554	7038
Mean	24240	4292

💡 3D Points from 2D Keypoint Matches



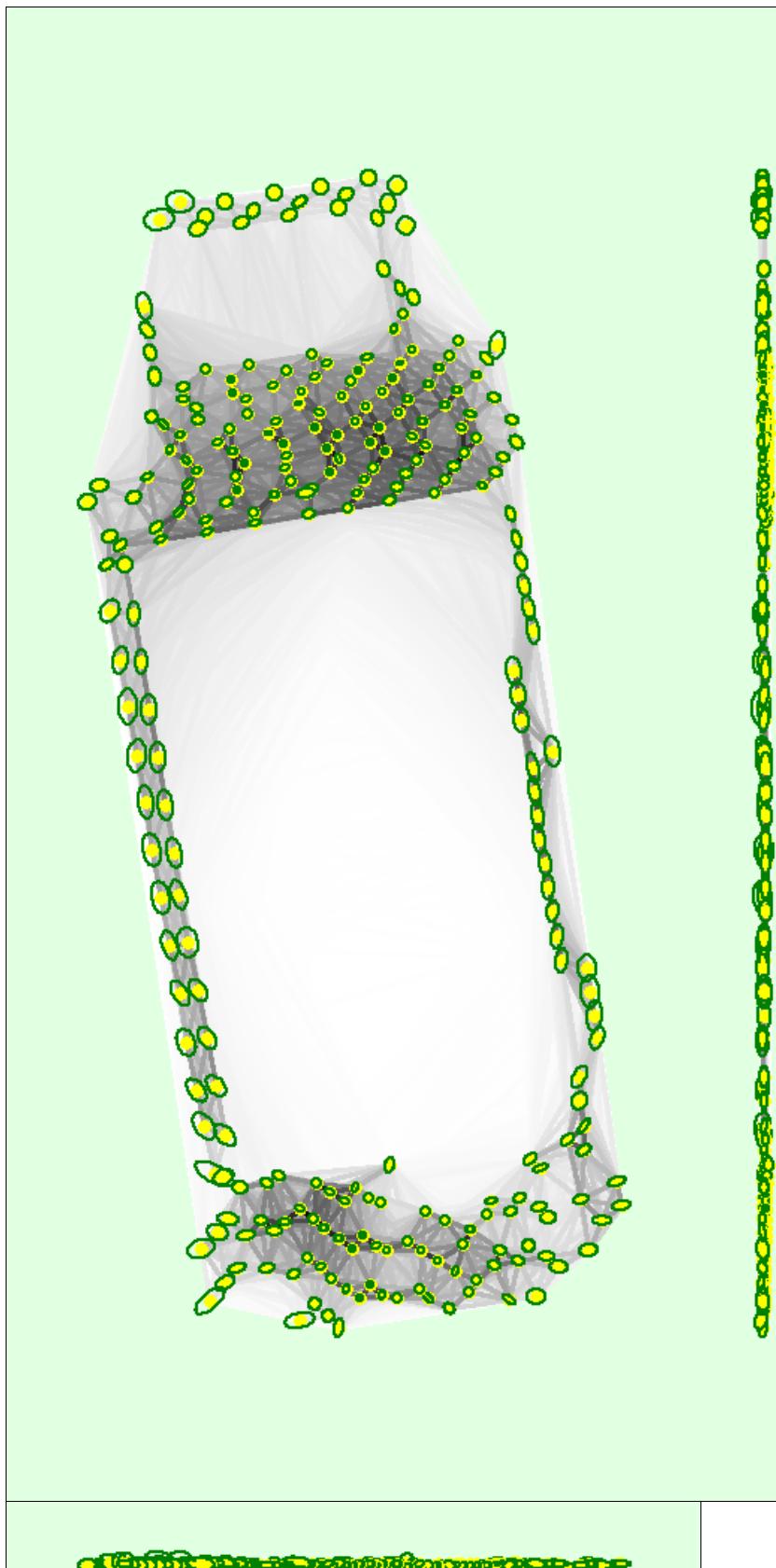
	Number of 3D Points Observed
In 2 Images	421079
In 3 Images	34976
In 4 Images	11284
In 5 Images	5273
In 6 Images	2888
In 7 Images	1785
In 8 Images	1167
In 9 Images	831
In 10 Images	592
In 11 Images	454
In 12 Images	386
In 13 Images	267
In 14 Images	220
In 15 Images	203
In 16 Images	154
In 17 Images	132
In 18 Images	118
In 19 Images	111
In 20 Images	109
In 21 Images	80
In 22 Images	61

In 23 Images	72
In 24 Images	60
In 25 Images	51
In 26 Images	53
In 27 Images	37
In 28 Images	41
In 29 Images	32
In 30 Images	37
In 31 Images	21
In 32 Images	26
In 33 Images	20
In 34 Images	24
In 35 Images	21
In 36 Images	17
In 37 Images	27
In 38 Images	23
In 39 Images	16
In 40 Images	14
In 41 Images	4
In 42 Images	21
In 43 Images	15
In 44 Images	15
In 45 Images	15
In 46 Images	8
In 47 Images	11
In 48 Images	12
In 49 Images	15
In 50 Images	9
In 51 Images	10
In 52 Images	11
In 53 Images	7
In 54 Images	9
In 55 Images	5
In 56 Images	6
In 57 Images	7
In 58 Images	5
In 59 Images	9
In 60 Images	7
In 61 Images	3
In 62 Images	12
In 63 Images	7
In 64 Images	7
In 65 Images	7
In 66 Images	5
In 67 Images	5
In 68 Images	10
In 69 Images	6
In 70 Images	4
In 71 Images	3
In 72 Images	6
In 73 Images	6
In 74 Images	6
In 75 Images	5
In 76 Images	7
In 77 Images	1
In 78 Images	2
In 79 Images	6
In 80 Images	6
In 81 Images	4

In 82 Images	10
In 83 Images	2
In 84 Images	5
In 85 Images	3
In 86 Images	6
In 87 Images	2
In 88 Images	4
In 89 Images	4
In 91 Images	1
In 92 Images	2
In 93 Images	2
In 95 Images	2
In 96 Images	1
In 97 Images	3
In 98 Images	4
In 99 Images	3
In 100 Images	5
In 101 Images	2
In 102 Images	1
In 103 Images	4
In 104 Images	2
In 105 Images	3
In 106 Images	1
In 107 Images	2
In 109 Images	4
In 110 Images	7
In 111 Images	2
In 112 Images	1
In 113 Images	2
In 116 Images	4
In 117 Images	1
In 118 Images	2
In 119 Images	1
In 120 Images	1
In 121 Images	1
In 122 Images	2
In 124 Images	1
In 136 Images	1
In 147 Images	1

 **2D Keypoint Matches**





Uncertainty ellipses 100x magnified

Number of matches

25 101 202 304 405 506 608 709 810 912

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. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

ⓘ Relative camera position and orientation uncertainties



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

Mean	0.003	0.003	0.002	0.082	0.014	0.032
Sigma	0.001	0.001	0.001	0.160	0.003	0.196

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z[m]	Error X[m]	Error Y[m]	Error Z[m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.029	0.121	-0.018	3.370	4 / 4
20 (3D)	0.020/ 0.020	0.041	0.097	0.028	3.240	5 / 5
21 (3D)	0.020/ 0.020	0.046	0.083	-0.002	4.345	3 / 3
24 (3D)	0.020/ 0.020	-0.007	0.011	-0.006	2.727	8 / 8
6 (3D)	0.020/ 0.020	-0.035	-0.040	0.023	2.378	5 / 5
7 (3D)	0.020/ 0.020	-0.031	-0.044	0.028	2.014	5 / 5
8 (3D)	0.020/ 0.020	-0.020	-0.026	0.046	1.490	5 / 5
9 (3D)	0.020/ 0.020	-0.027	0.025	0.008	3.585	6 / 6
10 (3D)	0.020/ 0.020	0.045	-0.045	0.046	1.943	5 / 5
26 (3D)	0.020/ 0.020	-0.061	-0.134	-0.044	2.117	7 / 7
27 (3D)	0.020/ 0.020	-0.293	-0.070	-0.008	1.827	6 / 6
14 (3D)	0.020/ 0.020	0.142	0.078	-0.024	4.182	8 / 8
16 (3D)	0.020/ 0.020	0.182	-0.120	0.017	2.798	8 / 8
28 (3D)	0.020/ 0.020	-0.011	-0.098	-0.031	2.320	7 / 7
17 (3D)	0.020/ 0.020	-0.216	0.118	-0.019	2.729	4 / 4
18 (3D)	0.020/ 0.020	-0.083	0.102	0.034	4.856	3 / 3
4 (3D)	0.020/ 0.020	-0.021	0.048	-0.022	2.797	8 / 8
5 (3D)	0.020/ 0.020	-0.026	0.057	-0.006	1.745	3 / 3
22 (3D)	0.020/ 0.020	0.068	0.118	0.045	4.310	8 / 8
1 (3D)	0.020/ 0.020	0.049	-0.013	-0.012	1.412	4 / 4
2 (3D)	0.020/ 0.020	0.001	-0.144	0.043	4.316	8 / 8
3 (3D)	0.020/ 0.020	-0.064	-0.061	-0.019	4.524	8 / 8
13 (3D)	0.020/ 0.020	0.045	0.124	-0.024	4.874	8 / 8
30 (3D)	0.020/ 0.020	-0.072	-0.017	0.005	3.307	8 / 8
29 (3D)	0.020/ 0.020	-0.019	-0.050	0.034	1.363	8 / 8
23 (3D)	0.020/ 0.020	-0.092	0.128	-0.063	4.168	8 / 8
25 (3D)	0.020/ 0.020	-0.005	-0.073	0.015	1.332	8 / 8
11 (3D)	0.020/ 0.020	0.046	-0.060	0.006	2.426	5 / 5
12 (3D)	0.020/ 0.020	0.037	-0.037	-0.011	1.684	6 / 6
15 (3D)	0.020/ 0.020	0.232	-0.060	-0.046	4.180	8 / 8
Mean [m]		-0.005985	0.000563	0.000781		
Sigma [m]		0.098547	0.083187	0.029021		
RMS Error [m]		0.098729	0.083189	0.029032		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
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Operating System Windows 10 Home, 64-bit

Coordinate Systems

Ground Control Point (GCP) Coordinate System	Arbitrary(m)
Output Coordinate System	Arbitrary(m)

Processing Options

Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes

Point Cloud Densification details**Processing Options**

Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	39m:48s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	06m:57s

Results

Number of Processed Clusters	3
Number of Generated Tiles	1
Number of 3D Densified Points	2575158
Average Density (per m ³)	1130.4

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	50%mgeom_mgcp_8
Processed	2021-05-11 16:47:40
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.83 cm / 0.33 in
Time for Initial Processing (without report)	01h:40m:24s

Quality Check



Images	median of 24902 keypoints per image	
Dataset	537 out of 537 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 5260.48 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.08 m	

Calibration Details



Number of Calibrated Images	537 out of 537
Number of Geolocated Images	0 out of 537

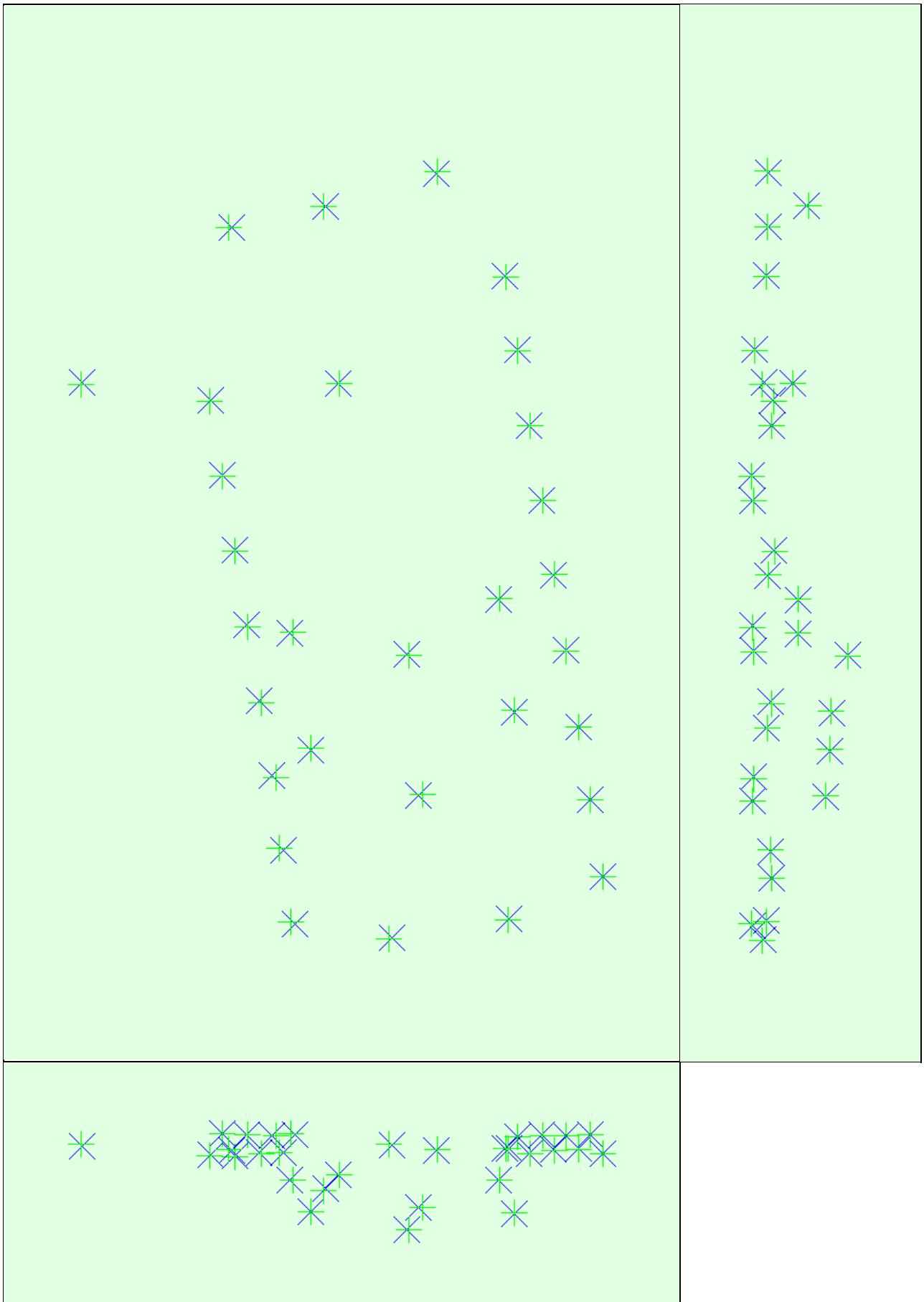
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

⚠ Absolute camera position and orientation uncertainties

i

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.004	0.112	0.016	0.046
Sigma	0.001	0.001	0.001	0.213	0.003	0.207

Bundle Block Adjustment Details

i

Number of 2D Keypoint Observations for Bundle Block Adjustment	2772597
Number of 3D Points for Bundle Block Adjustment	1180872
Mean Reprojection Error [pixels]	0.467

⚠ Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.

	The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.
--	---

⚠ 2D Keypoints Table

i

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24902	5260
Mn	16023	555
Max	30838	8433
Mean	24238	5163

⚠ 3D Points from 2D Keypoint Matches

i

	Number of 3D Points Observed
In 2 Images	1039370
In 3 Images	81210
In 4 Images	25450
In 5 Images	11815
In 6 Images	6299
In 7 Images	3896
In 8 Images	2691
In 9 Images	1811
In 10 Images	1303
In 11 Images	999
In 12 Images	730
In 13 Images	609
In 14 Images	519
In 15 Images	428
In 16 Images	375
In 17 Images	327
In 18 Images	293
In 19 Images	208

In 20 Images	195
In 21 Images	190
In 22 Images	145
In 23 Images	126
In 24 Images	114
In 25 Images	123
In 26 Images	88
In 27 Images	79
In 28 Images	72
In 29 Images	64
In 30 Images	62
In 31 Images	60
In 32 Images	59
In 33 Images	53
In 34 Images	61
In 35 Images	40
In 36 Images	67
In 37 Images	37
In 38 Images	39
In 39 Images	36
In 40 Images	31
In 41 Images	43
In 42 Images	21
In 43 Images	29
In 44 Images	29
In 45 Images	21
In 46 Images	26
In 47 Images	19
In 48 Images	14
In 49 Images	21
In 50 Images	17
In 51 Images	12
In 52 Images	23
In 53 Images	11
In 54 Images	13
In 55 Images	13
In 56 Images	14
In 57 Images	11
In 58 Images	7
In 59 Images	11
In 60 Images	13
In 61 Images	10
In 62 Images	12
In 63 Images	10
In 64 Images	13
In 65 Images	7
In 66 Images	8
In 67 Images	8
In 68 Images	11
In 69 Images	10
In 70 Images	9
In 71 Images	5
In 72 Images	14
In 73 Images	8
In 74 Images	9
In 75 Images	7
In 76 Images	2
In 77 Images	8
In 78 Images	8

In 79 Images	5
In 80 Images	4
In 81 Images	7
In 82 Images	2
In 83 Images	7
In 84 Images	3
In 85 Images	5
In 86 Images	4
In 87 Images	4
In 88 Images	2
In 89 Images	2
In 90 Images	6
In 91 Images	5
In 92 Images	3
In 93 Images	2
In 94 Images	2
In 95 Images	5
In 96 Images	2
In 97 Images	2
In 98 Images	4
In 99 Images	4
In 100 Images	2
In 102 Images	7
In 103 Images	5
In 104 Images	4
In 105 Images	2
In 106 Images	2
In 107 Images	6
In 108 Images	2
In 109 Images	3
In 111 Images	4
In 112 Images	2
In 113 Images	1
In 114 Images	2
In 115 Images	1
In 116 Images	2
In 117 Images	2
In 118 Images	1
In 119 Images	3
In 122 Images	1
In 124 Images	4
In 125 Images	4
In 126 Images	2
In 127 Images	1
In 128 Images	2
In 129 Images	1
In 130 Images	1
In 131 Images	2
In 132 Images	3
In 133 Images	1
In 134 Images	2
In 135 Images	1
In 136 Images	5
In 137 Images	2
In 138 Images	1
In 139 Images	2
In 142 Images	1
In 143 Images	2
In 144 Images	2

In 145 Images	2
In 146 Images	3
In 147 Images	2
In 148 Images	2
In 149 Images	2
In 150 Images	3
In 151 Images	1
In 152 Images	1
In 153 Images	2
In 155 Images	2
In 156 Images	2
In 157 Images	2
In 158 Images	2
In 159 Images	2
In 160 Images	2
In 161 Images	1
In 162 Images	2
In 163 Images	1
In 164 Images	2
In 165 Images	2
In 166 Images	1
In 168 Images	1
In 169 Images	1
In 170 Images	1
In 171 Images	3
In 172 Images	5
In 173 Images	1
In 175 Images	2
In 176 Images	1
In 177 Images	1
In 179 Images	1
In 180 Images	2
In 181 Images	4
In 182 Images	3
In 183 Images	1
In 188 Images	3
In 189 Images	1
In 190 Images	1
In 191 Images	4
In 195 Images	2
In 196 Images	1
In 198 Images	1
In 199 Images	1
In 200 Images	1
In 203 Images	1
In 204 Images	2
In 205 Images	2
In 206 Images	1
In 207 Images	2
In 215 Images	1
In 221 Images	2
In 225 Images	1
In 226 Images	1
In 229 Images	1
In 232 Images	1
In 236 Images	2
In 256 Images	1
In 266 Images	1

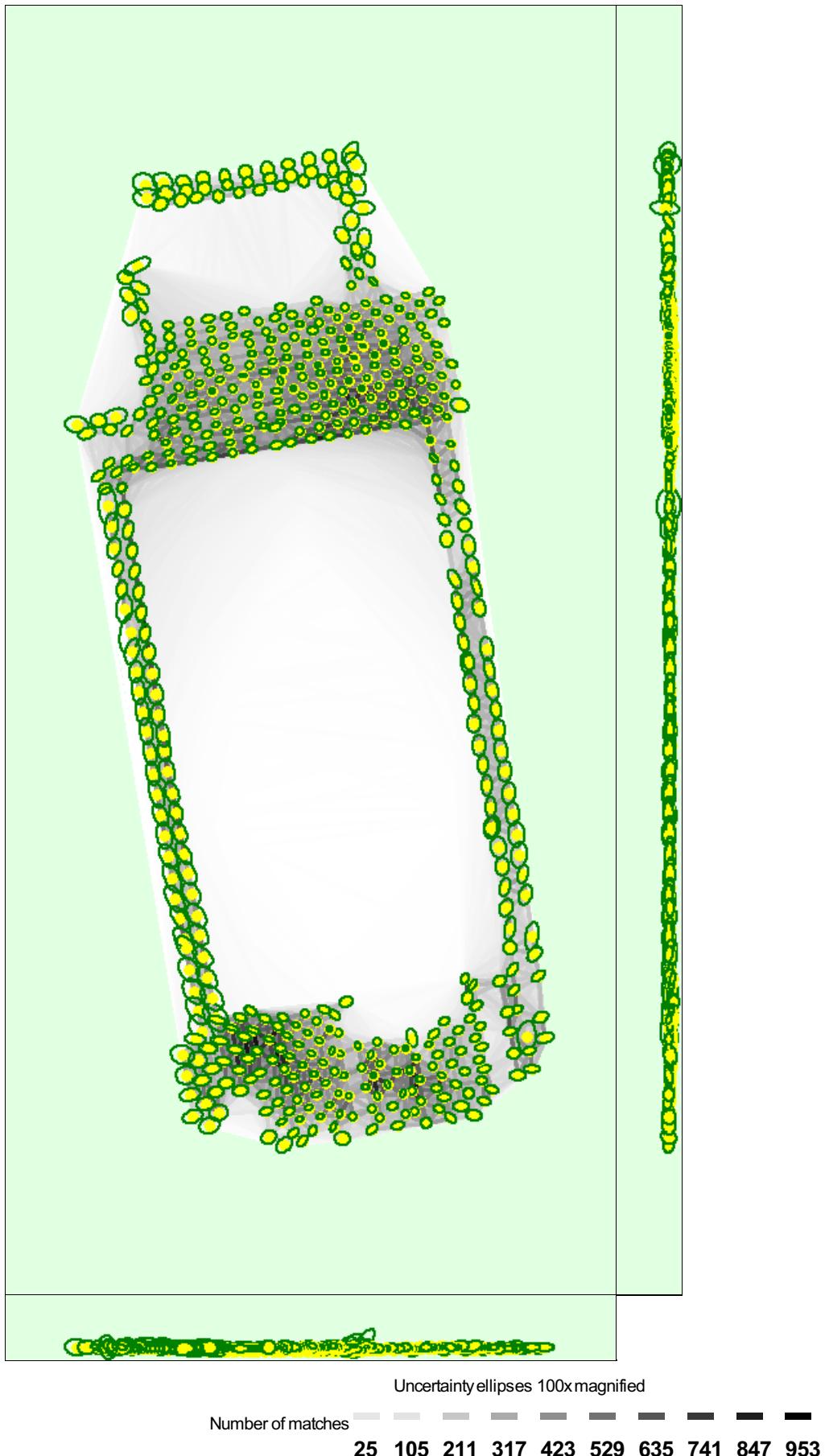


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

?

 Relative camera position and orientation uncertainties


	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.003	0.003	0.002	0.088	0.014	0.036
Sigma	0.001	0.002	0.001	0.164	0.004	0.158

Geolocation Details



?

 Ground Control Points


GCP Name	Accuracy XY/Z [m]	Error X[m]	Error Y[m]	Error Z[m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.035	0.107	-0.021	1.960	8 / 8
20 (3D)	0.020/ 0.020	0.001	0.082	0.058	1.121	8 / 8
21 (3D)	0.020/ 0.020	0.018	0.047	0.007	2.196	8 / 8
24 (3D)	0.020/ 0.020	-0.046	0.011	0.033	2.288	8 / 8
6 (3D)	0.020/ 0.020	-0.025	-0.002	0.036	2.400	8 / 8
7 (3D)	0.020/ 0.020	-0.035	-0.026	0.019	1.242	8 / 8
8 (3D)	0.020/ 0.020	-0.043	-0.026	0.038	1.970	8 / 8
9 (3D)	0.020/ 0.020	-0.026	0.018	0.008	2.593	8 / 8
10 (3D)	0.020/ 0.020	-0.020	-0.014	0.031	1.700	8 / 8
26 (3D)	0.020/ 0.020	-0.025	-0.129	-0.067	1.558	8 / 8
27 (3D)	0.020/ 0.020	-0.251	-0.108	-0.028	2.867	8 / 8
14 (3D)	0.020/ 0.020	0.204	0.070	-0.021	3.009	8 / 8
16 (3D)	0.020/ 0.020	0.267	-0.146	0.005	2.203	8 / 8
28 (3D)	0.020/ 0.020	0.036	-0.077	-0.024	2.384	8 / 8
17 (3D)	0.020/ 0.020	-0.270	0.146	-0.003	2.186	5 / 5
18 (3D)	0.020/ 0.020	-0.138	0.144	0.054	2.560	7 / 7
4 (3D)	0.020/ 0.020	-0.068	0.051	-0.018	2.135	8 / 8
5 (3D)	0.020/ 0.020	-0.009	0.052	0.008	1.496	5 / 5
22 (3D)	0.020/ 0.020	0.029	0.088	0.046	2.496	8 / 8
1 (3D)	0.020/ 0.020	0.134	-0.029	-0.043	2.776	8 / 8
2 (3D)	0.020/ 0.020	0.104	-0.015	0.076	1.733	8 / 8
3 (3D)	0.020/ 0.020	-0.056	-0.108	-0.065	1.981	8 / 8
13 (3D)	0.020/ 0.020	0.079	0.070	-0.007	4.210	8 / 8
30 (3D)	0.020/ 0.020	-0.127	0.015	-0.002	2.541	8 / 8
29 (3D)	0.020/ 0.020	-0.165	-0.053	0.020	1.571	8 / 8
23 (3D)	0.020/ 0.020	0.092	0.118	-0.107	2.410	5 / 8
25 (3D)	0.020/ 0.020	-0.080	-0.064	0.012	1.320	8 / 8
11 (3D)	0.020/ 0.020	0.029	-0.052	0.002	2.288	8 / 8
12 (3D)	0.020/ 0.020	0.010	-0.010	-0.008	1.938	8 / 8
15 (3D)	0.020/ 0.020	0.264	-0.107	-0.050	1.715	8 / 8
Mean [m]		-0.005051	0.001735	-0.000337		
Sigma [m]		0.122500	0.079788	0.039737		
RMS Error [m]		0.122604	0.079807	0.039738		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified v.s. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX2070 (Driver: 27.21.14.6611)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary(m)
Output Coordinate System	Arbitrary(m)

Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	01h:11m:47s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	10m:45s

Results



Number of Processed Clusters	6
Number of Generated Tiles	1
Number of 3D Densified Points	4437202
Average Density (per m ³)	1687.56

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	50%_ugeom_mgcp_8
Processed	2021-05-12 01:24:00
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.73 cm / 0.29 in
Time for Initial Processing (without report)	01h:07m:16s

Quality Check



Images	median of 24902 keypoints per image	
Dataset	537 out of 537 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 157.081 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.111 m	

Calibration Details



Number of Calibrated Images	537 out of 537
Number of Geolocated Images	0 out of 537

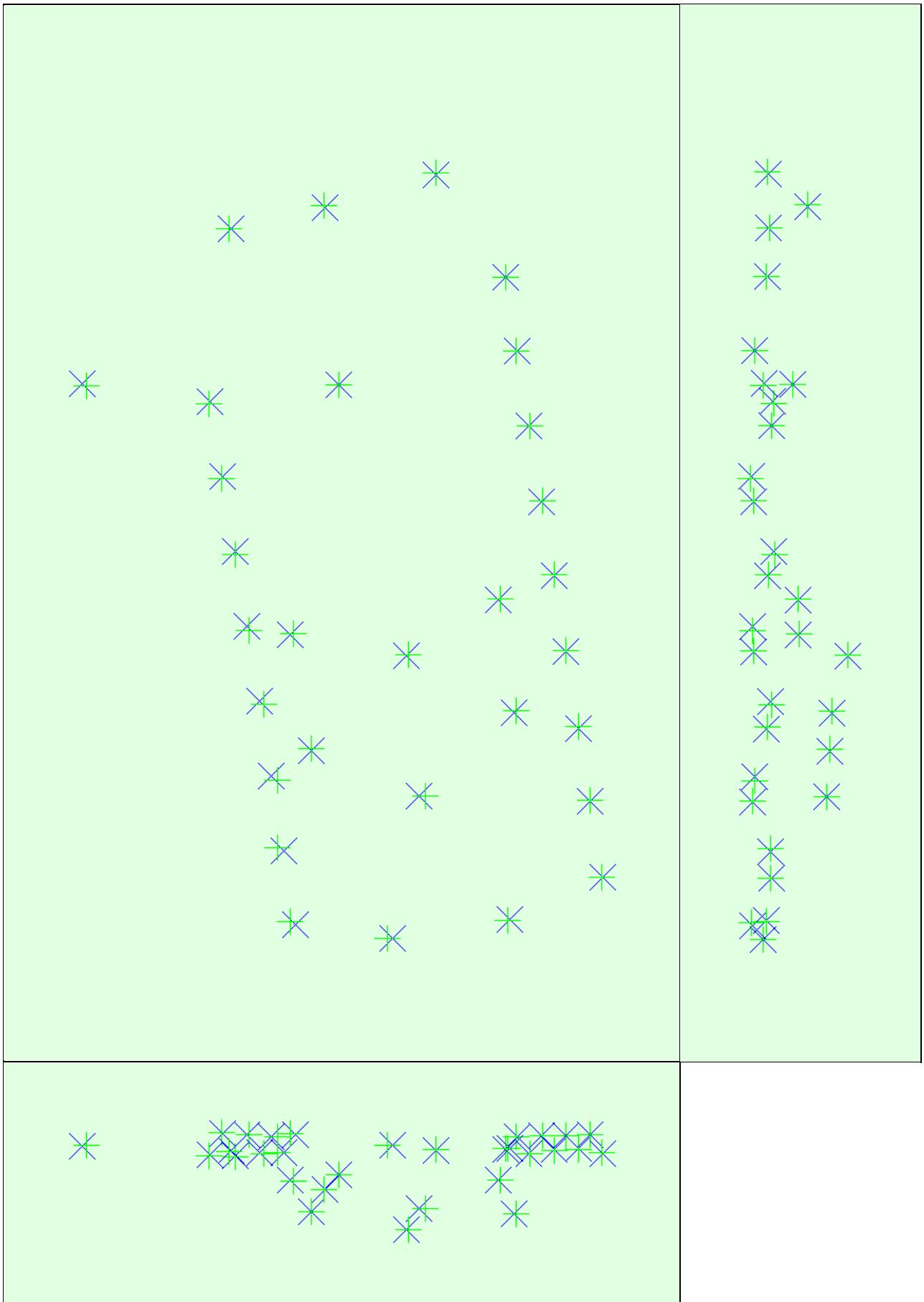
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

⚠ Absolute camera position and orientation uncertainties

i

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.005	0.005	0.004	0.132	0.018	0.055
Sigma	0.001	0.001	0.001	0.280	0.004	0.252

Bundle Block Adjustment Details

i

Number of 2D Keypoint Observations for Bundle Block Adjustment	83417
Number of 3D Points for Bundle Block Adjustment	11831
Mean Reprojection Error [pixels]	0.590

⚠ Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to see the average direction and magnitude of the re-projection error for each pixel. Note that the vectors are scaled for better visualization. The scale bar indicates the magnitude of 1 pixel error.

⚠ 2D Keypoints Table

i

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24902	157
Mn	16023	25
Max	30838	275
Mean	24238	155

⚠ 3D Points from 2D Keypoint Matches

i

	Number of 3D Points Observed
In 2 Images	5188
In 3 Images	2930
In 4 Images	1049
In 5 Images	522
In 6 Images	306
In 7 Images	208
In 8 Images	165
In 9 Images	113
In 10 Images	95
In 11 Images	91
In 12 Images	70
In 13 Images	63
In 14 Images	76
In 15 Images	44
In 16 Images	55
In 17 Images	50
In 18 Images	41
In 19 Images	31

In 20 Images	33
In 21 Images	22
In 22 Images	27
In 23 Images	34
In 24 Images	24
In 25 Images	25
In 26 Images	26
In 27 Images	21
In 28 Images	25
In 29 Images	18
In 30 Images	13
In 31 Images	12
In 32 Images	13
In 33 Images	18
In 34 Images	13
In 35 Images	10
In 36 Images	11
In 37 Images	16
In 38 Images	8
In 39 Images	10
In 40 Images	15
In 41 Images	14
In 42 Images	10
In 43 Images	10
In 44 Images	8
In 45 Images	10
In 46 Images	7
In 47 Images	9
In 48 Images	7
In 49 Images	5
In 50 Images	3
In 51 Images	8
In 52 Images	5
In 53 Images	12
In 54 Images	4
In 55 Images	3
In 56 Images	4
In 57 Images	7
In 58 Images	6
In 59 Images	3
In 60 Images	5
In 61 Images	3
In 62 Images	5
In 63 Images	3
In 64 Images	2
In 65 Images	5
In 66 Images	3
In 67 Images	3
In 68 Images	1
In 69 Images	4
In 70 Images	1
In 72 Images	4
In 73 Images	2
In 74 Images	4
In 75 Images	5
In 76 Images	1
In 77 Images	2
In 79 Images	3
In 81 Images	1

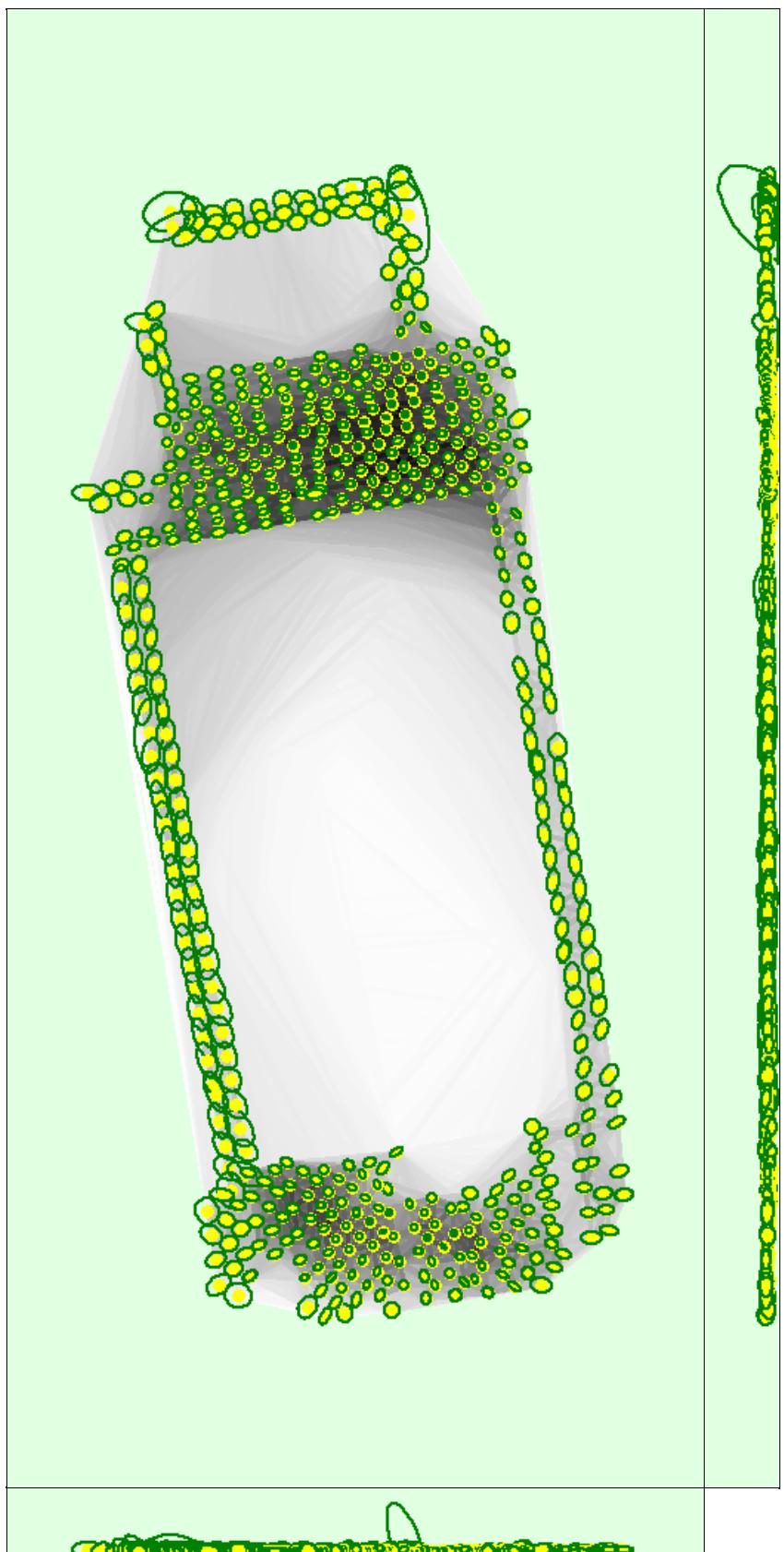
In 82 Images	3
In 83 Images	2
In 84 Images	1
In 85 Images	2
In 86 Images	1
In 87 Images	1
In 88 Images	2
In 89 Images	2
In 91 Images	5
In 92 Images	3
In 93 Images	1
In 94 Images	2
In 95 Images	2
In 96 Images	1
In 97 Images	3
In 98 Images	1
In 99 Images	3
In 100 Images	2
In 102 Images	3
In 104 Images	1
In 105 Images	3
In 107 Images	1
In 108 Images	2
In 110 Images	1
In 112 Images	2
In 114 Images	2
In 117 Images	3
In 118 Images	3
In 120 Images	1
In 121 Images	1
In 122 Images	2
In 124 Images	2
In 125 Images	1
In 126 Images	1
In 128 Images	1
In 131 Images	2
In 132 Images	4
In 133 Images	1
In 137 Images	1
In 138 Images	2
In 140 Images	1
In 142 Images	1
In 143 Images	3
In 144 Images	1
In 147 Images	2
In 148 Images	1
In 150 Images	1
In 151 Images	1
In 154 Images	2
In 155 Images	2
In 158 Images	1
In 159 Images	1
In 160 Images	1
In 161 Images	1
In 162 Images	1
In 164 Images	1
In 168 Images	1
In 171 Images	1
In 172 Images	2

In 176 Images	1
In 179 Images	2
In 180 Images	1
In 184 Images	1
In 186 Images	1
In 187 Images	3
In 193 Images	1
In 194 Images	1
In 196 Images	1
In 201 Images	4
In 205 Images	2
In 206 Images	1
In 208 Images	1
In 214 Images	1
In 216 Images	2
In 217 Images	2
In 223 Images	1
In 225 Images	1
In 226 Images	1
In 227 Images	2
In 228 Images	3
In 230 Images	1
In 231 Images	1
In 232 Images	1
In 238 Images	1
In 244 Images	3
In 245 Images	1
In 247 Images	1
In 258 Images	1
In 259 Images	1
In 260 Images	1
In 296 Images	1

?

2D Keypoint Matches





Uncertainty ellipses 100x magnified

Number of matches

25	25	36	55	73	91	110	128	146	165
----	----	----	----	----	----	-----	-----	-----	-----

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. Dark green ellipses indicate the relative camera position uncertainty of the bundle block adjustment result.

ⓘ Relative camera position and orientation uncertainties



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

Mean	0.003	0.003	0.002	0.099	0.016	0.041
Sigma	0.001	0.002	0.001	0.204	0.005	0.181

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z[m]	Error X[m]	Error Y[m]	Error Z[m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.090	0.234	-0.014	3.351	8 / 8
20 (3D)	0.020/ 0.020	-0.014	0.199	0.047	2.215	8 / 8
21 (3D)	0.020/ 0.020	0.054	0.150	-0.034	3.077	8 / 8
24 (3D)	0.020/ 0.020	-0.027	-0.001	-0.001	2.731	8 / 8
6 (3D)	0.020/ 0.020	-0.013	-0.044	0.019	3.751	8 / 8
7 (3D)	0.020/ 0.020	-0.029	-0.064	0.023	1.996	8 / 8
8 (3D)	0.020/ 0.020	-0.029	-0.055	0.056	2.666	8 / 8
9 (3D)	0.020/ 0.020	-0.016	-0.039	0.015	4.546	8 / 8
10 (3D)	0.020/ 0.020	-0.010	-0.080	0.036	2.713	8 / 8
26 (3D)	0.020/ 0.020	-0.110	-0.129	-0.043	1.958	8 / 8
27 (3D)	0.020/ 0.020	-0.390	-0.049	0.013	3.174	8 / 8
14 (3D)	0.020/ 0.020	0.270	0.030	-0.019	5.260	8 / 8
16 (3D)	0.020/ 0.020	0.388	-0.218	0.005	5.352	8 / 8
28 (3D)	0.020/ 0.020	-0.009	-0.130	-0.019	2.381	8 / 8
17 (3D)	0.020/ 0.020	-0.365	0.277	0.010	3.048	5 / 5
18 (3D)	0.020/ 0.020	-0.232	0.214	0.065	4.592	7 / 7
4 (3D)	0.020/ 0.020	-0.026	0.016	-0.040	2.107	8 / 8
5 (3D)	0.020/ 0.020	0.030	0.005	-0.012	1.657	5 / 5
22 (3D)	0.020/ 0.020	0.064	0.138	0.054	5.394	8 / 8
1 (3D)	0.020/ 0.020	0.129	-0.015	0.014	5.592	8 / 8
2 (3D)	0.020/ 0.020	0.068	-0.147	0.039	7.323	8 / 8
3 (3D)	0.020/ 0.020	0.054	-0.144	-0.062	8.248	8 / 8
13 (3D)	0.020/ 0.020	0.121	0.058	-0.024	6.377	8 / 8
30 (3D)	0.020/ 0.020	-0.135	-0.024	-0.008	2.502	8 / 8
29 (3D)	0.020/ 0.020	-0.222	-0.063	0.022	1.883	8 / 8
23 (3D)	0.020/ 0.020	-0.242	0.173	-0.071	6.044	8 / 8
25 (3D)	0.020/ 0.020	-0.159	-0.068	0.019	1.865	8 / 8
11 (3D)	0.020/ 0.020	0.039	-0.064	-0.011	3.727	8 / 8
12 (3D)	0.020/ 0.020	0.038	-0.011	-0.027	2.742	8 / 8
15 (3D)	0.020/ 0.020	0.344	-0.168	-0.043	2.301	8 / 8
Mean [m]		-0.017326	-0.000771	0.000255		
Sigma [m]		0.172995	0.126089	0.034554		
RMS Error [m]		0.173861	0.126091	0.034555		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
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Coordinate Systems

Ground Control Point (GCP) Coordinate System	Arbitrary(m)
Output Coordinate System	Arbitrary(m)

Processing Options

Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes

Point Cloud Densification details**Processing Options**

Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	01h:58m:58s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	10m:24s

Results

Number of Processed Clusters	4
Number of Generated Tiles	1
Number of 3D Densified Points	3792811
Average Density (per m ³)	1891.86

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	100%_mgeom_mgcp_8
Processed	2021-04-30 20:05:58
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.58 cm / 0.23 in

Quality Check



Images	median of 24911 keypoints per image	
Dataset	1073 out of 1074 images calibrated (99%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 171.735 matches per calibrated image	
Georeferencing	yes, 30 GCPs (30 3D), mean RMS error = 0.321 m	

Calibration Details



Number of Calibrated Images	1073 out of 1074
Number of Geolocated Images	0 out of 1074

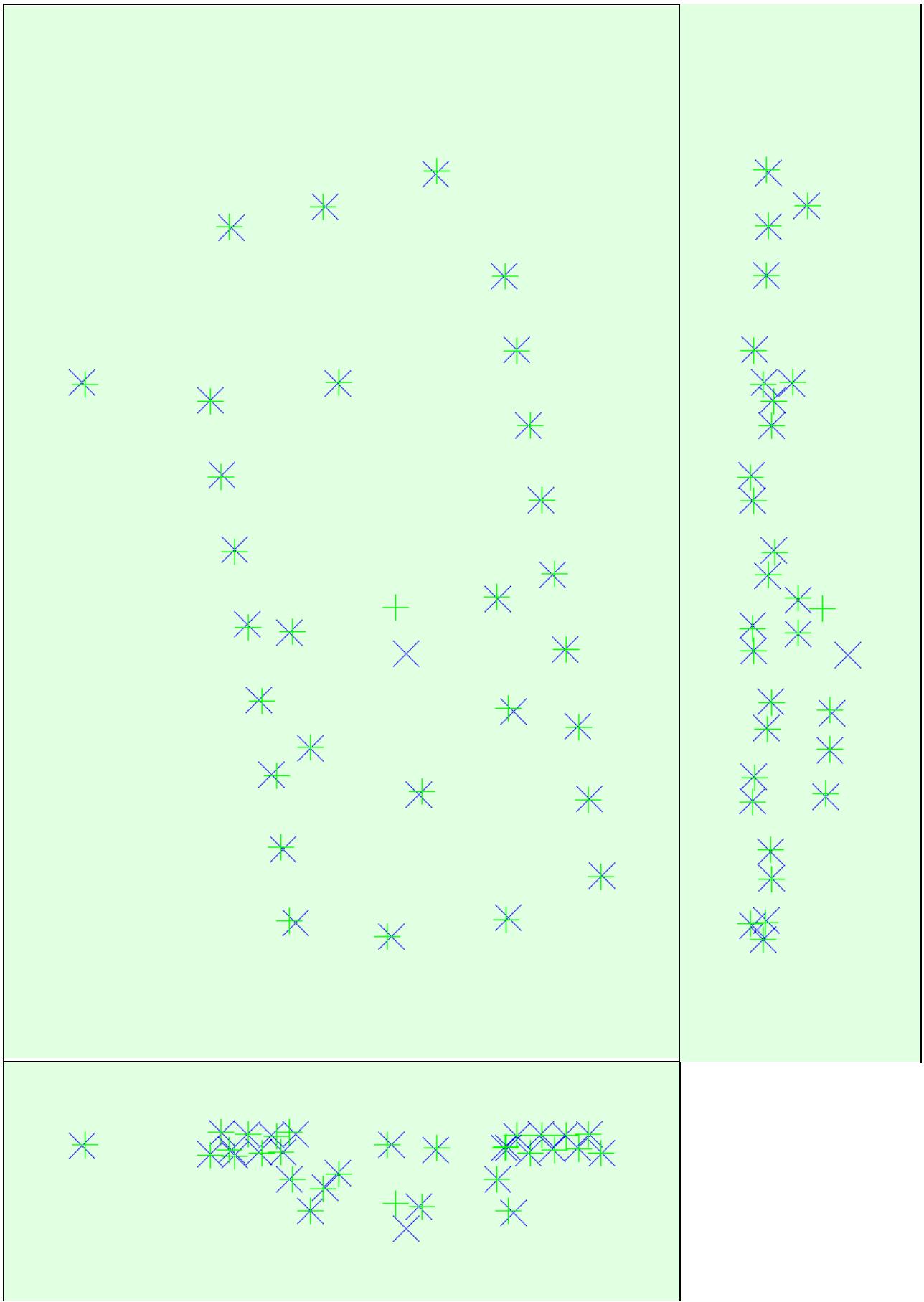
Initial Image Positions



The preview is not generated for images without geolocation.

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.

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.004	0.123	0.015	0.059
Sigma	0.001	0.001	0.001	0.316	0.004	0.302

Bundle Block Adjustment Details



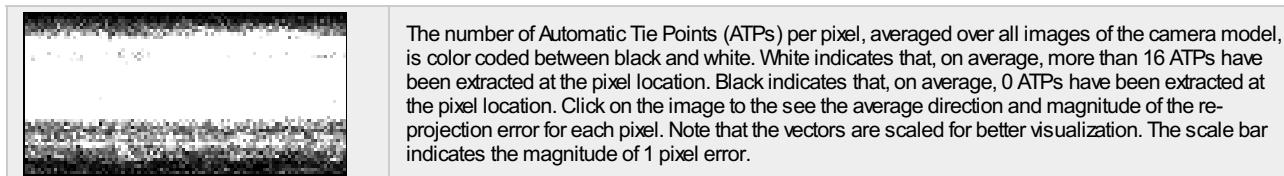
Number of 2D Keypoint Observations for Bundle Block Adjustment	185666
Number of 3D Points for Bundle Block Adjustment	22306
Mean Reprojection Error [pixels]	0.604

💡 Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



💡 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24911	172
Mn	15697	23
Max	30913	314
Mean	24236	173

💡 3D Points from 2D Keypoint Matches



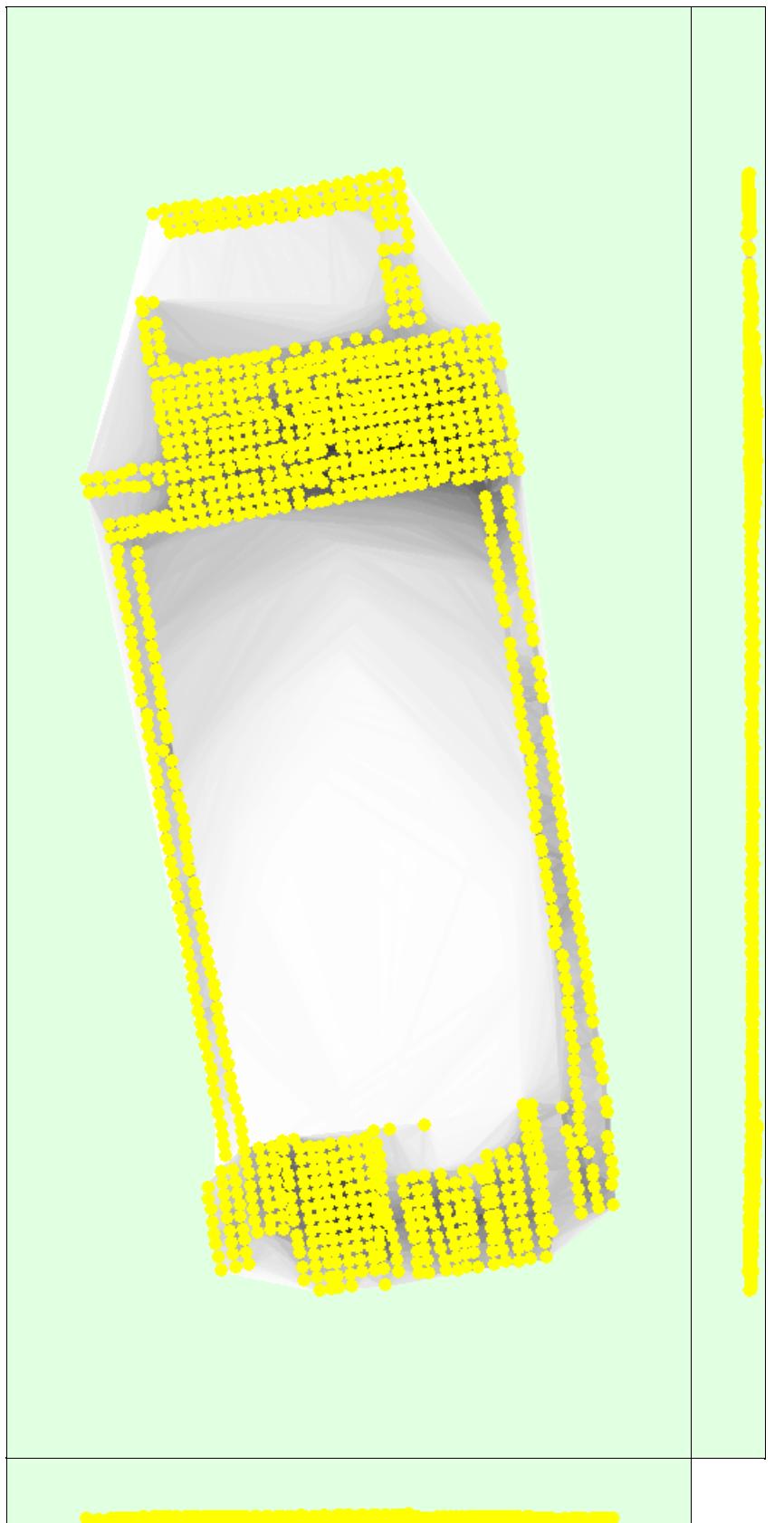
	Number of 3D Points Observed
In 2 Images	7168
In 3 Images	5348
In 4 Images	2989
In 5 Images	1537
In 6 Images	892
In 7 Images	609
In 8 Images	457
In 9 Images	368
In 10 Images	274
In 11 Images	236
In 12 Images	186
In 13 Images	183
In 14 Images	152
In 15 Images	109
In 16 Images	118
In 17 Images	86
In 18 Images	75
In 19 Images	64

In 20 Images	57
In 21 Images	64
In 22 Images	74
In 23 Images	49
In 24 Images	38
In 25 Images	47
In 26 Images	40
In 27 Images	31
In 28 Images	37
In 29 Images	32
In 30 Images	24
In 31 Images	27
In 32 Images	30
In 33 Images	29
In 34 Images	23
In 35 Images	22
In 36 Images	17
In 37 Images	25
In 38 Images	26
In 39 Images	22
In 40 Images	20
In 41 Images	24
In 42 Images	13
In 43 Images	15
In 44 Images	13
In 45 Images	16
In 46 Images	16
In 47 Images	21
In 48 Images	15
In 49 Images	15
In 50 Images	11
In 51 Images	18
In 52 Images	15
In 53 Images	13
In 54 Images	14
In 55 Images	13
In 56 Images	12
In 57 Images	7
In 58 Images	15
In 59 Images	6
In 60 Images	9
In 61 Images	11
In 62 Images	13
In 63 Images	7
In 64 Images	7
In 65 Images	5
In 66 Images	6
In 67 Images	8
In 68 Images	7
In 69 Images	5
In 70 Images	10
In 71 Images	9
In 72 Images	13
In 73 Images	6
In 74 Images	4
In 75 Images	5
In 76 Images	9
In 77 Images	5
In 78 Images	2

In 79 Images	9
In 80 Images	3
In 81 Images	6
In 82 Images	4
In 83 Images	6
In 84 Images	1
In 85 Images	6
In 86 Images	2
In 87 Images	7
In 88 Images	1
In 89 Images	3
In 90 Images	3
In 91 Images	2
In 92 Images	4
In 93 Images	4
In 94 Images	2
In 95 Images	3
In 96 Images	4
In 97 Images	3
In 98 Images	1
In 99 Images	1
In 100 Images	3
In 101 Images	4
In 102 Images	2
In 103 Images	4
In 104 Images	3
In 105 Images	1
In 106 Images	2
In 107 Images	1
In 108 Images	2
In 109 Images	2
In 110 Images	3
In 112 Images	3
In 113 Images	4
In 114 Images	4
In 116 Images	1
In 117 Images	3
In 118 Images	3
In 119 Images	3
In 121 Images	5
In 122 Images	3
In 124 Images	2
In 125 Images	1
In 127 Images	1
In 128 Images	2
In 129 Images	1
In 130 Images	2
In 131 Images	3
In 132 Images	1
In 134 Images	3
In 135 Images	1
In 136 Images	1
In 137 Images	2
In 138 Images	1
In 141 Images	1
In 143 Images	4
In 144 Images	2
In 145 Images	1
In 146 Images	1

In 147 Images	1
In 148 Images	2
In 149 Images	3
In 150 Images	3
In 151 Images	2
In 152 Images	3
In 153 Images	1
In 154 Images	3
In 157 Images	3
In 159 Images	1
In 165 Images	2
In 168 Images	1
In 170 Images	1
In 171 Images	1
In 172 Images	1
In 173 Images	1
In 174 Images	2
In 175 Images	1
In 176 Images	1
In 179 Images	1
In 181 Images	1
In 182 Images	1
In 183 Images	3
In 184 Images	1
In 188 Images	1
In 189 Images	1
In 190 Images	2
In 191 Images	1
In 192 Images	2
In 195 Images	3
In 204 Images	1
In 208 Images	3
In 209 Images	2
In 212 Images	1
In 214 Images	2
In 215 Images	1
In 217 Images	1
In 218 Images	1
In 219 Images	1
In 220 Images	3
In 223 Images	1
In 224 Images	1
In 226 Images	1
In 228 Images	1
In 229 Images	1
In 232 Images	2
In 234 Images	1
In 239 Images	1
In 240 Images	1
In 241 Images	1
In 246 Images	1
In 251 Images	1
In 252 Images	1
In 253 Images	2
In 256 Images	1
In 259 Images	1
In 260 Images	1
In 261 Images	1
In 262 Images	2

In 263 Images	1
In 267 Images	1
In 274 Images	1
In 278 Images	1
In 280 Images	1
In 286 Images	1
In 287 Images	1
In 288 Images	1
In 289 Images	1
In 290 Images	1
In 294 Images	1
In 300 Images	1
In 301 Images	2
In 304 Images	1
In 307 Images	1
In 310 Images	1
In 321 Images	1
In 323 Images	1
In 327 Images	1
In 337 Images	1
In 343 Images	1
In 347 Images	1
In 352 Images	1
In 356 Images	1
In 357 Images	1
In 370 Images	1
In 371 Images	1
In 379 Images	1
In 381 Images	1
In 387 Images	1
In 388 Images	1
In 395 Images	1
In 402 Images	1
In 406 Images	1
In 408 Images	1
In 409 Images	1
In 410 Images	2
In 412 Images	1
In 416 Images	1
In 423 Images	1
In 424 Images	1
In 427 Images	1
In 432 Images	1
In 436 Images	2
In 442 Images	1
In 443 Images	2
In 445 Images	1
In 451 Images	1
In 456 Images	1
In 460 Images	1
In 480 Images	1
In 487 Images	1
In 500 Images	1
In 508 Images	1
In 514 Images	1



Number of matches

25 25 41 62 83 104 125 146 167 188

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.

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.083	0.144	-0.001	5.745	8/8
20 (3D)	0.020/ 0.020	0.025	0.133	0.076	7.417	8/8
21 (3D)	0.020/ 0.020	0.090	0.125	-0.061	6.916	8/8
24 (3D)	0.020/ 0.020	-0.043	-0.014	0.028	1.847	8/8
6 (3D)	0.020/ 0.020	-0.084	0.011	0.034	3.360	8/8
7 (3D)	0.020/ 0.020	-0.059	-0.011	0.041	2.381	8/8
8 (3D)	0.020/ 0.020	-0.065	-0.002	0.044	2.448	8/8
9 (3D)	0.020/ 0.020	-0.067	0.009	-0.002	6.758	8/8
10 (3D)	0.020/ 0.020	-0.033	0.019	0.049	4.591	8/8
26 (3D)	0.020/ 0.020	0.272	-0.158	-0.160	3.144	8/8
27 (3D)	0.020/ 0.020	-0.222	-0.216	-0.040	1.466	8/8
14 (3D)	0.020/ 0.020	0.262	0.013	-0.009	5.345	8/8
16 (3D)	0.020/ 0.020	0.160	-0.142	0.004	7.071	7/7
28 (3D)	0.020/ 0.020	0.012	-0.117	0.014	2.072	8/8
17 (3D)	0.020/ 0.020	-0.327	0.062	0.042	4.940	8/8
18 (3D)	0.020/ 0.020	-0.170	0.111	0.060	6.979	8/8
4 (3D)	0.020/ 0.020	-0.047	0.007	-0.041	2.216	8/8
5 (3D)	0.020/ 0.020	-0.032	0.023	-0.028	3.709	8/8
22 (3D)	0.020/ 0.020	-0.011	0.079	0.063	3.165	8/8
1 (3D)	0.020/ 0.020	0.124	-0.074	-0.023	5.672	8/8
2 (3D)	0.020/ 0.020	0.097	-0.025	0.049	1.542	8/8
3 (3D)	0.020/ 0.020	-0.038	-0.167	-0.092	6.225	8/8
13 (3D)	0.020/ 0.020	0.137	0.138	-0.021	11.387	8/8
30 (3D)	0.020/ 0.020	0.614	-2.769	-1.498	1.441	8/8
29 (3D)	0.020/ 0.020	-0.210	-0.077	0.031	1.732	8/8
23 (3D)	0.020/ 0.020	-0.205	0.162	-0.057	3.427	8/8
25 (3D)	0.020/ 0.020	0.020	-0.094	0.007	1.019	8/8
11 (3D)	0.020/ 0.020	0.049	0.029	0.011	2.620	8/8
12 (3D)	0.020/ 0.020	0.061	0.074	-0.003	2.219	8/8
15 (3D)	0.020/ 0.020	0.335	-0.084	-0.092	7.301	8/8
Mean [m]		0.018701	-0.093699	-0.052541		
Sigma [m]		0.183502	0.506385	0.273341		
RMS Error [m]		0.184452	0.514981	0.278345		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options



Detected Template	No Template Available
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
Advanced: Matching Strategy	Use Geometrically Verified Matching: yes
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Mnimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	04h:49m:41s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	20m:38s

Results



Number of Processed Clusters	7
Number of Generated Tiles	1
Number of 3D Densified Points	6645582
Average Density (per m ³)	3398.11

Quality Report



Generated with Pix4Dmapper version 4.6.4



Important: Click on the different icons for:



Help to analyze the results in the Quality Report



Additional information about the sections



Click [here](#) for additional tips to analyze the Quality Report

Summary



Project	100%_ugeom_mgcp_8
Processed	2021-05-05 07:16:01
Camera Model Name(s)	Insta360Pro_1.9_7680x3840 (RGB)
Average Ground Sampling Distance (GSD)	0.71 cm / 0.28 in
Time for Initial Processing (without report)	06h:07m:51s

Quality Check



Images	median of 24911 keypoints per image	
Dataset	1074 out of 1074 images calibrated (100%), all images enabled	
Camera Optimization	0% relative difference between initial and optimized internal camera parameters	
Matching	median of 6949.27 matches per calibrated image	
Georeferencing	yes, 29 GCPs (29 3D), mean RMS error = 0.337 m	

Calibration Details



Number of Calibrated Images	1074 out of 1074
Number of Geolocated Images	0 out of 1074

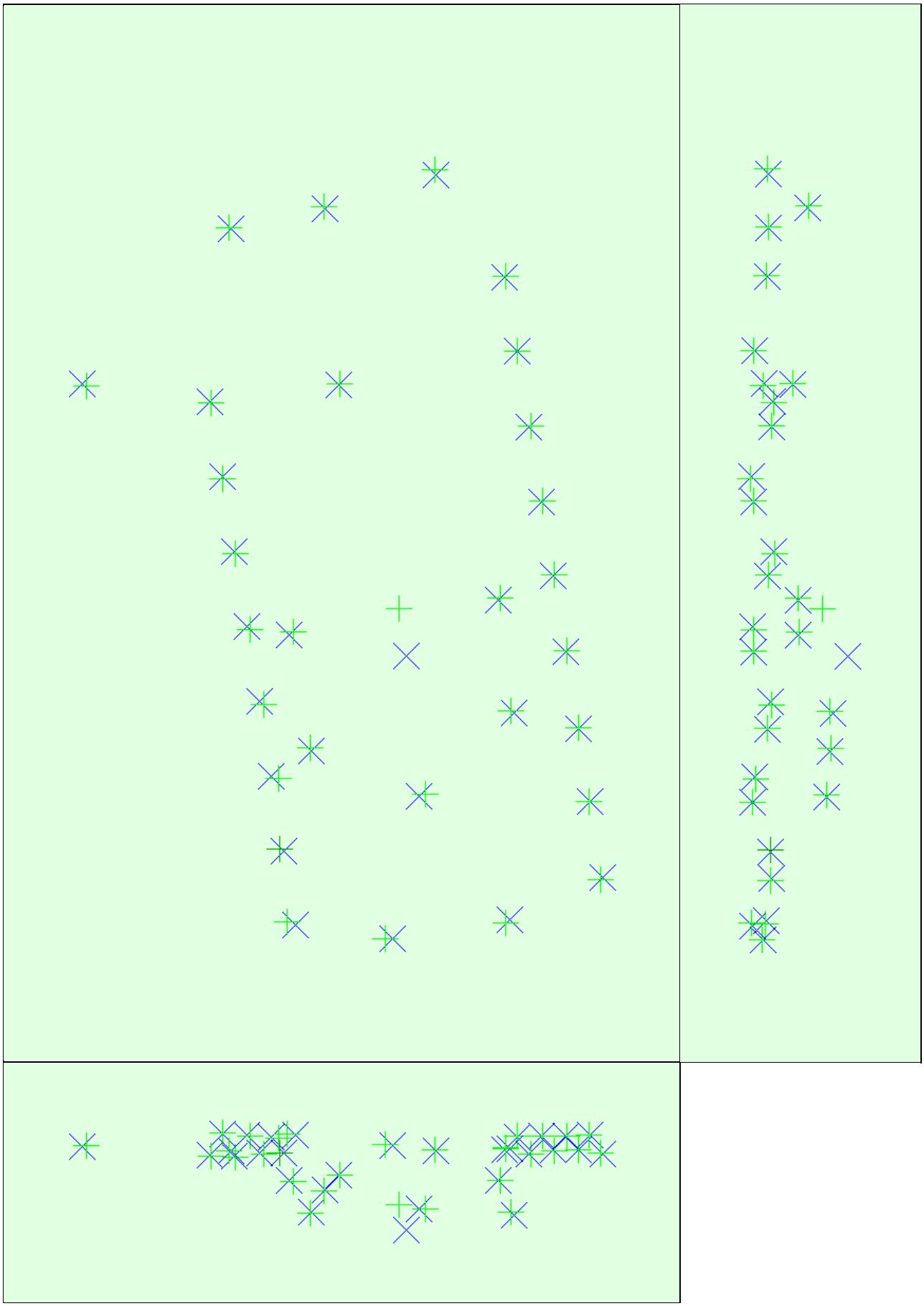
Initial Image Positions



The preview is not generated for images without geolocation.

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). Dark green ellipses indicate the absolute position uncertainty of the bundle block adjustment result.

⚠ Absolute camera position and orientation uncertainties

i

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.004	0.004	0.004	0.113	0.014	0.058
Sigma	0.001	0.001	0.001	0.250	0.003	0.325

Bundle Block Adjustment Details

i

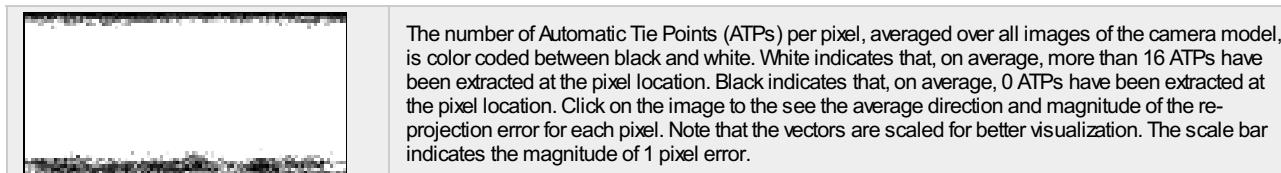
Number of 2D Keypoint Observations for Bundle Block Adjustment	7232832
Number of 3D Points for Bundle Block Adjustment	3068533
Mean Reprojection Error [pixels]	0.487

⚠ Internal Camera Parameters



EXIF ID: Insta360Pro_1.9_7680x3840

It is a spherical camera and it doesn't have internal parameters.



⚠ 2D Keypoints Table

i

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	24911	6949
Mn	15697	620
Max	30913	9578
Mean	24235	6734

⚠ 3D Points from 2D Keypoint Matches

i

	Number of 3D Points Observed
In 2 Images	2686249
In 3 Images	224942
In 4 Images	68209
In 5 Images	30713
In 6 Images	16747
In 7 Images	9928
In 8 Images	6626
In 9 Images	4588
In 10 Images	3483
In 11 Images	2506
In 12 Images	1903
In 13 Images	1566
In 14 Images	1155
In 15 Images	1055
In 16 Images	861
In 17 Images	712
In 18 Images	625
In 19 Images	585

In 20 Images	471
In 21 Images	400
In 22 Images	348
In 23 Images	276
In 24 Images	275
In 25 Images	283
In 26 Images	236
In 27 Images	207
In 28 Images	189
In 29 Images	163
In 30 Images	165
In 31 Images	133
In 32 Images	132
In 33 Images	115
In 34 Images	128
In 35 Images	105
In 36 Images	102
In 37 Images	81
In 38 Images	101
In 39 Images	83
In 40 Images	80
In 41 Images	78
In 42 Images	65
In 43 Images	51
In 44 Images	55
In 45 Images	57
In 46 Images	44
In 47 Images	52
In 48 Images	54
In 49 Images	43
In 50 Images	42
In 51 Images	33
In 52 Images	34
In 53 Images	37
In 54 Images	47
In 55 Images	28
In 56 Images	39
In 57 Images	32
In 58 Images	28
In 59 Images	36
In 60 Images	22
In 61 Images	26
In 62 Images	26
In 63 Images	17
In 64 Images	26
In 65 Images	34
In 66 Images	22
In 67 Images	23
In 68 Images	17
In 69 Images	21
In 70 Images	18
In 71 Images	15
In 72 Images	17
In 73 Images	18
In 74 Images	18
In 75 Images	15
In 76 Images	12
In 77 Images	17
In 78 Images	17

In 79 Images	12
In 80 Images	8
In 81 Images	11
In 82 Images	14
In 83 Images	6
In 84 Images	10
In 85 Images	8
In 86 Images	12
In 87 Images	11
In 88 Images	14
In 89 Images	13
In 90 Images	14
In 91 Images	12
In 92 Images	13
In 93 Images	3
In 94 Images	11
In 95 Images	9
In 96 Images	8
In 97 Images	9
In 98 Images	6
In 99 Images	6
In 100 Images	10
In 101 Images	9
In 102 Images	6
In 103 Images	12
In 104 Images	9
In 105 Images	4
In 106 Images	3
In 107 Images	5
In 108 Images	2
In 109 Images	4
In 110 Images	6
In 111 Images	4
In 112 Images	2
In 113 Images	6
In 114 Images	7
In 115 Images	7
In 116 Images	9
In 117 Images	6
In 118 Images	3
In 119 Images	4
In 120 Images	3
In 121 Images	4
In 122 Images	3
In 123 Images	6
In 124 Images	5
In 125 Images	7
In 126 Images	10
In 127 Images	3
In 128 Images	3
In 129 Images	4
In 130 Images	1
In 131 Images	7
In 132 Images	3
In 133 Images	3
In 134 Images	3
In 135 Images	1
In 136 Images	1
In 137 Images	3

In 138 Images	7
In 139 Images	1
In 140 Images	6
In 141 Images	6
In 142 Images	2
In 143 Images	4
In 144 Images	3
In 145 Images	3
In 146 Images	5
In 147 Images	4
In 148 Images	6
In 149 Images	2
In 150 Images	4
In 151 Images	3
In 152 Images	1
In 154 Images	5
In 155 Images	2
In 156 Images	2
In 157 Images	1
In 158 Images	3
In 159 Images	4
In 160 Images	3
In 161 Images	1
In 162 Images	5
In 164 Images	4
In 165 Images	1
In 166 Images	1
In 167 Images	1
In 168 Images	1
In 169 Images	2
In 171 Images	1
In 172 Images	2
In 173 Images	3
In 174 Images	1
In 175 Images	2
In 176 Images	3
In 177 Images	1
In 178 Images	2
In 179 Images	3
In 180 Images	1
In 181 Images	5
In 182 Images	3
In 183 Images	1
In 184 Images	3
In 185 Images	1
In 186 Images	3
In 187 Images	2
In 188 Images	1
In 189 Images	3
In 190 Images	1
In 191 Images	1
In 192 Images	1
In 193 Images	3
In 194 Images	2
In 195 Images	3
In 196 Images	2
In 197 Images	1
In 198 Images	2
In 200 Images	2

In 201 Images	3
In 202 Images	2
In 203 Images	2
In 204 Images	1
In 205 Images	2
In 206 Images	3
In 207 Images	3
In 209 Images	2
In 210 Images	1
In 211 Images	1
In 212 Images	1
In 213 Images	6
In 214 Images	1
In 215 Images	1
In 216 Images	4
In 217 Images	1
In 218 Images	1
In 220 Images	2
In 221 Images	2
In 222 Images	3
In 223 Images	1
In 224 Images	1
In 225 Images	2
In 226 Images	2
In 227 Images	2
In 231 Images	1
In 233 Images	1
In 235 Images	2
In 236 Images	2
In 237 Images	2
In 239 Images	3
In 241 Images	1
In 242 Images	2
In 243 Images	1
In 245 Images	2
In 246 Images	1
In 248 Images	1
In 249 Images	1
In 251 Images	2
In 252 Images	3
In 253 Images	2
In 254 Images	2
In 256 Images	1
In 258 Images	2
In 259 Images	3
In 261 Images	2
In 262 Images	1
In 263 Images	3
In 264 Images	1
In 265 Images	1
In 267 Images	1
In 268 Images	2
In 269 Images	1
In 274 Images	2
In 275 Images	1
In 276 Images	1
In 277 Images	1
In 278 Images	1
In 279 Images	2

In 281 Images	3
In 285 Images	1
In 286 Images	1
In 287 Images	1
In 288 Images	2
In 290 Images	1
In 292 Images	1
In 293 Images	2
In 295 Images	4
In 296 Images	1
In 297 Images	2
In 298 Images	2
In 301 Images	1
In 304 Images	1
In 306 Images	2
In 310 Images	1
In 311 Images	1
In 313 Images	1
In 314 Images	2
In 315 Images	1
In 316 Images	1
In 317 Images	1
In 318 Images	1
In 320 Images	1
In 325 Images	1
In 326 Images	1
In 327 Images	3
In 328 Images	1
In 329 Images	1
In 330 Images	1
In 332 Images	1
In 333 Images	2
In 337 Images	1
In 338 Images	2
In 340 Images	2
In 347 Images	2
In 348 Images	1
In 350 Images	1
In 351 Images	2
In 352 Images	1
In 354 Images	2
In 355 Images	2
In 356 Images	1
In 360 Images	1
In 361 Images	1
In 363 Images	1
In 368 Images	1
In 370 Images	1
In 374 Images	3
In 375 Images	1
In 377 Images	1
In 380 Images	1
In 381 Images	1
In 383 Images	1
In 384 Images	1
In 386 Images	1
In 388 Images	2
In 389 Images	2
In 391 Images	1

In 393 Images	1
In 395 Images	1
In 397 Images	1
In 402 Images	1
In 404 Images	1
In 407 Images	2
In 420 Images	1
In 421 Images	1
In 424 Images	1
In 425 Images	1
In 427 Images	1
In 430 Images	1
In 435 Images	2
In 441 Images	1
In 443 Images	1
In 444 Images	1
In 445 Images	1
In 450 Images	1
In 454 Images	1
In 455 Images	2
In 459 Images	1
In 463 Images	1
In 464 Images	1
In 466 Images	1
In 473 Images	1
In 474 Images	1
In 483 Images	1
In 489 Images	1
In 574 Images	1
In 580 Images	1

 **2D Keypoint Matches**



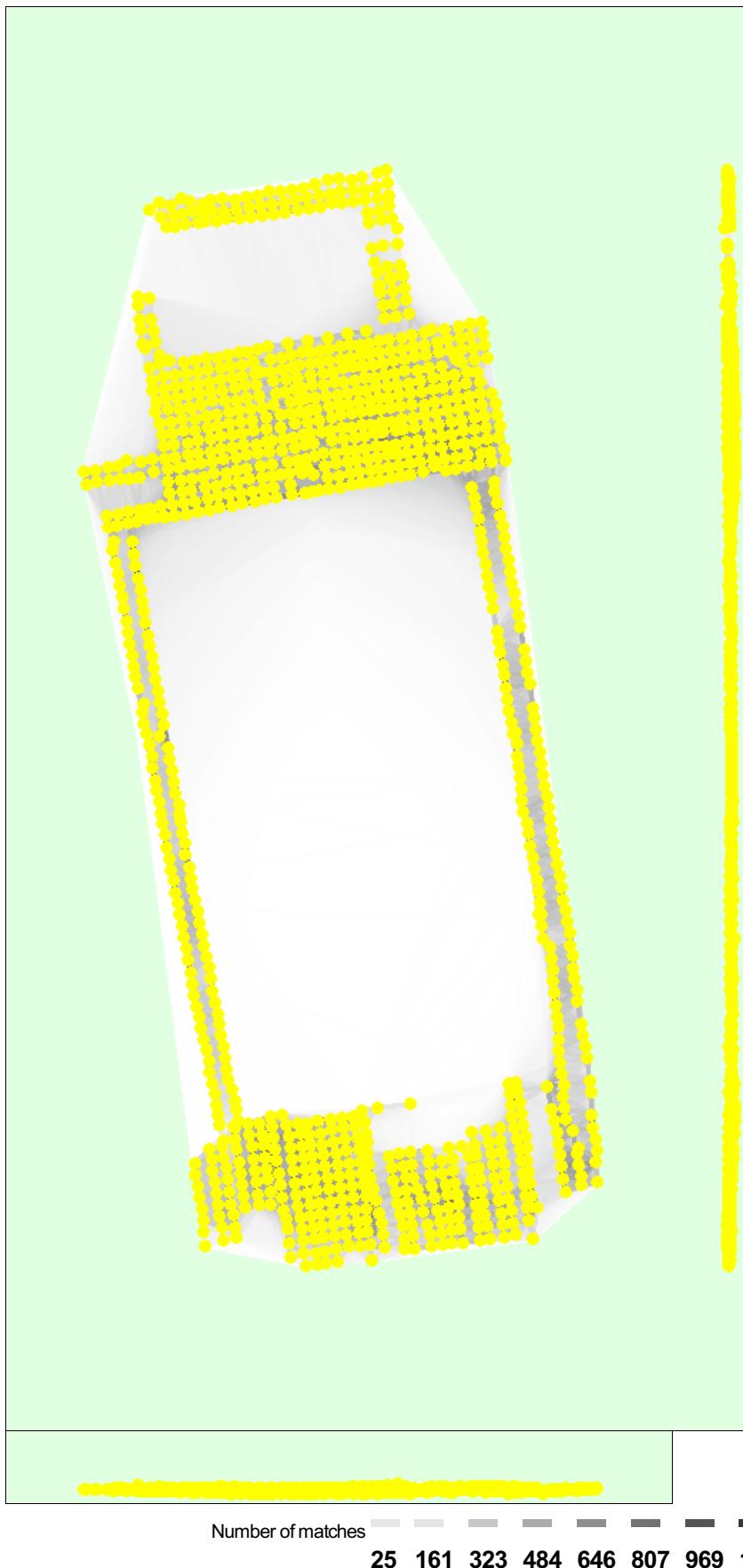


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details



Ground Control Points



GCP Name	Accuracy XY/Z [m]	Error X [m]	Error Y [m]	Error Z [m]	Projection Error [pixel]	Verified/Marked
19 (3D)	0.020/ 0.020	-0.169	0.186	0.017	4.838	8/8
20 (3D)	0.020/ 0.020	-0.051	0.139	0.089	7.288	8/8
21 (3D)	0.020/ 0.020	0.017	0.124	-0.043	8.606	8/8
24 (3D)	0.020/ 0.020	-0.068	-0.031	0.016	1.840	8/8
6 (3D)	0.020/ 0.020	-0.077	-0.062	0.019	3.464	8/8
7 (3D)	0.020/ 0.020	-0.059	-0.065	0.023	2.756	8/8
8 (3D)	0.020/ 0.020	-0.063	-0.060	0.046	3.677	8/8
9 (3D)	0.020/ 0.020	-0.049	-0.047	-0.007	5.047	8/8
10 (3D)	0.020/ 0.020	-0.014	-0.026	0.037	4.788	8/8
26 (3D)	0.020/ 0.020	0.181	-0.131	-0.144	3.276	8/8
27 (3D)	0.020/ 0.020	-0.360	-0.171	0.003	1.834	8/8
14 (3D)	0.020/ 0.020	0.420	0.002	-0.036	6.117	8/8
16 (3D)	0.020/ 0.020	0.219	-0.167	0.016	9.579	4/8
28 (3D)	0.020/ 0.020	0.074	-0.182	0.015	2.210	8/8
17 (3D)	0.020/ 0.020	-0.459	0.139	0.098	4.081	8/8
18 (3D)	0.020/ 0.020	-0.279	0.187	0.088	10.507	8/8
4 (3D)	0.020/ 0.020	-0.035	-0.045	-0.065	2.612	8/8
5 (3D)	0.020/ 0.020	-0.022	-0.044	-0.037	4.194	8/8
22 (3D)	0.020/ 0.020	-0.047	0.064	0.051	2.150	8/8
1 (3D)	0.020/ 0.020	0.115	-0.117	-0.004	7.516	8/8
2 (3D)	0.020/ 0.020	0.054	-0.067	0.089	3.441	8/8
3 (3D)	0.020/ 0.020	0.064	-0.292	-0.034	8.379	8/8
13 (3D)	0.020/ 0.020	0.227	0.180	-0.067	13.270	8/8
30 (3D)	0.020/ 0.020	0.477	-2.777	-1.468	1.567	8/8
29 (3D)	0.020/ 0.020	-0.219	-0.150	0.027	1.618	8/8
23 (3D)	0.020/ 0.020	-0.239	0.156	-0.073	2.964	8/8
25 (3D)	0.020/ 0.020	-0.146	-0.144	0.014	0.927	8/8
11 (3D)	0.020/ 0.020	0.084	0.025	-0.015	4.071	8/8
12 (3D)	0.020/ 0.020	0.099	0.112	-0.036	2.777	8/8
15 (3D)	0.020/ 0.020	0.506	-0.188	-0.092	4.188	8/8
Mean [m]		-0.001226	-0.113369	-0.051279		
Sigma [m]		0.218687	0.519265	0.273545		
RMS Error [m]		0.218690	0.531496	0.278310		

Localisation accuracy per GCP and mean errors in the three coordinate directions. The last column counts the number of calibrated images where the GCP has been automatically verified vs. manually marked.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-9700K CPU @ 3.60GHz RAM: 16GB GPU: Intel(R) UHD Graphics 630 (Driver: 27.20.100.8681), NVIDIA GeForce RTX 2070 (Driver: 27.21.14.6611)
Operating System	Windows 10 Home, 64-bit

Coordinate Systems



Ground Control Point (GCP) Coordinate System	Arbitrary (m)
Output Coordinate System	Arbitrary (m)

Processing Options



Detected Template	3D Models
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Free Flight or Terrestrial
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, yes

Point Cloud Densification details



Processing Options



Image Scale	1/2 (Half image size, Default)
Point Density	Optimal
Minimum Number of Matches	3
3D Textured Mesh Generation	yes
3D Textured Mesh Settings:	Resolution: Medium Resolution (default) 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	47m:19s
Time for Point Cloud Classification	NA
Time for 3D Textured Mesh Generation	23m:35s

Results



Number of Processed Clusters	30
Number of Generated Tiles	1
Number of 3D Densified Points	5001910
Average Density (per m ³)	4072.31