Quality Report

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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	CA502R_FullBlock_CU_SBR_WrongVal
Processed	2022-12-10 17:16:20
Camera Model Name(s)	CA502R_NADIR_28.0_6000x4000 (RGB), CA502R_RIGHT_43.0_6000x4000 (RGB), CA502R_LEFT_43.0_6000x4000 (RGB), CA502R_REAR_43.0_6000x4000 (RGB), CA502R_FRONT_43.0_6000x4000 (RGB)
Rig name(s)	«CA502_OBLIQUE_RIG_WRONG_INITIAL»
Average Ground Sampling Distance (GSD)	2.59 cm / 1.02 in
Area Covered	1.557 km^2 / 155.6739 ha / 0.60 sq. mi. / 384.8778 acres

Quality Check

Images	median of 7189 keypoints per image	✓
Dataset	6065 out of 6065 images calibrated (100%), all images enabled	✓
Camera Optimization	0.49% relative difference between initial and optimized internal camera parameters	✓
Matching	median of 189.42 matches per calibrated image	✓
Georeferencing	yes, 48 GCPs (48 3D), mean RMS error = 0.024 m	✓

Preview

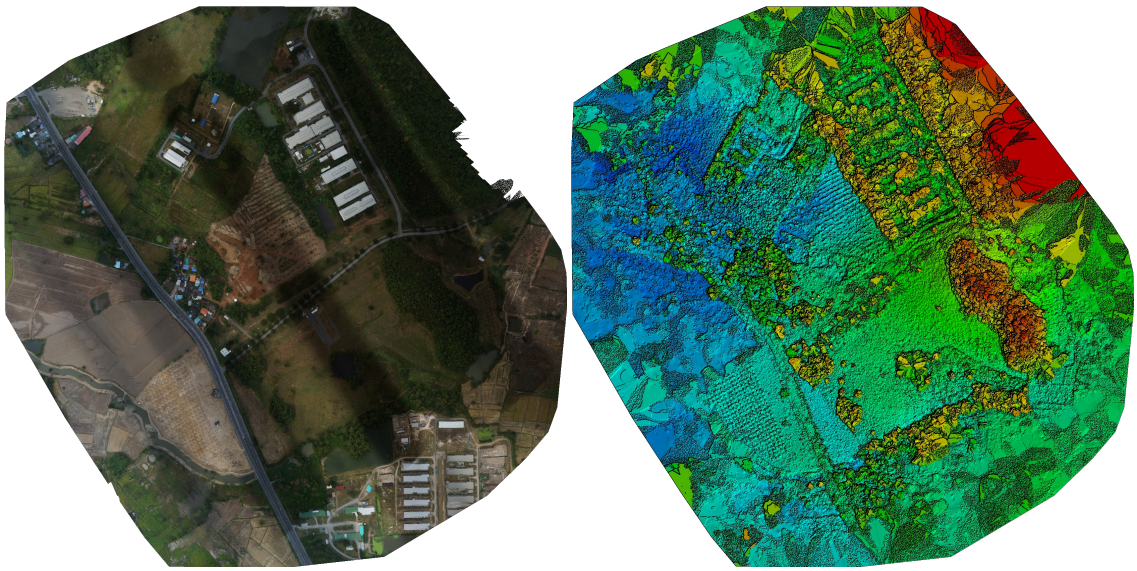


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details

Number of Calibrated Images	6065 out of 6065
Number of Geolocated Images	6065 out of 6065

Initial Image Positions

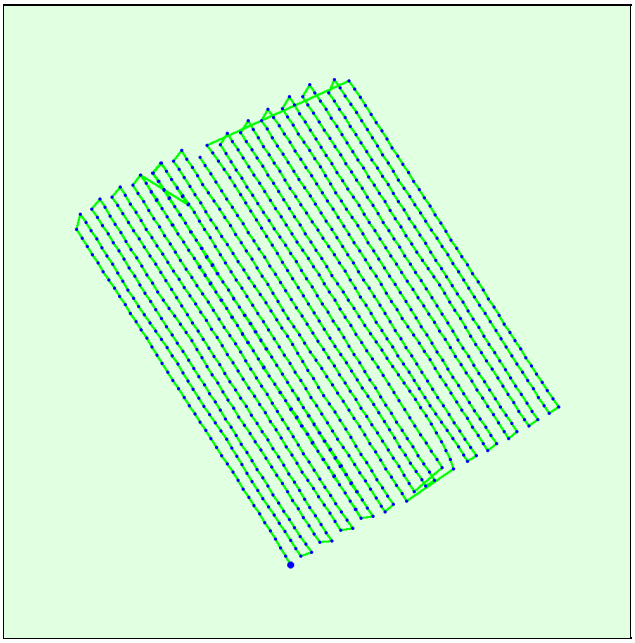
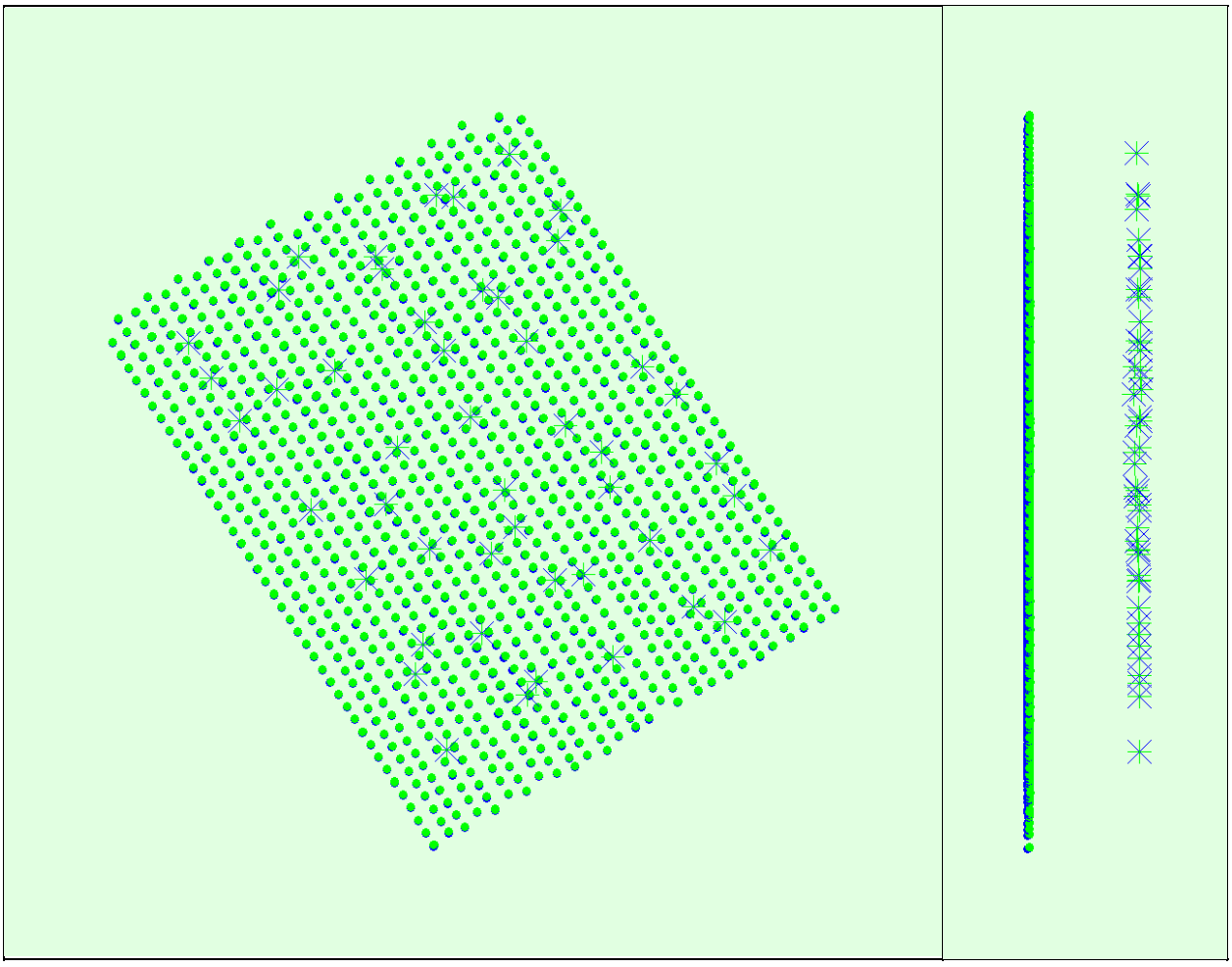


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



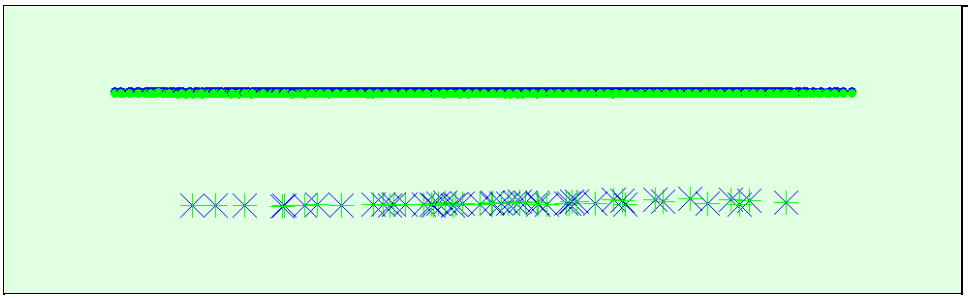


Figure 3: Offset between initial (blue dots) and computed (green dots) image positions as well as the offset between the GCPs initial positions (blue crosses) and their computed positions (green crosses) in the top-view (XY plane), front-view (XZ plane), and side-view (YZ plane).

Absolute camera position and orientation uncertainties

Uncertainty computation failed.

Overlap

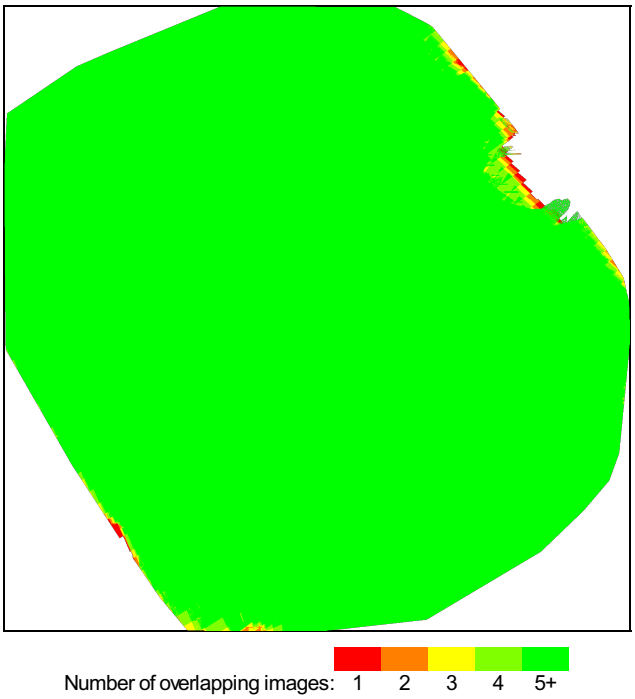


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic.
Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint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

Bundle Block Adjustment Details

Number of 2D Keypoint Observations for Bundle Block Adjustment	2755430
Number of 3D Points for Bundle Block Adjustment	889763
Mean Reprojection Error [pixels]	0.102

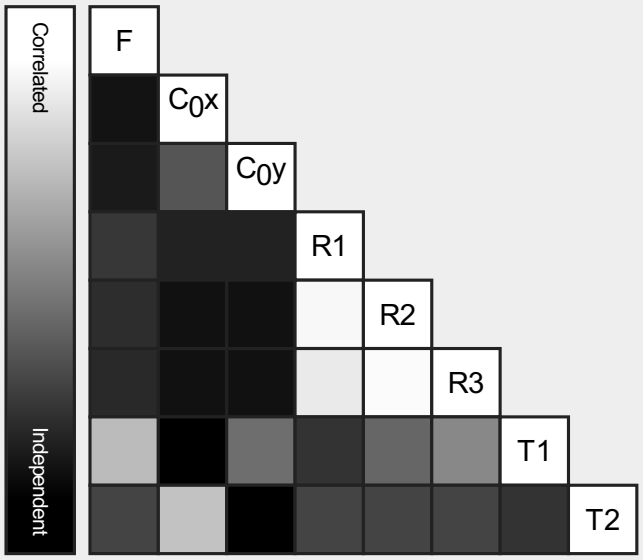
Internal Camera Parameters

CA502R_NADIR_28.0_6000x4000 (RGB). Sensor Dimensions: 23.520 [mm] x 15.680 [mm]

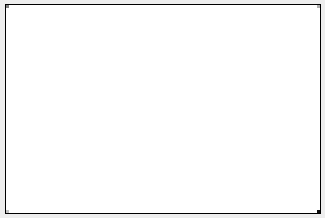
EXIF ID: ILCE-5100_0.0_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	7142.860 [pixel] 28.000 [mm]	3000.000 [pixel] 11.760 [mm]	2000.000 [pixel] 7.840 [mm]	-0.048	0.037	-0.011	-0.000	-0.001

Optimized Values	7147.185 [pixel] 28.017 [mm]	3032.468 [pixel] 11.887 [mm]	1919.151 [pixel] 7.523 [mm]	-0.107	-0.002	-0.001	-0.001	0.001
Uncertainties (Sigma)	530.464 [pixel] 2.079 [mm]	426.064 [pixel] 1.670 [mm]	322.329 [pixel] 1.264 [mm]	0.519	4.658	12.364	0.011	0.014



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



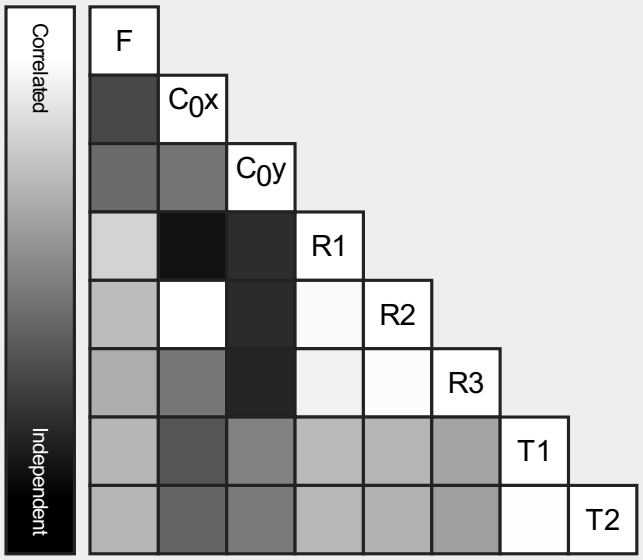
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the 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.

Internal Camera Parameters

CA502R_RIGHT_43.0_6000x4000 (RGB). Sensor Dimensions: 23.520 [mm] x 15.680 [mm]

EXIF ID: ILCE-5100_0.0_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	10969.400 [pixel] 43.000 [mm]	3000.000 [pixel] 11.760 [mm]	2000.000 [pixel] 7.840 [mm]	-0.048	0.037	-0.011	-0.000	-0.001
Optimized Values	11061.139 [pixel] 43.360 [mm]	3072.692 [pixel] 12.045 [mm]	2017.980 [pixel] 7.910 [mm]	-8.821	-0.060	0.113	-5.358	4.174
Uncertainties (Sigma)	1322.409 [pixel] 5.184 [mm]	50.490 [pixel] 0.198 [mm]	51.106 [pixel] 0.200 [mm]	7.828	203.300	1388.355	0.689	0.533



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.

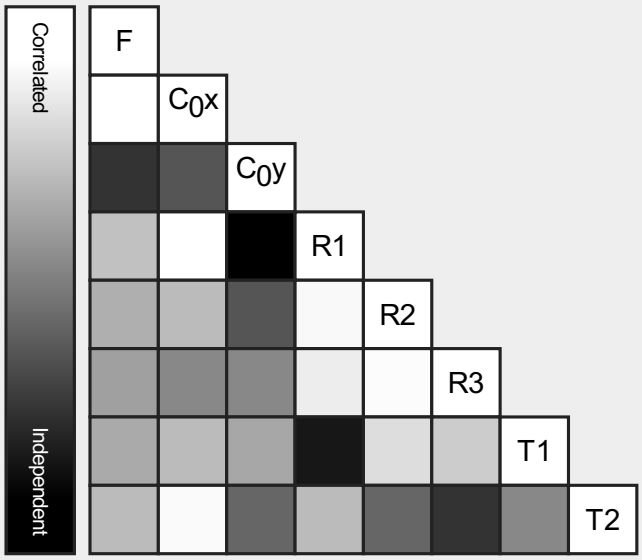
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the 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.

Internal Camera Parameters

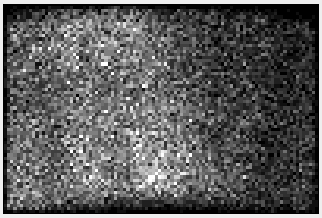
CA502R_LEFT_43.0_6000x4000 (RGB). Sensor Dimensions: 23.520 [mm] x 15.680 [mm]

EXIF ID: ILCE-5100_0.0_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	10969.400 [pixel] 43.000 [mm]	3000.000 [pixel] 11.760 [mm]	2000.000 [pixel] 7.840 [mm]	-0.048	0.037	-0.011	-0.000	-0.001
Optimized Values	11002.366 [pixel] 43.129 [mm]	3065.797 [pixel] 12.018 [mm]	1926.759 [pixel] 7.553 [mm]	0.001	-0.203	0.478	0.001	-0.000
Uncertainties (Sigma)	819.614 [pixel] 3.213 [mm]	4817.693 [pixel] 18.885 [mm]	2729.370 [pixel] 10.699 [mm]	4.477	95.798	617.676	0.082	0.145



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



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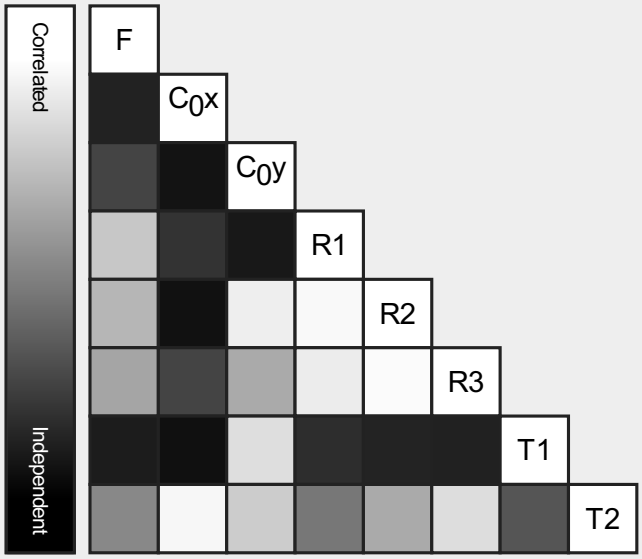
Internal Camera Parameters

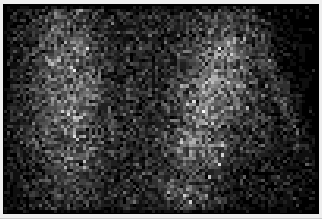
CA502R_REAR_43.0_6000x4000 (RGB). Sensor Dimensions: 23.520 [mm] x 15.680 [mm]

EXIF ID: ILCE-5100_0.0_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	10969.400 [pixel] 43.000 [mm]	3000.000 [pixel] 11.760 [mm]	2000.000 [pixel] 7.840 [mm]	-0.048	0.037	-0.011	-0.000	-0.001
Optimized Values	11031.186 [pixel] 43.242 [mm]	3007.076 [pixel] 11.788 [mm]	1945.948 [pixel] 7.628 [mm]	0.017	-0.360	0.941	0.000	-0.001
Uncertainties (Sigma)	890.130 [pixel] 3.489 [mm]	3553.054 [pixel] 13.928 [mm]	2840.811 [pixel] 11.136 [mm]	4.858	102.351	657.572	0.105	0.108



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other parameters.



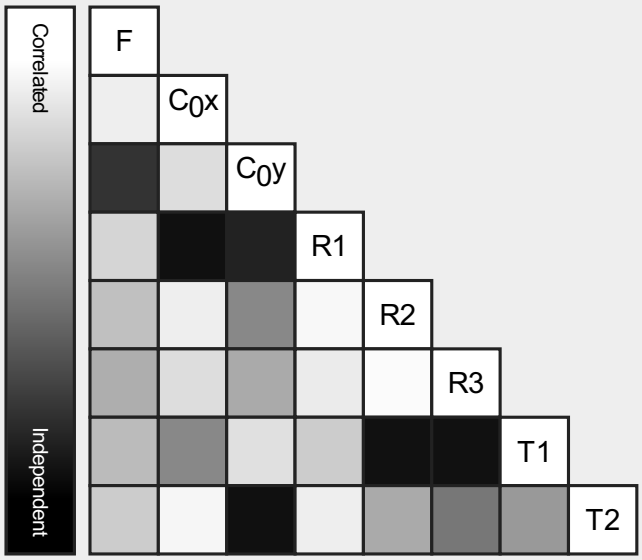
The number of Automatic Tie Points (ATPs) per pixel, averaged over all images of the camera model, is color coded between black and white. White indicates that, on average, more than 16 ATPs have been extracted at the pixel location. Black indicates that, on average, 0 ATPs have been extracted at the pixel location. Click on the image to the 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.

Internal Camera Parameters

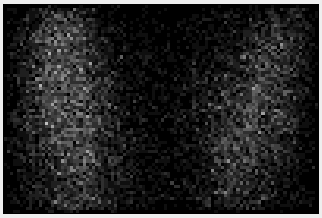
CA502R_FRONT_43.0_6000x4000 (RGB). Sensor Dimensions: 23.520 [mm] x 15.680 [mm]

EXIF ID: ILCE-5100_0.0_6000x4000

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	10969.400 [pixel] 43.000 [mm]	3000.000 [pixel] 11.760 [mm]	2000.000 [pixel] 7.840 [mm]	-0.048	0.037	-0.011	-0.000	-0.001
Optimized Values	11045.483 [pixel] 43.298 [mm]	3016.622 [pixel] 11.825 [mm]	1952.256 [pixel] 7.653 [mm]	-0.007	-0.276	1.783	0.001	0.000
Uncertainties (Sigma)	992.738 [pixel] 3.892 [mm]	4646.858 [pixel] 18.216 [mm]	3960.731 [pixel] 15.526 [mm]	5.498	112.836	693.682	0.145	0.138



The correlation between camera internal parameters determined by the bundle adjustment. White indicates a full correlation between the parameters, ie. any change in one can be fully compensated by the other. Black indicates that the parameter is completely independent, and is not affected by other 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 the 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.

Camera Rig «CA502_OBLIQUE_RIG_WRONG_INITIAL» Relatives. Images: 6065

	Transl X [m]	Transl Y [m]	Transl Z [m]	Rot X [degree]	Rot Y [degree]	Rot Z [degree]
CA502R_NADIR_28.0_6000x4000 (RGB)	Reference Camera					
CA502R_RIGHT_43.0_6000x4000 (RGB)						
Initial Values	0.000	0.051	-0.022	0.000	-45.000	90.000
Optimized values	0.000	0.051	-0.022	-0.003	-44.996	49.122
Uncertainties (sigma)				4.700	4.242	6.772
CA502R_LEFT_43.0_6000x4000 (RGB)						
Initial Values	0.000	-0.051	-0.022	0.000	45.000	90.000
Optimized values	0.000	-0.051	-0.022	0.383	44.275	89.553
Uncertainties (sigma)				18.435	14.114	27.745
CA502R_REAR_43.0_6000x4000 (RGB)						
Initial Values	-0.051	0.000	-0.022	45.000	0.000	0.000
Optimized values	-0.051	0.000	-0.022	43.394	-0.891	0.085
Uncertainties (sigma)				14.527	2.814	18.586
CA502R_FRONT_43.0_6000x4000 (RGB)						
Initial Values	0.051	0.000	-0.022	-45.000	0.000	180.000
Optimized values	0.051	0.000	-0.022	-44.894	-0.364	179.104
Uncertainties (sigma)				20.393	24.252	2.504

2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	7189	189
Min	3572	0
Max	10294	3826
Mean	7145	454

2D Keypoints Table for Camera CA502R_NADIR_28.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	7143	1611
Min	3854	42
Max	9889	3826
Mean	7124	1648

2D Keypoints Table for Camera CA502R_RIGHT_43.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	7162	0
Min	4698	0
Max	9633	16
Mean	7076	0

2D Keypoints Table for Camera CA502R_LEFT_43.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	7149	210
Min	3685	1
Max	8760	851

Mean	7067	222

2D Keypoints Table for Camera CA502R_REAR_43.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	7251	191
Min	3572	3
Max	10294	2706
Mean	7208	211

2D Keypoints Table for Camera CA502R_FRONT_43.0_6000x4000 (RGB)

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	7279	181
Min	3667	5
Max	9313	808
Mean	7251	191

Median / 75%/ Maximal Number of Matches Between Camera Models

	CA502R_NADIR_28... (RGB)	CA502R_RIGHT_43... (RGB)	CA502R_LEFT_43.... (RGB)	CA502R_REAR_43.... (RGB)	CA502R_FRONT_43 (RGB)
CA502R_NADIR_28.0_6000x4000 (RGB)	61 / 191 / 2426	1 / 1 / 1	1 / 1 / 9	1 / 2 / 392	1 / 1 / 347
CA502R_RIGHT_43.0_6000x4000 (RGB)		1 / 1 / 16	1 / 1 / 2		
CA502R_LEFT_43.0_6000x4000 (RGB)			7 / 31 / 762	1 / 1 / 4	1 / 1 / 11
CA502R_REAR_43.0_6000x4000 (RGB)				7 / 29 / 1592	1 / 2 / 64
CA502R_FRONT_43.0_6000x4000 (RGB)					6 / 24 / 474

3D Points from 2D Keypoint Matches

	Number of 3D Points Observed
In 2 Images	630355
In 3 Images	106863
In 4 Images	45922
In 5 Images	25468
In 6 Images	16471
In 7 Images	11727
In 8 Images	8794
In 9 Images	6851
In 10 Images	5587
In 11 Images	4845
In 12 Images	4211
In 13 Images	3486
In 14 Images	3023
In 15 Images	2720
In 16 Images	2521
In 17 Images	2176
In 18 Images	1879
In 19 Images	1646
In 20 Images	1310
In 21 Images	1011
In 22 Images	753
In 23 Images	541
In 24 Images	341
In 25 Images	259
In 26 Images	239
In 27 Images	190

In 28 Images	165
In 29 Images	127
In 30 Images	94
In 31 Images	79
In 32 Images	45
In 33 Images	35
In 34 Images	14
In 35 Images	11
In 36 Images	3
In 37 Images	1

2D Keypoint Matches

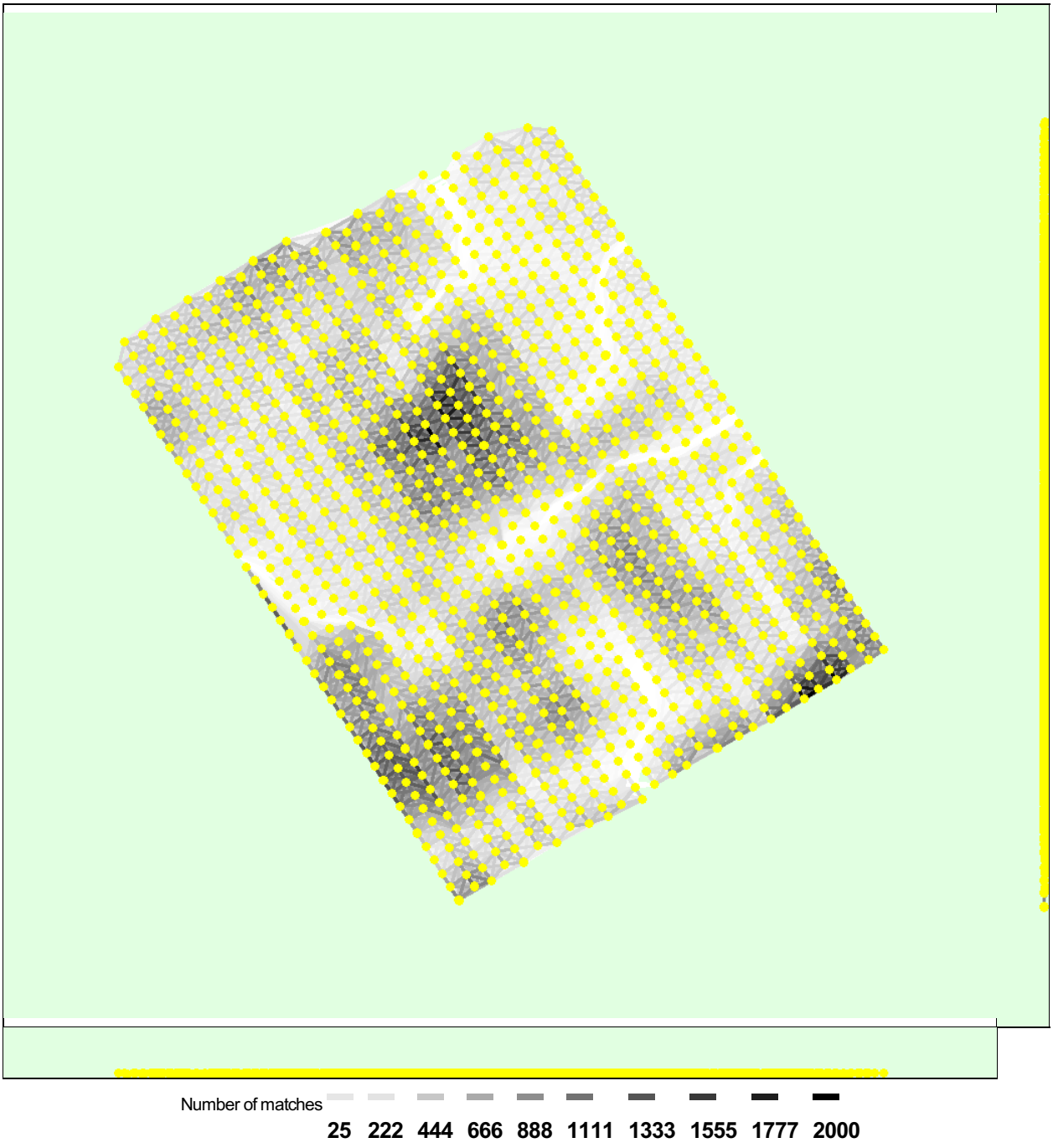


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

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
LCP-01 (3D)	0.020/ 0.050	0.042	0.009	0.107	0.291	24 / 30
LCP-02 (3D)	0.020/ 0.050	0.007	-0.015	-0.021	0.218	25 / 30
LCP-03 (3D)	0.020/ 0.050	-0.006	0.008	0.031	0.177	25 / 30
LCP-04 (3D)	0.020/ 0.050	0.048	-0.016	0.054	0.211	27 / 30
LCP-05 (3D)	0.020/ 0.050	-0.020	-0.013	-0.020	0.147	25 / 30
LCP-06 (3D)	0.020/ 0.050	0.009	0.033	-0.040	0.220	25 / 30
LCP-07 (3D)	0.020/ 0.050	0.042	0.010	0.016	0.205	25 / 30
LCP-08 (3D)	0.020/ 0.050	0.006	0.006	0.045	0.145	25 / 30
LCP-09 (3D)	0.020/ 0.050	-0.004	-0.022	0.031	0.171	26 / 30
LCP-10 (3D)	0.020/ 0.050	0.016	-0.041	0.017	0.154	26 / 30
LCP-11 (3D)	0.020/ 0.050	0.029	0.027	0.017	0.259	25 / 30
LCP-12 (3D)	0.020/ 0.050	0.021	0.002	0.021	0.229	25 / 30
LCP-13 (3D)	0.020/ 0.050	-0.028	-0.014	0.037	0.096	24 / 30
LCP-14 (3D)	0.020/ 0.050	0.006	-0.014	0.016	0.200	25 / 30
LCP-15 (3D)	0.020/ 0.050	-0.005	-0.014	0.007	0.419	23 / 30
LCP-16 (3D)	0.020/ 0.050	0.023	0.027	0.030	0.308	26 / 30
LCP-17 (3D)	0.020/ 0.050	-0.011	-0.001	0.023	0.176	25 / 30
LCP-18 (3D)	0.020/ 0.050	0.086	-0.037	-0.007	0.222	24 / 30
LCP-19 (3D)	0.020/ 0.050	-0.013	-0.017	-0.005	0.118	25 / 30
LCP-21 (3D)	0.020/ 0.050	0.009	0.032	0.015	0.211	27 / 30
LCP-22 (3D)	0.020/ 0.050	-0.027	0.011	0.028	0.146	25 / 30
LCP-23 (3D)	0.020/ 0.050	-0.014	-0.006	0.039	0.244	24 / 30
LCP-24 (3D)	0.020/ 0.050	-0.023	0.014	0.012	0.192	26 / 30
LCP-25 (3D)	0.020/ 0.050	-0.024	-0.023	0.009	0.116	26 / 30
LCP-26 (3D)	0.020/ 0.050	0.004	0.017	0.015	0.135	23 / 30
LCP-27 (3D)	0.020/ 0.050	-0.020	0.013	0.012	0.111	25 / 30
LCP-28 (3D)	0.020/ 0.050	-0.018	0.020	-0.017	0.245	24 / 30
LCP-29 (3D)	0.020/ 0.050	-0.017	0.017	0.021	0.145	27 / 30
LCP-30 (3D)	0.020/ 0.050	-0.003	-0.003	0.006	0.099	24 / 30
LCP-32 (3D)	0.020/ 0.050	-0.017	0.035	0.047	0.376	26 / 30
GCP-01 (3D)	0.020/ 0.050	-0.024	0.013	-0.008	0.133	27 / 30
GCP-02 (3D)	0.020/ 0.050	-0.002	-0.013	-0.012	0.183	25 / 30
GCP-03 (3D)	0.020/ 0.050	0.016	0.015	-0.017	0.169	25 / 30
GCP-04 (3D)	0.020/ 0.050	-0.016	0.006	-0.023	0.367	24 / 30
GCP-05 (3D)	0.020/ 0.050	-0.030	-0.016	-0.011	0.147	24 / 30
GCP-06 (3D)	0.020/ 0.050	-0.001	0.021	-0.004	0.284	25 / 30
GCP-07 (3D)	0.020/ 0.050	-0.002	-0.009	-0.001	0.156	28 / 30
GCP-08 (3D)	0.020/ 0.050	0.032	0.011	-0.036	0.257	26 / 30
GCP-09 (3D)	0.020/ 0.050	-0.008	-0.014	-0.028	0.165	24 / 30
GCP-10 (3D)	0.020/ 0.050	-0.014	-0.013	-0.026	0.075	26 / 30
GCP-11 (3D)	0.020/ 0.050	-0.014	0.003	-0.025	0.242	26 / 30
GCP-12 (3D)	0.020/ 0.050	-0.010	-0.021	-0.015	0.204	23 / 30
GCP-13 (3D)	0.020/ 0.050	0.005	0.007	-0.079	0.220	28 / 30
GCP-14 (3D)	0.020/ 0.050	0.026	-0.013	-0.001	0.231	26 / 30
GCP-15 (3D)	0.020/ 0.050	-0.021	0.005	-0.008	0.234	26 / 30
GCP-16 (3D)	0.020/ 0.050	0.010	-0.017	-0.074	0.456	24 / 30
GCP-17 (3D)	0.020/ 0.050	0.008	-0.008	-0.014	0.182	26 / 30
GCP-18 (3D)	0.020/ 0.050	-0.025	-0.002	-0.014	0.200	22 / 30
Mean [m]		0.000556	0.000124	0.003156		
Sigma [m]		0.023226	0.017734	0.031541		
RMS Error [m]		0.023233	0.017734	0.031698		

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.

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.00	0.00	0.00
-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	0.00	0.00	0.00
-3.00	0.00	49.43	49.60	55.60
0.00	3.00	50.57	50.40	44.40
3.00	6.00	0.00	0.00	0.00
6.00	9.00	0.00	0.00	0.00
9.00	12.00	0.00	0.00	0.00
12.00	15.00	0.00	0.00	0.00
15.00	-	0.00	0.00	0.00
Mean [m]		-0.338278	-1.836602	2.673856
Sigma [m]		0.176786	0.140232	0.097687
RMS Error [m]		0.381687	1.841947	2.675640

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

Geolocation Bias	X	Y	Z
Translation [m]	-0.338289	-1.836777	2.690939

Bias between image initial and computed geolocation given in output coordinate system.

Relative Geolocation Variance

Relative Geolocation Error	Images X [%]	Images Y [%]	Images Z [%]
[-1.00, 1.00]	100.00	100.00	100.00
[-2.00, 2.00]	100.00	100.00	100.00
[-3.00, 3.00]	100.00	100.00	100.00
Mean of Geolocation Accuracy [m]	5.000000	5.000000	10.000000
Sigma of Geolocation Accuracy [m]	0.000000	0.000000	0.000000

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

Initial Processing Details

System Information

Hardware	CPU: Intel(R) Core(TM) i7-5930K CPU @ 3.50GHz RAM: 32GB GPU: NVIDIA GeForce GTX 1660 Ti (Driver: 31.0.15.2686)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems

Image Coordinate System	WGS 84 (2D)
Ground Control Point (GCP) Coordinate System	WGS 84 / UTM zone 47N (2D)
Output Coordinate System	WGS 84 / UTM zone 47N (2D)

Processing Options

Detected Template	No Template Available
Keypoints Image Scale	Rapid, Image Scale: 0.25
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, no
Rig «CA502_OBLIQUE_RIG_WRONG_INITIAL» processing	optimize relative rotation