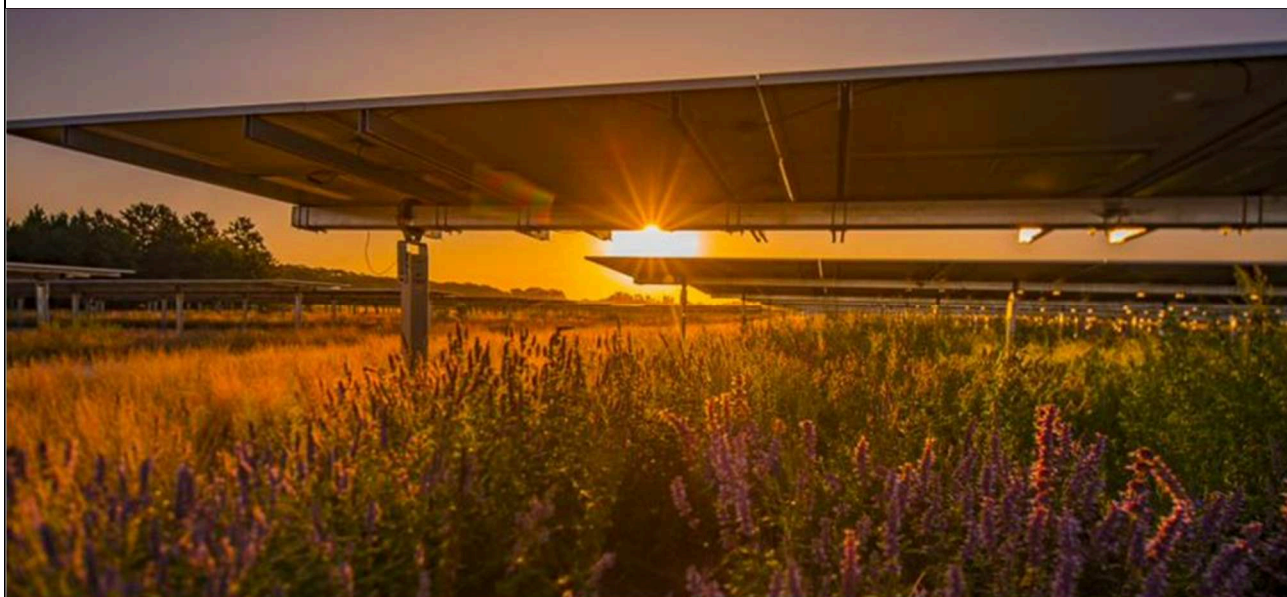


LOCALIZZAZIONE

REGIONE SICILIA
 PROVINCIA DI CATANIA
 COMUNI DI RADDUSA E RAMACCA



TITOLO BREVE

AGRIVOLTAICO "RADDUSA"

SPAZIO PER ENTI (VISTI, PROTOCOLLI, APPROVAZIONI, ALTRO)

REVISIONI	00	18/01/2022	PRIMA EMISSIONE ELABORATO	D'Angelo Ruvolo	Claudio Rizzo	Claudio Rizzo
	REV	DATA	DESCRIZIONE	REDATTO	VERIFICATO	APPROVATO

PROPONENTE

FRI-EL SOLAR

FRI-EL SOLAR S.r.l.
 Piazza del Grano 3 -39100 Bolzano (BZ)
 P.IVA 02023090380
 +39 0471324210 - fri-elsolar@legalmail.it

PROGETTAZIONE E SERVIZI



ENVLAB s.r.l.s. - C.F./P. IVA 02920050842
 Via Smeraldo n. 39 - 92016 RIBERA (AG)
 0925 096280 - envlab@pec.it - www.envlab.it

CODICE ELABORATO

FR-RADDUSA-AFV-PD-R-1.1.2.0-r0A-R00

FOGLIO

1/10

FORMATO

A4

SCALA



IL DIRETTORE TECNICO DI ENVLAB



PROGETTO

IMPIANTO AGRIVOLTAICO "RADDUSA" - PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO AGRIVOLTAICO DELLA POTENZA DI 58,95 MW_p (55 MW IN IMMISSIONE) CON SISTEMA DI ACCUMULO DA 20,00 MW E RELATIVE OPERE DI CONNESSIONE ALLA RTN RICADENTE NEI COMUNI DI RADDUSA E RAMACCA

OGGETTO ELABORATO

PROGETTO DEFINITIVO
 REPORT RILIEVO E RESTITUZIONE
 ORTOFOTOGRAMMETRICA DELLE AREE DI PROGETTO

Progettazione e Consulenza Ambientale	ELABORATO	PROPONENTE
	REPORT RILIEVO E RESTITUZIONE ORTOFOTOGRAMMETRICA DELLE AREE DI PROGETTO	FRI-EL SOLAR Piazza del Grano 3 - 39100 Bolzano (BZ) P.IVA 02023090380 +39 0471324210 - fri-elsolar@legalmail.it
IMPIANTO AGRIVOLTAICO "RADDUSA" PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO AGRIVOLTAICO DELLA POTENZA DI 58,95 MWp (55 MW IN IMMISSIONE) CON SISTEMA DI ACCUMULO DA 20,00 MW E RELATIVE OPERE DI CONNESSIONE ALLA RTN RICADENTE NEI COMUNI DI RADDUSA E RAMACCA		

1. PREMESSA

Il presente documento costituisce il Report relativo alle operazioni di rilievo e restituzione ortofotogrammetrica delle aree entro cui è stato elaborato il progetto dell'impianto agrivoltaico "Raddusa" della potenza di 58,95 MWp (55 MW in immissione) con sistema di accumulo da 20 MW - 40MWh e delle relative opere di connessione alla RTN che la società FRI-EL SOLAR S.r.l. intende realizzare nei Comuni di Raddusa (CT) e Ramacca (CT).

Il soggetto proponente dell'iniziativa è la Società FRI-EL SOLAR S.r.l. avente sede legale ed operativa in Bolzano, Piazza del Grano 3, iscritta nella Sezione Ordinaria della Camera di Commercio Industria Agricoltura ed Artigianato di Bolzano, C.F. e P.IVA N. 02023090380. La Fri-El Solar persegue lo sviluppo in Sicilia ed in altre parti d'Italia di progetti nel campo delle energie rinnovabili ed è parte del gruppo Fri-El Green Power SpA.

In particolare il rilievo aero-topografico o fotogrammetrico di prossimità è operato mediante Sistemi Aeromobili a Pilotaggio Remoto (SAPR, comunemente denominati "droni") registrati presso ENAC: la finalità è quella di fornire, attraverso l'attività di tecnici qualificati ed abilitati, un modello fotogrammetrico, ovvero un modello tridimensionale misurabile, in scala, dell'area rilevata, che ne riporta tutte le caratteristiche geometriche, cromatiche e materiche e che rappresenta un database sempre interrogabile.

La ENVLAB è operatore regolarmente abilitato da ENAC con codice "ITEFZcUeXi" verificabile nell'elenco operatori raggiungibile al seguente link https://www.d-flight.it/new_portal/elenco-operatori/.

La pianificazione del volo del SAPR consta della definizione dei parametri necessari all'esecuzione del rilievo fotogrammetrico di prossimità da SAPR che sono:

- *Ts tempo di scatto (espresso in secondi);*
- *Fs frequenza di scatto (n° foto al secondo);*
- *Vs velocità di volo del SAPR (metri/secondo);*
- *GSD (Ground Simple Distance).*

Il rilievo dell'area oggetto del progetto è stato eseguito mediante l'ausilio di sistemi aerofotogrammetrici, con apposito aeromobile a pilotaggio remoto o APR, dotato di camera digitale ad alta risoluzione.

L'impianto topografico generale e il rilievo dei relativi Ground Control Point (GCP) posizionati secondo il piano di volo programmato, è stato condotto mediante strumentazione GPS (NRTK-GNSS) e successiva acquisizione, interpretazione, elaborazione e restituzione finale di dati.

I dati risultanti dai rilievi acquisiti con sistemi APR costituiscono il dato di input per le successive analisi di caratterizzazione dell'area indagata.

L'APR è condotto da un pilota in possesso del riconoscimento della competenza (Attestato/Licenza di Pilota di APR), in stato di validità di cui alla Sezione IV del Regolamento ENAC vigente.

Il rilievo si è svolto secondo le seguenti attività:

1. *pianificazione piano di volo in funzione delle condizioni climatiche;*
2. *rilievo aerofotogrammetrico mediante sistema APR;*
3. *elaborazione big data da rilievo;*
4. *restituzione di cartografia di base in scala di dettaglio in proiezione planoaltimetrica;*

Progettazione e Consulenza Ambientale	ELABORATO	PROPONENTE
	<p align="center">REPORT RILIEVO E RESTITUZIONE ORTOFOTOGRAMMETRICA DELLE AREE DI PROGETTO</p>	<p>FRI-ELSOLAR Piazza del Grano 3 - 39100 Bolzano (BZ) P.IVA 02023090380 +39 0471324210 - fri-elsolar@legalmail.it</p>
<p align="center"><i>IMPIANTO AGRIVOLTAICO "RADDUSA"</i> PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO AGRIVOLTAICO DELLA POTENZA DI 58,95 MWp (55 MW IN IMMISSIONE) CON SISTEMA DI ACCUMULO DA 20,00 MW E RELATIVE OPERE DI CONNESSIONE ALLA RTN RICADENTE NEI COMUNI DI RADDUSA E RAMACCA</p>		

5. *realizzazione di un modello tridimensionale in formato mesh;*
6. *produzione di un dettagliato Modello Digitale del Terreno (DTM);*
7. *elaborazione di un ortofotopiano in formato TFF/TFW e sua sovrapposizione alla CTR regionale o alla aerofotogrammetria pubblica esistente;*
8. *estrapolazione di curve di livello del terreno sull'intera area indagata in formato DWG/SHP, UTM dato ERTS 89/WGS84;*
9. *estrapolazione di punti quotati;*
10. *produzione di ortofoto in formato .kml da importare direttamente in Google Earth.*

Le informazioni acquisite con metodo fotogrammetrico sono integrate da rilievi in campo con strumentazione topografica e/o GNSS per garantire la corretta definizione della geometria del terreno oggetto di studio.

Nel seguito è riportato integralmente il Report generato dal software PIX4D impiegato per l'elaborazione delle immagini georeferenziate acquisite da Drone.

Le migliaia immagini in alta risoluzione, la grande quantità di dati generata e le elaborazioni di modelli 3D, DEM ed ortomosaici sono disponibili presso gli archivi digitali di Envlab per eventuale consultazione su richiesta.

- !** **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 i

Project	raddusa nord
Processed	2021-10-21 10:52:51
Camera Model Name(s)	FC6310_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	2.40 cm / 0.95 in
Area Covered	0.267 km ² / 26.7183 ha / 0.10 sq. mi. / 66.0564 acres
Time for Initial Processing (without report)	19m:35s

Quality Check i

? Images	median of 60124 keypoints per image	✓
? Dataset	234 out of 234 images calibrated (100%), all images enabled	✓
? Camera Optimization	1.16% relative difference between initial and optimized internal camera parameters	✓
? Matching	median of 35277.8 matches per calibrated image	✓
? Georeferencing	yes, no 3D GCP	⚠

? Preview i

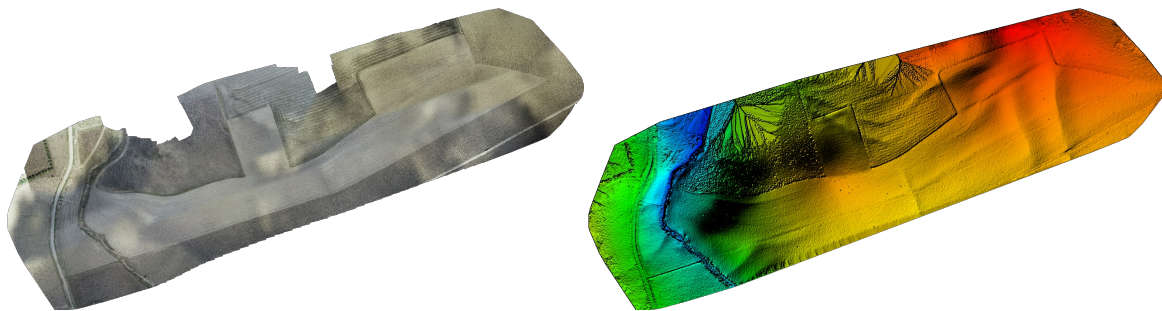


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details i

Number of Calibrated Images	234 out of 234
Number of Geolocated Images	234 out of 234

? Initial Image Positions i

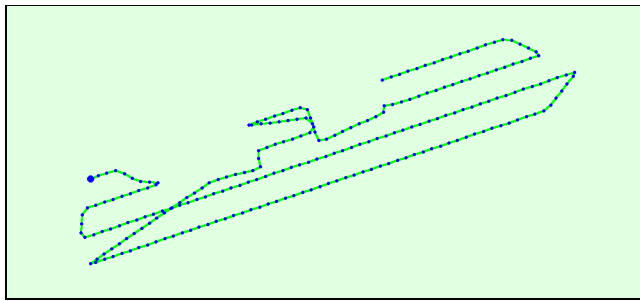
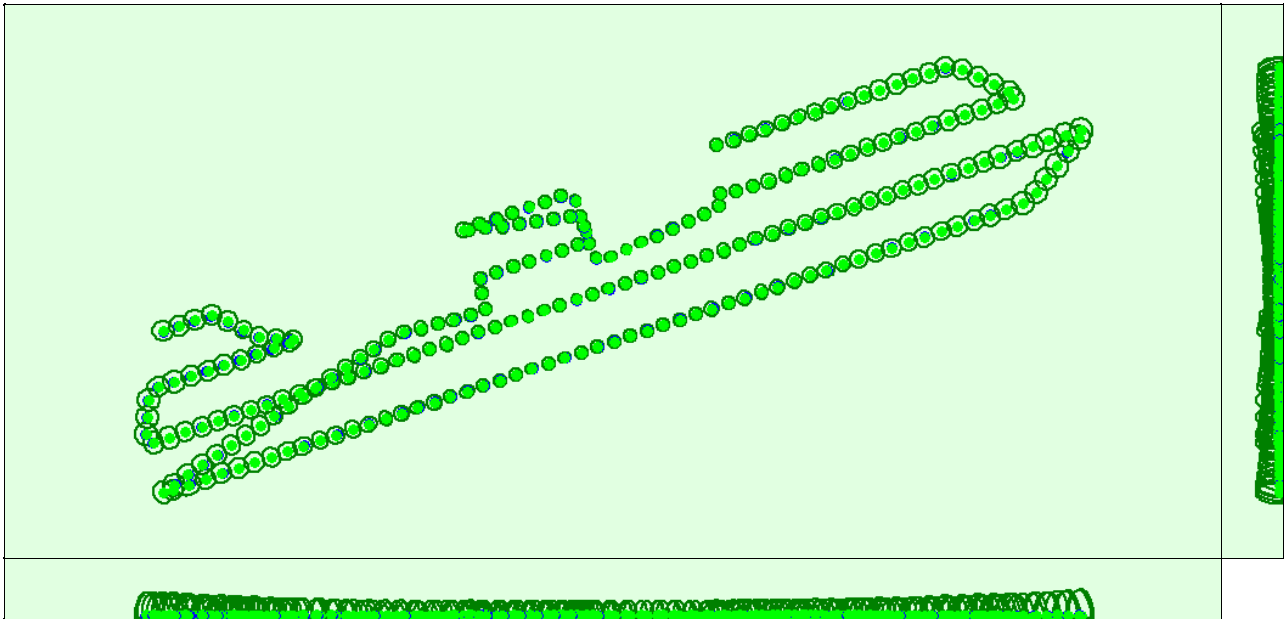


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions



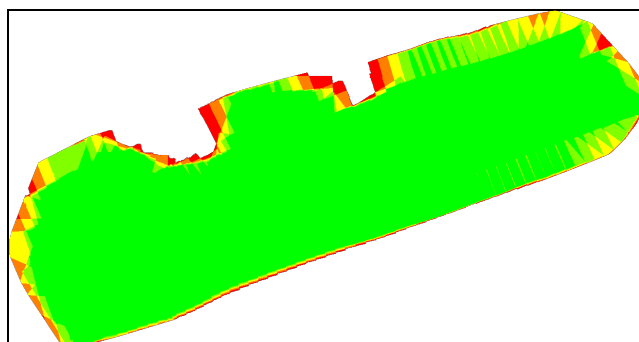
Uncertainty ellipses 100x magnified

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

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.080	0.079	0.160	0.036	0.032	0.012
Sigma	0.017	0.017	0.029	0.003	0.007	0.000

Overlap



Number of overlapping images: 1 2 3 4 5+

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

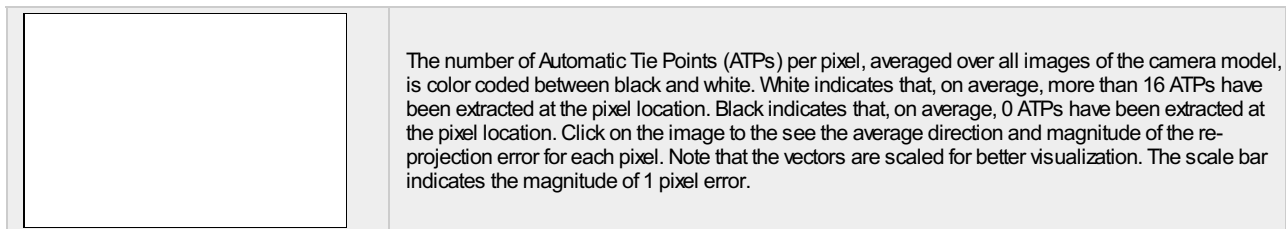
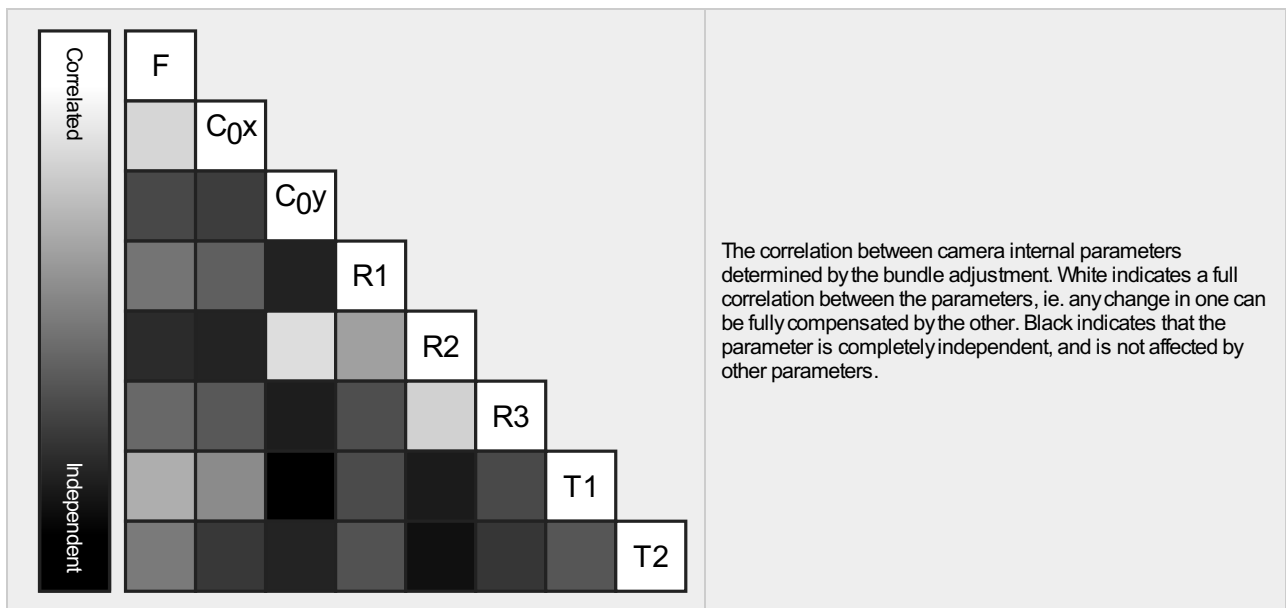
Number of 2D Keypoint Observations for Bundle Block Adjustment	8420835
Number of 3D Points for Bundle Block Adjustment	2617146
Mean Reprojection Error [pixels]	0.140

Internal Camera Parameters

FC6310_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310S_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3668.759 [pixel] 8.604 [mm]	2736.001 [pixel] 6.417 [mm]	1823.999 [pixel] 4.278 [mm]	0.003	-0.008	0.008	-0.000	0.000
Optimized Values	3711.630 [pixel] 8.705 [mm]	2714.076 [pixel] 6.365 [mm]	1806.649 [pixel] 4.237 [mm]	-0.014	0.004	0.006	-0.002	-0.001
Uncertainties (Sigma)	6.578 [pixel] 0.015 [mm]	0.198 [pixel] 0.000 [mm]	0.095 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000



2D Keypoints Table

	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	60124	35278
Mn	46481	21130
Max	71679	50395
Mean	59697	35986

3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	1436889
In 3 Images	506141
In 4 Images	263689
In 5 Images	155194
In 6 Images	76883
In 7 Images	50000
In 8 Images	35806
In 9 Images	25870
In 10 Images	18878
In 11 Images	11803
In 12 Images	8245
In 13 Images	6479
In 14 Images	4929
In 15 Images	3827
In 16 Images	3006
In 17 Images	2329
In 18 Images	1836
In 19 Images	1361
In 20 Images	964
In 21 Images	726
In 22 Images	507
In 23 Images	382
In 24 Images	292
In 25 Images	250
In 26 Images	205
In 27 Images	145
In 28 Images	137
In 29 Images	102
In 30 Images	62
In 31 Images	53
In 32 Images	47
In 33 Images	35
In 34 Images	27
In 35 Images	17
In 36 Images	11
In 37 Images	14
In 38 Images	2
In 39 Images	3

2D Keypoint Matches



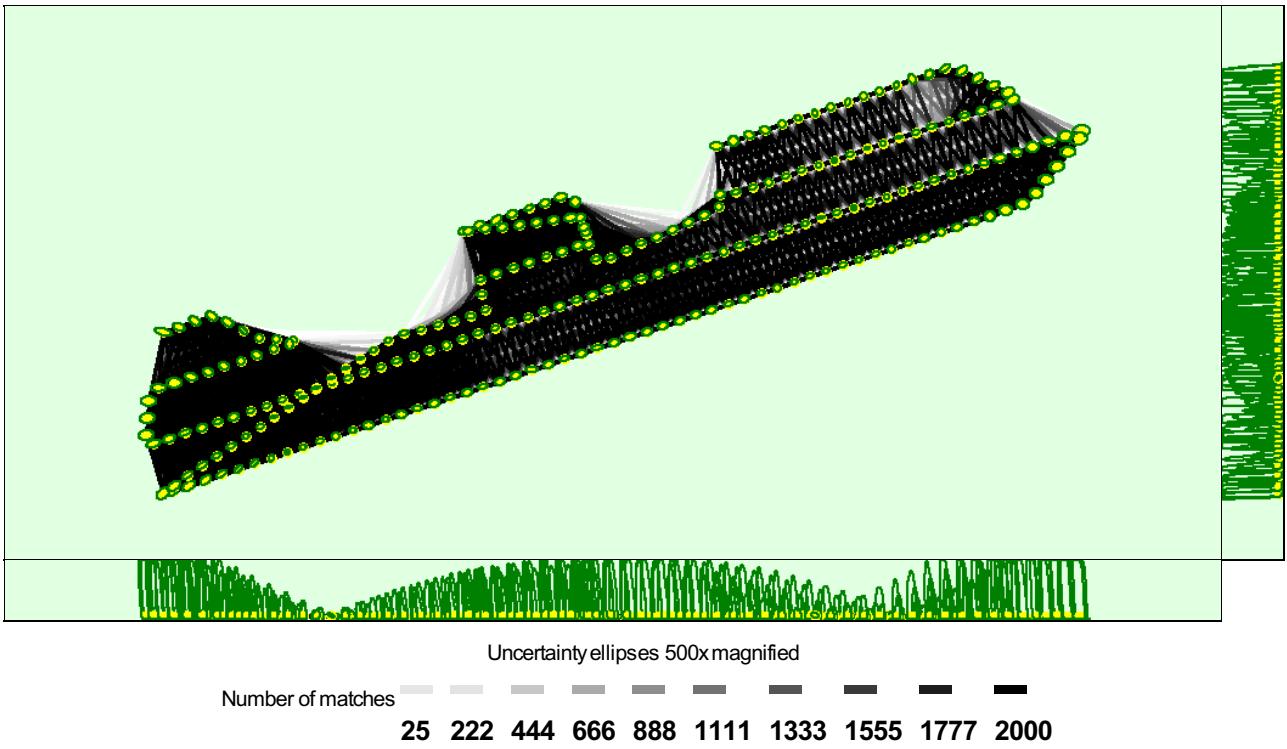


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images. Dark green ellipses indicate the relative camera position uncertainty 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	0.009	0.007	0.087	0.021	0.034	0.002
Sigma	0.002	0.001	0.048	0.018	0.021	0.001

Geolocation Details

Absolute Geolocation Variance

Min Error [m]	Max Error [m]	Geolocation Error X [%]	Geolocation Error Y [%]	Geolocation Error Z [%]
-	-15.00	0.00	0.00	0.00
-15.00	-12.00	0.00	0.00	0.00
-12.00	-9.00	0.00	0.00	0.00
-9.00	-6.00	0.00	0.00	0.00
-6.00	-3.00	0.00	0.00	0.00
-3.00	0.00	42.74	53.85	43.59
0.00	3.00	57.26	46.15	56.41
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]		-0.000000	0.000000	0.000002
Sigma [m]		0.495250	0.288403	0.435768
RMS Error [m]		0.495250	0.288403	0.435768

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

Relative Geolocation Variance



Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	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.

Geolocation Orientational Variance	RMS [degree]
Omega	0.806
Phi	0.262
Kappa	4.289

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-10700 CPU @ 2.90GHz RAM: 16GB GPU: NVIDIA Quadro P1000 (Driver: 27.21.14.5148), Intel(R) UHD Graphics 630 (Driver: 27.20.100.8190)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 33N (EGM96 Geoid)

Processing Options



Detected Template	CUDDIACURVE OK*
Keypoints Image Scale	Full, Image Scale: 1
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, yes

Point Cloud Densification details



Processing Options



Image Scale	multiscale, 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	15m:42s
Time for Point Cloud Classification	03m:43s
Time for 3D Textured Mesh Generation	06m:12s

Results



Number of Processed Clusters	2
Number of Generated Tiles	1
Number of 3D Densified Points	30630568
Average Density (per m ³)	255.93

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (2.4 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: yes
Grid DSM	Generated: yes, Spacing [cm]: 100
Raster DTM	Generated: yes Merge Tiles: yes
DTM Resolution	5 x GSD (2.4 [cm/pixel])
Contour Lines Generation	Generated: yes Contour Base [m]: 0 Elevation Interval [m]: 0.5 Resolution [cm]: 300 Minimum Line Size [vertices]: 10
Time for DSM Generation	12m:18s
Time for Orthomosaic Generation	36m:30s
Time for DTM Generation	24m:50s
Time for Contour Lines Generation	03s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s

- !** **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	raddusa sud
Processed	2021-10-25 20:35:57
Camera Model Name(s)	FC6310_8.8_5472x3648 (RGB)
Average Ground Sampling Distance (GSD)	3.04 cm / 1.20 in
Area Covered	1.632 km ² / 163.1922 ha / 0.63 sq. mi. / 403.4654 acres
Time for Initial Processing (without report)	01h:08m:27s

Quality Check



? Images	median of 61984 keypoints per image	✓
? Dataset	1206 out of 1206 images calibrated (100%), all images enabled	✓
? Camera Optimization	3.7% relative difference between initial and optimized internal camera parameters	✓
? Matching	median of 17560.5 matches per calibrated image	✓
? Georeferencing	yes, no 3D GCP	⚠

? Preview

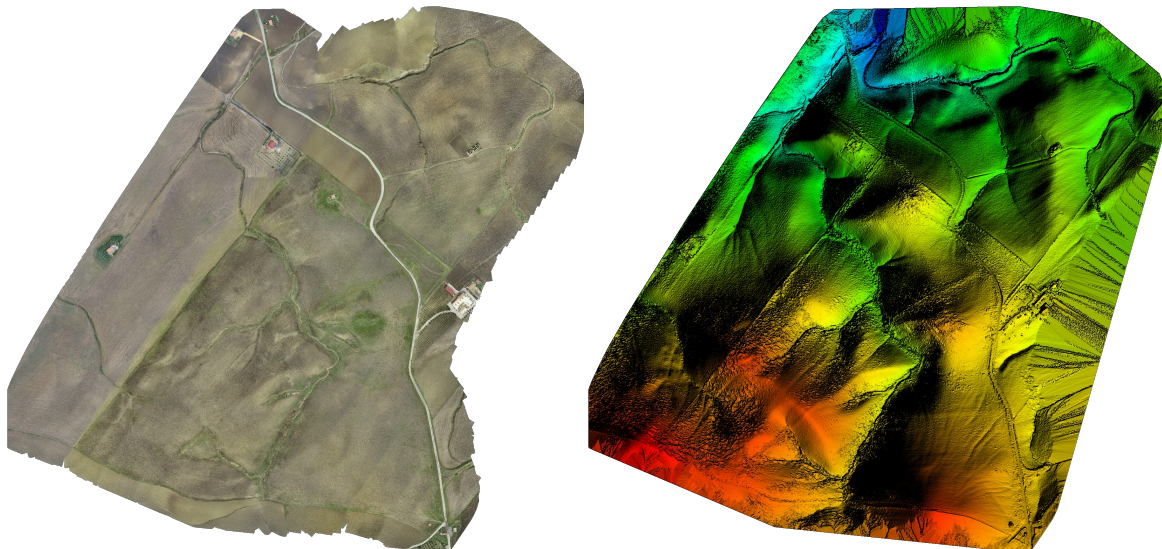


Figure 1: Orthomosaic and the corresponding sparse Digital Surface Model (DSM) before densification.

Calibration Details



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

Initial Image Positions

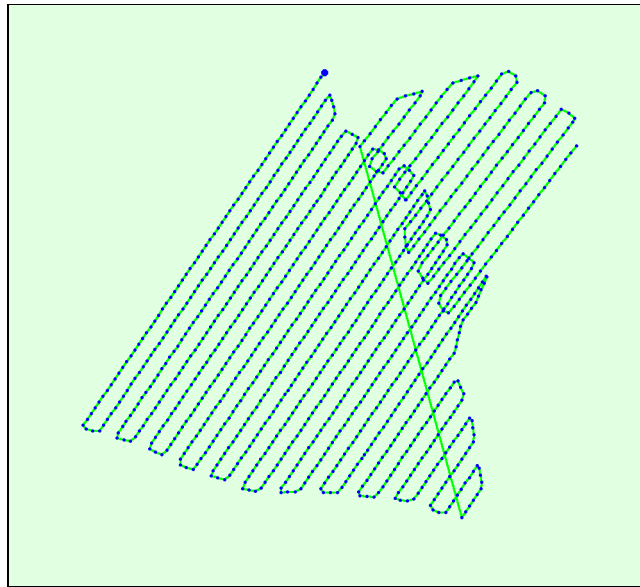
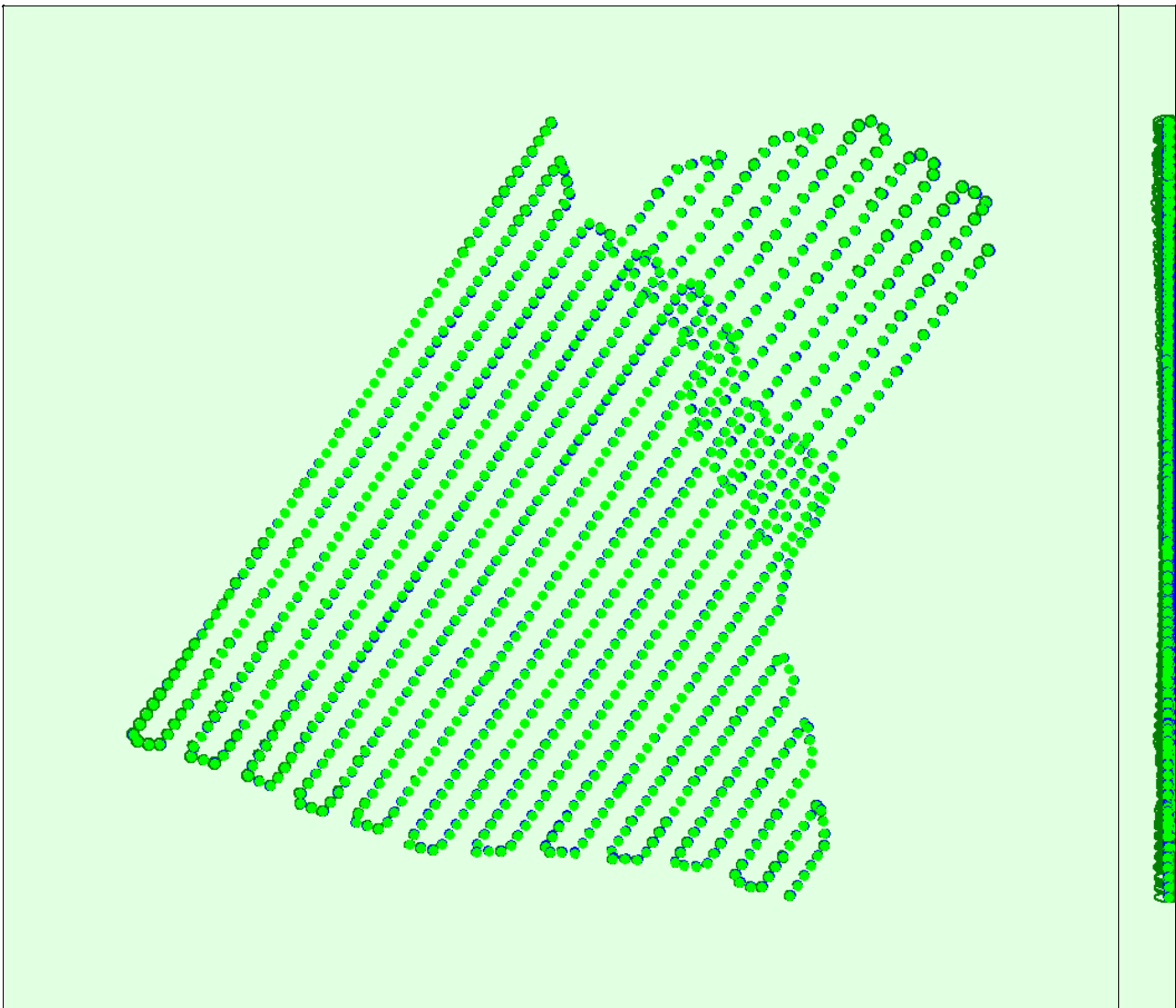
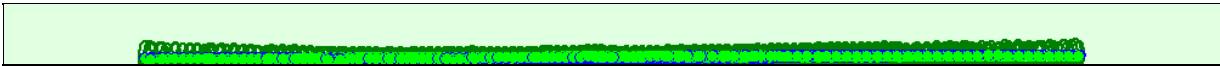


Figure 2: Top view of the initial image position. The green line follows the position of the images in time starting from the large blue dot.

Computed Image/GCPs/Manual Tie Points Positions





Uncertainty ellipses 100xmagnified

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

	X[m]	Y[m]	Z[m]	Omega [degree]	Phi [degree]	Kappa [degree]
Mean	0.066	0.066	0.153	0.019	0.019	0.006
Sigma	0.012	0.012	0.034	0.005	0.003	0.001

🔍 Overlap

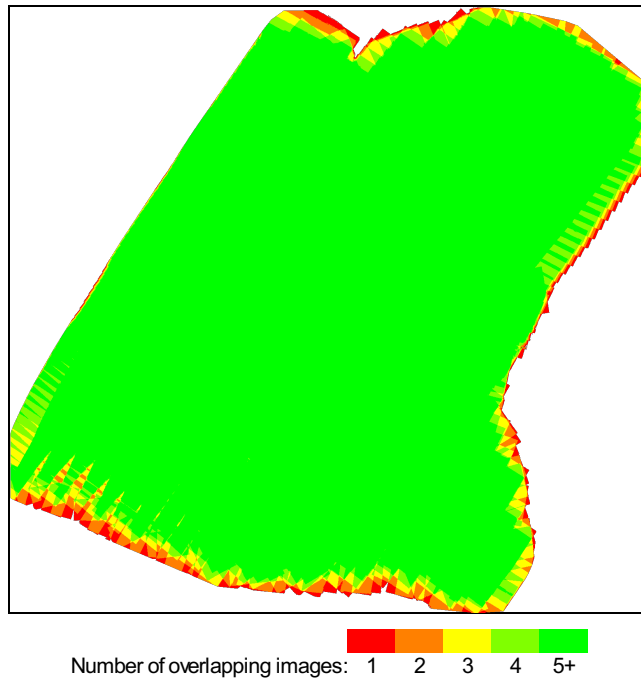


Figure 4: Number of overlapping images computed for each pixel of the orthomosaic. Red and yellow areas indicate low overlap for which poor results may be generated. Green areas indicate an overlap of over 5 images for every pixel. Good quality results will be generated as long as the number of keypoint 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	21652586
Number of 3D Points for Bundle Block Adjustment	7199871
Mean Reprojection Error [pixels]	0.111

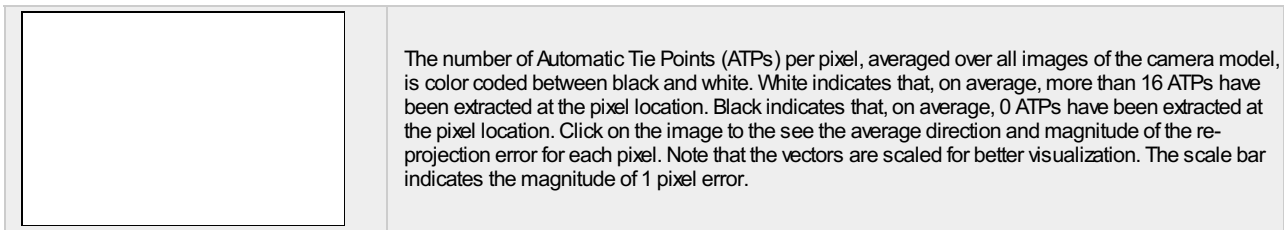
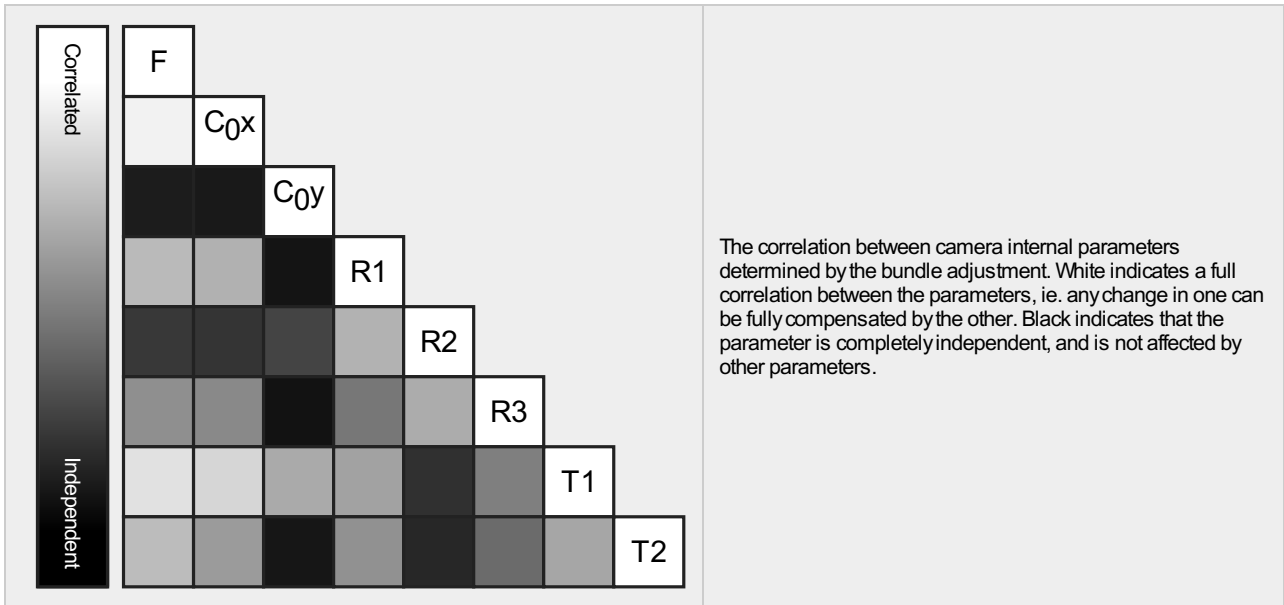
🔍 Internal Camera Parameters

📷 FC6310_8.8_5472x3648 (RGB). Sensor Dimensions: 12.833 [mm] x 8.556 [mm]

EXIF ID: FC6310S_8.8_5472x3648

	Focal Length	Principal Point x	Principal Point y	R1	R2	R3	T1	T2
Initial Values	3668.759 [pixel] 8.604 [mm]	2736.001 [pixel] 6.417 [mm]	1823.999 [pixel] 4.278 [mm]	0.003	-0.008	0.008	-0.000	0.000
Optimized Values	3804.511 [pixel] 8.923 [mm]	2716.067 [pixel] 6.370 [mm]	1806.567 [pixel] 4.237 [mm]	-0.014	0.004	0.007	-0.002	-0.001

Uncertainties (Sigma)	8.061 [pixel] 0.019 [mm]	0.195 [pixel] 0.000 [mm]	0.054 [pixel] 0.000 [mm]	0.000	0.000	0.000	0.000	0.000
-----------------------	-----------------------------	-----------------------------	-----------------------------	-------	-------	-------	-------	-------



? 2D Keypoints Table



	Number of 2D Keypoints per Image	Number of Matched 2D Keypoints per Image
Median	61984	17560
Mn	27207	893
Max	79980	42236
Mean	59976	17954

? 3D Points from 2D Keypoint Matches



	Number of 3D Points Observed
In 2 Images	4334778
In 3 Images	1358401
In 4 Images	603574
In 5 Images	314151
In 6 Images	186238
In 7 Images	122014
In 8 Images	82709
In 9 Images	55705
In 10 Images	39664
In 11 Images	28309
In 12 Images	20918
In 13 Images	14886
In 14 Images	10809
In 15 Images	7723
In 16 Images	5537
In 17 Images	4167
In 18 Images	3048
In 19 Images	2118

In 20 Images	1491
In 21 Images	1086
In 22 Images	892
In 23 Images	556
In 24 Images	404
In 25 Images	176
In 26 Images	123
In 27 Images	99
In 28 Images	77
In 29 Images	54
In 30 Images	56
In 31 Images	34
In 32 Images	24
In 33 Images	18
In 34 Images	12
In 35 Images	9
In 36 Images	4
In 37 Images	4
In 38 Images	3

? 2D Keypoint Matches

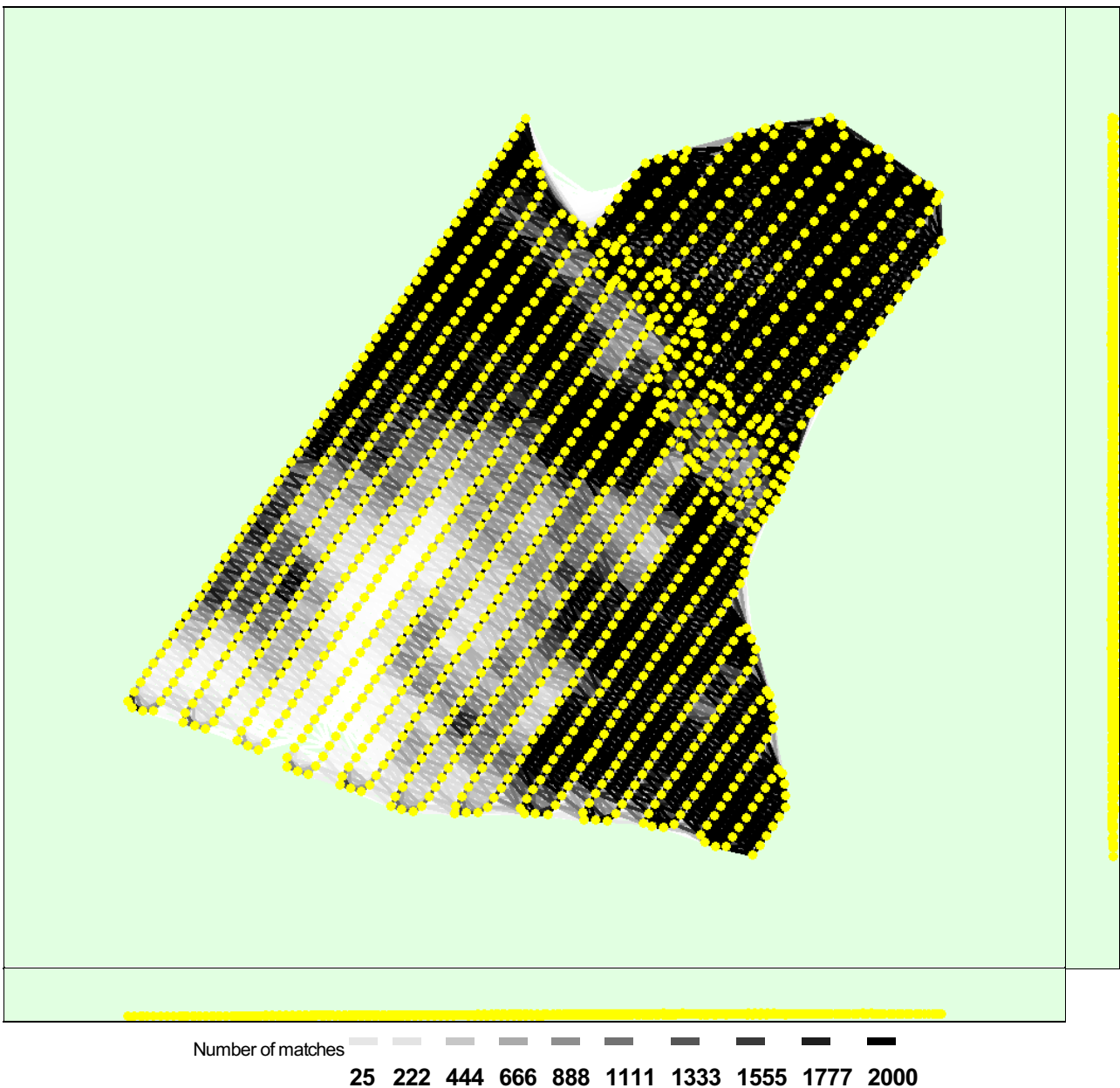


Figure 5: Computed image positions with links between matched images. The darkness of the links indicates the number of matched 2D keypoints between the images. Bright links indicate weak links and require manual tie points or more images.

Geolocation Details



? Absolute Geolocation Variance



Mn 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	6.05	0.00
-3.00	0.00	58.46	37.48	51.66
0.00	3.00	41.54	56.47	48.34
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]		-0.000000	-0.000000	0.000000
Sigma [m]		1.293792	1.546295	0.970660
RMS Error [m]		1.293792	1.546295	0.970660

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

? Relative Geolocation Variance



Relative Geolocation Error	Images X[%]	Images Y[%]	Images Z[%]
[-1.00, 1.00]	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.

Geolocation Orientational Variance	RMS [degree]
Omega	0.529
Phi	0.543
Kappa	11.163

Geolocation RMS error of the orientation angles given by the difference between the initial and computed image orientation angles.

Initial Processing Details



System Information



Hardware	CPU: Intel(R) Core(TM) i7-10700 CPU @ 2.90GHz RAM: 16GB GPU: NVIDIA Quadro P1000 (Driver: 27.21.14.5148), Intel(R) UHD Graphics 630 (Driver: 27.20.100.8190)
Operating System	Windows 10 Pro, 64-bit

Coordinate Systems



Image Coordinate System	WGS 84 (EGM96 Geoid)
Output Coordinate System	WGS 84 / UTM zone 33N (EGM96 Geoid)

Processing Options



Detected Template	CUDDIA CURVE OK*
Keypoints Image Scale	Full, Image Scale: 1
Advanced: Matching Image Pairs	Aerial Grid or Corridor
Advanced: Matching Strategy	Use Geometrically Verified Matching: no
Advanced: Keypoint Extraction	Targeted Number of Keypoints: Automatic
Advanced: Calibration	Calibration Method: Standard Internal Parameters Optimization: All External Parameters Optimization: All Rematch: Auto, no

Point Cloud Densification details



Processing Options



Image Scale	multiscale, 1/2 (Half image size, Default)
Point Density	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:02m:11s
Time for Point Cloud Classification	15m:39s
Time for 3D Textured Mesh Generation	23m:08s

Results



Number of Processed Clusters	53
Number of Generated Tiles	8
Number of 3D Densified Points	150096182
Average Density (per m ³)	115.26

DSM, Orthomosaic and Index Details



Processing Options



DSM and Orthomosaic Resolution	1 x GSD (3.04 [cm/pixel])
DSM Filters	Noise Filtering: yes Surface Smoothing: yes, Type: Sharp
Raster DSM	Generated: yes Method: Inverse Distance Weighting Merge Tiles: yes
Orthomosaic	Generated: yes Merge Tiles: yes GeoTIFF Without Transparency: no Google Maps Tiles and KML: yes
Grid DSM	Generated: yes, Spacing [cm]: 100

Raster DTM	Generated: yes Merge Tiles: yes
DTMResolution	5 x GSD (3.04 [cm/pixel])
Contour Lines Generation	Generated: yes Contour Base [m]: 0 Elevation Interval [m]: 0.5 Resolution [cm]: 300 Minimum Line Size [vertices]: 10
Time for DSM Generation	59m:02s
Time for Orthomosaic Generation	02h:20m:35s
Time for DTM Generation	01h:05m:47s
Time for Contour Lines Generation	13s
Time for Reflectance Map Generation	00s
Time for Index Map Generation	00s