

Sensefly Swinglet CAM - eBee & Menci APS software



UFLY system (Swinglet-CAM)

Il sistema è composto da:

- ***Sensefly Swinglet UAV** 16 Mpx camera, completamente autonomo,
- ***Sensefly E-mo-tion 2** software di pianificazione, gestione e georeferenziazione immagini
- ***Menci APS software** software di processamento per la generazione di DSM, Pointcloud, Mesh, DTM, OrthoPhoto

swinglet CAM

The easy-to-use flying camera

Ampiezza alare: 80 cm

Peso : 500 gr

Autonomia: 30 min per batteria

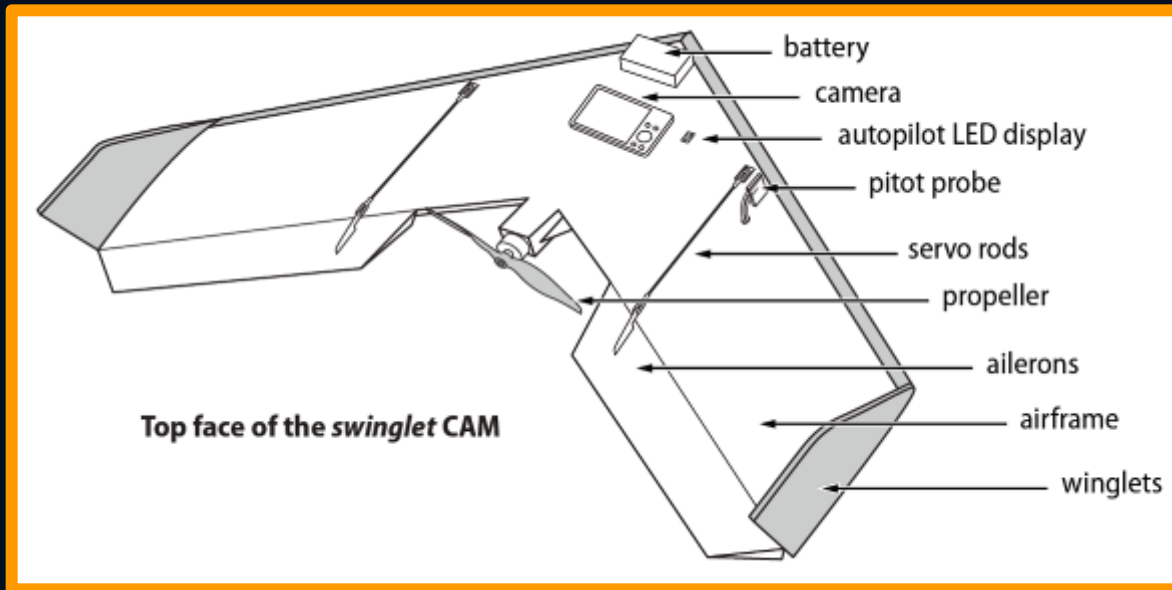
Portata radio: 1.3 Km

Atterraggio autonomo con raggio di 20 m

Velocità di crociera: 10 m/sec

Area potenzialmente coperta con una batteria: 1 km² (100 ha) a quota 350 m

Resistenza al vento: 7 m/sec (25 km/h)



swinglet CAM

The easy-to-use flying camera



Sofisticata elettronica :

Gli strumenti elettronici a bordo consistono di un Autopilota il quale è in grado di gestire autonomamente il velivolo, un GPS utilizzato per mantenere la traiettoria prefissata e un sensore IMU utilizzato per ricevere le informazioni riguardo agli angoli di assetto durante il volo.

Anche in caso di assenza del segnale radio il velivolo è progettato per portare a compimento la missione pianificata.

PITOT PROBE:

La sonda di Pitot è utilizzata per ricevere informazioni relative alla velocità del vento.



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Macchina Fotografica:

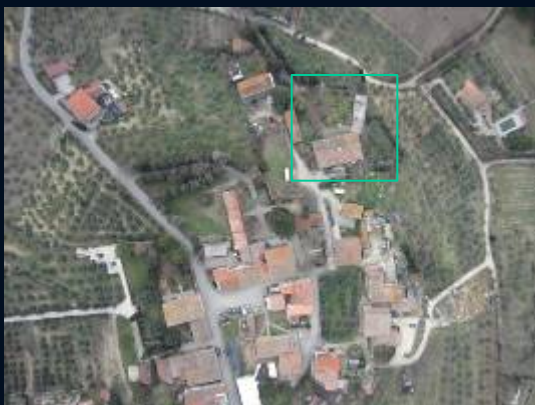
Canon IXUS 125 HS

Risoluzione: 16 Mpixel

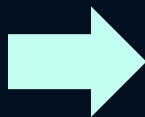
Lunghezza focale: 4.4 mm



Il certificato della macchina viene
Estratto presso I laboratori della
Menci Software



Scatto a 250 m



Dettaglio in 1:1

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The easy-to-use flying camera

CAMERA Nir:

Canon PowerShot ELPH 110HS

Risoluzione: 16 mpixel

Lunghezza focale: 4.4 mm

Il certificato della macchina viene
Estratto presso I laboratori della
Menci Software

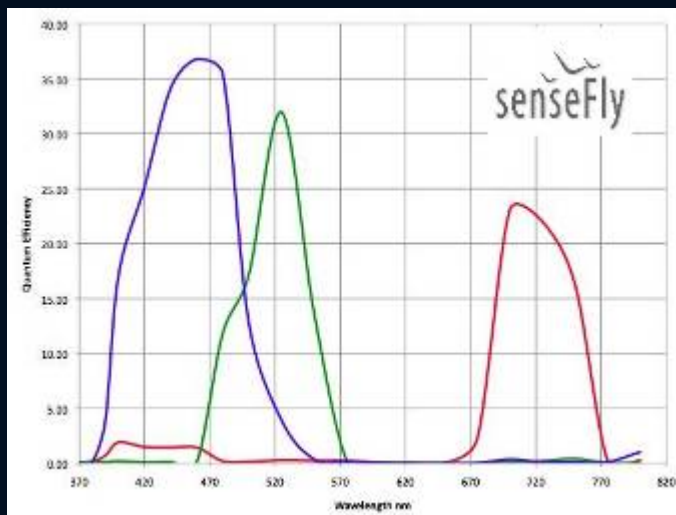


image processing tech

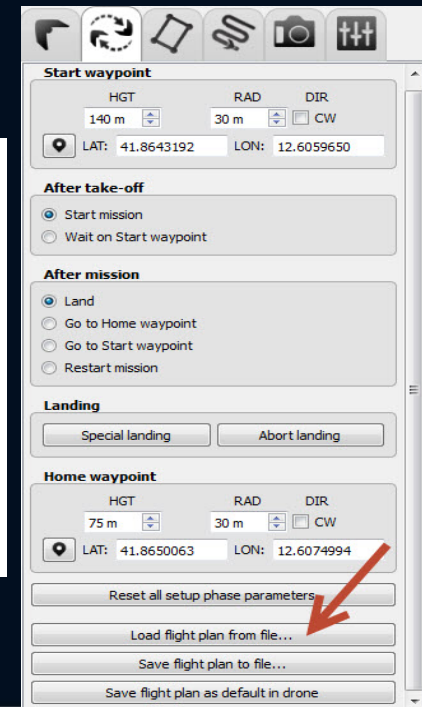
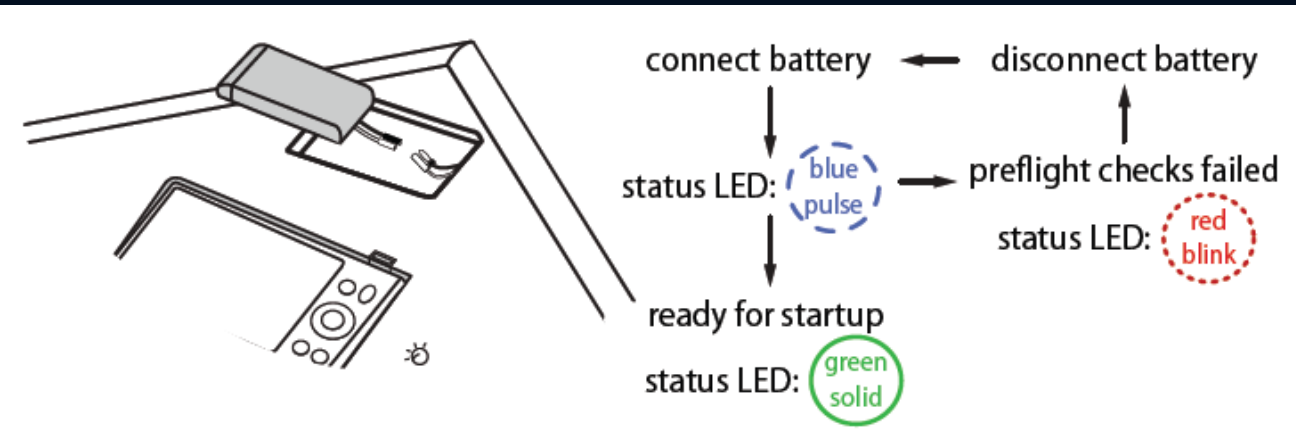


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Flight execution

WORKFLOW DI VOLO:

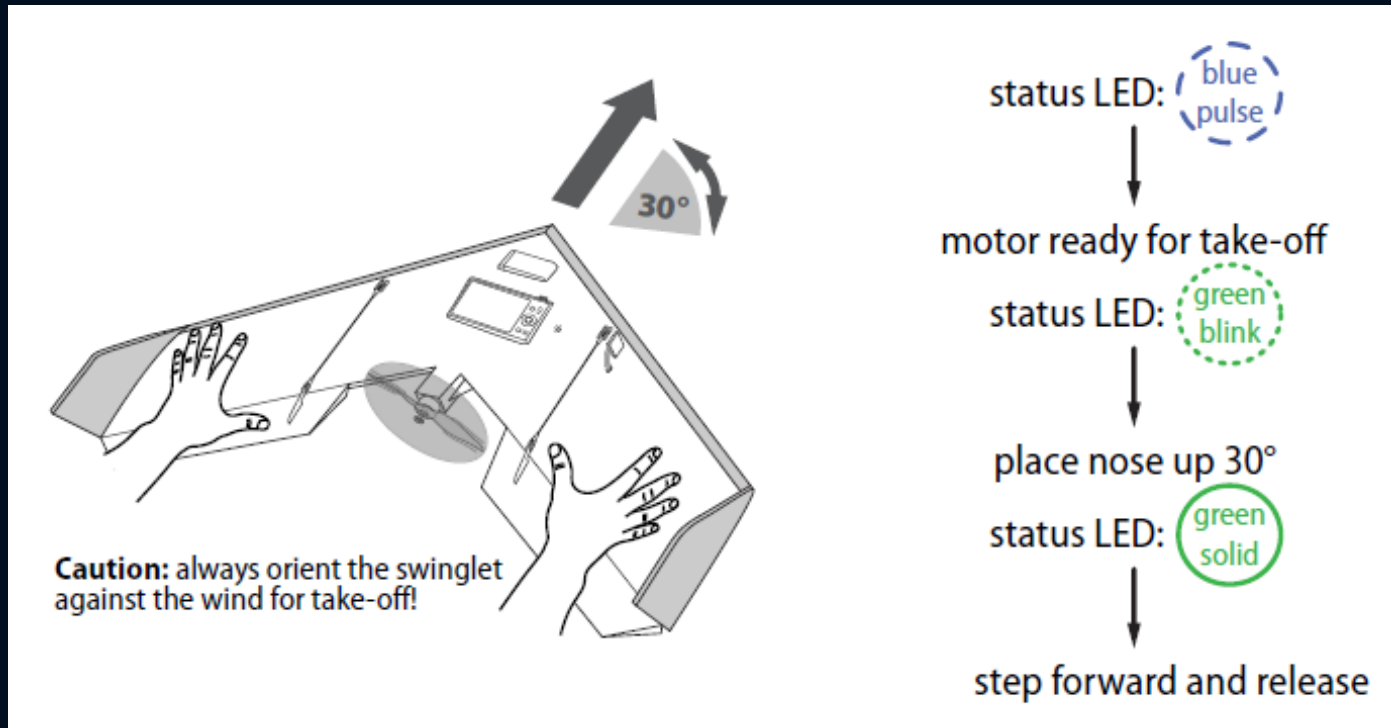
- 1) Connettere la macchina fotografica
- 2) Connettere la batteria
- 3) Attendere il termine della procedura di controllo (green led)
- 4) Caricare il piano di volo precedentemente impostato



Flight execution

WORKFLOW DI VOLO:

- 5) Scuotere tre volte il velivolo avanti ed indietro per l'accensione del motore
- 6) Eseguire il decollo inclinando lo strumento a 30° esclusivamente controvento



WORKFLOW DI VOLO:

- 7) Durante il volo è possibile controllare l'attuale traiettoria del drone, in caso di forte vento (>7 m/s) il Drone tornerà alla Home automaticamente .
- 8) Durante la procedura di atterraggio il dispositivo necessita di un'area libera da ostacoli per almeno 40 metri (un raggio specifico di 20 metri è richiesto). Lo Swinglet planerà dolcemente al suolo seguendo una traiettoria circolare.
- 9) Dopo l'atterraggio è sempre buona norma controllare la qualità delle immagini per evitare ed essere sicuri che non ci sia troppo effetto mosso.
- 10) Una volta controllate le immagini è possibile procedere con la fase di Georeferenziazione per assegnare ad ognuna di esse le coordinate geografiche.



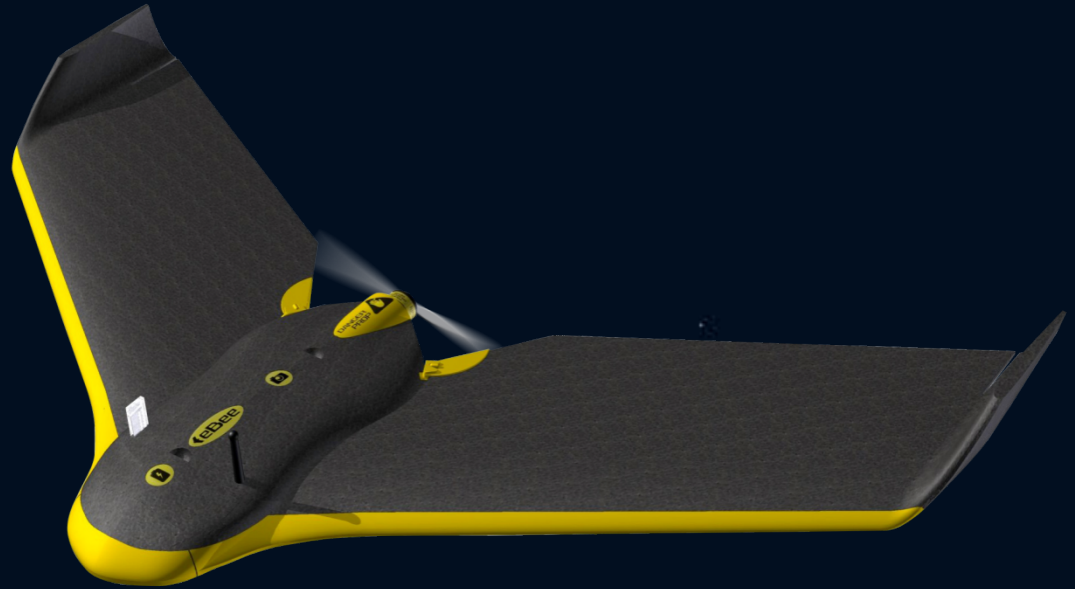
image processing tech



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Autonomous flying sensors



eBee – Overview

image processing tech



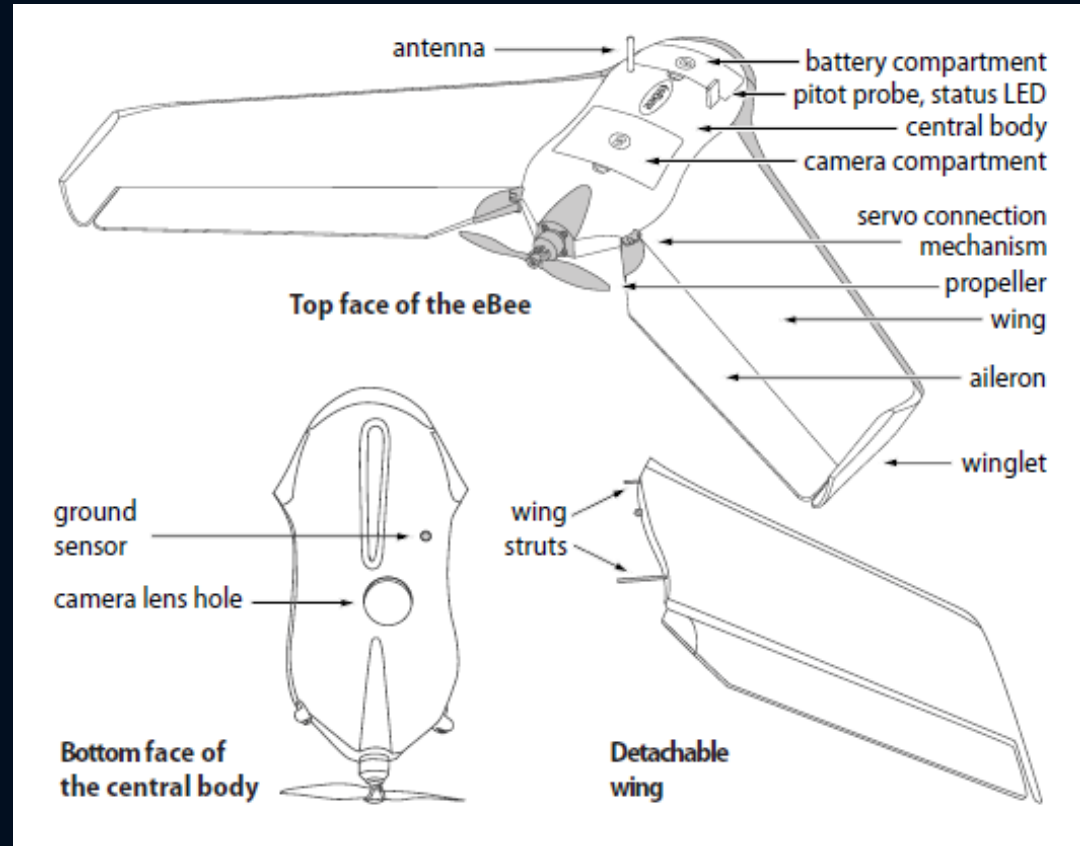
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- - Caratteristiche principali
- - Componentistica
- - Assemblaggio
- - eMotion 2



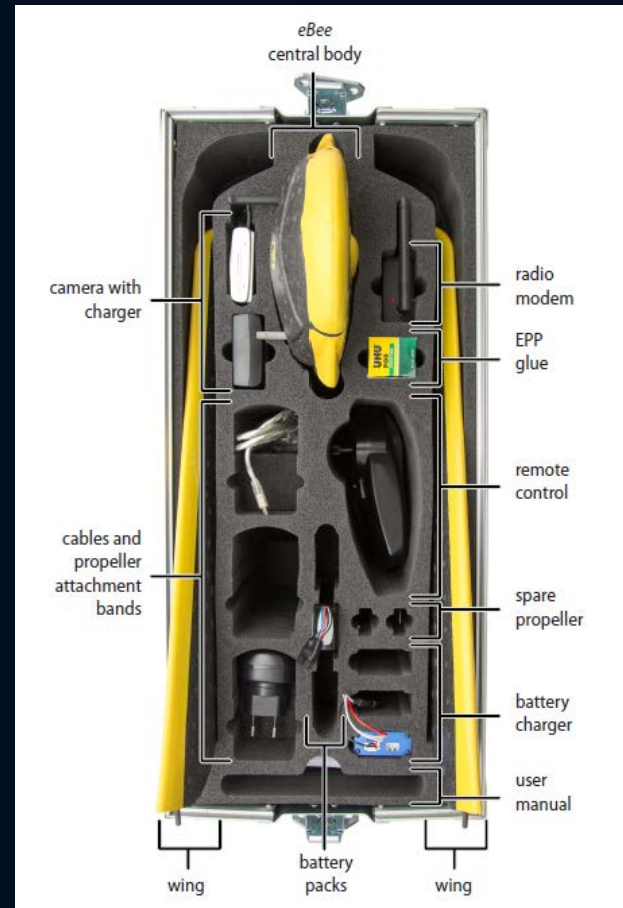
eBee – Caratteristiche principali

- 630g peso al decollo
- 96cm ampiezza alare
- 45 minuti di volo
- Resistenza al vento fino a 45km/h
- 36 – 57km/h velocità di crociera
- 16MP camera (RGB or NIR)
- Portata radio fino a 3km
- Area coperta 1-10km²
- Ground sensor
- Decollo a mano
- Ali staccabili
- On board data logging
- Trasportabile in una comoda valigetta (IATA)



Componentistica

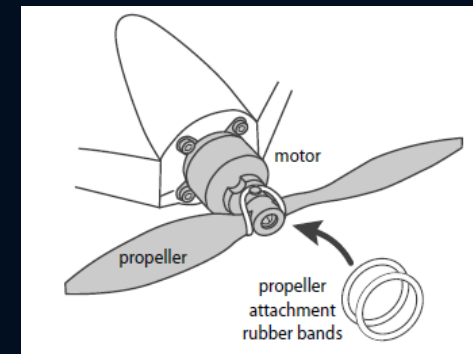
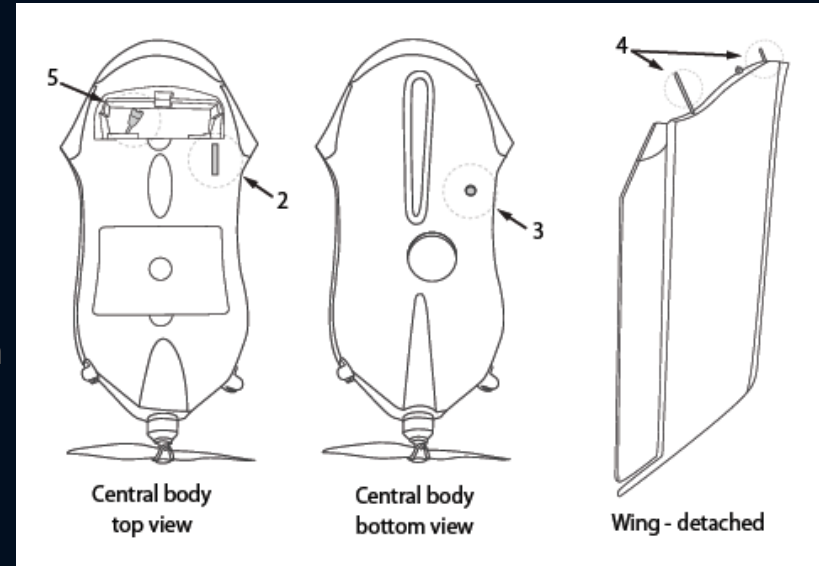
- 1x carrying case with foam protection
- 1x eBee central body with built-in autopilot
- 1x pair of detachable wings
- 1x spare propeller
- 10x spare propeller attachment rubber bands
- 2x Lithium-Polymer battery packs
- 1x Lithium-Polymer battery charger (including cables)
- 1x 2.4 GHz USB radio modem for data link (including USB cable)
- 1x remote control (including battery pack, charger and cables)
- 1x still camera (including memory card, battery and charger)
- 1x USB cable for interfacing with camera and on-board autopilot
- 1x EPP glue
- 1x eBee user manual



Assemblaggio

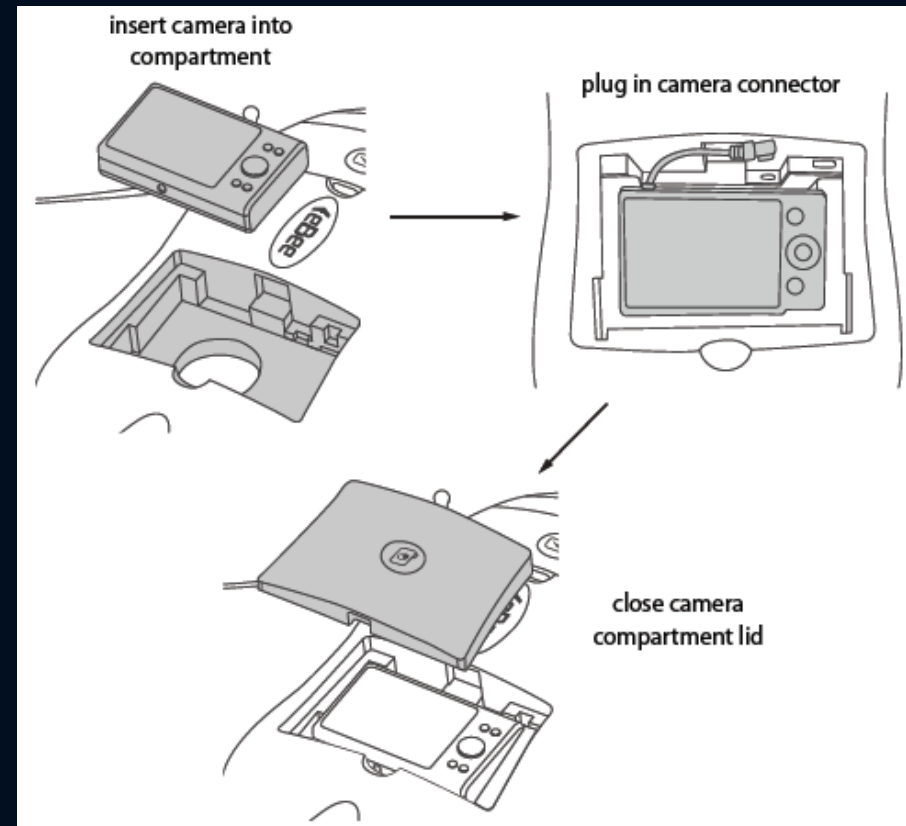
Procedura standard per il controllo dei vari elementi che compongono il Drone.

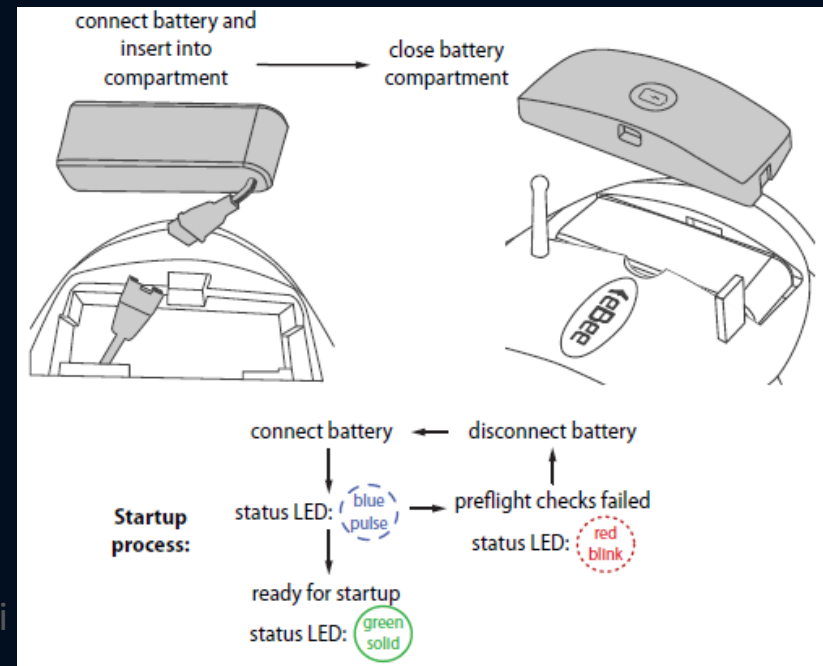
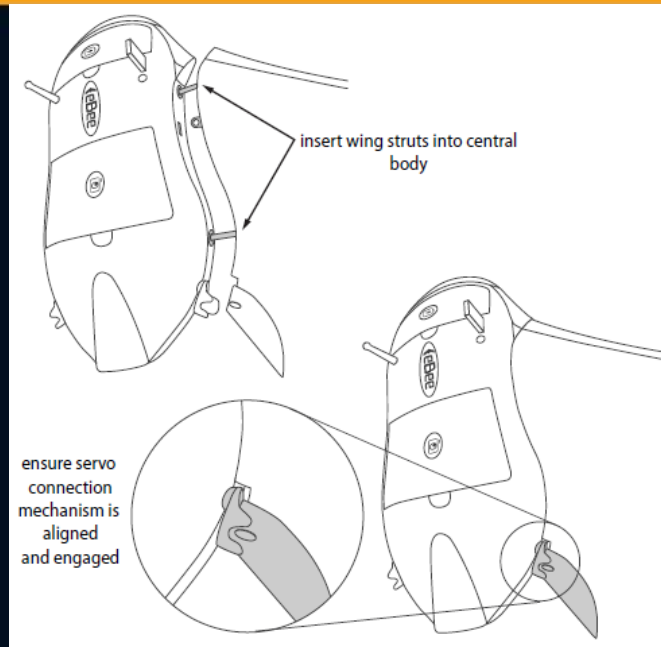
- 1 – Controllare l'integrità delle ali
- 2 – Verificare che la sonda di Pitot sia correttamente agganciata e non ostruita
- 3 - Verificare che il Ground Sensor sia libero da ostruzioni
- 5 – Controllare che i cavi della batteria siano ben isolati
- 6 – Montare l'elica



Assemblaggio

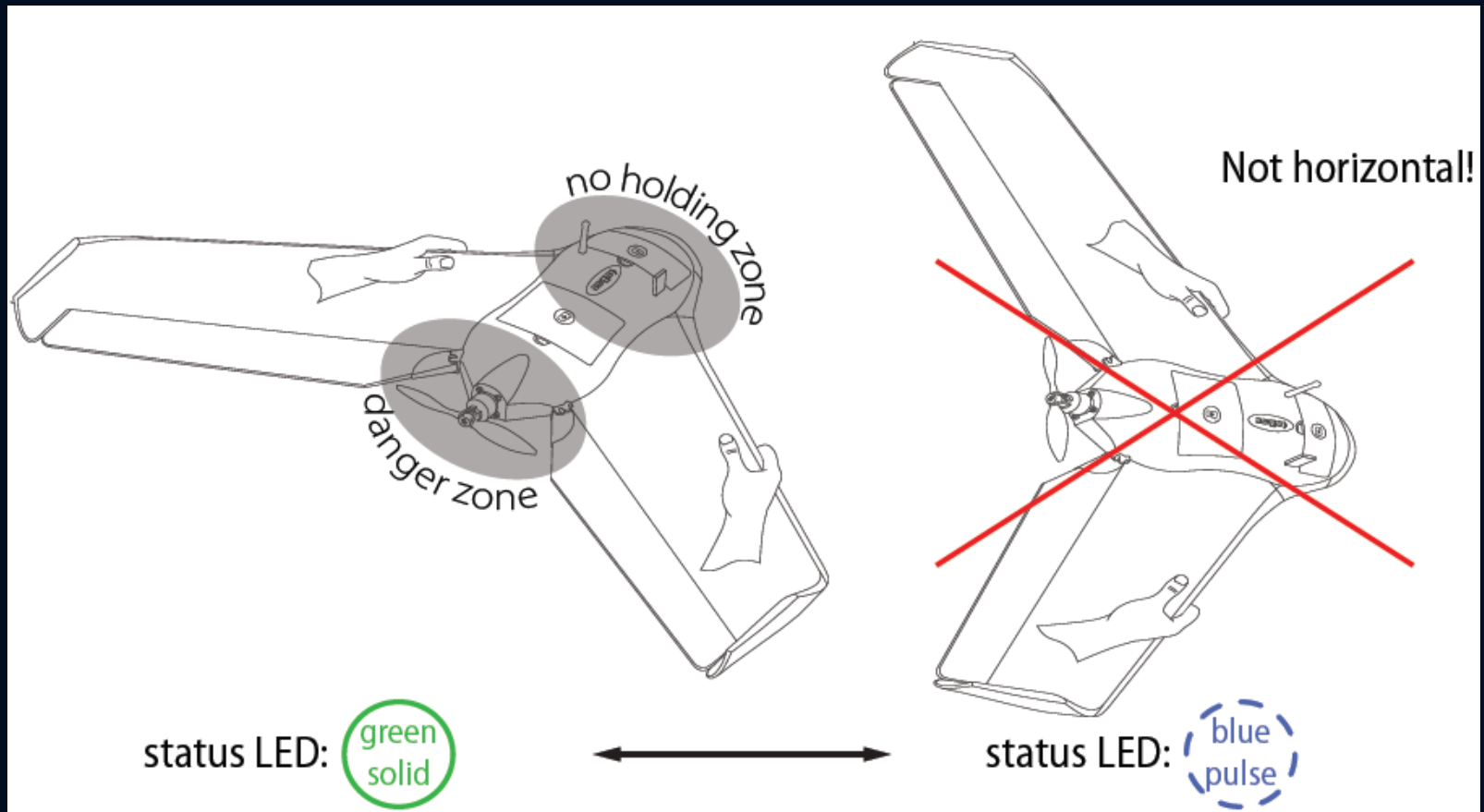
- 7 – Controllare che la macchina fotografica abbia la memoria vuota
- 8 – Controllare che la macchina fotografica ha a disposizione energia sufficiente
- 9 – Connettere la macchina fotografica attraverso la porta USB
- **Importante: eBee deve sempre volare con la macchina fotografica a bordo, volare senza di essa può causare la perdita dell'apparecchio.**



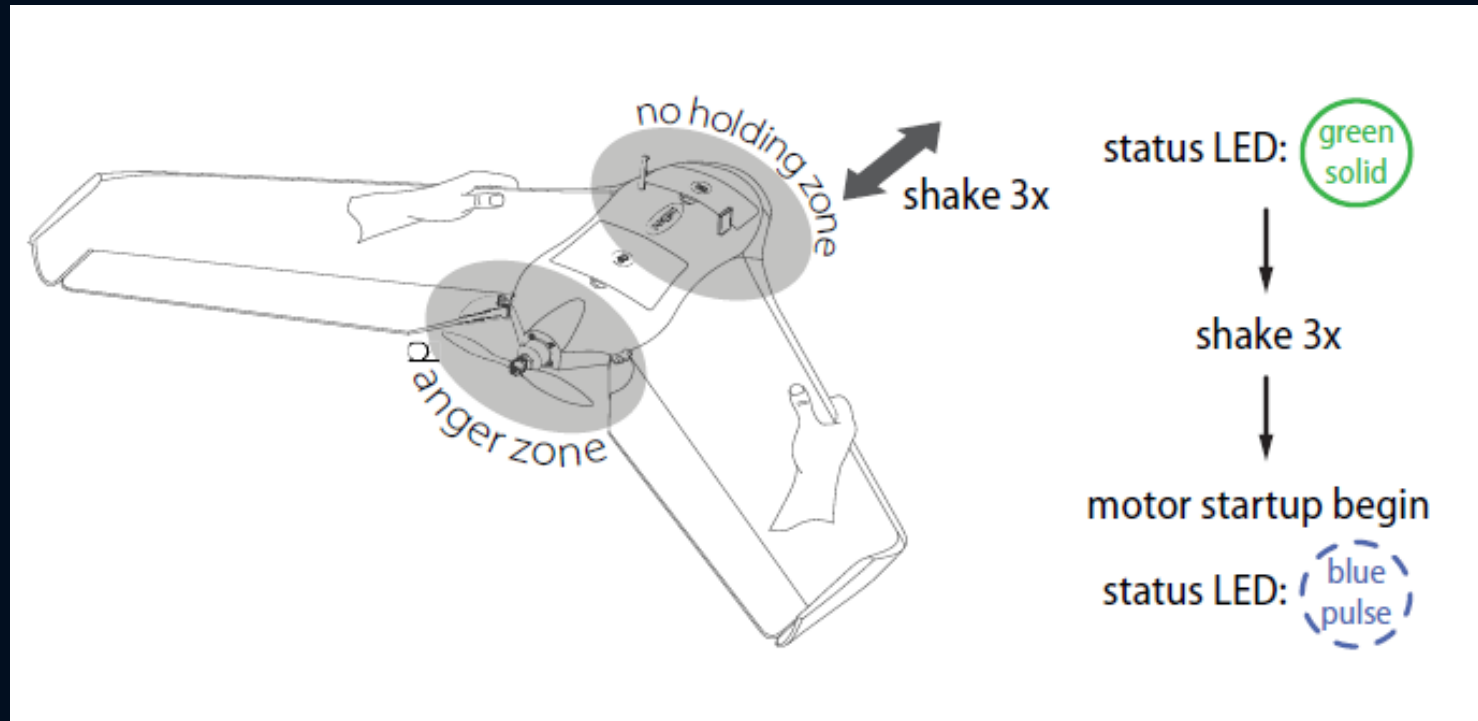


- 11 – Connettere le ali
- 12 – connettere la batteria posizionando lo strumento orizzontalmente.
- La sonda di Pitot s'illuminerà a seconda dello stato in cui si trova lo strumento

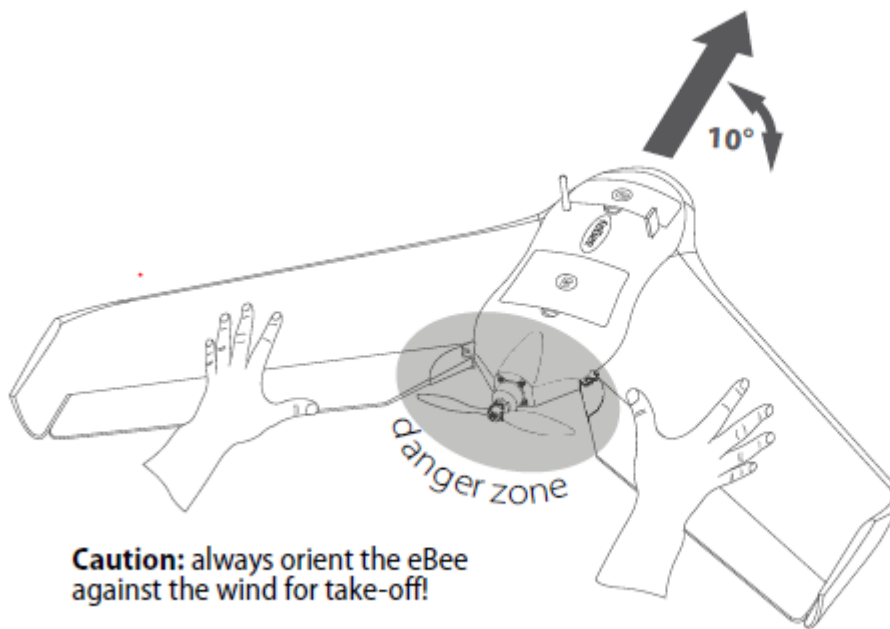
Tecnica di Lancio



Tecnica di Lancio



Tecnica di Lancio



status LED: 

motor ready for take-off

status LED: 

place nose up 10°

status LED: 

step forward and release

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Softwares



eMotion 2 è il software che permette di interagire con i Droni di casa Sensefly, è facile da utilizzare e con pochi passaggi permette di pianificare un volo direttamente dalla comodità del tuo ufficio.



APS è la soluzione giusta alla creazione di dati cartografici: la procedura di areotriangolazione è completamente automatica dopodiché seguendo un semplice ed intuitivo workflow è possibile ottenere una serie di dati cartografici di alta attendibilità.

eMotion 2

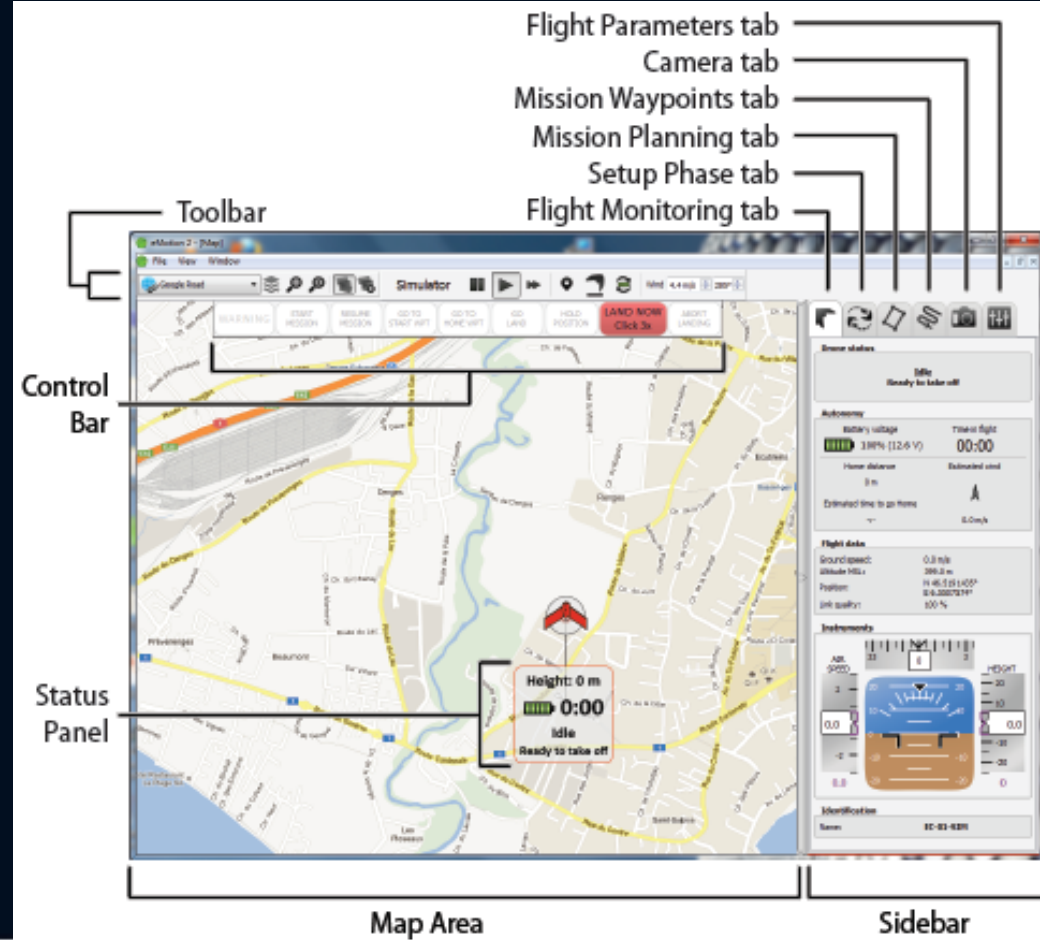
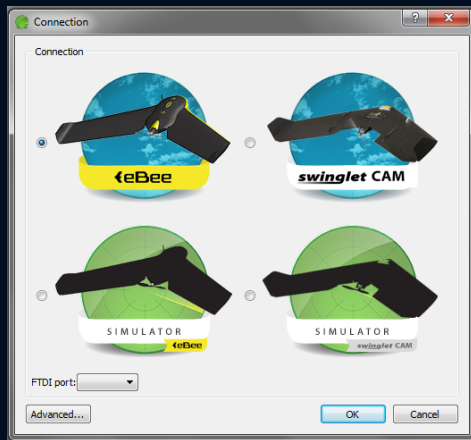


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eMotion 2 – Key Points



- eBee gestisce fino a 30 waypoints
- L'altezza è sempre relativa al punto di decollo
- Puoi specificare home location e landing location in due luoghi diversi
- Se il progetto è troppo esteso eMotion 2 dividerà automaticamente l'area in una serie di voli
- Possibilità di simulare il volo

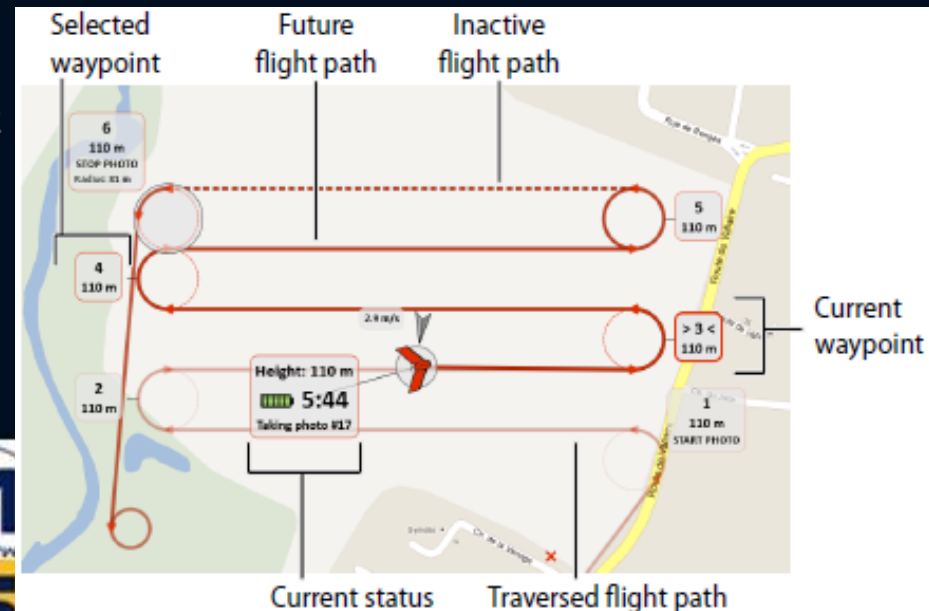
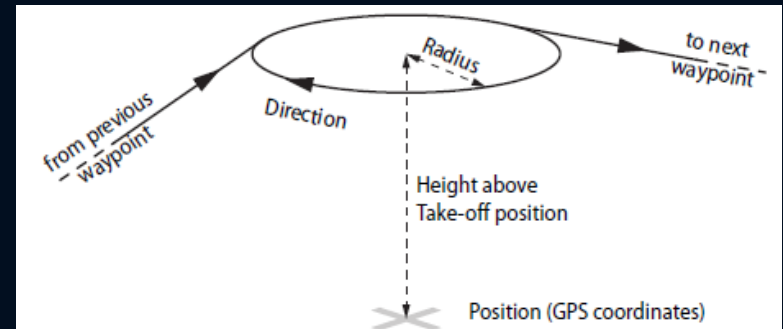


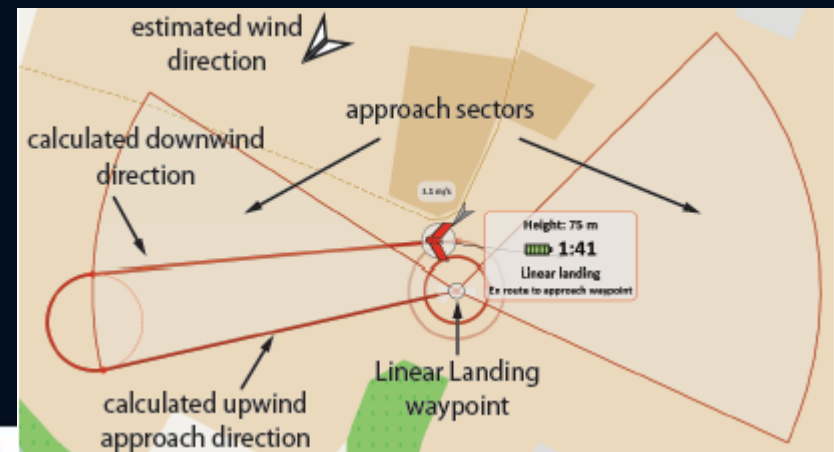
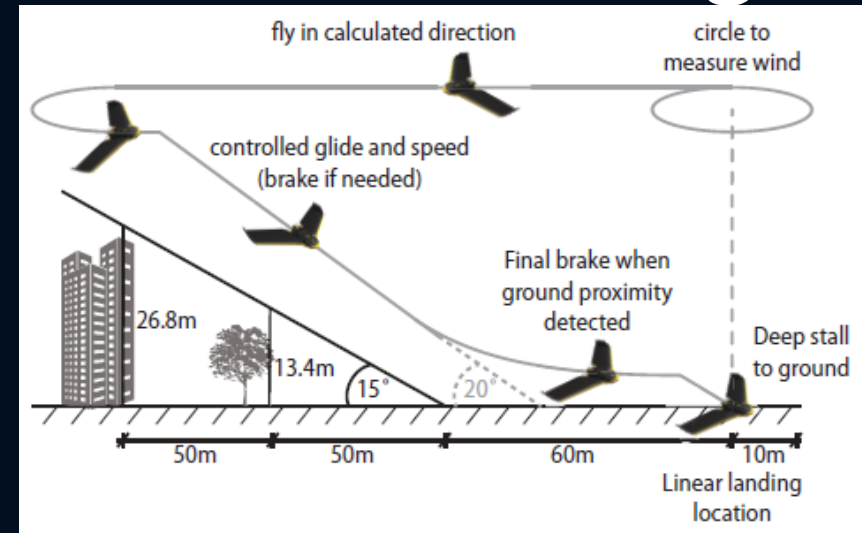
image processing tech



eMotion 2 – Key Points on Landing



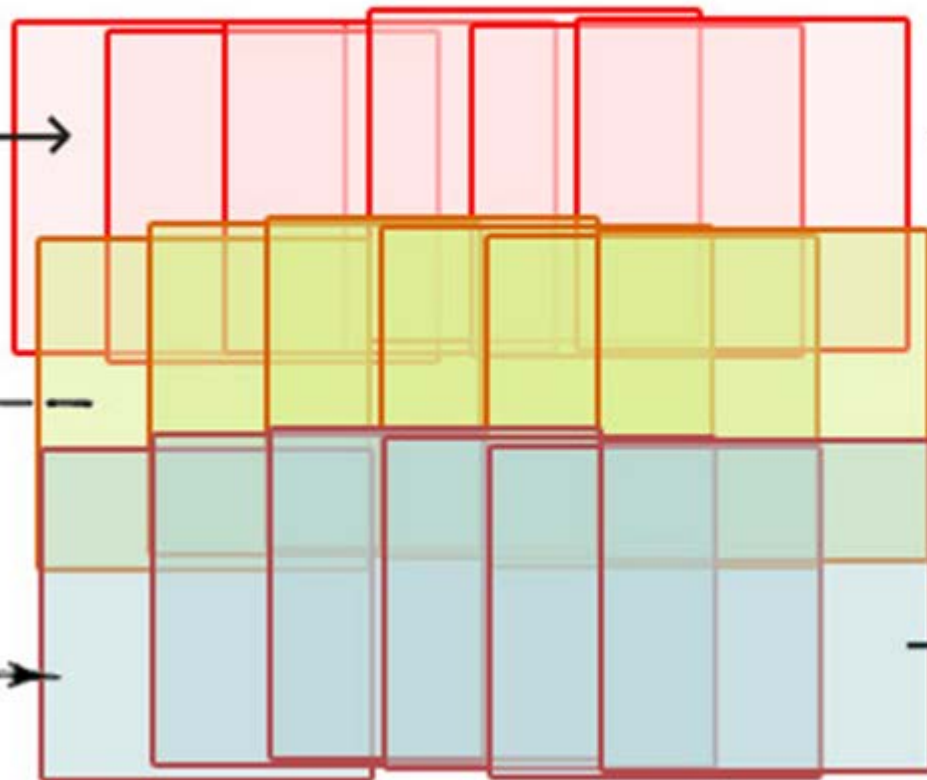
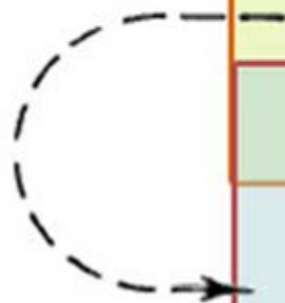
- Il metodo di atterraggio preferito è il circolare
- Si possono eseguire anche atterraggi rettilinei
- Eseguire un atterraggio di tipo lineare sempre controvento.
- Durante l'atterraggio circolare si consiglia un raggio di 20 metri libero da ostacoli, con vento fino a 40 metri
- Ambedue gli atterraggi utilizzano il ground sensor



Longitudinal Overlap (Images) 80%



Flight Line



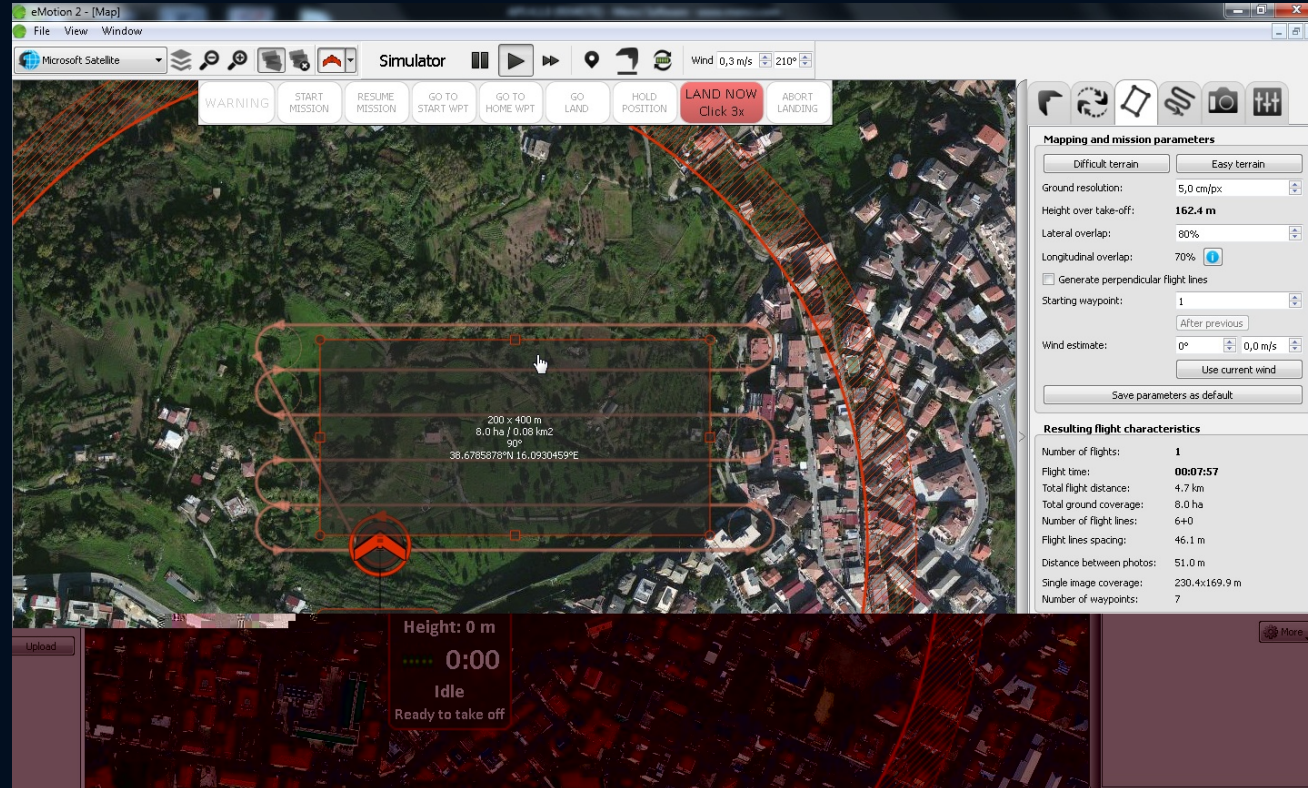
Transversal
Overlap
(Strips) 80%



Sensefly E-mo-tion 2: Flight planning

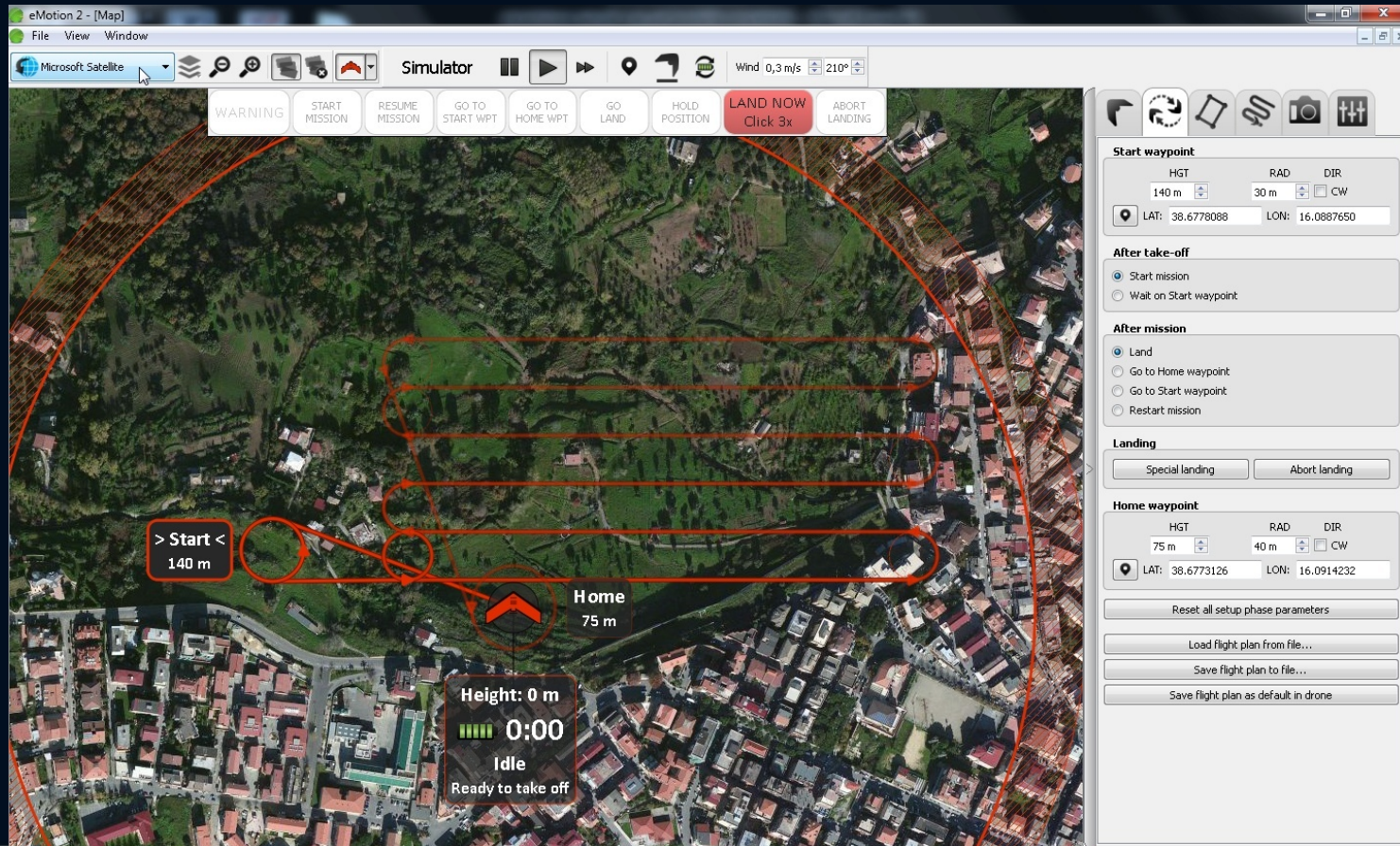
FLIGHT SIMULATION:

1) Attraverso uno specifico rettangolo o poligono è possibile definire l'area che si vuol investigare. In base alla sovrapposizione e all'altezza di volo questo verrà suddiviso in una serie di strisciate.



Sensefly E-motion 2: Flight planning

2) Caricato il piano di volo precedentemente salvato sarà necessario controllare la direzione del vento per posizionare lo Start e la Home relativamente alla fase dell'atterraggio.



Sensefly E-mo-tion 2: Flight planning

2) Una volta definito il piano di volo è possibile interagire con il drone ad ogni momento .

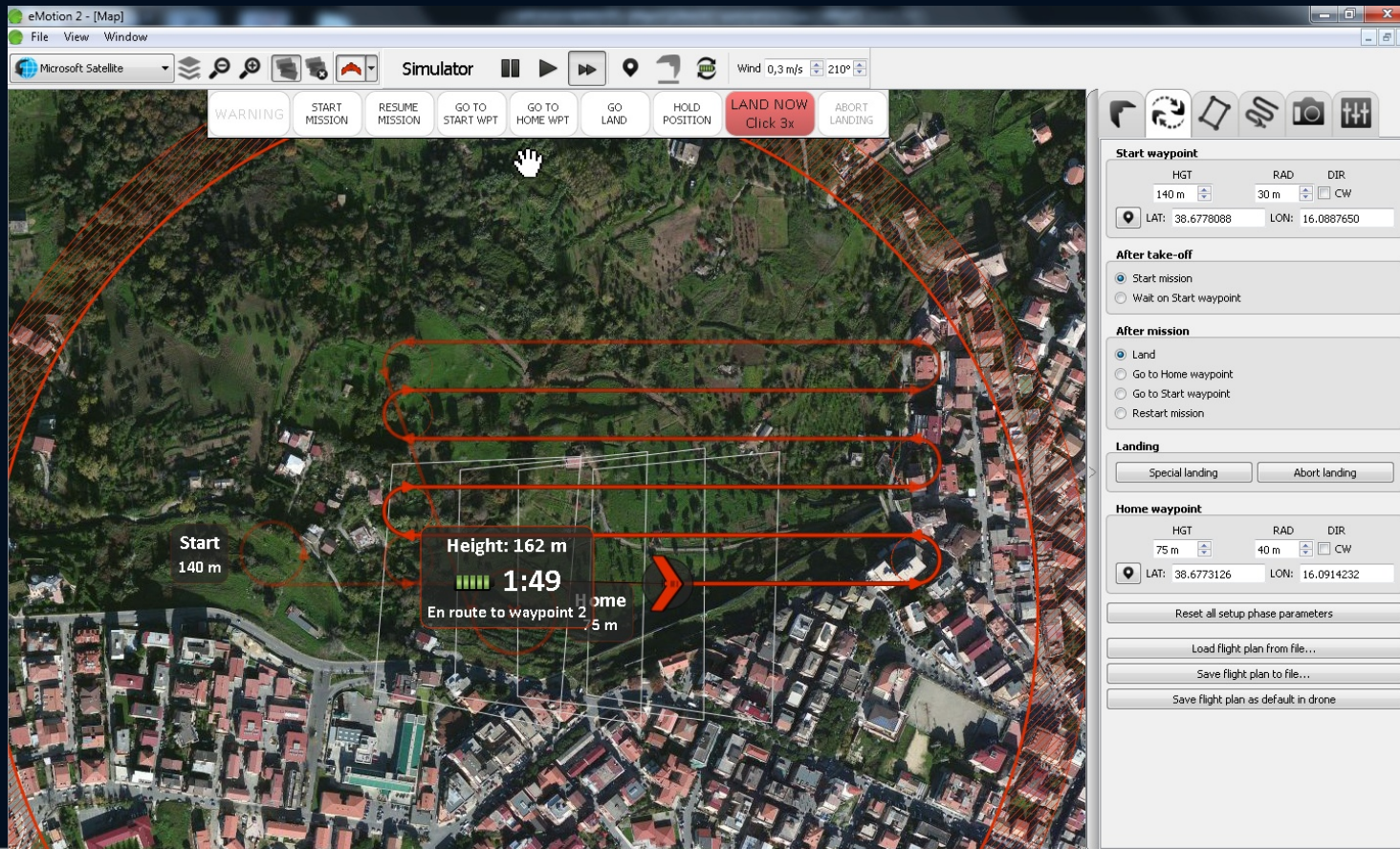


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Image properties

Images coordinate system

☒ Datum : World Geodetic System 1984; Coordinate system : WGS 84

Geolocation and orientation

☒ Geolocated images: 51 out of 51

Clear

From EXIF

From file...

Camera model

☒ Detected: CanonIXUS125HS_4.3_3456x4608

	Image	Latitude	Longitude	Altitude	Yaw	Pitch	
☒	IMG_0148.JPG	43.5074329000	11.8889223000	465.2989196777	51.8502502441	7.4698395729	4.645
☒	IMG_0149.JPG	43.5077098000	11.8896192000	467.2571716309	60.2287292480	7.6107134819	1.080
☒	IMG_0150.JPG	43.5080204000	11.8902849000	467.1683044434	51.2051582336	7.4675130844	-2.90
☒	IMG_0151.JPG	43.5083054000	11.8910002000	467.2004394531	64.7089767456	6.9301419258	-1.00
☒	IMG_0152.JPG	43.5086299000	11.8916760000	466.5433044434	49.0715789795	7.0108814240	0.736
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☒	IMG_0156.JPG	43.5100004000	11.8937899000	464.5637512207	250.6921386719	7.7905044556	-3.08

Next

Cancel

Help

Dalle Immagini all'informazione cartografica: APS



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Menci APS

APS è un prodotto della Menci Software il quale può essere utilizzato con qualunque sistema UAV per l'acquisizione di immagini **small format e medium format**.

È in grado di eseguire l'intero processo di Aereo Triangolazione in completa autonomia.

Eseguita la fase di Bundle Adjustment seguendo un semplice ed intuitivo workflow è possibile ottenere:

DSM, Point Cloud, Mesh, DTM, Contour Lines and OrthoPhoto.

Ogni immagine è accoppiata con dei file di orientamento esterno ed interno in modo da poter ottenere la visione Stereoscopica dell'intero blocco fotogrammetrico.

Menci APS

1/5 IMPORT

2/5 FIND FEATURES

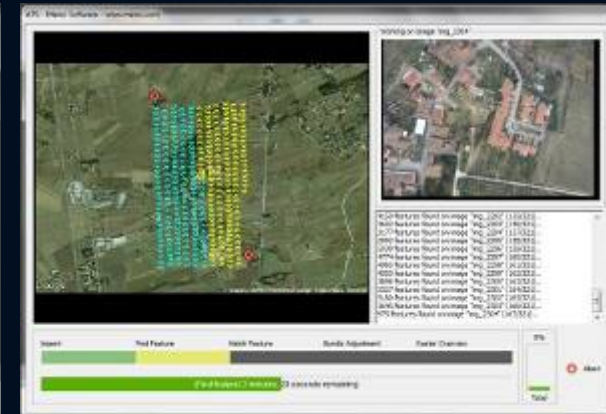
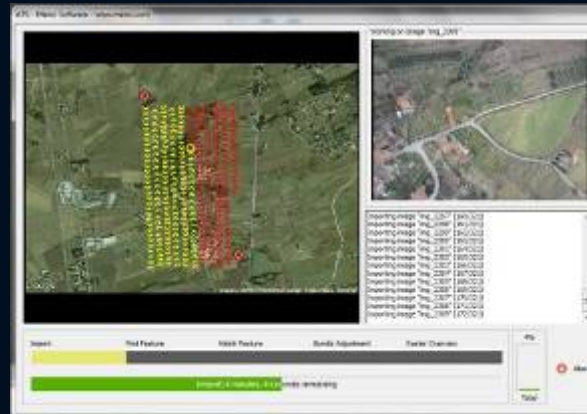
1/5 IMPORT

2/5 FIND FEATURES

3/5 MATCH FEATURES

4/5 BUNDLE ADJUSTMENT

5/5 RASTER GENERATION



3/5 MATCH FEATURES

4/5 BUNDLE ADJUSTMENT

5/5 RASTER GENERATION

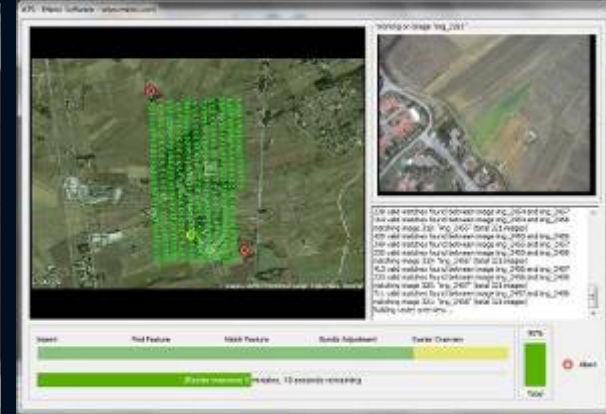
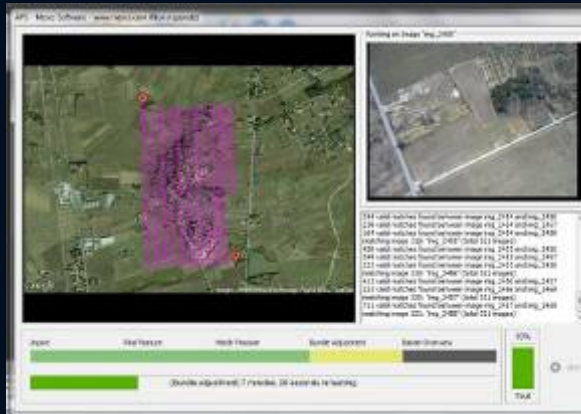
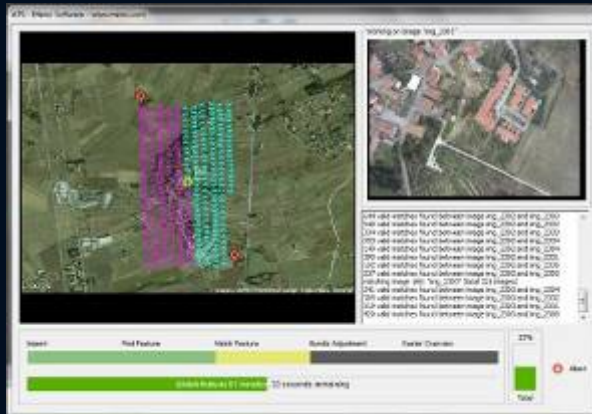
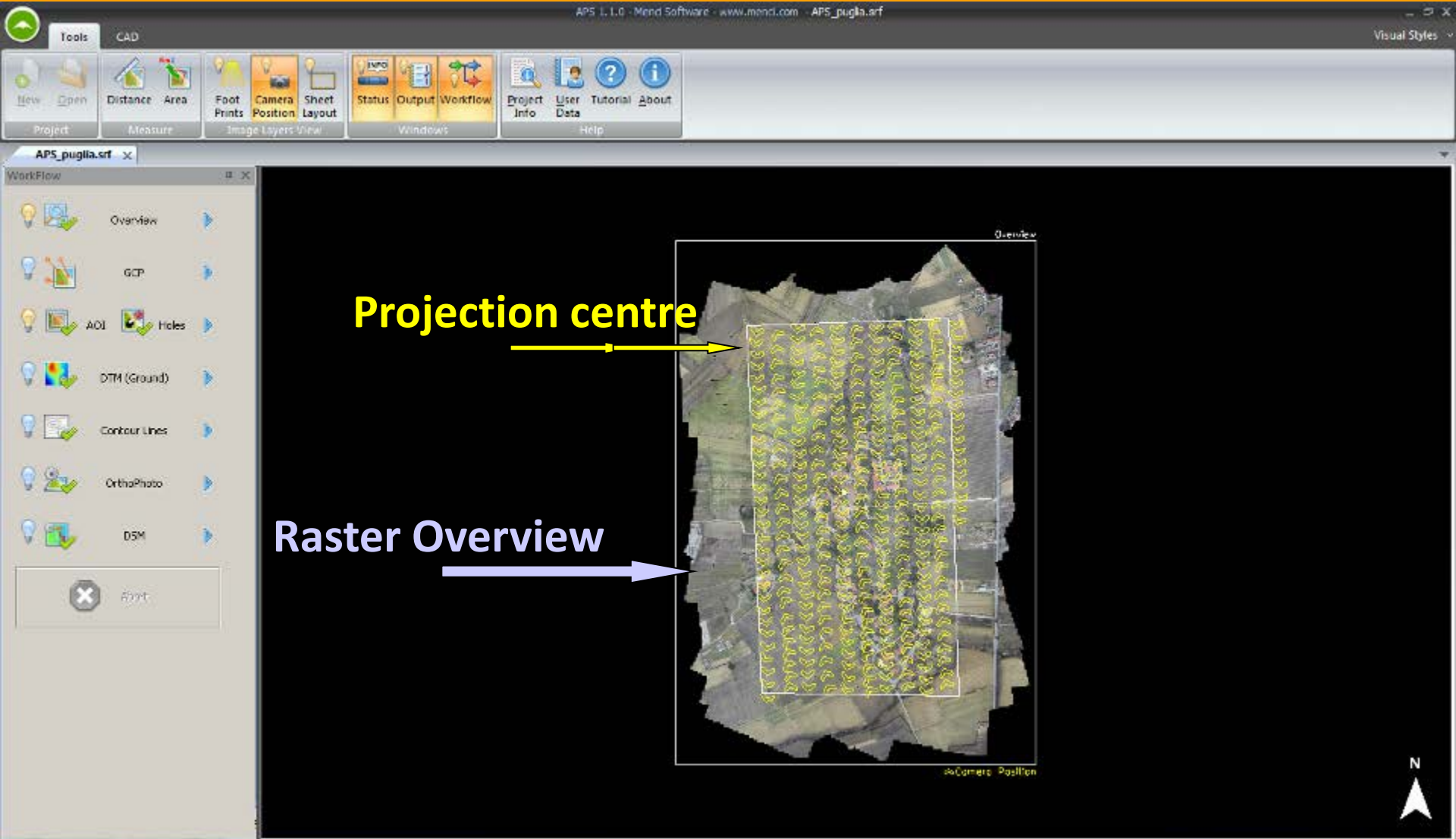


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GCP collimation

GCP Collimation

54 images

p1080272_



Point Management

Add Points Points Color

Collimations

Point ID	I...	res
☒ 1	14	0.000 0.000 0.000
☒ 1071	20	-0.011 -0.004 -0.018
☒ 1072	32	0.000 0.000 0.000
☒ 2	37	0.000 0.000 0.000
☒ 3	21	0.000 0.000 0.000

SHIFT + Click to add a collimation
CTRL+ Click to remove a collimation

Refine Collimation

Evaluate

Close

Menci APS

AREA OF
INTEREST

DSM

DEM

Contour lines

Orthophoto

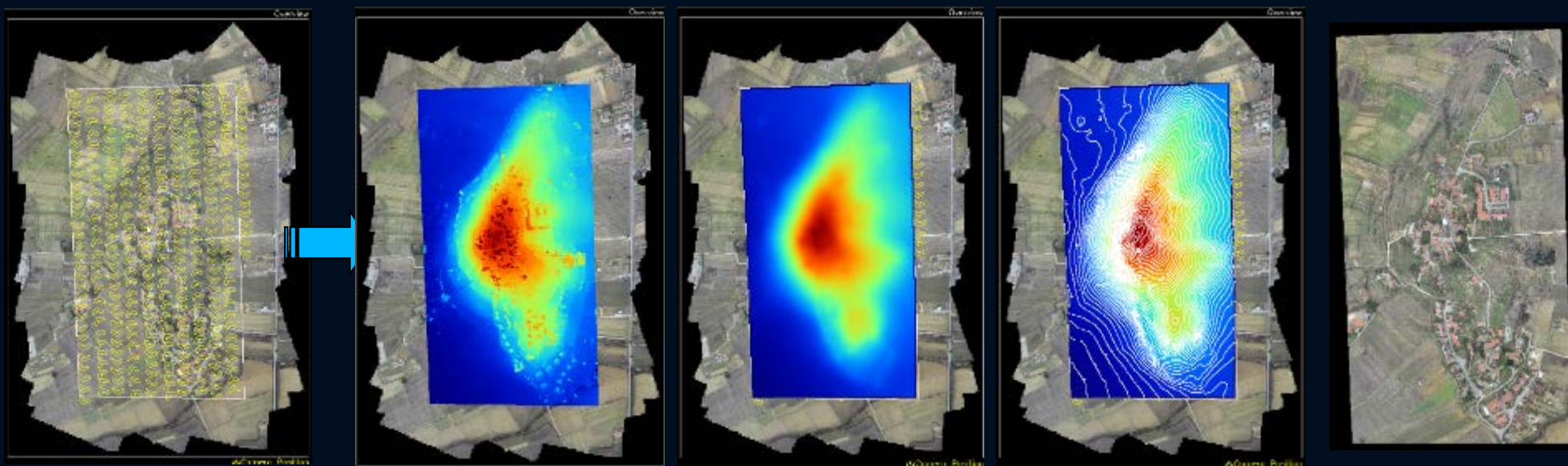


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Case History
by fixed wings UAV
**SWINGLET CAM – eBee
and APS Menci Software**

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Cartografia dettagliata e Caratterizzazione 3D per una frana

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Number of images: 1031

Average GSD m: 0.06 m

Total Area: 3.407 Km²

Orthophoto Area: 2.231 Km²

Camera Model: Canon IXUS 220HS

Flight Time: 7 hours, 41 minutes, 43 seconds

Absolute Flight Height: 1000 m

Relative Flight Height: 200 m

Average Ground Elevation: 800 m

Bundled Images: 1031

Average Bundle Residuals: 1.44 um

Bundle Time: 03:10:41

GCP imported: no

Orthophoto Average GSD: 0.06 m

DSM average GSD: 0.35 m

3D points number: 18.229.603

Total Process Time: 11:51:18

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Performed flight

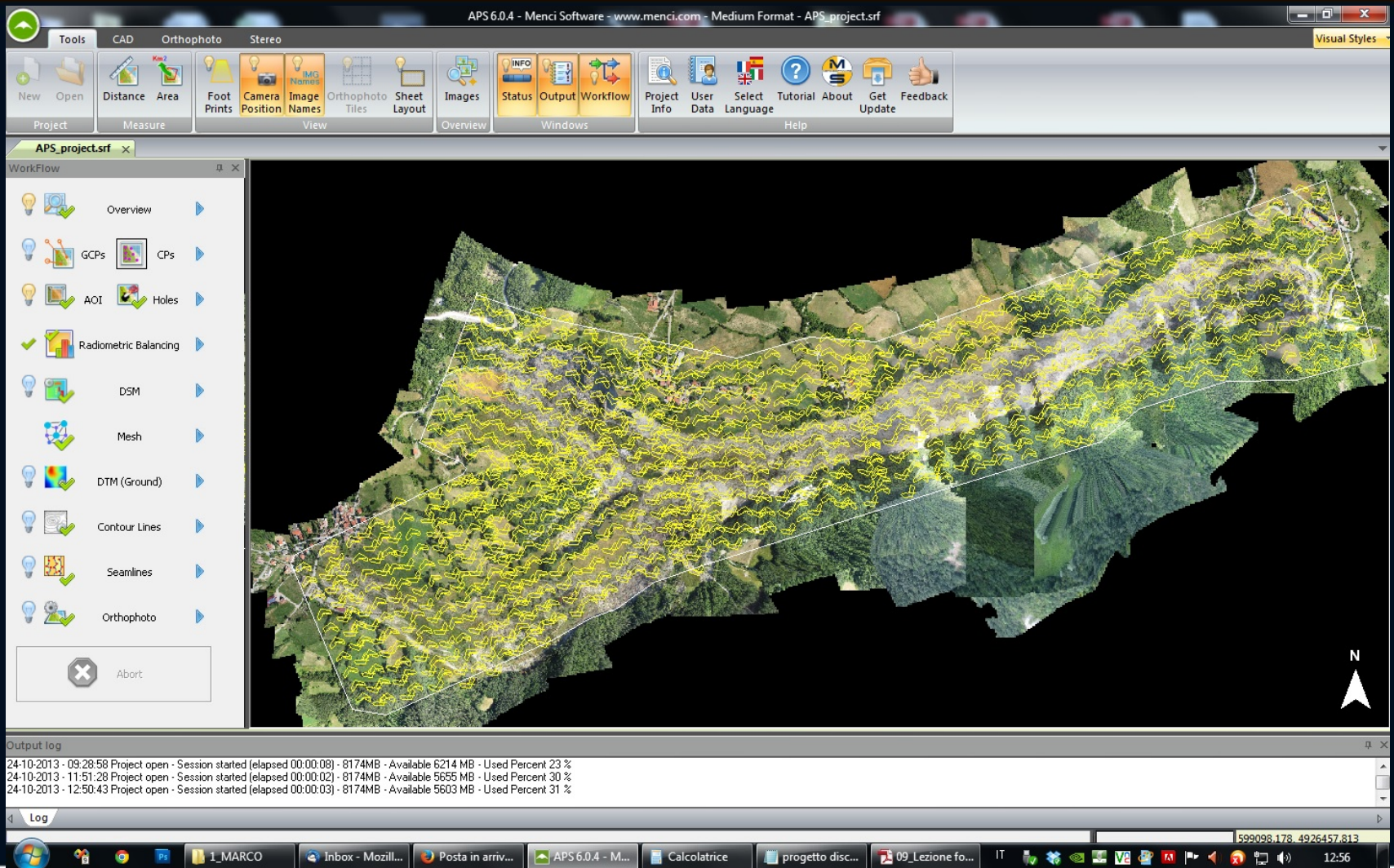


image processing tech



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Orthophoto

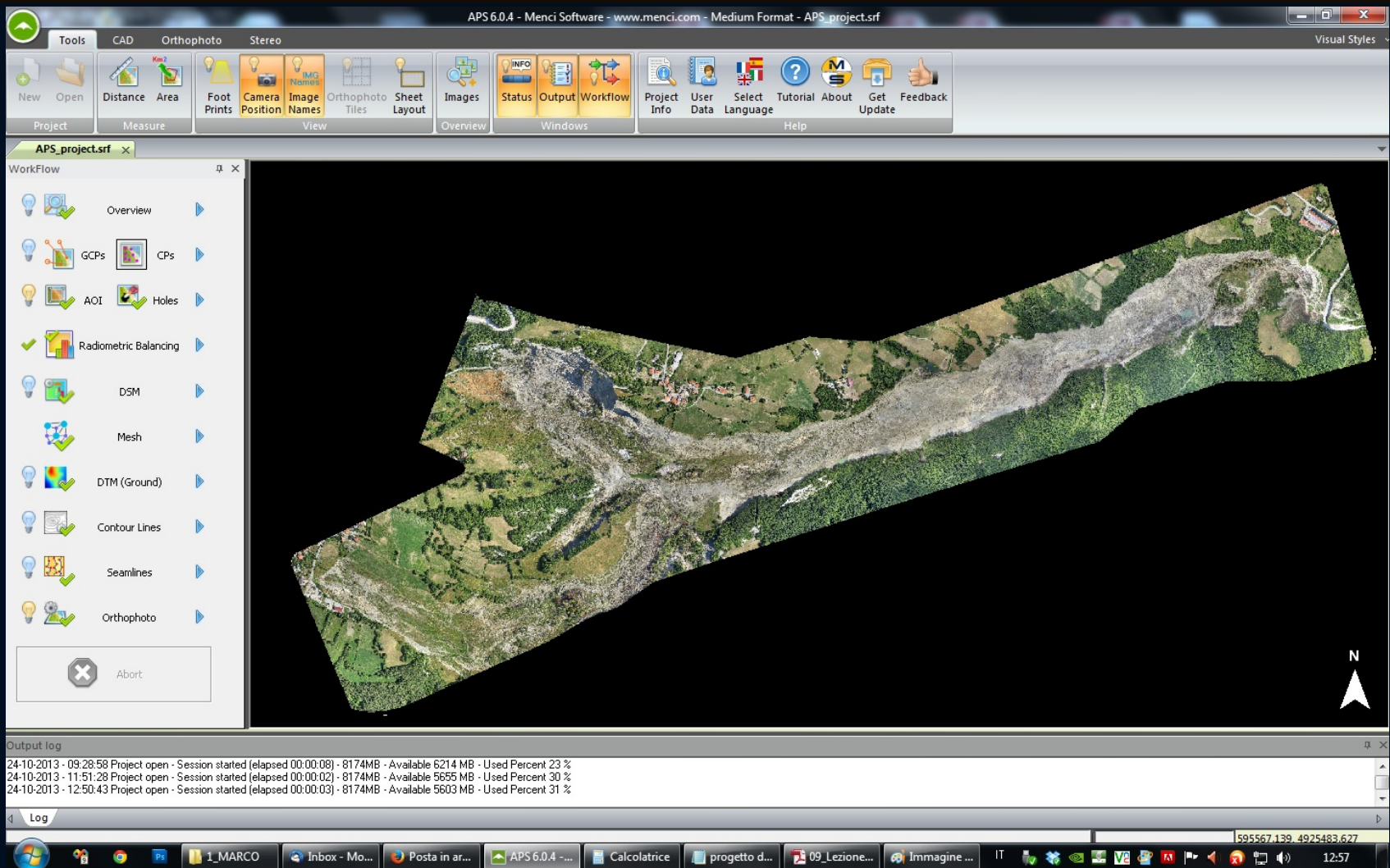


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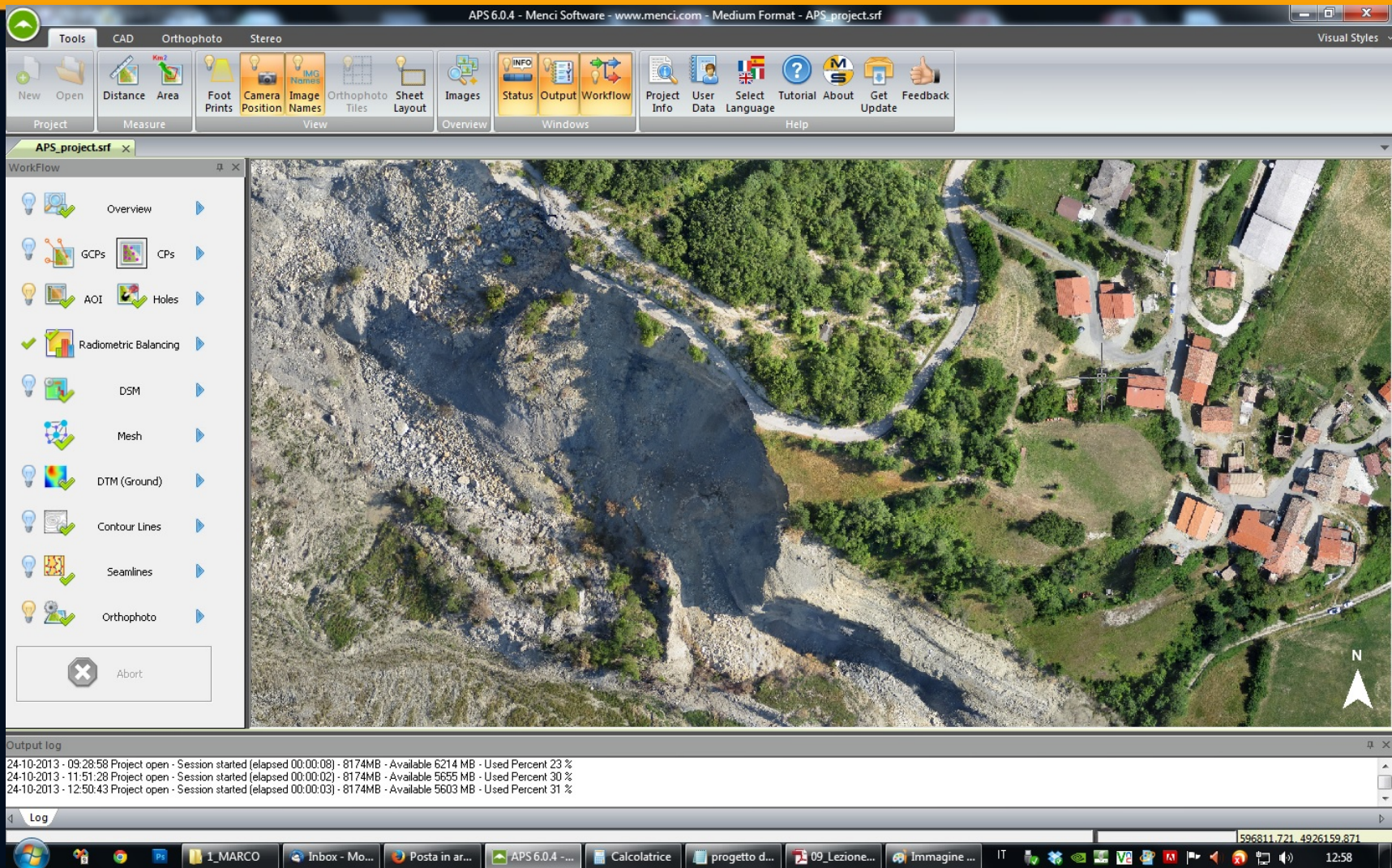


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Contour lines

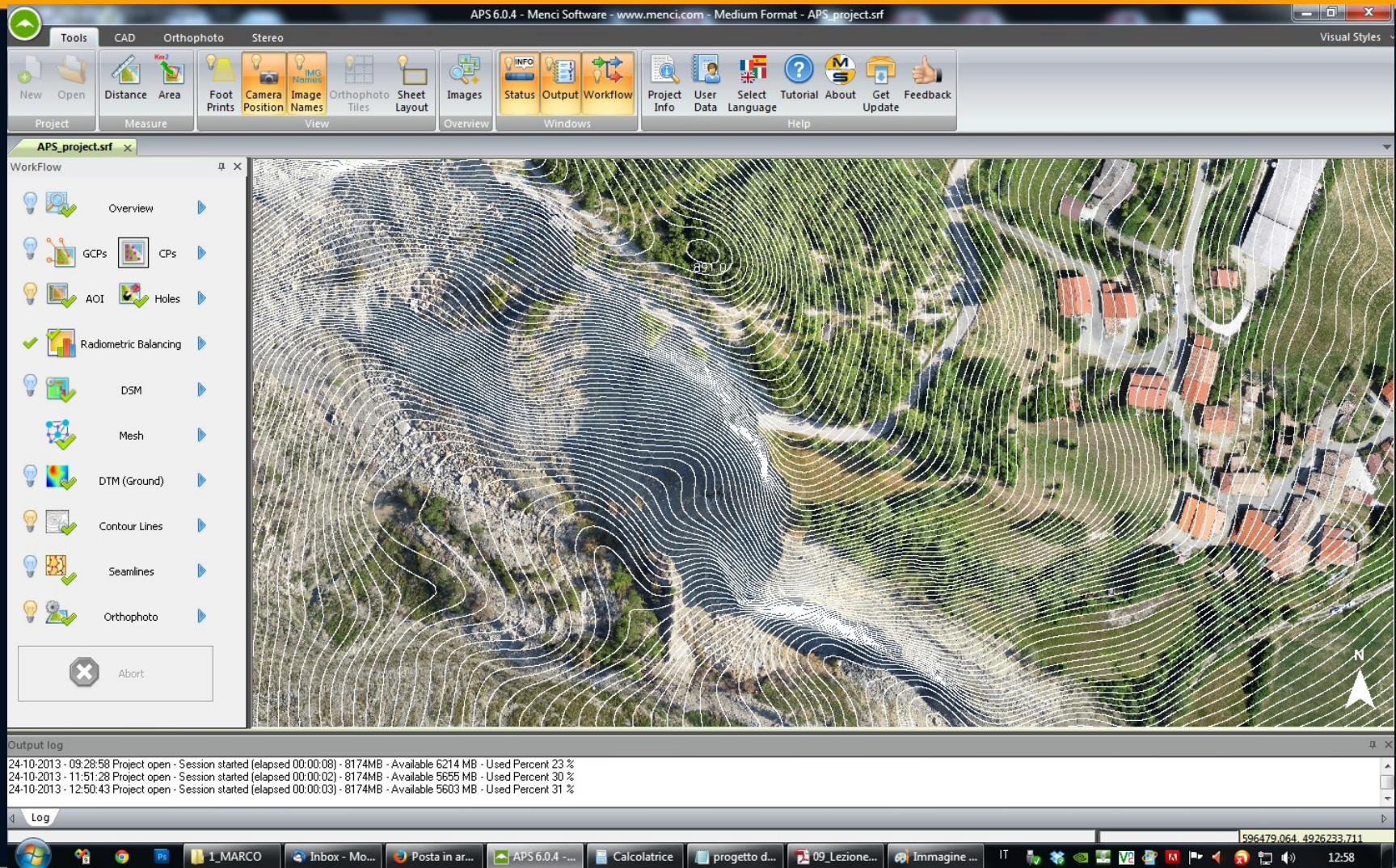


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DSM

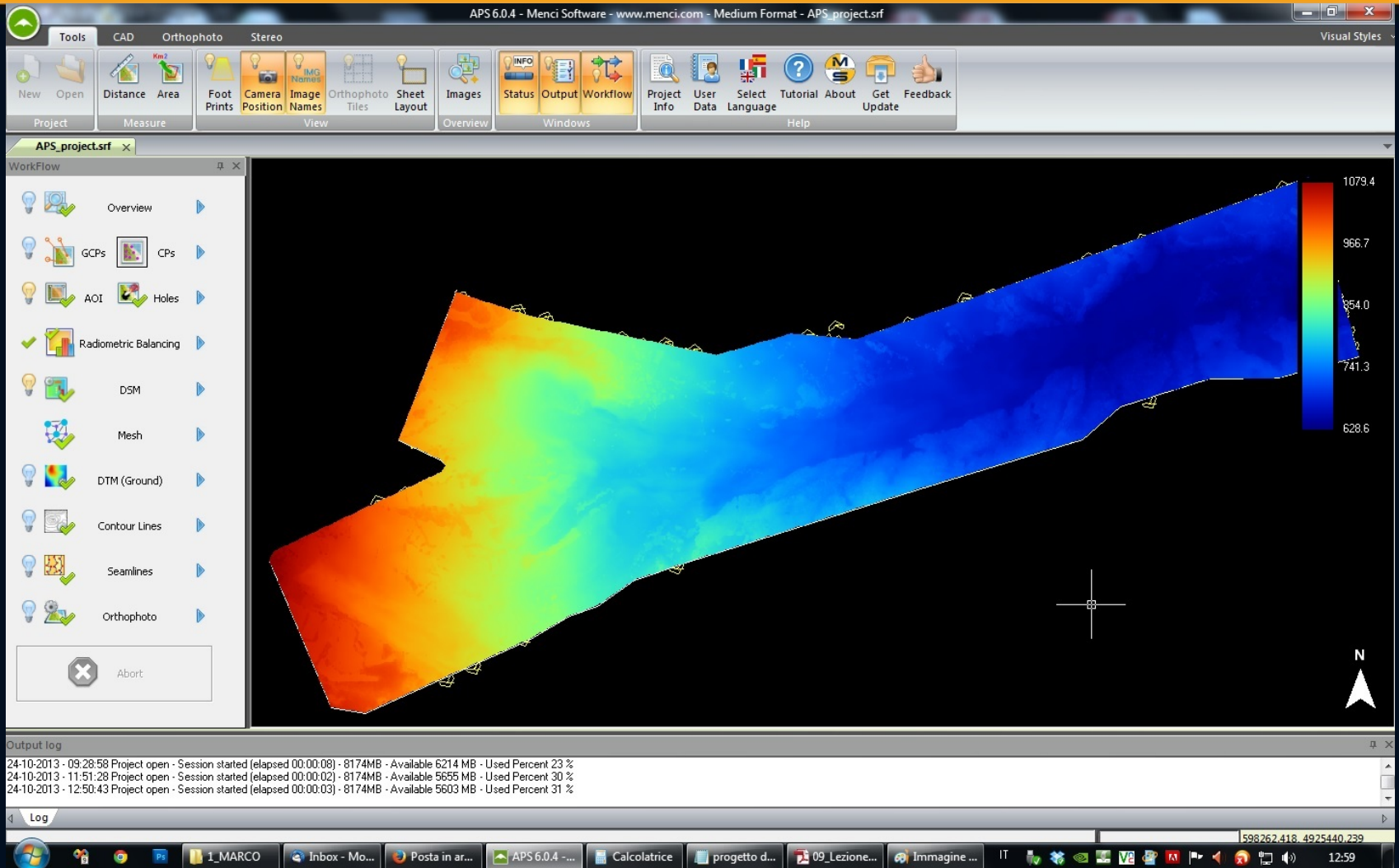


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Point Cloud

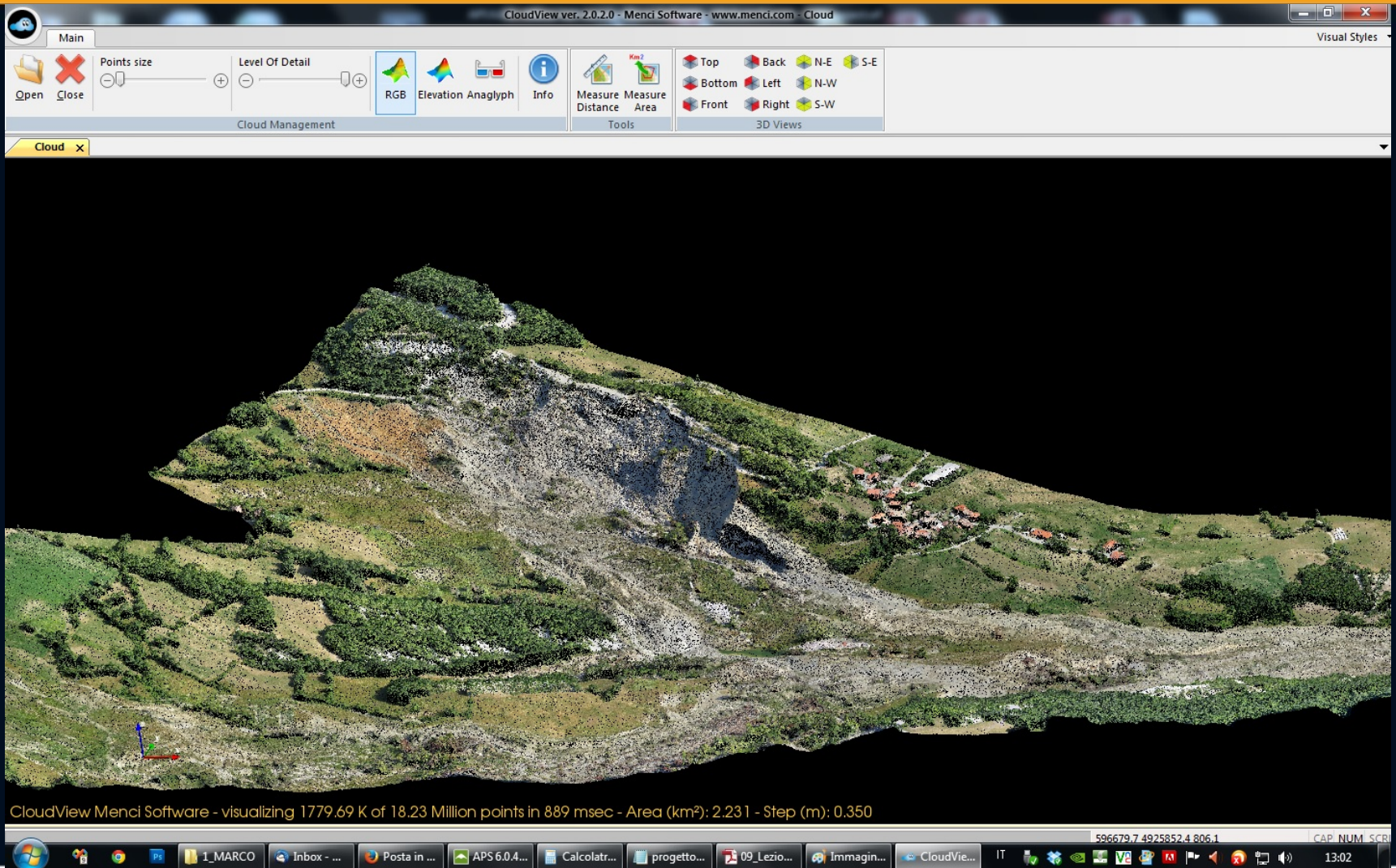


image processing tech



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Cartografia dettagliata e Caratterizzazione 3D per una foresta affetta da parassiti

Number of images: 122 each flight

Average GSD m: 0.06 m

Total Area: 0.716 Km²

Orthophoto Area: 0.237 Km²

Camera Model: Canon IXUS 127HS, ELPH (Nir)

Flight Time: 21 minutes ef

Absolute Flight Height: 1398.72 m

Relative Flight Height: 215 m

Average Ground Elevation: 1185m

Bundled Images: 122 ef

Average Bundle Residuals: 3.56 um

Bundle Time: 00:19:45

GCP imported: no

Orthophoto Average GSD: 0.06 m

DSM average GSD: 0.35 m

3D points number: 1.940.941

Total Process Time: 00:26:27

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Performed flight

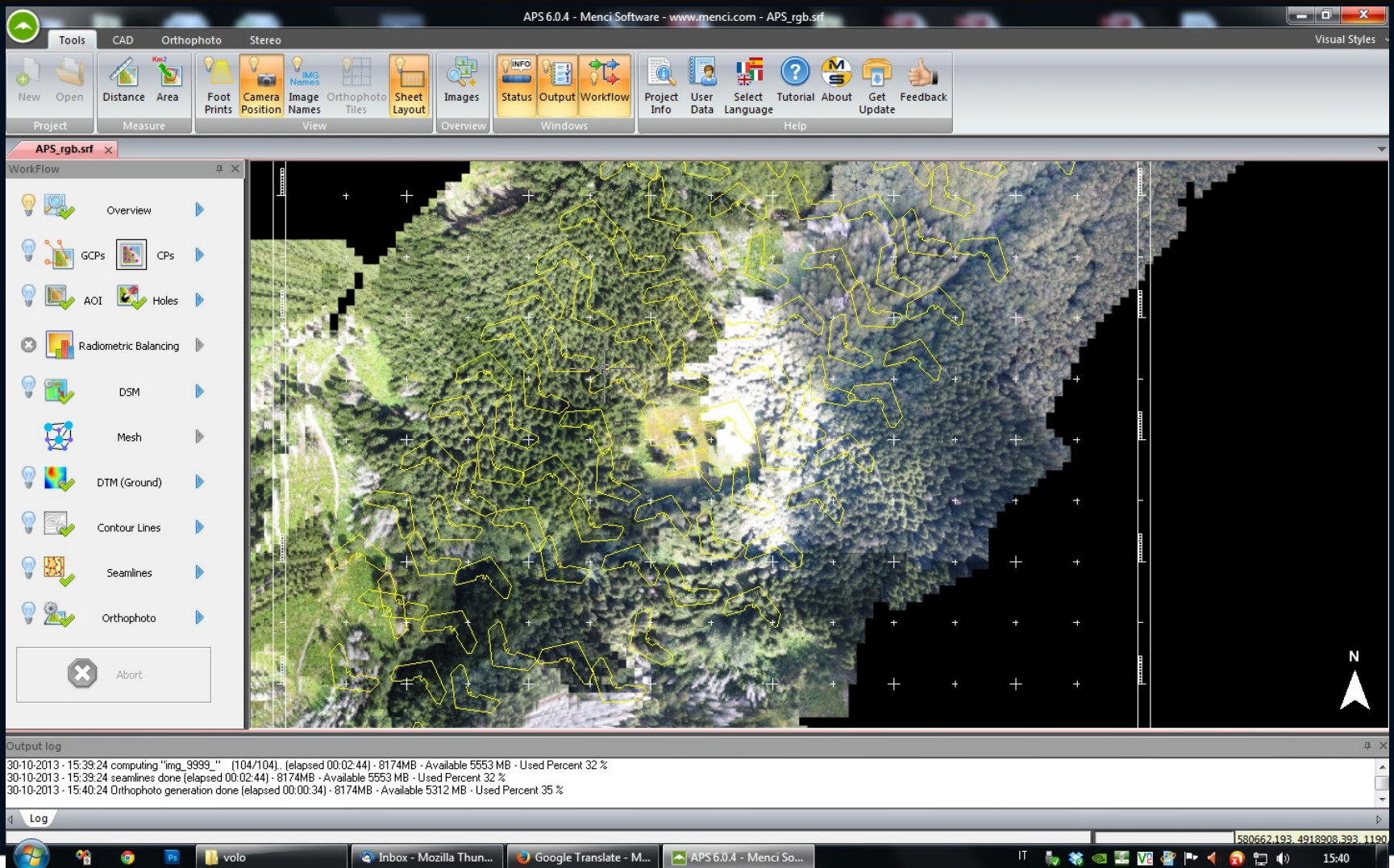


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Orthophoto

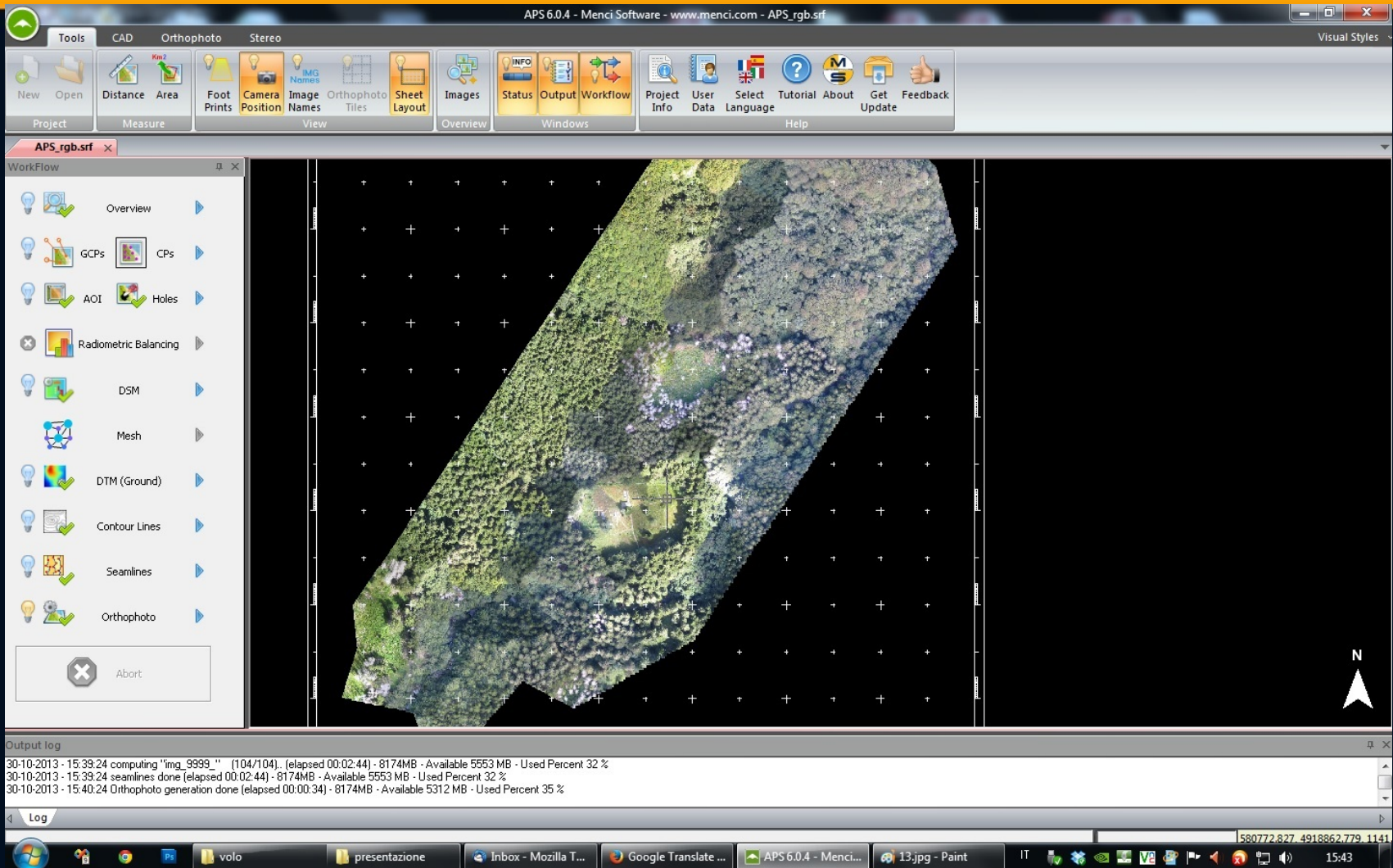


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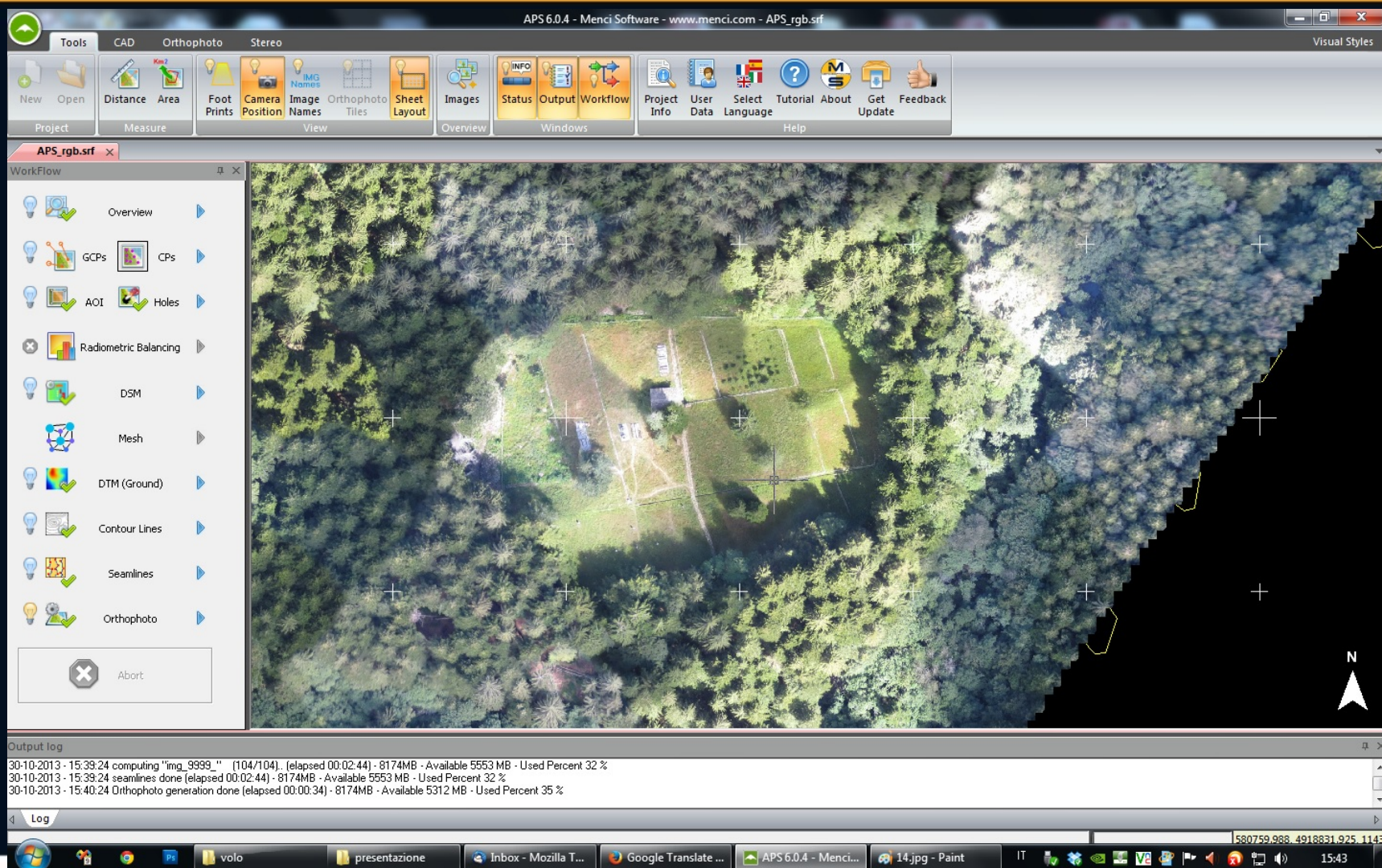


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Orthophoto Nir

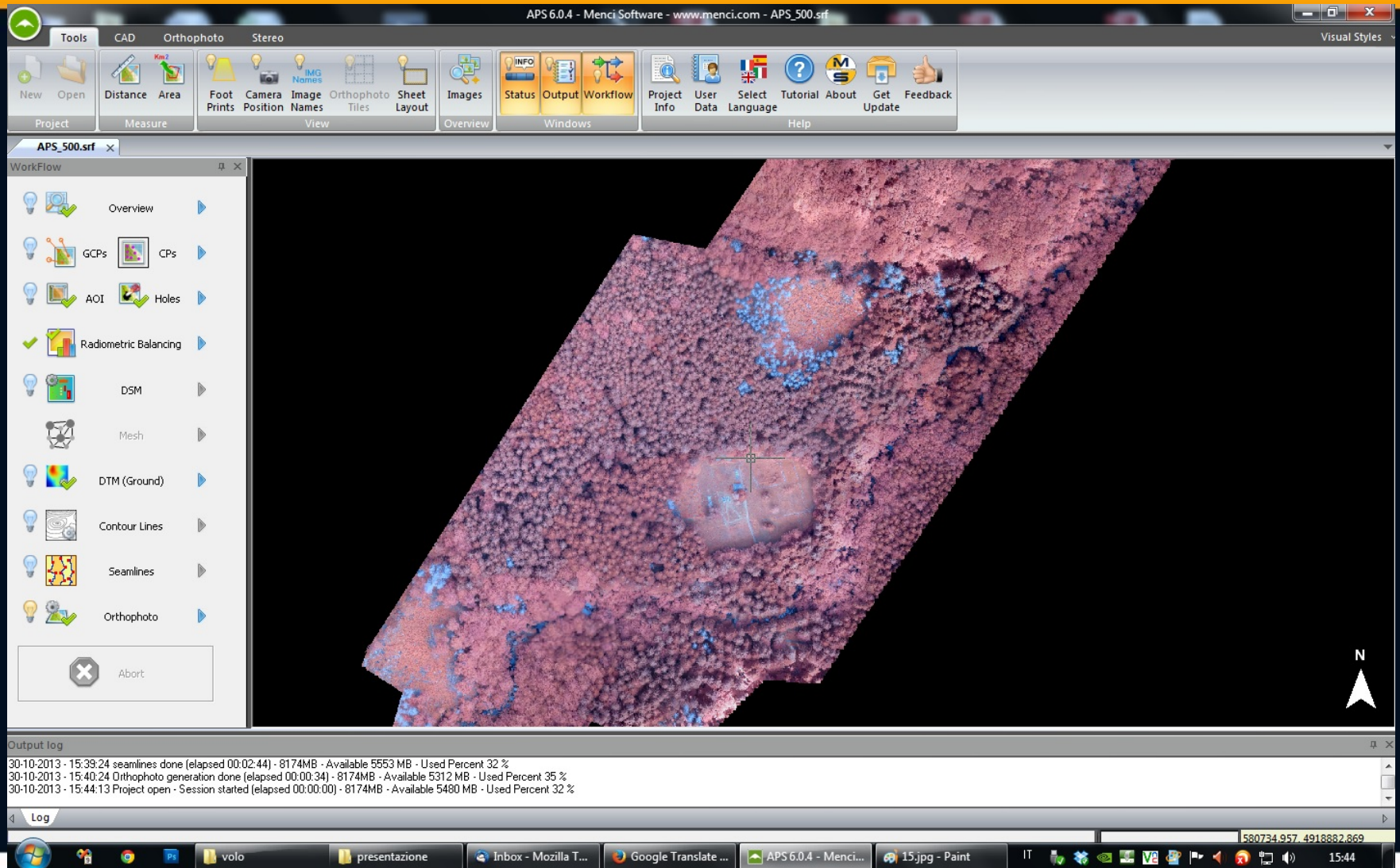


image processing tech



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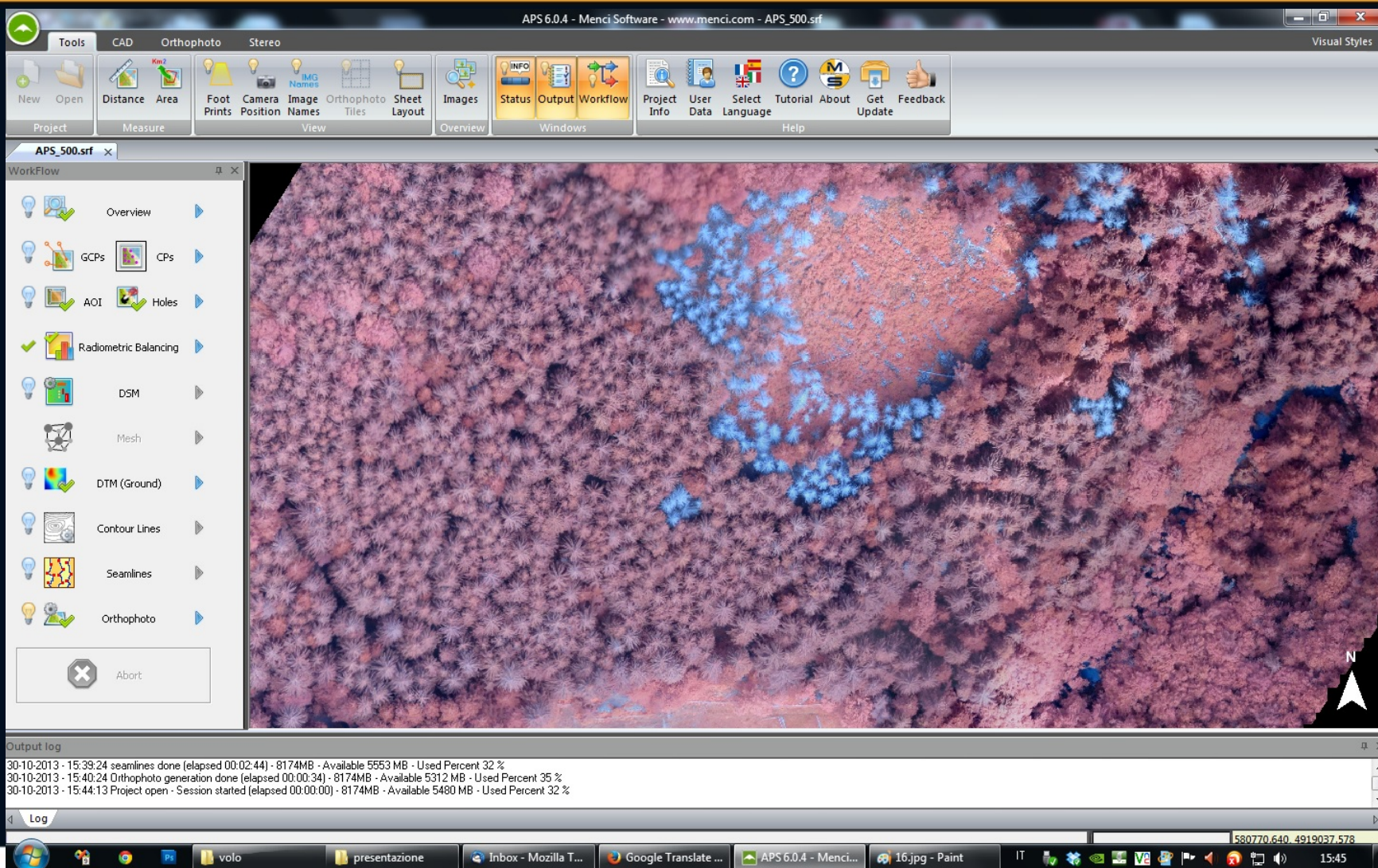


image processing tech



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Contour lines

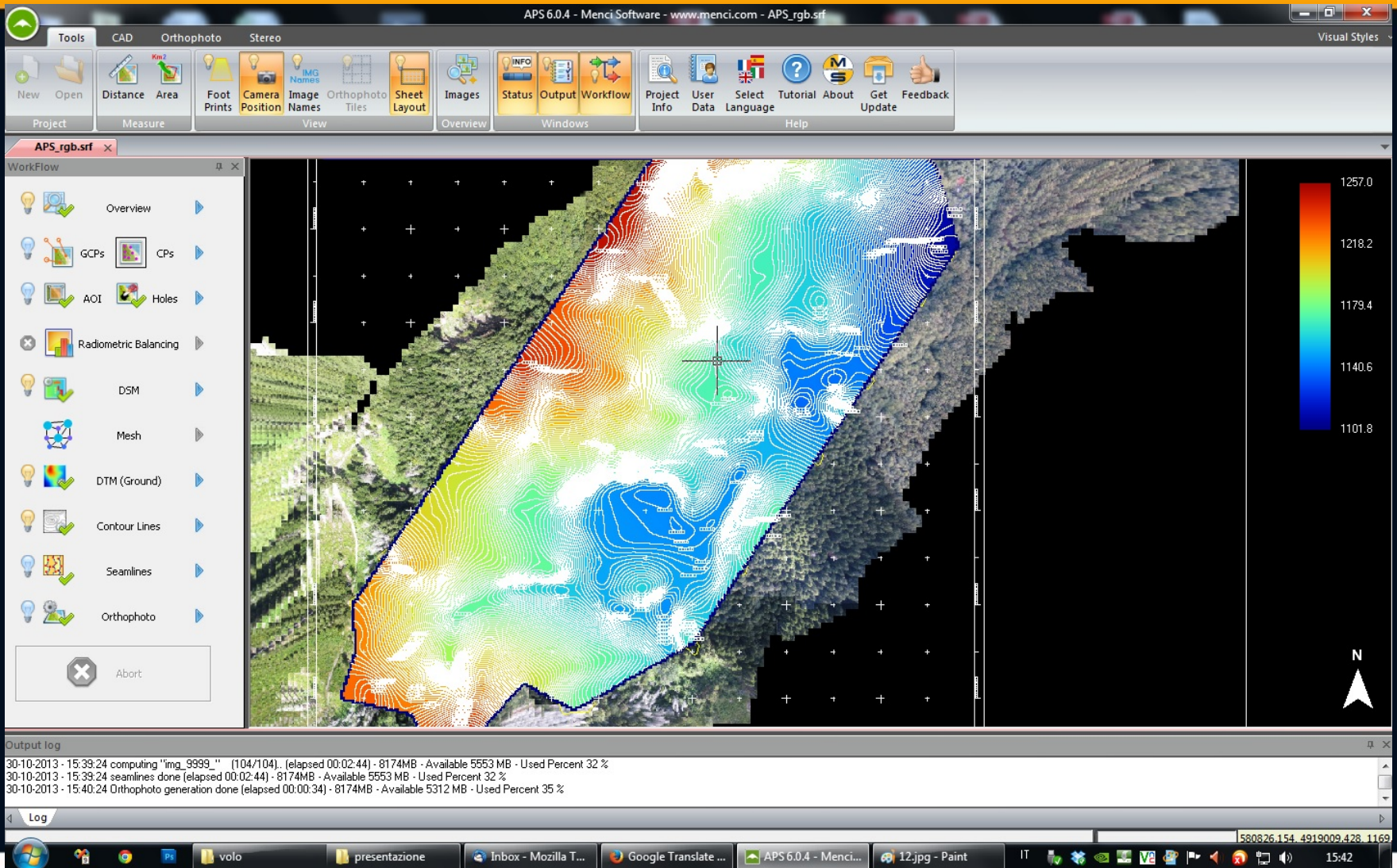


image processing tech



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DSM

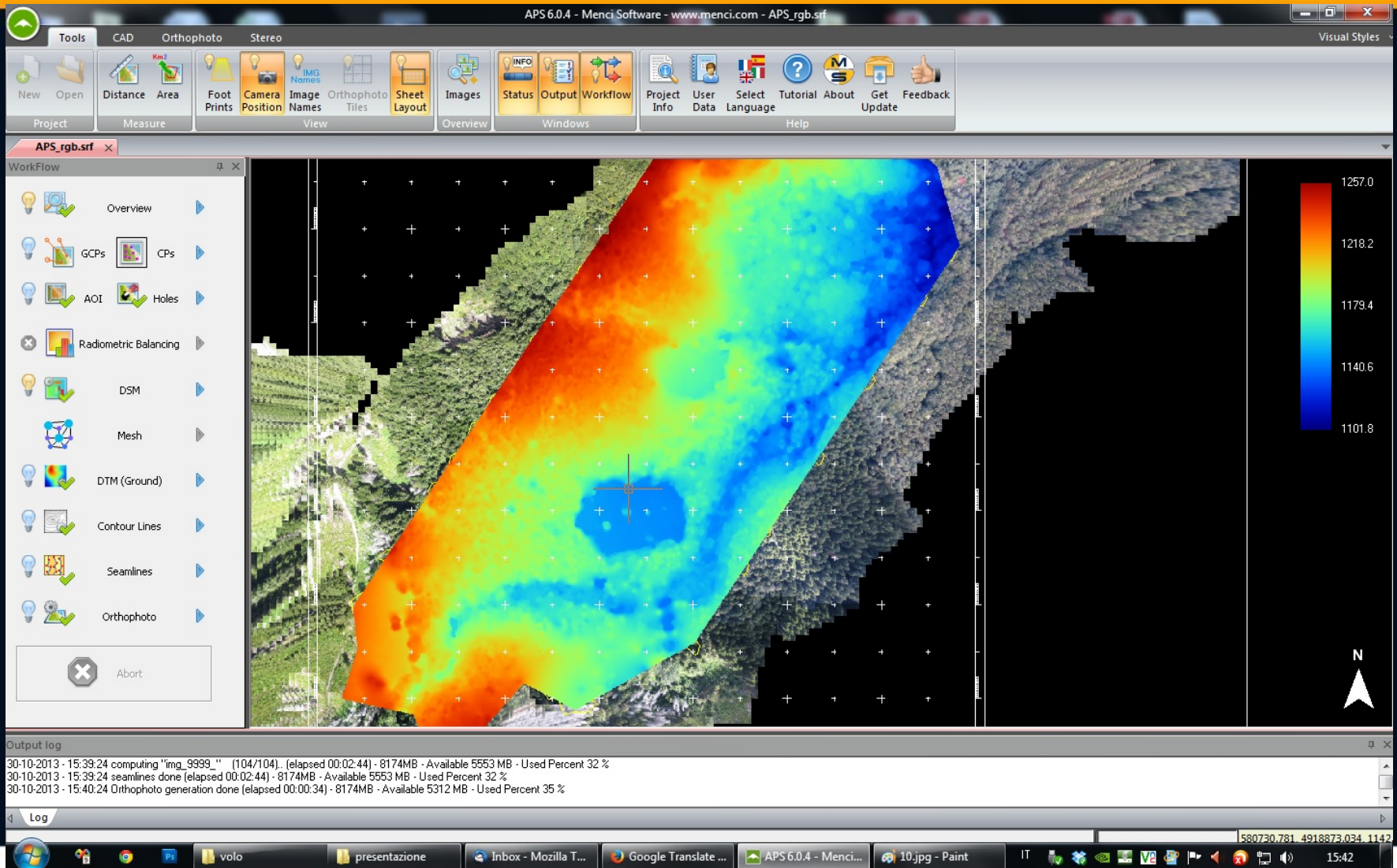


image processing tech



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Point cloud

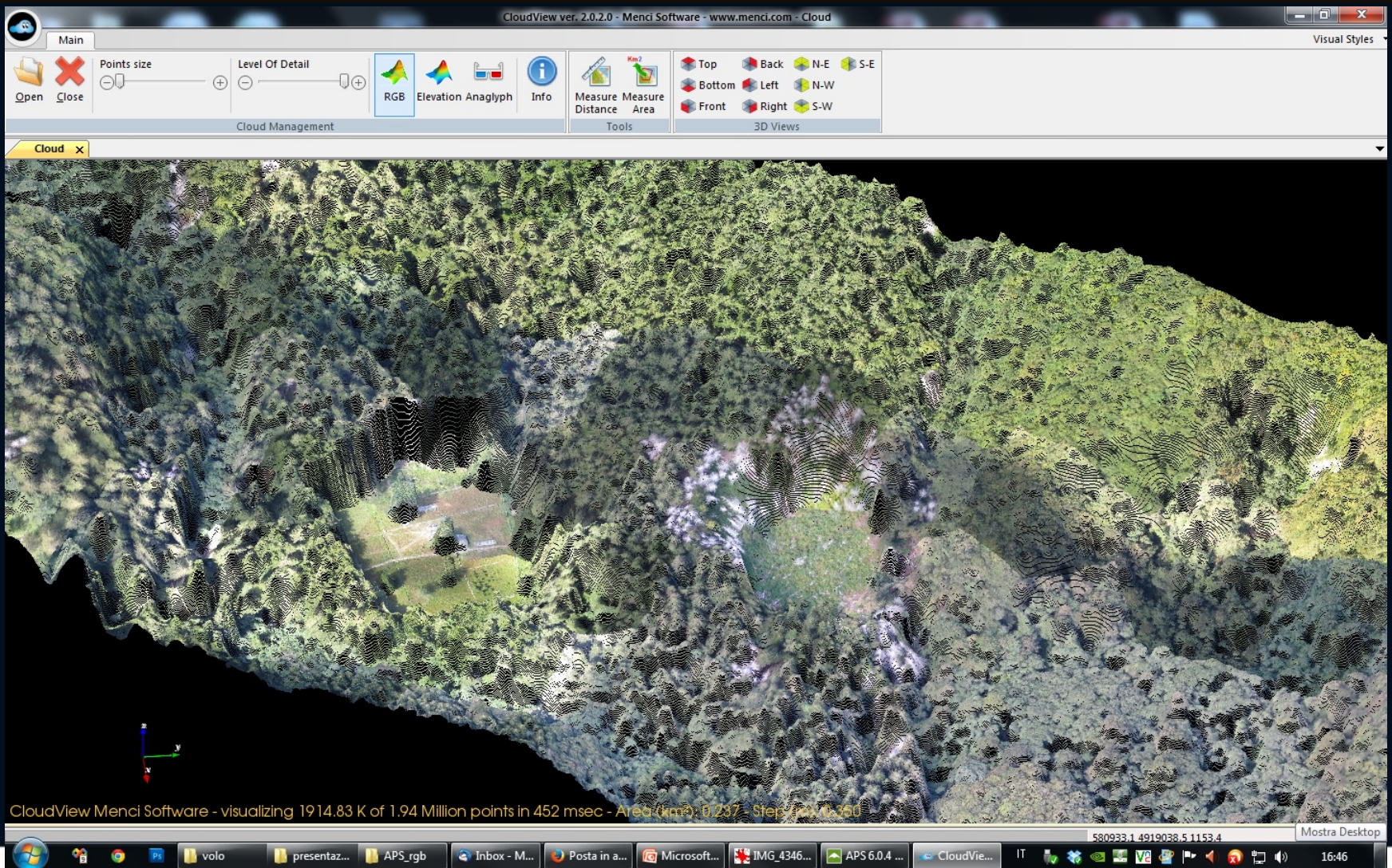


image processing tech



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Cartografia dettagliata e Caratterizzazione 3D per un casello autostradale

Number of images: 98

Average GSD m: 0.05 m

Total Area: 0.314 Km²

Orthophoto Area: 0.181 Km²

Camera Model: Canon IXUS 220HS

Flight Time: 0 hours, 9 minutes, 4 seconds

Absolute Flight Height: 169.45 m

Relative Flight Height: 154.24 m

Average Ground Elevation: 15.21 m

Bundled Images: 97

Average Bundle Residuals: 1.111 um

Bundle Time: 00:14:41

GCP imported: no

Orthophoto Average GSD: 0.05 m

DSM average GSD: 0.2 m

3D points number: 4.435.843

Total Process Time: 00:49:18

image processing tech



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Performed flight

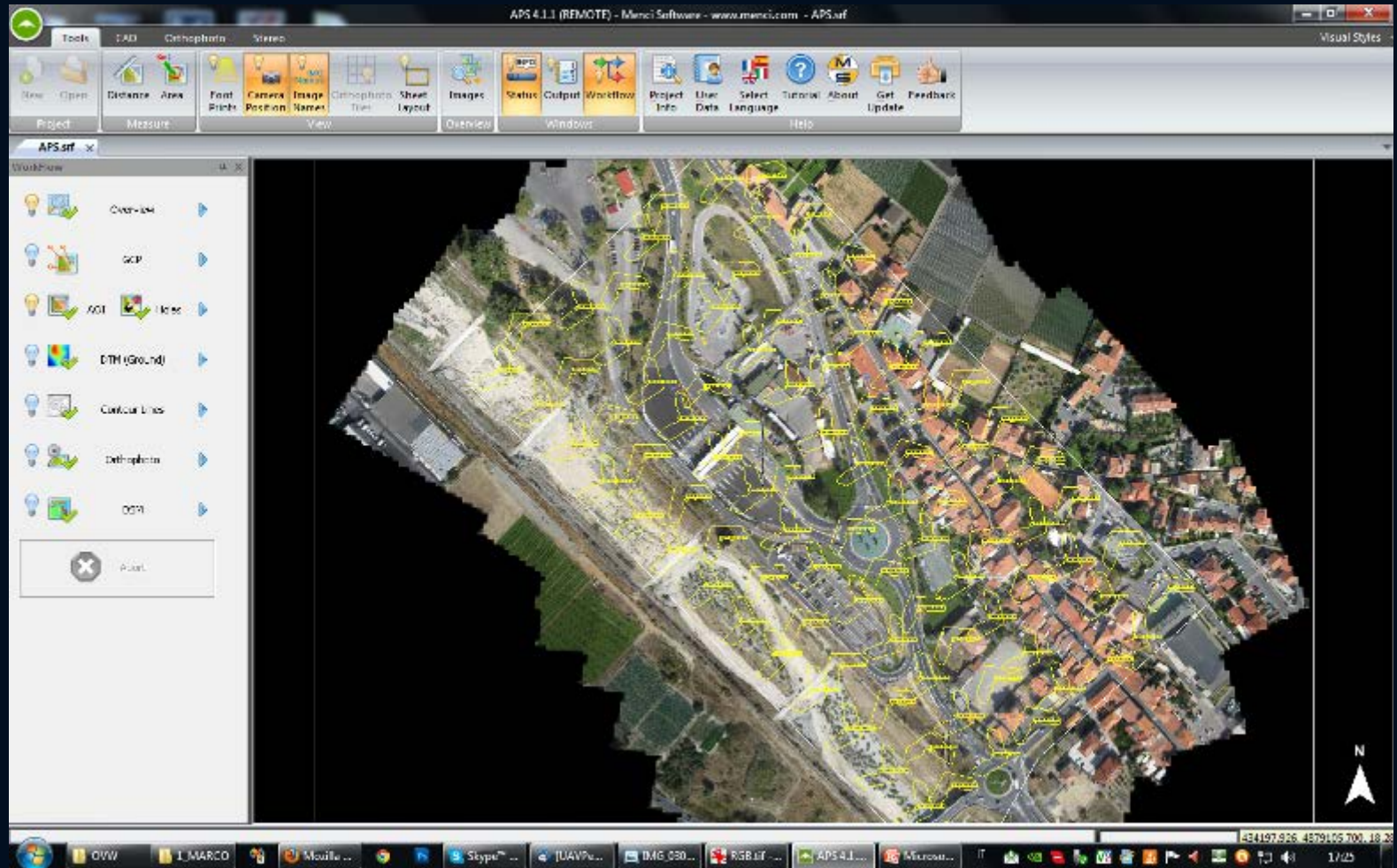


image processing tech



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Orthophoto

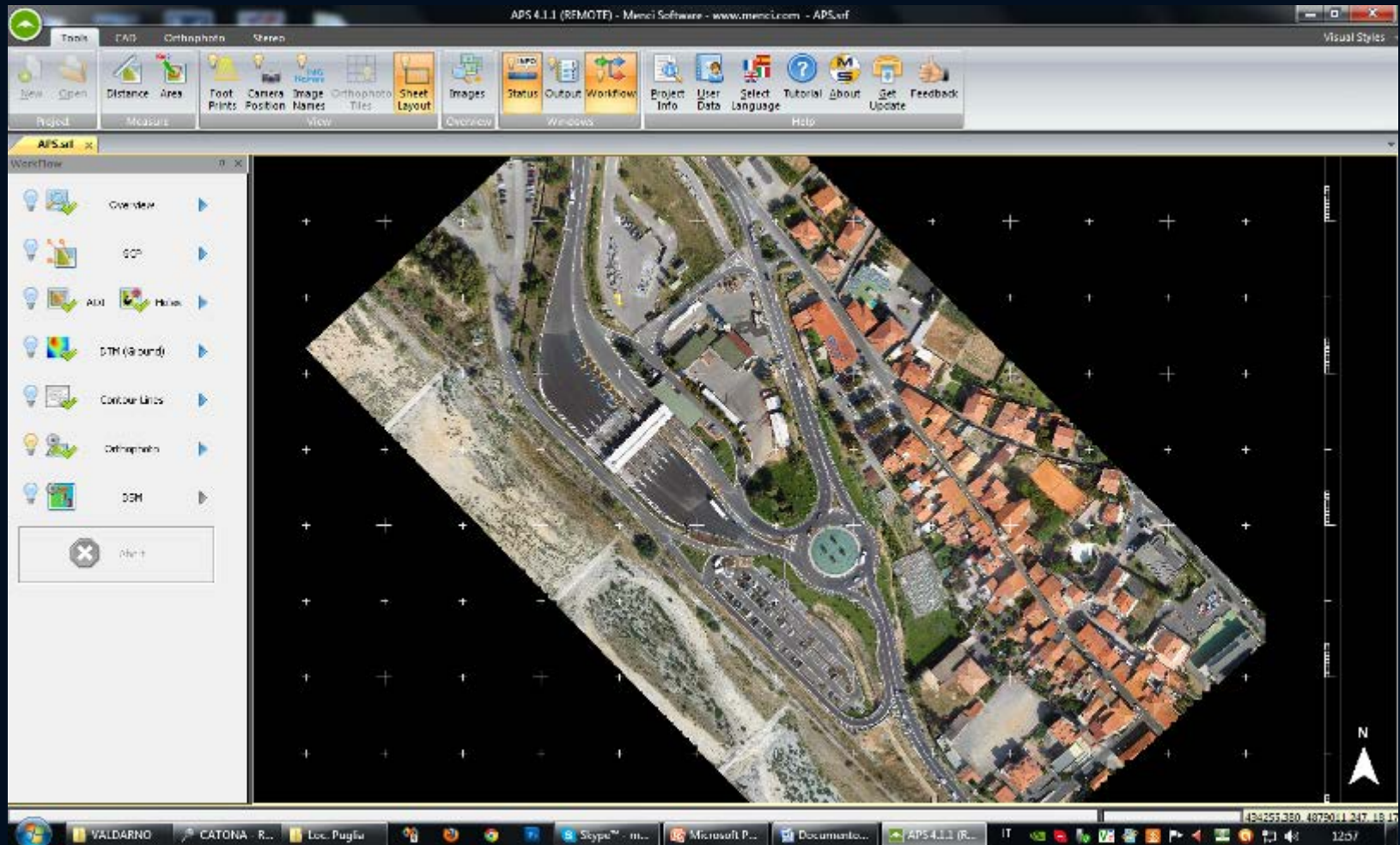


image processing tech



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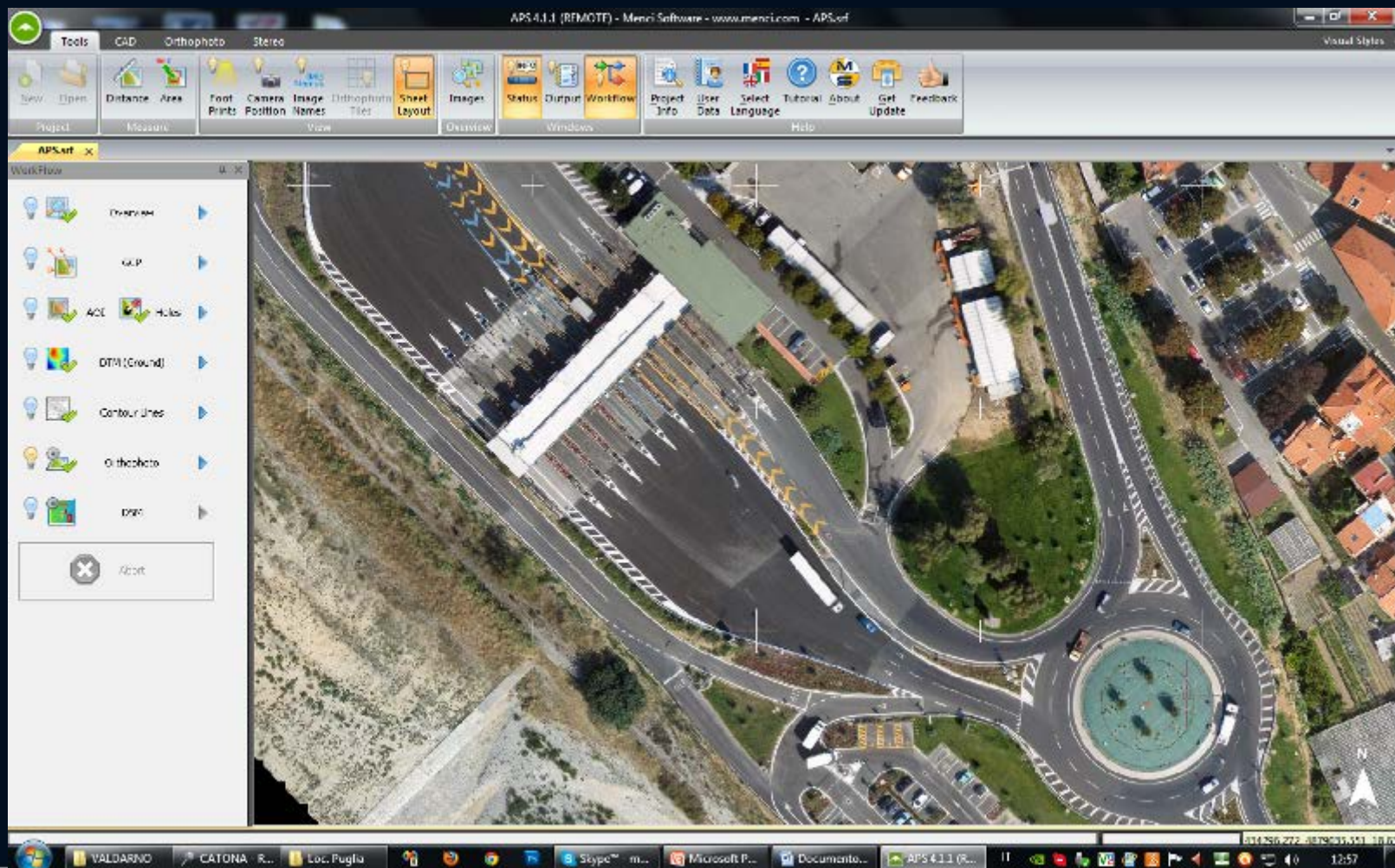


image processing tech



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DSM

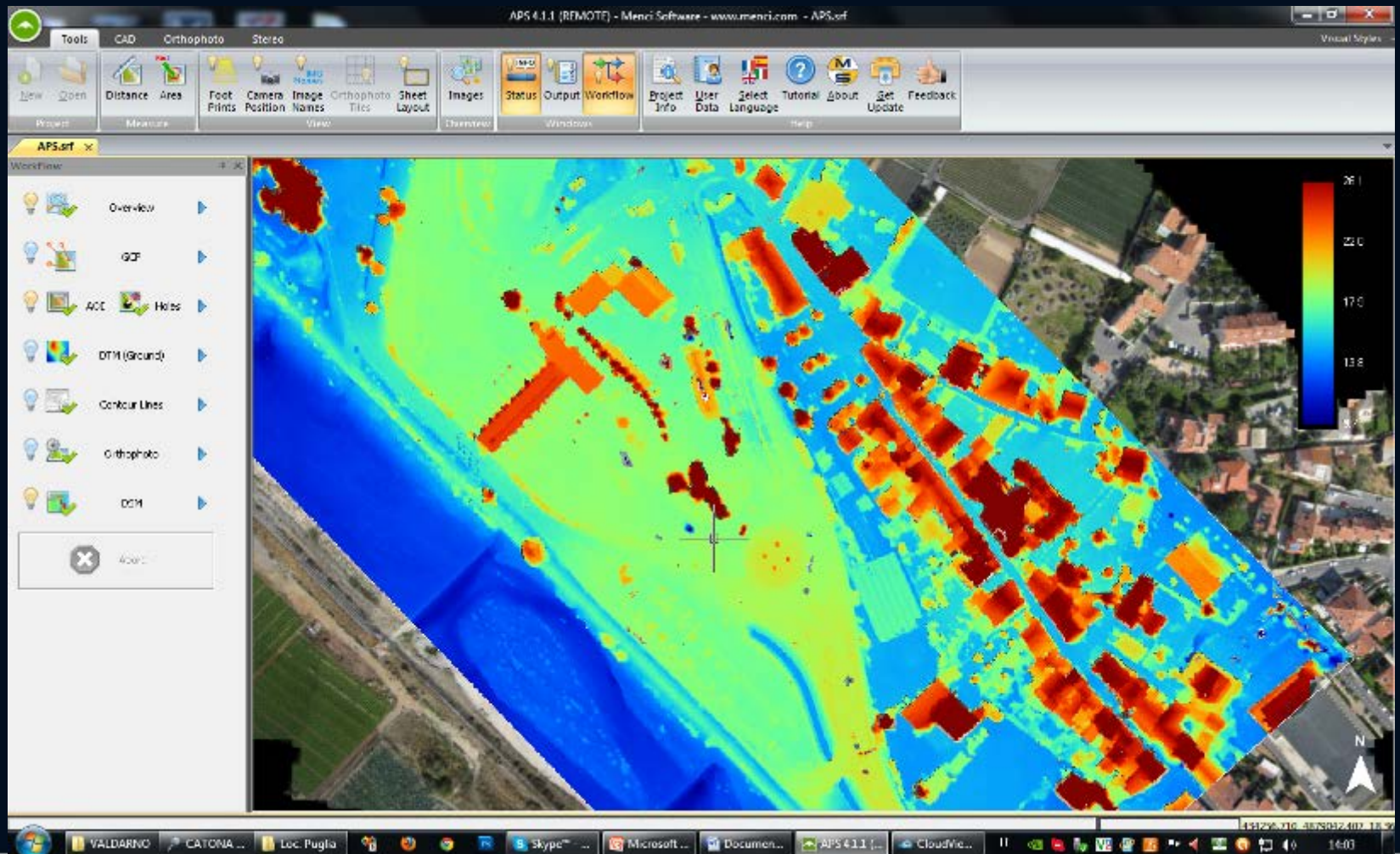


image processing tech



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3d Point cloud

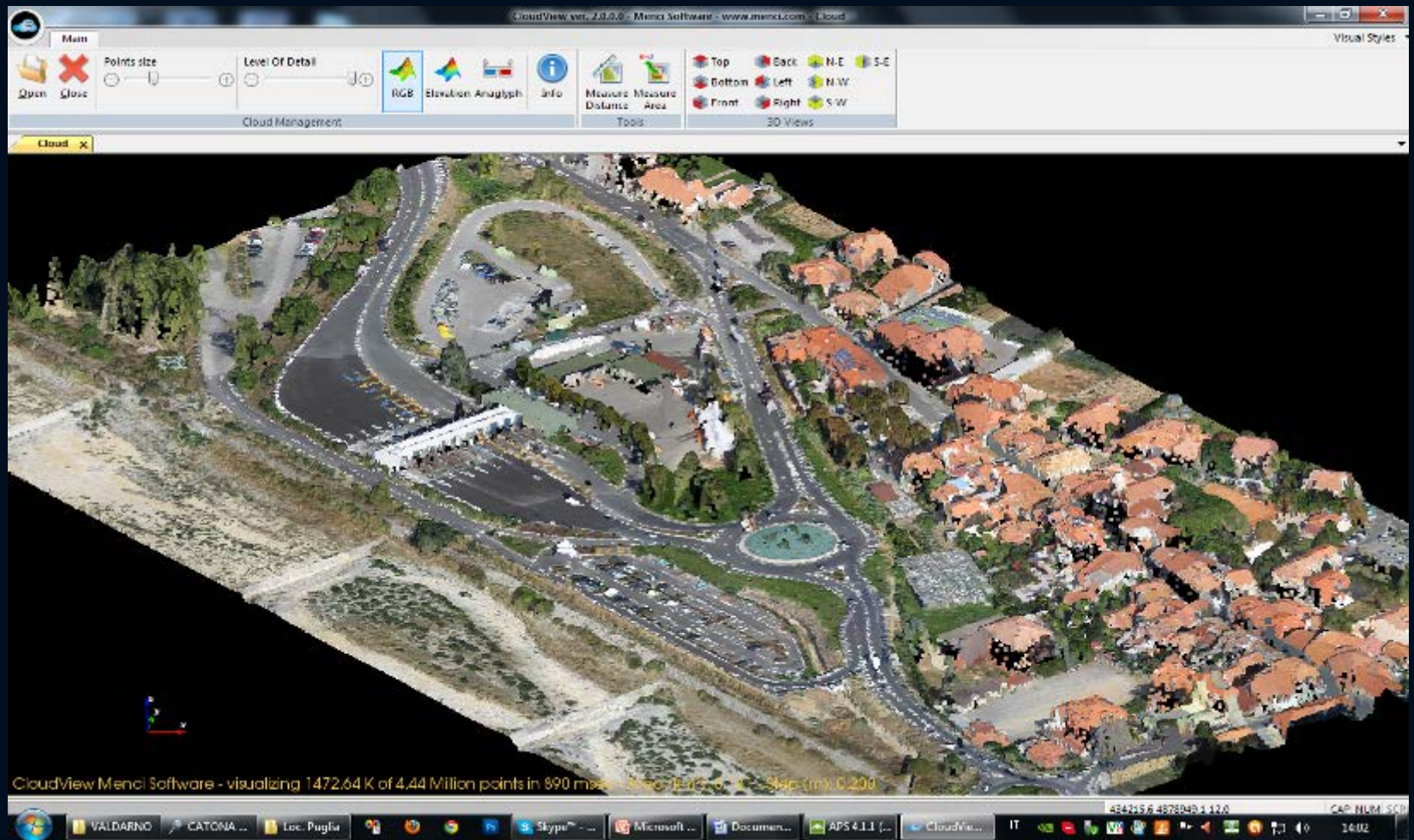


image processing tech



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Cartografia dettagliata e Caratterizzazione 3D di una cava

image processing tech



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Number of images: 200

Average GSD m: 0.04 m

Total Area: 0.396 Km²

Orthophoto Area: 0.060 Km²

Camera Model: Canon IXUS 220HS

Flight Time: 0 hours, 22 minutes, 32 seconds

Absolute Flight Height: 358.01 m

Relative Flight Height: 124.82 m

Average Ground Elevation: 233.19 m

Bundled Images: 200

Average Bundle Residuals: 1.146 um

Bundle Time: 01:14:27

GCP imported: yes

GCP Average Residuals: 0.010 m

Orthophoto Average GSD: 0.04 m

DSM average GSD: 0.2 m

3D points number: 5992094

Total Process Time: 01:54:59

image processing tech



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Performed flight

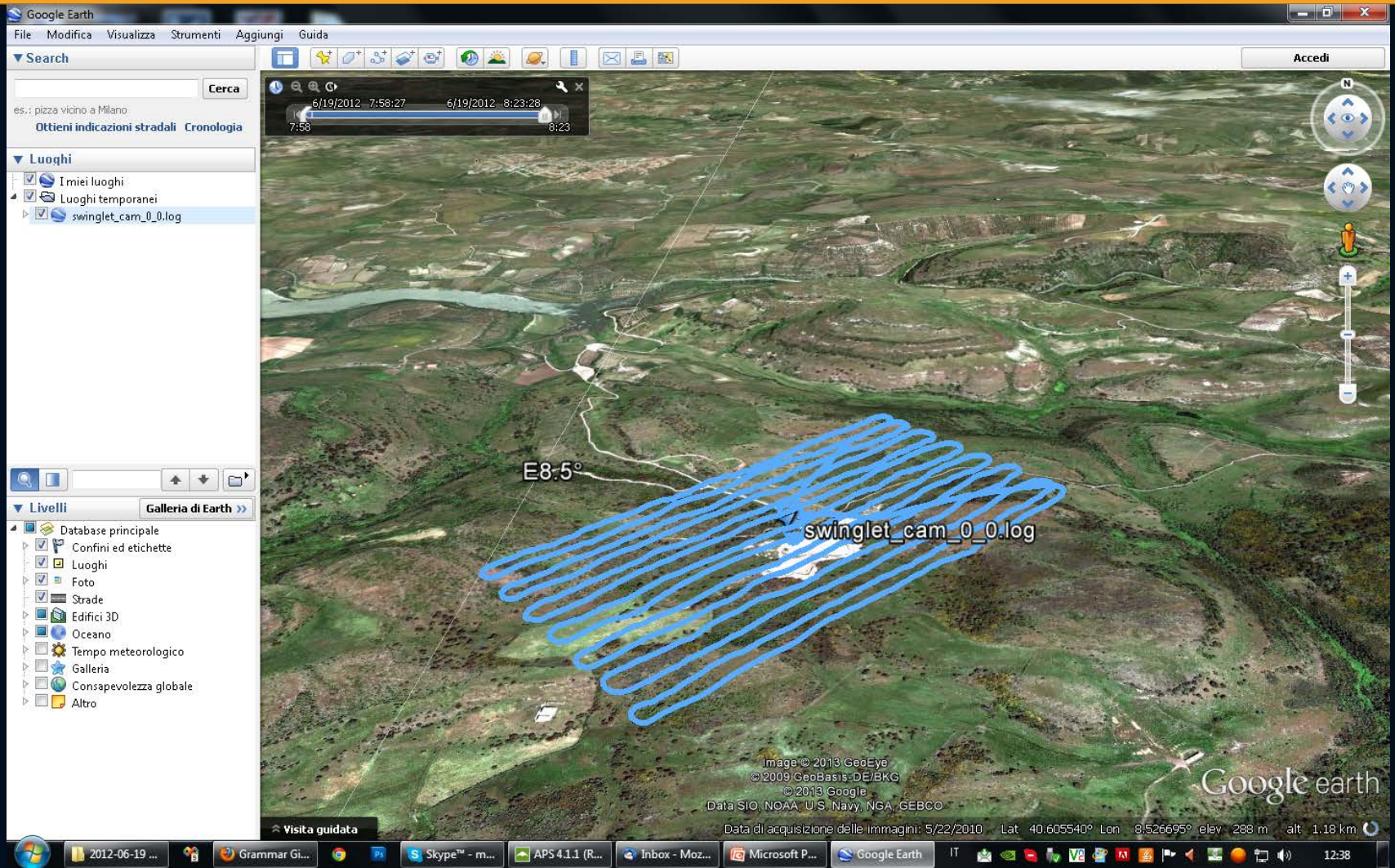


image processing tech



www.menci.com

Performed flight and projection centre

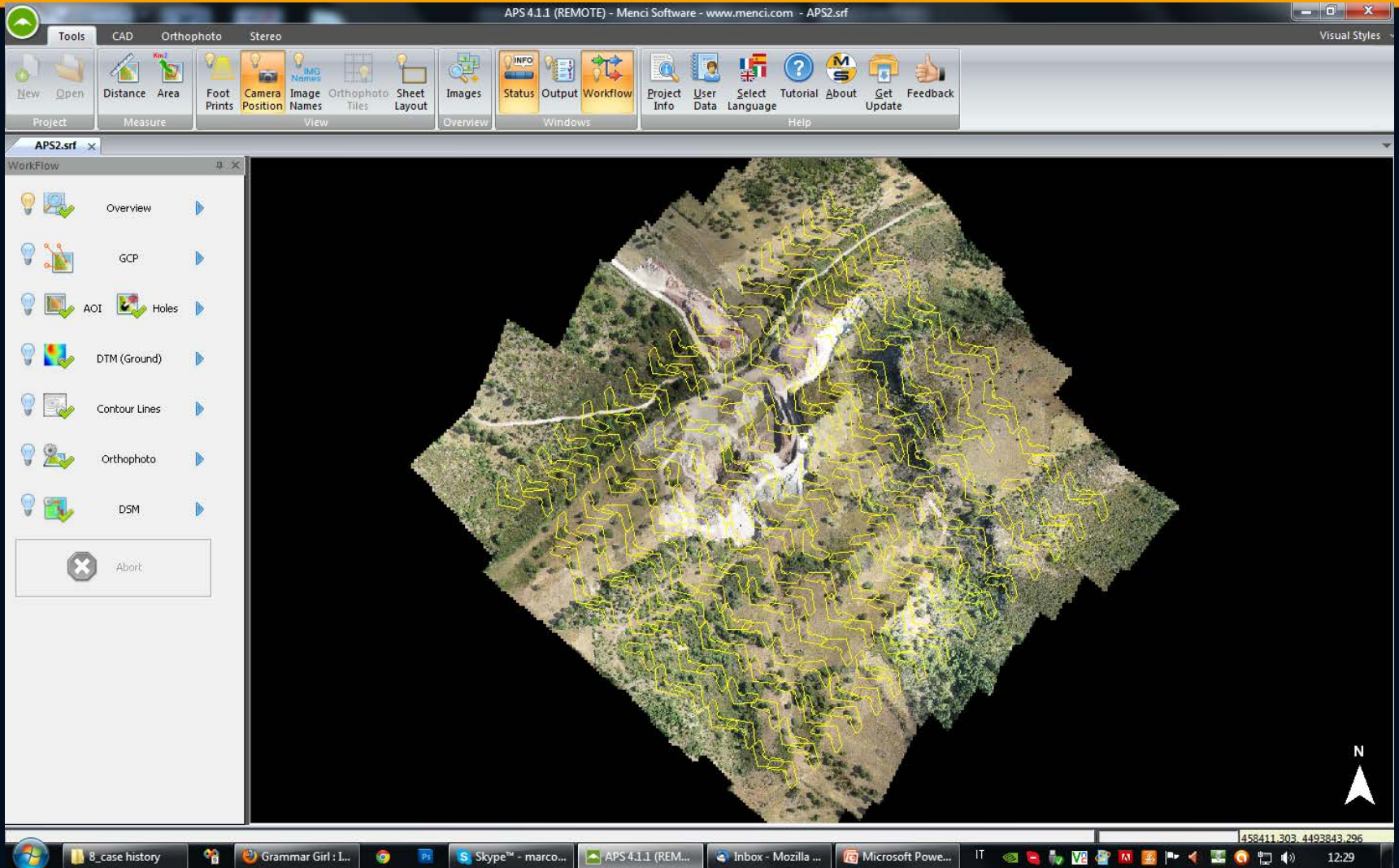


image processing tech



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GCP collimation

APS 4.1.1 (REMOTE) - Menci Software - www.menci.com - APS2.srf

Tools CAD Orthophoto Stereo

New Open Distance Area Foot Prints Camera Position Image Names Orthophoto Tiles Sheet Layout Images Status Output Workflow Project Info User Data Select Language Tutorial About Get Update Feedback

APS2.srf x

Workflow

Overview GCP AOI Holes DTM (Ground) Contour Lines Orthophoto DSM

Abort

GCP Collimation

200 images img_5210_

img_5155_ img_5156_ img_5157_ img_5158_ img_5159_ img_5160_ img_5161_ img_5162_ img_5163_ img_5164_ img_5165_ img_5166_ img_5167_ img_5168_ img_5169_ img_5170_ img_5187_ img_5188_ img_5189_ img_5190_ img_5191_ img_5192_ img_5193_ img_5194_ img_5195_ img_5196_ img_5197_ img_5198_ img_5199_ img_5200_ img_5201_ img_5202_ img_5203_ img_5204_ img_5205_ img_5206_ img_5207

Point Management

Add Points Points Color

Collimations

Point ID	I...	res
☐ 10	-1	0.000 0.000 0.000
☐ 11	-1	0.000 0.000 0.000
☒ 3	39	0.006 0.009 0.003
☐ 4	-1	0.000 0.000 0.000
☒ 5	92	-0.010 -0.002 -0.000
☐ 6	-1	0.000 0.000 0.000
☒ 7	134	0.002 -0.008 0.005

SHIFT + Click to add a collimation
CTRL+ Click to remove a collimation

Refine Collimation

Evaluate

Close

Loading data

458040.083_4493931.231

12:31

image processing tech



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Orthophoto

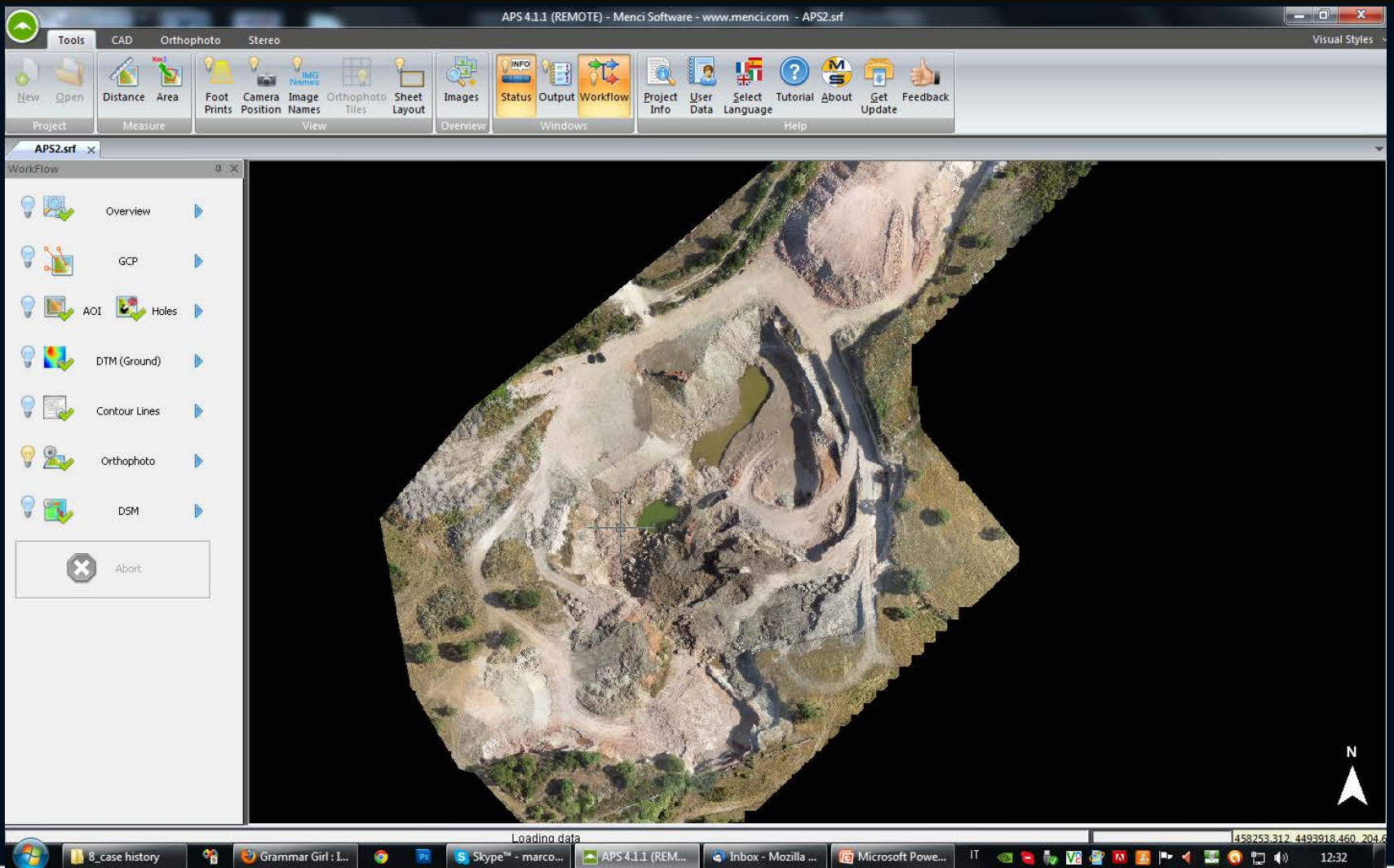


image processing tech



www.menci.com

DSM

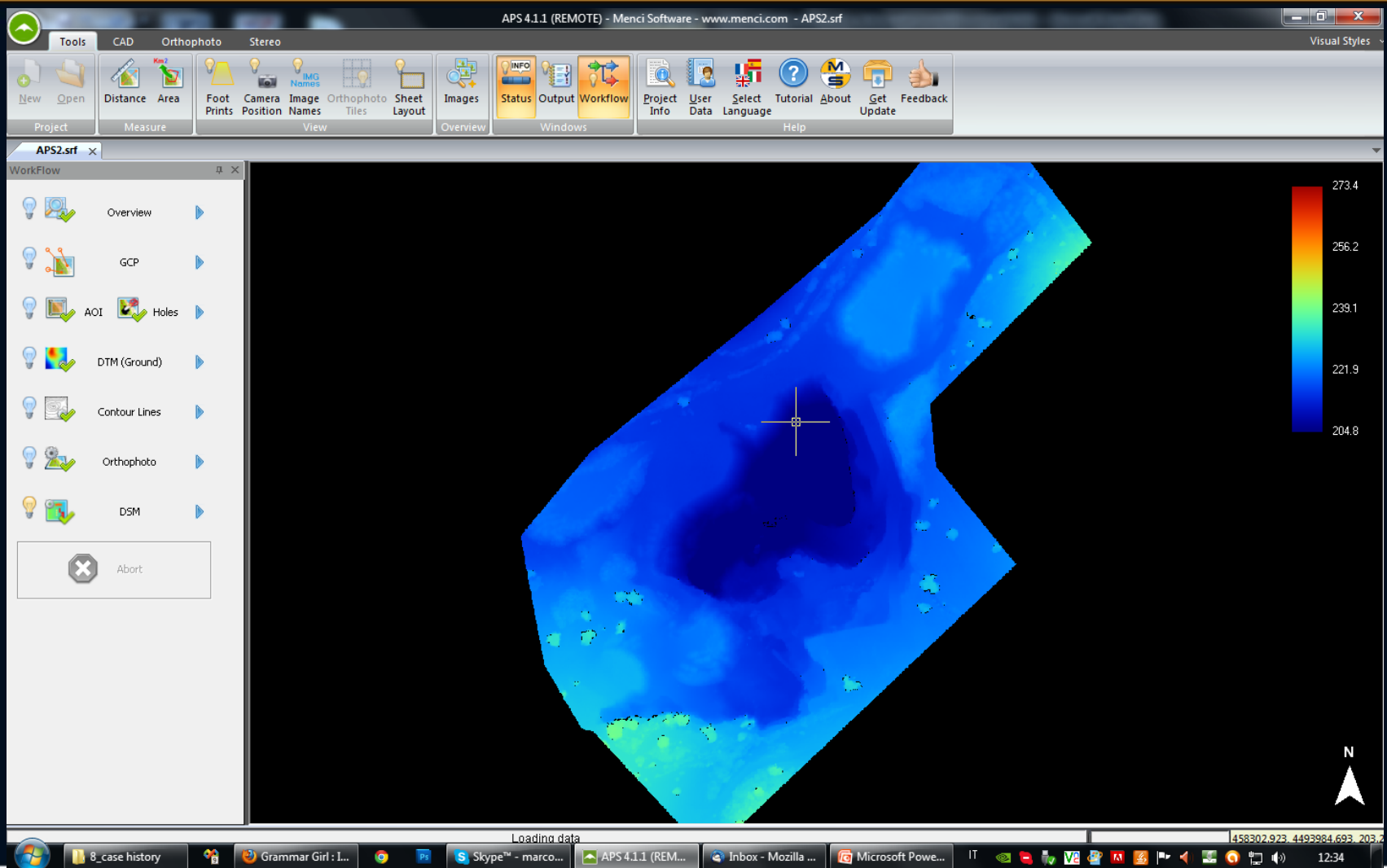


image processing tech



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3D Point cloud

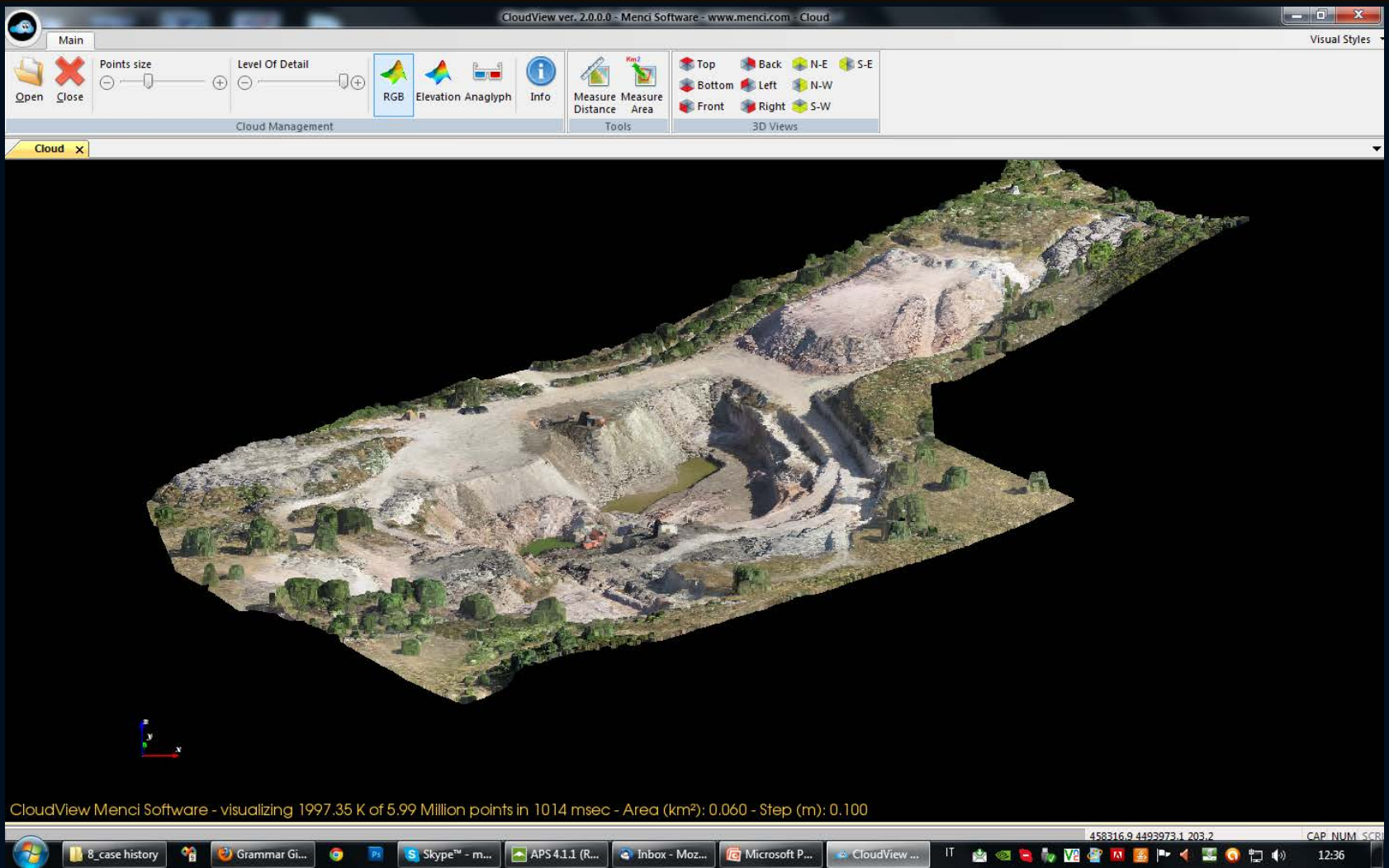


image processing tech



www.menci.com

Cartografia dettagliata e Caratterizzazione 3D per un tratto di costa

Number of images: 416

Average GSD m: 0.05 m

Total Area: 1.421 Km²

Orthophoto Area: 1.221 Km²

Camera Model: Canon IXUS 220HS

Flight Time: 45 minuti

Absolute Flight Height: 156.84 m

Relative Flight Height: 151.78 m

Average Ground Elevation: 5.06 m

Bundled Images: 416

Average Bundle Residuals: 1.146 um

Bundle Time: 3 h 25 min

GCP imported: yes

GCP Average Residuals: 0.045 m

Orthophoto Average GSD: 0.05 m

DSM average GSD: 5 m

3D points number: 9 milioni

Total Process Time: 8 h 45 min

image processing tech



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Performed flight

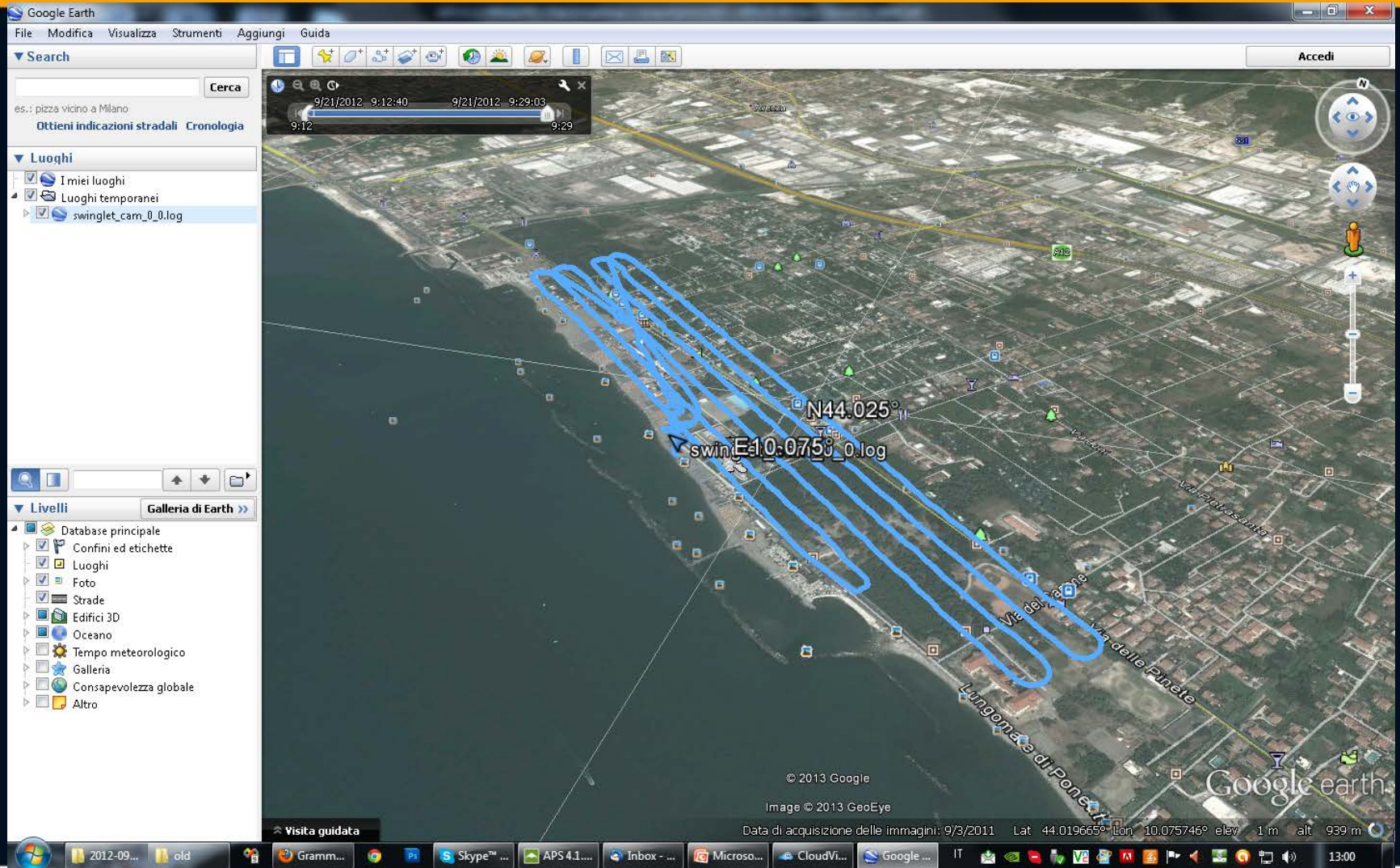


image processing tech



www.menci.com

Performed flight and projection centre

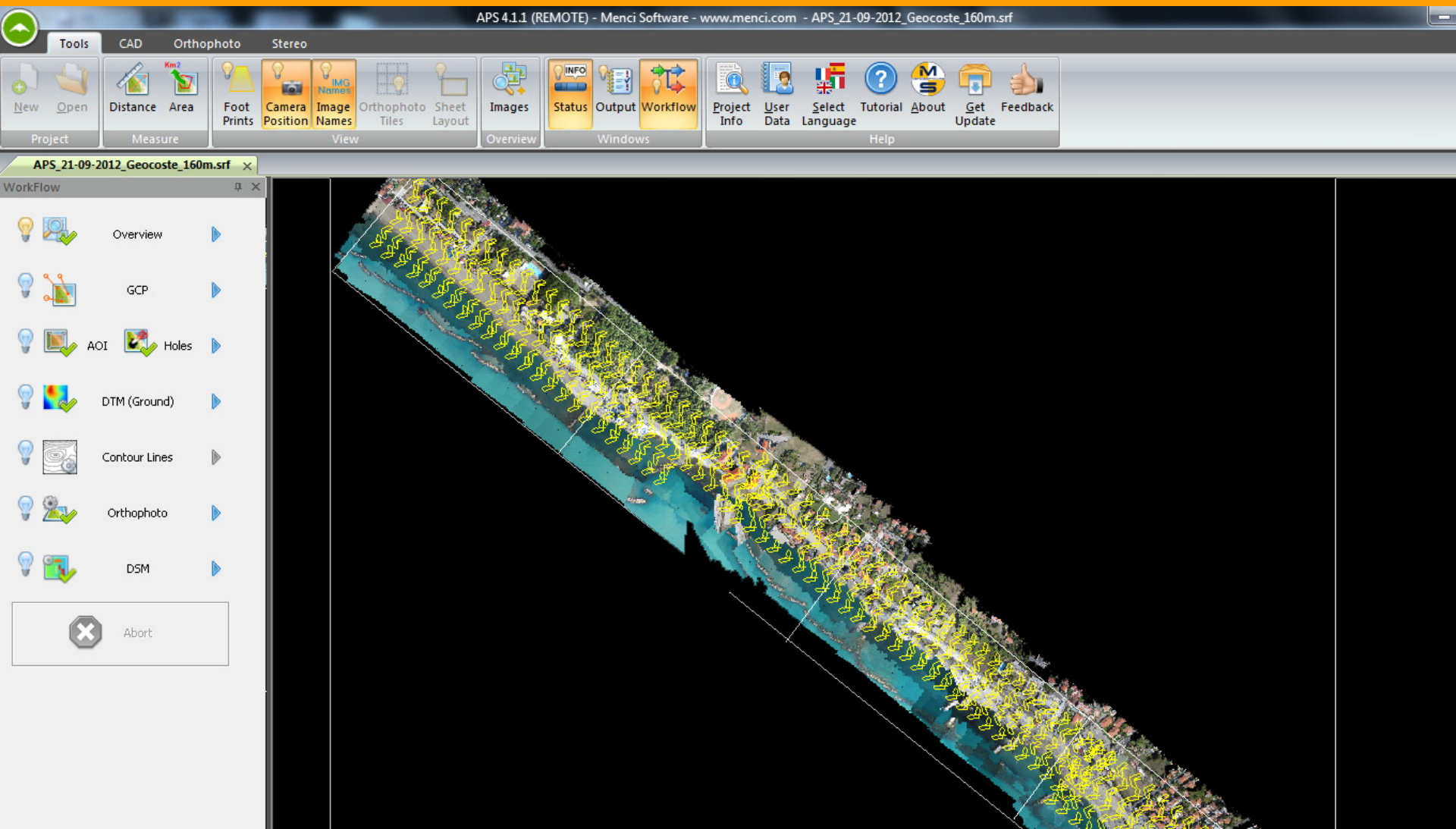


image processing tech



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GCP collimation

APS 4.1.1 (REMOTE) - Menci Software - www.menci.com - APS_21-09-2012_Geocoste_160m.srf

Visual Styles

Tools CAD Orthophoto Stereo

New Open Distance Area Foot Prints Camera Position Image Names Orthophoto Tiles Sheet Layout Images Status Output Workflow Project Info User Data Select Language Tutorial About Get Update Feedback

Project Measure View Overview Windows Help

APS_21-09-2012_Geocoste_160m.srf GCP Collimation

Workflow

Overview GCP AOI Holes DTM (Ground) Contour Lines Orthophoto DSM

Abort

416 images

img_0389

img_0054
img_0055
img_0056
img_0057
img_0058
img_0059
img_0060
img_0061
img_0062
img_0063
img_0064
img_0065
img_0066
img_0067
img_0068
img_0069
img_0070
img_0071
img_0072
img_0073
img_0074
img_0075
img_0076
img_0077
img_0078
img_0079
img_0080
img_0081
img_0082
img_0083
img_0084
img_0085
img_0086
img_0087
img_0088
img_0089
img_0090

Point Management

Add Points Points Color

Collimations

Point ID	I...	res
☒ 1	50	-0.012 0.002 0.008
☒ 2	72	0.003 -0.017 -0.009
☐ 3	205	0.000 0.000 0.000
☒ 4	333	-0.024 -0.099 -0.015
☒ 5	107	0.015 -0.003 -0.000
☒ 6	126	0.004 0.015 -0.002
☒ 7	244	-0.012 0.004 0.003
☒ 8	362	0.039 0.123 0.044

SHIFT + Click to add a collimation
CTRL + Click to remove a collimation

Refine Collimation

Evaluate

Close

585341.093 4875142.380

13:03

image processing tech



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Orthophoto

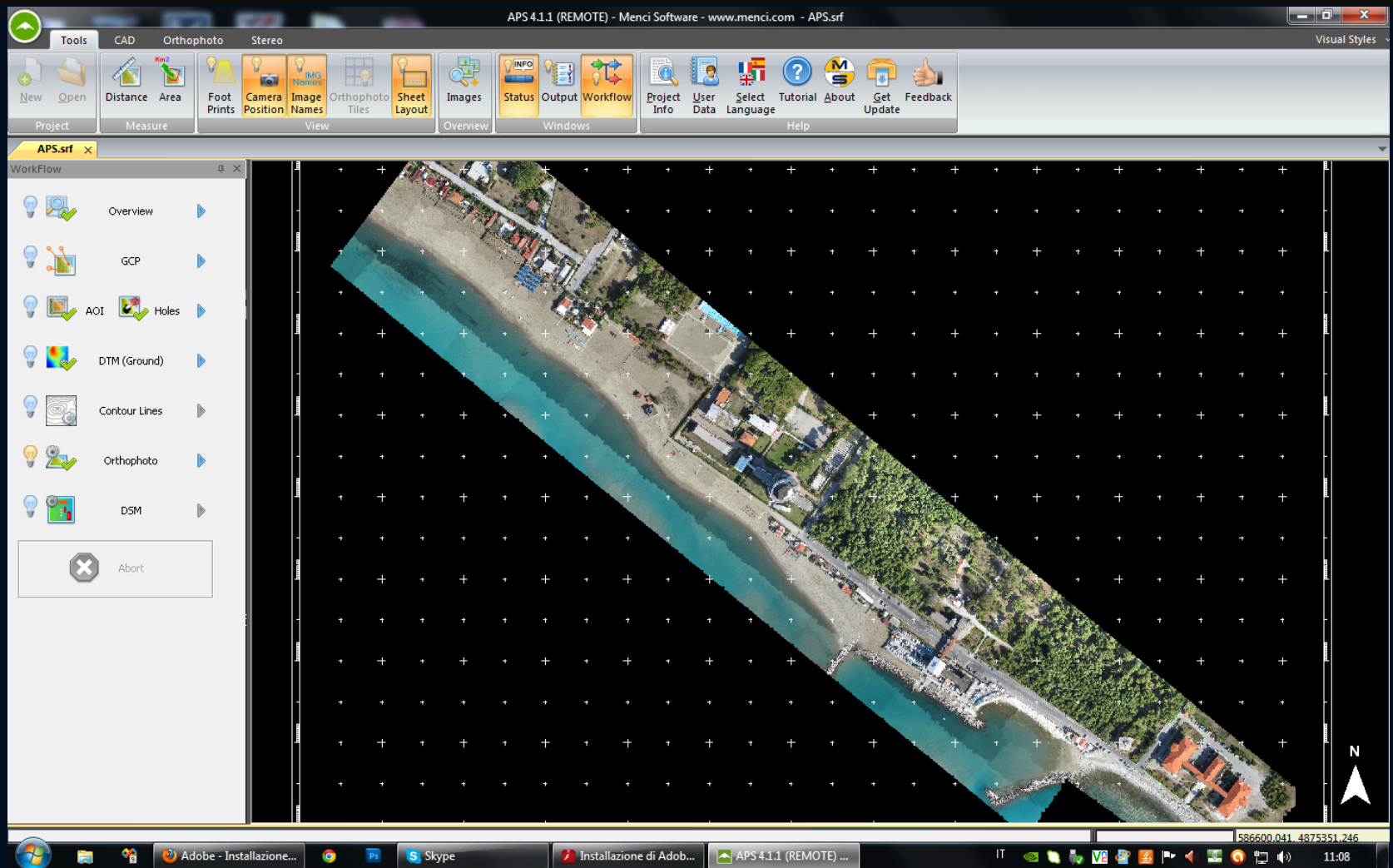


image processing tech



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DSM

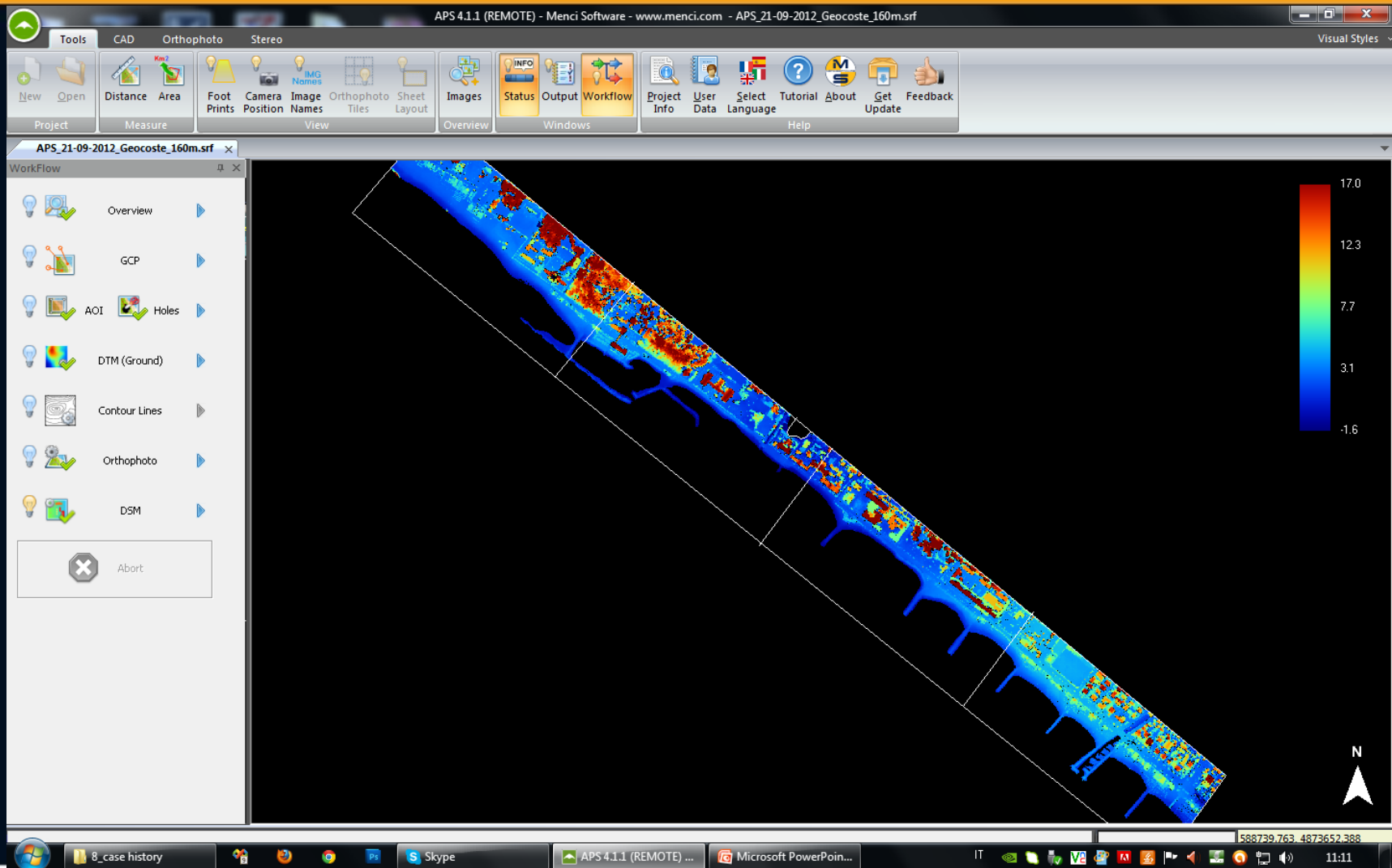


image processing tech



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3D point cloud

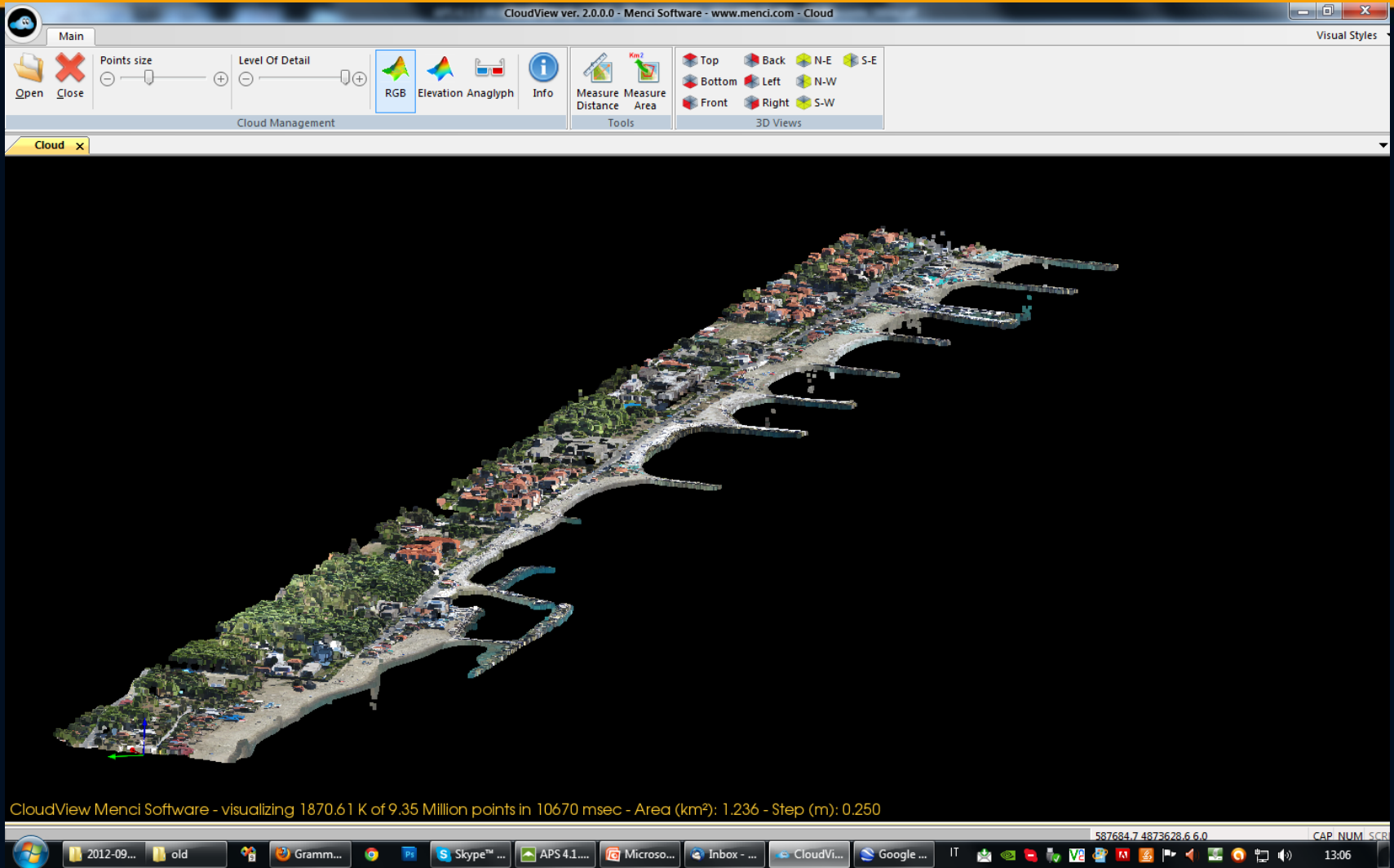


image processing tech



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Cartografia dettagliata e Caratterizzazione 3D per un centro storico

image processing tech



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Number of images: 97

Average GSD m: 0.05 m

Total Area: 0.267 Km²

Orthophoto Area: 0.218 Km²

Camera Model: Canon IXUS 220HS

Flight Time: 8 minutes, 35 seconds

Absolute Flight Height: 196.57 m

Relative Flight Height: 128.85 m

Average Ground Elevation: 67.72 m

Bundled Images: 97

Average Bundle Residuals: 0.875um

Bundle Time: 00:28:48

GCP imported: no

GCP Average Residuals: -

Orthophoto Average GSD: 0.05 m

DSM average GSD: 0.23

3D points number: 3.957.761

Total Process Time: 01:14:02

image processing tech



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Performed flight

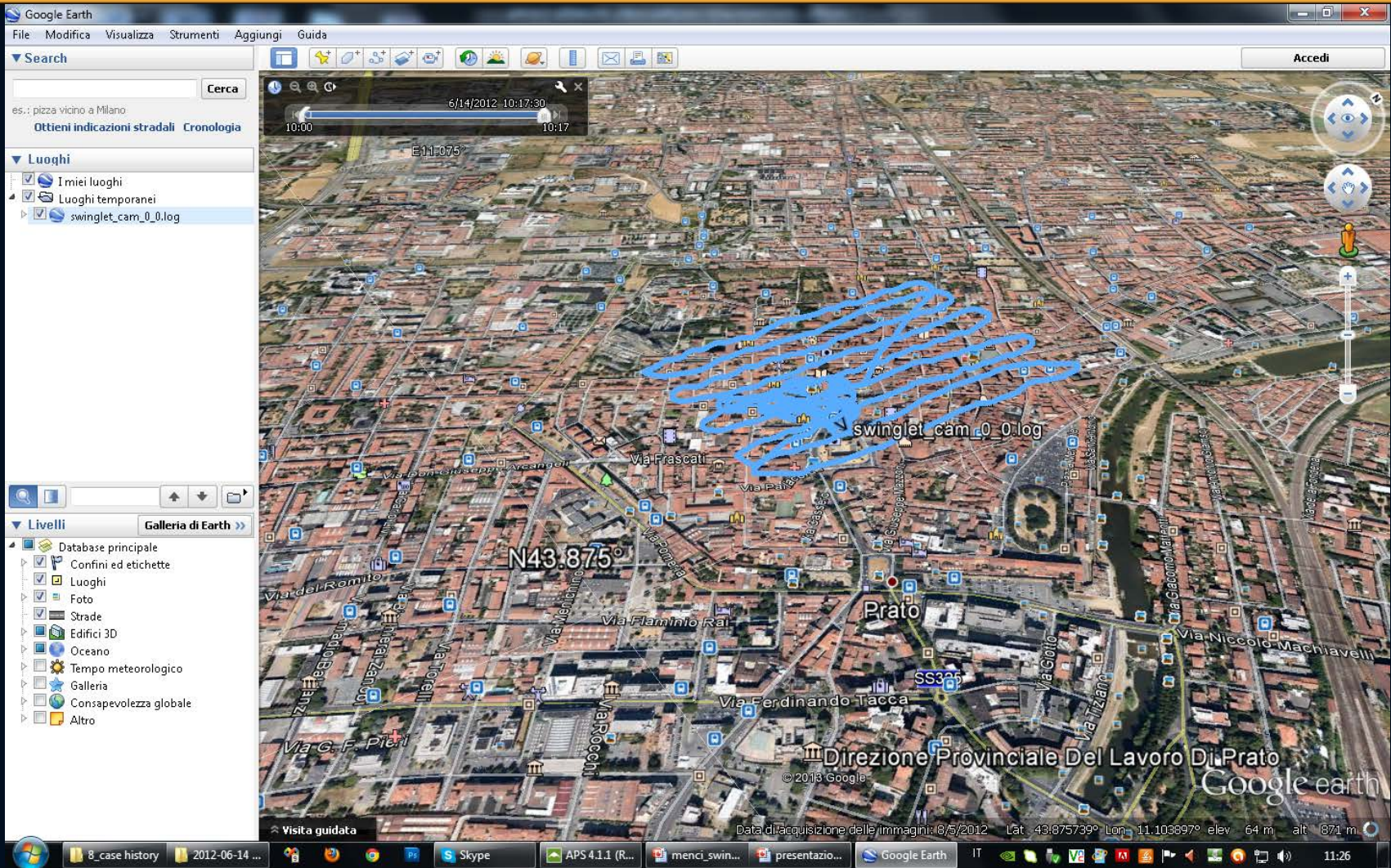


image processing tech



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Performed flight and projection centre

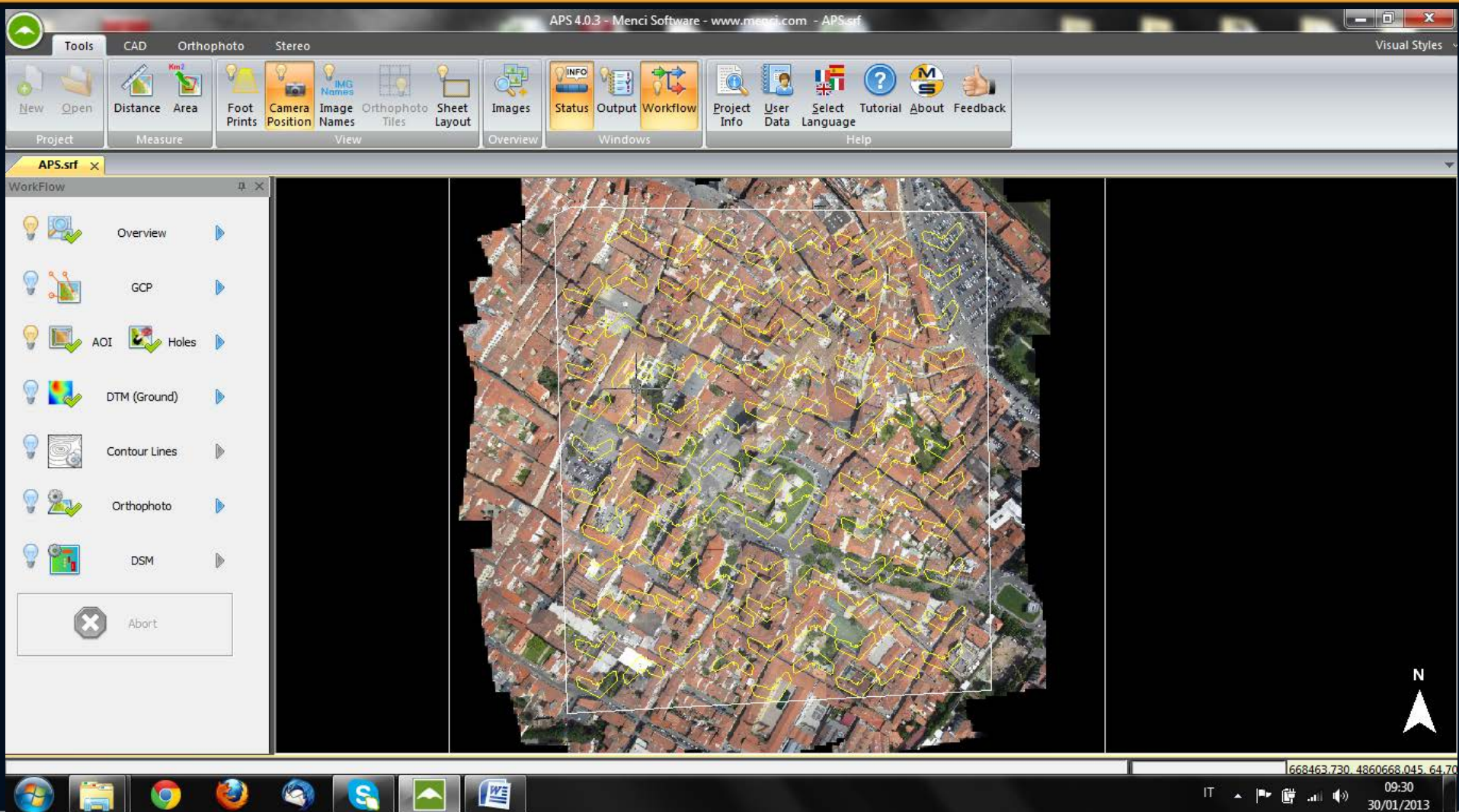


image processing tech



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Orthophoto

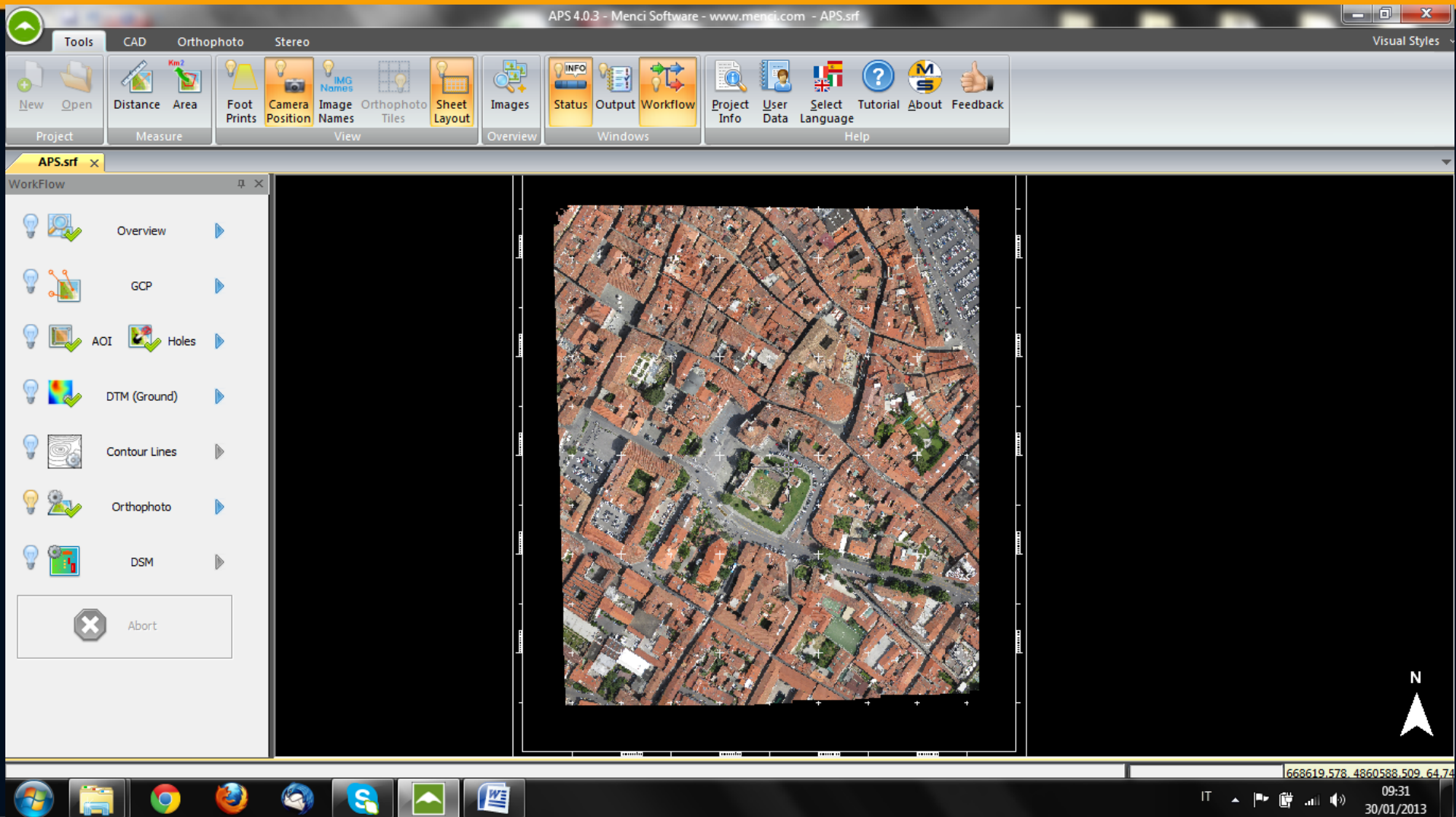


image processing tech



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Orthophoto detail

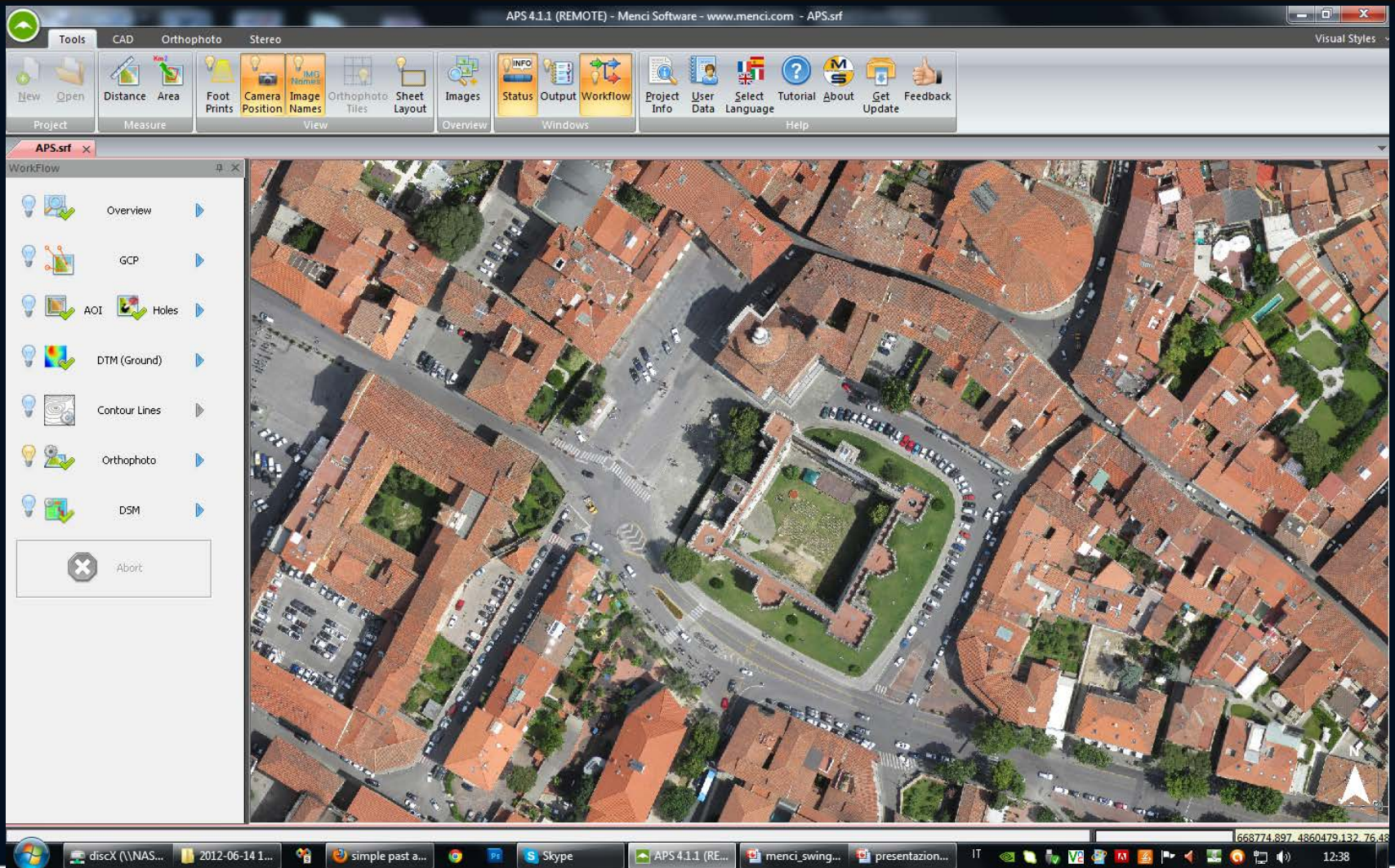


image processing tech



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DSM

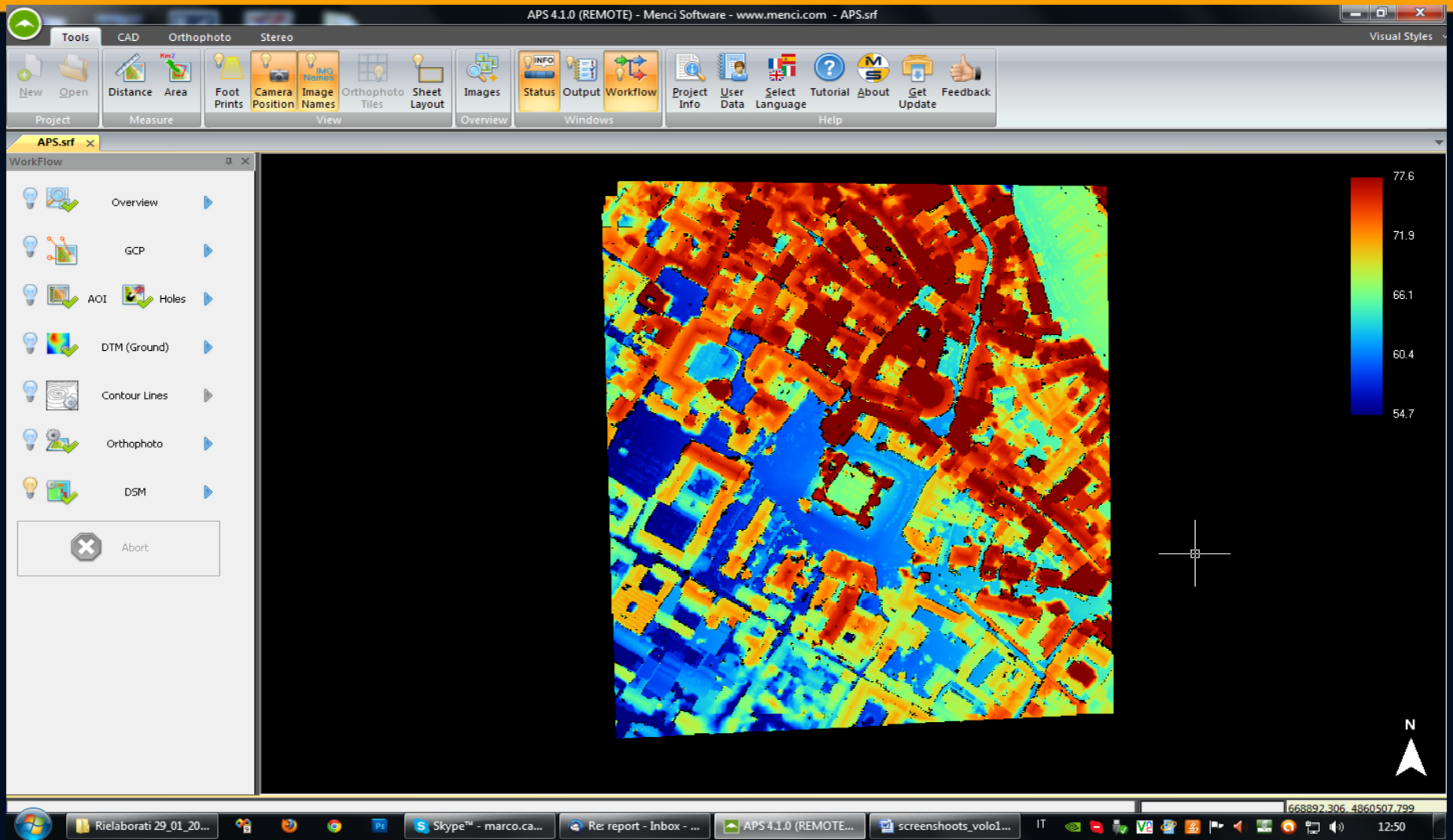


image processing tech



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3D Point Cloud

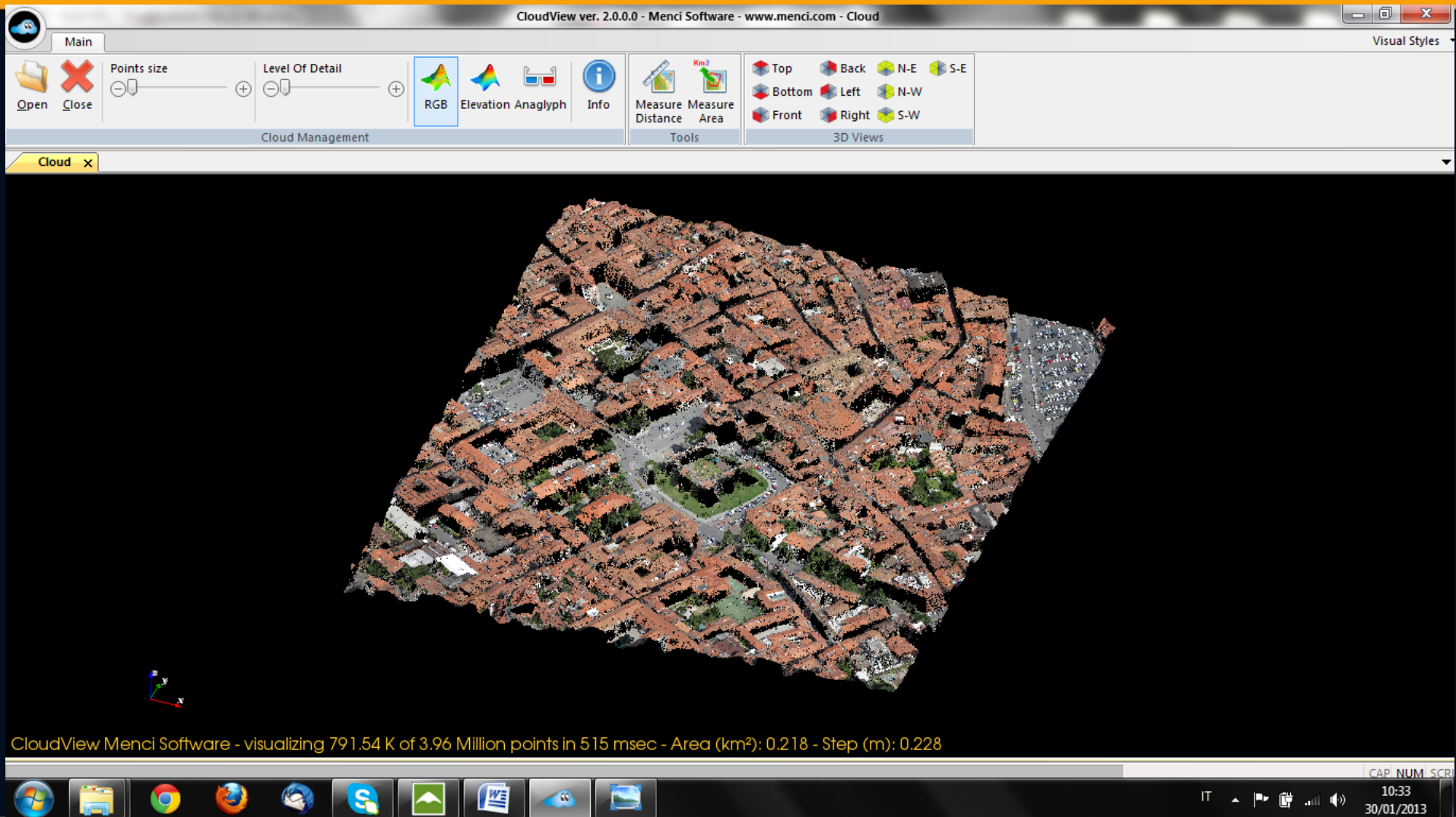


image processing tech



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APPLICATIONS:

Territorial survey

Environmental survey

Topographic survey

Geological survey

Evolving areas: quarry, land slides,
rivers, shores, landfills

Design and control for infrastructures.

Verification and monitoring in yards.

Grazie per la vostra attenzione

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Ufficio: Tel 0575/383960 Fax 0575/382051**

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