

*A3 Edge*

*Aerial Survey and Mapping System  
from VisionMap*



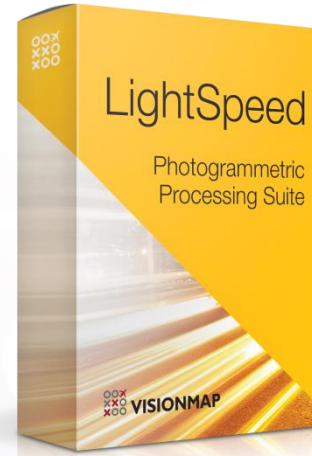


VisionMap's systems set a new standard for productivity in geospatial data production.





**Aerial survey camera**



**LightSpeed  
Photogrammetric Suite**



**Ground processing system**



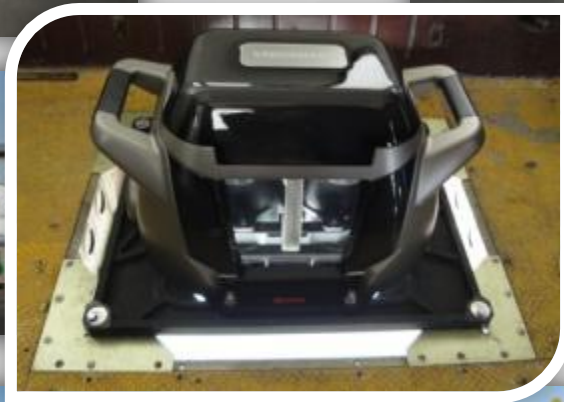
Camera	A3 Edge
Focal length (mm)	300
Max FOV (°)	110
CCD pixel size (μ)	7.4
CCD size (pix)	4,864 x 3,232
Maximal footprint (pix)	75,000 x 9,600
Max image size (Mpix)	700
Color	RGB / RGB+NIR
Color Depth (bit)	12
Vertical & Oblique aerial survey	Yes
Motion compensation	Forward, Roll, Vibration (FMC, RMC, VC)
Weight (kg)	42
Camera dimensions (cm)	50*60*60
Operation temperature (°C)	-15° - +55°

- Highest aerial survey productivity – up to **11,000 sq.km per hour**
- Highest orthophoto productivity – up to **9,000 sq.km per day**
- Highest GSD from a given flight altitude – **2.5 cm every 1,000 m**
- **Vertical & Oblique** images by one camera
- AT accuracy without Control Points – **20 – 50 cm**
- Fully automatic image processing, including **AT, DSM, dense DSM, orthophoto**
- **No need** for field geodetic works



- Vertical & Oblique accurately oriented images
- Stereopairs
- Orthophoto
- Dense DSM (colored point cloud)
- Point cloud based true orthophoto
- 3D City model with third party SW
- Oblique imagery use with Oblivision
- Automatic object recognition with Video Profiler





A3 Edge was designed for complete ease of use with compact size and light weight (42 kg total).

- ✓ **No special mounting required**
- ✓ **Detachable storage (VSSR)**
- ✓ **Installation time = 10-15 min.**

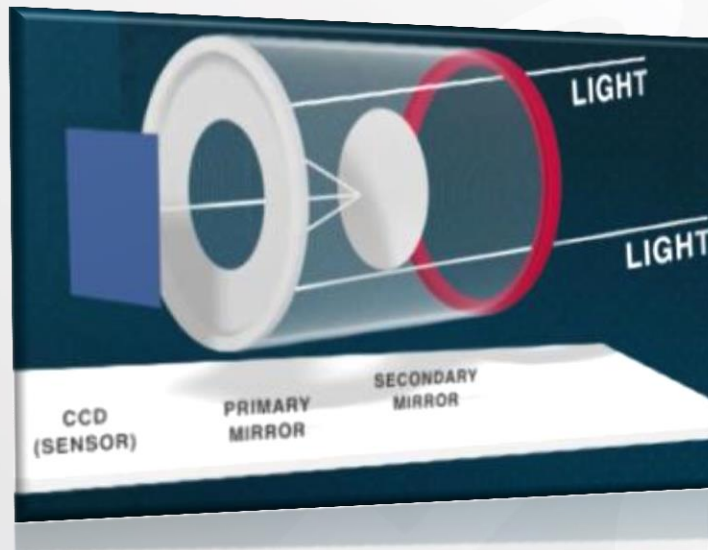
**Watch how fast A3 is installed!**





The A3 telescopes' secondary mirror compensates for 3 types of motion:

1. Telescopes' **Roll motion**
2. Aircraft's **Forward motion**
3. Aircraft's **Vibrations**



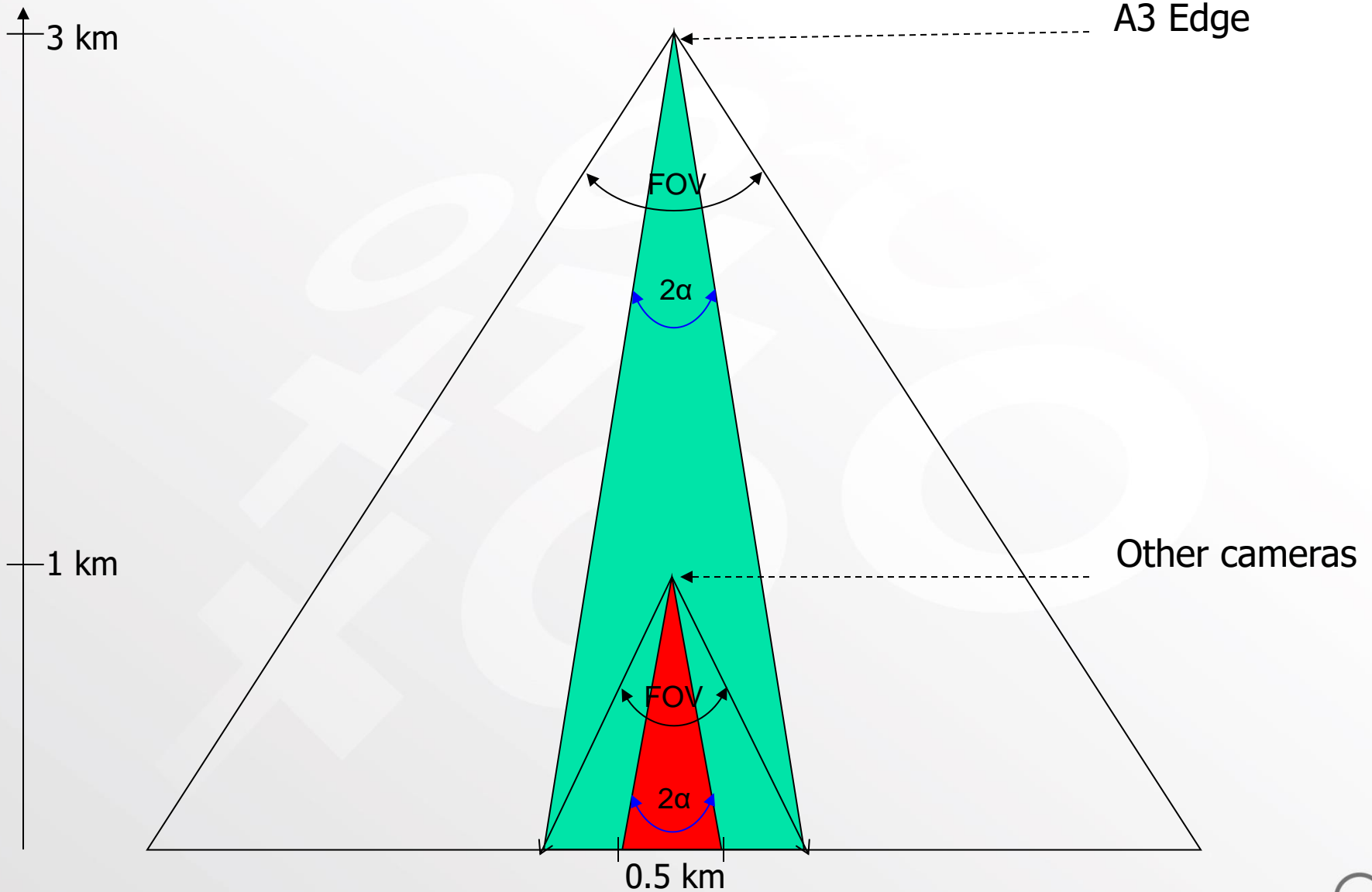
Camera scans at 1 radian/sec:  
**Motion compensation: off**



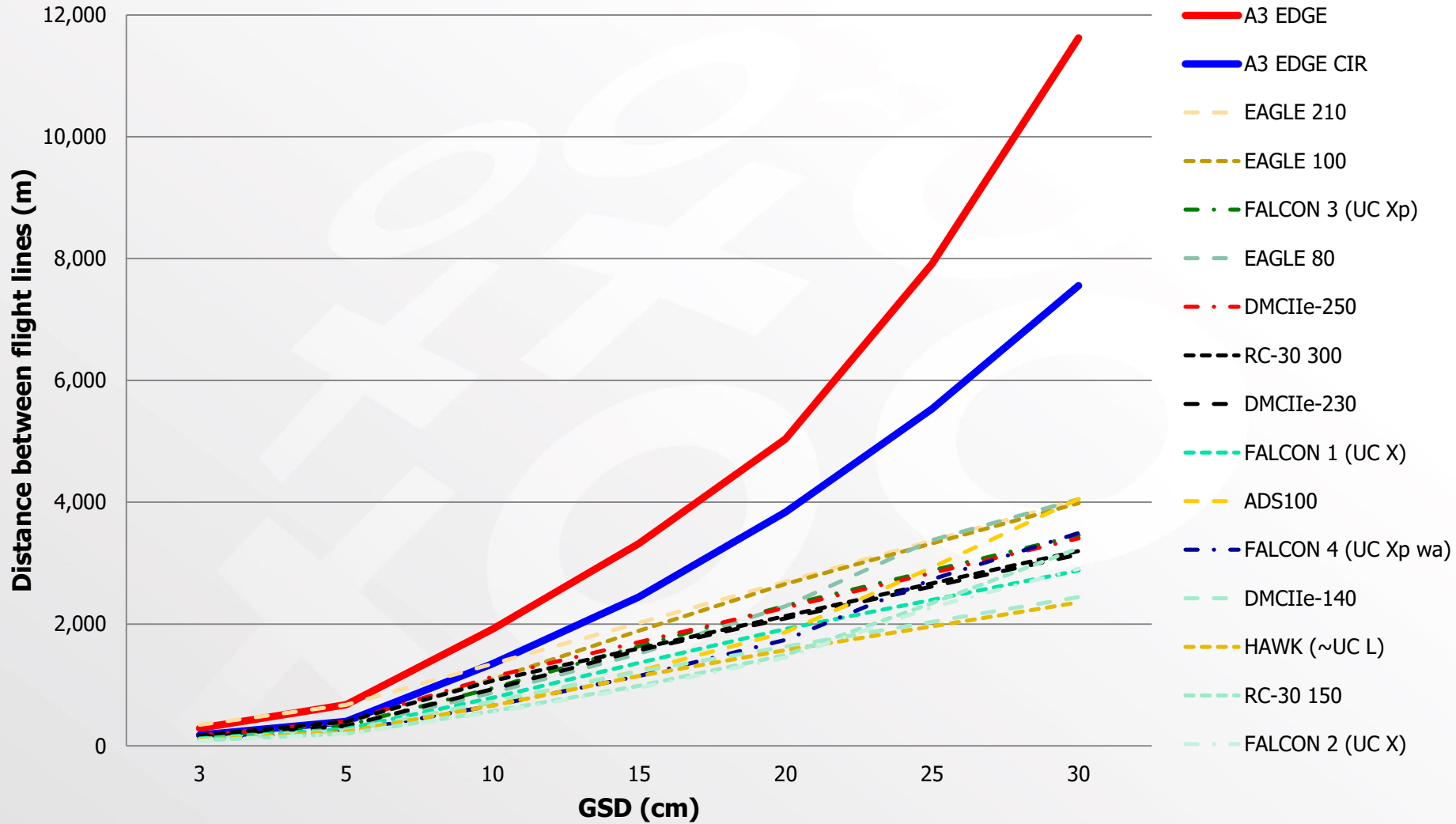
Camera scans at 1 radian/sec:  
**Motion compensation: on**



VisionMap's patented motion compensation technology provides **sharp, high quality images** at high and low altitudes, at any speed.







<b>Orthophoto resolution (cm)</b>	<b>3</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>	<b>30</b>
Altitude (feet)	3,300	5,500	11,000	16,600	22,100	27,700	33,200
Image GSD (cm)	2.50	4.17	8.33	12.50	16.67	20.83	25.00
Ground speed (knot)	130	160	240	330	370	410	450
Permissible orthophoto angle (2 $\alpha$ ,deg)	17°	25°	35°	40°	50°	60°	65°
Maximal building leaning (%)	15%	22%	32%	36%	47%	58%	64%
<b>Distance between flight lines (m)</b>	<b>273</b>	<b>674</b>	<b>1,917</b>	<b>3,320</b>	<b>5,671</b>	<b>8,777</b>	<b>11,622</b>
<b>Aerial survey productivity (sq.km/hour)</b>	<b>66</b>	<b>200</b>	<b>852</b>	<b>2,029</b>	<b>3,886</b>	<b>6,665</b>	<b>9,686</b>

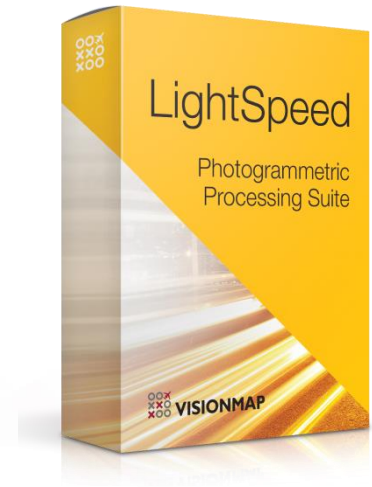
### Comments:

1. Forward overlap – 55%, side overlap - => 60%
2. Permissible orthophoto angle 2 $\alpha$  and building leaning correspond to the following well known parameters for aerial survey flight with analog RC30 or RMK TOP cameras with focal length 150 mm:

Side overlap for RC30 / RMK TOP (%)	20%	28%	35%	42%	55%	61%	67%	72%	78%	84%
Permissible orthophoto angle (2 $\alpha$ ,deg)	65°	60°	55°	50°	40°	35°	30°	25°	20°	15°
Maximal building leaning (%)	64%	58%	52%	47%	36%	32%	27%	22%	18%	13%



- **Flight Planning** (TopoFlight for A3, Switzerland)
- **Navigation**
- **Camera management**
- **Flight Viewer**
- **Fast Mosaic**
- **Data Viewer**
- **Control and Processing Center**
- **LightSpeed**
  - Aerial triangulation
  - DSM creation
  - Orthophoto production



## Tightly bound third party software for:

- **Stereocompilation**
  - Photomod, Racurs ([www.racurs.ru](http://www.racurs.ru))
- **3D City modeling**
  - Acute3D, Bentley Systems ([www.acute3d.com](http://www.acute3d.com))
- **Oblique imagery**
  - Oblivision, IDAN Computers ([www.idan.com](http://www.idan.com))
- **Automatic object recognition**
  - Visual Profiler, Video-Inform ([www.video-inform.com](http://www.video-inform.com))



- **Stationary HW configuration**

- 60-64 cores, 8 GB RAM each
- Storage ~48 TB
- LightSpeed stationary license

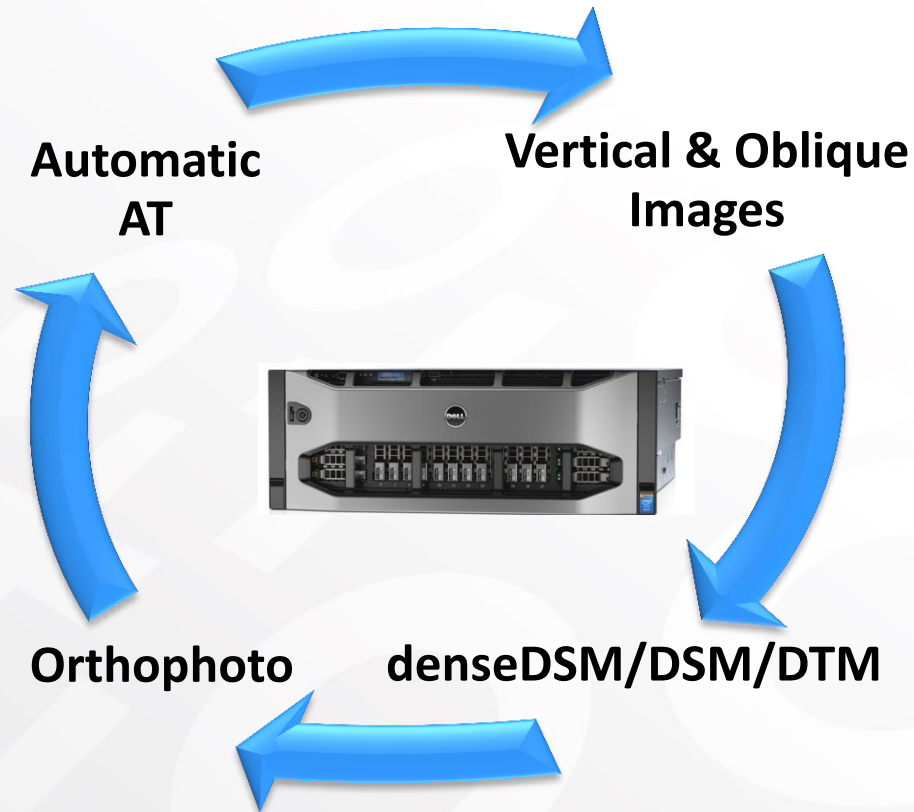


- **Mobile HW configuration**

- 20 - 24 cores, 8 GB RAM each
- Storage ~20 TB
- LightSpeed mobile license







LightSpeed is the **only** software that solves oblique imagery photogrammetrically, and provides a multi vertical/oblique block with very high uniform accuracy.



## LightSpeed processes thousands of km<sup>2</sup> per day

- ✓ Fully automatic Aerial Triangulation, Dense DSM, Orthophoto Mosaic, Oblique, Stereo Models
- ✓ Solves 250,000 frames in a single block
- ✓ High accuracy with or without DGPS stations and/or GCPs
- ✓ Significantly lower operational costs
- ✓ One operator for a full end-to-end workflow



GSD (cm)	Block Area (sq.km)
5	1,000
10	5,000
15	12,000
20	23,000
25	38,000
30	56,000

Image GSD (cm)	5	10	15	20	25	30
<b>LightSpeed Orthophoto Processing Speed (km<sup>2</sup>/24 hrs)</b>	250	1,000	2,250	4,000	6,250	9,000

Note:

1. Processing productivity is calculated for a fully automatic A3 processing not including DSM calculation and common manual processes like cut-line editing and QA.
2. Processing productivity is calculated for the VisionMap LightSpeed standard cluster, optimal aerial survey parameters (forward overlap -55%, side overlap – 60%) and assumes parallel processing of several projects.



## Stuttgart University Accuracy Certification

Camera	Forward overlap (p%)	Side overlap (q%)	Strips	GCP	RMS East (m)	RMS North (m)	RMS Z (m)	RMS-E/GSD (%)	RMS-N/GSD (%)	RMS-Z/GSD (%)
A3 (Case 5b)	52%	86%	8	5	0.020	0.023	0.052	33%	39%	87%
A3 (case 6b)	52%	86%	8	10	0.015	0.018	0.030	24%	30%	50%
A3 (Case 7b)	52%	73%	5	5	0.017	0.023	0.050	28%	39%	84%
A3 (Case 8b)	52%	73%	5	10	0.016	0.017	0.035	27%	28%	58%

### Notes:

- Average altitude: 1972 m
- Flight line direction: east-west, bi-directional
- Average ground speed: 113 knot
- Difference in ground speed in two directions: 23 knot
- GSD: 6 cm
- Number of flight line: 8
- Average forward overlap: p = 52%
- Average side overlap: q = 86% (when all 8 flight lines are considered) or 73% (when 5 flight lines are considered)
- Number of check points: 136

The complete report can be found on [www.visionmap.com/files/IFP\\_Visionmap\\_A3\\_Report.pdf](http://www.visionmap.com/files/IFP_Visionmap_A3_Report.pdf).



GSD (cm)	5		10		15		20		25		30	
	RMSxy	RMSz	RMSxy	RMSz	RMSxy	RMSz	RMSxy	RMSz	RMSxy	RMSz	RMSxy	RMSz
<b>AT (internal, pix)</b>	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5	1.0
<b>AT - PPP without GCP (abs. in cm)</b>	20.0	22.5	25.0	30.0	35.0	40.0	40.0	45.0	45.0	50.0	50.0	55.0
<b>AT - DGPS without GCP (abs. in cm)</b>	10.0	12.5	15.0	17.5	20.0	22.5	25.0	27.5	30.0	32.5	35.0	37.5
<b>AT - DGPS \ PPP with GCP (abs. in cm)</b>	4.0	5.0	6.0	7.5	7.5	10.0	10.0	14.0	12.5	18.0	15.0	21.0

## Notes

- Assuming PPP accuracy: RMSxy and RMSz – not more than 18 cm / Assuming DGPS accuracy: RMSxy and RMSz – not more than 8 cm.
- Forward overlap - not less than 55%; Side overlap - not less than 60%.
- Number of strips in one AT block - not less than 2; Number of sweeps in one strip - not less than 20.
- GCP - signalized points with coordinates in WGS84; GCP placement - every second strip every 15th sweep;
- Accuracy assessment - in WGS84; Accuracy assessment on GCPs- regarding check points which are located between outside strips of the block.
- AT (internal) - AT accuracy assessed on tie points.
- Check Points Accuracy: RMSxy and RMSz - not more than 2.5cm.



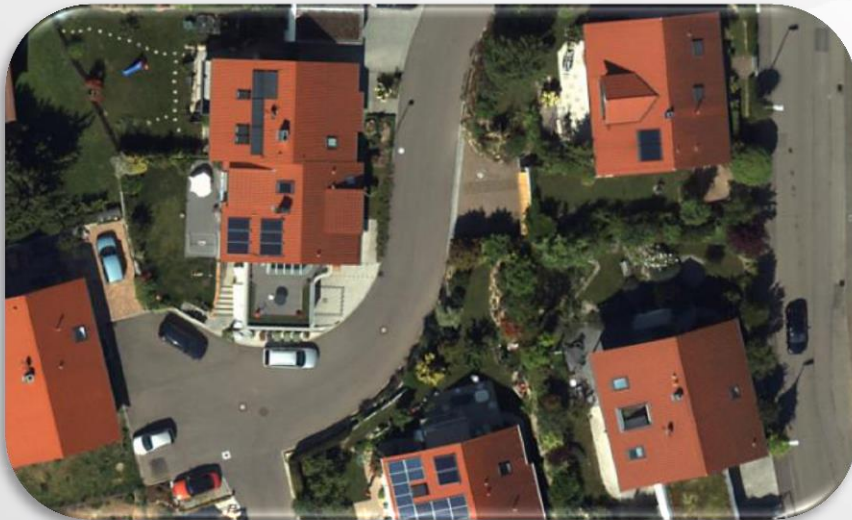
**Orthophoto / Mapping / Cadastre / GIS**



**Oblique images**



**High resolution urban images**



**3D City Modeling**



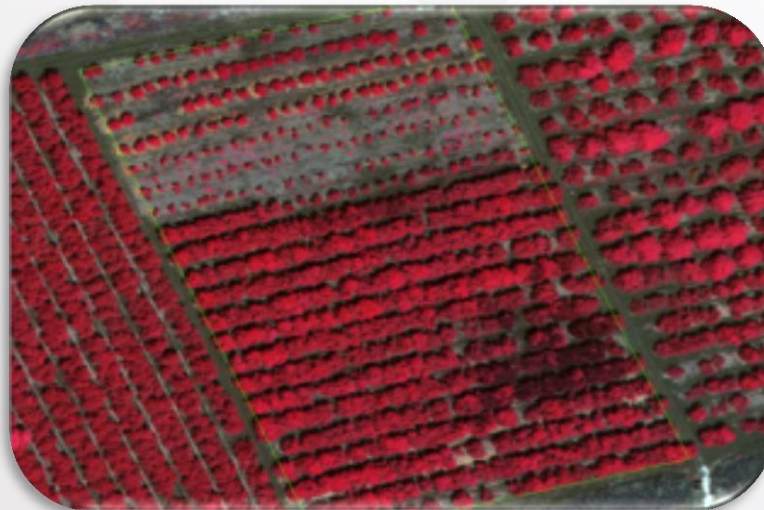
**Forestry**



**Emergency Situation / Rapid Response**



**Agriculture**



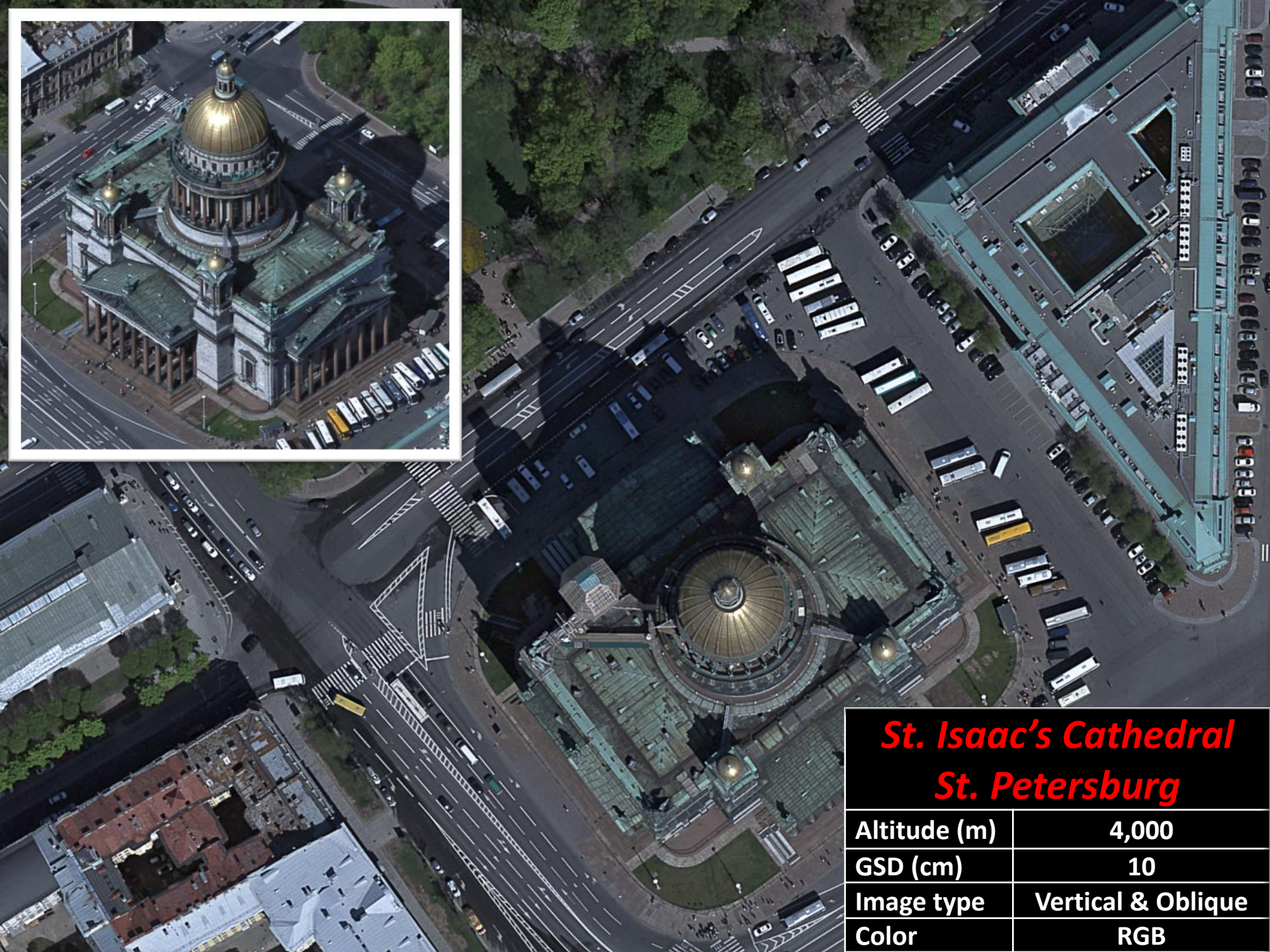




Jerusalem, The Holy Sepulcher







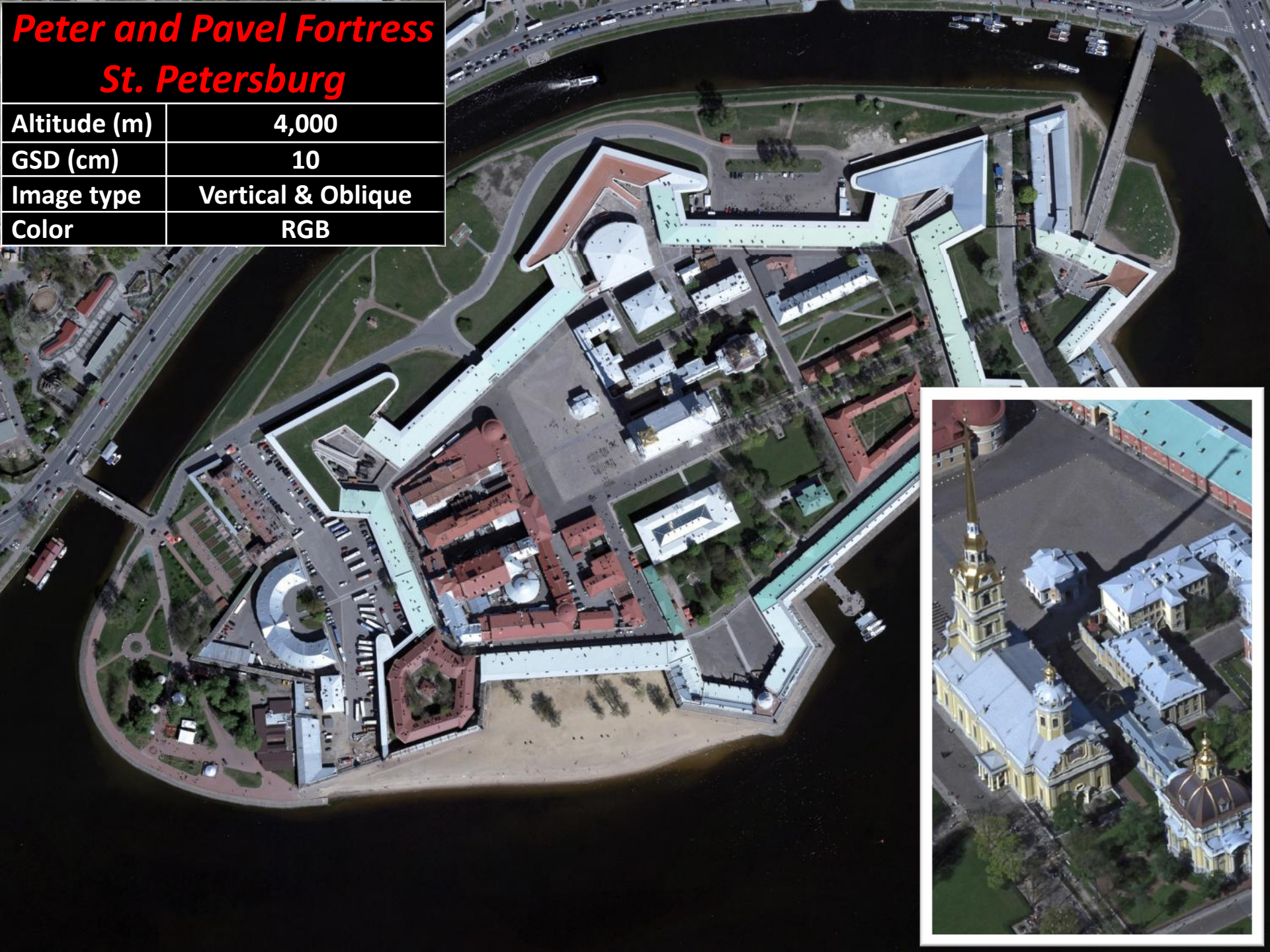
***St. Isaac's Cathedral  
St. Petersburg***

Altitude (m)	4,000
GSD (cm)	10
Image type	Vertical & Oblique
Color	RGB

# *Peter and Pavel Fortress*

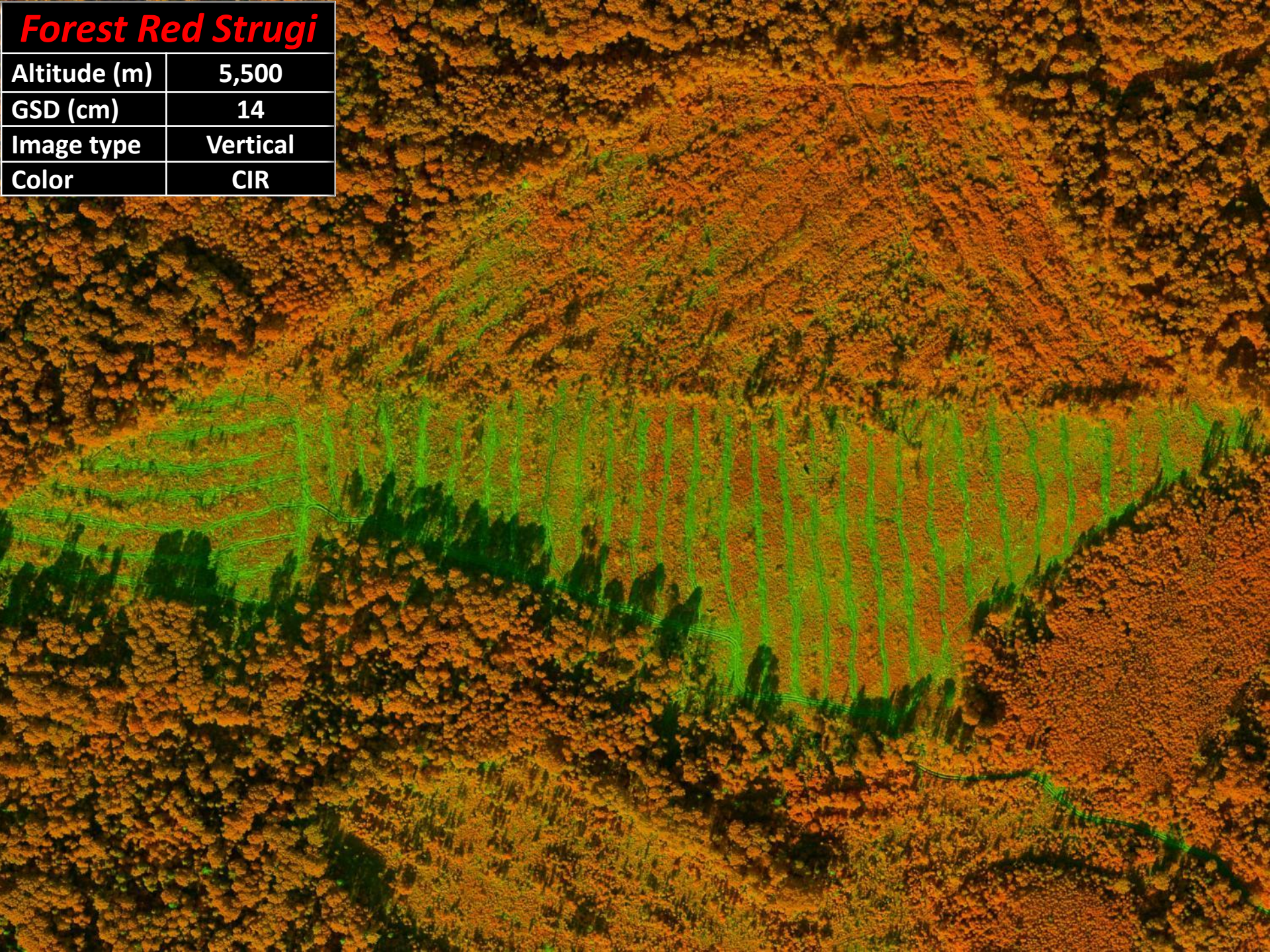
## *St. Petersburg*

Altitude (m)	4,000
GSD (cm)	10
Image type	Vertical & Oblique
Color	RGB



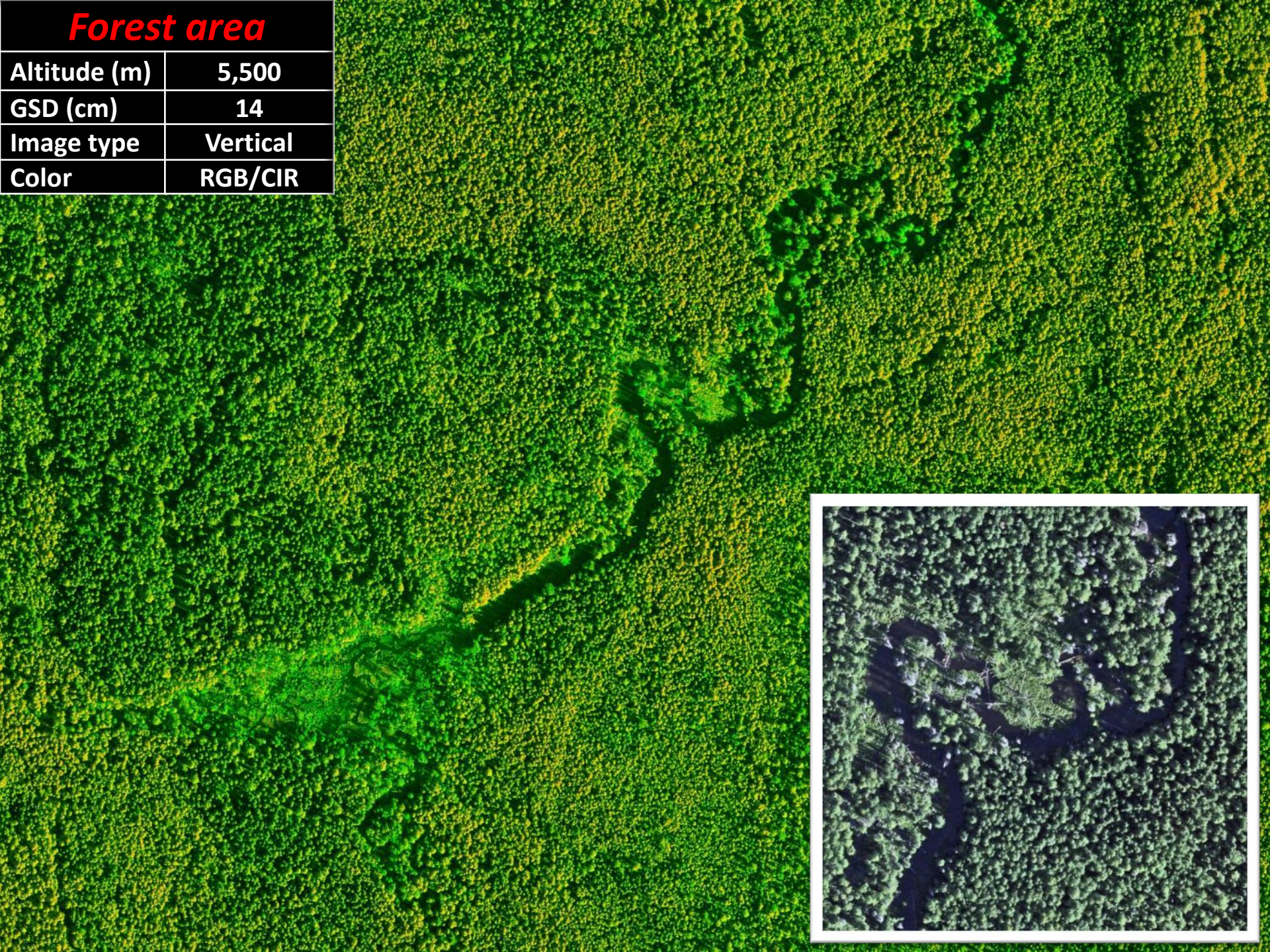
# *Forest Red Strugi*

Altitude (m)	5,500
GSD (cm)	14
Image type	Vertical
Color	CIR



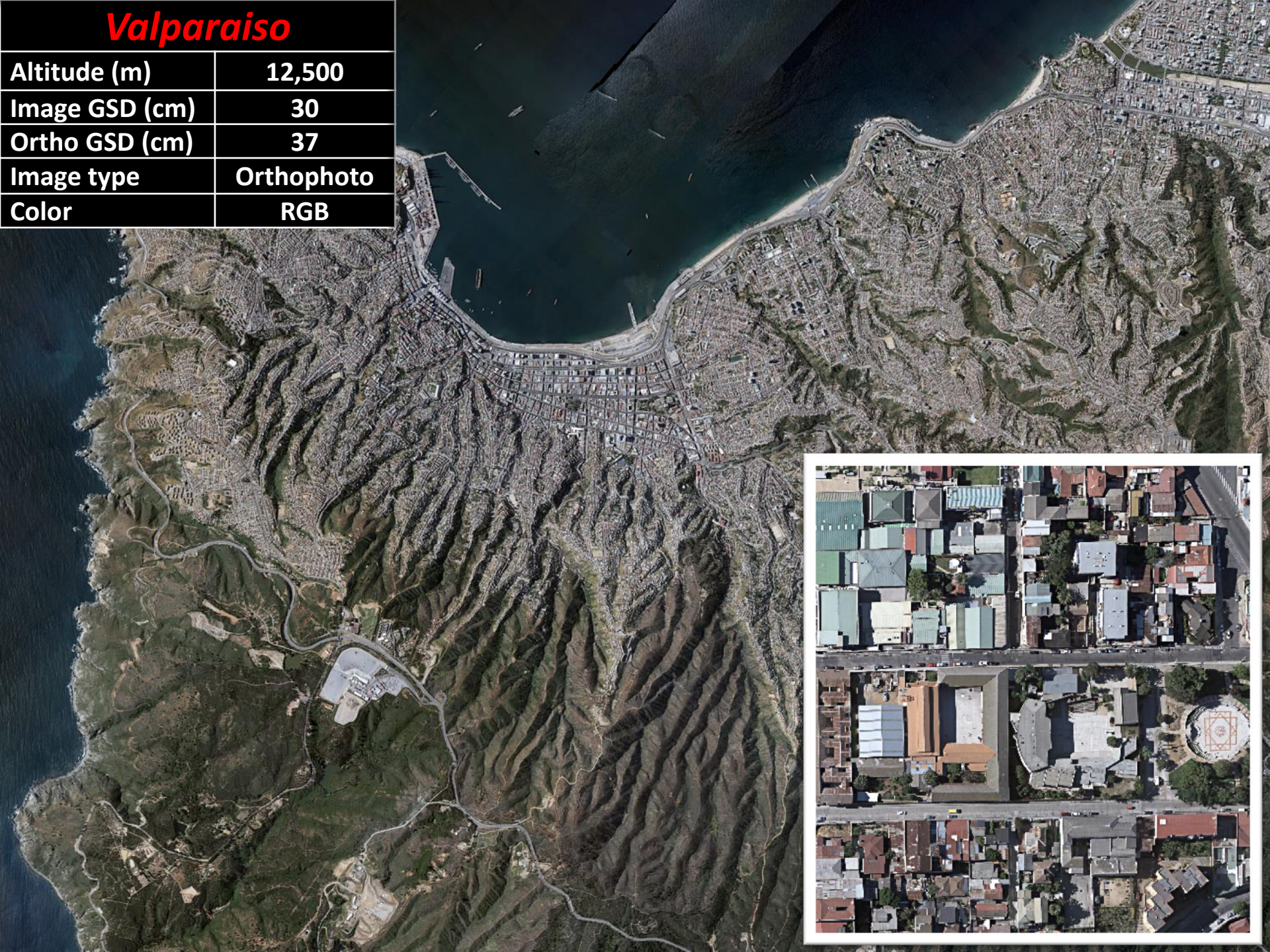
## *Forest area*

Altitude (m)	5,500
GSD (cm)	14
Image type	Vertical
Color	RGB/CIR



# Valparaiso

Altitude (m)	12,500
Image GSD (cm)	30
Ortho GSD (cm)	37
Image type	Orthophoto
Color	RGB



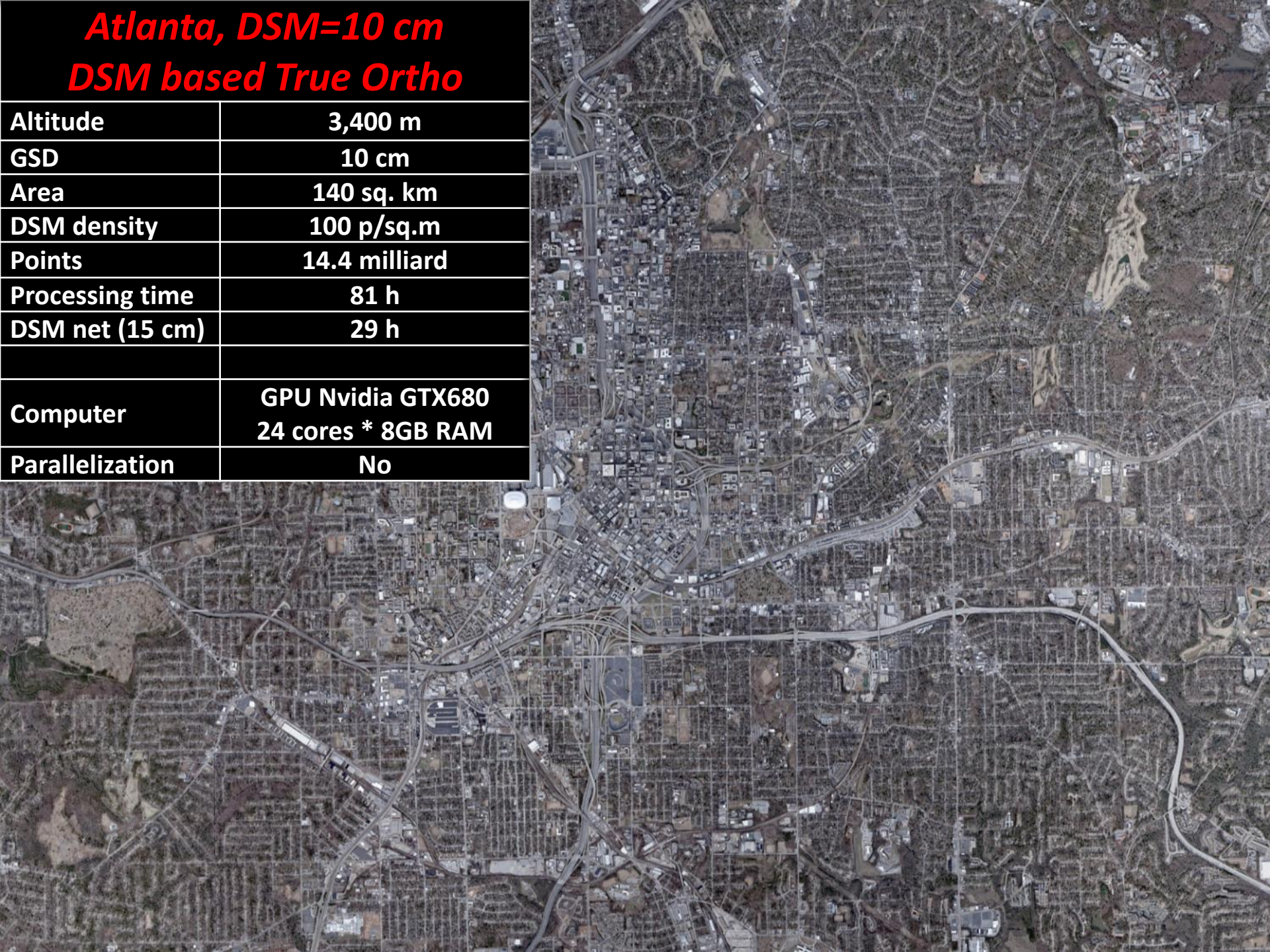


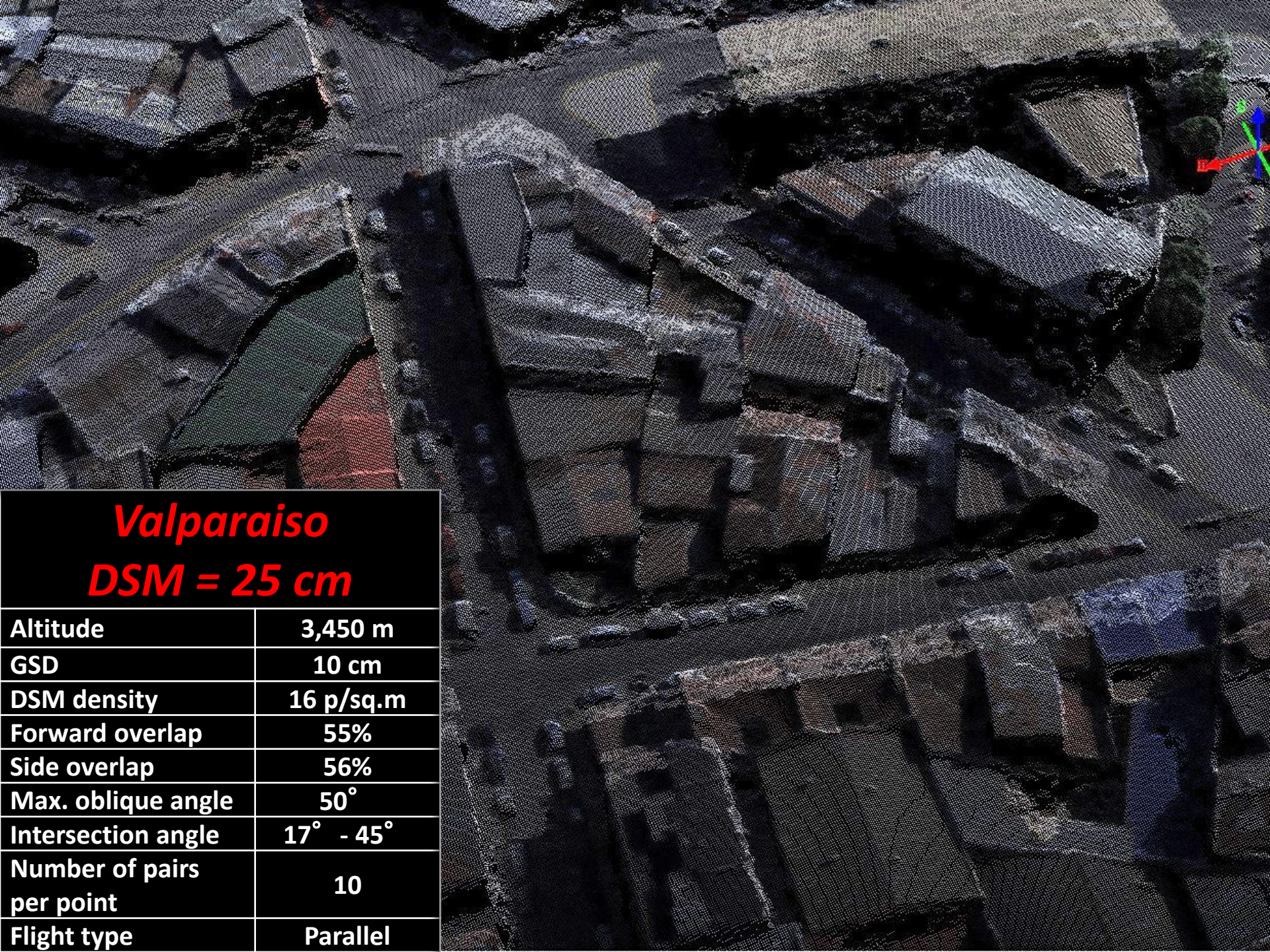
GSD – 5 cm  
DSM density – 400 points per sq.m



**Atlanta, DSM=10 cm**  
**DSM based True Ortho**

<b>Altitude</b>	<b>3,400 m</b>
<b>GSD</b>	<b>10 cm</b>
<b>Area</b>	<b>140 sq. km</b>
<b>DSM density</b>	<b>100 p/sq.m</b>
<b>Points</b>	<b>14.4 milliard</b>
<b>Processing time</b>	<b>81 h</b>
<b>DSM net (15 cm)</b>	<b>29 h</b>
<b>Computer</b>	<b>GPU Nvidia GTX680</b> <b>24 cores * 8GB RAM</b>
<b>Parallelization</b>	<b>No</b>





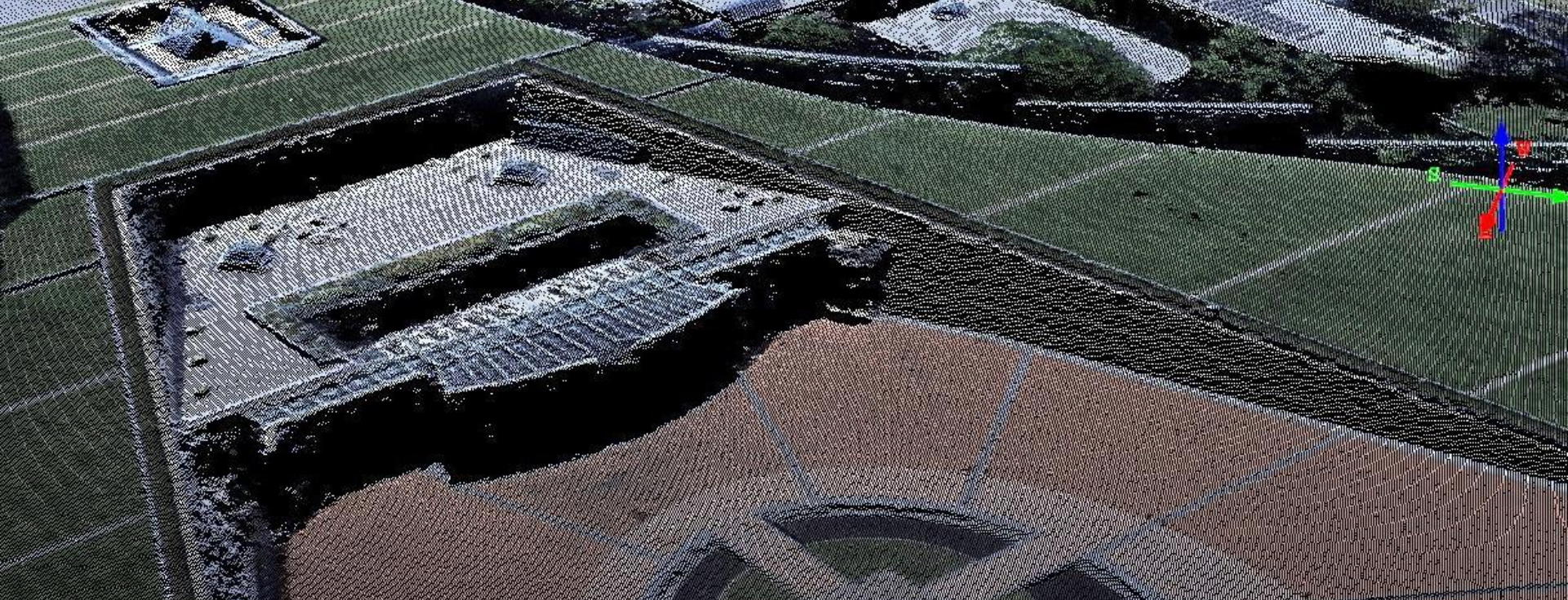
## ***Valparaiso*** ***DSM = 25 cm***

Altitude	3,450 m
GSD	10 cm
DSM density	16 p/sq.m
Forward overlap	55%
Side overlap	56%
Max. oblique angle	50°
Intersection angle	17° - 45°
Number of pairs per point	10
Flight type	Parallel



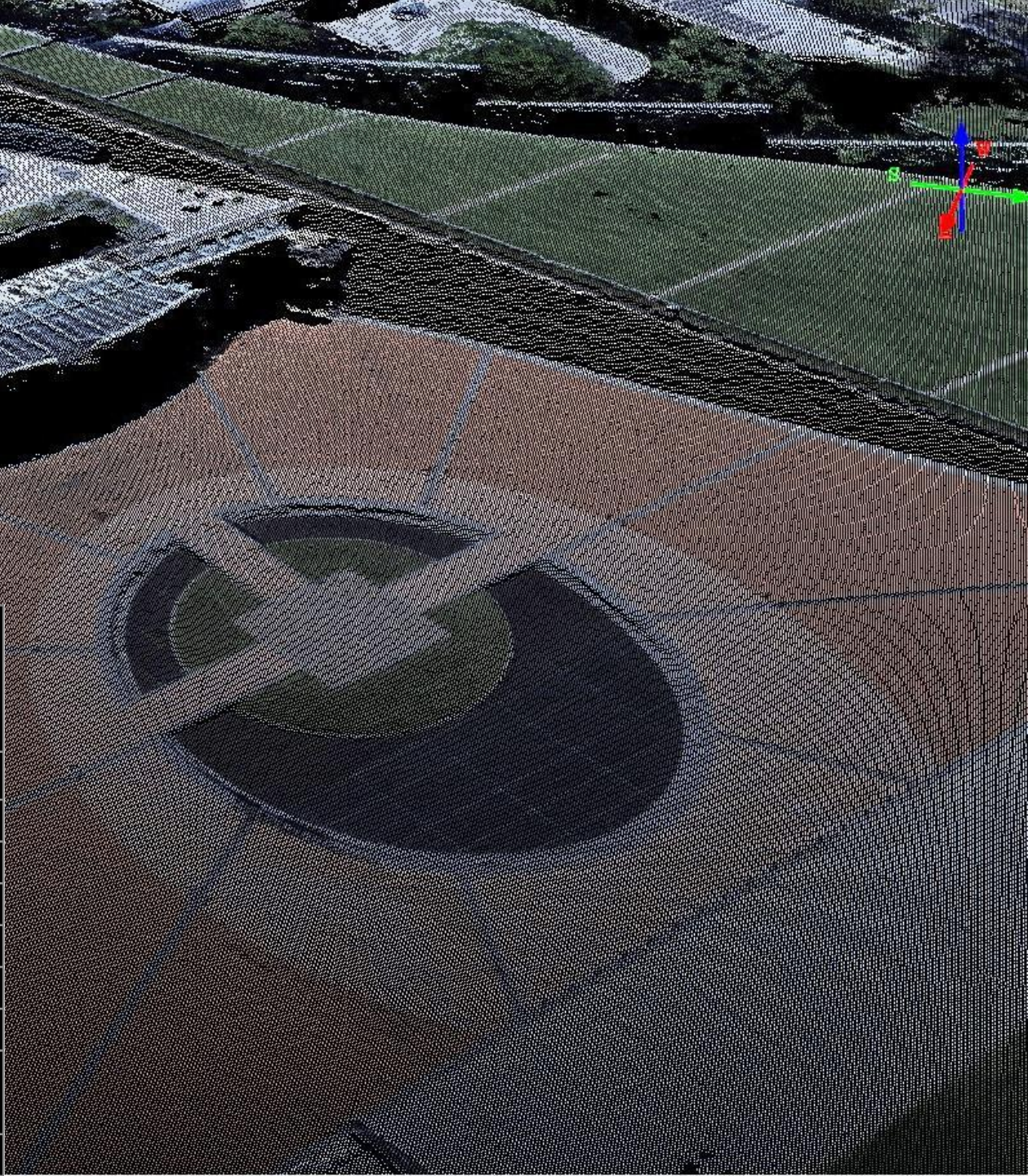


***Valparaiso, DSM=25 cm  
DSM based True Ortho***



**Canberra**  
**DSM = 25 cm**

Altitude	3,120 m
GSD	8 cm
DSM density	16 p/sq.m
Forward overlap	55%
Side overlap	80%
Max. oblique angle	50°
Intersection angle	15° - 45°
Number of pairs per point	8
Flight type	Parallel





**Canberra, DSM=25 cm**  
**DSM based True Ortho**





Oblique images

Orthophoto

10m





## Shateau Lapallise, France





## Devils Tower, USA

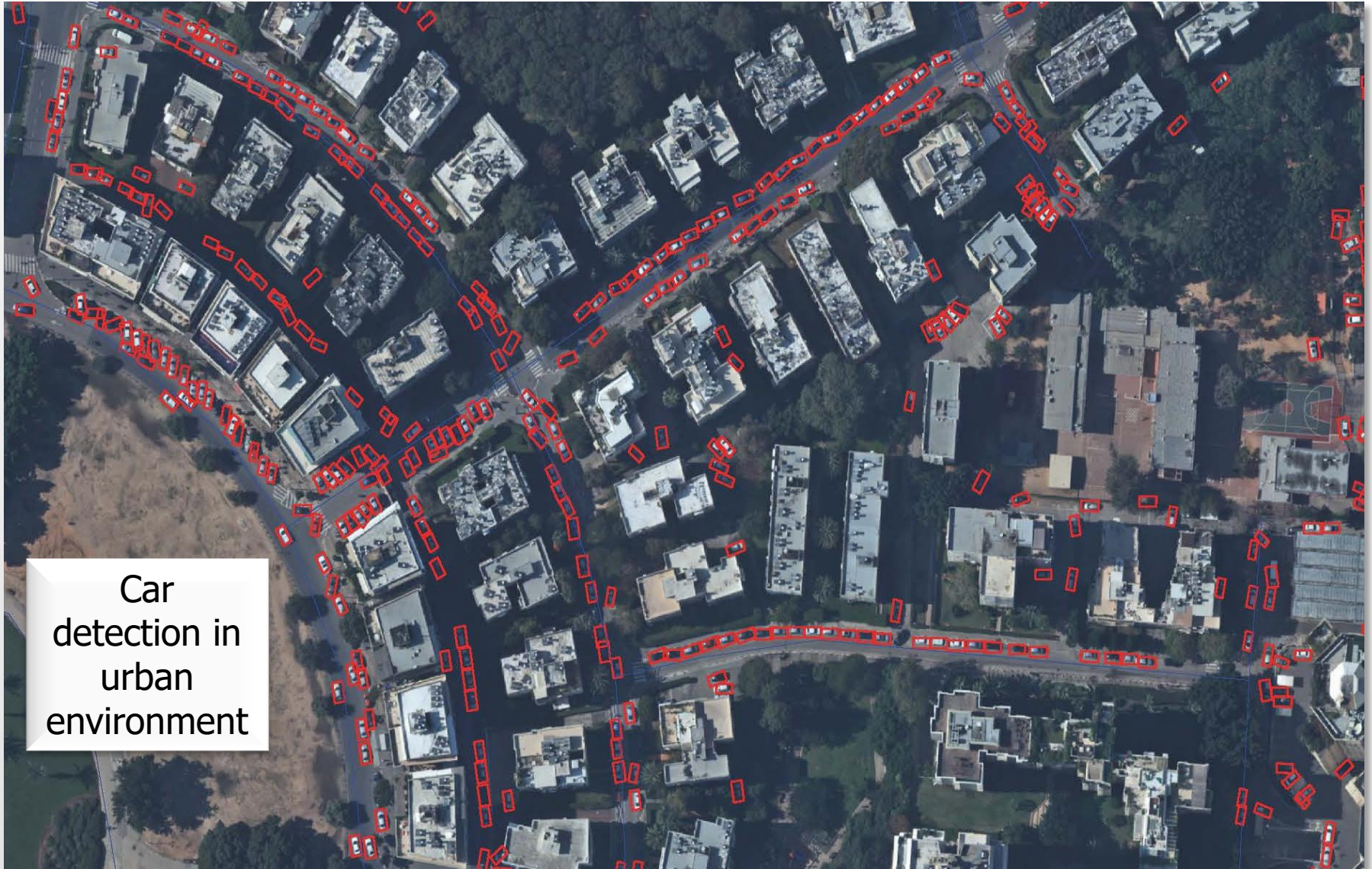




## Mount Newman mine, Australia

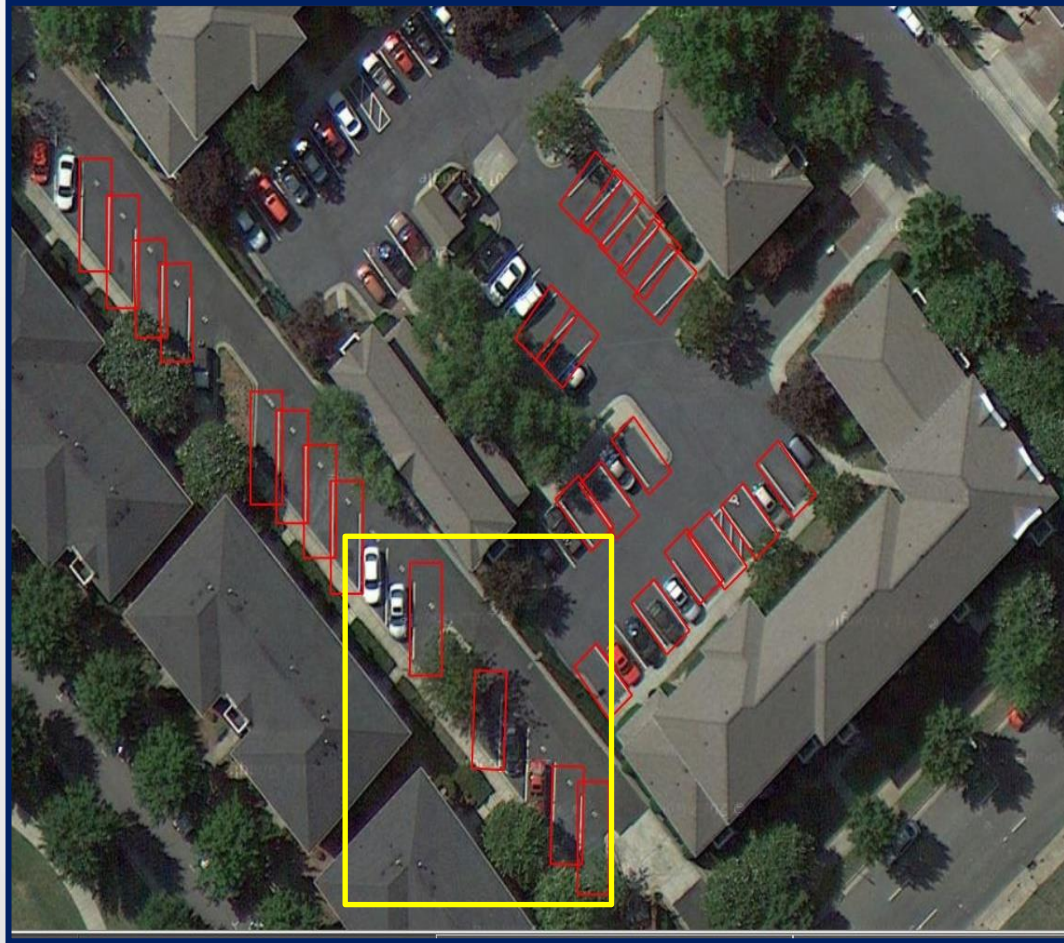






Car  
detection in  
urban  
environment





Elephants  
counting and  
monitoring





*Thank You*

**RAFAEL**   
**VISIONMAP**

VISIONMAP

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