

Schrägbilder, Eigenschaften und Fähigkeiten der UltraCam Osprey

UltraCam Osprey M3 Premium
UltraCam Osprey M3 Essential

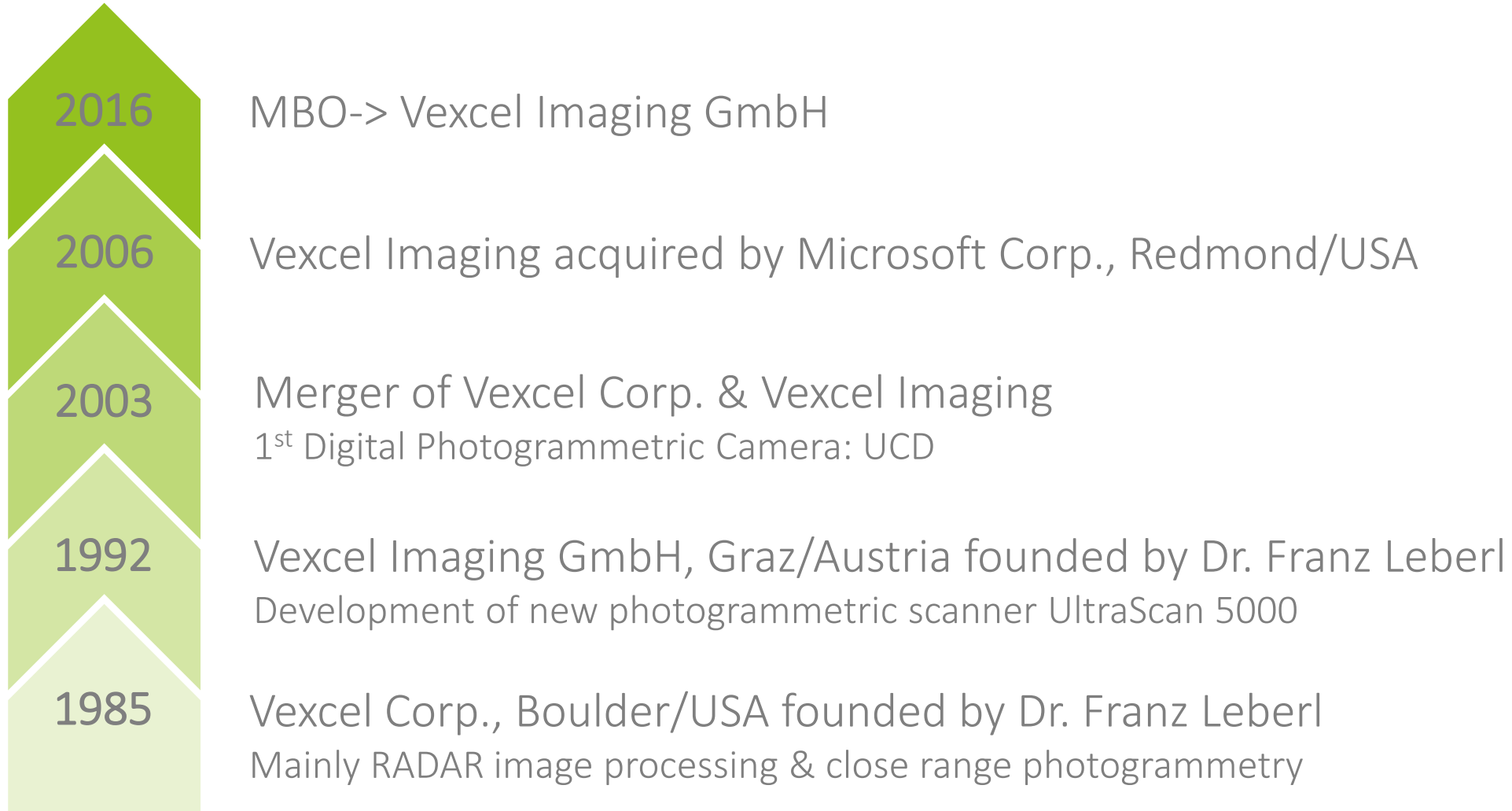




Agenda

- Vexcel Imaging GmbH History
- Product Portfolio
- Concept of the UltraCam
- Calibration of the UltraCam
- UltraCam Osprey Concept
- UltraMap Workflow

History





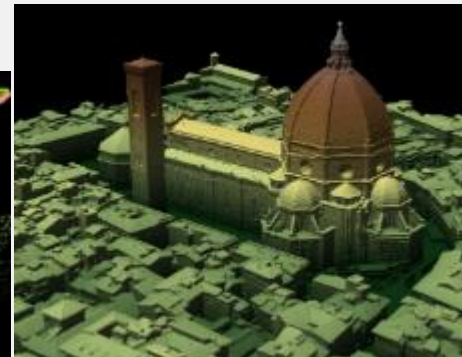
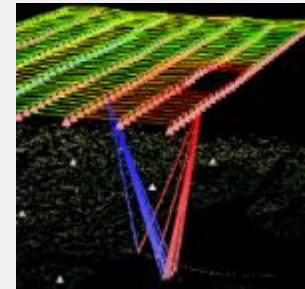
Exploring the world from every angle

Aerial Cameras



Terrestrial Systems

UltraMap & Orbit Software





3 camera categories

● Wide-Area Mapping
UltraCam Condor

● Photogrammetric Oblique
UltraCam Osprey M3 Premium
UltraCam Osprey M3 Essential



● Photogrammetric Nadir
UltraCam Eagle M2
UltraCam Falcon M1
UltraCam Falcon M2



Image footprints from 10,300 to 38,000 pixels

Wide-Area Mapping

Capture large regions in record-time for automated DSM, DTM and ortho image generation as well as for classification needs.

Condor M1



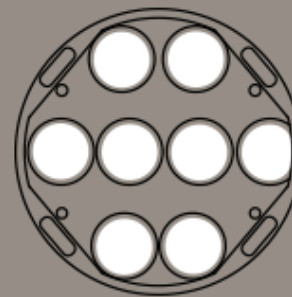
Photogrammetric Nadir

From lower altitude engineering applications to high-altitude orthophotography projects

Eagle M2

Falcon M1

Falcon M2



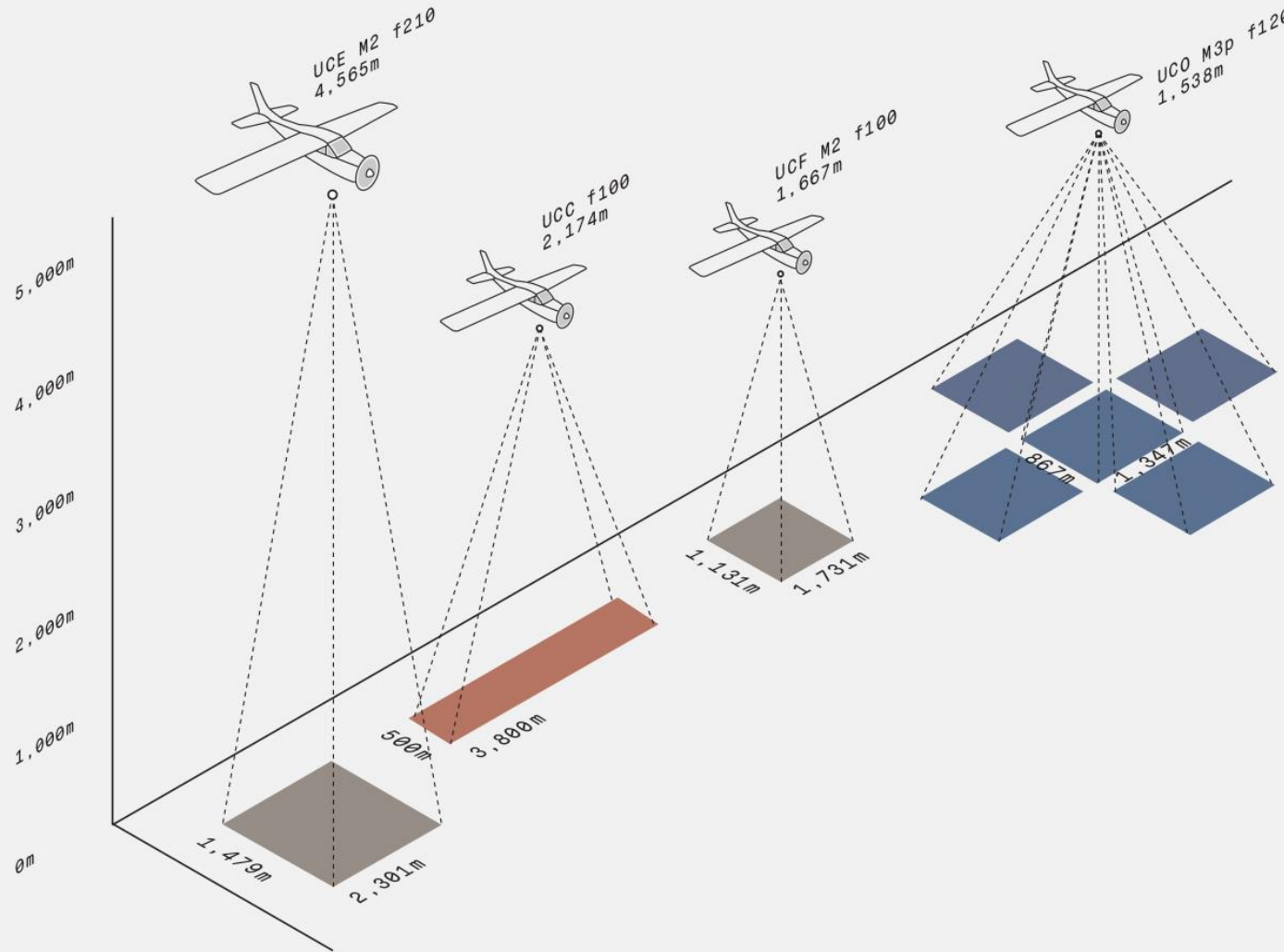
Photogrammetric Oblique

Urban mapping 3D city modeling and photogrammetric applications (cadastre, infrastructure planning, etc.)

**Osprey M3
Premium**

**Osprey M3
Essential**





Our comprehensive digital
aerial camera portfolio
provides a wide range of
imaging capabilities.

For collections @ 10 cm GSD



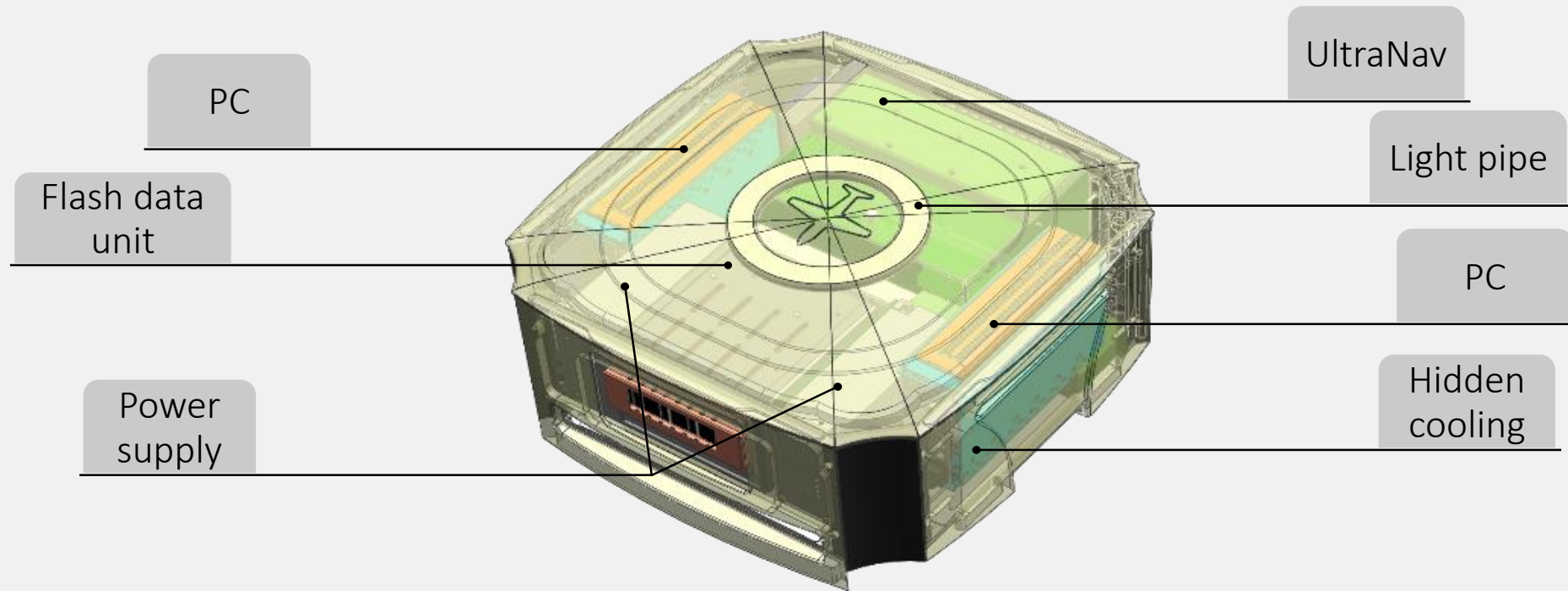
Highly integrated housing design



Sensors, storage and computing, along with direct geo-referencing and flight management subsystems are all built into the camera housing.



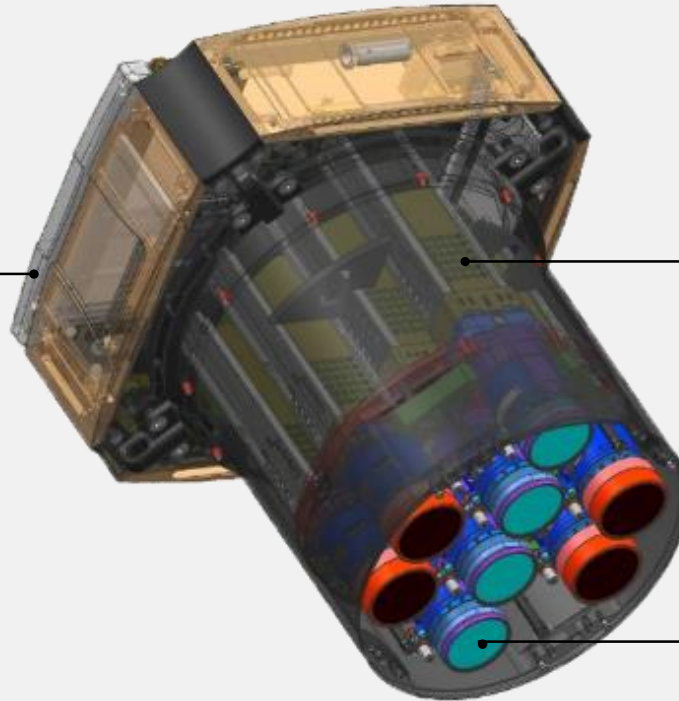
Built-in subsystems





Sensor stack

Retractable
Handles



Custom CCD @ 72 db signal/noise
14 bit dynamic image collection
Custom electronics for fast frame
rate & high image dynamic

UCNA
Cones

Custom optics
Custom shutter with
feedback loop

Optics



In-flight exchangeable & redundant storage system



Solid state disk pack

Storage capacity from 5 to 10 TB

Data protection by internal RAID

2.2 kg weight of the data unit



Data download via
docking station



Ultra-handy operator panel



10.4'' TFT LCD (1024 x 768 XGA)

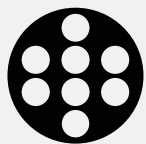
Sunlight readable (contrast 1200:1)

IR touch screen: No extra glass plate

Usage of gloves and pens possible

Integrated USB interfaces

Integrated VESA mount adapter & hidden cable connectors at the back



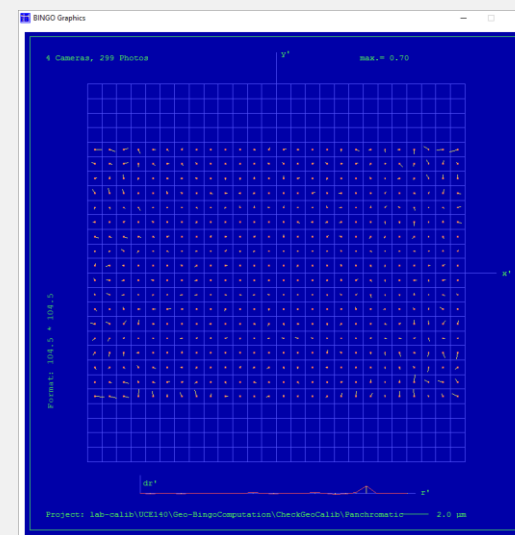
Laboratory Calibration

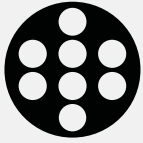
Bundle Adjustment

Panchromatic cameras:

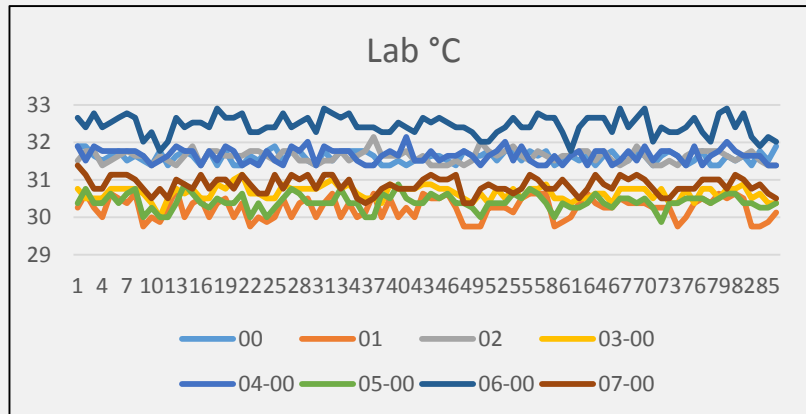
max residual : $0.70\ \mu\text{m}$

RMS photo residuals (x/y): $0.5\ \mu\text{m}$

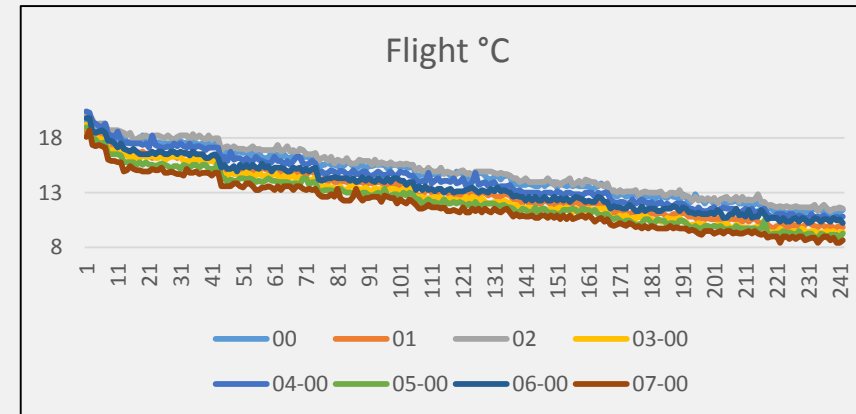




Temperature Analysis



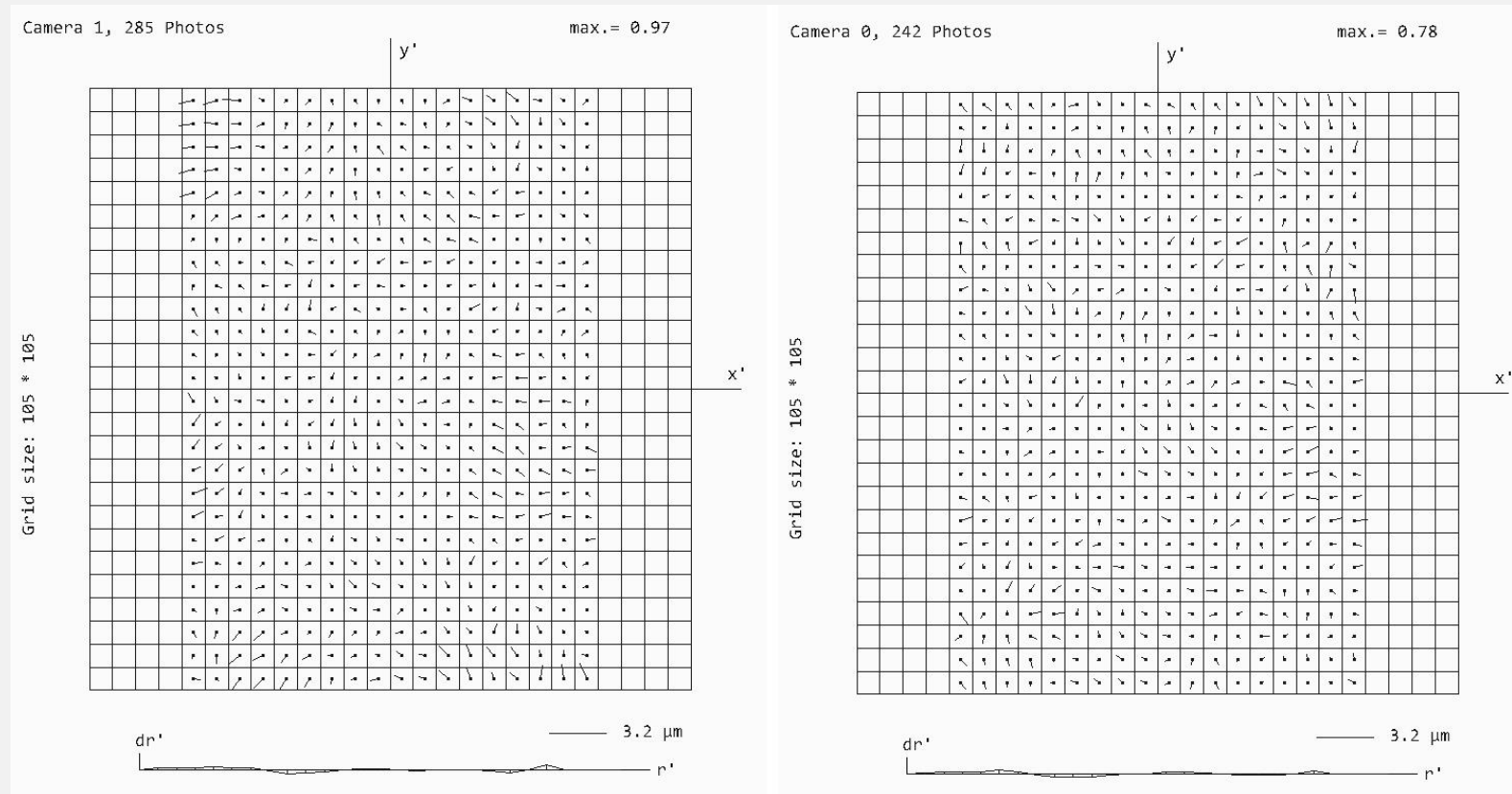
Temperature at Lens Cones (Lab)

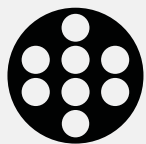


Temperature at Lens Cones (Flight)

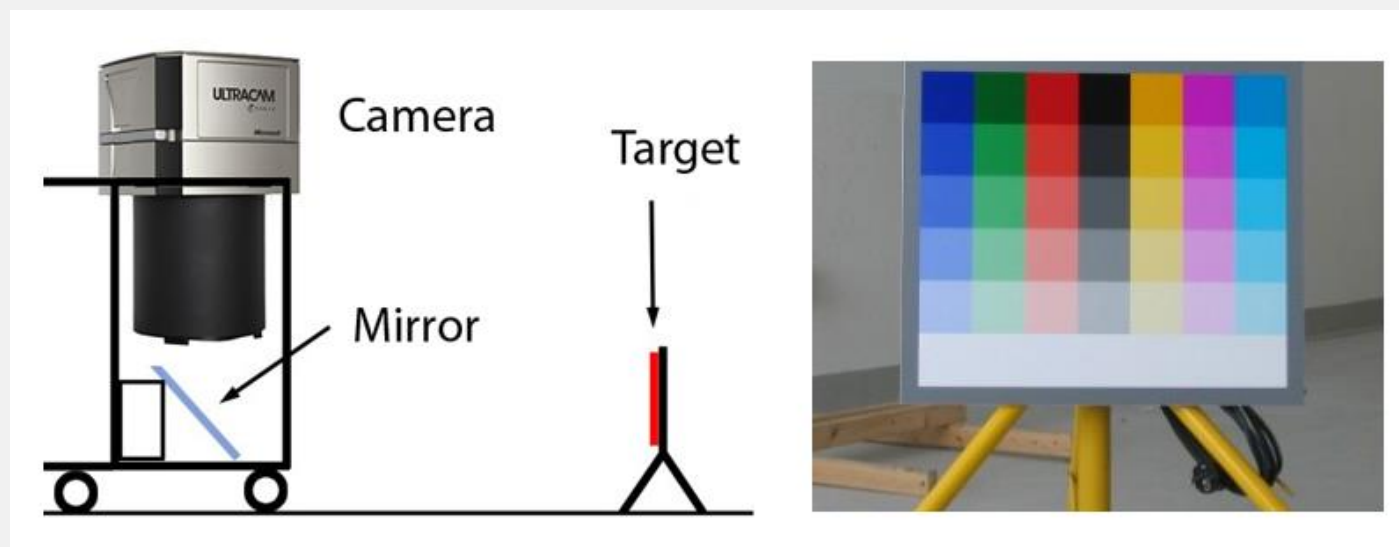


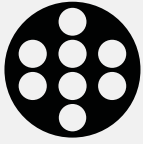
Results from validation flights





Radiometric Calibration

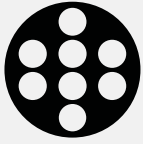




Radiometric Calibration

Dark Image Analysis
Bright Field Analysis
Shutter Release Time Calibration
Color Target Analysis
Sensor Settings and Weak Pixel
Mapping

Hedler Daylight Light sources
Spectrometer / Ulbricht Sphere
Shutter Calibration Station
Color Target
Sensor Settings and Weak Pixel
Mapping



Photogrammetric Oblique

- UltraCam Osprey M3 Premium
UltraCam Osprey M3 Essential





ULTRACAM OSPREY

Photogrammetry meets oblique

Designed for maximum flexibility,
the UltraCam Osprey Mark 3
Premium extends a full
photogrammetric nadir camera
with oblique capture capability in
four directions.





Nadir

High-resolution PAN

- 13,470 x 8,670 pixels
- 5.2 μm CCDs
- 80 mm focal length

RGB & NIR lens system

- 6,735 x 4,335 pixels
- 5.2 μm CCDs
- 40 mm focal length
- 1:2 Pansharpen ratio



Oblique

Color lens system

- 10,300 x 7,700 pixels
- 5.2 μm CCDs
- 120 mm focal length
- Forward/backward: Landscape oriented
- Left/right: Portrait oriented

Simultaneous collect or „Nadir only“ mode



UltraCam Osprey Mark 3 Premium

Focal Lens/ Pixel Size

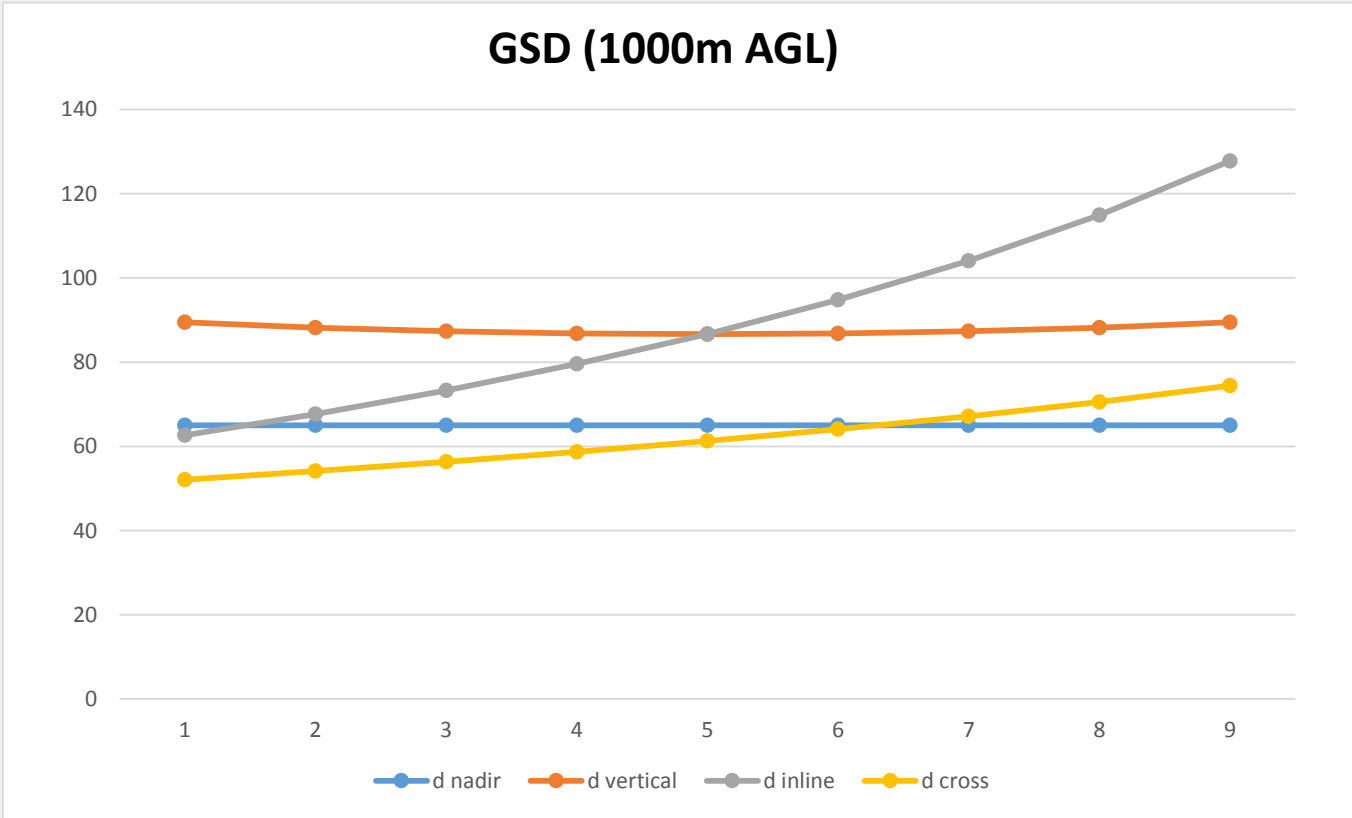
Nadir Pan	80.0 mm	5,2 µm	(FTF 7092 M) (2 pcs)
Nadir RGB	40.0 mm	5,2 µm	(FTF 7046 C)
Nadir NIR	40.0 mm	4,6 µm	(FTF 7852 M)
Oblique Sensor Heads	120.0 mm	5,2 µm	(FTF 10481 C) (4pcs)

Frame Format

Nadir Pan	13470 * 8670
Nadir RGB	6735 * 4335
Nadir NIR	7613 * 4900
Left/Right/Fwd/Bwd	10300 * 7700



Optimal off nadir angle



GSD Nadir @ 1000m	65 mm
Line Dist @ 25% SOL	650 m
Base Lgth @ 75 % FOL	140m
Time btw. Frames	2,0 sec
GSD RGB/NIR @ 1000m	130/115 mm
GSD Obl @ 45 deg	61/87/87 mm



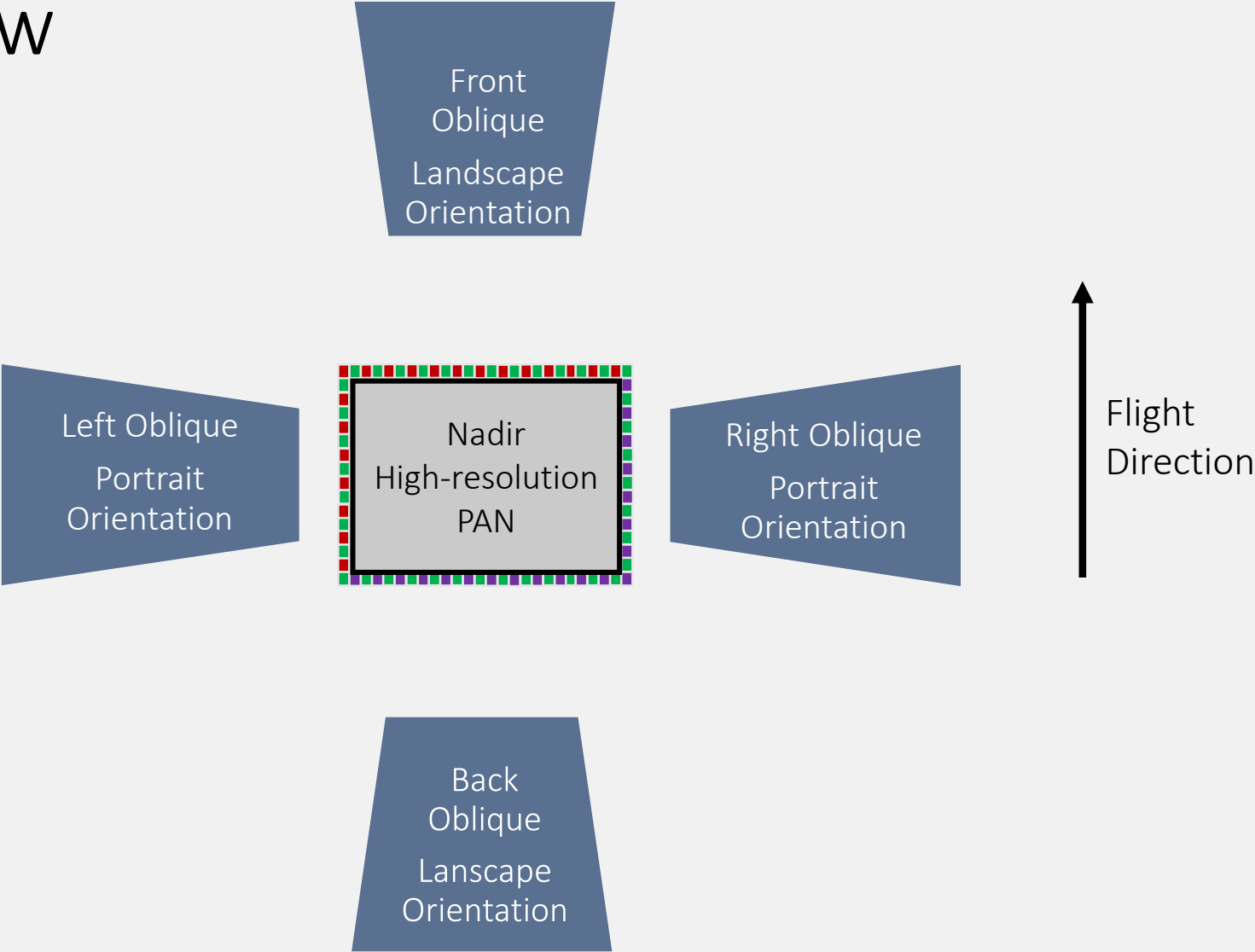
Sensor System

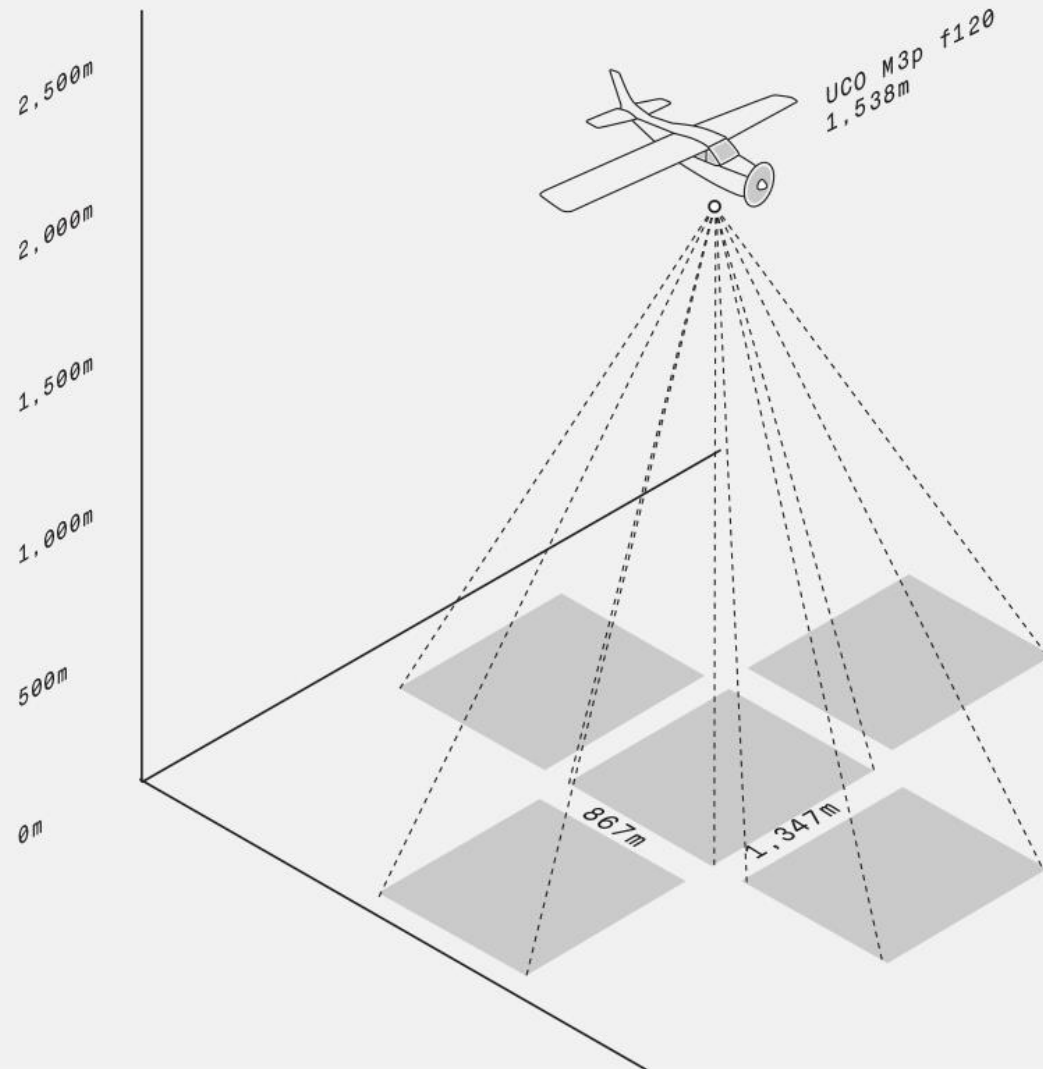


- 1 frame per 1.75 seconds
- >72 db dynamic range
- 14 bits analog-to-digital-conversion
- 1/750 to 1/64 shutter (longlife central leaf)
- Forward Motion Compensation by Time Delay and Integration
- 50 pixels maximum FMC capacity



Layout Top-Down View





Best efficiency using the full swath width of the nadir cone in conjunction with the perfectly aligned oblique image overlap.

For collections @ 10 cm GSD





ULTRACAM

OSPREY

Urban mapping and 3D city modeling

The UltraCam Osprey Mark 3
Essential allows for cost-
effective, multi-directional
data capture at first-rate
image quality.





Nadir

RGB lens system

- 80 mm focal length
- 10,300 x 7,700 pixels
- 5.2 μm CCDs

NIR lens system (optional)

- 40 mm focal length
- 5,880 x 4,390 pixels
- 5.2 μm CCDs



Oblique

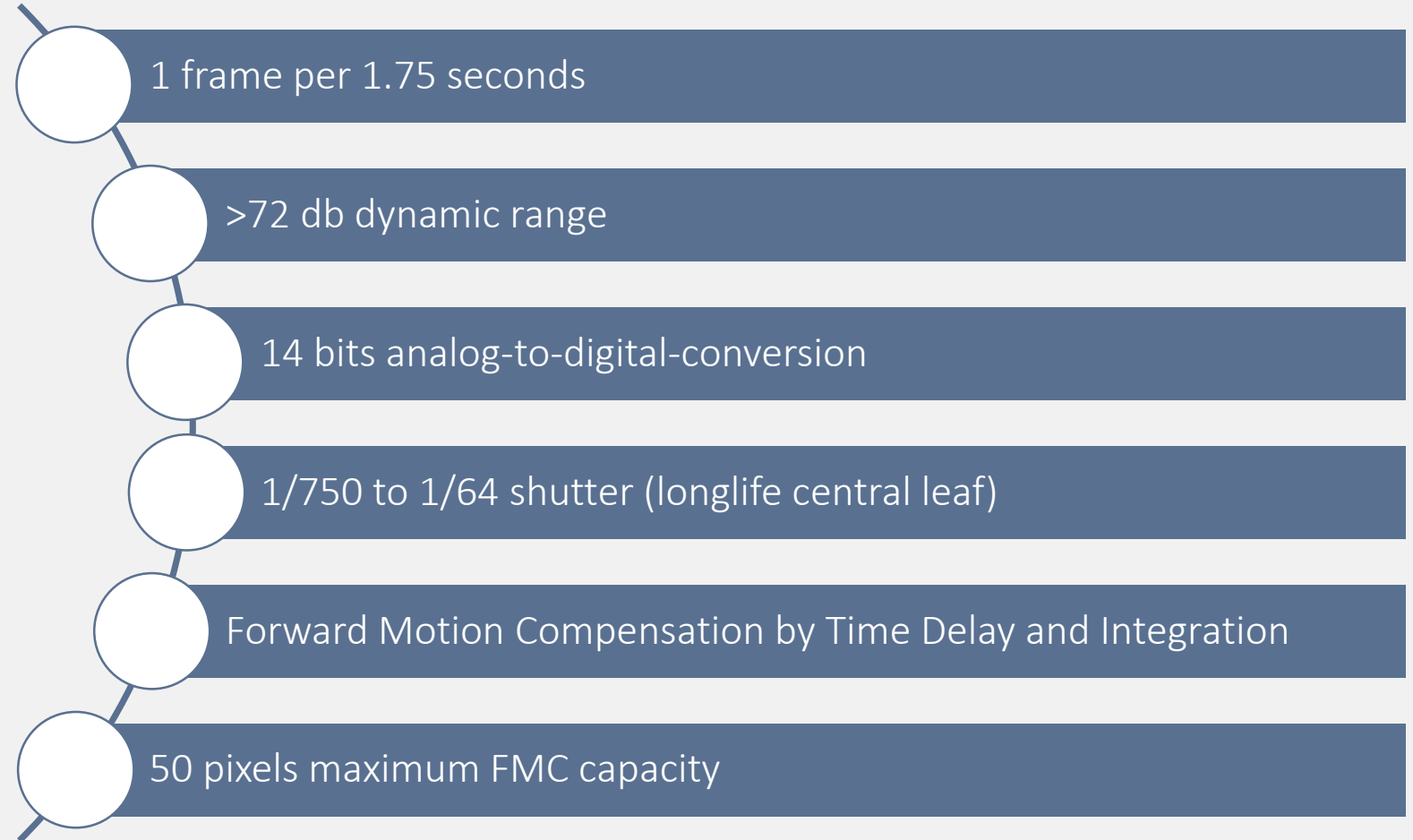
Color lens system

- 120 mm focal length
- 10,300 x 7,700 pixels
- 5.2 μm CCDs
- Forward/backward: Landscape oriented
- Left/right: Portrait oriented

Upgradeable to an UltraCam Osprey Mark 3 Premium

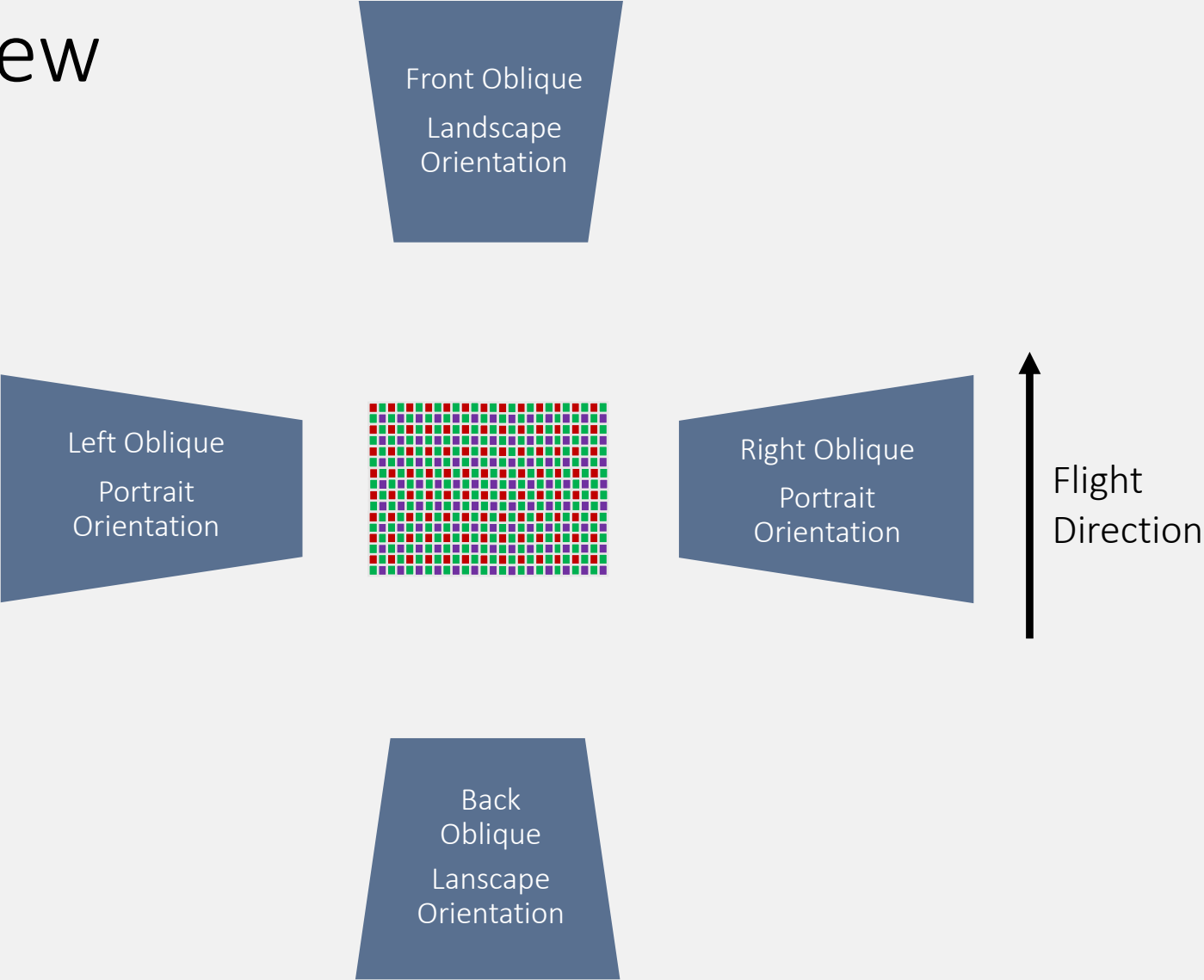


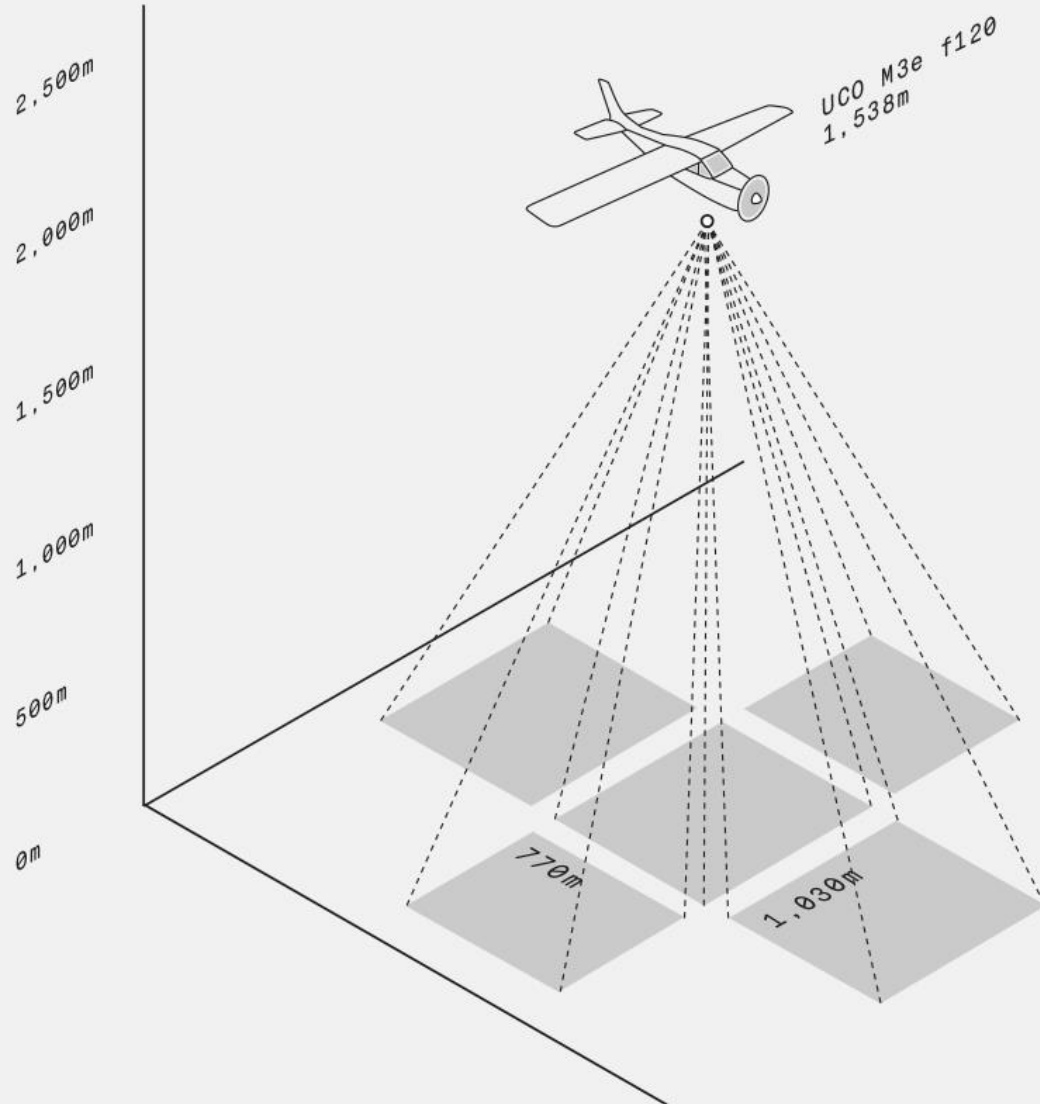
Sensor System





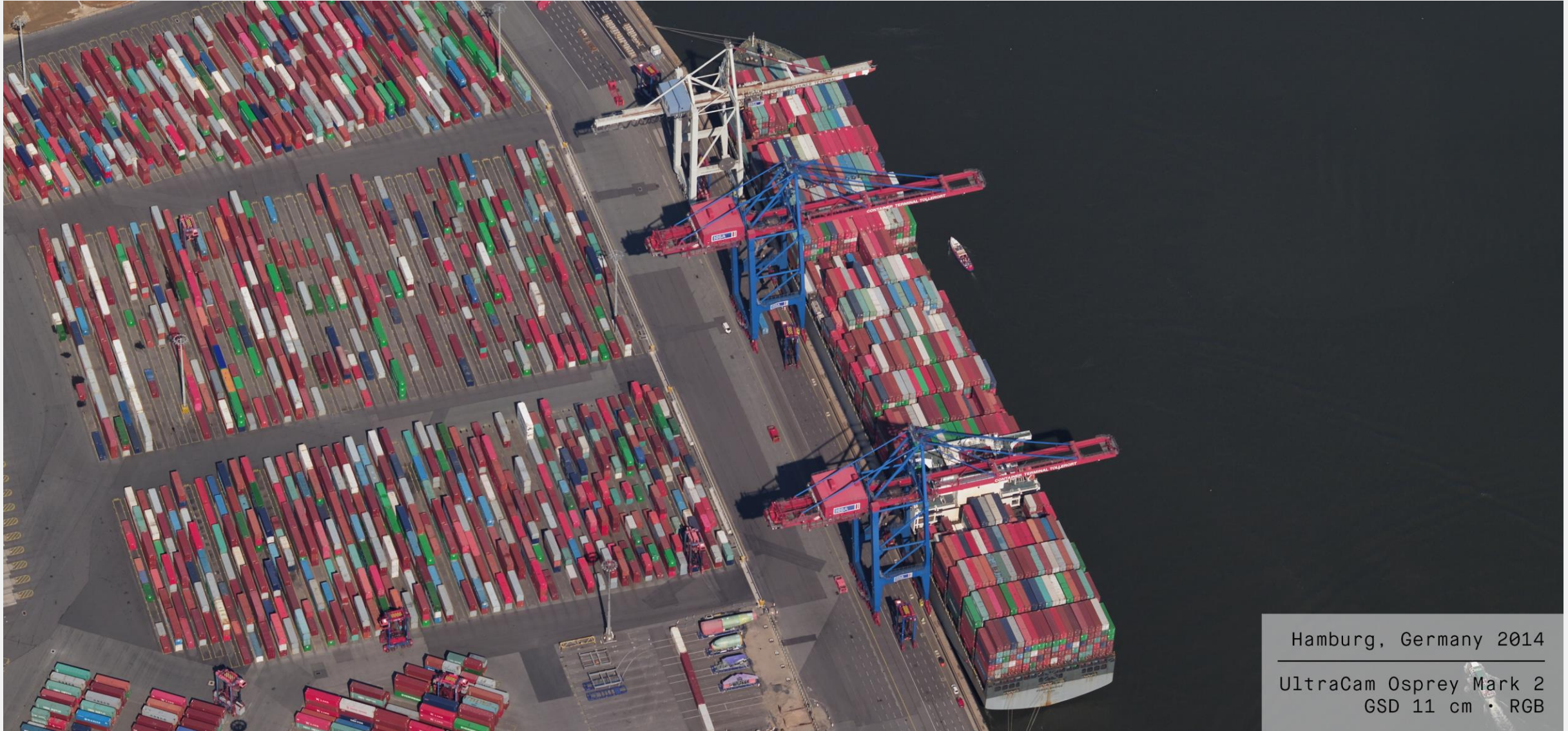
Layout Top-Down View





Delivering 1 frame per 1.75 seconds, the system can be flown at a flight speed of 124 knots at 10 cm GSD and 80% forward overlap.

For collections @ 10 cm GSD



Hamburg, Germany 2014

UltraCam Osprey Mark 2
GSD 11 cm • RGB



UltraMap v4.0 Processing Suite





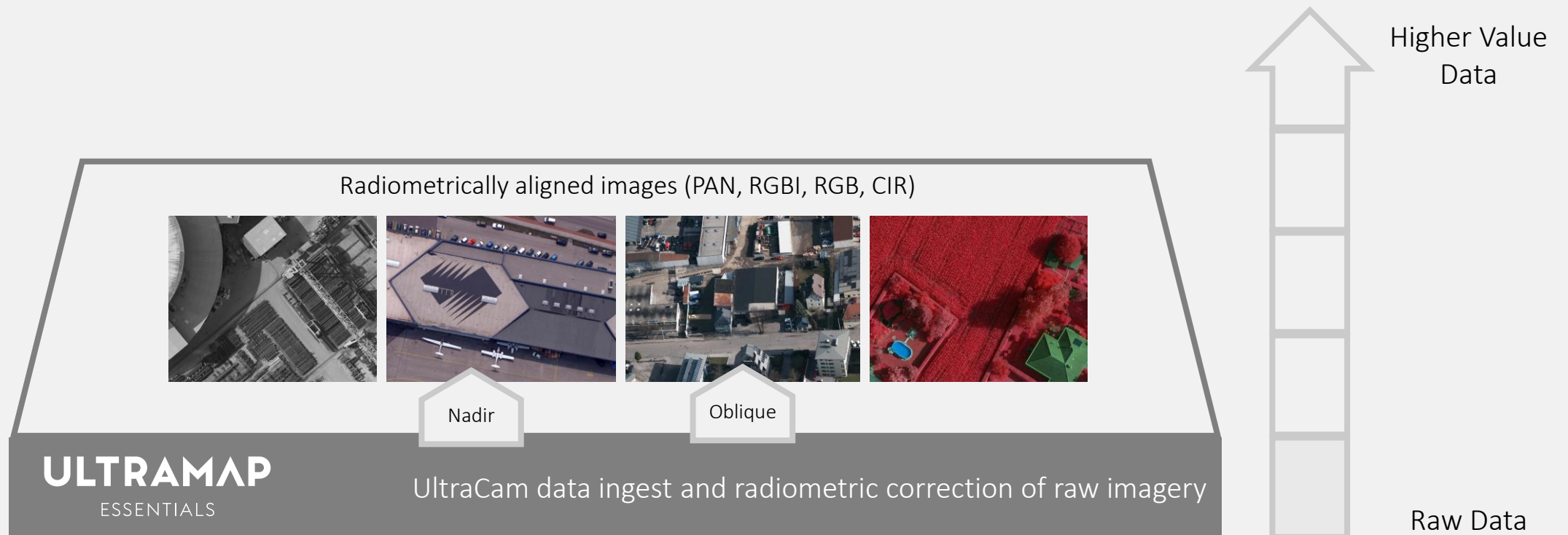
ULTRAMAP

From raw data to high
value information

UltraMap is the state-of-the-art
photogrammetric workflow system
designed to process huge amounts of
UltraCam data in the shortest possible time
with the highest degree of automization.

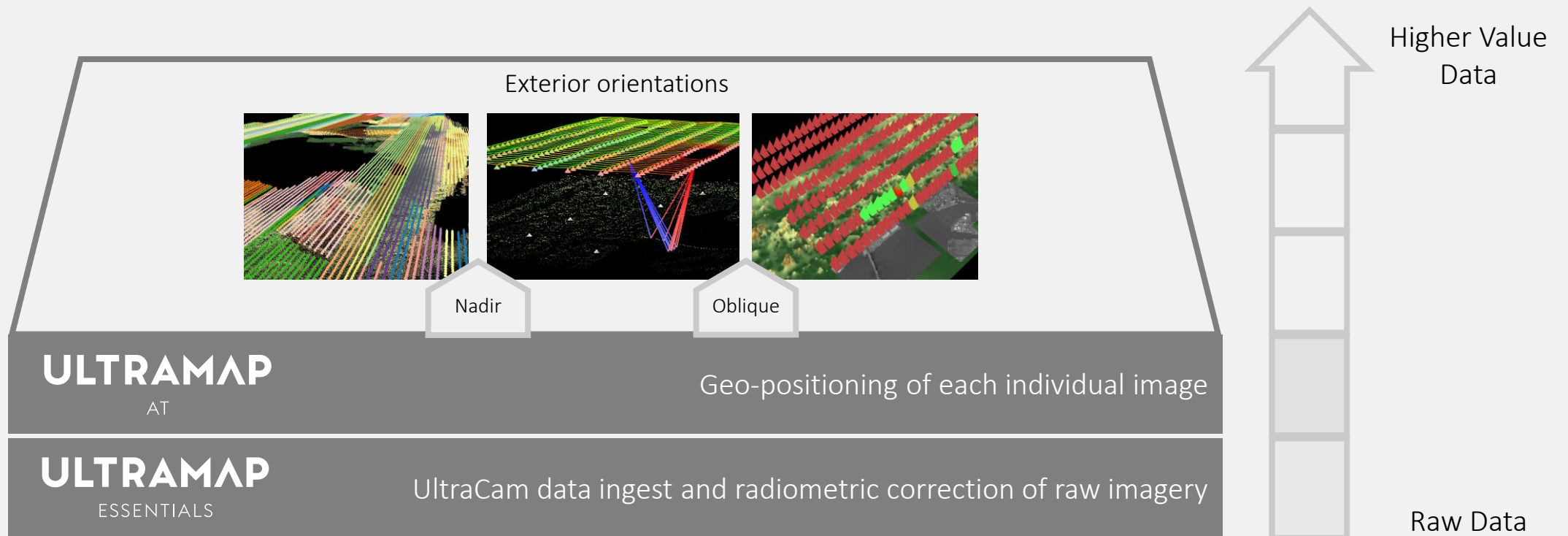


Flexibility Through Modular Design



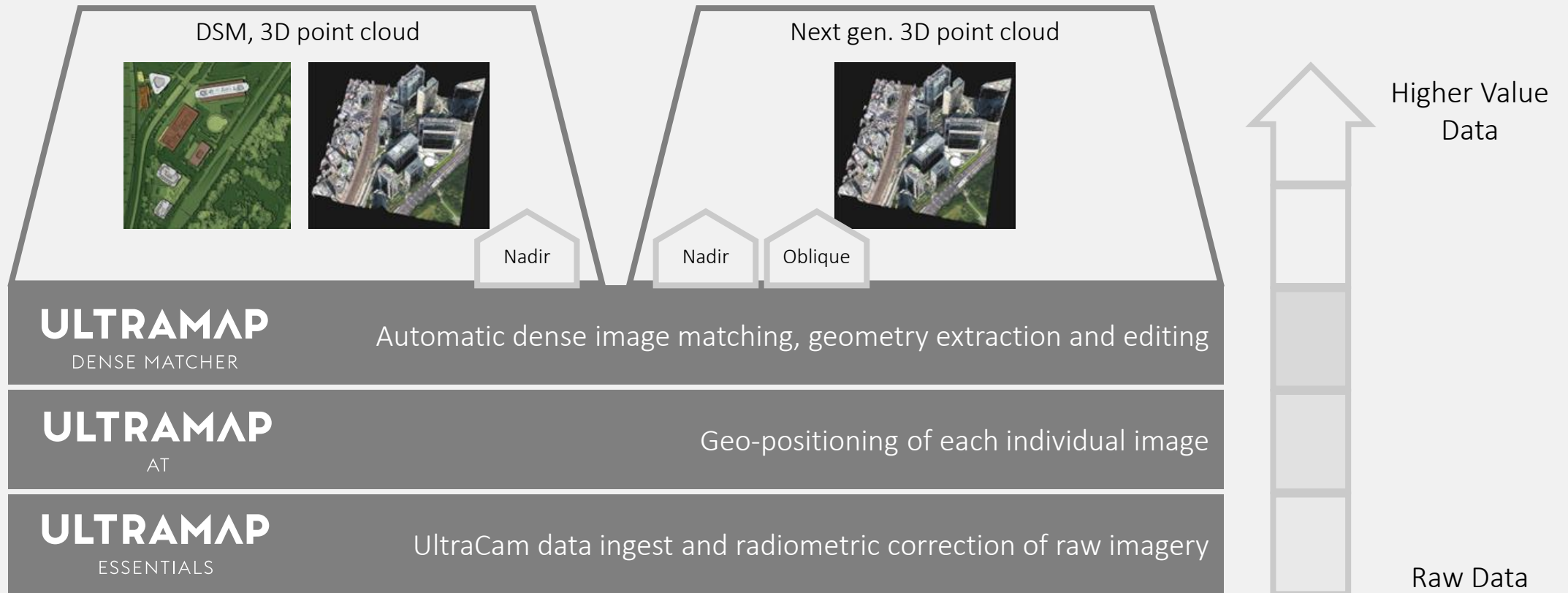


Flexibility Through Modular Design



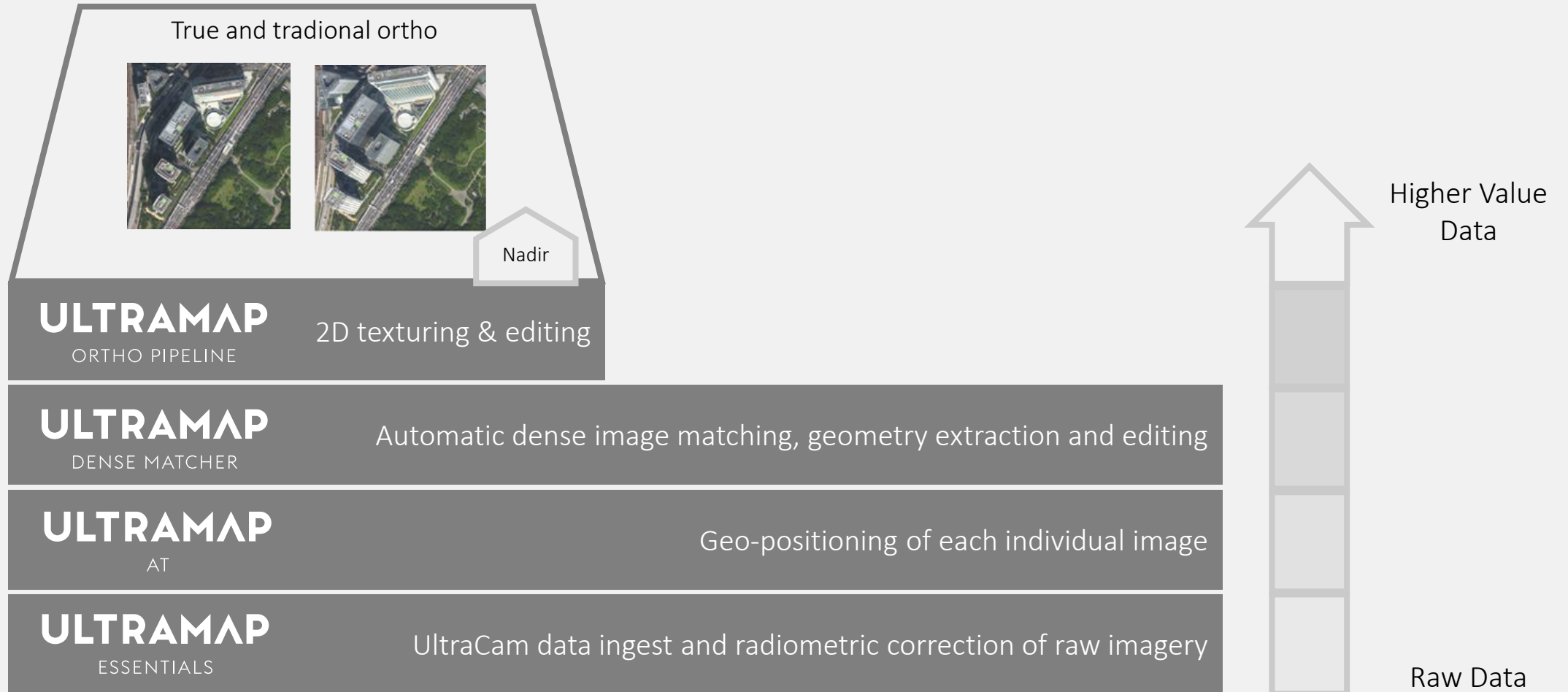


Flexibility Through Modular Design



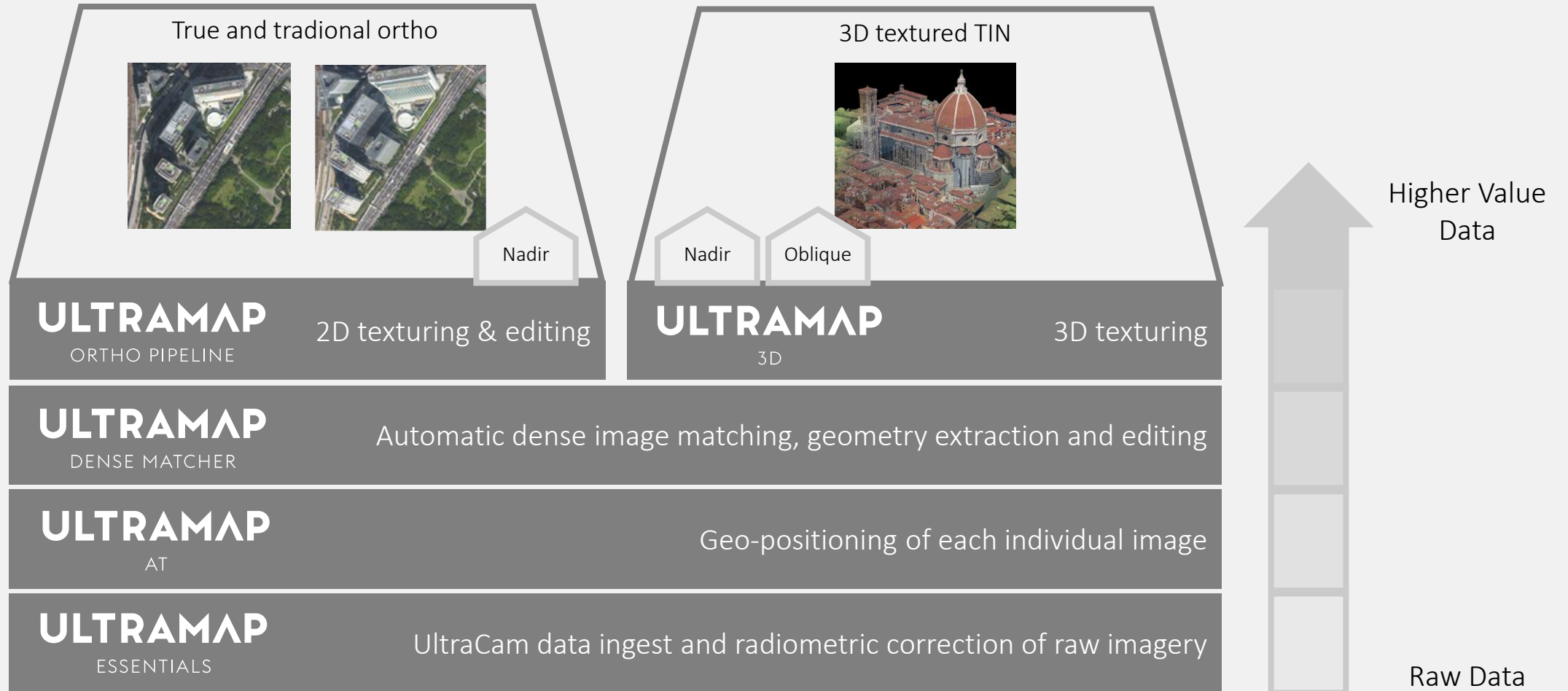


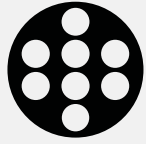
Flexibility Through Modular Design





Flexibility Through Modular Design

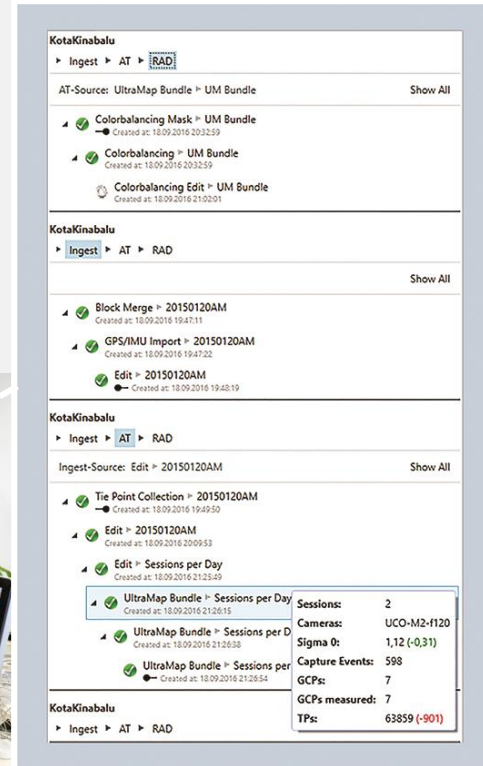
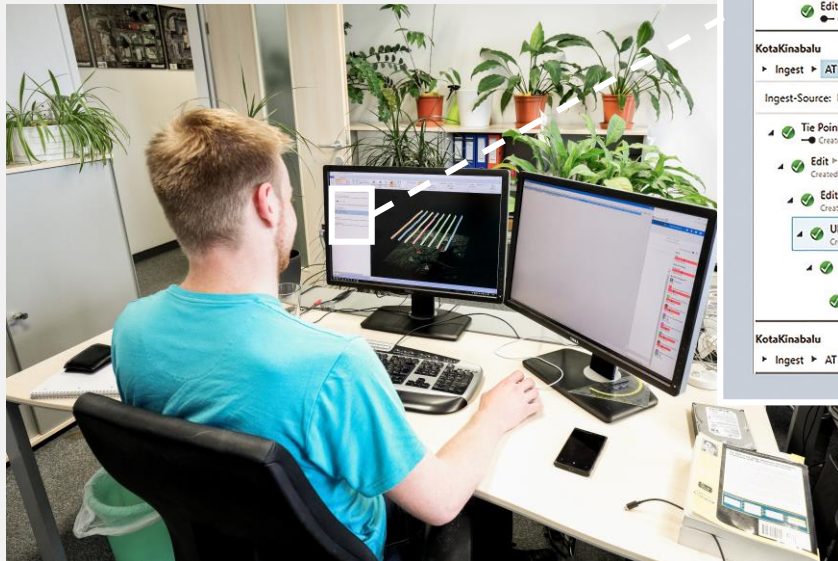




Feature Highlights



End-to-end solution



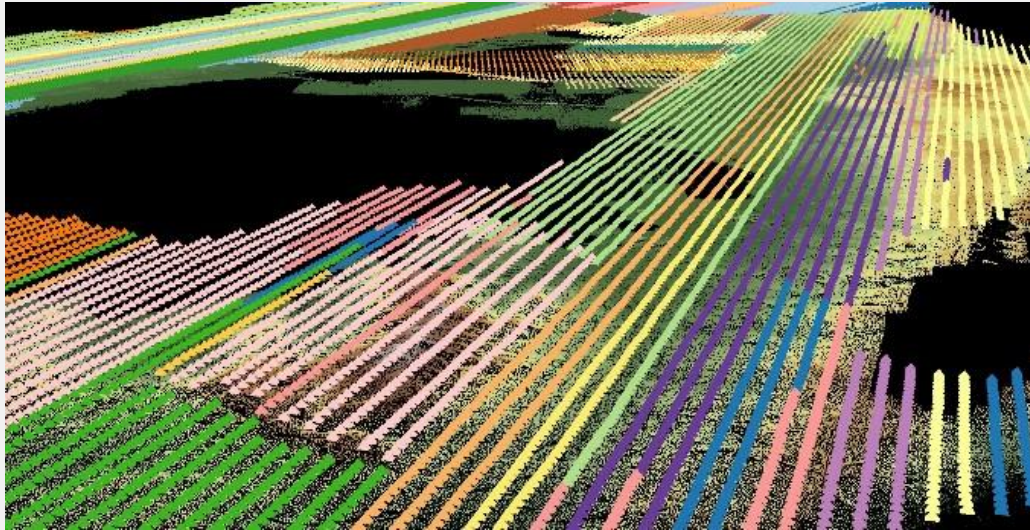
UltraMap offers one single application for AT, Radiometry and creation of 3D models

Keep track of your project and record all workflow actions!

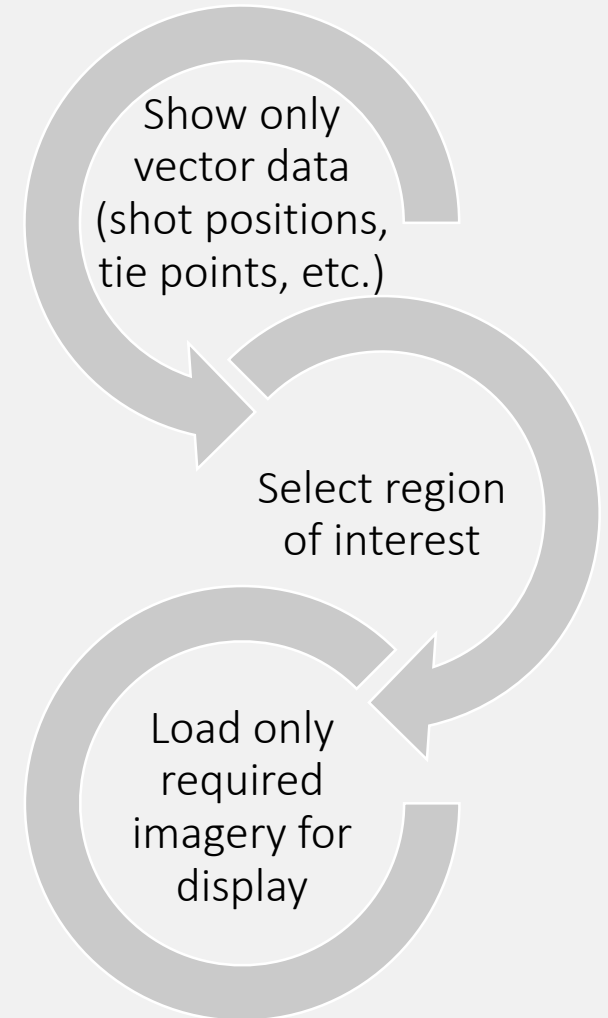


Prepared to process large datasets

Process huge amounts of UltraCam data in the shortest possible time



Each flight line color represents one flight mission





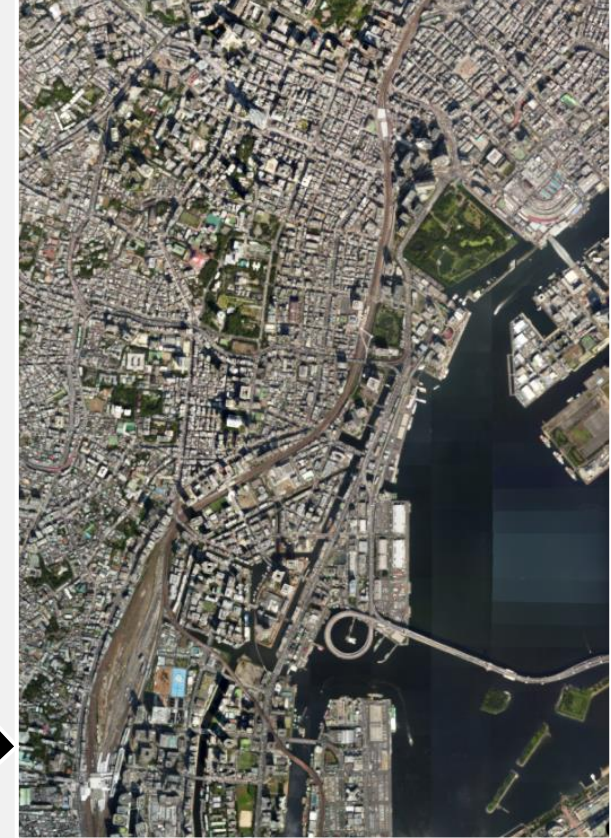
New Color Balancing approach



Raw



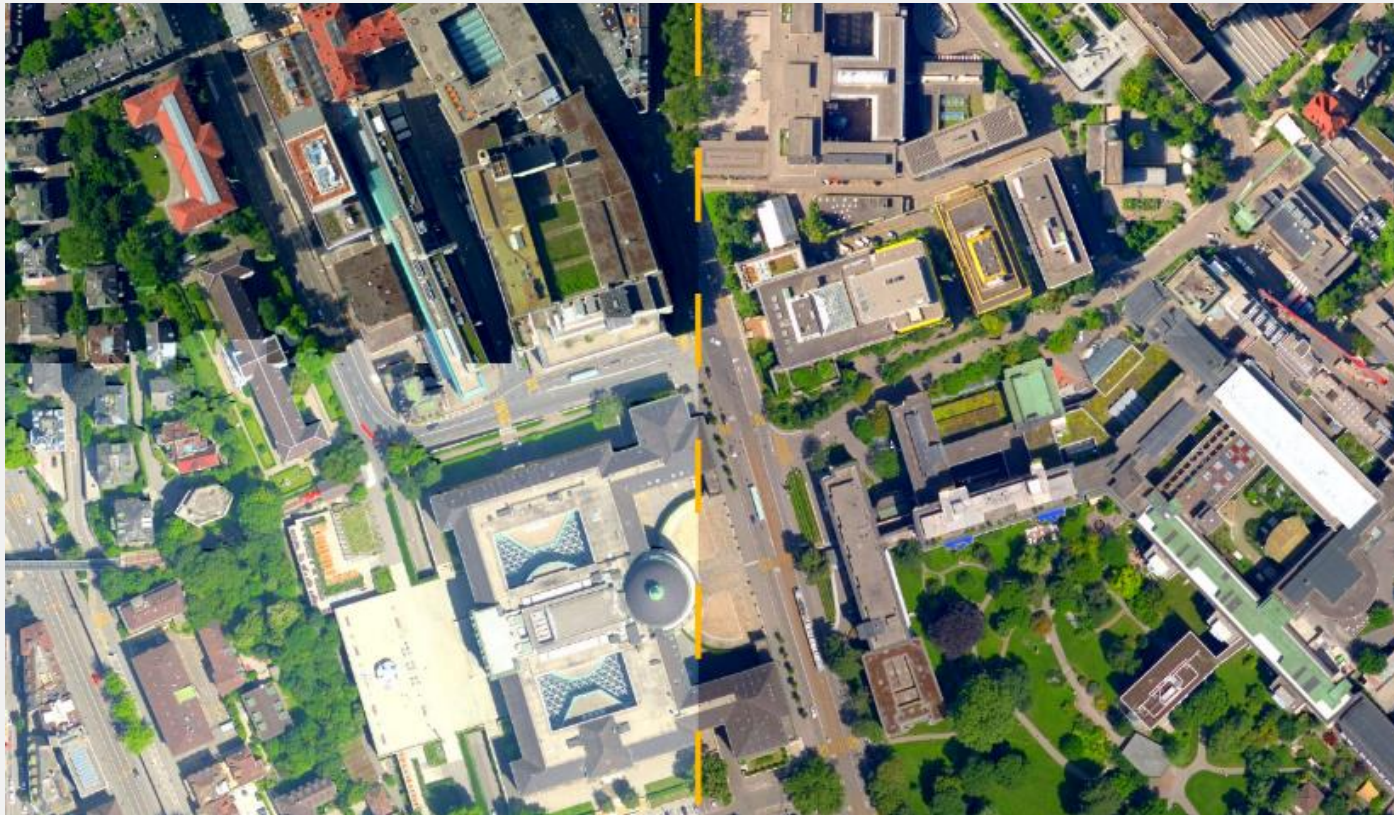
Mask



Balanced



Simultaneous Nadir and Oblique Color Balancing

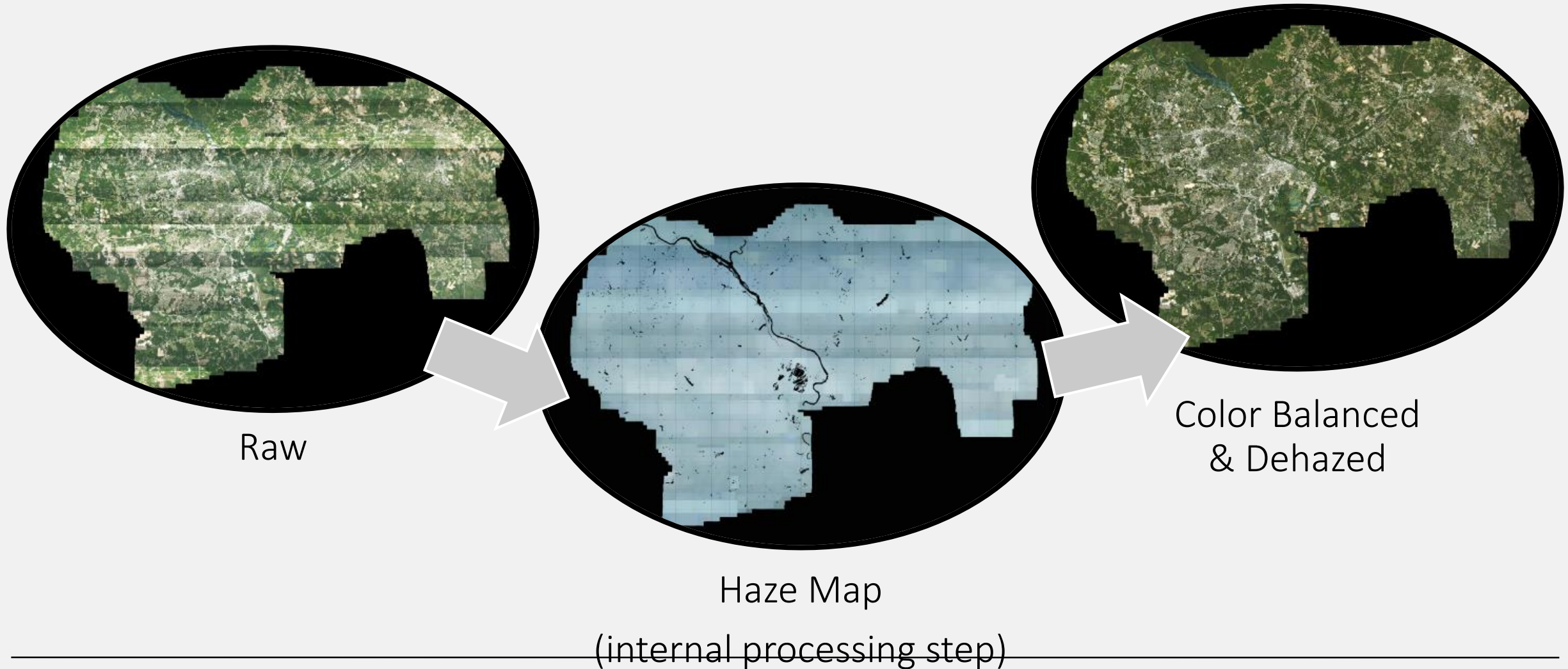


Raw

Balanced



De-Hazing for varying atmospheric conditions





Powerful dehazing of oblique images

PRE-DEHAZING





Powerful dehazing of oblique images

POST-DEHAZING



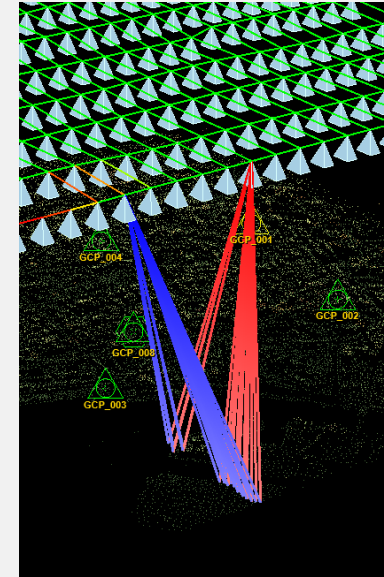
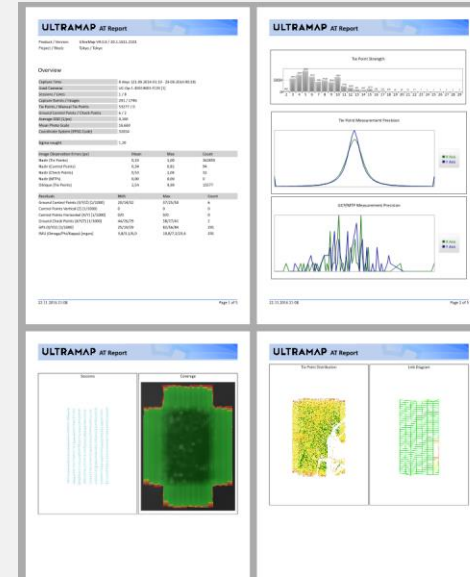
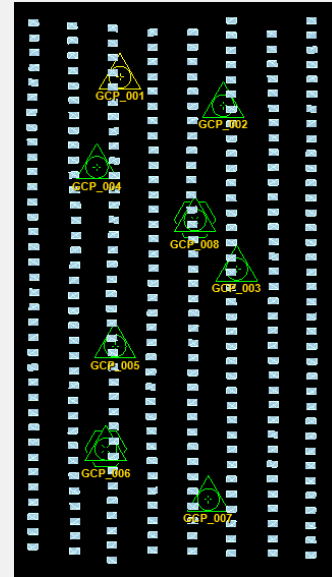
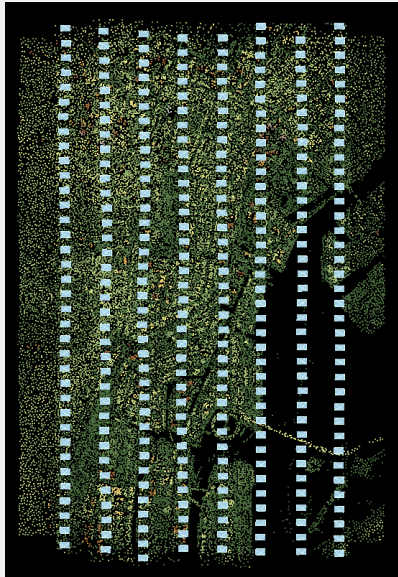
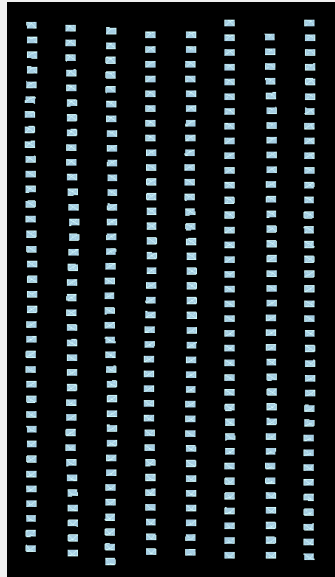


Color balancing and dehazing result





Aero-triangulation



Capture Events (291) Images (291) Tie Points (33277) Ground Control Points (8) Manual Tie Points (0)									
Image	Session	Line	Recorded	Air	Ts	X	Y	Z	Omega [deg]
Session 0 (291 Images)									
842	0	19	21.09.2014 01:10:27	F 5.6	1/1000	386214.615	394333.179	1435.180	-0.06102
843	0	19	21.09.2014 01:10:29	F 5.6	1/1000	386217.873	394347.023	1436.310	-0.06612
844	0	19	21.09.2014 01:10:32	F 5.6	1/1000	386218.206	3943617.363	1437.736	-0.04113
845	0	19	21.09.2014 01:10:35	F 5.6	1/1000	386216.423	3943762.413	1439.860	-0.07514
846	0	19	21.09.2014 01:10:38	F 5.6	1/1000	386212.932	3943907.462	1442.132	-0.06169
847	0	19	21.09.2014 01:10:40	F 5.6	1/1000	386206.564	3944051.793	1442.801	-0.05724
848	0	19	21.09.2014 01:10:43	F 5.6	1/1000	386200.577	3944197.036	1442.160	-0.05411
849	0	19	21.09.2014 01:10:46	F 5.6	1/1000	386197.454	3944340.346	1441.005	-0.05700
850	0	19	21.09.2014 01:10:49	F 5.6	1/1000	386196.952	3944485.190	1438.902	-0.04934
851	0	19	21.09.2014 01:10:51	F 5.6	1/1000	386198.944	3944628.875	1435.395	-0.05633
852	0	19	21.09.2014 01:10:54	F 5.6	1/1000	386202.573	3944777.415	1430.963	-0.05196
853	0	19	21.09.2014 01:10:57	F 5.6	1/1000	386206.095	3944914.434	1427.784	-0.05087
854	0	19	21.09.2014 01:11:00	F 5.6	1/1000	386208.836	3945057.817	1427.284	-0.06266
855	0	19	21.09.2014 01:11:02	F 5.6	1/1000	386209.317	3945201.633	1428.742	-0.05490
856	0	19	21.09.2014 01:11:05	F 5.6	1/1000	386207.691	3945345.392	1430.846	-0.05287
857	0	19	21.09.2014 01:11:08	F 5.6	1/1000	386205.474	3945489.360	1433.147	-0.06178
858	0	19	21.09.2014 01:11:10	F 5.6	1/1000	386204.155	3945633.683	1435.050	-0.04896
859	0	19	21.09.2014 01:11:13	F 5.6	1/1000	386204.502	3945777.837	1435.699	-0.05031
860	0	19	21.09.2014 01:11:16	F 5.6	1/1000	386208.546	3945921.538	1435.351	-0.04402
861	0	19	21.09.2014 01:11:19	F 5.6	1/1000	386215.796	3946066.897	1434.302	-0.04475
862	0	19	21.09.2014 01:11:22	F 5.6	1/1000	386223.030	3946211.219	1432.489	-0.04422
863	0	19	21.09.2014 01:11:24	F 5.6	1/1000	386227.340	3946355.837	1431.589	-0.05077
864	0	19	21.09.2014 01:11:27	F 5.6	1/1000	386227.488	3946499.800	1432.823	-0.05094
865	0	19	21.09.2014 01:11:30	F 5.6	1/1000	386222.677	3946643.263	1435.777	-0.06693
866	0	19	21.09.2014 01:11:33	F 5.6	1/1000	386214.420	3946788.184	1439.850	-0.05873
867	0	19	21.09.2014 01:11:35	F 5.6	1/1000	386207.169	3946930.952	1442.104	-0.05048
868	0	19	21.09.2014 01:11:38	F 5.6	1/1000	386203.863	3947073.757	1441.598	-0.04102

Image 849 - Color
Camera: UC2-M2-F120
Calibration:
Principal Distance [mm]: UC-Op-1-30314001-F120 [1]
Principal Point X [mm]: 0
Principal Point Y [mm]: 0
Image Types: LxR2-Color
Bit Depth: 16
Pixel Size [µm]: 10.4
Image Width [µm]: 8735
Image Height [µm]: 4315

Input
Preparation

Automated Tie
Point Collection

[Ground Control
Measurement]

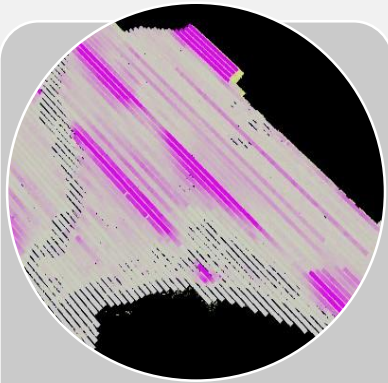
Bundle
Adjustment

Visual Analytics

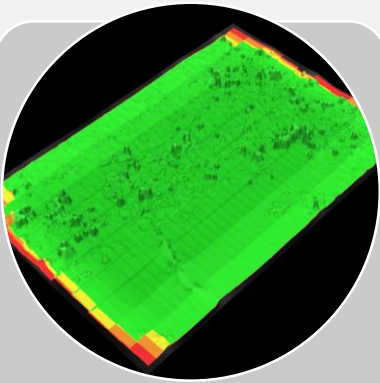
Final Image
EOs



Full integration of visual analytics features



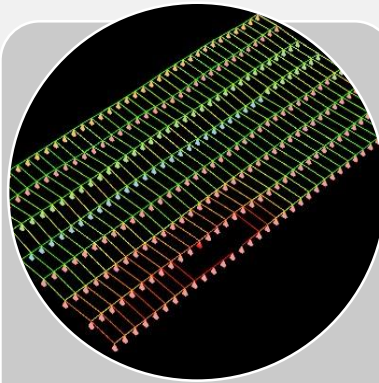
Discovering
critical missions
or trigger events



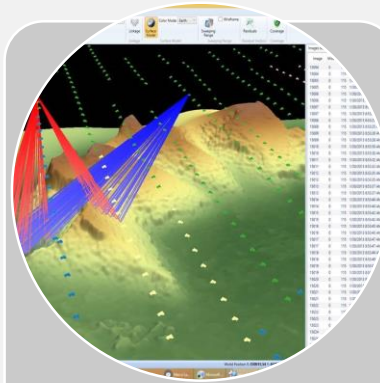
Freely
configurable
overlap



Color coded
flight missions



Configurable link
diagram



Identifying point
correspondences

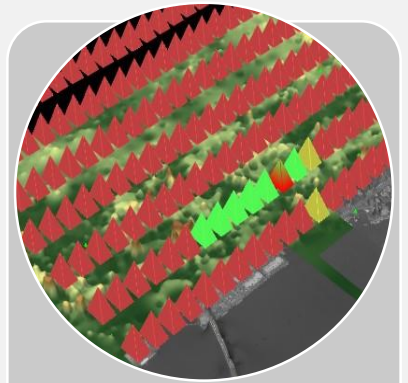


Image
visualization on
tie point surface



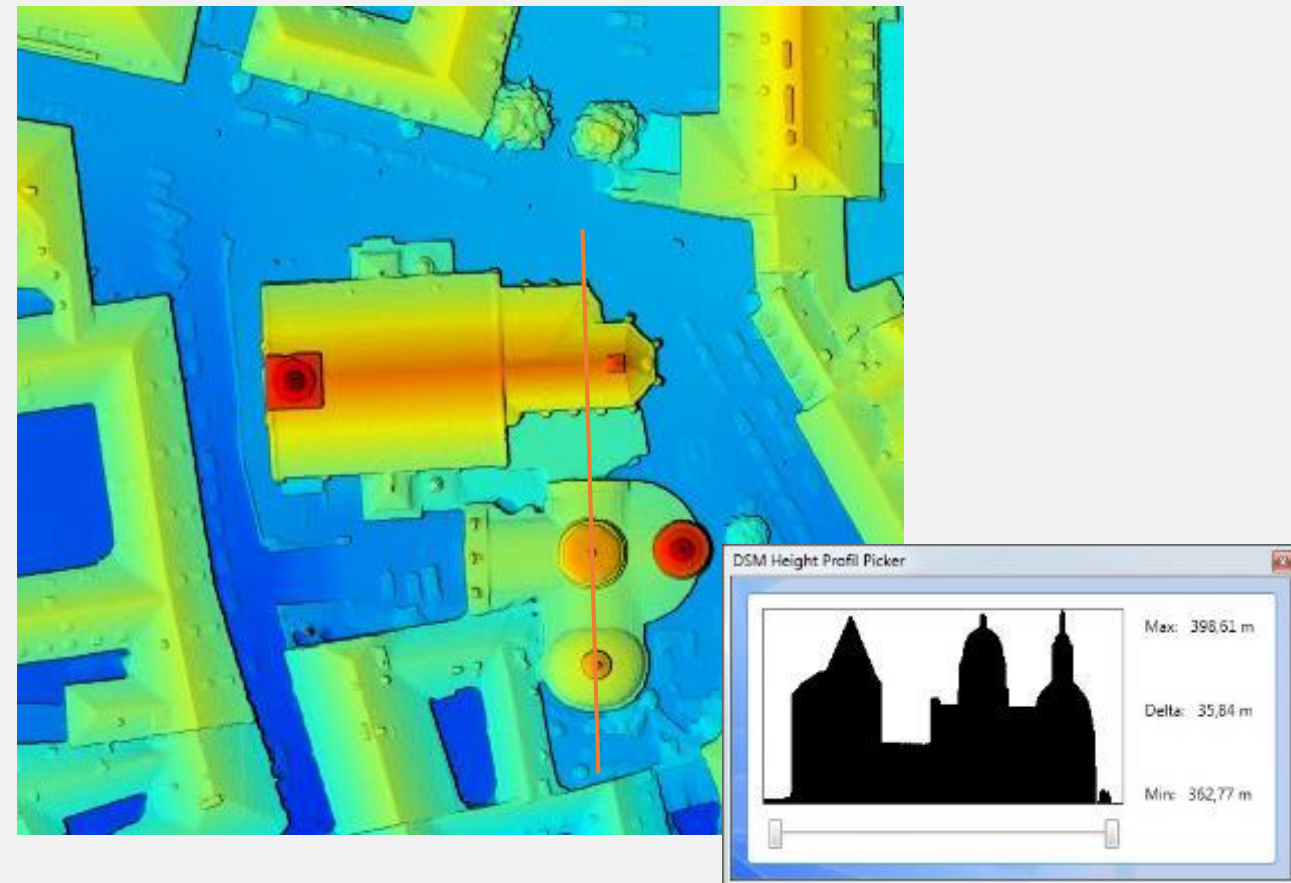


Automatic dense image matching

3D Point Cloud (RGB, RGBI, CIR)



Digital Surface Model (DSM)



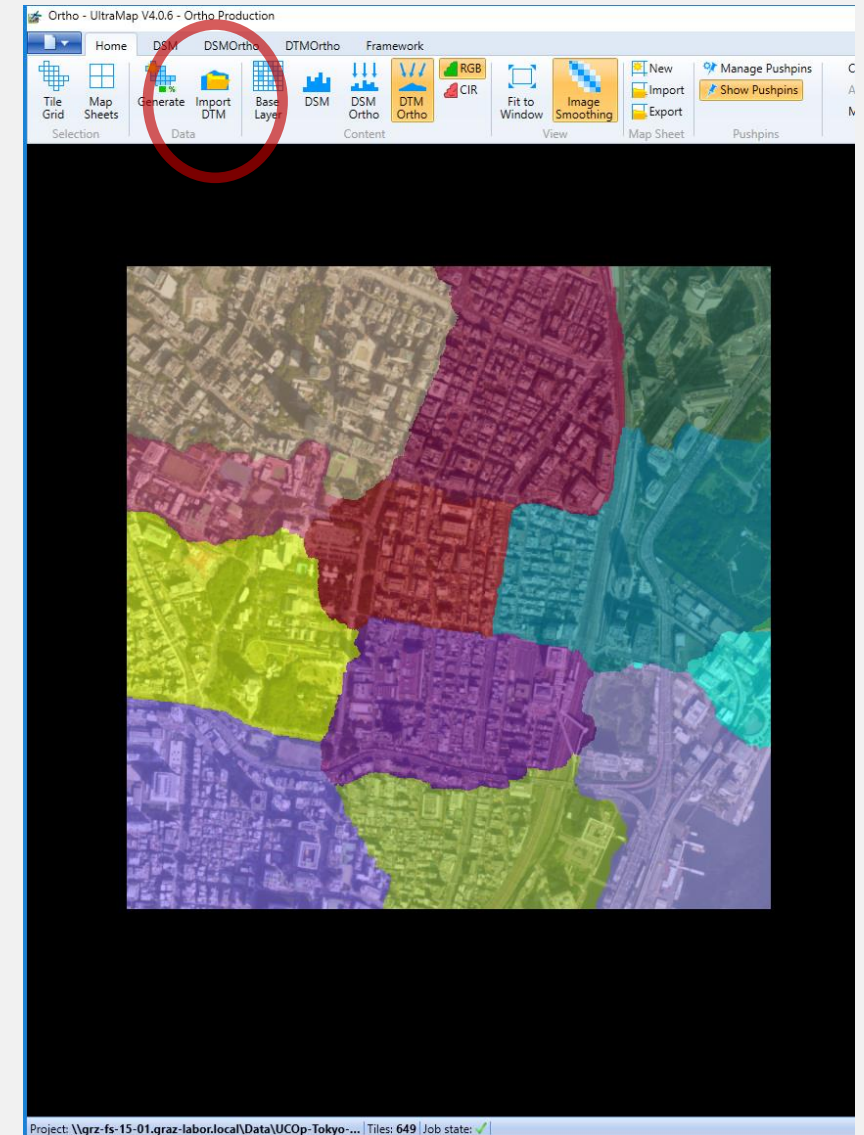


Import external DTM

Use an existing DTM from Lidar, your client or any other source for ortho photo production

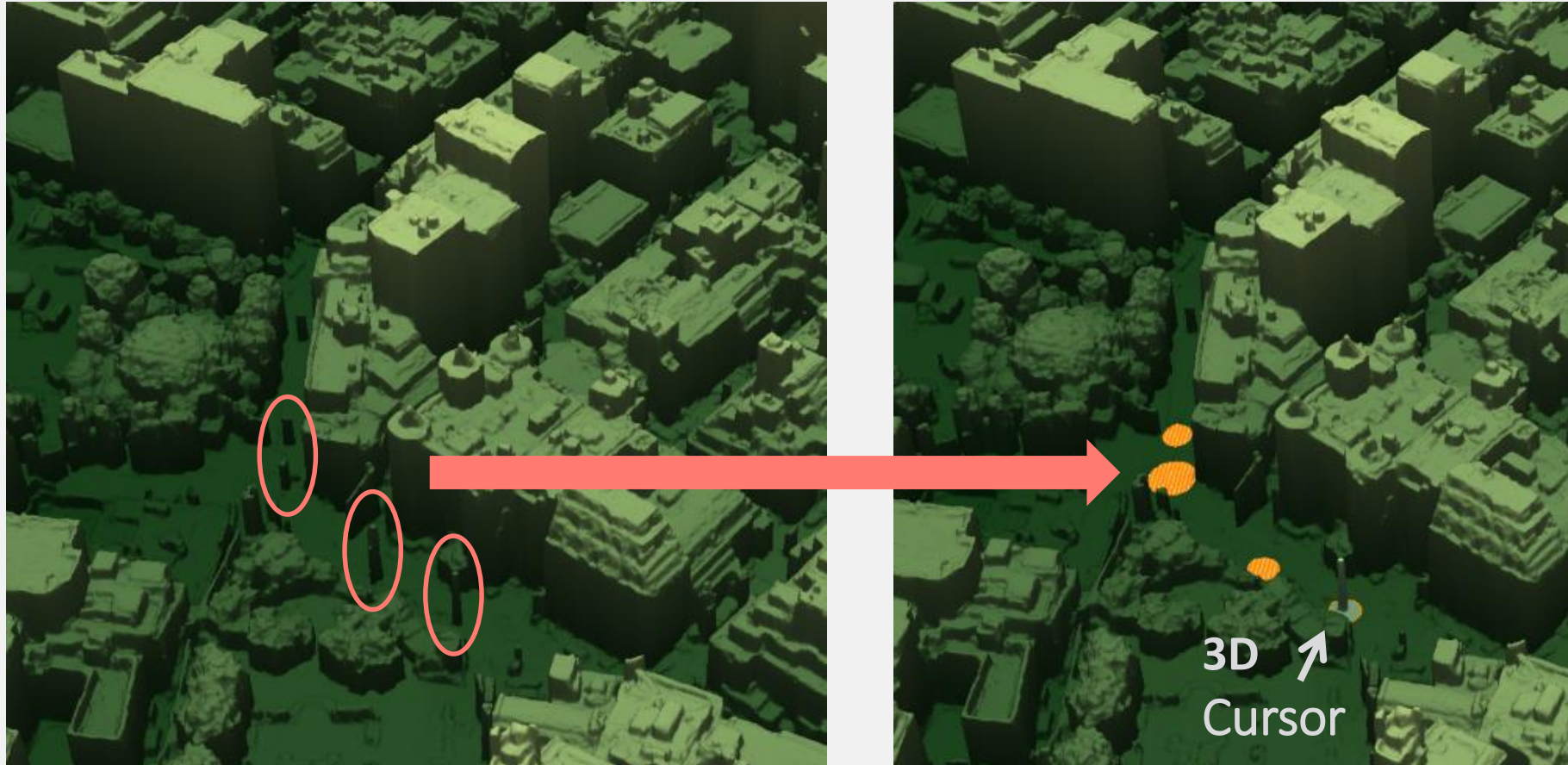
Automated seamline placement

Seamline editing possible



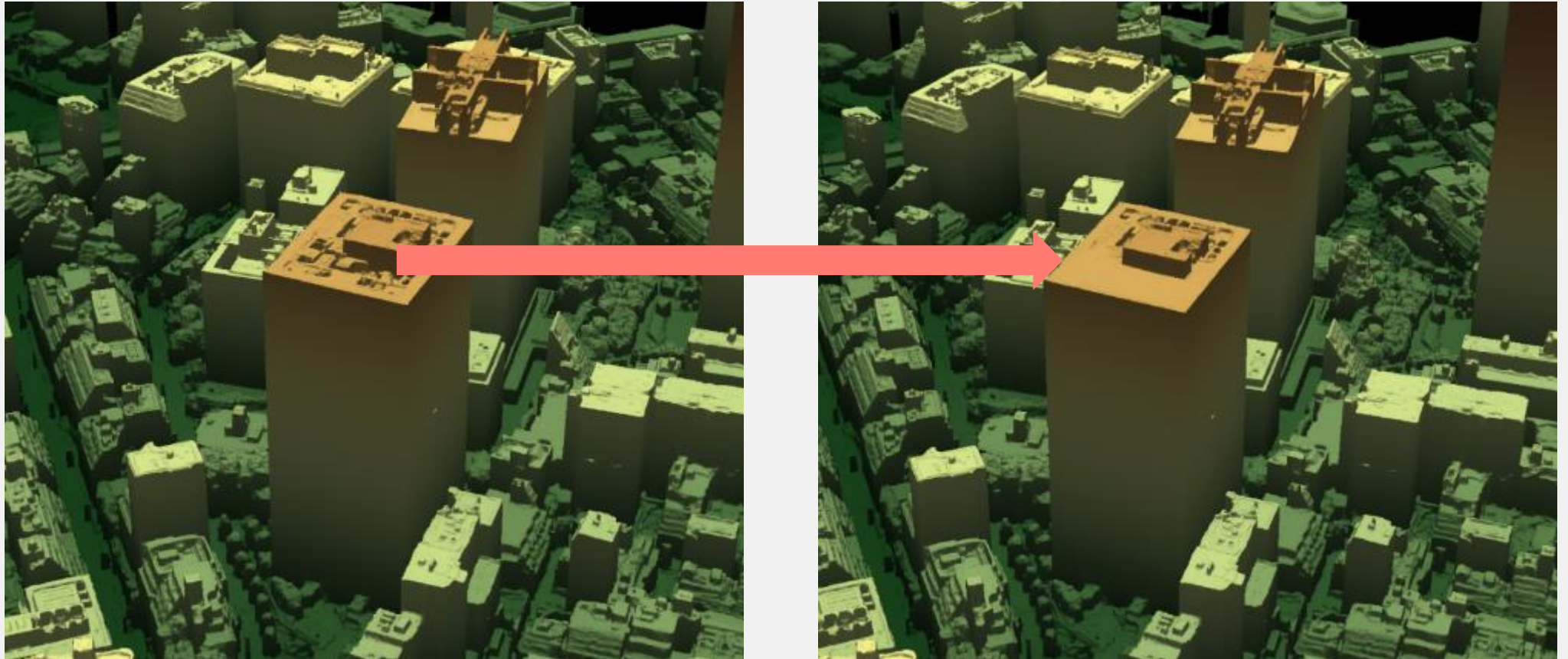


Intelligent 3D object removal



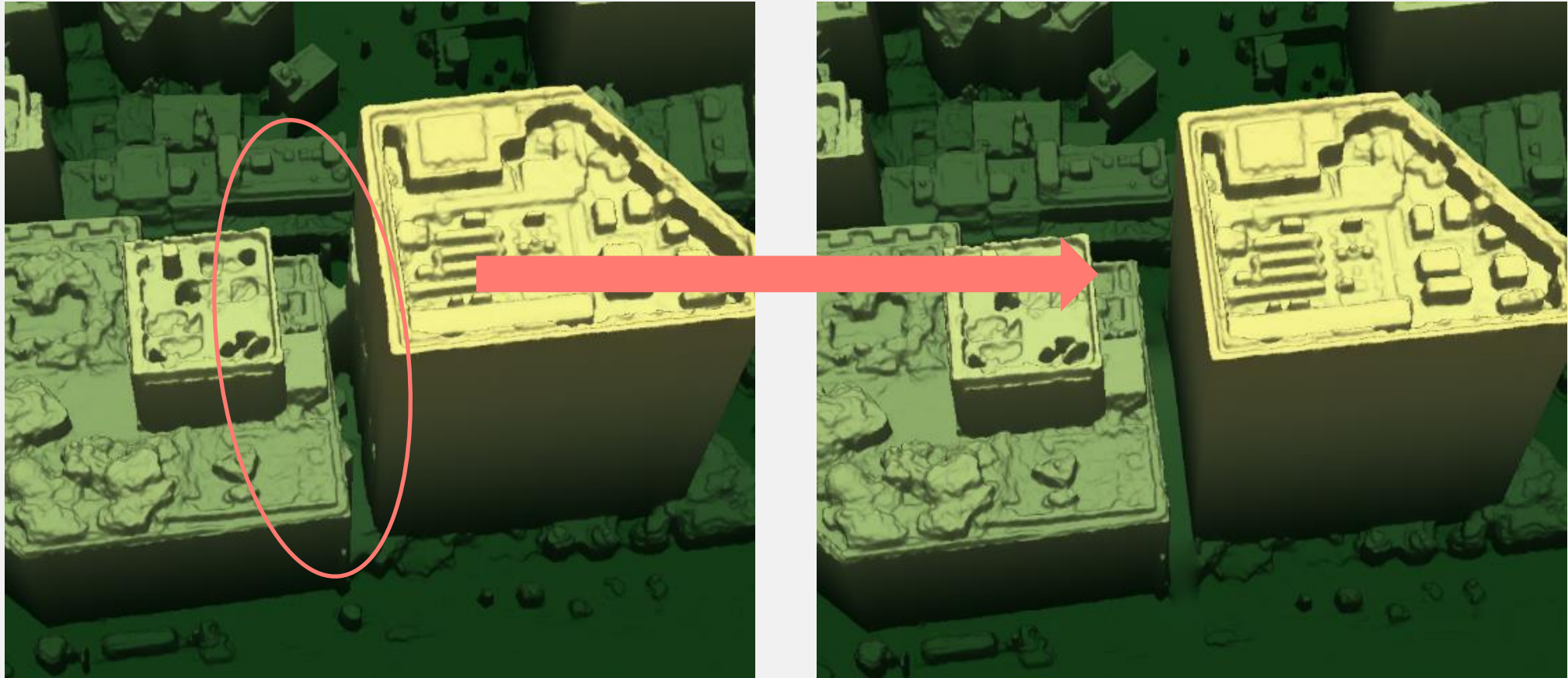


Software guided 3D restoration



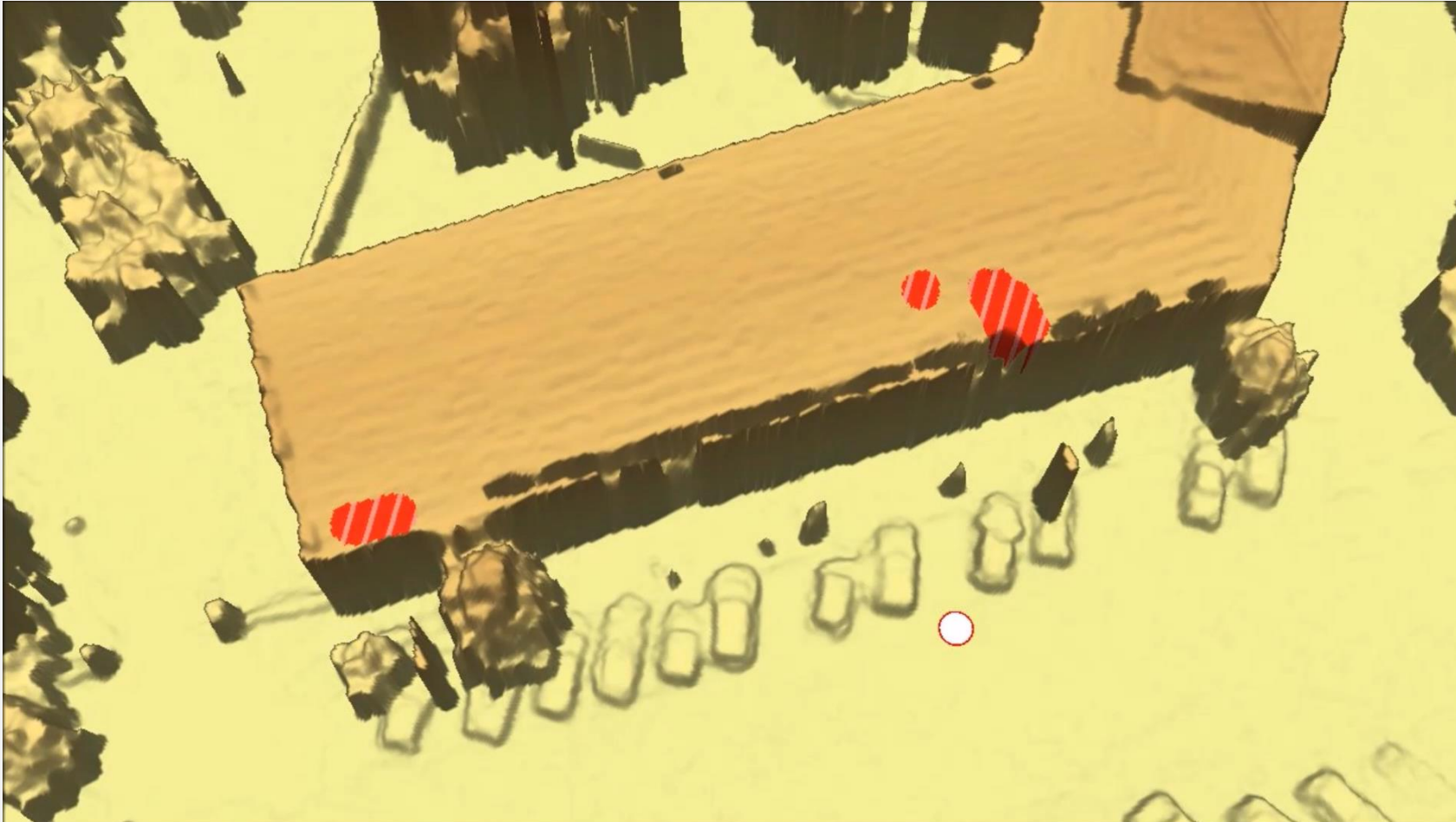


Easy straightening of building edges



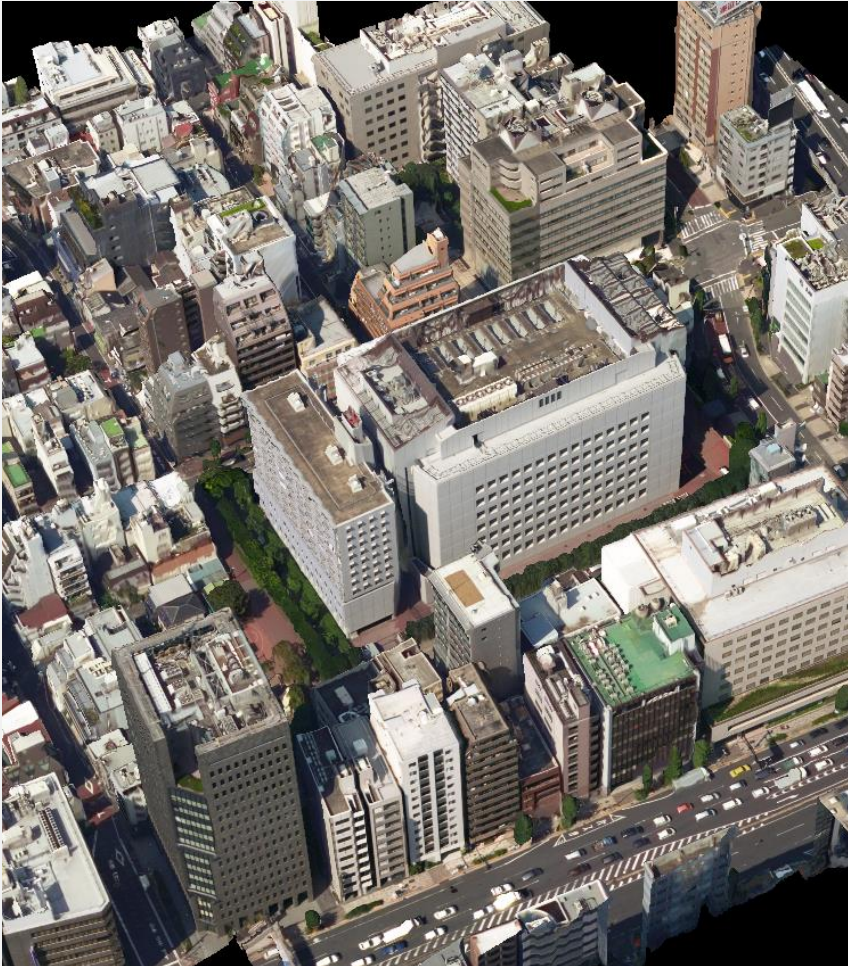


Intuitive reconstructions





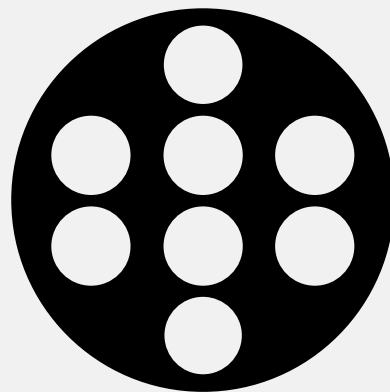
Automated 3D textured TIN (preview)



Combine nadir & oblique imagery for automated 3D geometry reconstruction

Take advantage of all viewing directions for best possible texturing

Output as OBJ and LAS (more formats to come)



VEXCEL
IMAGING