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EuroSDR / ISPRS Workshop

Ultracam Osprey - nadir meets oblique

Southampton, UK, Oct 19-20, 2015

Michael Gruber
michgrub@microsoft.com

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UltraCam Family

Osprey Eagle Falcon Hawk

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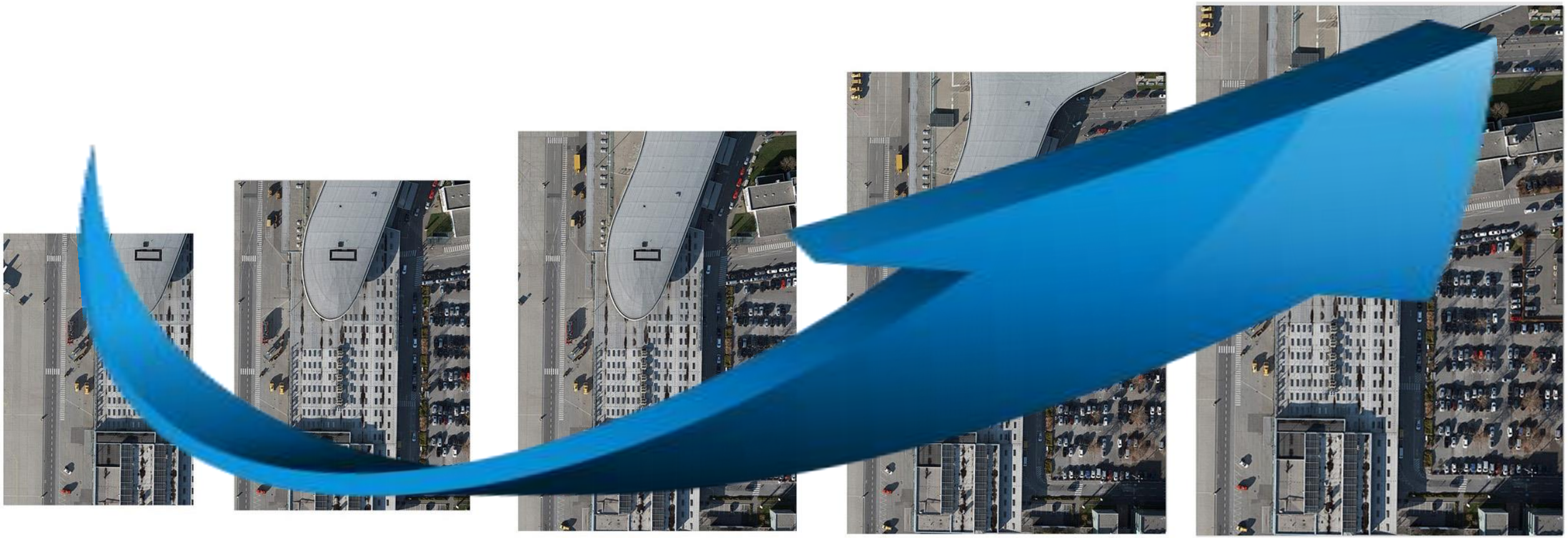

Hawk	Falcon	Falcon prime	Eagle	Eagle prime
90	136	196	260	349 Mpixel

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UltraCamOsprey Prime II

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UltraCamOsprey Prime II

Focal Lens/ Pixel Size

Nadir PAN	80 mm	f 1/5.6
Nadir RGB and NIR	40 mm	f 1/5.6
Oblique Sensor Heads	120 mm	f 1/5.6

Frame Format / Pixel Size

Nadir PAN	13470 * 8670	5.2 µm
Nadir RGB and NIR	6735 * 4335	5.2 µm
Oblique Sensor Heads Fwd/Bwd/Left/Right	10300 * 7700	5.2 µm

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UltraCamOsprey Prime Lite

Focal Lens/ Pixel Size

Nadir RGB	80 mm	f 1/5.6
NIR	40 mm	f 1/5.6
Oblique Sensor Heads	120 mm	f 1/5.6

Frame Format / Pixel Size

Nadir RGB	10300 * 7700	5.2 µm
Nadir RGB and NIR	6735 * 4335	5.2 µm
Oblique Sensor Heads Fwd/Bwd/Left/Right	10300 * 7700	5.2 µm

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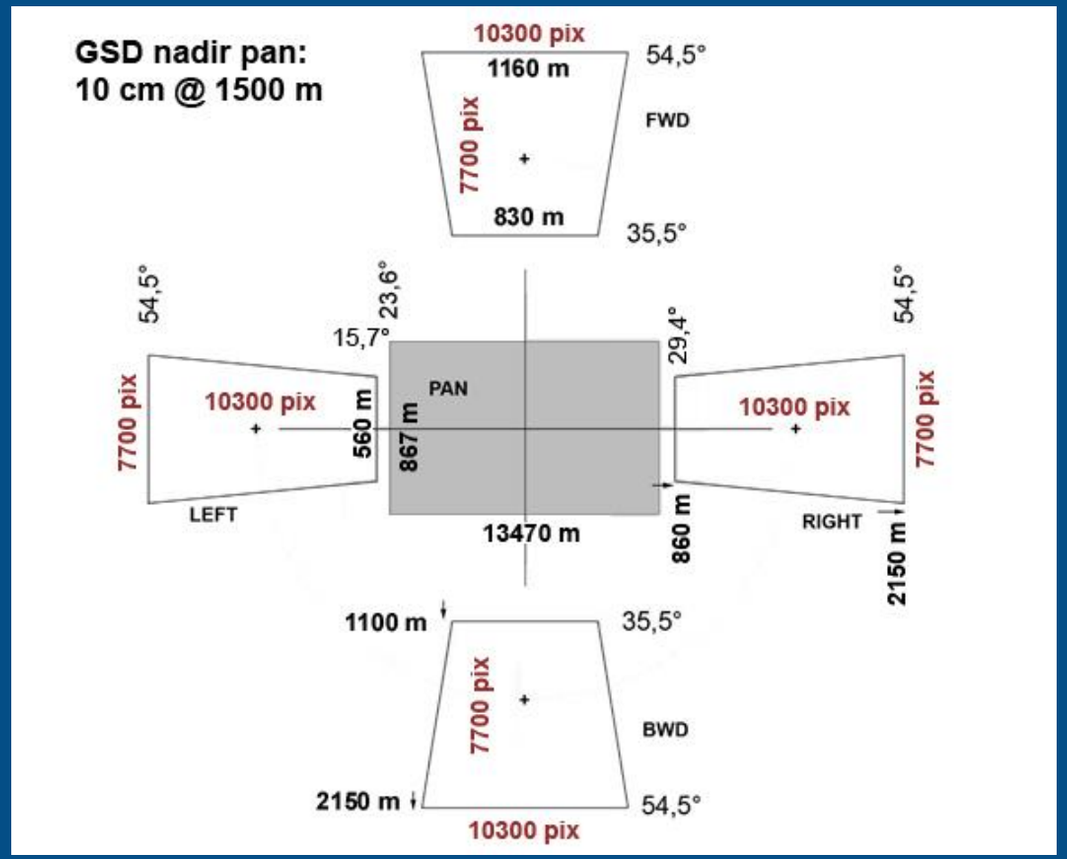
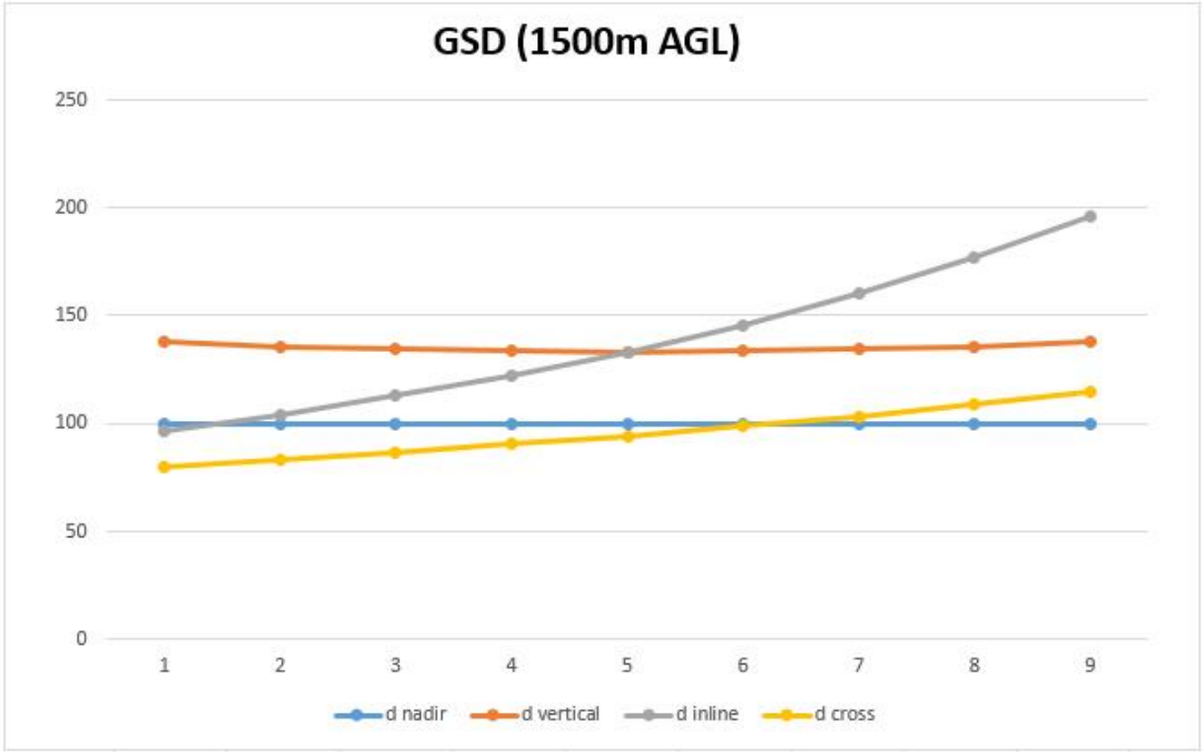
UltraCamOsprey Prime II



Footprint



deg	35,0	37,5	40,0	42,5	45,0	47,5	50,0	52,5	55,0

GSD

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Oblique View

Salzburg, @ 750 m

GSD 5 cm to 8 cm

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Nadir and Oblique

Calibration

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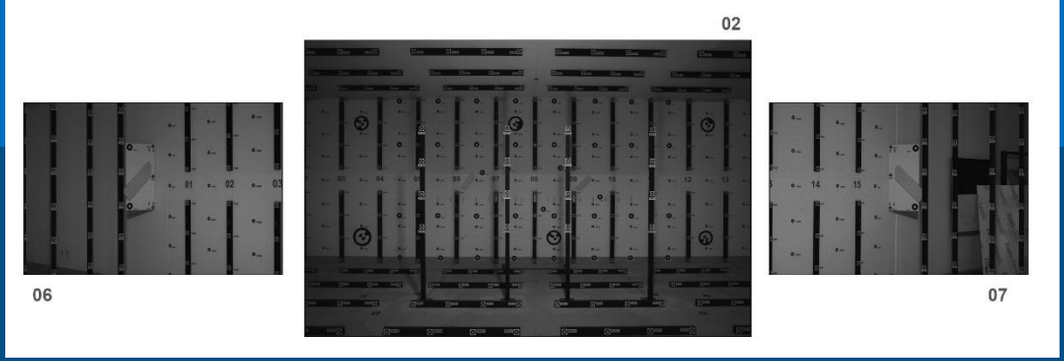
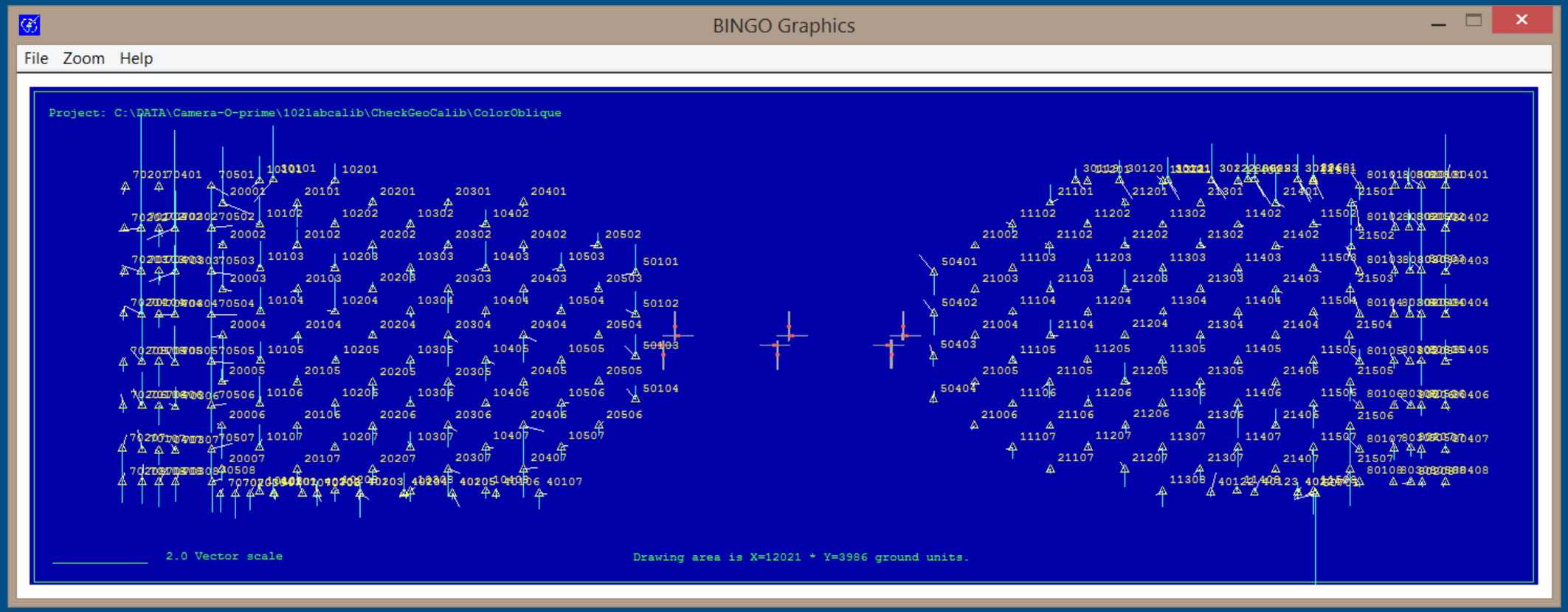


Oblique Calibration



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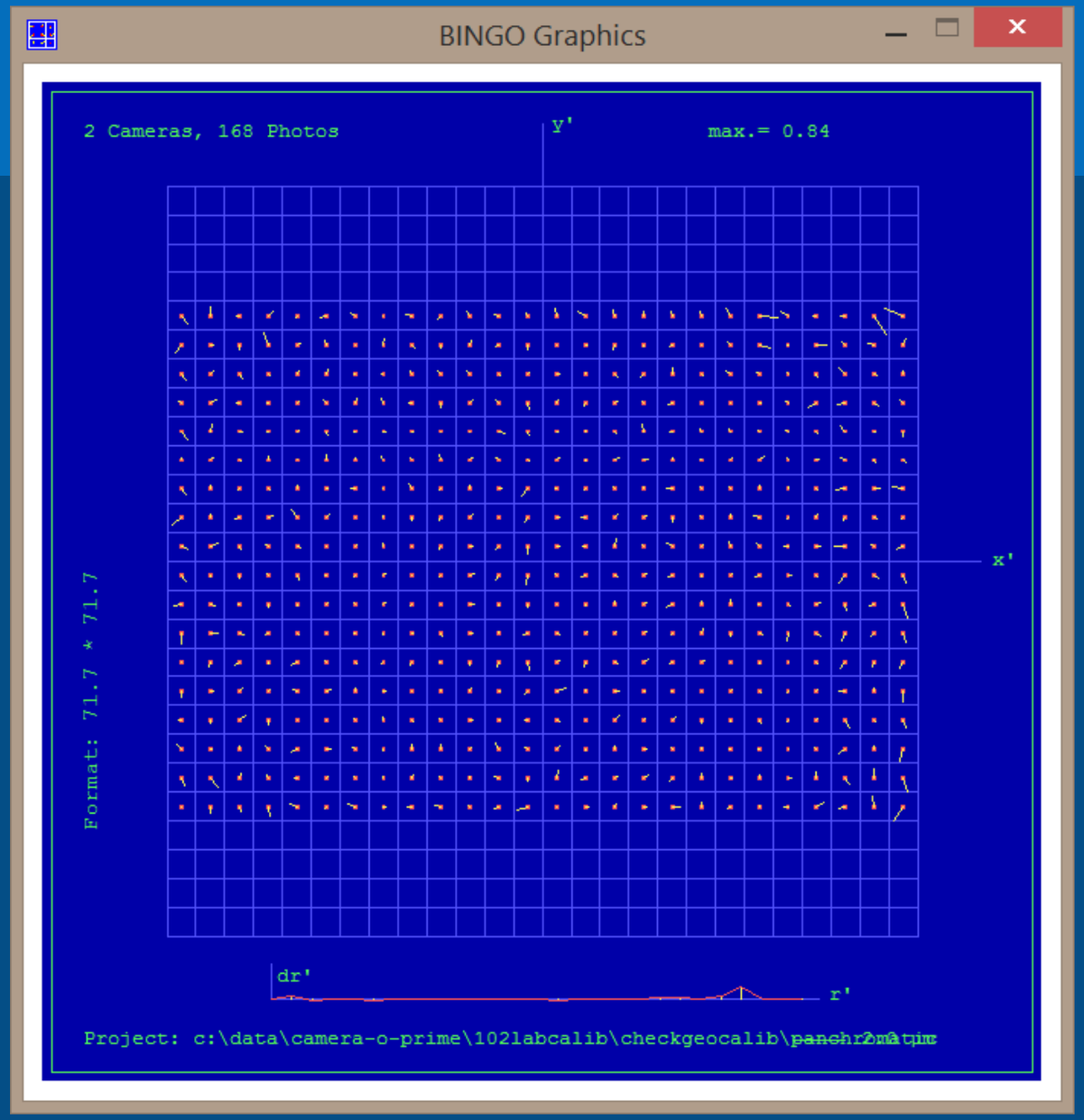
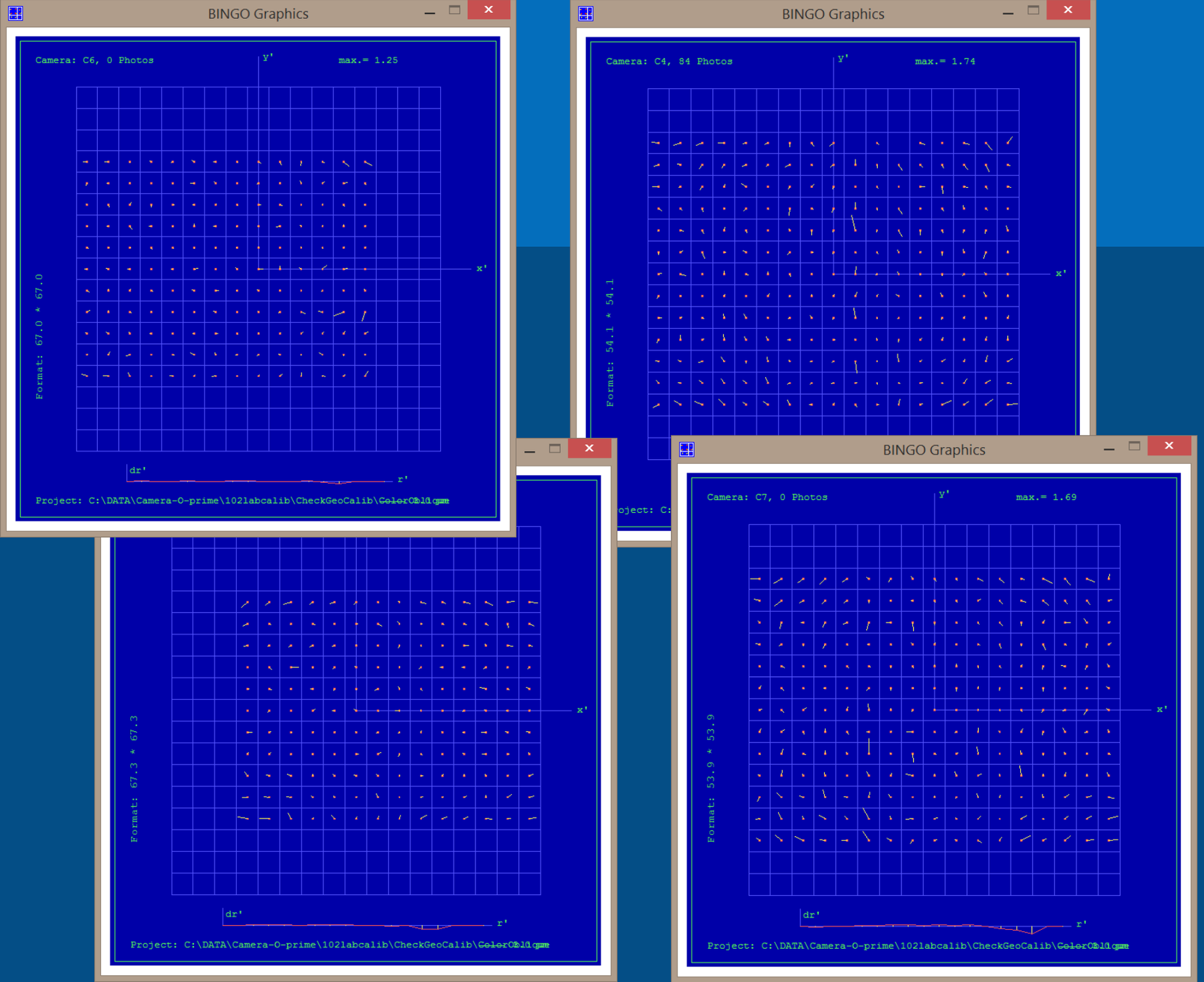


Bundle Adjustment
Nadir camera at 0,9 µm accuracy.



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Bundle Adjustment Oblique at 1,4 µm accuracy. Nadir results serve for platform calibration

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		X	Y	Z	phi	omega	kappa
ECCA	C4	158,0382	-112,8951	113,1829	0,1523	-49,9985	-0,0826
ECCA	C5	69,8002	-77,0879	91,6587	-49,9297	0,0108	-0,0087
ECCA	C6	-6,1004	-151,1954	27,9638	50,0419	-0,0544	0,0406
ECCA	C7	-68,4033	-48,4339	-48,361	0,1203	50,0065	0,1324

Platform Calibration

Sample Projects / Camera Accuracy

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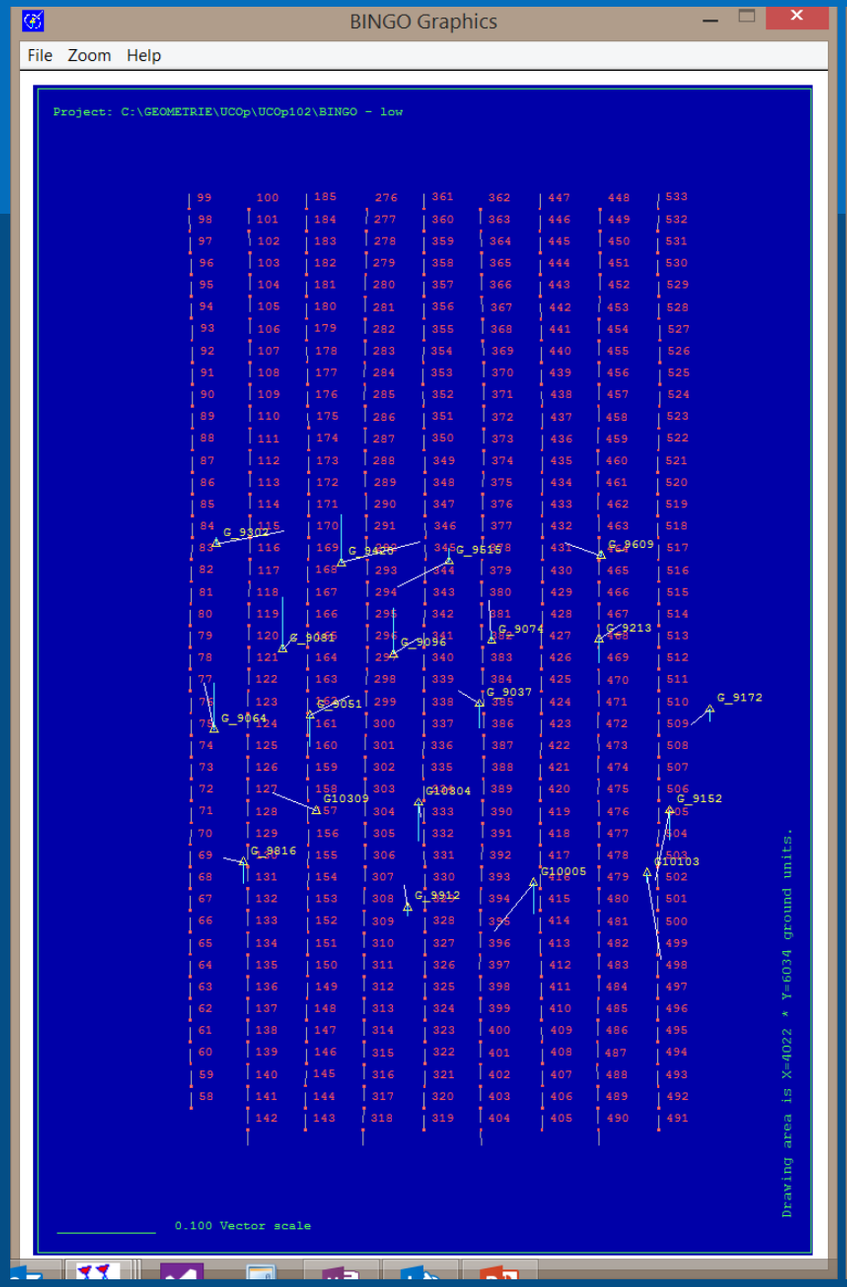

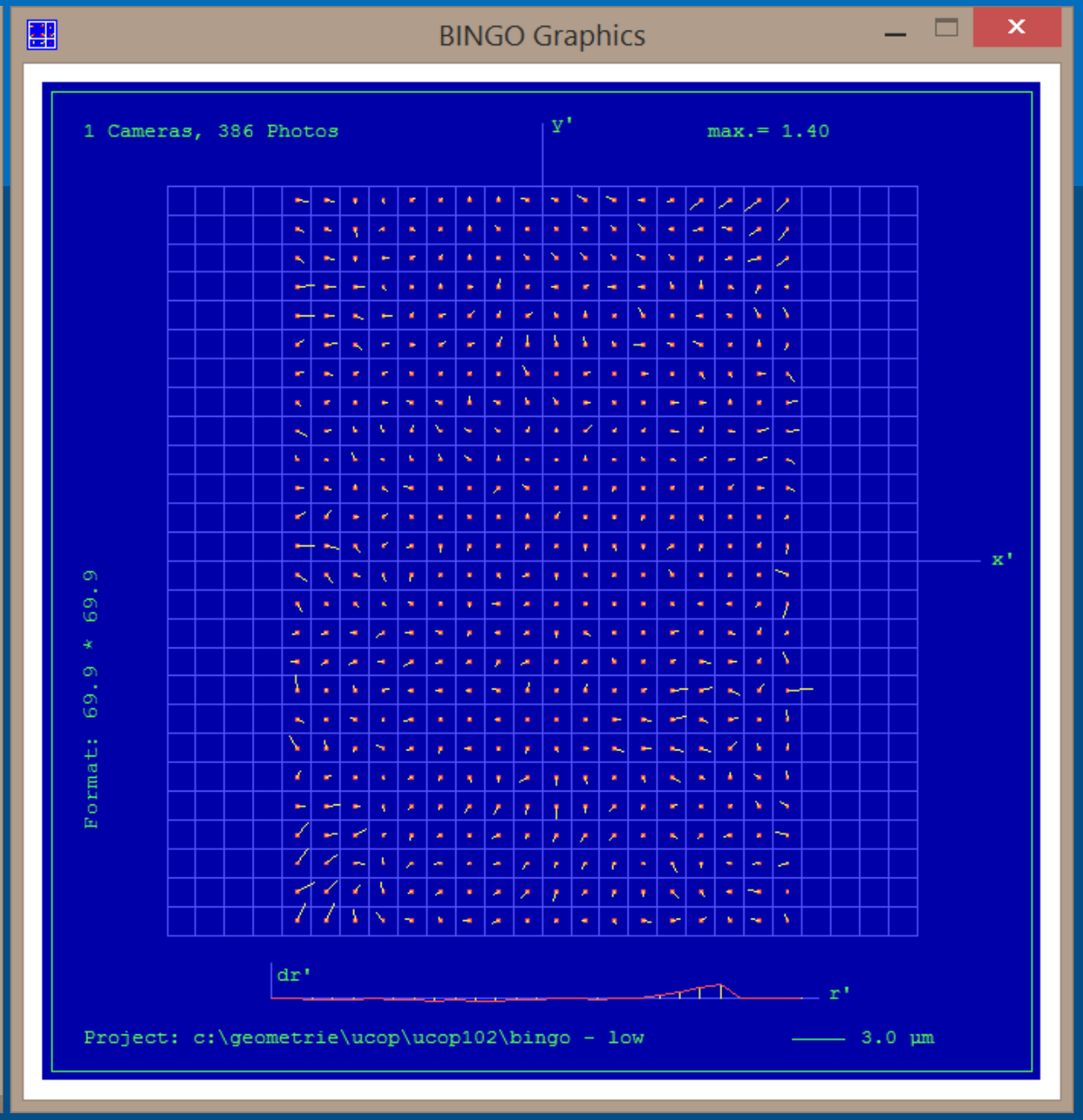

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Results from LSBA

RMS control point residuals:	35.	34.	29.	[mm]
Maximum control point residuals:	80.	89.	51.	[mm]
RMS GPS residuals:	6.	6.	9.	[mm]
Maximum GPS residuals:	18.	15.	27.	[mm]
RMS IMU residuals:	2.9	3.1	5.1	[mg]
Maximum IMU residuals:	7.5	8.7	9.3	[mg]

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Digital Photogrammetric Workflow for Nadir and Oblique

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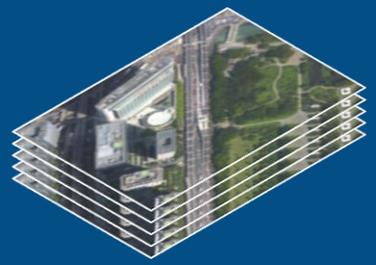
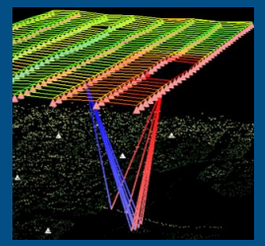
The Complete & Modular End-to-End Workflow for UltraCam Imagery

Image Acquisition



Radiometrically aligned Images



Aerial Triangulation

3D Point Cloud

Digital Surface Model (DSM) And Editing

True (DSM) Ortho

Traditional (DTM) Ortho

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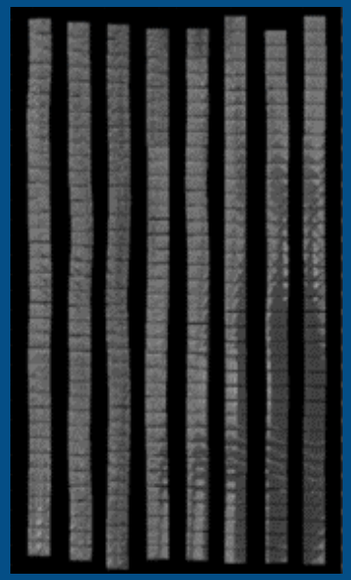
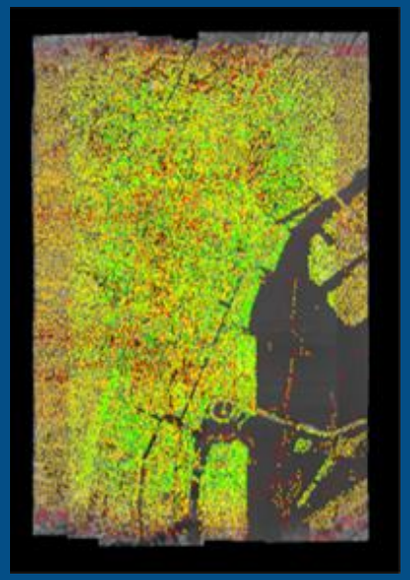
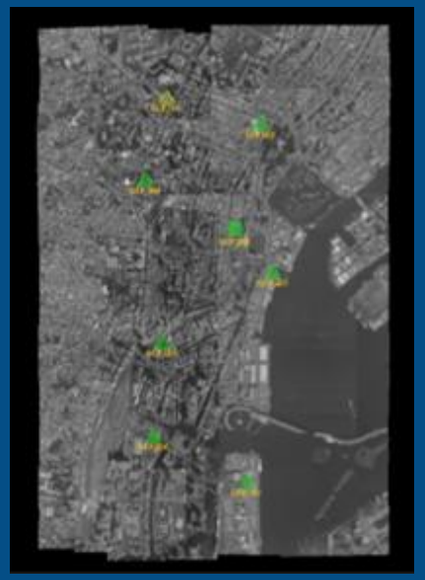
UltraMap – Aerial Triangulation



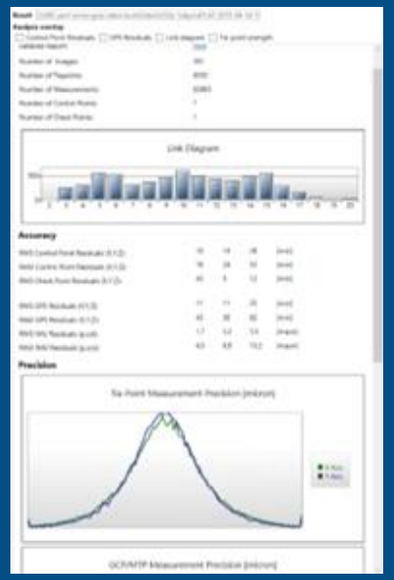
Input Preparation



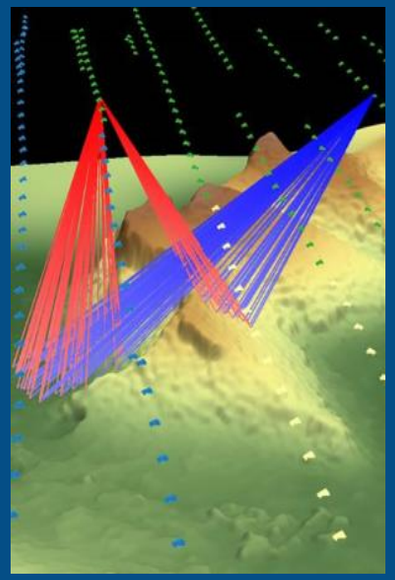
Automated Tie Point Collection



[Grond Control Measurement]



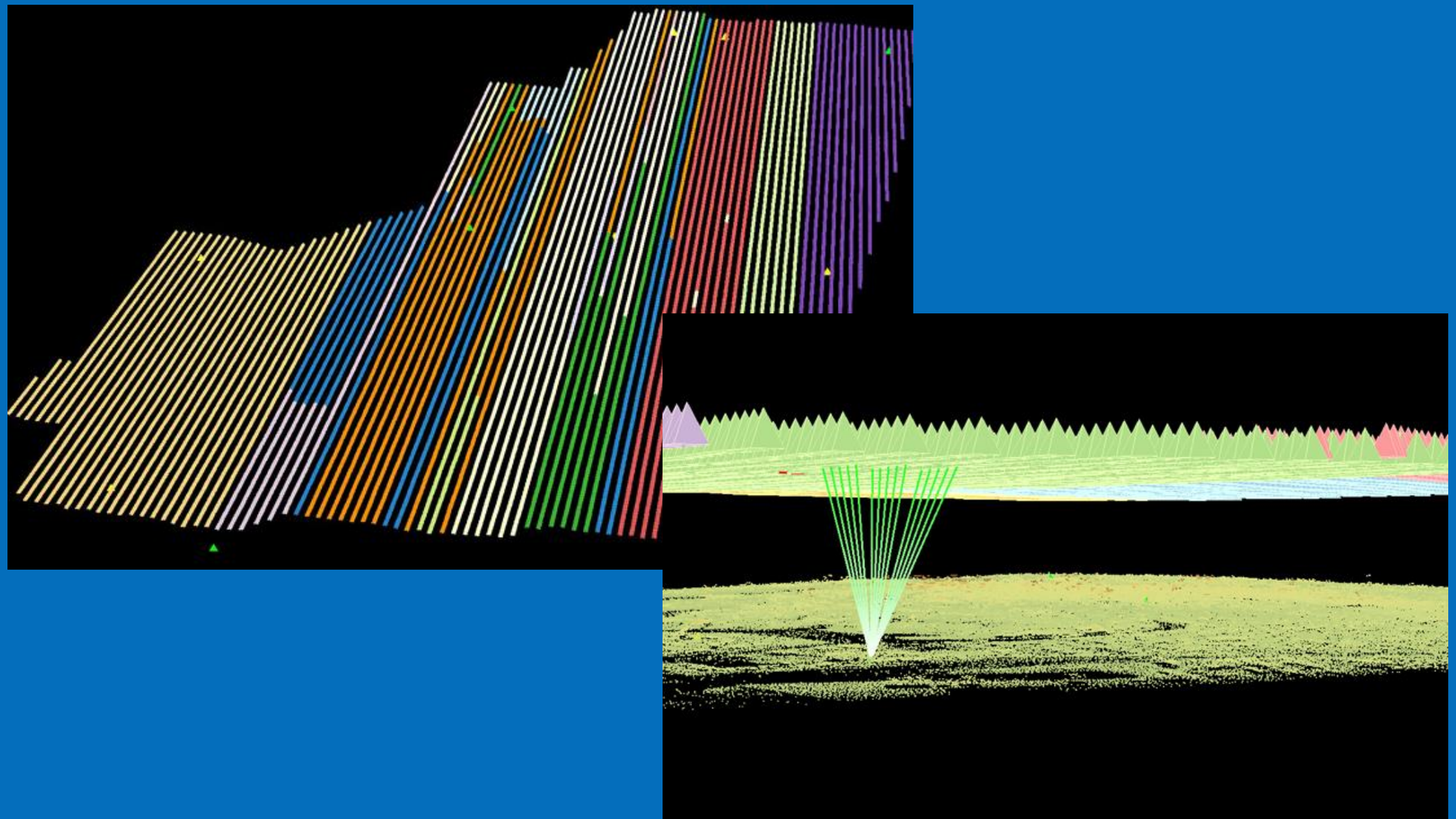
Bundle Adjustment (Bingo 6.6)



Oblique AT

NEW
Visual Analytics
NEW

UltraMap-AT



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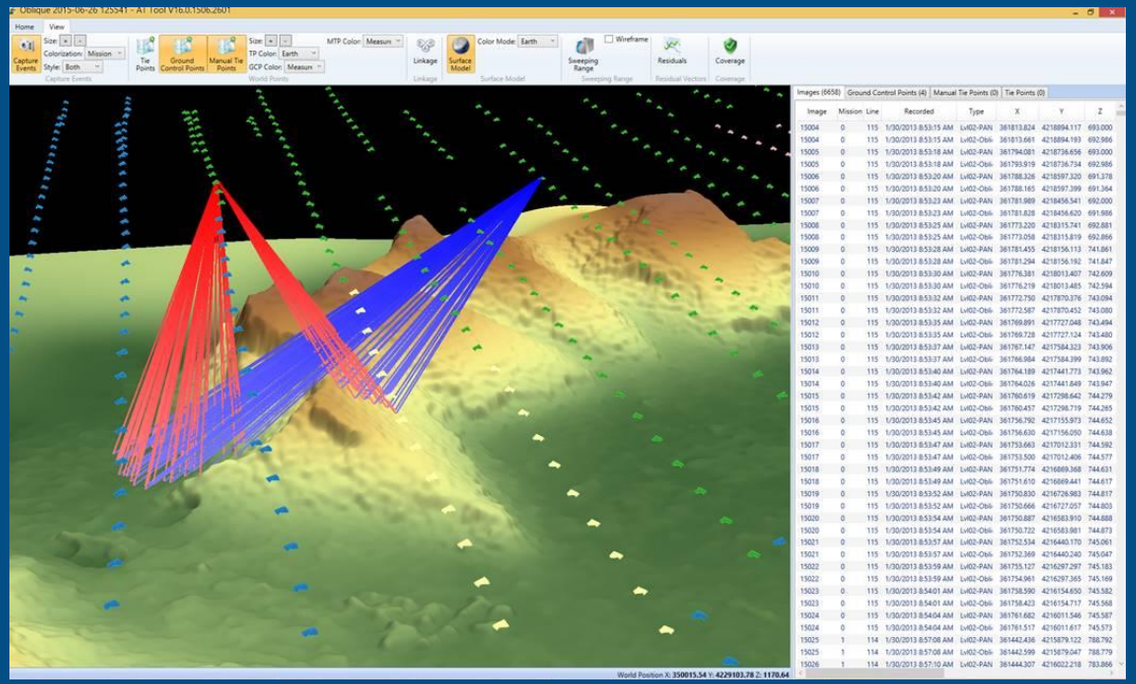
Visual Analytics – Built-in Terrain and Image Visualization



Identifying Point Correspondences

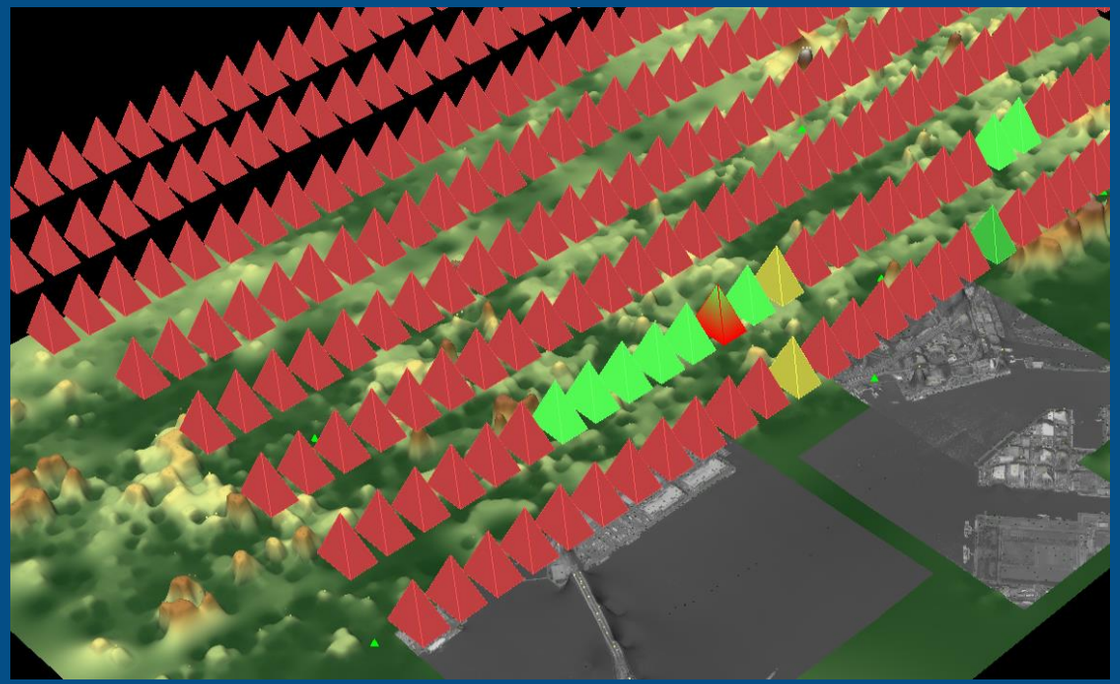
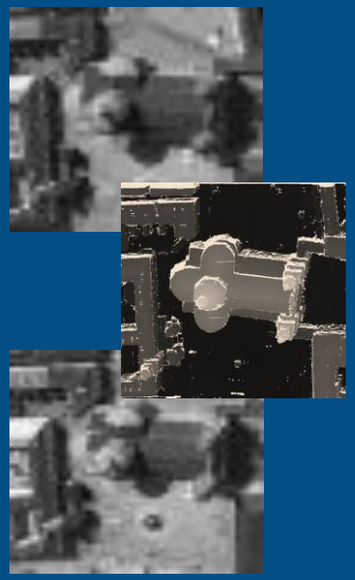
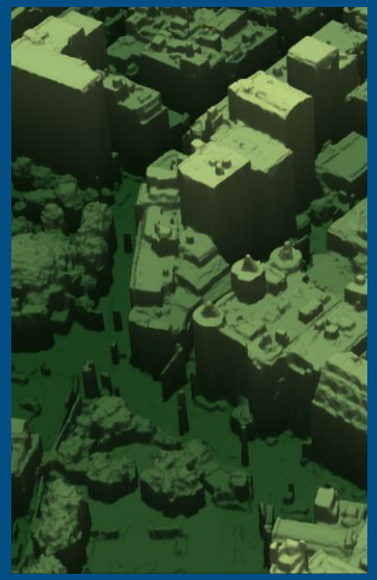


Image Visualization on
Tie Point Surface

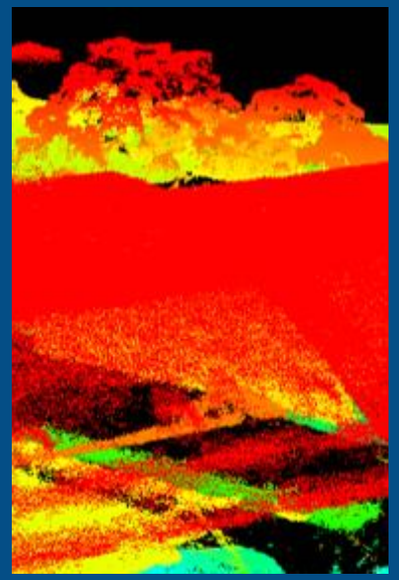
UltraMap – Dense Matcher



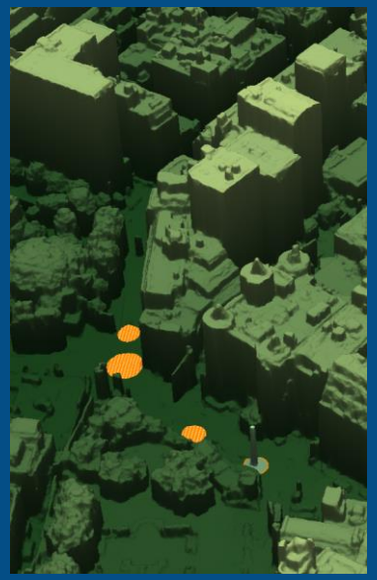
Dense Matcher



Digital Surface Model



Point Cloud Export (RGBI & CIR)



NEW DSM Editing NEW

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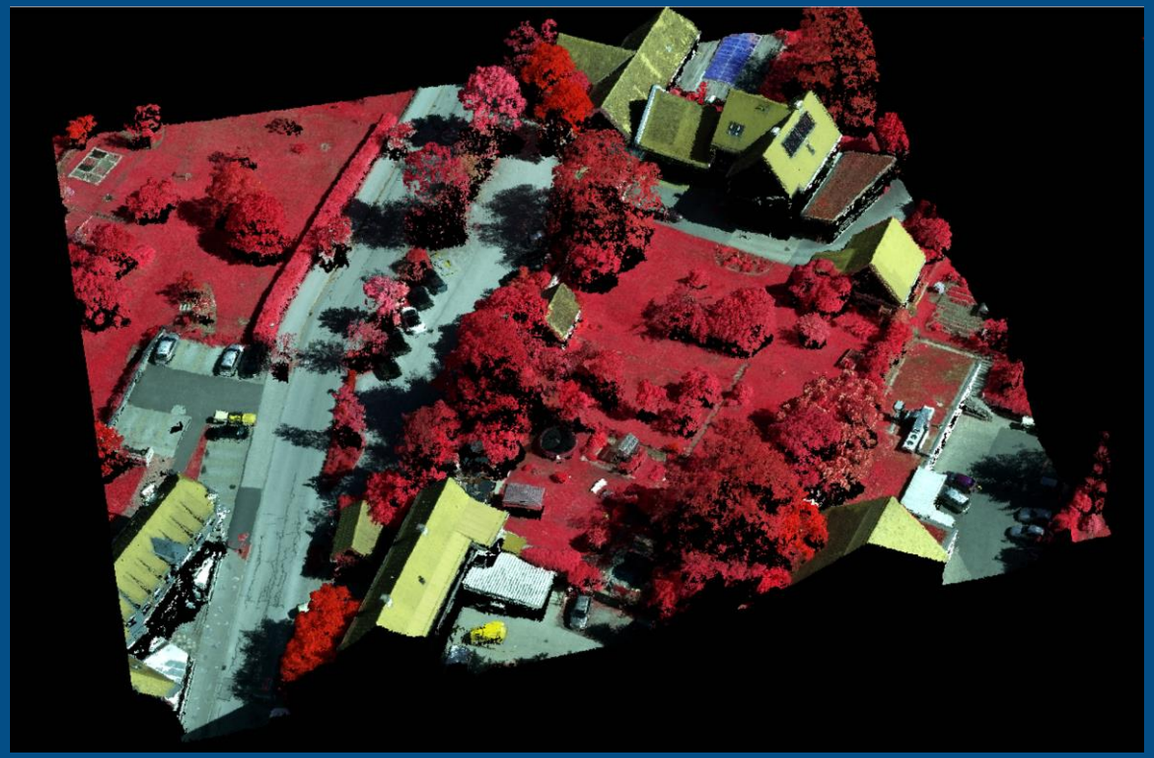
Point Cloud Export Options: RGBI & CIR



ULTRAMAP Essentials

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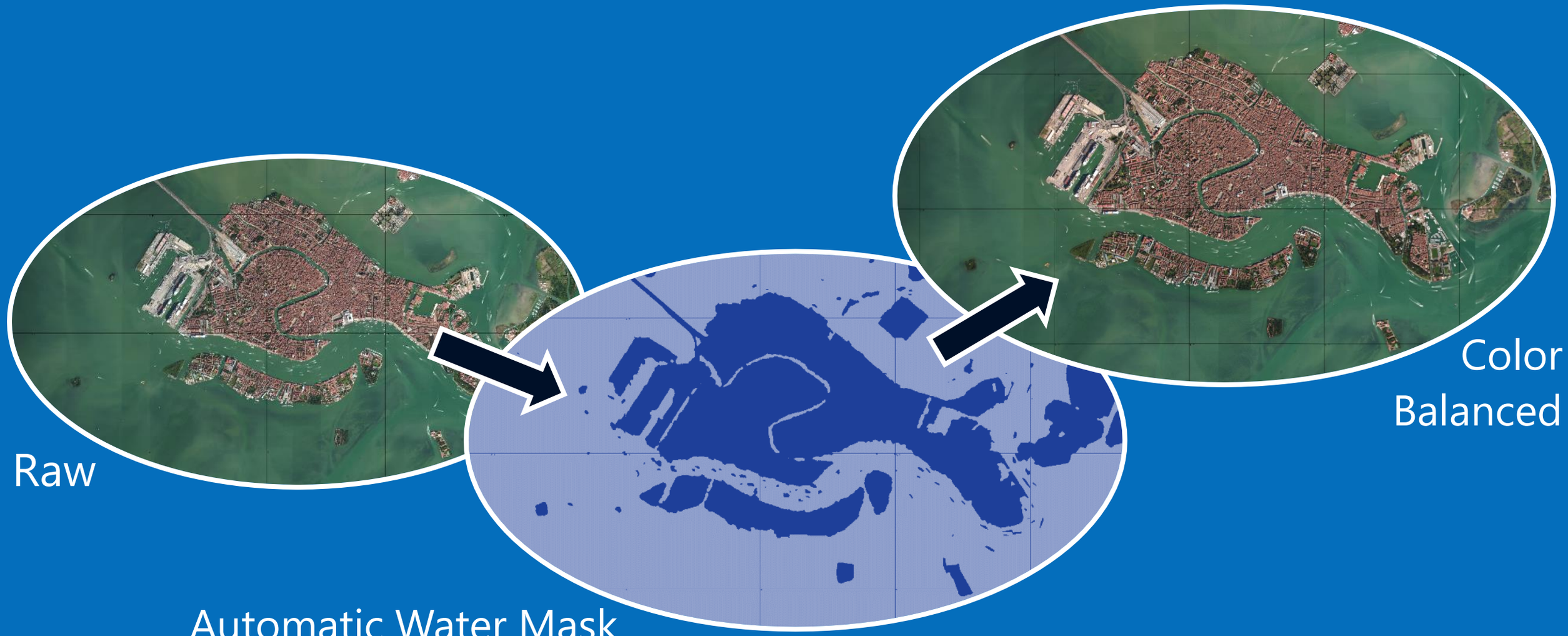
Incorporation of Automatically Created Water Mask



ULTRAMAP Essentials

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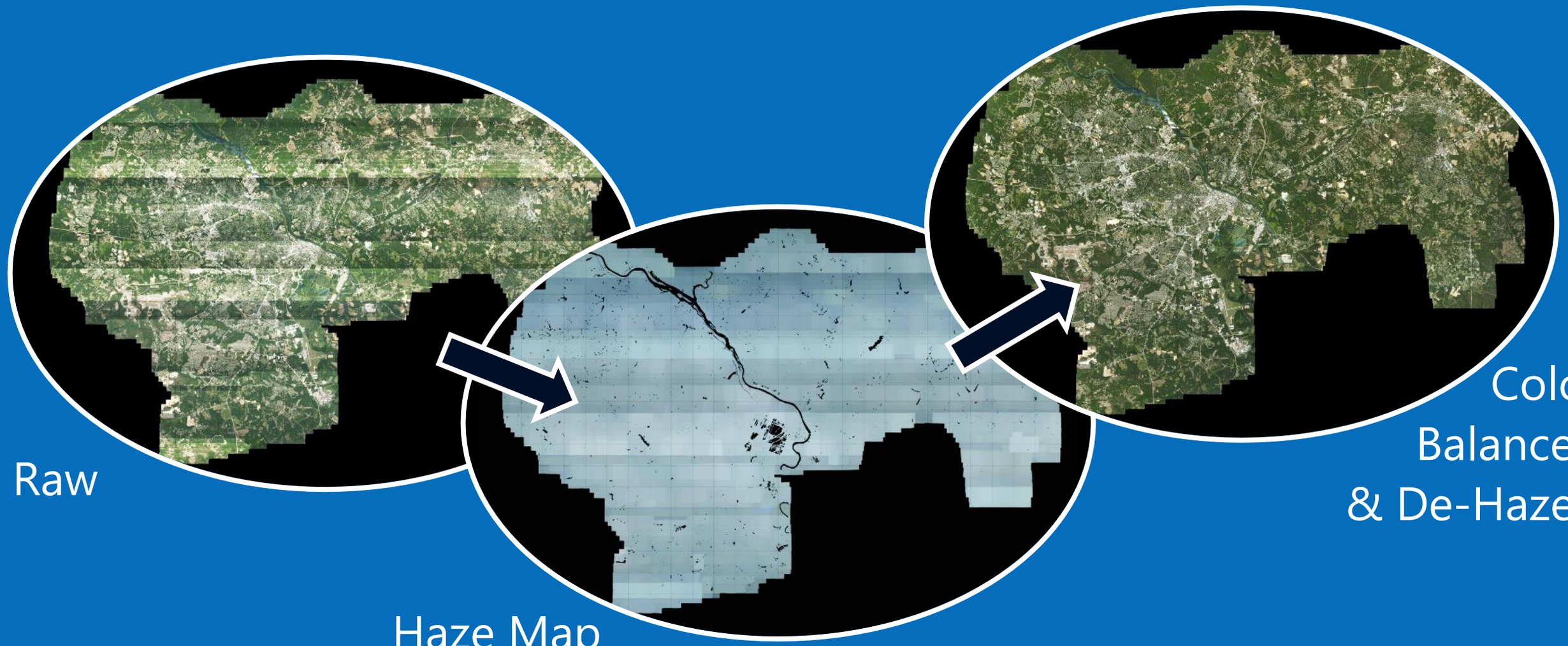
De-Hazing for Varying Atmospheric Conditions



ULTRAMAP Essentials

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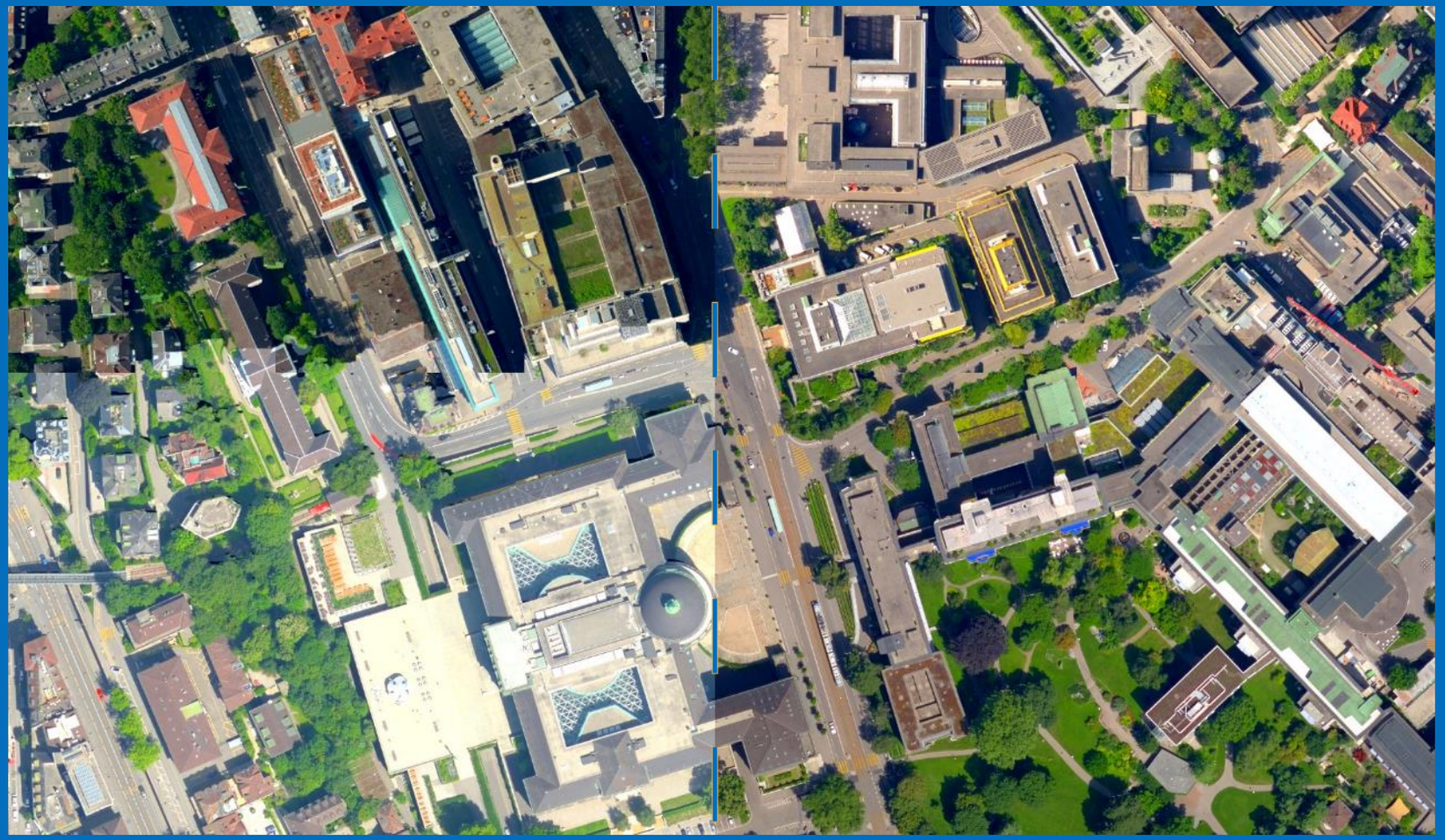
Simultaneous Oblique and Nadir Color Balancing

Raw



Balanced

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Powerful De-Hazing of Oblique Images

ULTRAMAP Essentials

Microsoft

Powerful De-Hazing of Oblique Images

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UltraMap

Large Project Case Study UltraCam Osprey P

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Microsoft

Augusta, GA

UltraCam Osprey
~140.000 images

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Preview Ortho unbalanced

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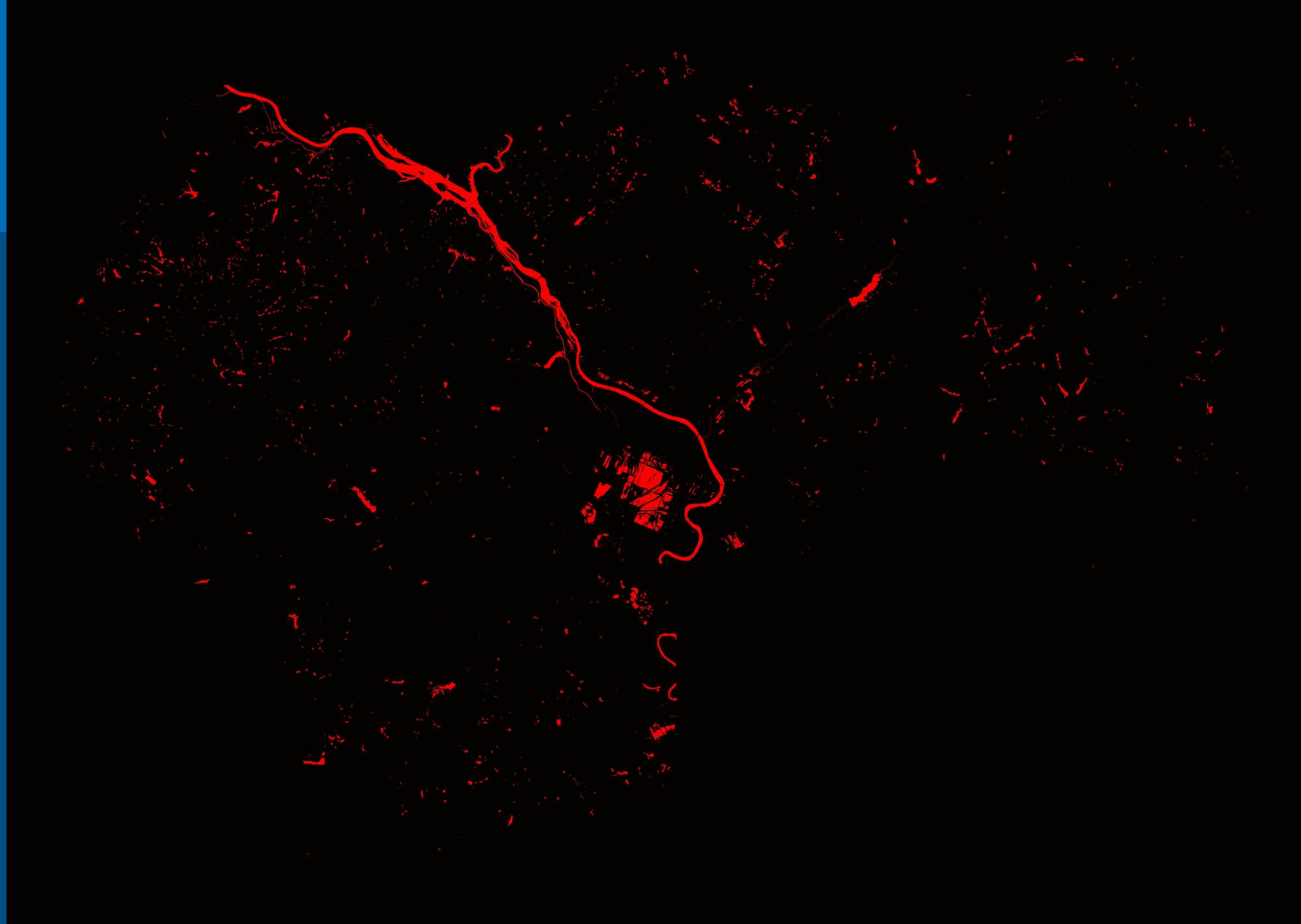

Watermask

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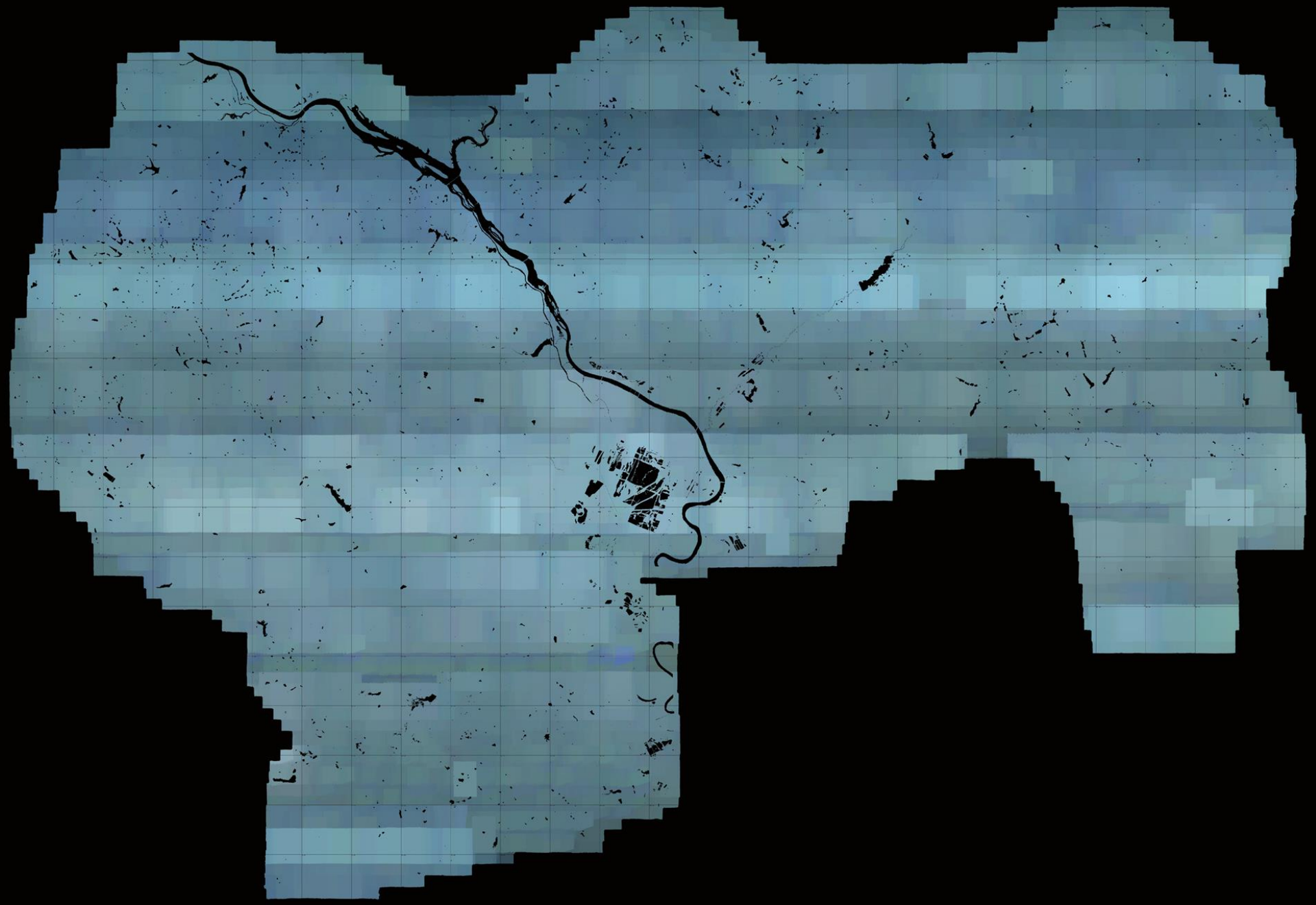

Haze Map

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Preview Ortho balanced

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UltraMap preview

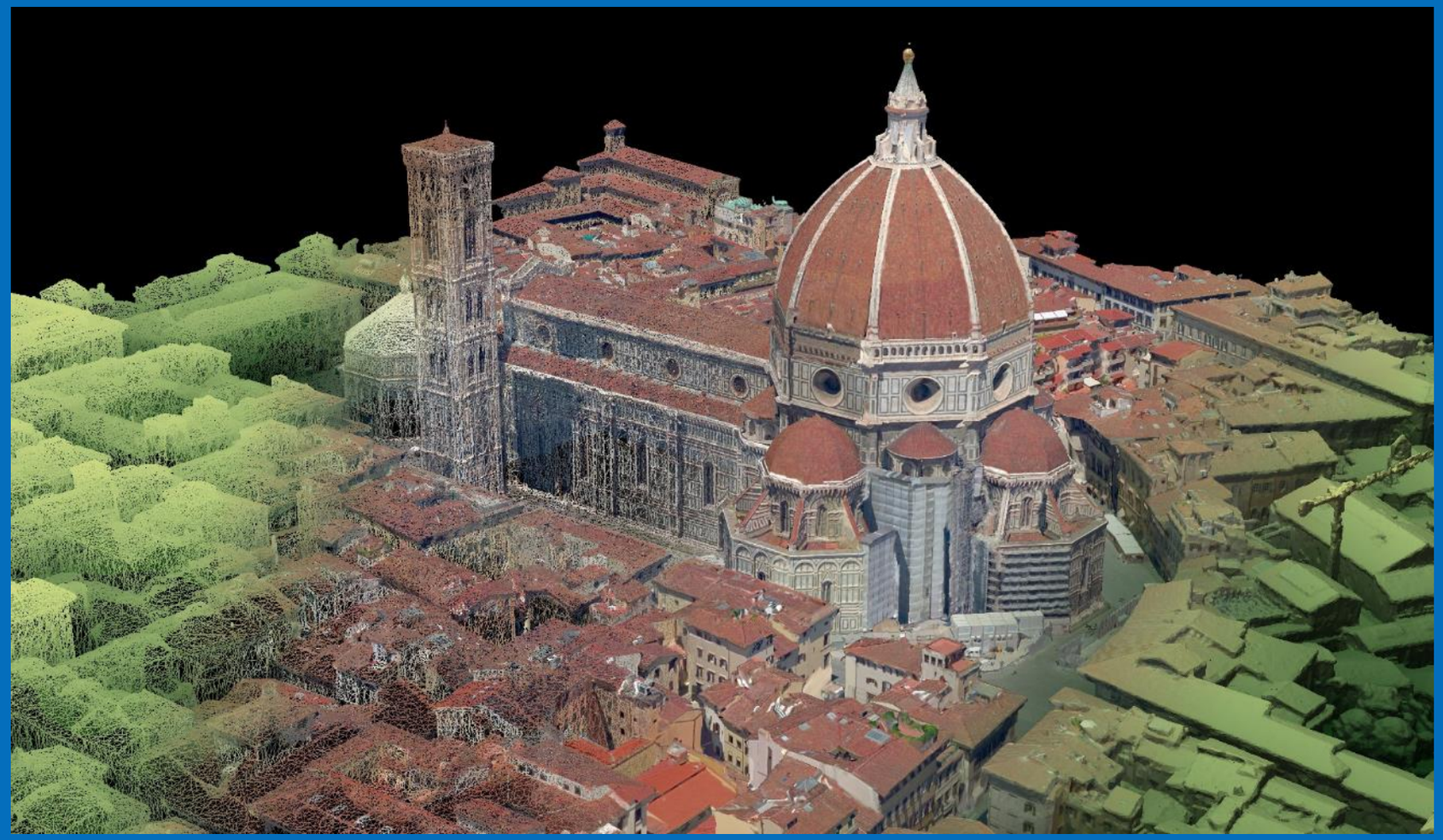
3 D object reconstruction

ULTRAMAP 3D

Microsoft

UltraMap – Technology Preview

Automatic 3D Textured TIN Creation using the industry leading Microsoft 3D modeling technology known from Virtual Earth and Bing Maps.



ULTRAMAP 3D

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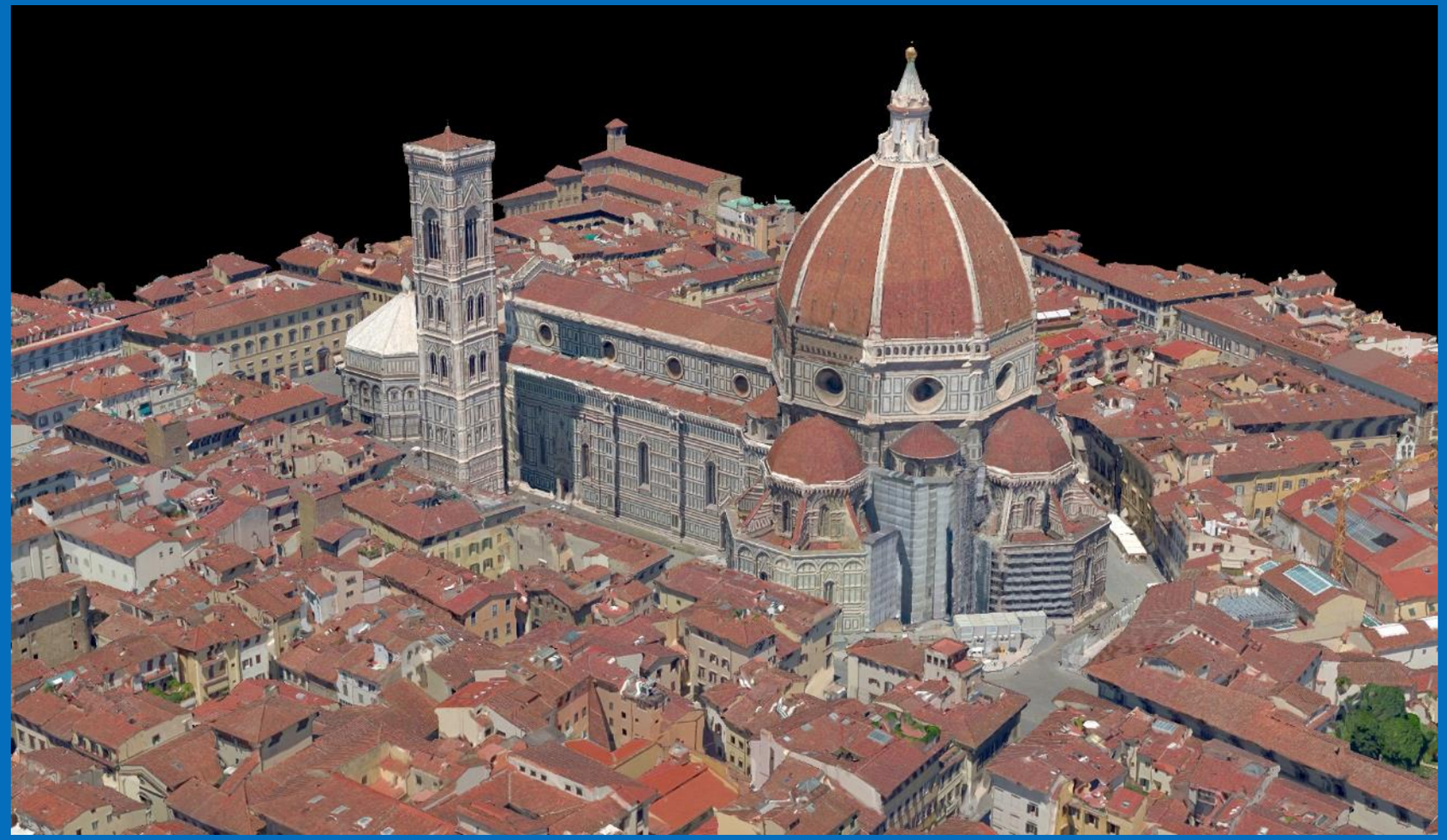

ULTRAMAP 3D

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ULTRAMAP 3D

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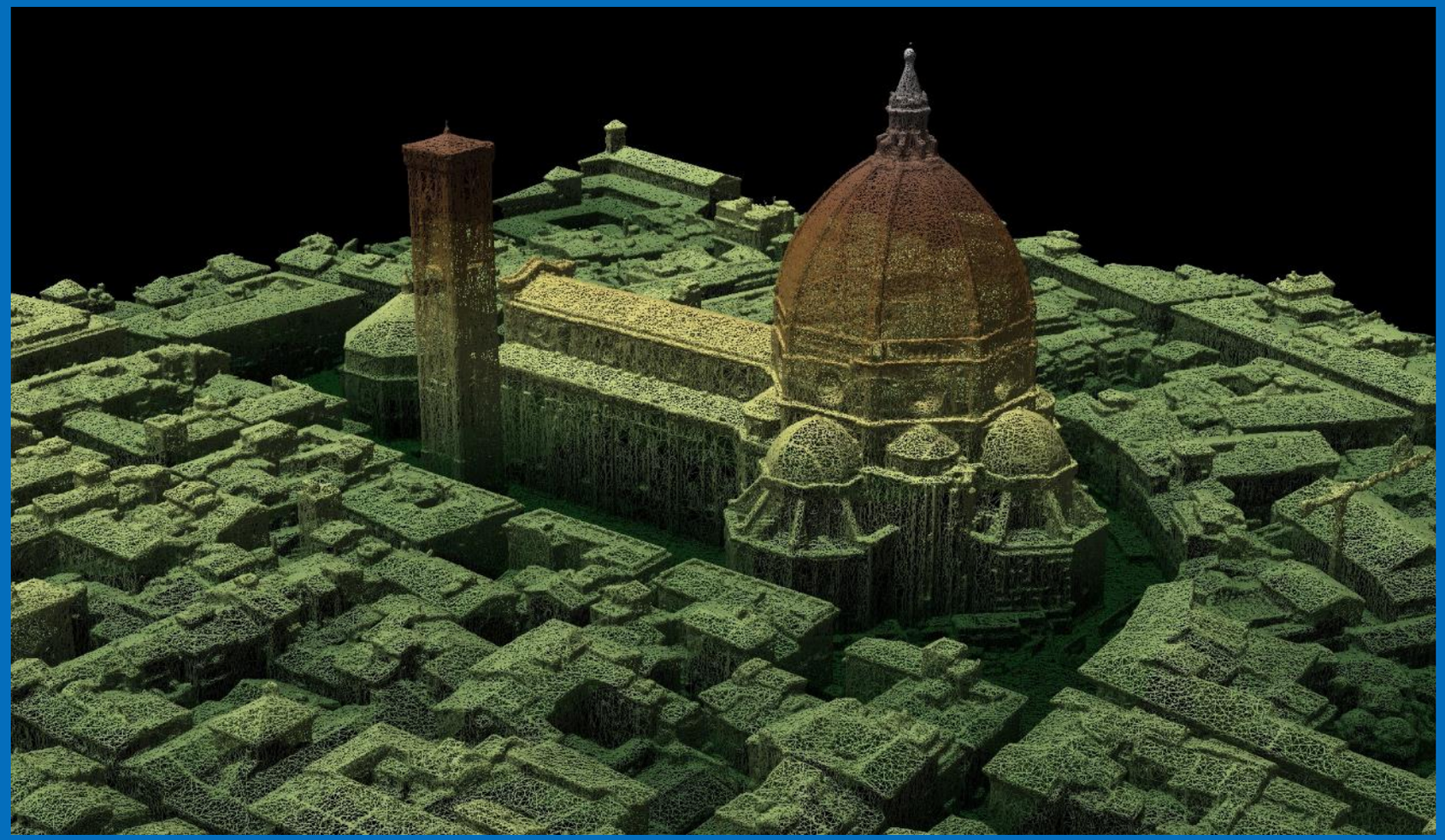

ULTRAMAP 3D

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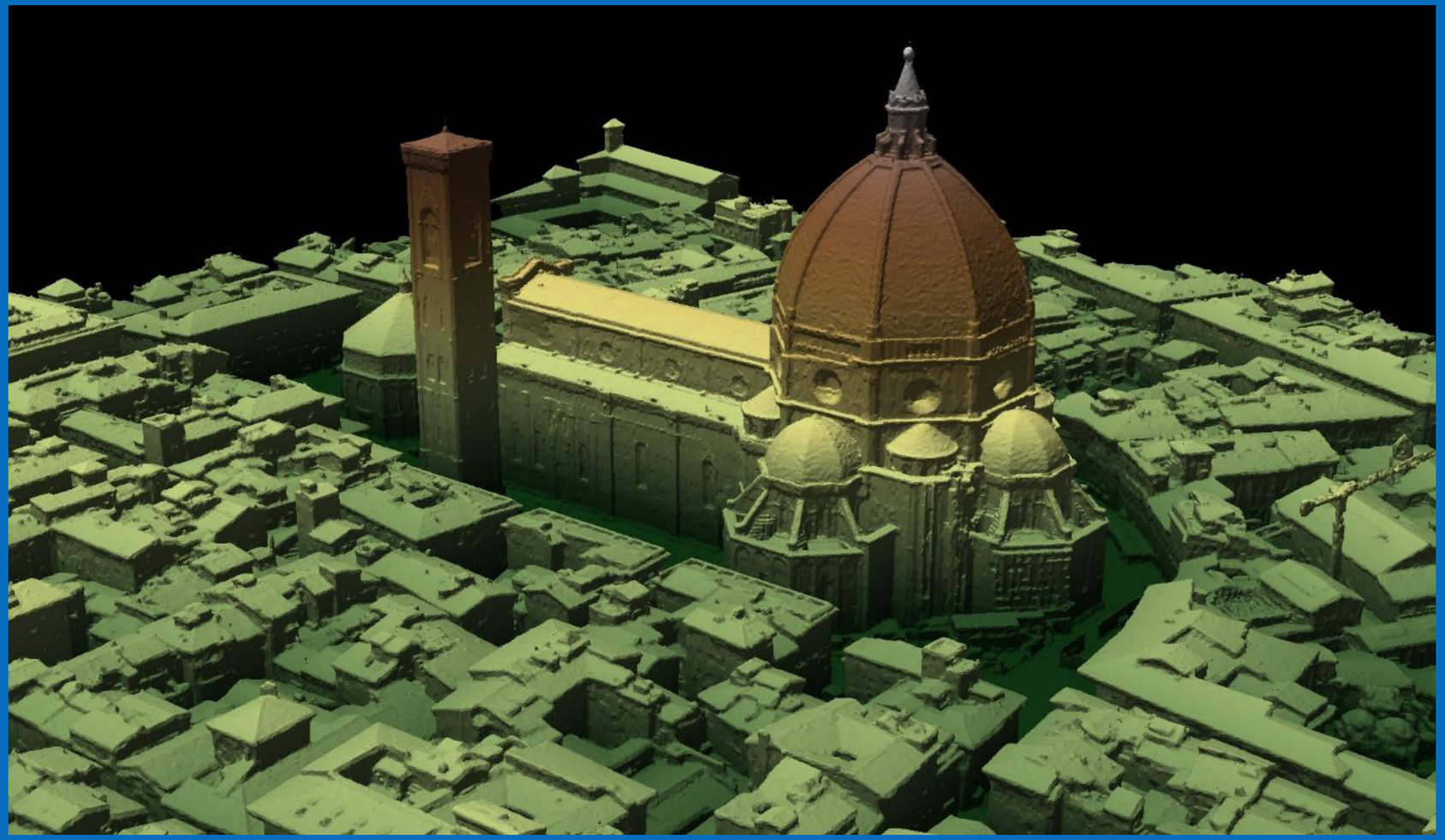

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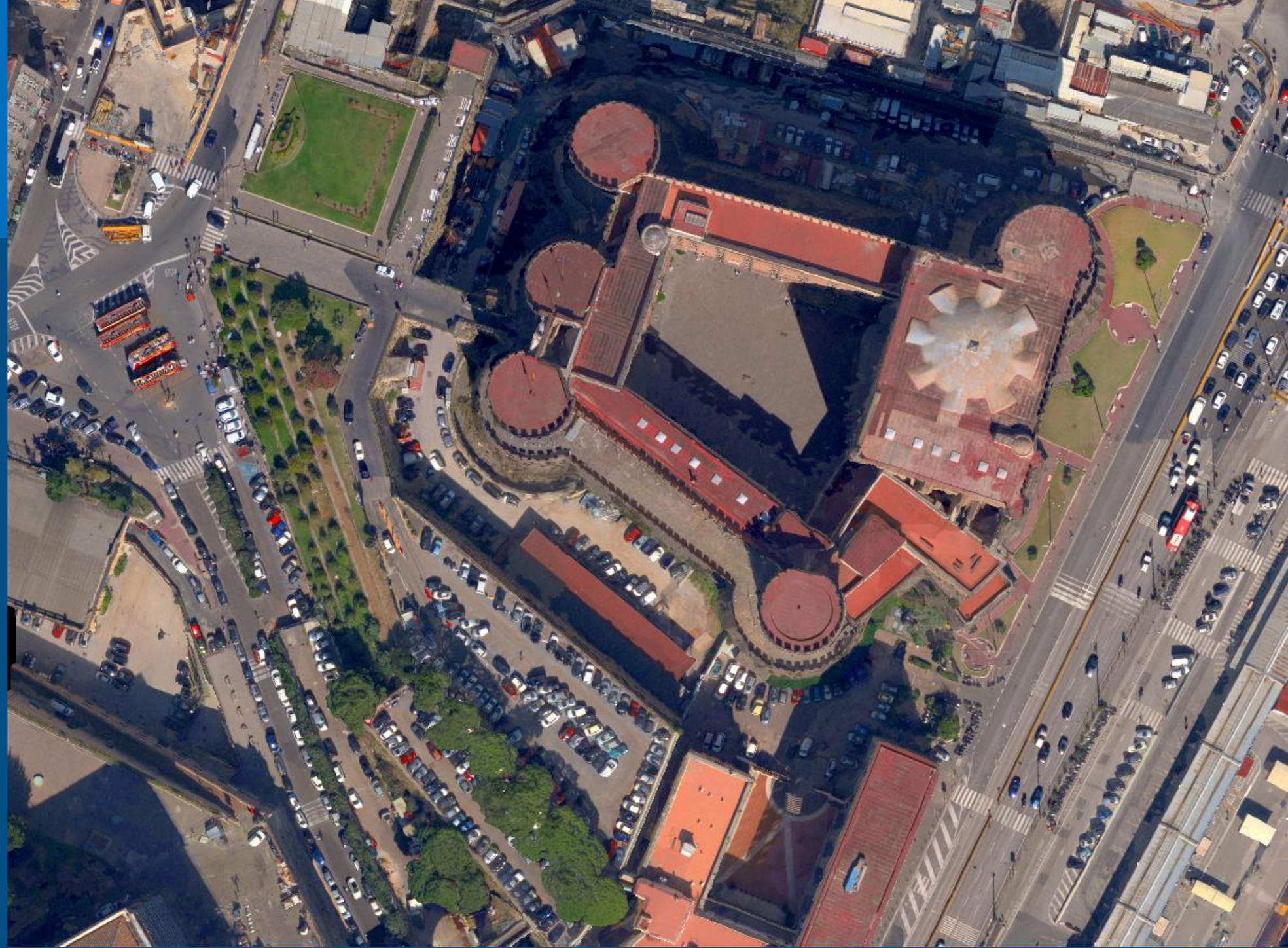

3D Model Castello Nuovo Naples

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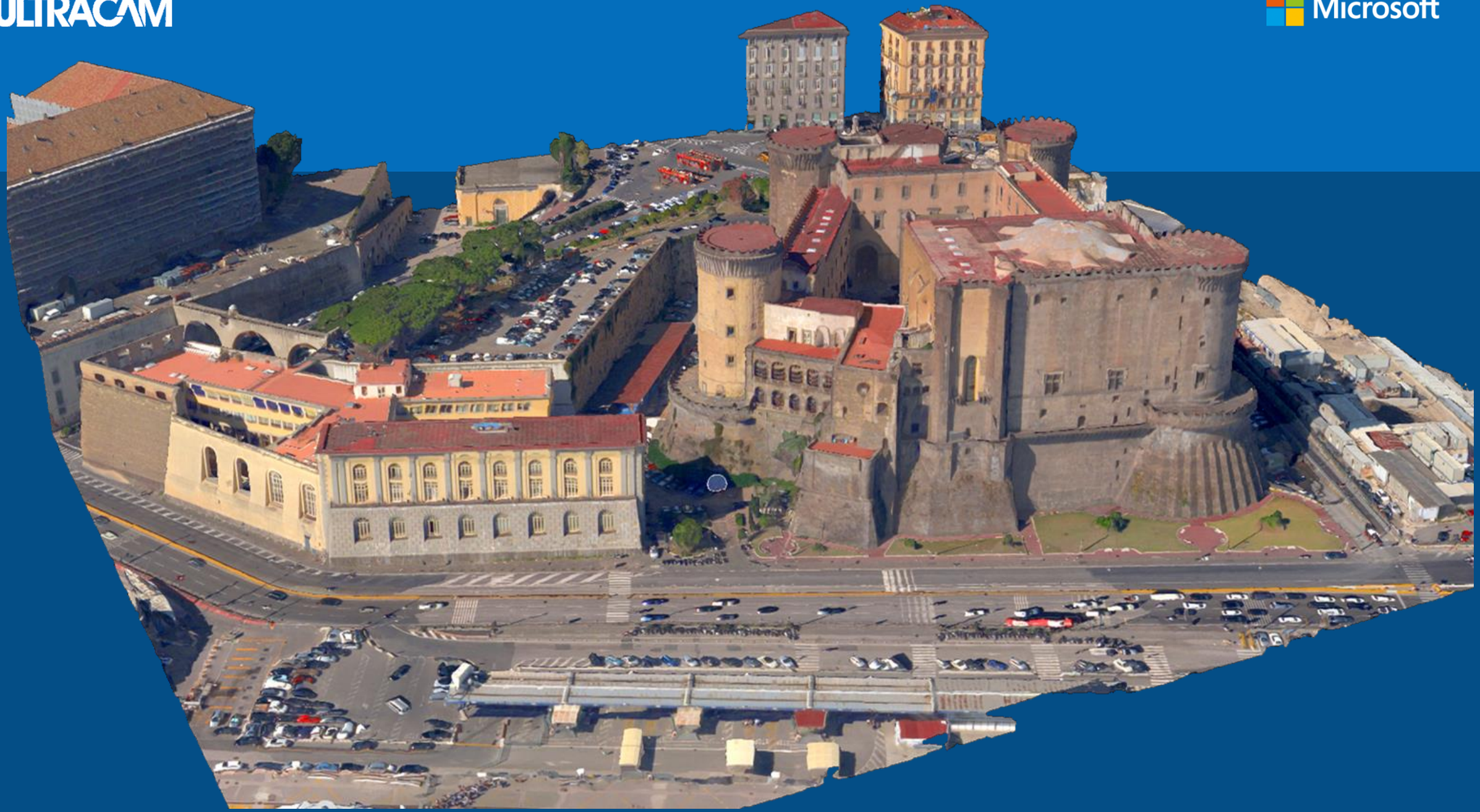

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Thank you!