Oblique Aerial Camera Set Up

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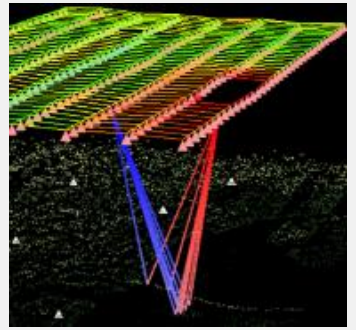
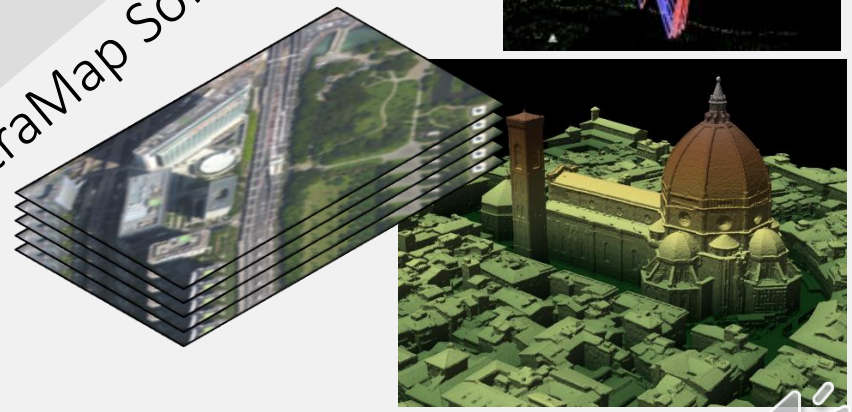
Exploring the world from every angle

Aerial Cameras

Terrestrial Systems

UltraMap Software





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Aerial Cameras for

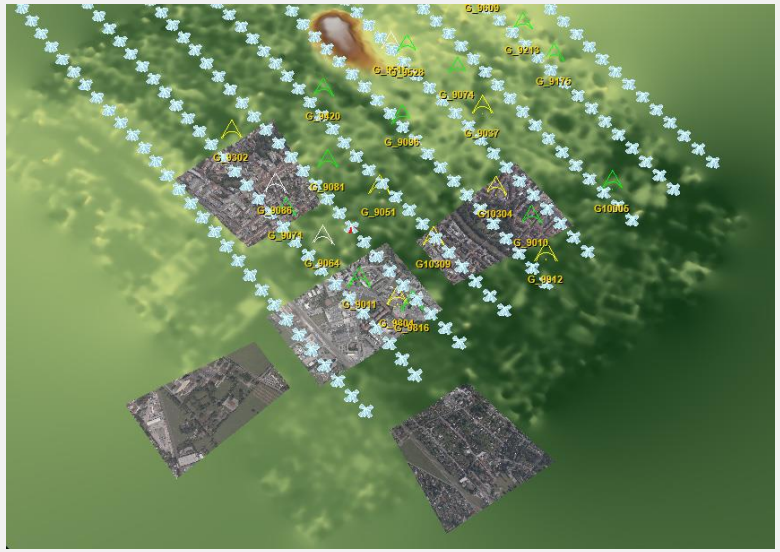
Nadir
Obliqe
Wide Area Mapping

Photogrammetric
Workflow

Photogrammetry meets oblique

The UltraCam Osprey Mark 3 Premium combines two cameras in one photogrammetric housing

- Mapping grade nadir (pan, 116 Mpix)
- 80 Mpix oblique (4 directions)
- 80mm / 120 mm lens system



Graz, 7 cm GSD
UltraCam Osprey

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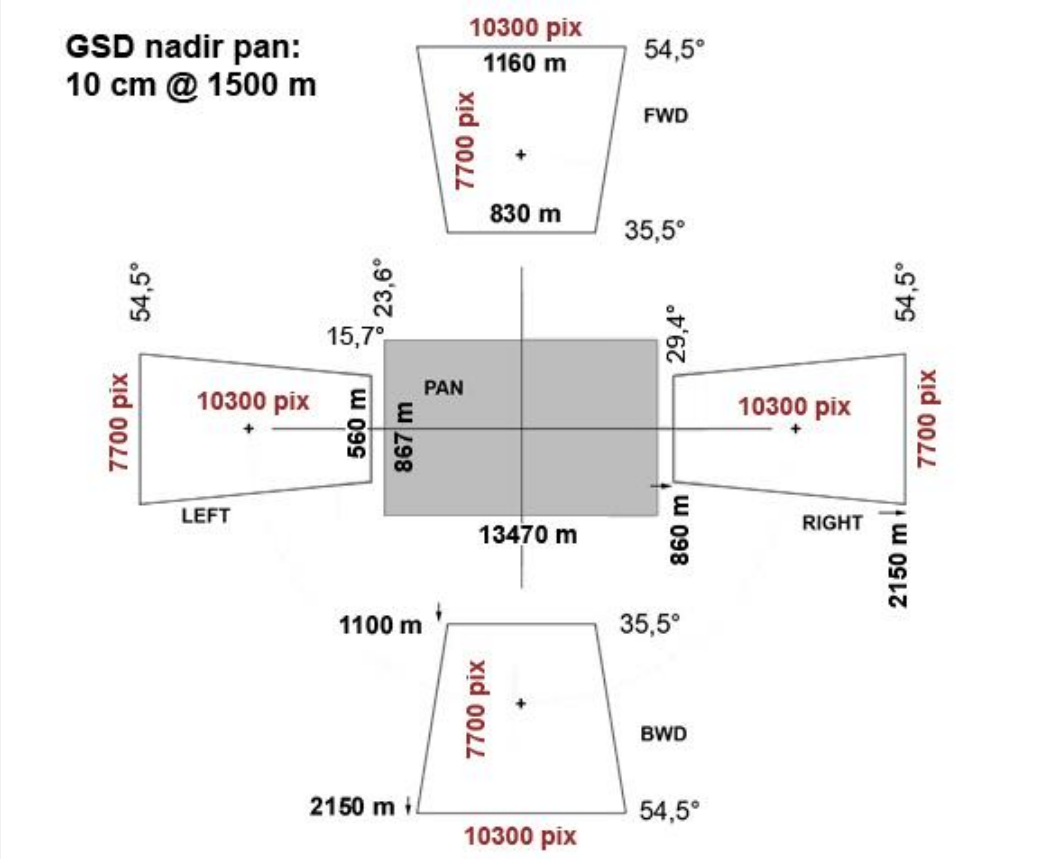
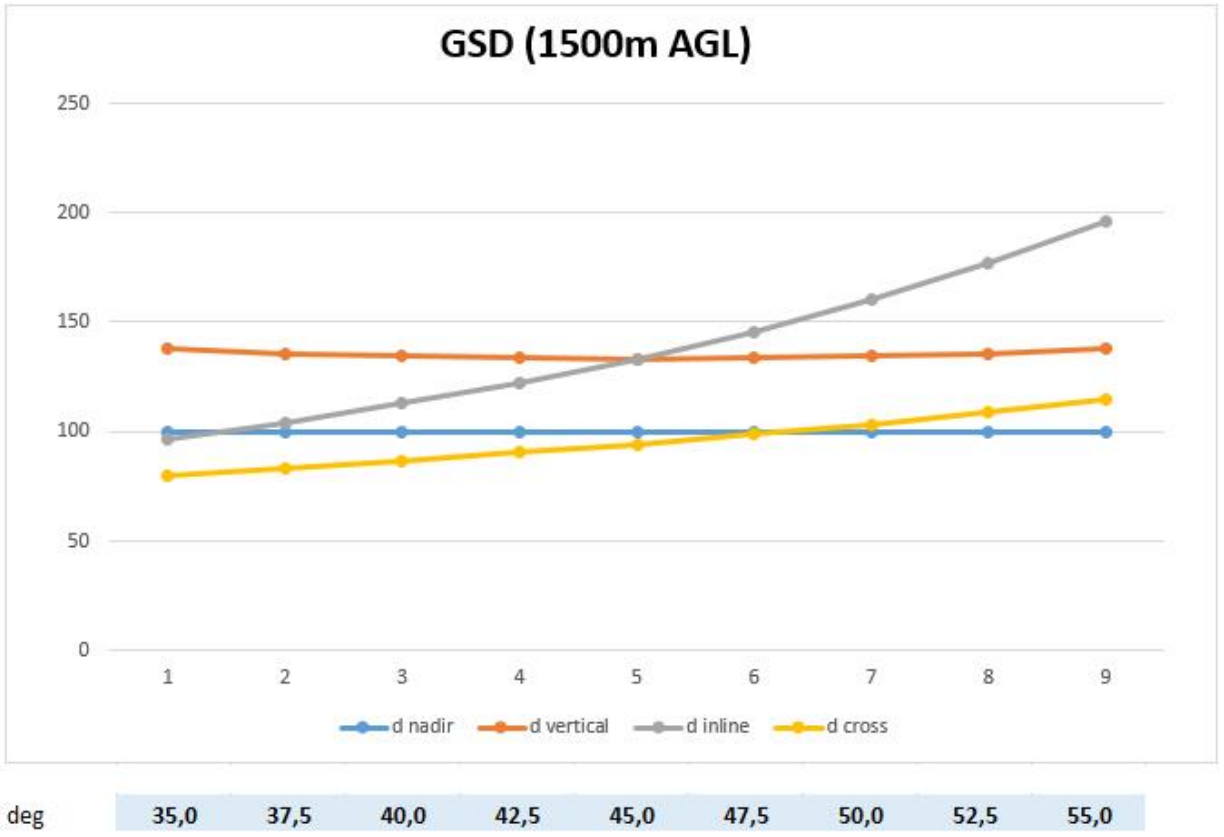
UltraCam Osprey Mark 3
Graz, at 6,5 cm GSD

UltraCam Osprey



Footprint

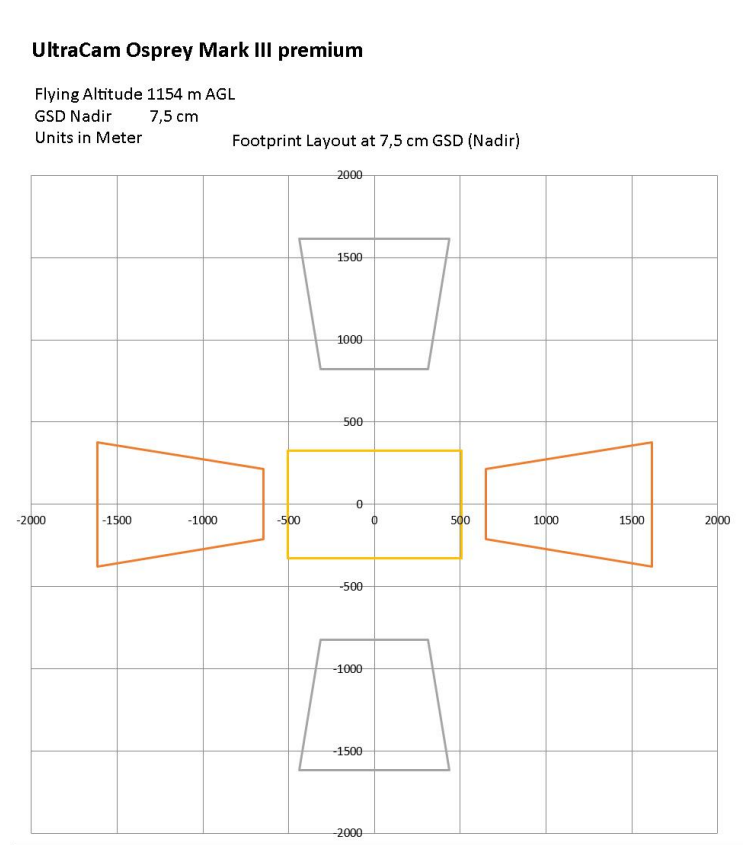


GSD

Basic design idea:

- High quality (photogrammetry grade) nadir
- Geometry backbone for block set up
- 45° oblique to 4 cardinal directions
- Well balanced focal length for nadir and oblique

Recommended flight Pattern (60% Sidelap, 80% Endlap)



Footprint dimensions	cross track	long track			
pan +/- (m) from Nadir	505,19	325,17		**Sidelap [%]**	**60**
pan full footprint size (m)	1010,38	650,34		**Endlap [%]**	**80**
rgb +/- (m) from Nadir	505,19	325,17		**Speed [m/s]**	**74,32**
				Speed [kn]	**144,47**
left/right near	648,64	212,66		**Height [ft]**	**3786,09**
left/right far	1616,15	378,34			
forwd/backwd near	312,13	824,00		**Strip-Dist. [m]**	**404,15**
forwd/backwd far	437,14	1616,15		**BaseLength [m]**	**130,07**

Minimum flight Pattern (40% Sidelap, 60% Endlap)

Footprint dimensions	cross track	long track			
pan +/- (m) from Nadir	505,19	325,17		**Sidelap [%]**	**40**
pan full footprint size (m)	1010,38	650,34		**Endlap [%]**	**60**
rgb +/- (m) from Nadir	505,19	325,17		**Speed [m/s]**	**148,65**
				Speed [kn]	**288,95**
left/right near	648,64	212,66		**Height [ft]**	**3786,09**
left/right far	1616,15	378,34			
forwd/backwd near	312,13	824,00		**Strip-Dist. [m]**	**606,23**
forwd/backwd far	437,14	1616,15		**BaseLength [m]**	**260,13**

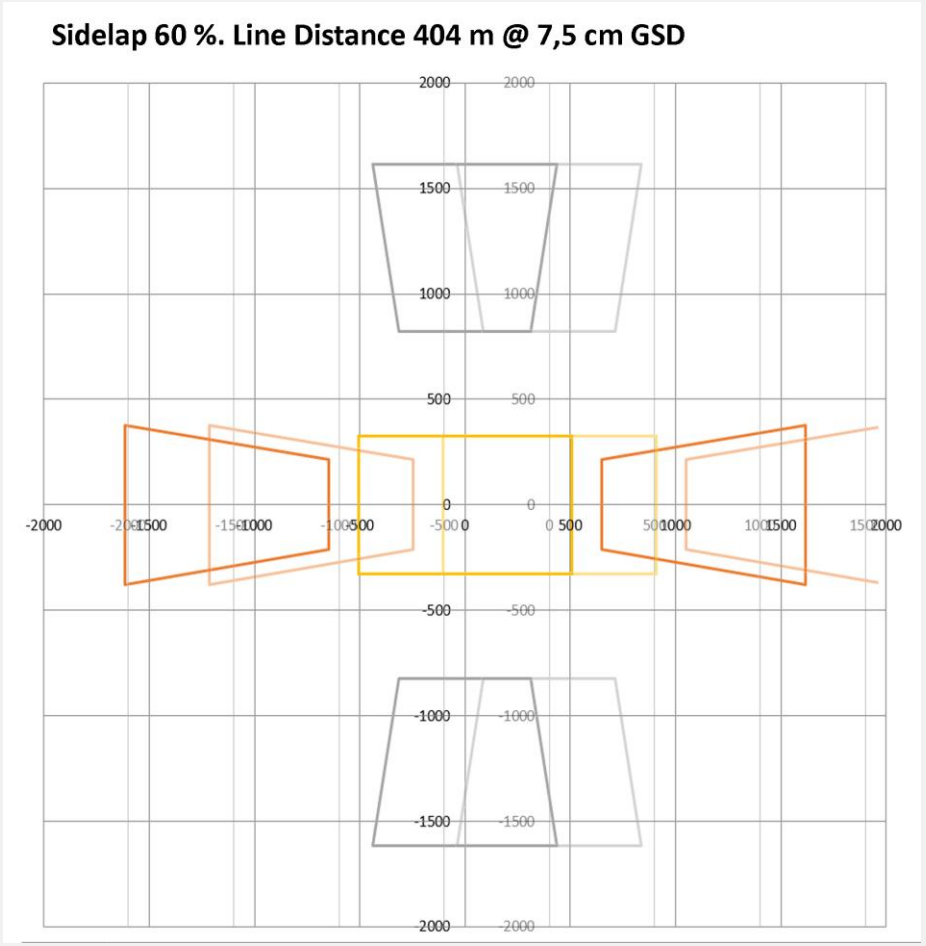
The flight pattern is based on the following assumptions:

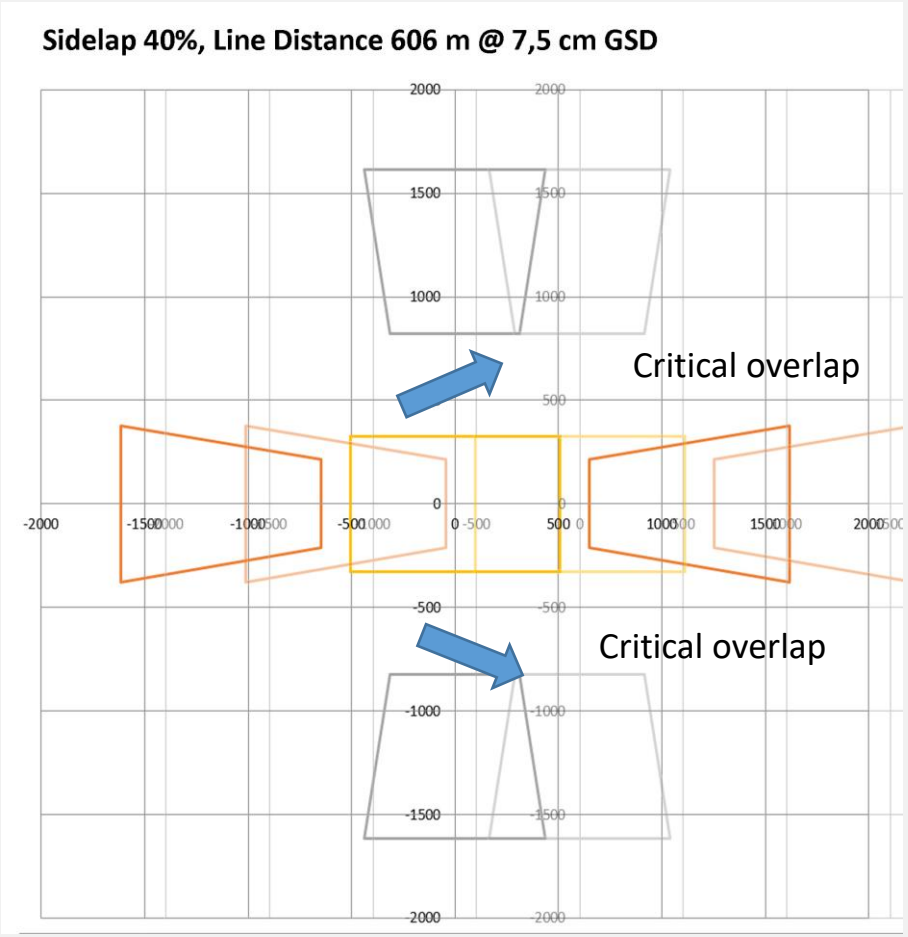
- The terrain is flat
- Nadir GSD @7,5 cm

A dense flight pattern like the recommended flight pattern (60% sidelap and 80% endlap)
does have additional advantage

- Reduced occlusions
- Less differences in perspective foreshortening between adjacent shot positions.

Additional flight-lines and shot positions to cover the entire AOI from all directions:





Flight Path

Overlap area of footprints at 60% Sidelap and 40% Sidelap

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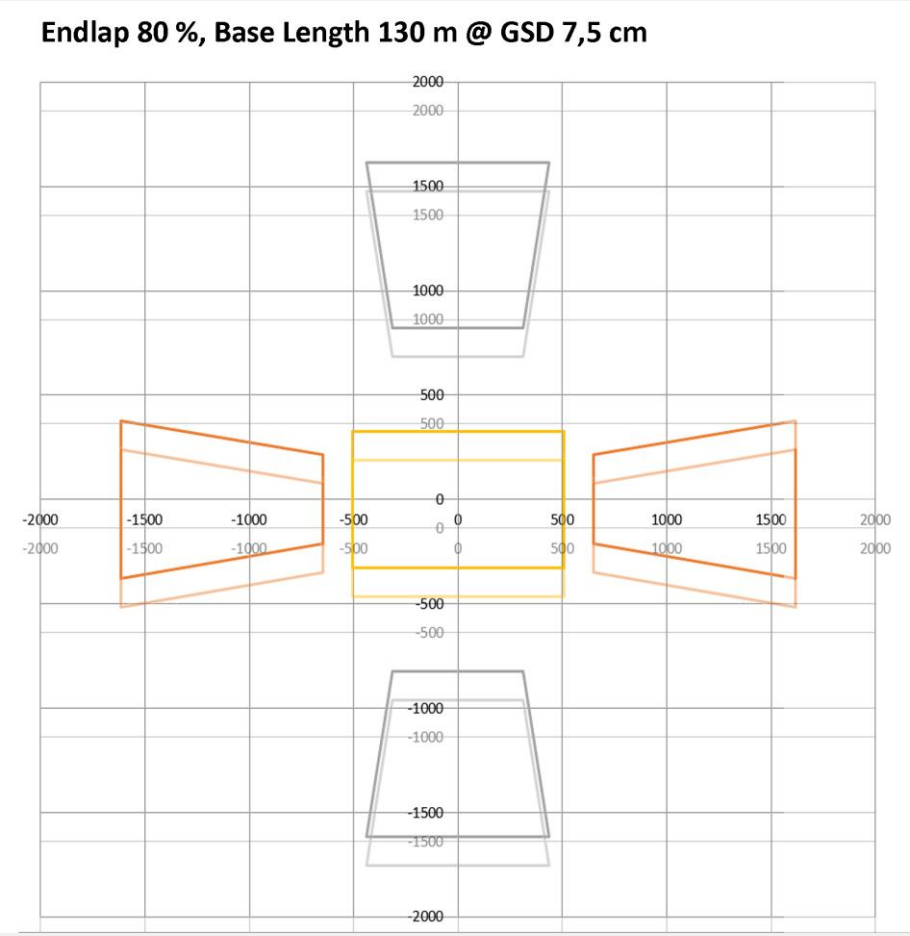
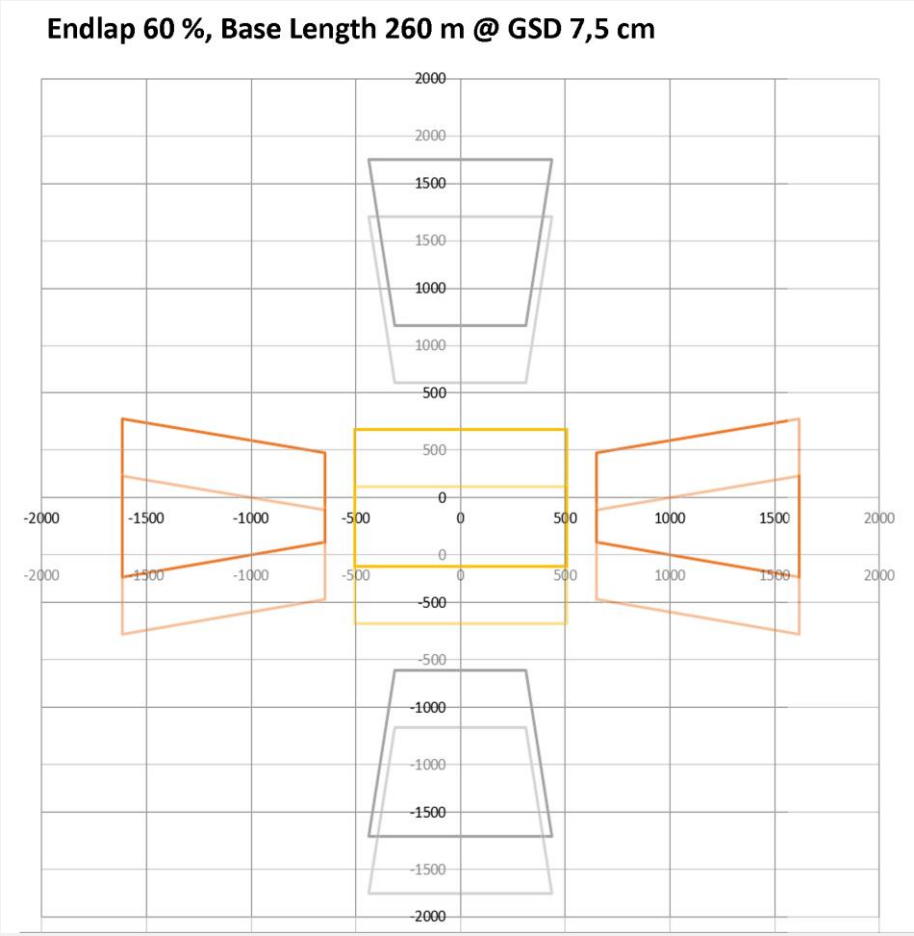
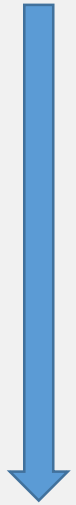
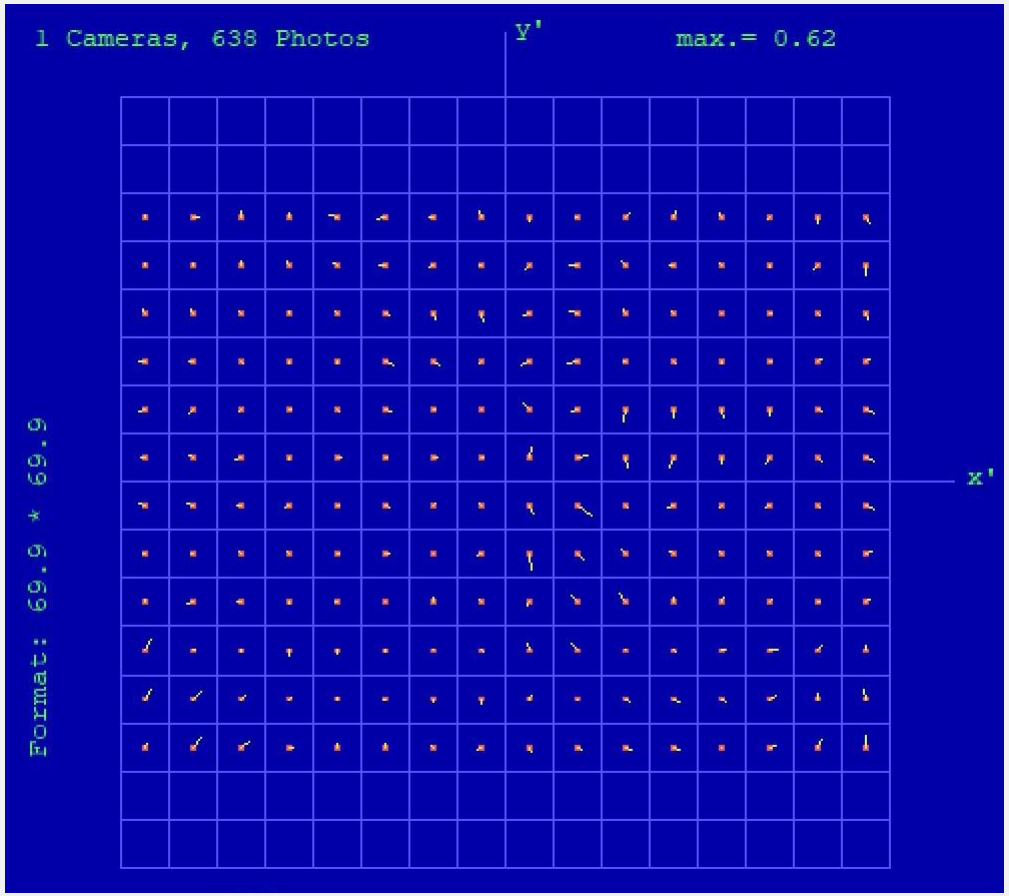






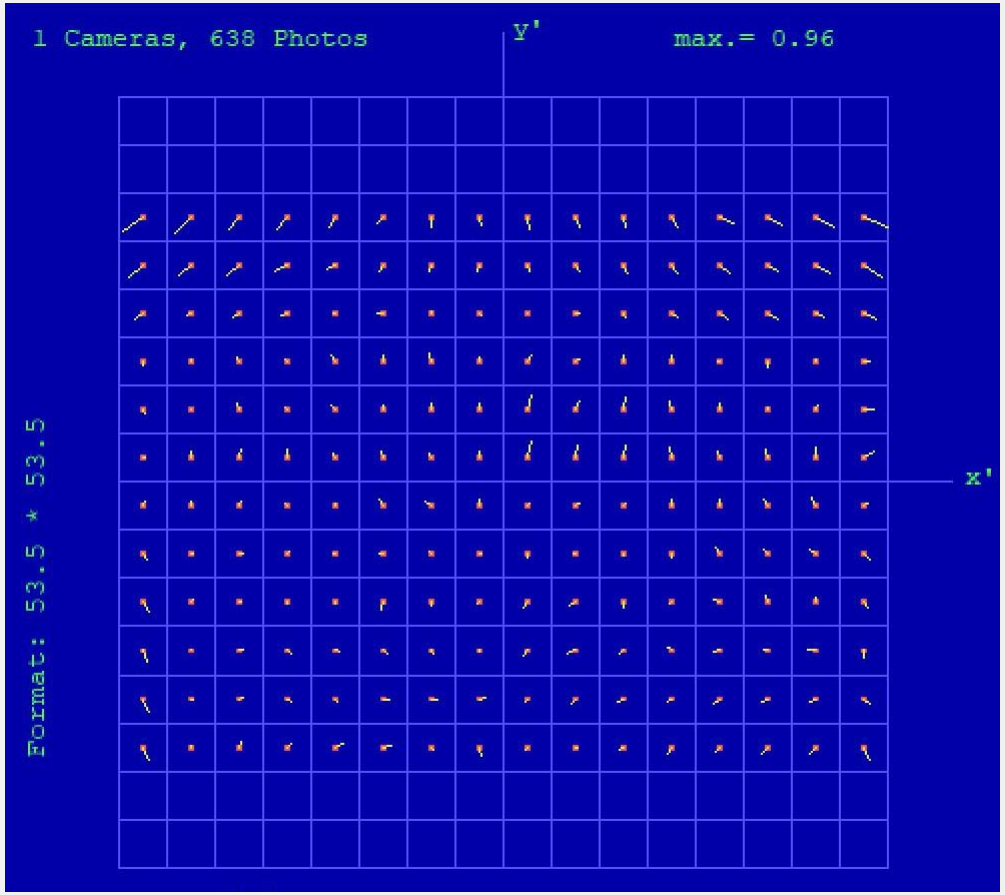
Flight Path

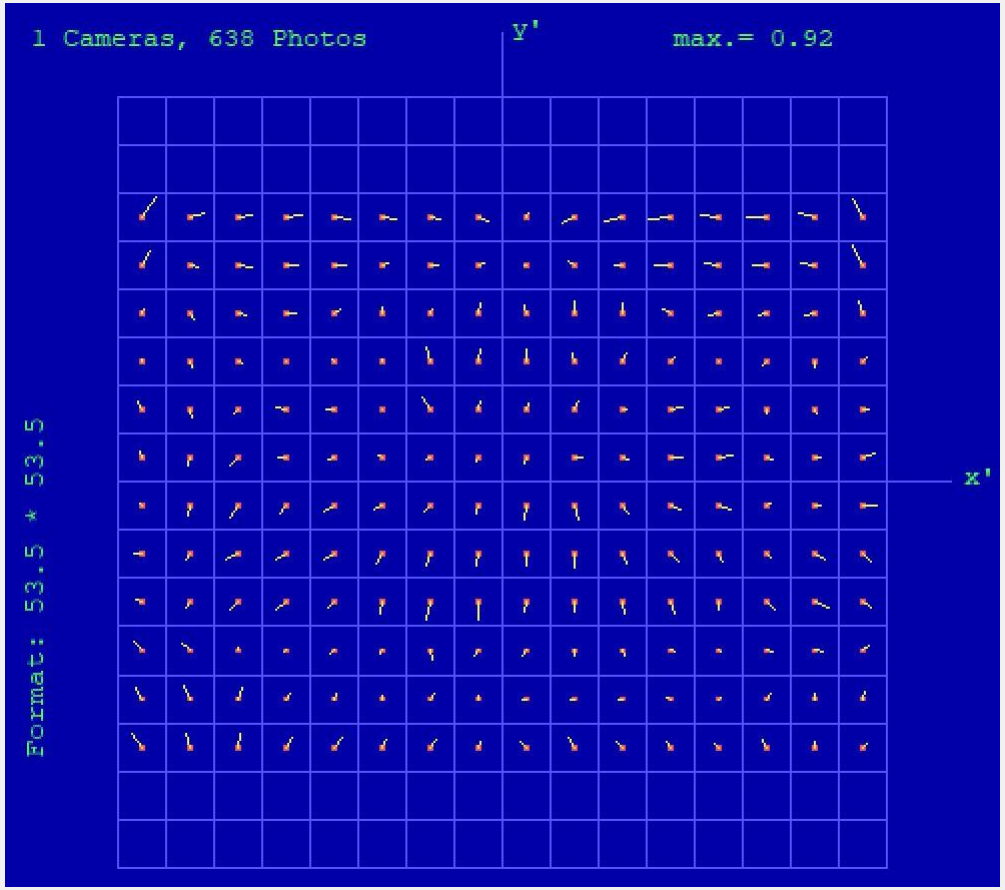
Overlap area of footprints at 80% Endlap and 60% Endlap



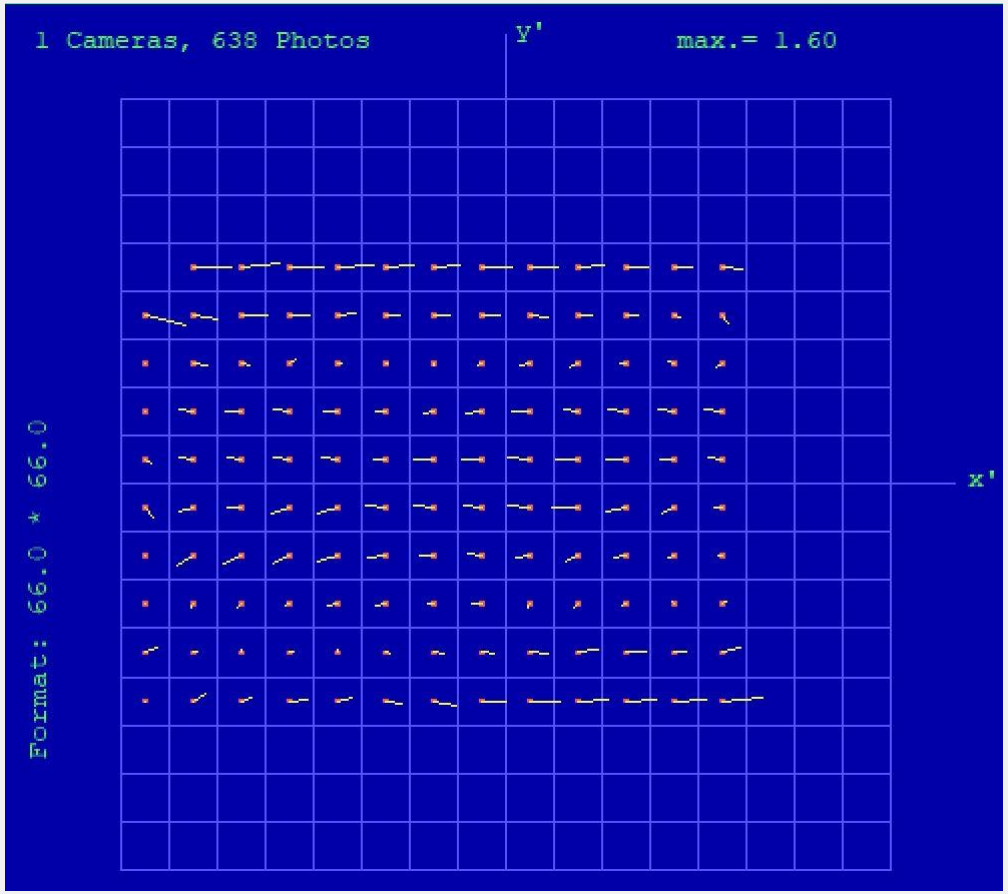
Project results
based on standard Nadir AT
638 events
10 cm GSD @ 1600 m
Nadir serves as the photogrammetry backbone
RMSE GCP: 21 / 23 /17 mm

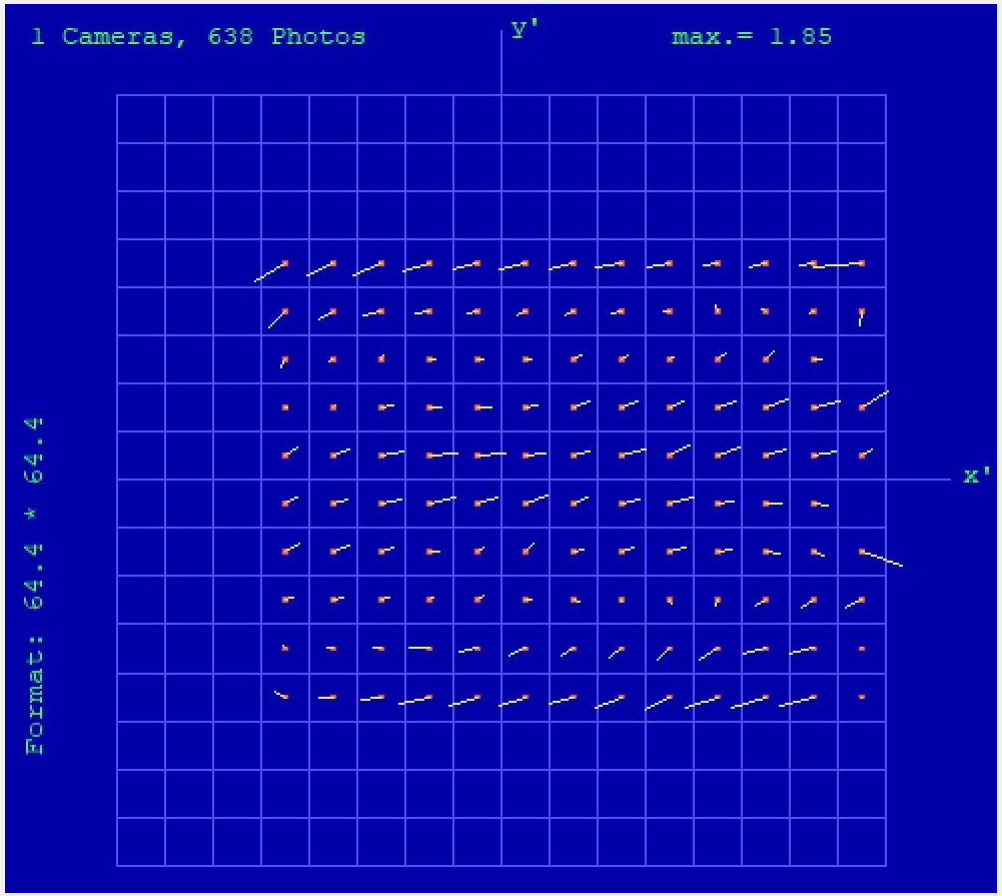
Nadir @ 80 mm FD



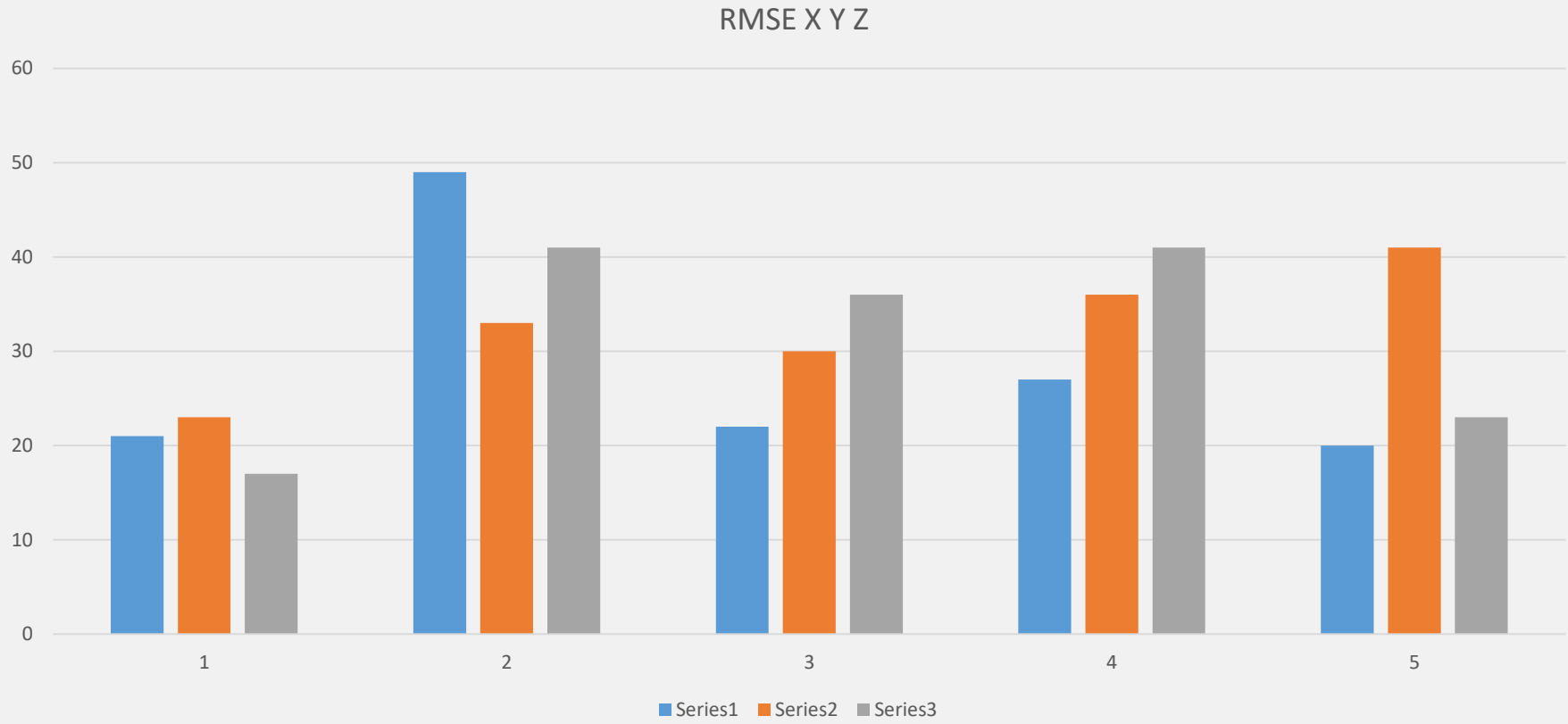


Fwd and Bwd @ 120 mm FD

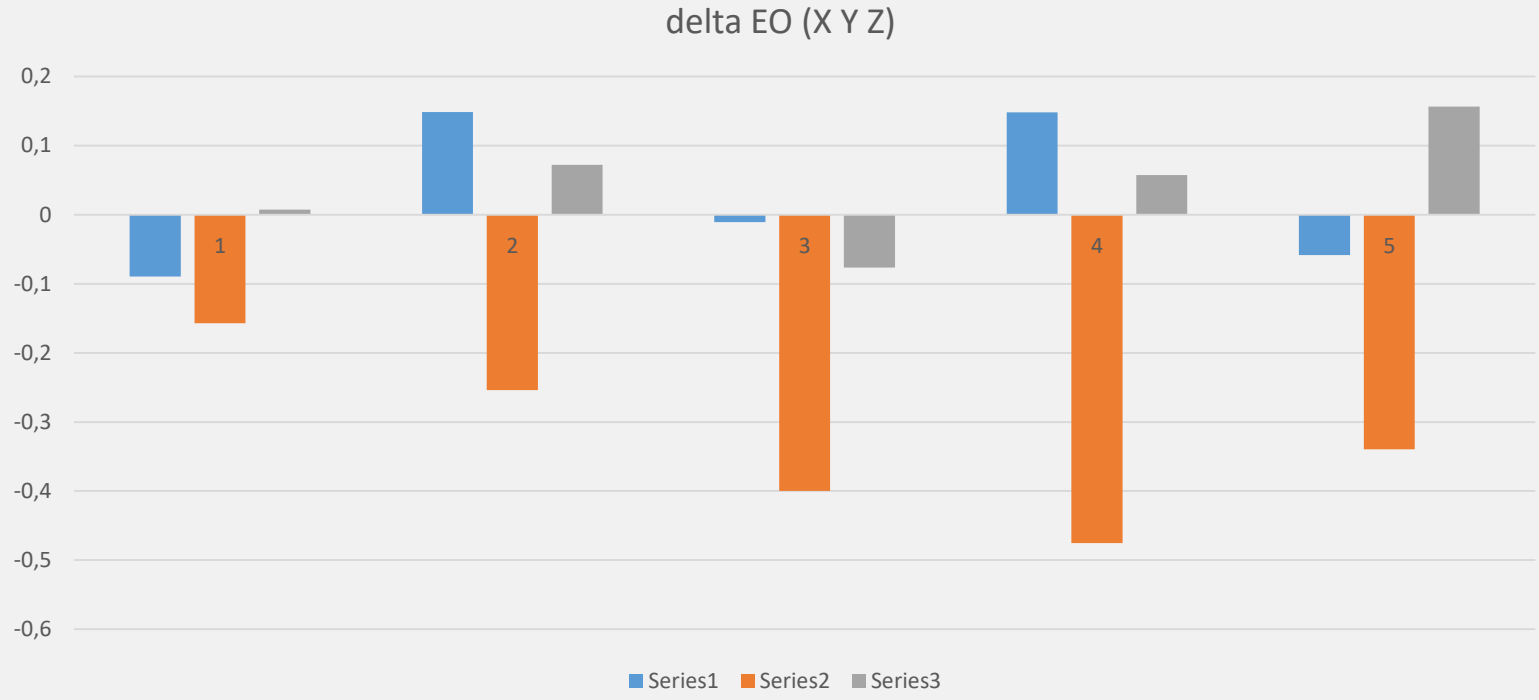




Fwd and Bwd @ 120 mm FD



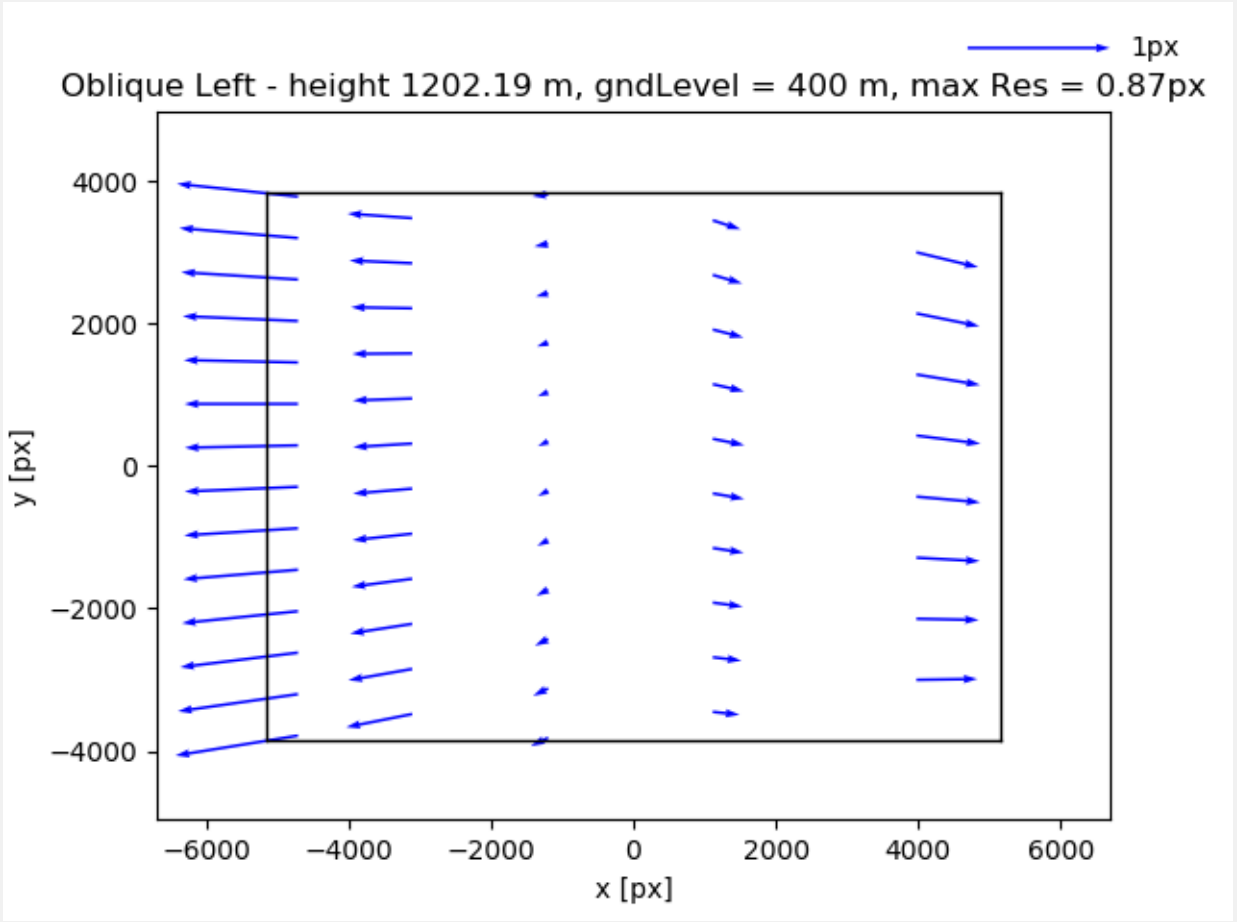
GCP residuals from Nadir, Backward, Forward, Left and Right Camera



Eccentricity vector from Nadir to Backward, Forward, Left and Right Camera

Influence of earth curvature :

- Depending on flying altitude
- Results from simulation to better understand the magnitude of that impact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Oblique Left - height 1202.19 m, gndLevel = 400 m, max Res = 0.87px
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2000
0
−2000
−4000
y [px]
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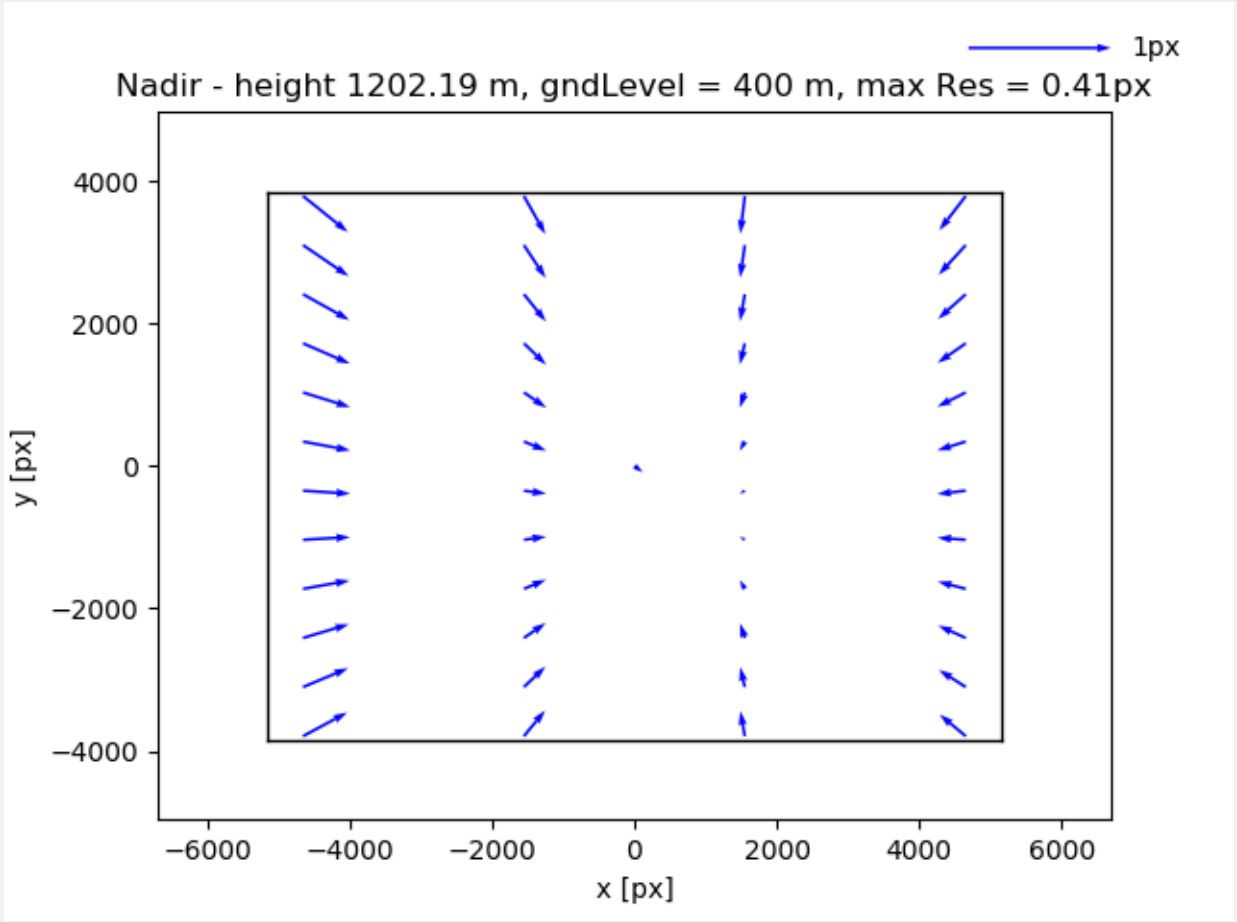
−2000
0
2000
4000
6000
x [px]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−2000
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2000
4000
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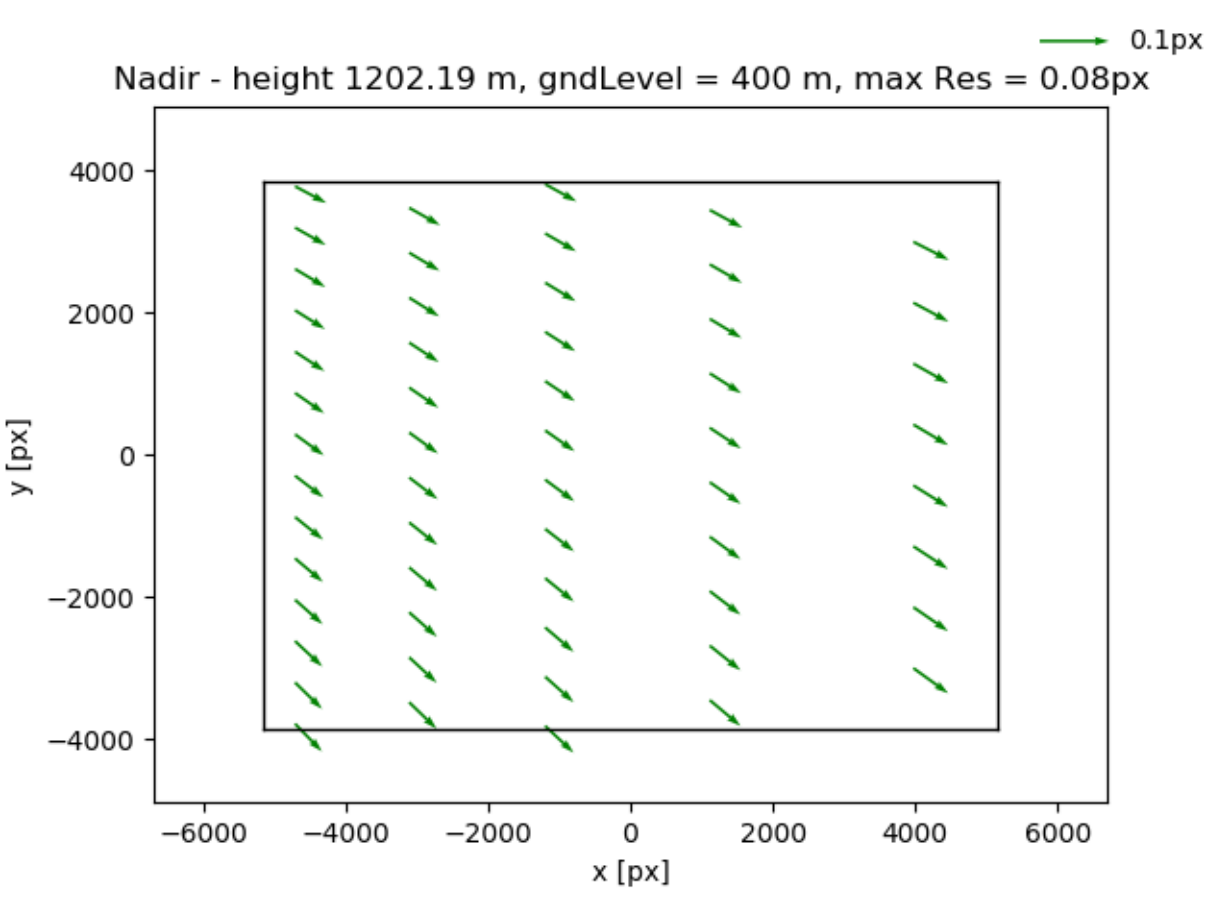
x [px]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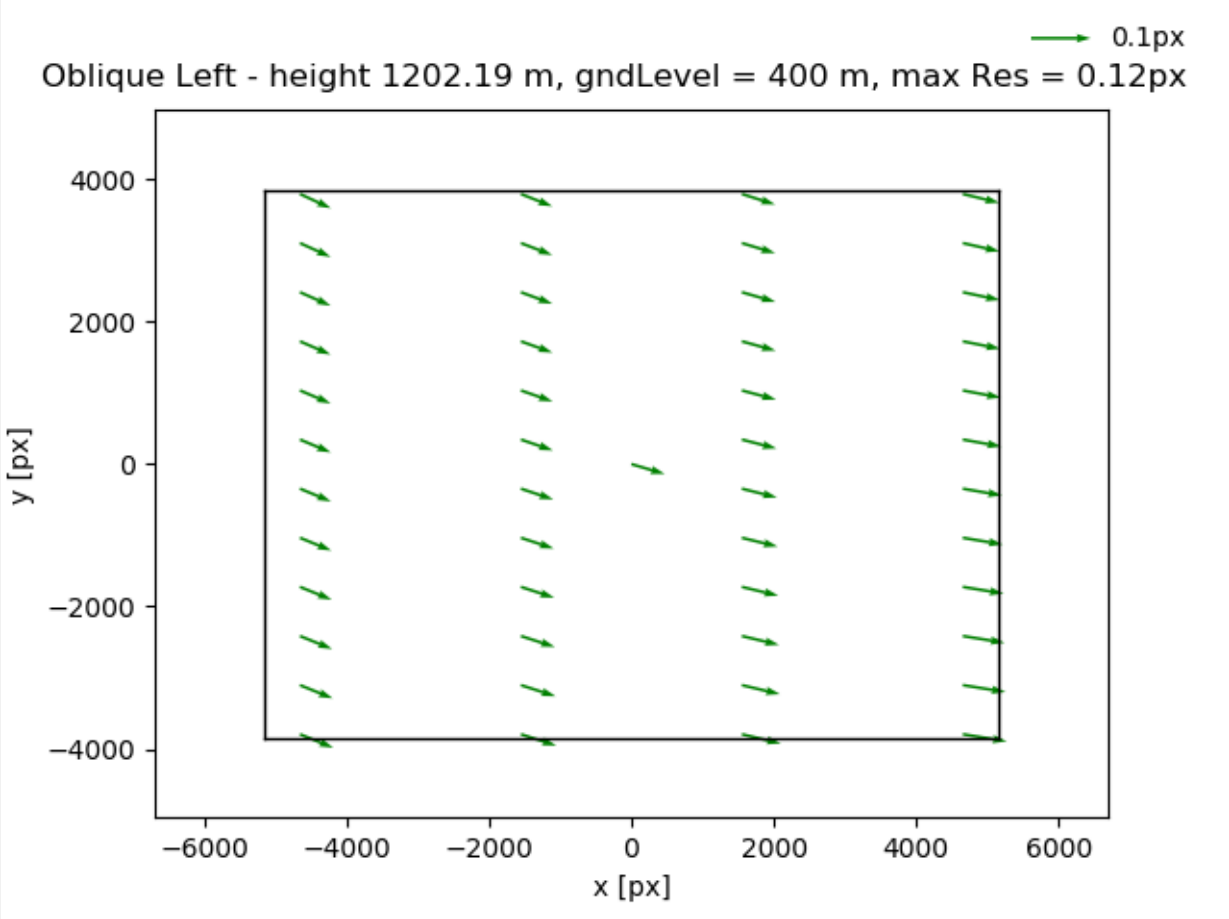
−2000
0
2000
4000
6000
x [px]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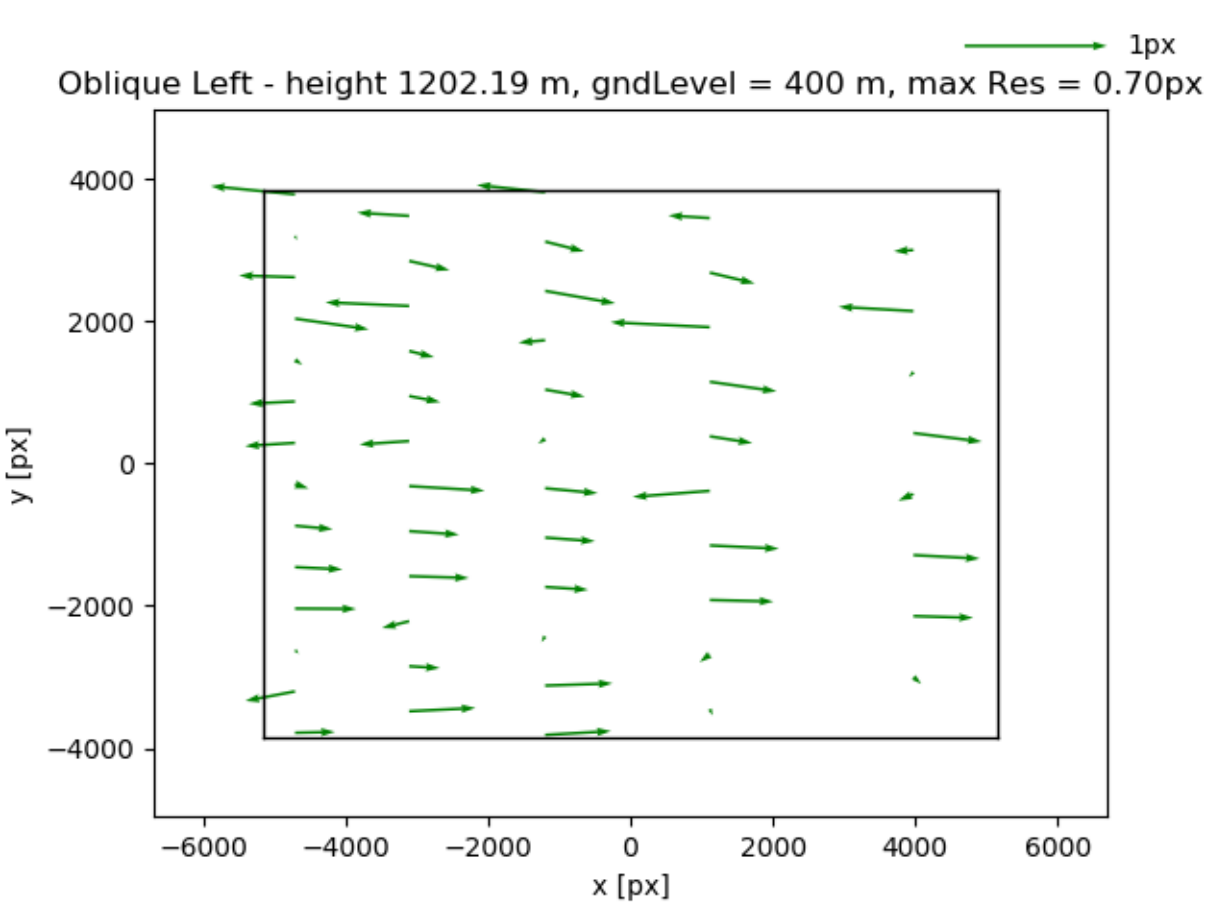
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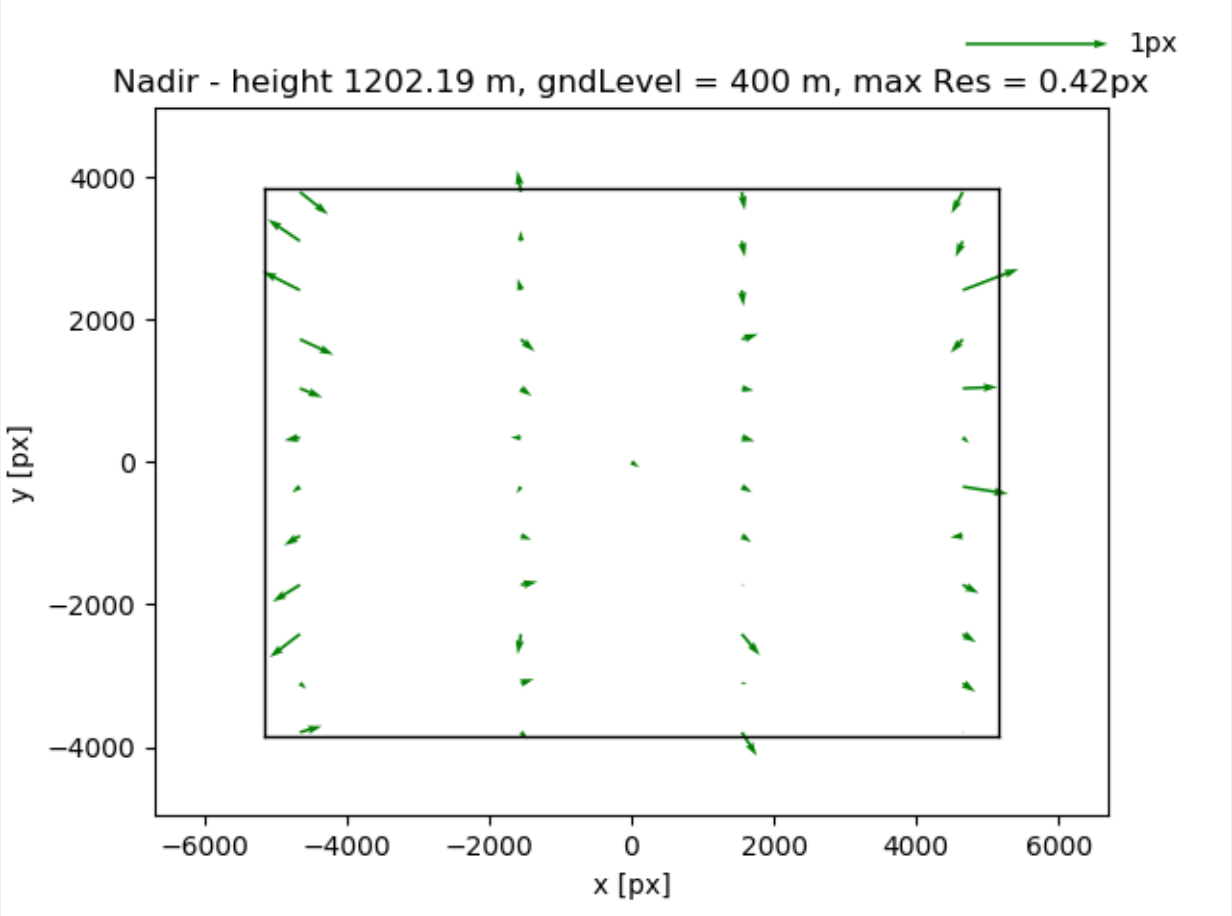
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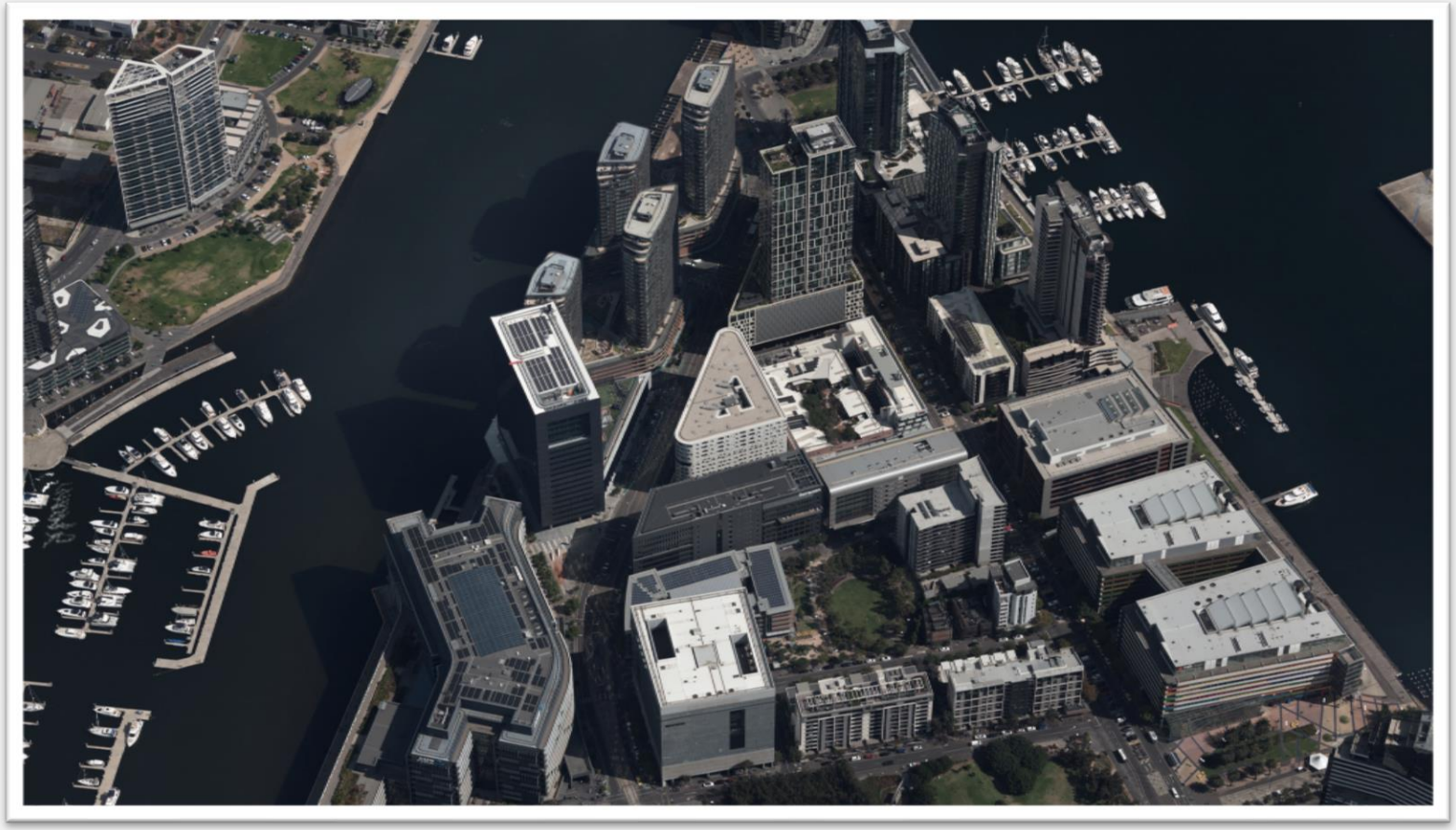
Oblique image data
Flight Mission Melbourne



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