



LiDAR and Photogrammetry

Compared and Combined

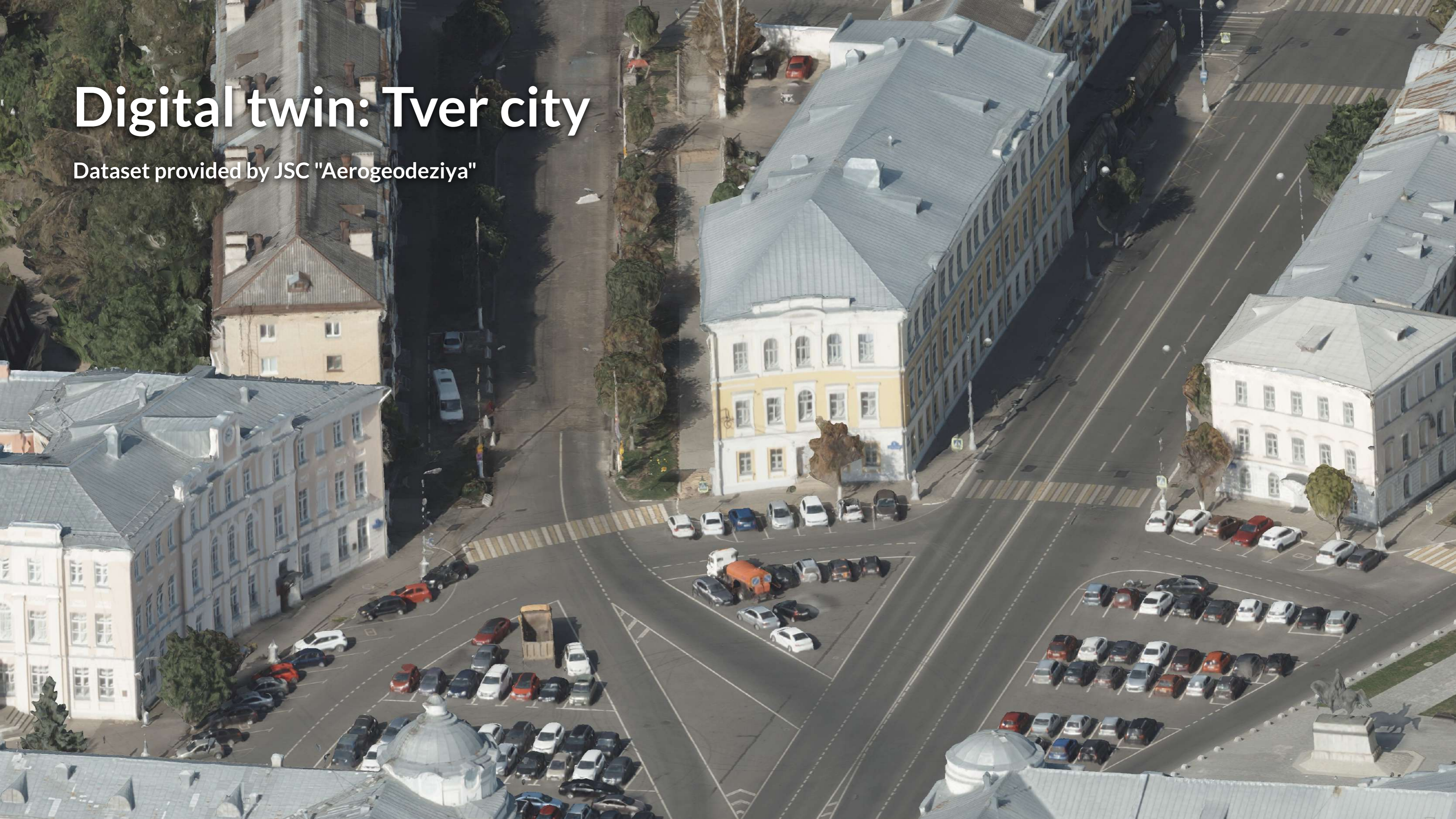


Nikolai Poliarnyi

info@agisoft.com

Digital twin: Tver city

Dataset provided by JSC "Aerogeodeziya"



Digital twin: Tver city

Altitude: 1150 m

Speed: 210 km/h

System: Leica CityMapper-2H

Tver city, dataset provided by JSC "Aerogeodeziya"



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Photos:

150 Megapixels

80/80% Overlap

1100 pixels/m²

Nadir: 3 cm GSD

Nadir

Tver city, dataset provided by JSC "Aerogeodeziya"



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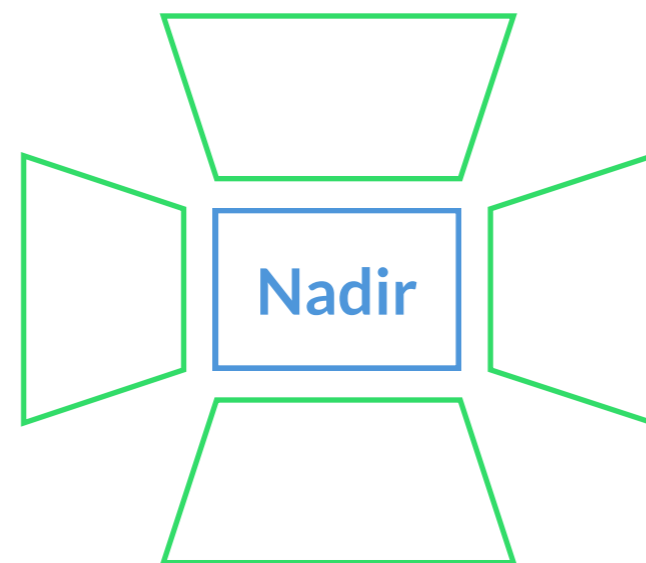
150 Megapixels

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Nadir: 3 cm GSD

Oblique: 4 cm GSD



4 x Oblique 45°

Tver city, dataset provided by JSC "Aerogeodeziya"



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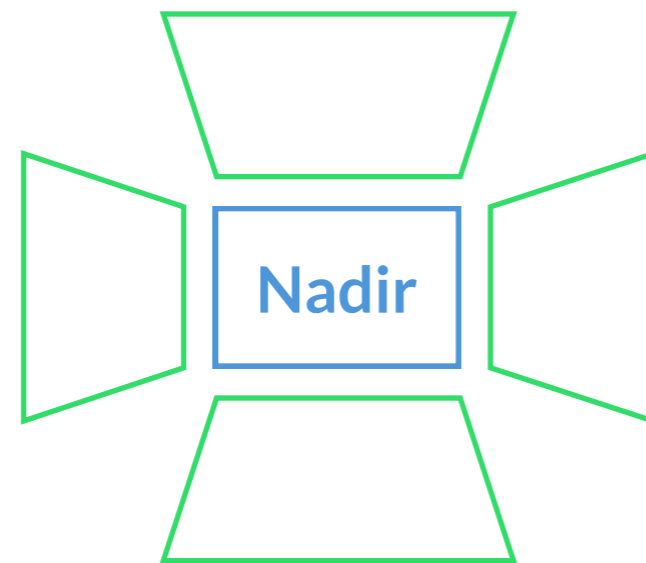
Oblique: 4 cm GSD

LiDAR:

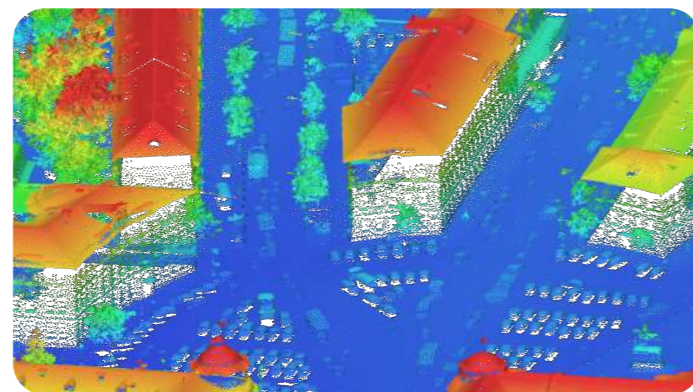
- Aggregated density:

120 points/m²

- Sensor trajectory



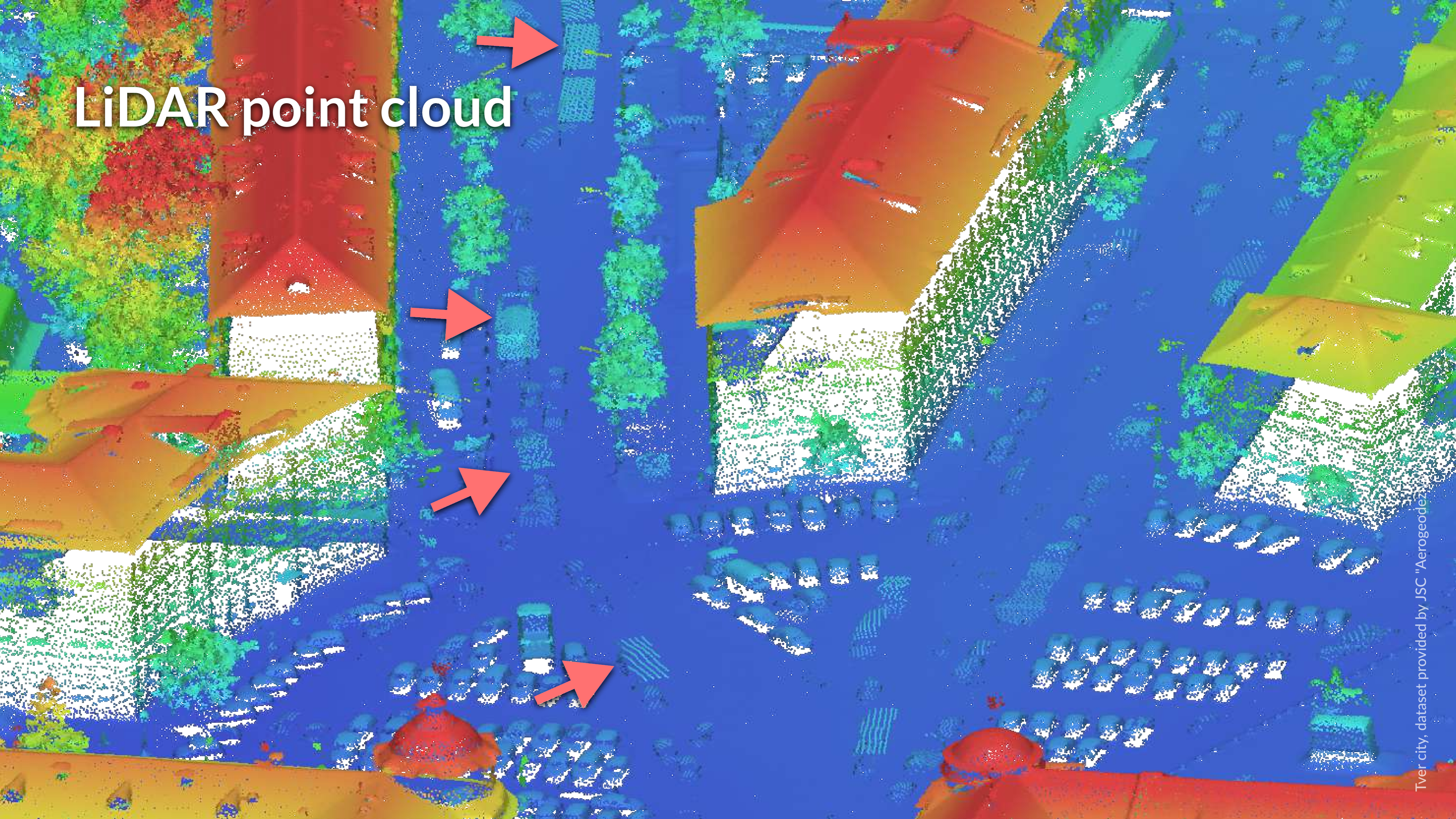
4 x Oblique 45°



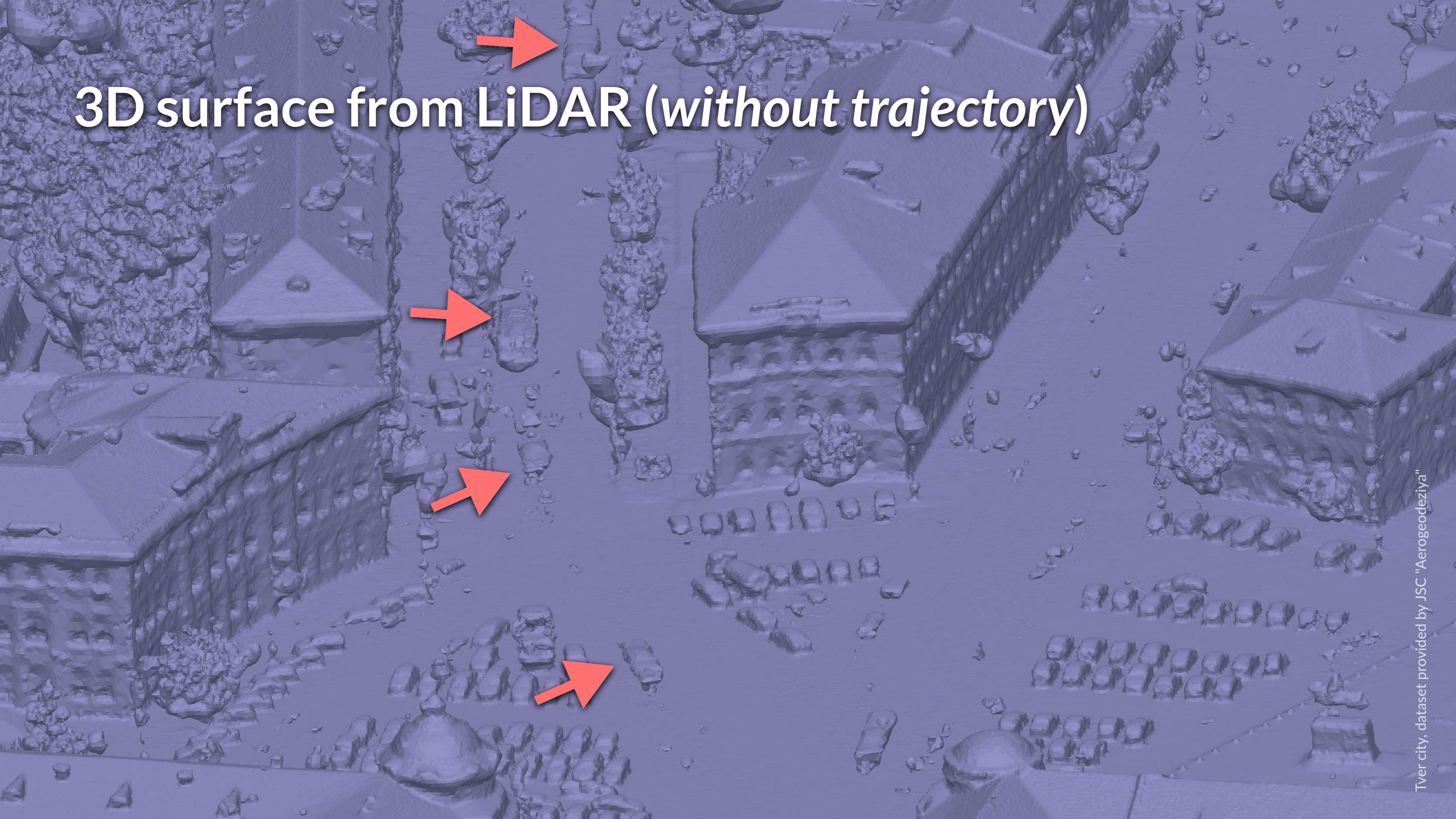
Tver city, dataset provided by JSC "Aerogeodeziya"



LiDAR point cloud



3D surface from LiDAR (*without trajectory*)

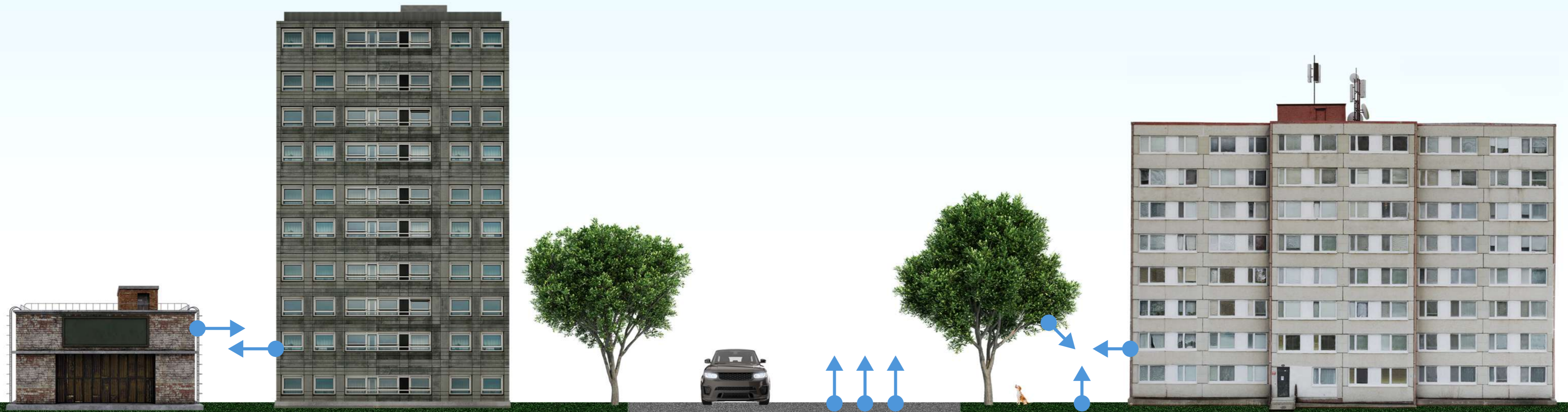


3D surface from LiDAR (with trajectory)



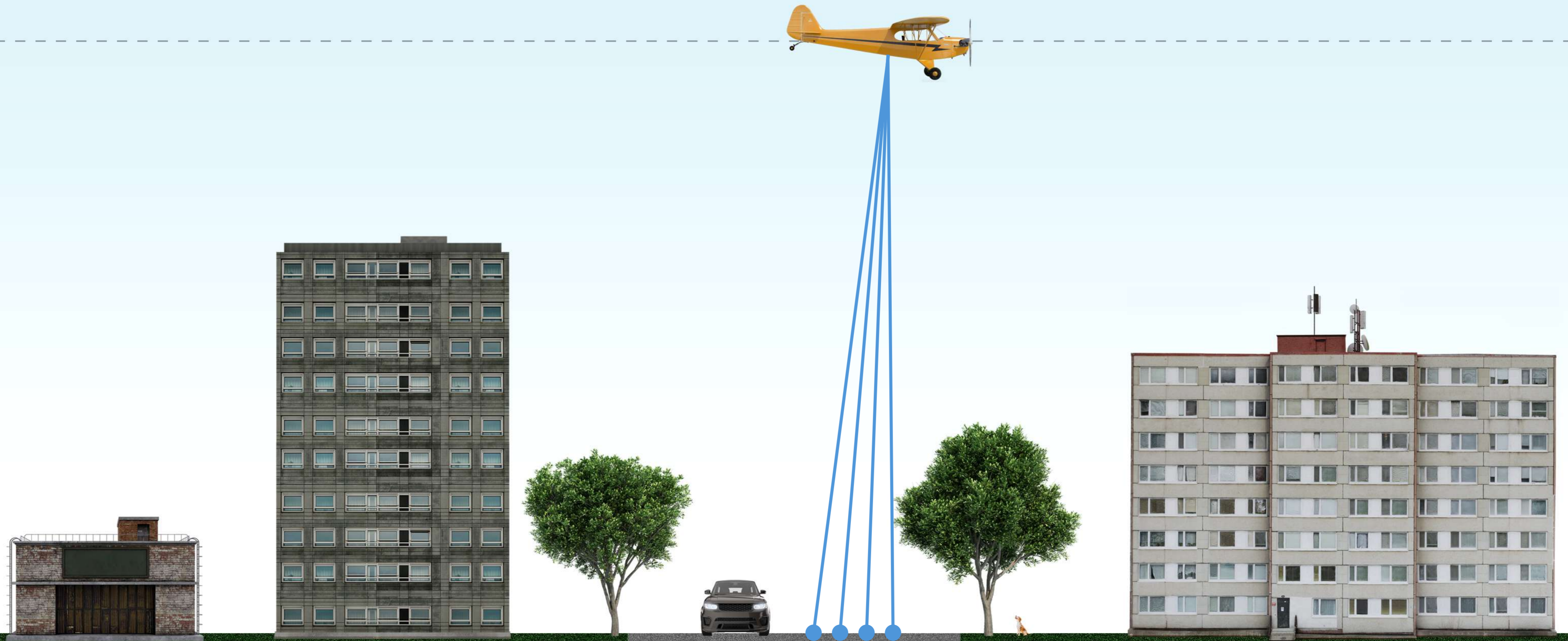


LiDAR points + normals (*without trajectory*)



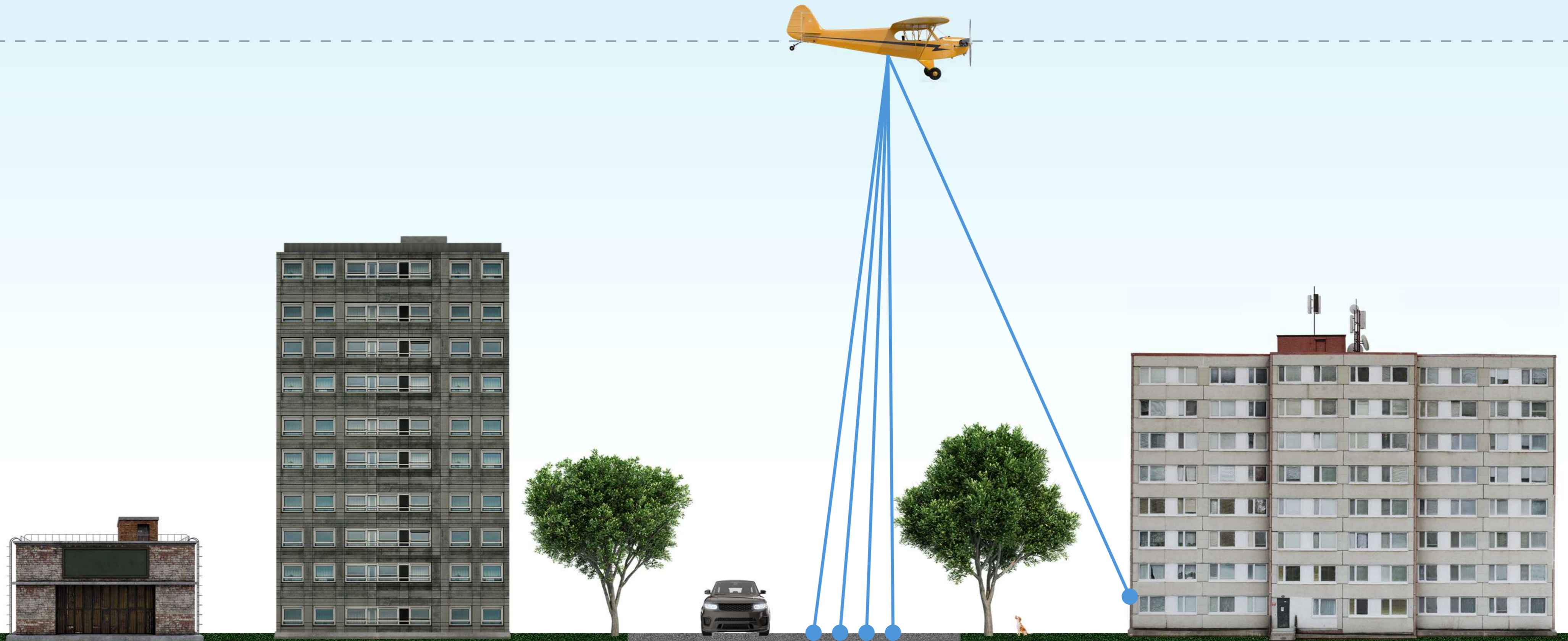
LiDAR points + trajectory

—●
Visibility rays



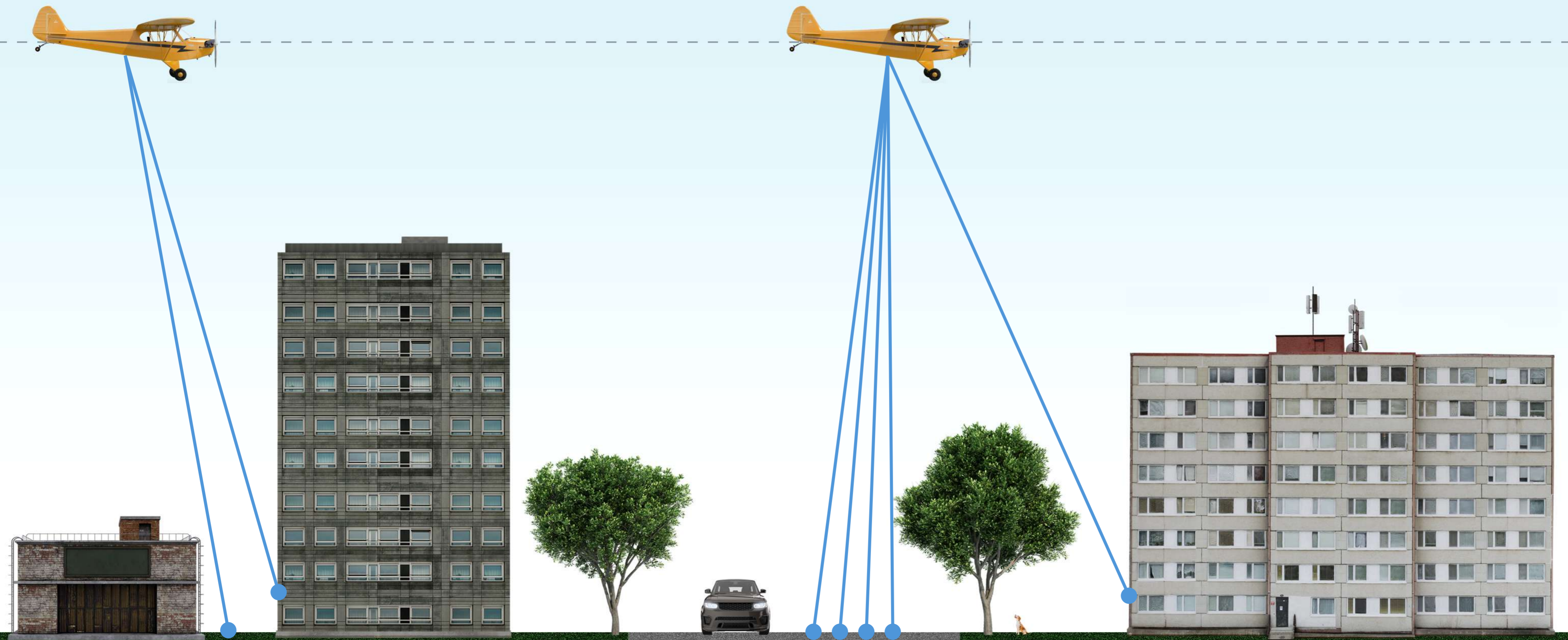
LiDAR points + trajectory

—●
Visibility rays



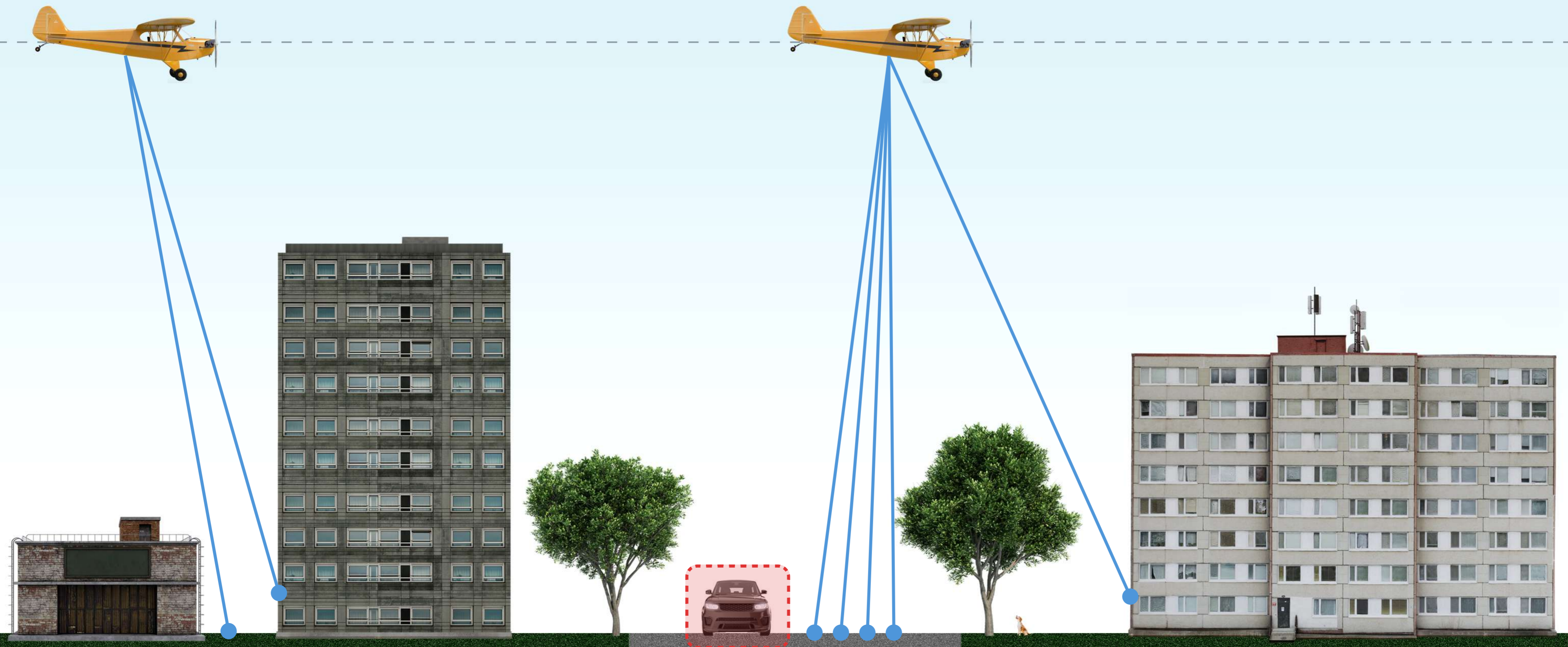
LiDAR points + trajectory

—●
Visibility rays



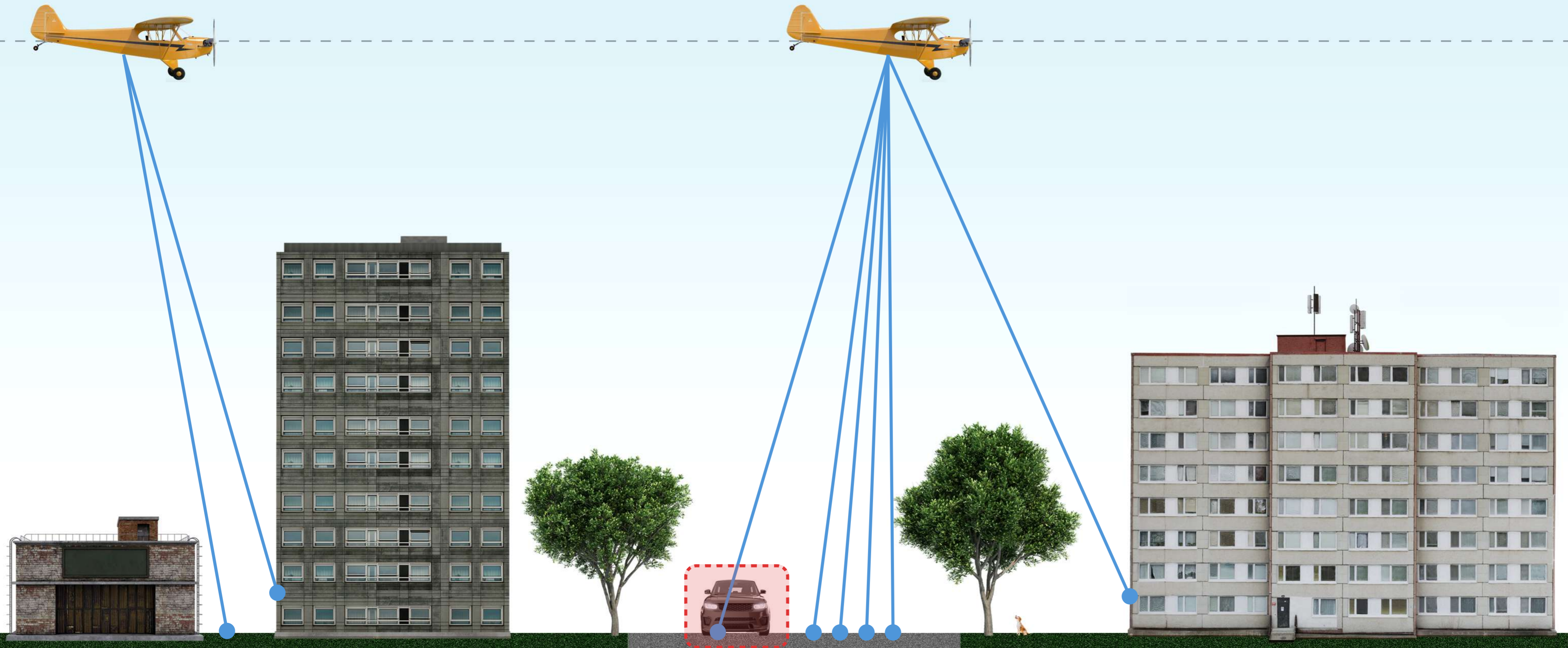
LiDAR points + trajectory

—●
Visibility rays



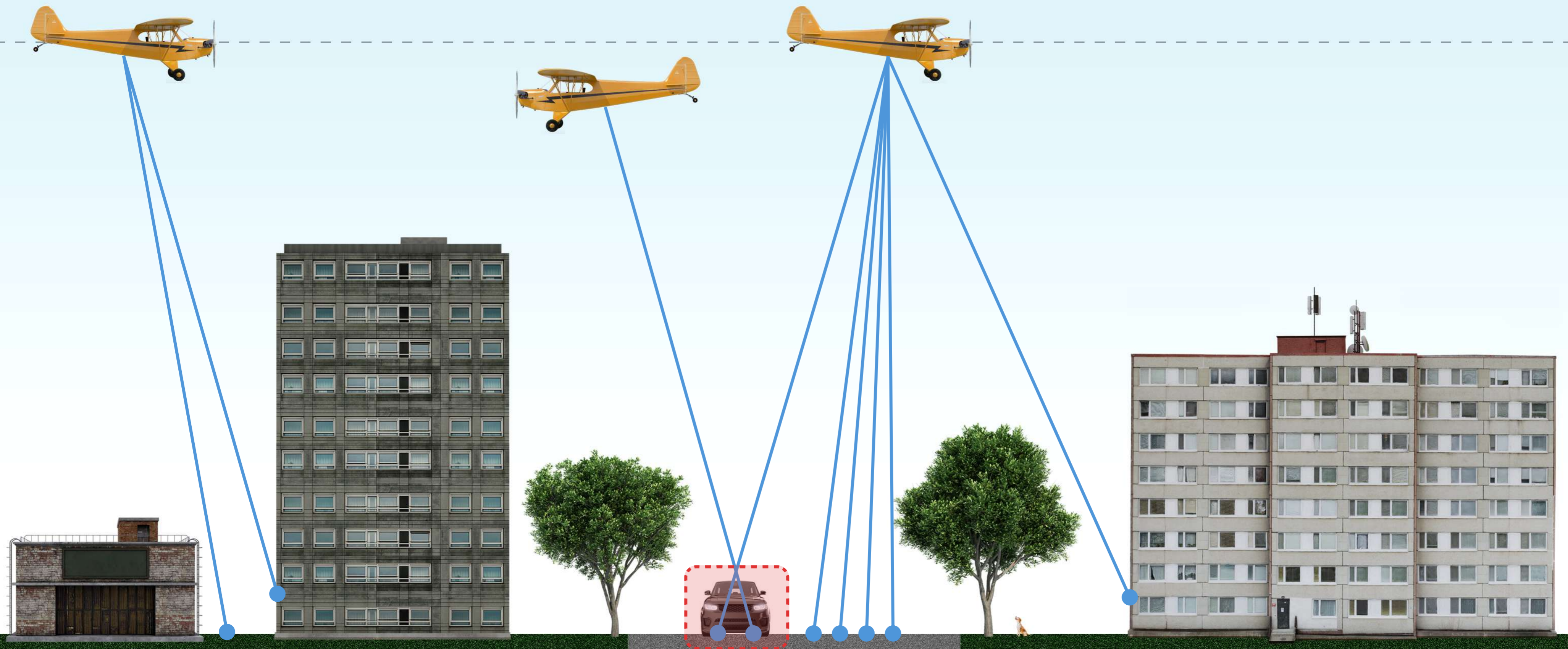
LiDAR points + trajectory

—●
Visibility rays



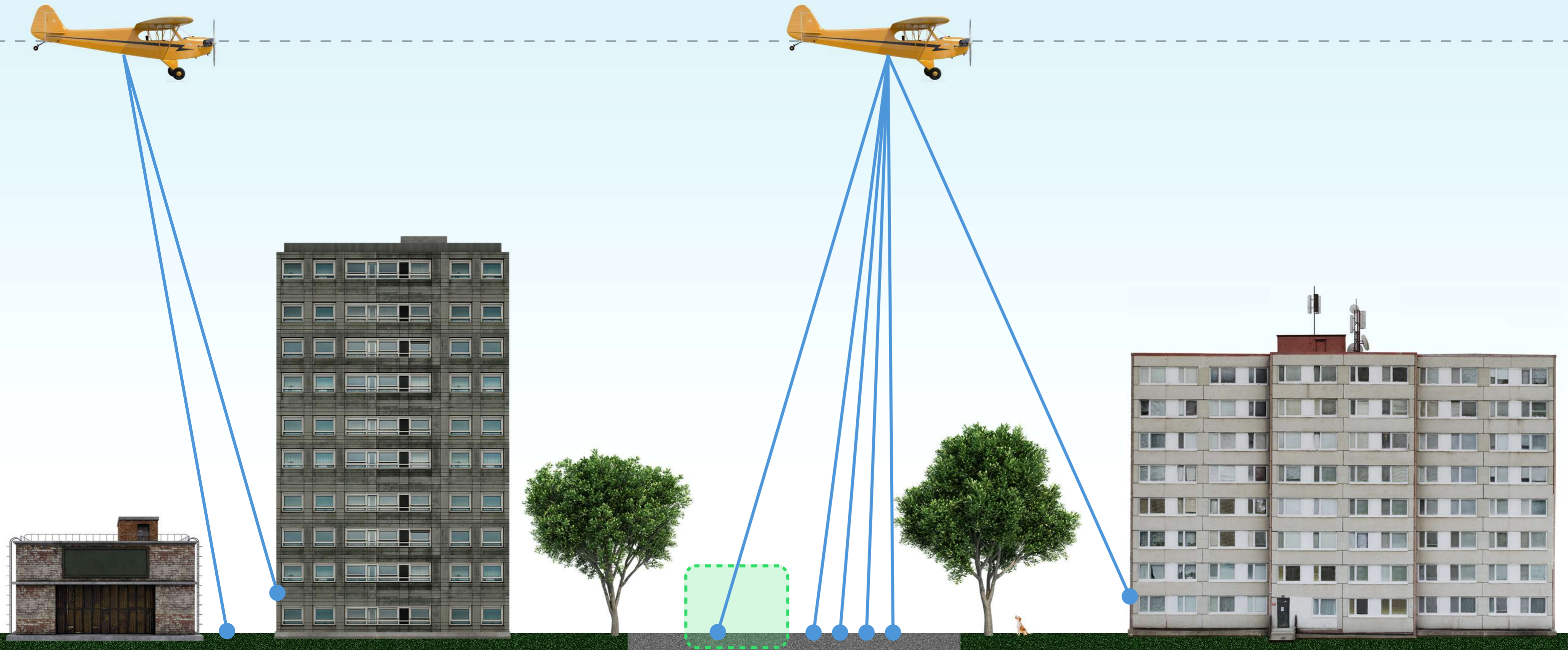
LiDAR points + trajectory

—●
Visibility rays



LiDAR points + trajectory

—●
Visibility rays



Tver city



Photogrammetry



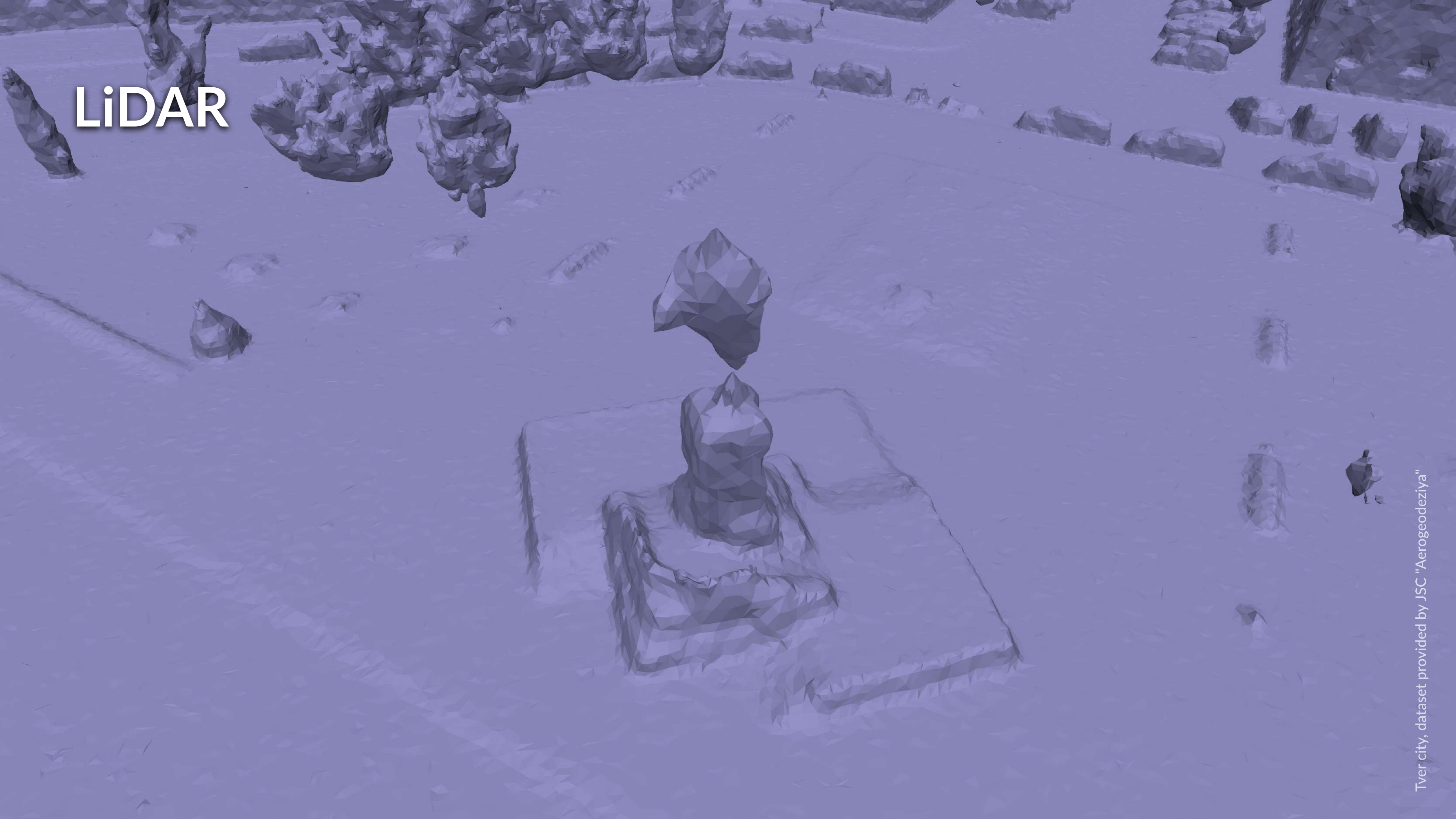
Photogrammetry + LiDAR



Tver city



LiDAR



Photogrammetry



LiDAR (with trajectory)

Processing time: x1.0 slower

24 minutes

(baseline)

Photogrammetry

Processing time: x5.1 slower

2 hours 2 minutes

Photogrammetry

Processing time: x5.1 slower

2 hours 2 minutes

Photogrammetry + LiDAR

Processing time: x6.6 slower

2 hours 40 minutes

Tver city



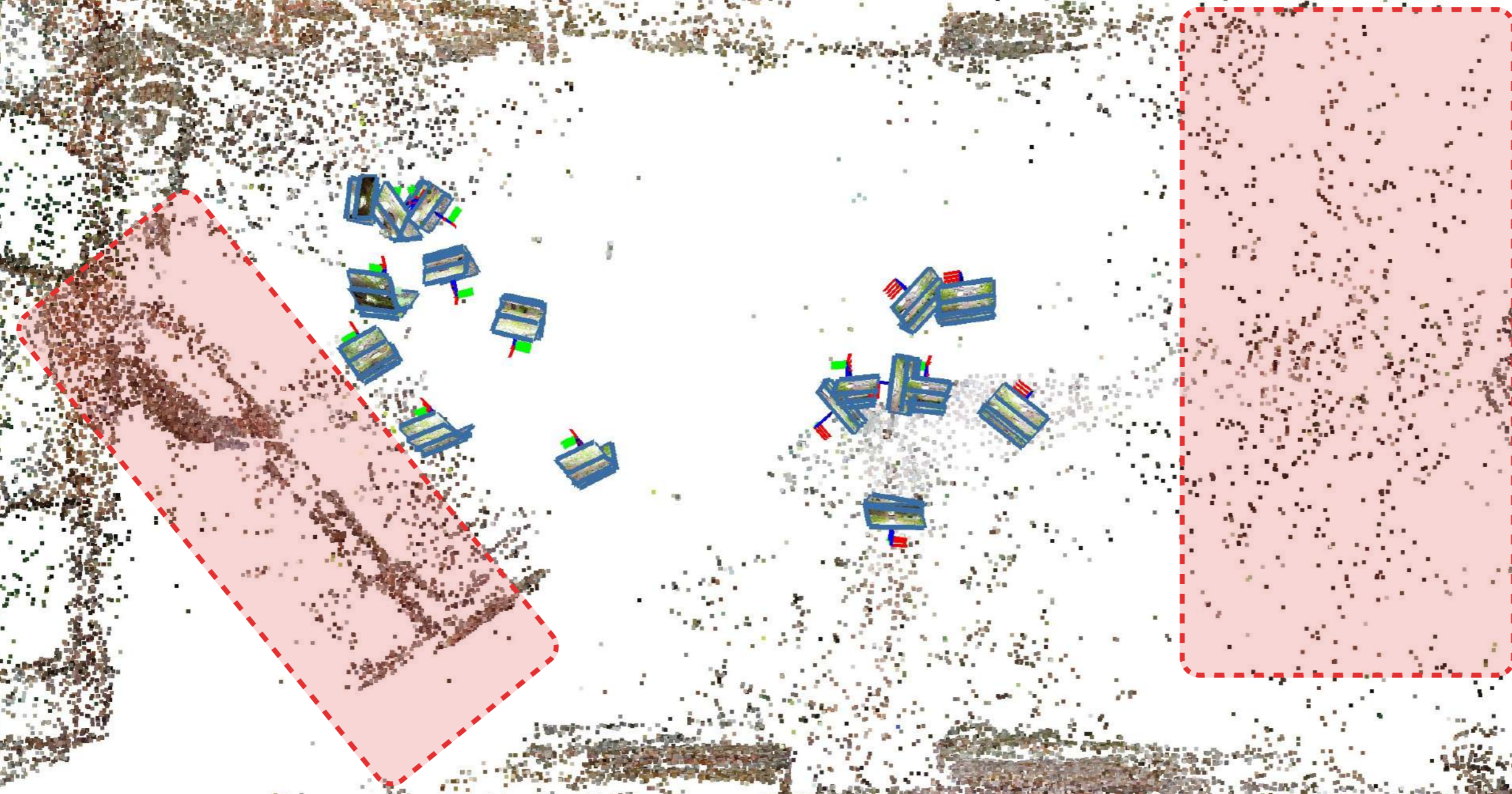
Potemkin's mansion



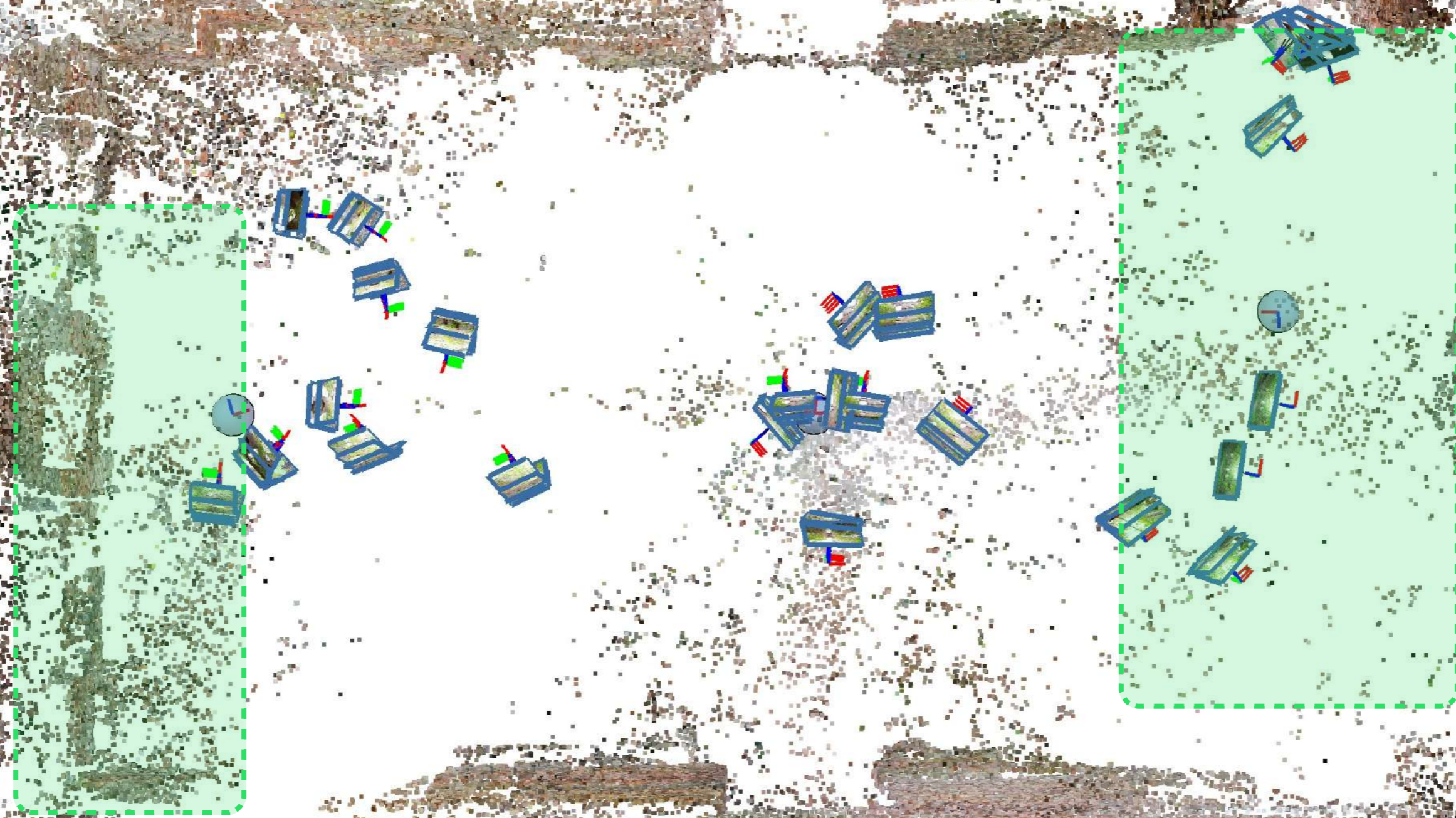
Potemkin's mansion



**Without geometric registration
of terrestrial laser scans**



**With geometric registration
of terrestrial laser scans**



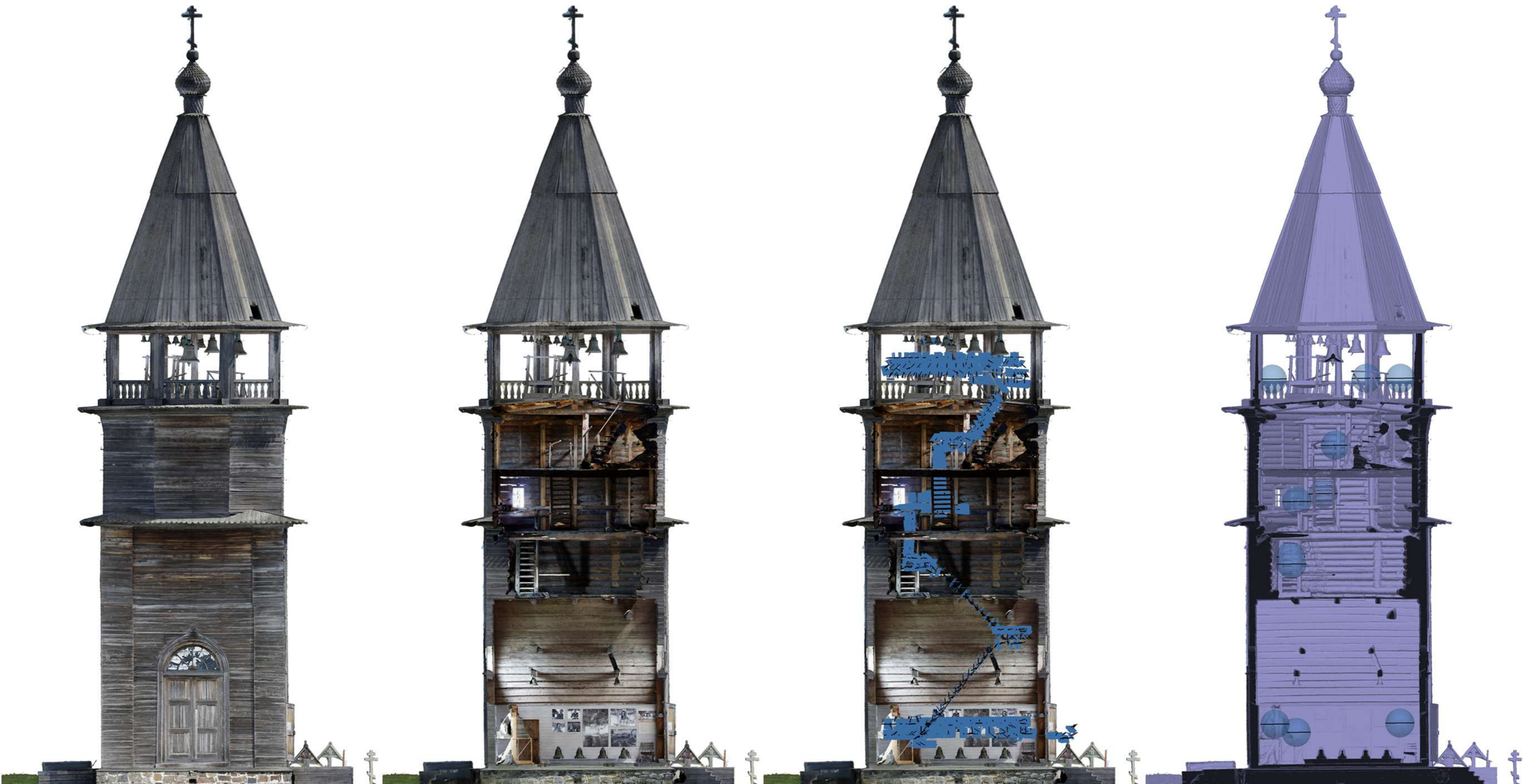
Combined: photos + terrestrial laser scans

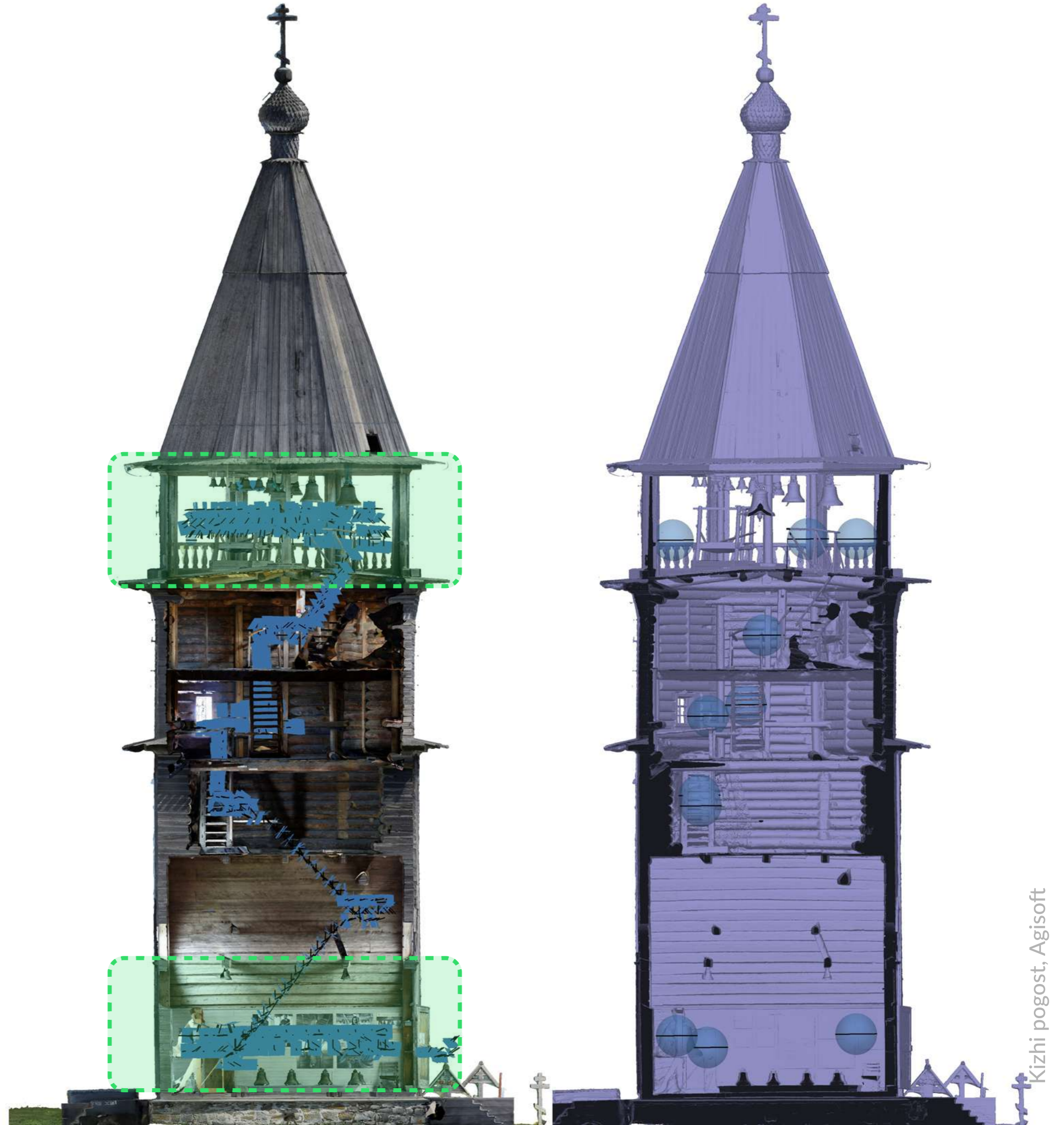


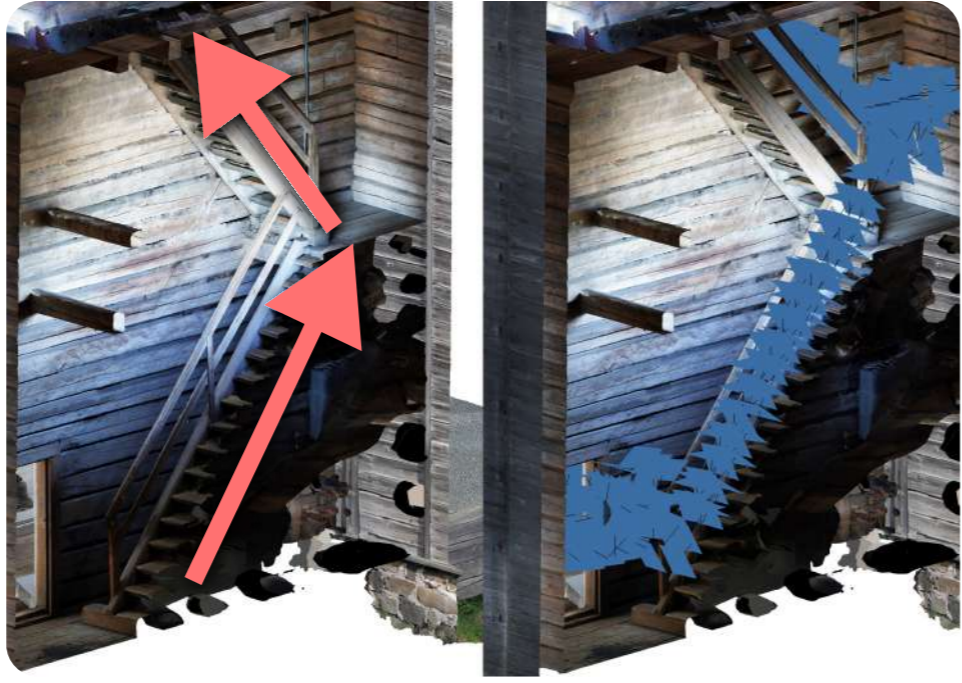
Combined: photos + terrestrial laser scans

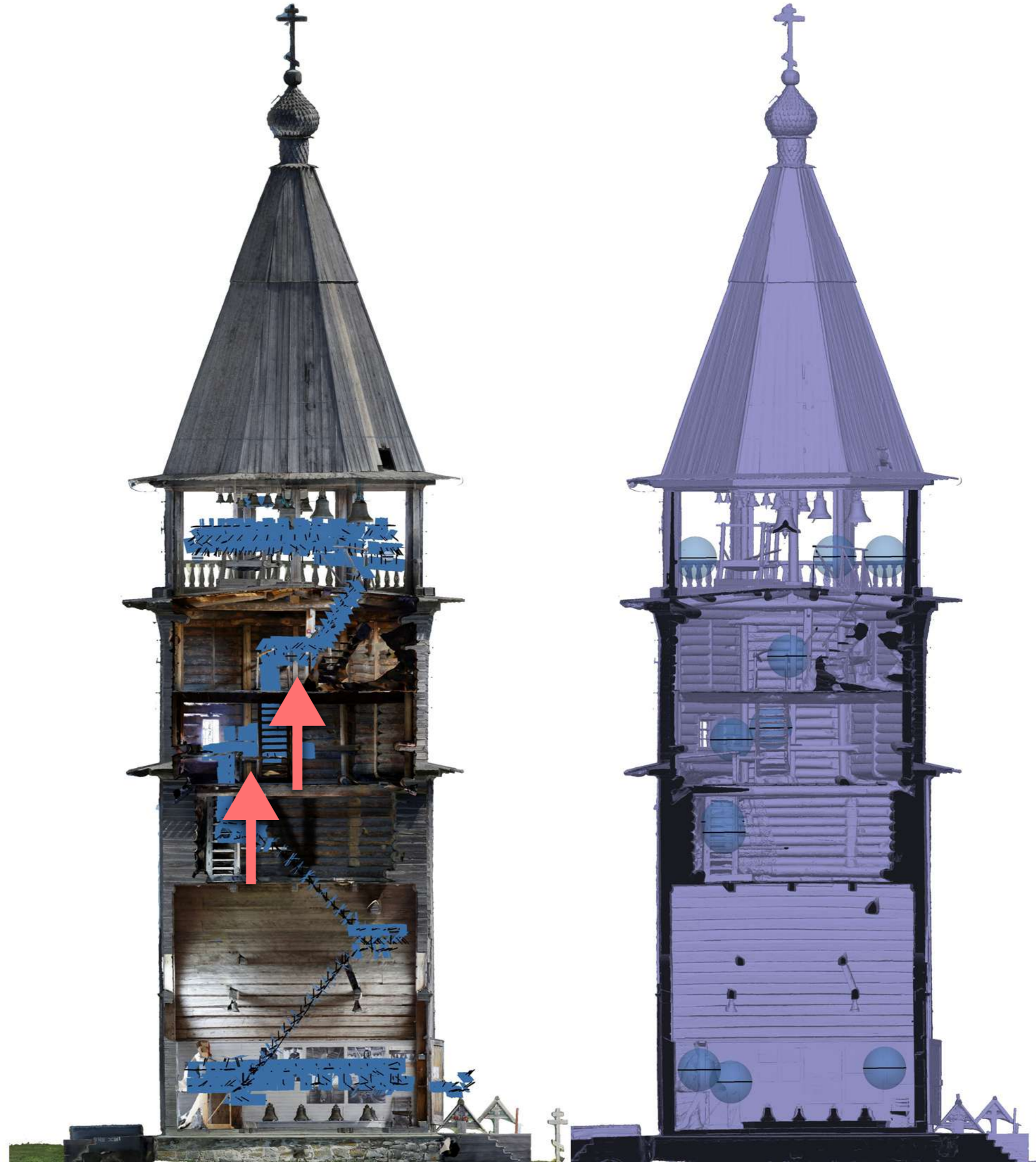


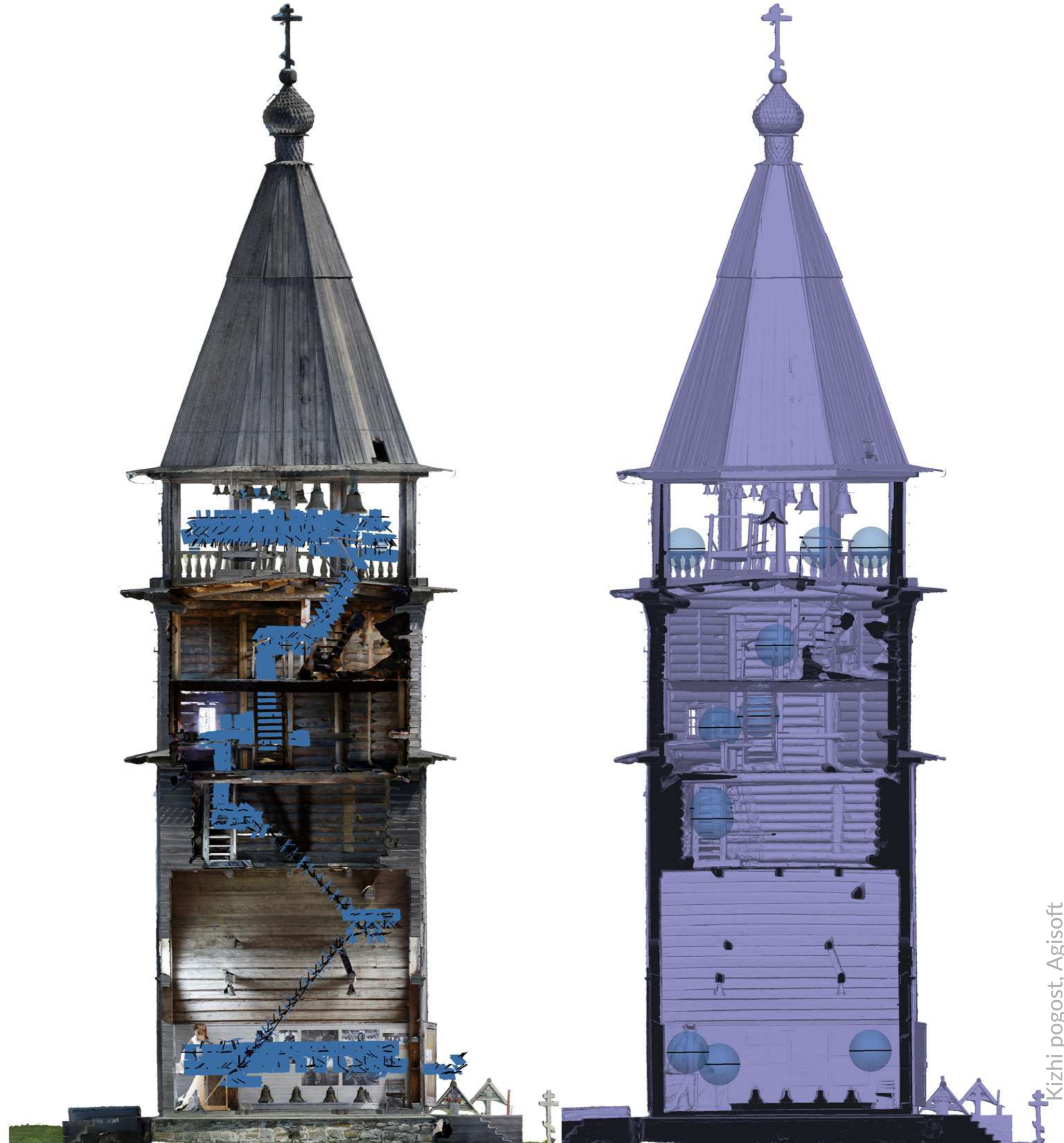
Combined: photos + terrestrial laser scans











LiDAR or Photogrammetry?

LiDAR data processing is faster

LiDAR is reliable in obscure areas:

- between facades and trees
- in narrow passages (especially interior)

Photogrammetry:

- more details where overlap is good

**Best results achieved
with combined processing!**

LiDAR and Photogrammetry

Compared and Combined

Metashape 2.0 (2023)

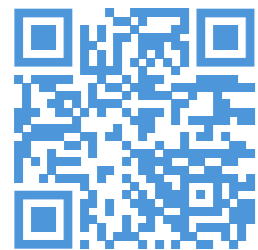
- combined surface reconstruction (aerial LiDAR, TLS, photogrammetry)
- combined alignment of TLS and photogrammetry

Metashape 2.1 (2024)

- geometric registration of point clouds (aerial LiDAR, TLS, photogrammetry)

Thanks for your attention!

Questions?



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