

# **PHOTOMOD 6.4**

new features

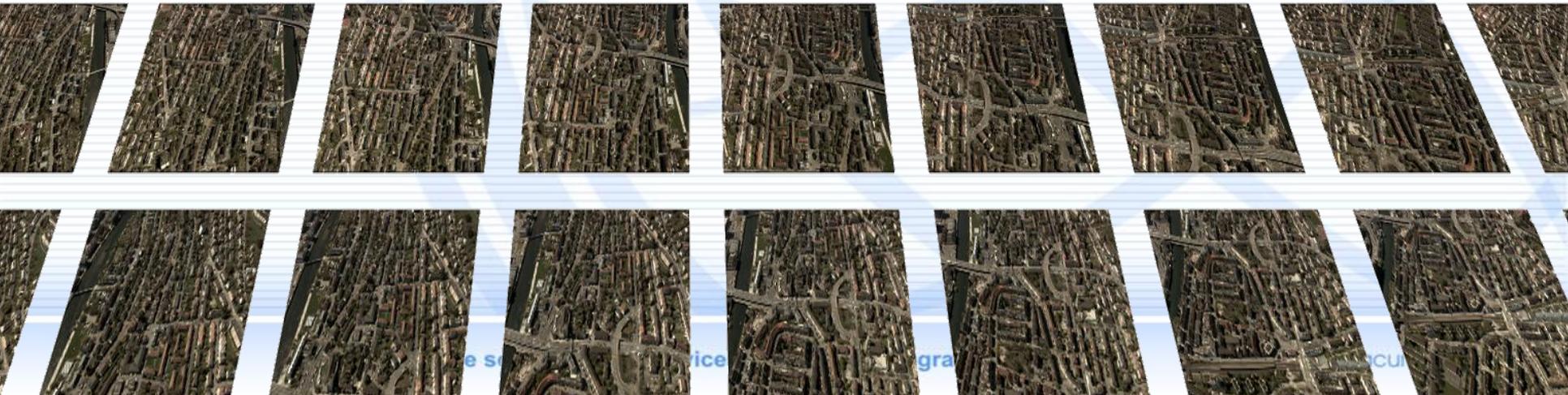
Dmitry Kochergin  
Head of Technical support department  
Racurs, Russia

**Crete, Greece. September 2018**



# PHOTOMOD 6.4 highlights

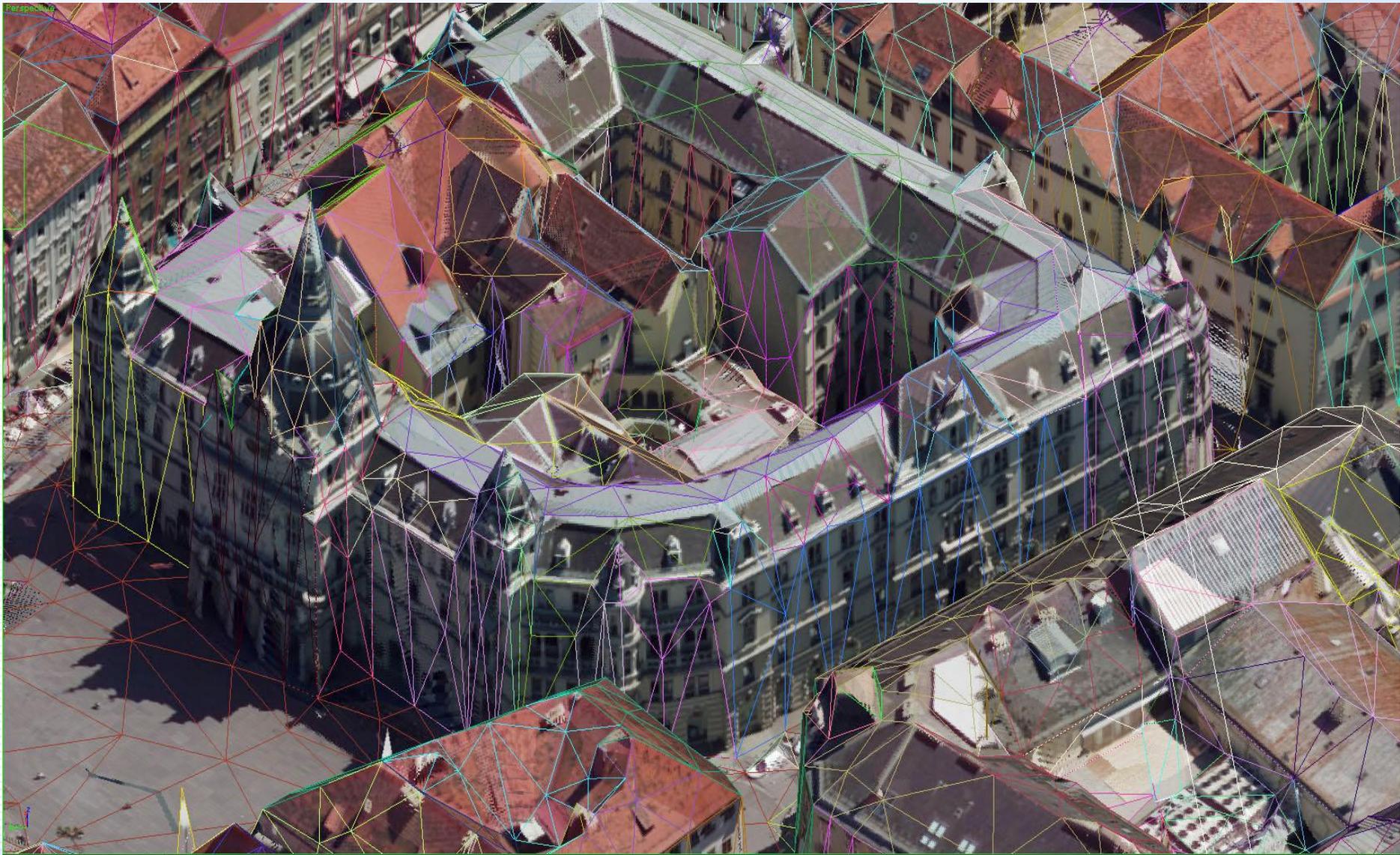
- ✓ 3D - TIN / 2.5D - TIN
- ✓ Point cloud filtering capabilities
- ✓ Radical speeding up of satellite blocks adjustment
- ✓ UAS AT improvements ("bad" block layout)
- ✓ 3D modeling for satellite imagery
- ✓ New sensors supported
- ✓ Export of RPC (affine transformation)
- ✓ New 3D formats for export (Cesium platform)
- ✓ Additional stereovectorization tools
- ✓ Stereo Client application/service
- ✓ True-Ortho improvements
- ✓ Full support of GSK 2011
- ✓ PHOTOMOD Conveyor modifications
- ✓ Web-layers from GIS "Panorama"



# 3D-model



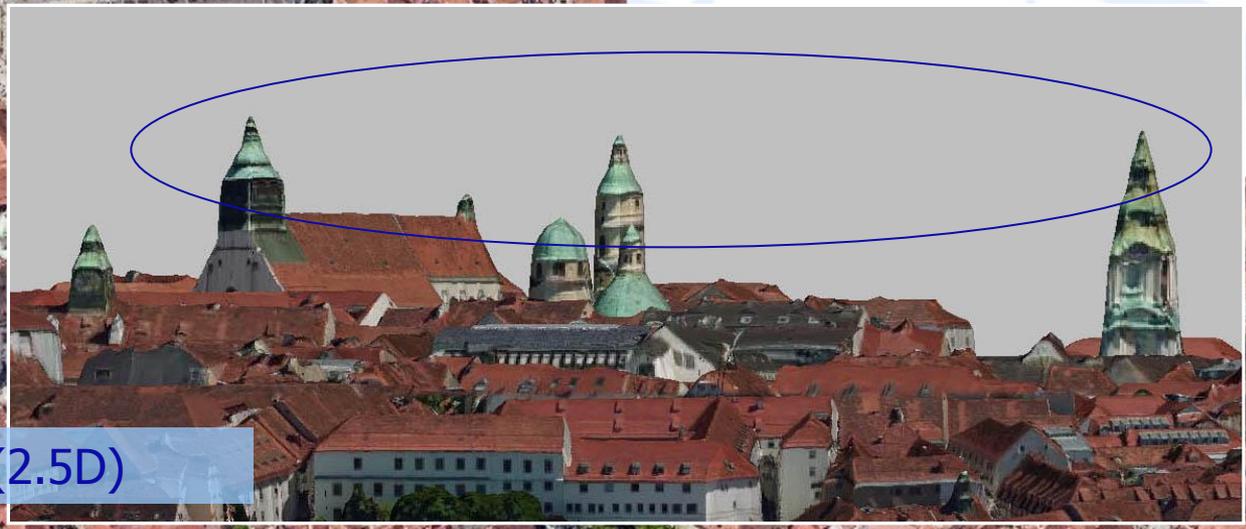
# TIN



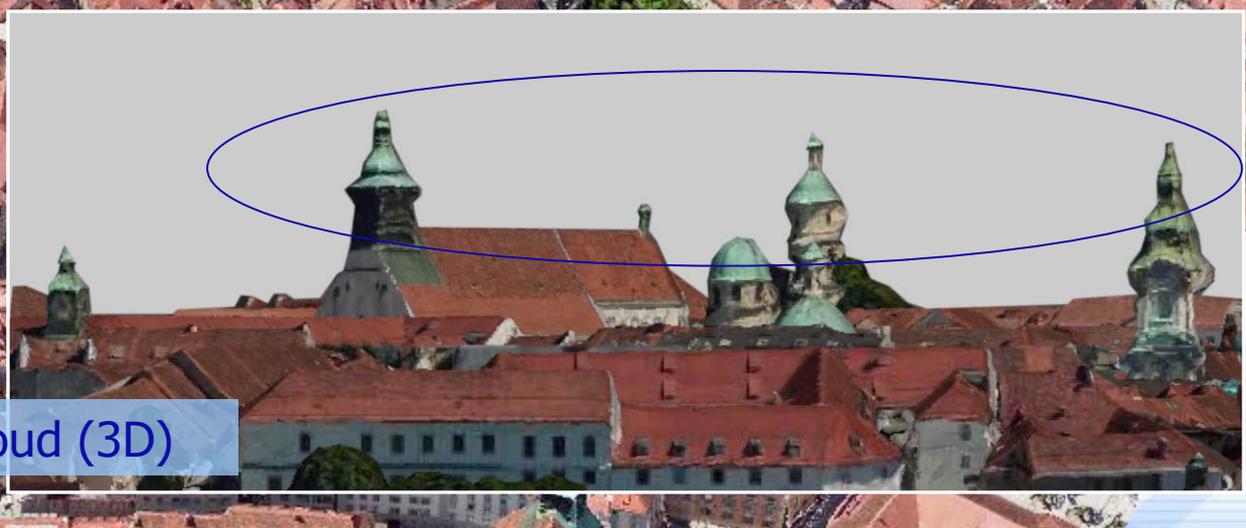
# TIN textured (3D-model)



# 3D-TIN vs "2.5"D-TIN



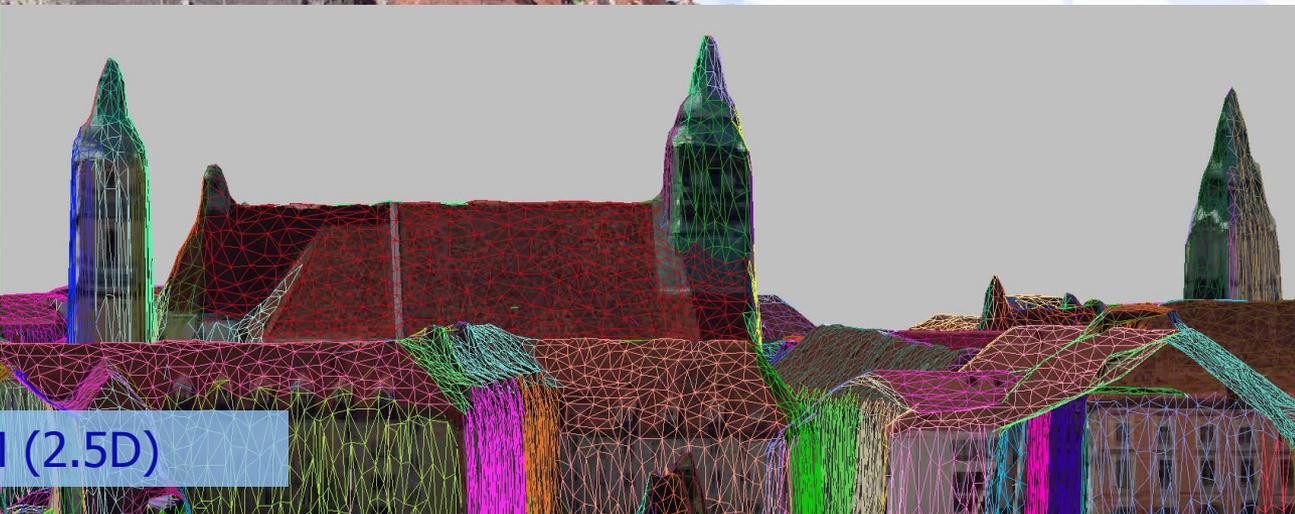
Based on DSM (2.5D)



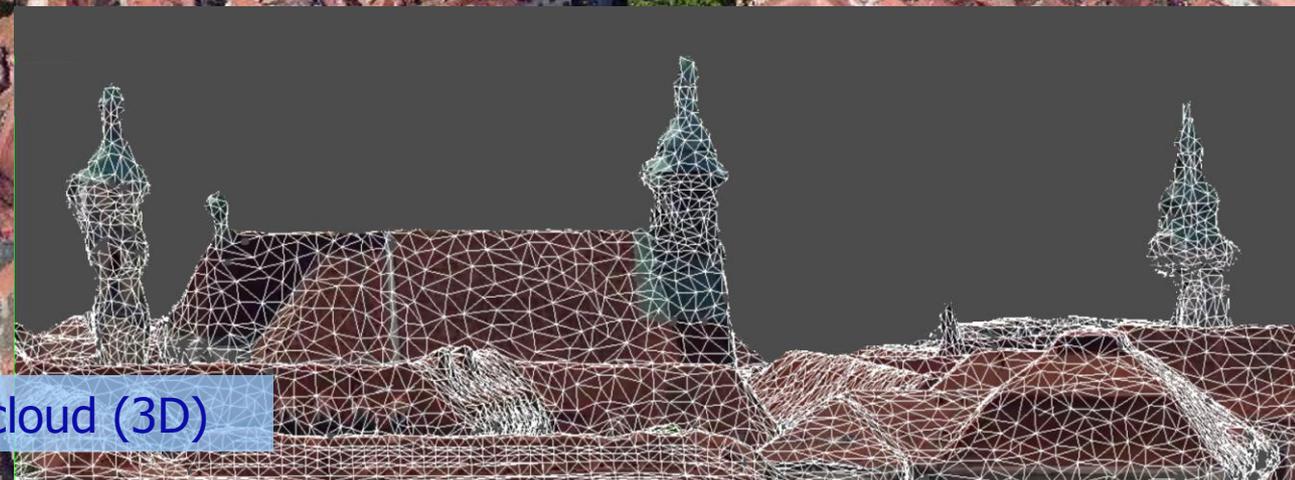
Based on point cloud (3D)



# 3D-TIN vs "2.5"D-TIN



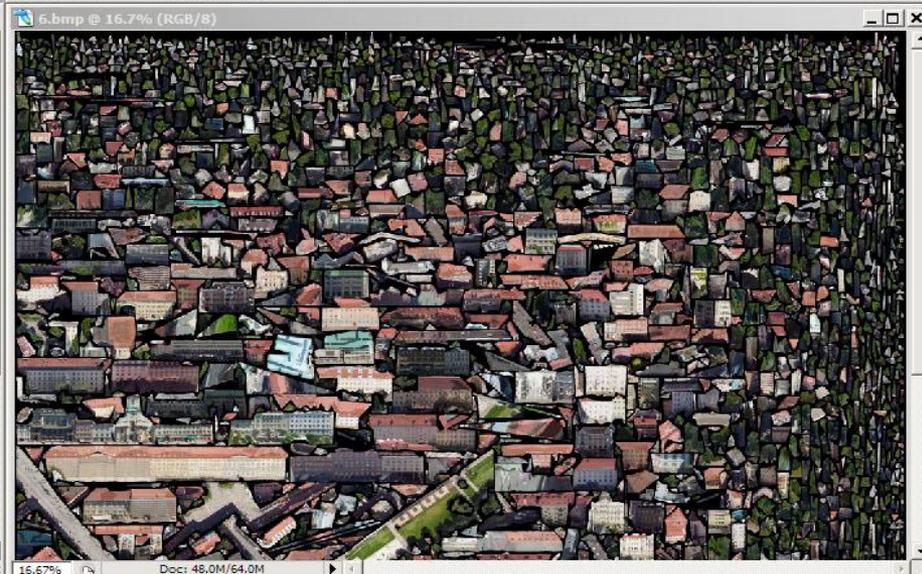
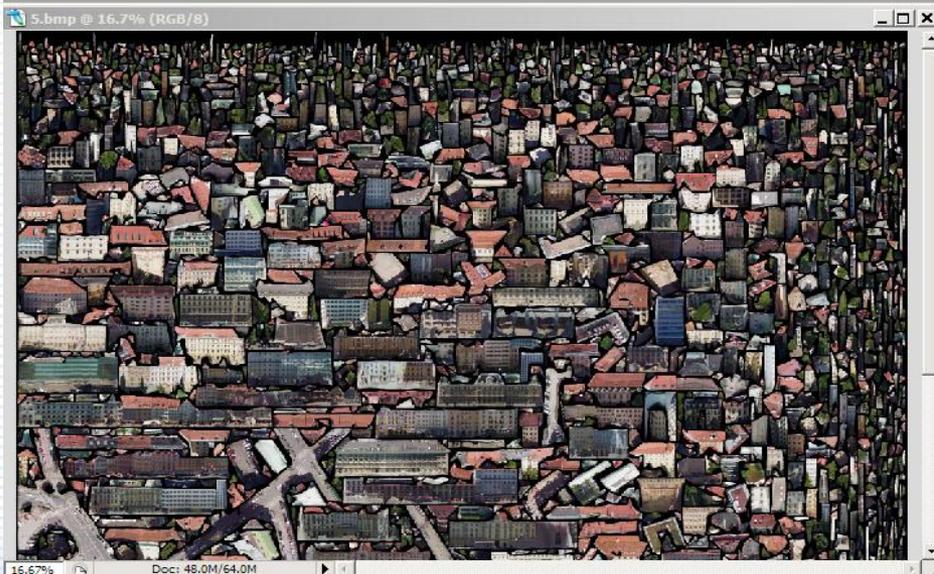
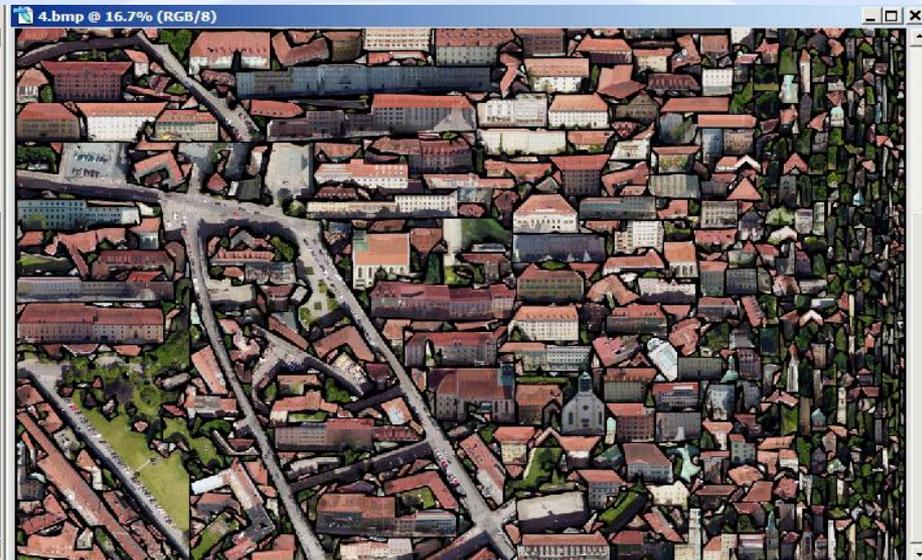
Based on DSM (2.5D)



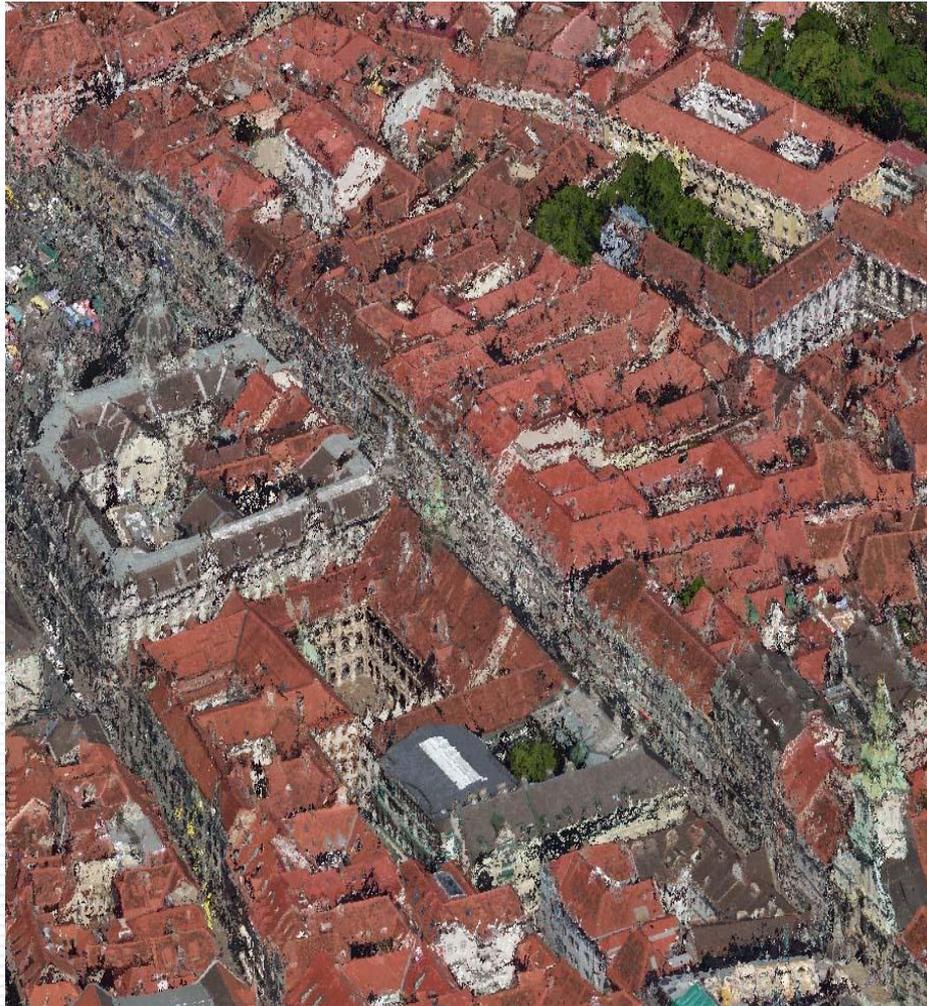
Based on point cloud (3D)



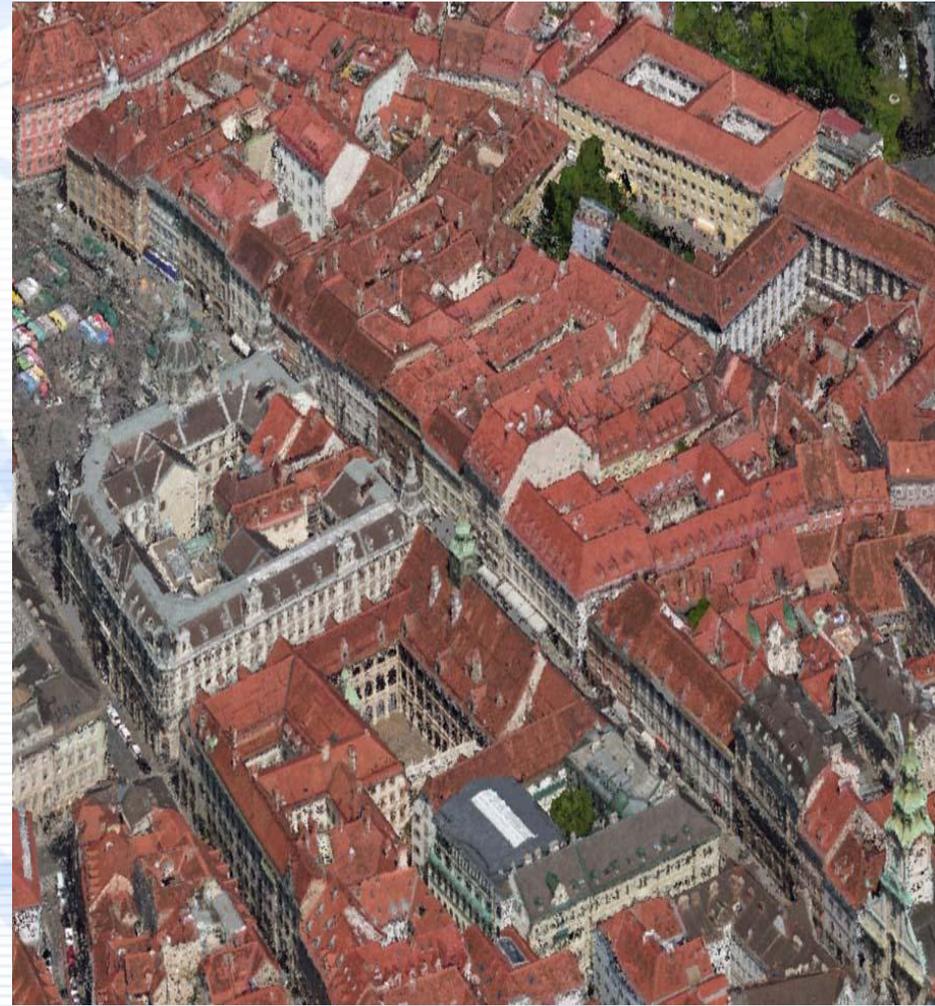
# 3D-model from 3D-TIN. Textures calculation



# LAS filtering by number of "returns"



>1 returns



> 4 returns

# LAS filtering. Noise above and below the surface

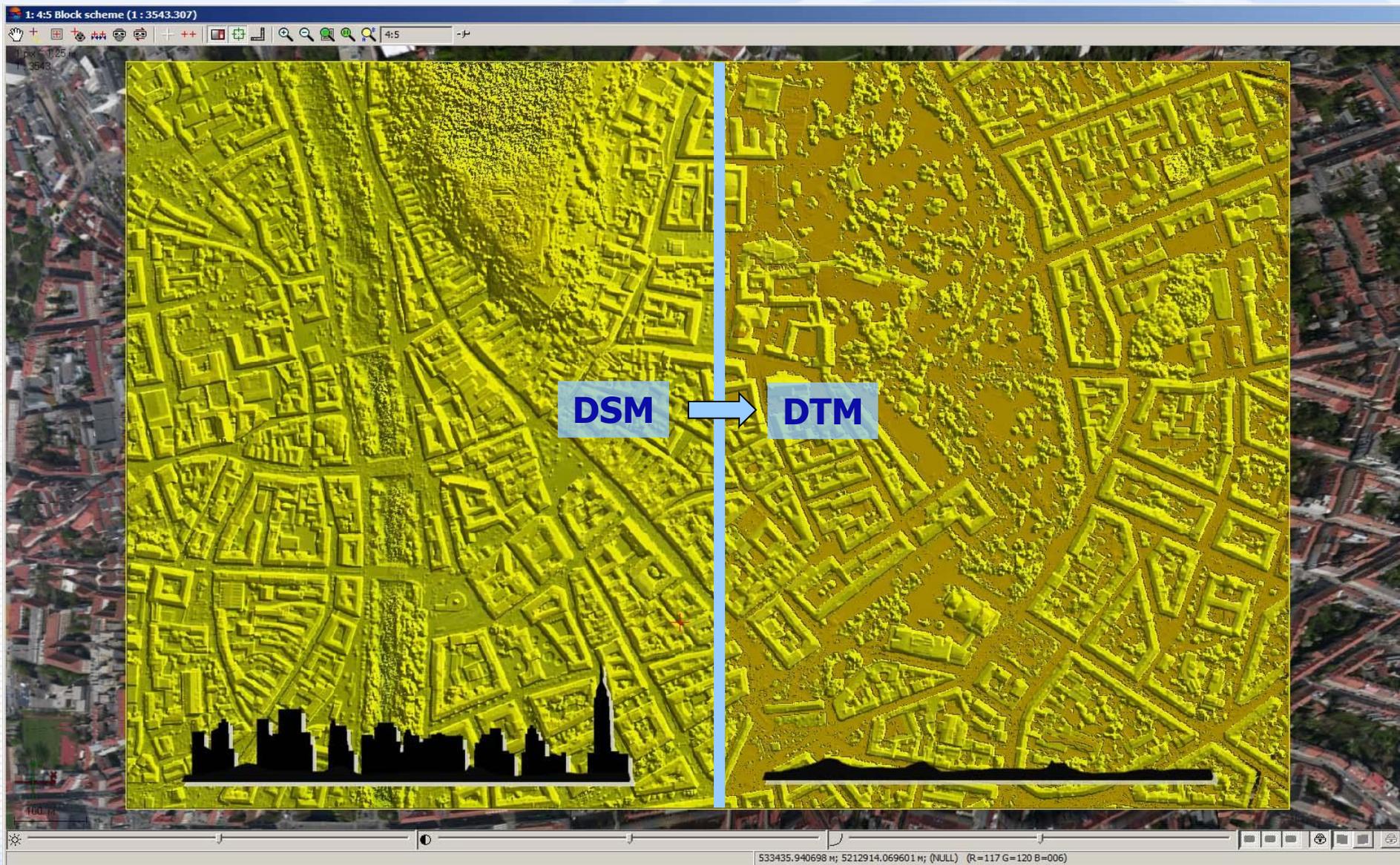
by using DSM



by using DTM



# Filter by slope angle



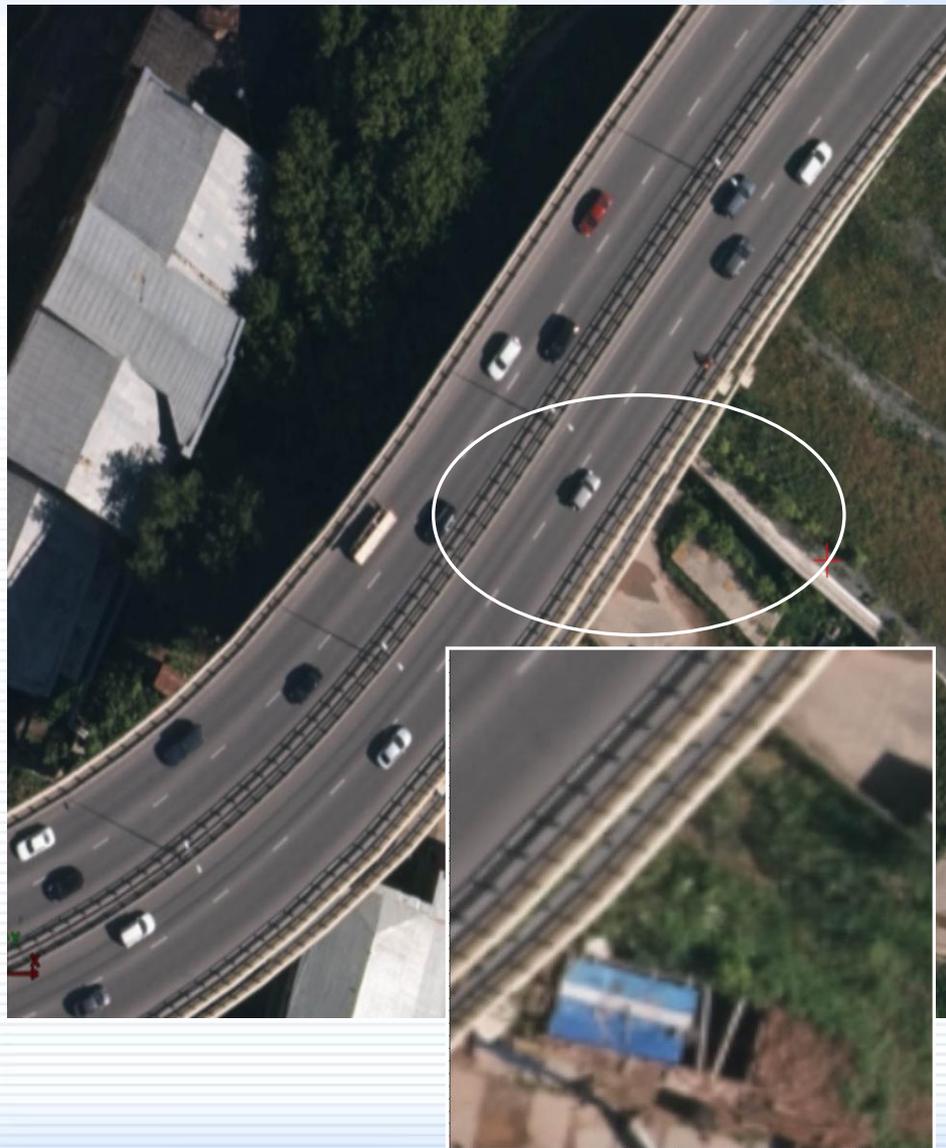
# "Old" and "new" filter parameters

The screenshot displays a GIS application window titled "1: 4:5 Block scheme (1 : 3543.307)". The main view shows an aerial photograph of a city with a yellow filter overlay. Two dialog boxes are open:

- Slope based filter (new):**
  - Input resource: /red Dima/Data/dem/DSM\_0\_071m\_only\_instrip/final\_dem.x-dem
  - Output resource: /projects/UCOp-Graz\_Combined\_Dima/Data/dem/DSM\_0\_071m\_o
  - Distance of points mutual influence: 300.0 M
  - Deviation from smoothed surface: 1.0 M
  - Intermediate DEM pyramid level: 1
  - Options:  Inside selected polygons,  Open DEM after filtering,  Delete intermediate data
  - Buttons: OK, Cancel
- Parameters of buildings and vegetation filter (old):**
  - Name: Basic
  - Source DEM cell size: 0.071000 M
  - Thinout coefficient for calculating basis points: 28.0
  - Space between basic points: 2.000000 M
  - Distance of points mutual influence: Near 6.0 M, Far 54.0 M
  - Filter surges:  Up,  Down
  - Spikes only:  Up,  Down
  - Threshold slope angle for spikes: 45 degrees
  - Maximum area of flat surges: 50000 M<sup>2</sup>, 2000 M<sup>2</sup>
  - Intermediate smoothing radius: 108 M
  - Allowed point deviation from smoothed surface: 1.0 M
  - Maximum area of inclined surges: 10000 M<sup>2</sup>
  - Buttons: OK, Cancel

At the bottom of the window, coordinates are shown: 532058.440698 M; 5213186.569601 M; 409.447870 M (R=179 G=175 B=173). The text "Декартова правая" is visible in the bottom right corner.

# Bridges and invisible zones while orthorectification



# PHOTOMOD UAS. Low quality of block layout

The screenshot displays the PHOTOMOD software interface. The main window shows a block layout of aerial photographs of a rural area, with a white and red drone flying in the upper right corner. The 'Automatic Tie Point Measurement' dialog box is open, showing the following configuration:

- Correlator configuration: Medium copy
- Name: 8, 9
- Calibrate camera
- Make block adjustment
- Assign self-calibrated camera
- Delete intermediate data
- Low block layout quality

The 'Low block layout quality' option is highlighted with a red box. The dialog box also includes 'Parameters', 'Distributed processing', 'OK', and 'Cancel' buttons.

# Manual angle settings for UAS multicamera survey

Slanting photography\_adjusted - PHOTOMOD

Project Block Orientation Grid Terrain Vectors Rasters Edit Service Window Help

1: 1:3 Block scheme (1 : 8503.937)

1 pix ~ 6. m  
1 : 17008

1 pix ~ 3. m  
1 : 8504

500. m

200. m

558813.993791 m; 4152995.051636 m; 0.000000 m (R=192 G=192 B=192)

CGCS2000

**Compute Kappa angle by flight direction**

- For all images
- For the selected images
- Select off nadir angle
- 45
- Nadir
- Left
- Right
- Forward
- Backward

More OK Cancel

# Satellite imagery

## New sensors supported

- ✓ Aist – 2D (Russia)
- ✓ PlanetScope (USA)
- ✓ TripleSat (China)

3d models from multitemporal high-resolution images





# Stereo Client



# Export to Cesium platform



An open-source JavaScript library for world-class 3D globe and maps

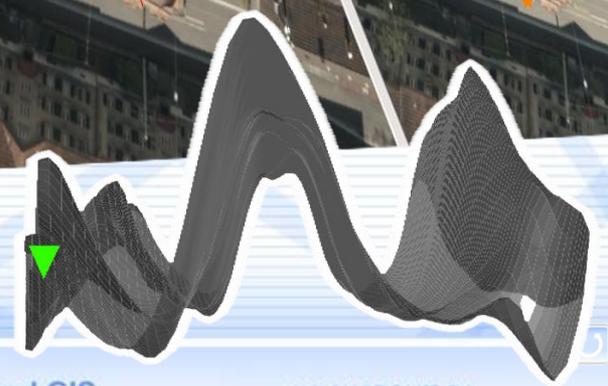
Tap to interact

.obj, .b3dm, .json, .glTF  
formats

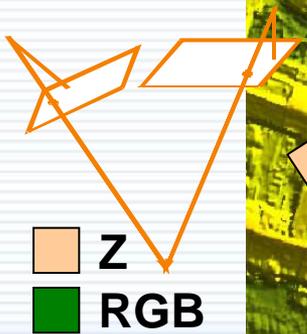
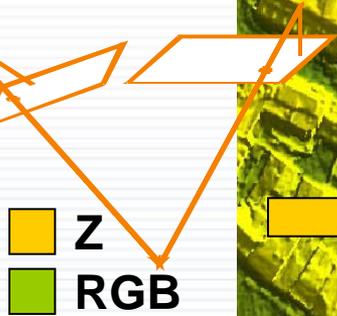
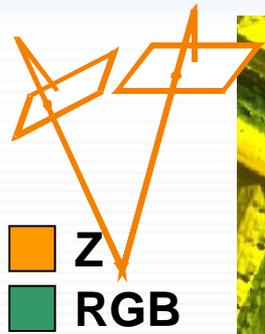
# DSM building by using "weights"



Most "reliable" Z



# True Ortho pixel value (RGB)



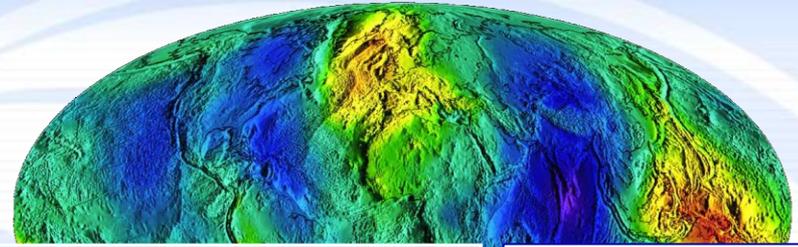
Most "reliable" RGB



# Support of 32453-2017 standard (GOST)

GOST 32453-2013  
SK 42/95  
PZ 90.02  
Reference ellipsoid (Krasovsky)

GOST 32453-2017  
GSK 2011  
PZ 90.11  
Mean Earth ellipsoid (GSK 2011)

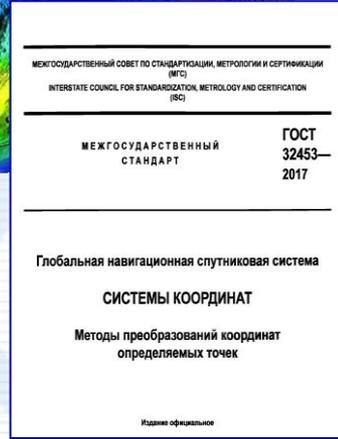


View reference system

Search

Name	Description
Геоцентрическая ПЗ-90 (ГОСТ 32453-2017)	
Геоцентрическая ПЗ-90.02 (ГОСТ 32453-2017)	
Геоцентрическая ПЗ-90.11 (ГОСТ 32453-2017)	
Широта-долгота ПЗ-90 (ГОСТ 32453-2017)	
Широта-долгота ПЗ-90.02 (ГОСТ 32453-2017)	
Широта-долгота ПЗ-90.11 (ГОСТ 32453-2017)	
Широта-долгота Пулковско 1942 (ГОСТ 32453-2017)	Геодезическая (широта - долгота - высота над р
Широта-долгота Пулковско 1995 (ГОСТ 32453-2017)	Геодезическая (широта - долгота - высота над р
Геоцентрическая ГСК-2011 (ГОСТ 32453-2017)	
Широта-долгота ГСК-2011 (ГОСТ 32453-2017)	
ГСК-2011, зона 1 (ГОСТ 32453-2017)	0°в.д.-6°в.д. Северное полушарие
ГСК-2011, зона 2 (ГОСТ 32453-2017)	6°в.д.-12°в.д. Северное полушарие
ГСК-2011, зона 3 (ГОСТ 32453-2017)	12°в.д.-18°в.д. Северное полушарие
ГСК-2011, зона 4 (ГОСТ 32453-2017)	18°в.д.-24°в.д. Северное полушарие
ГСК-2011, зона 5 (ГОСТ 32453-2017)	24°в.д.-30°в.д. Северное полушарие
ГСК-2011, зона 6 (ГОСТ 32453-2017)	30°в.д.-36°в.д. Северное полушарие
ГСК-2011, зона 7 (ГОСТ 32453-2017)	36°в.д.-42°в.д. Северное полушарие
ГСК-2011, зона 8 (ГОСТ 32453-2017)	42°в.д.-48°в.д. Северное полушарие
ГСК-2011, зона 9 (ГОСТ 32453-2017)	48°в.д.-54°в.д. Северное полушарие
ГСК-2011, зона 10 (ГОСТ 32453-2017)	54°в.д.-60°в.д. Северное полушарие
ГСК-2011, зона 11 (ГОСТ 32453-2017)	60°в.д.-66°в.д. Северное полушарие
ГСК-2011, зона 12 (ГОСТ 32453-2017)	66°в.д.-72°в.д. Северное полушарие
ГСК-2011, зона 13 (ГОСТ 32453-2017)	72°в.д.-78°в.д. Северное полушарие

Details New Edit Remove Export... Import... Close



ГОСТ 32453—2017

Приложение Г  
(обязательное)

Параметры преобразования между системой координат ПЗ-90.11 и системой координат WGS-84 (G1150)

Г.1 Преобразование координат из системы координат ПЗ-90.11 в систему координат WGS-84 (G1150)

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{WGS-84(G1150)}} = [1 + (-0,008)10^{-6}] \begin{bmatrix} 1 & -2,041066 \cdot 10^{-6} \\ +2,041066 \cdot 10^{-6} & 1 \\ +1,716240 \cdot 10^{-8} & +1,115071 \cdot 10^{-8} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ПЗ-90.11}}$$

Г.2 Преобразование координат из системы координат WGS-84 (G1150) в систему координат ПЗ-90.11

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ПЗ-90.11}} = [1 - (-0,008)10^{-6}] \begin{bmatrix} 1 & +2,041066 \cdot 10^{-6} \\ -2,041066 \cdot 10^{-6} & 1 \\ -1,716240 \cdot 10^{-8} & -1,115071 \cdot 10^{-8} \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{WGS-84(G1150)}}$$

ГОСТ 32453—2017

А.5 Преобразование координат из референционной системы координат ГСК-2011 в систему координат ПЗ-90.11

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ПЗ-90.11}} = [1 + (-0,0006)10^{-6}] \begin{bmatrix} 1 & +2,569513 \cdot 10^{-10} & +9,211460 \cdot 10^{-11} \\ -2,569513 \cdot 10^{-10} & 1 & -2,724653 \cdot 10^{-9} \\ -9,211460 \cdot 10^{-11} & +2,724653 \cdot 10^{-9} & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ГСК-2011}} + \begin{bmatrix} 0,000 \\ +0,014 \\ -0,008 \end{bmatrix}$$

Эпоха параметров преобразования 2011,0

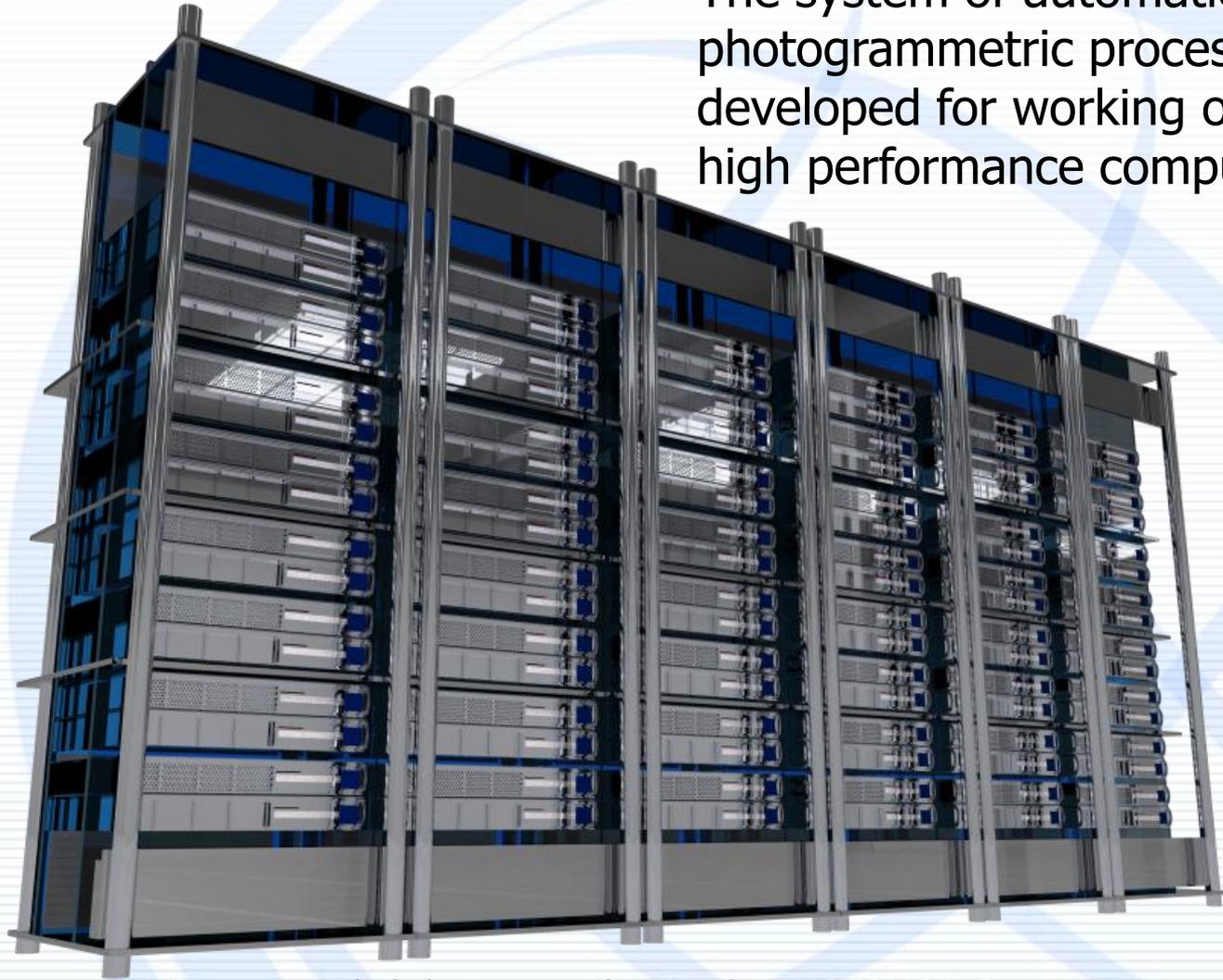
А.6 Преобразование координат из системы координат ПЗ-90.11 в референционную систему координат ГСК-2011

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ГСК-2011}} = [1 - (-0,0006)10^{-6}] \begin{bmatrix} 1 & -2,569513 \cdot 10^{-10} & -9,211460 \cdot 10^{-11} \\ +2,569513 \cdot 10^{-10} & 1 & -2,724653 \cdot 10^{-9} \\ +9,211460 \cdot 10^{-11} & -2,724653 \cdot 10^{-9} & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{\text{ПЗ-90.11}} - \begin{bmatrix} 0,000 \\ +0,014 \\ -0,008 \end{bmatrix}$$

Also supported in Android version of GeoCalculator

# PHOTOMOD Conveyor. HPC. UAS project version is upcoming

The system of automatic photogrammetric processing, developed for working on high performance computers



Recommended cluster specification for PHOTOMOD Conveyor are as following  
100-200 Intel Xeon E5 CPU cores and SSD storage



# PHOTOMOD Conveyor. Big datasets. One button technology

The screenshot displays the PHOTOMOD Remote Starter Tool interface, which is used for managing and starting PHOTOMOD Conveyor SA processes. The interface is divided into several sections:

- PHOTOMOD Remote Starter Tool (Main Window):** Features a table with columns: N, Hostname, Comment, IP address, Keyring, Connection status, and Remote Process status.
- PHOTOMOD Conveyor SA (Left Window):** Contains configuration options for:
  - General:** Project name (UC\_demos), Project type (Aerial survey).
  - Source data:** Source data folder (D:\Conveyor\_projects\UltraCam\images) and PHOTOMOD project (/temp/UC\_demos/Projects/UC\_demos).
  - Coordinate system:** CK-42, зона В (42° в.д., -48° в.д.) and Orientation: left, geo-referencing: global coordinate system.
  - Output file formats:** TIFF/BigTIFF, BMP, IMG/IGE, MegaTIFF, RSW.
  - Georeference format:** Text file, None, ArcWorld, MapInfo TAB, Internal (GeoTIFF, IMG).
  - Internal overview pyramids:** External overview pyramids checked.
  - Output folder:** D:\Conveyor\_projects\UC\_output.
- PHOTOMOD Conveyor SA (Middle Window):** Contains configuration options for:
  - Processing stages:** Create projects and add images, Search for GCPs, Search for tie points, Adjust project, Search pickets, Build DTM, Build DSM, Orthorectificate and create mosaic project, Build output mosaic.
  - Root folder for intermediate data:** /temp.
  - Intermediate data management:** Clear PHOTOMOD projects folder before run, Clear orthoimages folder, Clear output folder, Clear logs folder, Tasks paralleling..., Delete intermediate data.
- PHOTOMOD Conveyor SA (Right Window):** Contains configuration options for:
  - Building parameters:** GSD (0.1 m), DEM for orthorectification (DTM), Constant elevation (400.0 m), DEM.
  - Splitting into sheets:** Simple kilometers splitting, Standard, Standart splitting into sheets (Scale: 1:2 000, Quarters names: a, b, c, d), Add "(s.h.)" to sheet name, Fill zeroes to 1:100 000.
  - From resource:** Fill background out sheets area, Create rectangle sheets boundaries, Use useful areas for sheets activation.
- Control Panel (Right Side):** Includes buttons for Run, Stop, Add host, Remove host, Edit keyring, Set group for selected nodes, Set remote start path, Edit port, Set an operator ui file name, Server, Local Client, Monitor, Open the UI, and Terminal.
- Command Line (Bottom):** Displays the execution commands for the local\_guard, PhSocketServer, and PhSocketClient processes.



Thank you for attention !

