Development of a toolkit for exhaustive Quality Control of radiometric aspect of high definition aerial Lidar data in Greece

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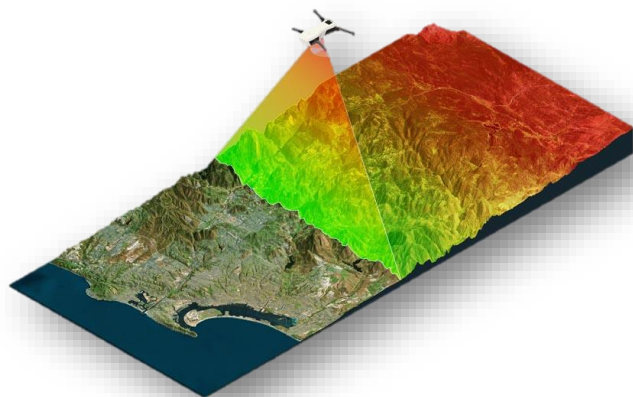**Geospatial Information Department**

Cartography Division
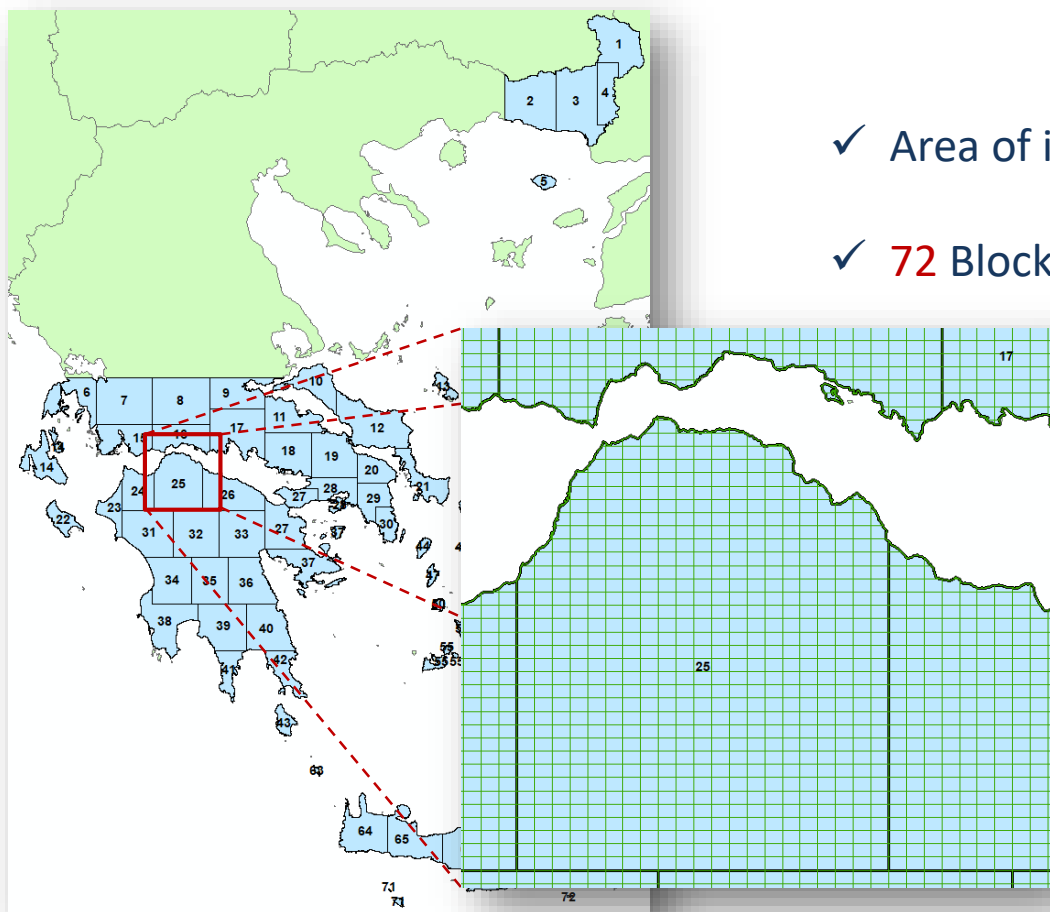
LIDAR Project

"High definition aerial data"

✓ European Recovery Fund

✓ Contract signing date: December 2024

✓ Project completion date: December 2025

SDQ 2025: 5th International Workshop on Spatial Data Quality, **20-21 November 2025**, Athens

"Development of a toolkit for exhaustive quality control of radiometric aspects of high definition aerial Lidar data in Greece "

LIDAR Project
Data volume

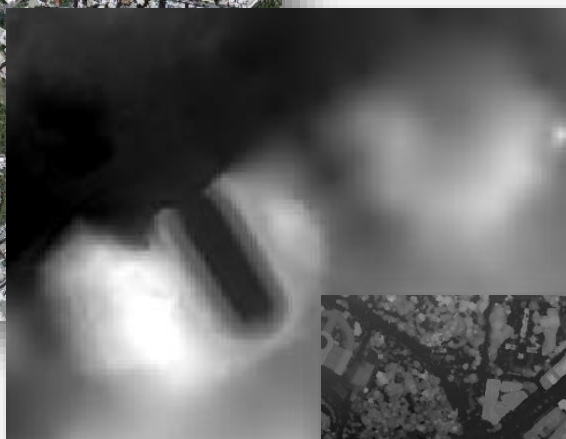✓ Area of interest: 61.500 km^2

✓ 72 Blocks

✓ Number of tiles: 23.185

  ○ Tiling scale: 1:2.500
  ○ Dimension: 2.000 x 1.500 m

LIDAR Project
Raster Deliverables

✓ For each tile:

- Orthoimage (RGB), resolution 0.5m, 8-bit

- Digital Terrain Model (DTM), resolution 1m

- Digital Surface Model (DSM), resolution 1m

HELLENIC REPUBLIC
Ministry of Digital Governance
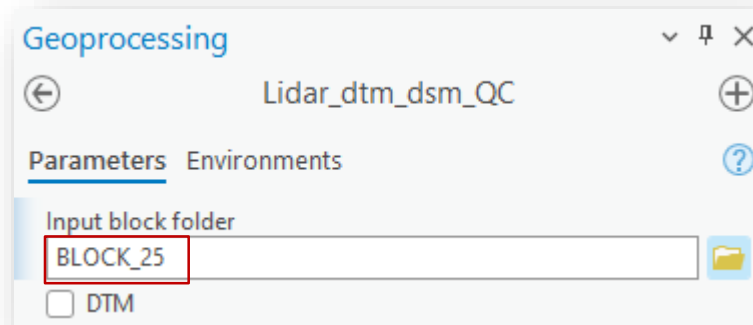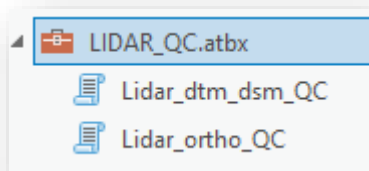
Hellenic Cadastre

QC – Tools

ArcPy / Spatial Analyst

QC – DSM/DTM
Tools - Analysis

✓ **3 control zones:**

- Inner zone (-5m)
- Coastal zone (buffer 15m)
- Outer zone

— — — coastline

——— buffer 5m inside the coastline

——— buffer 5m inside & 10m outside the coastline = 15m

QC – DSM/DTM
Tools - Analysis
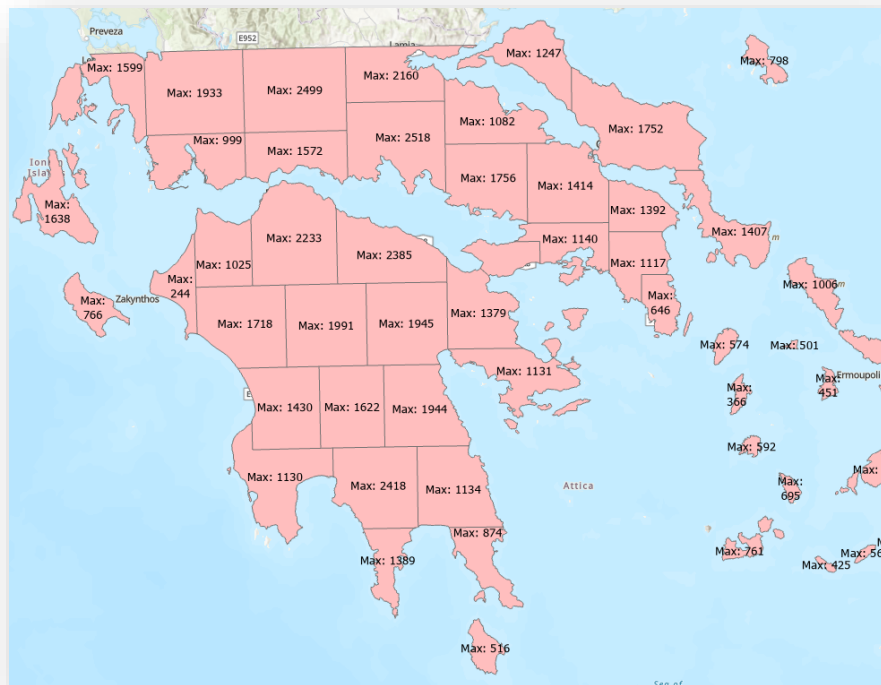
- ✓ **Inner** zone QC:
  - ○ Min value > 0
  - ○ Max value < {block max}
  - ○ NoData value
- ✓ **Coastal** zone QC:
  - ○ Min value > -2
  - ○ Max value < 10
- ✓ **Outer** zone QC:
  - ○ Value = 0 or NoData

QC – Orthoimages RGB
Tools - Analysis

- ✓ 2 control zones :
  - o Inner zone QC :
    - ▪ Min value > 0
    - ▪ NoData value
  - o Outer zone QC :
    - • Value = 0
- ✓ Histogram range:
  - o Max – Min: > 230 (8-bit)

QC – DTM/DSM/Orthoimages
Tools – Exported files

```
Files with incorrect values:
0440042390.tif has NoData values within the inner boundaries of the block (buffer 5m)
0442042375.tif has NoData values within the inner boundaries of the block (buffer 5m)
0444042615.tif has MIN Value = -0.019999999552965164 within the inner boundaries of the block (buffer 5m)
0446042615.tif has MIN Value = -0.009999999776482582 within the inner boundaries of the block (buffer 5m)
0450042450.tif has NoData values within the inner boundaries of the block (buffer 5m)
0450042465.tif has NoData values within the inner boundaries of the block (buffer 5m)
0450042600.tif has MIN Value = -0.23999999463558197 within the inner boundaries of the block (buffer 5m)
0452042465.tif has NoData values within the inner boundaries of the block (buffer 5m)
0452042585.tif is outside Z:\Working\BLOCKS_DEM\BLOCKS\BLOCKS_COAST_BUFFER_15.shp boundaries
0452042600.tif has MIN Value = -0.3199999928474426 within the inner boundaries of the block (buffer 5m)
0452042600.tif is outside Z:\Working\BLOCKS_DEM\BLOCKS\BLOCKS_COAST_BUFFER_15.shp boundaries
0454042270.tif has NoData values within the inner boundaries of the block (buffer 5m)
0454042570.tif has NoData values within the inner boundaries of the block (buffer 5m)
0454042585.tif is outside Z:\Working\BLOCKS_DEM\BLOCKS\BLOCKS_COAST_BUFFER_15.shp boundaries
0454042600.tif is outside Z:\Working\BLOCKS_DEM\BLOCKS\\BLOCK_19_INNER_BUFFER_5m.shp boundaries
0454042600.tif is outside Z:\Working\BLOCKS_DEM\BLOCKS\BLOCKS_COAST_BUFFER_15.shp boundaries
0458042420.tif has NoData values within the inner boundaries of the block (buffer 5m)
0458042540.tif has NoData values within the inner boundaries of the block (buffer 5m)
```

```
0444042615.tif, 445122.5, 4262341.5
0444042615.tif, 445119.5, 4262340.5
0444042615.tif, 445115.5, 4262338.5
0444042615.tif, 445111.5, 4262337.5
0444042615.tif, 445112.5, 4262337.5
0444042615.tif, 445052.5, 4262320.5
0444042615.tif, 445289.5, 4262268.5
0444042615.tif, 445510.5, 4262258.5
0444042615.tif, 445323.5, 4262255.5
0444042615.tif, 445616.5, 4262254.5
0444042615.tif, 445347.5, 4262252.5
0444042615.tif, 445576.5, 4262234.5
0444042615.tif, 445718.5, 4262159.5
0444042615.tif, 445721.5, 4262137.5
```

DTM/DSM

✓ For each block:

- 7 .txt files:
  - Total errors, names of tiles
  - 6 files with detailed information per tile, point coordinates per control zone

- 6 shapefiles:
  - They contain all points with incorrect values (per control zone)

Orthoimages

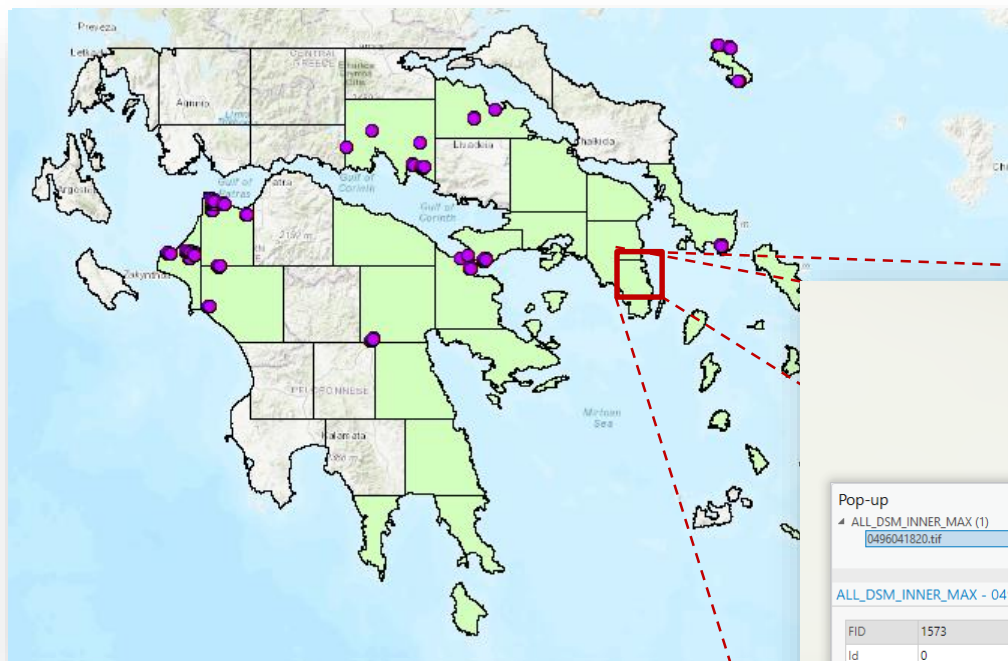✓ For each block:
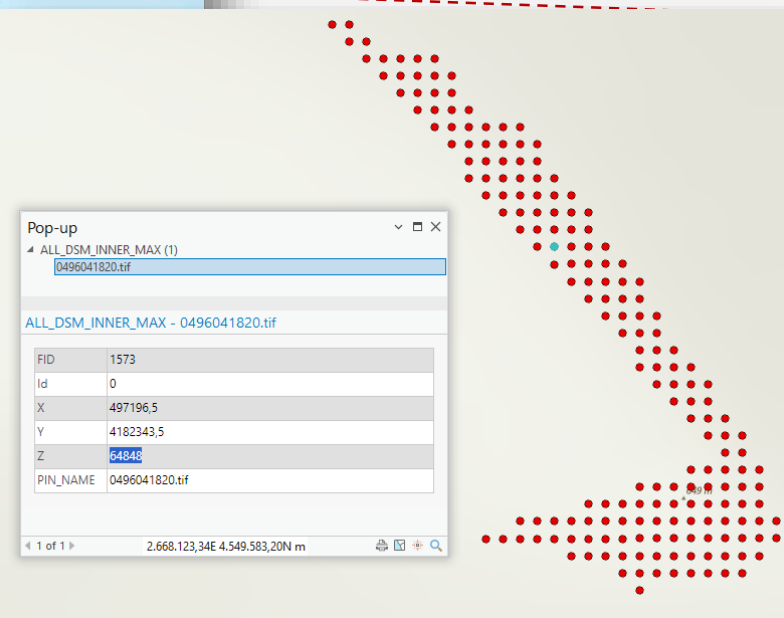
✓ 1 .txt file with the tiles containing errors, per band.

QC – DSM Results

- ✓ **31 Block DSM**
  - ○ 8.574 tiles
- ✓ **17 tiles > Max**
  - ○ 2.747 points

al and

Pop-up

▲ ALL_DSM_INNER_MAX (1)
0496041820.tif

ALL_DSM_INNER_MAX - 0496041820.tif

FID	1573
Id	0
X	497196,5
Y	4182343,5
Z	64848
PIN_NAME	0496041820.tif

◄ 1 of 1 ►   2.668.123,34E 4.549.583,20N m

QC – Time

✓ **DSM – 1 Block:**

   497 tiles in **8.820 sec** = **17.7 sec** / tile

✓ **Orthoimages (3 bands):**

   35 sec / tile

Processor	13th Gen Intel(R) Core(TM) i7-13700 2.10 GHz
Installed RAM	64,0 GB (63,8 GB usable)

```
Start Time: Πέμπτη, 18 Σεπτεμβρίου 2025 12:16:24 μμ
Succeeded at Πέμπτη, 18 Σεπτεμβρίου 2025 12:16:24 μμ (Elapsed Time: 0,00 seconds)
Executing (lidar_dtm_dsm_QC): lidarDTMDSMQC Z:\LIDAR_Archive\BLOCK_19 #
Start Time: Πέμπτη, 18 Σεπτεμβρίου 2025 12:16:24 μμ
Checking 1 / 497 files (0432042225.tif of BLOCK_19).
Checking 2 / 497 files (0432042240.tif of BLOCK_19).
Checking 3 / 497 files (0432042255.tif of BLOCK_19).
Checking 4 / 497 files (0432042270.tif of BLOCK_19).
Checking 5 / 497 files (0432042285.tif of BLOCK_19).
...
Checking 497 / 497 files (0470042435.tif of BLOCK_19).
Succeeded at Πέμπτη, 18 Σεπτεμβρίου 2025 2:43:24 μμ (Elapsed Time: 2 hours 27 minutes 0 seconds)
```

Thank you
for your attention!