Client:

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1. Project description

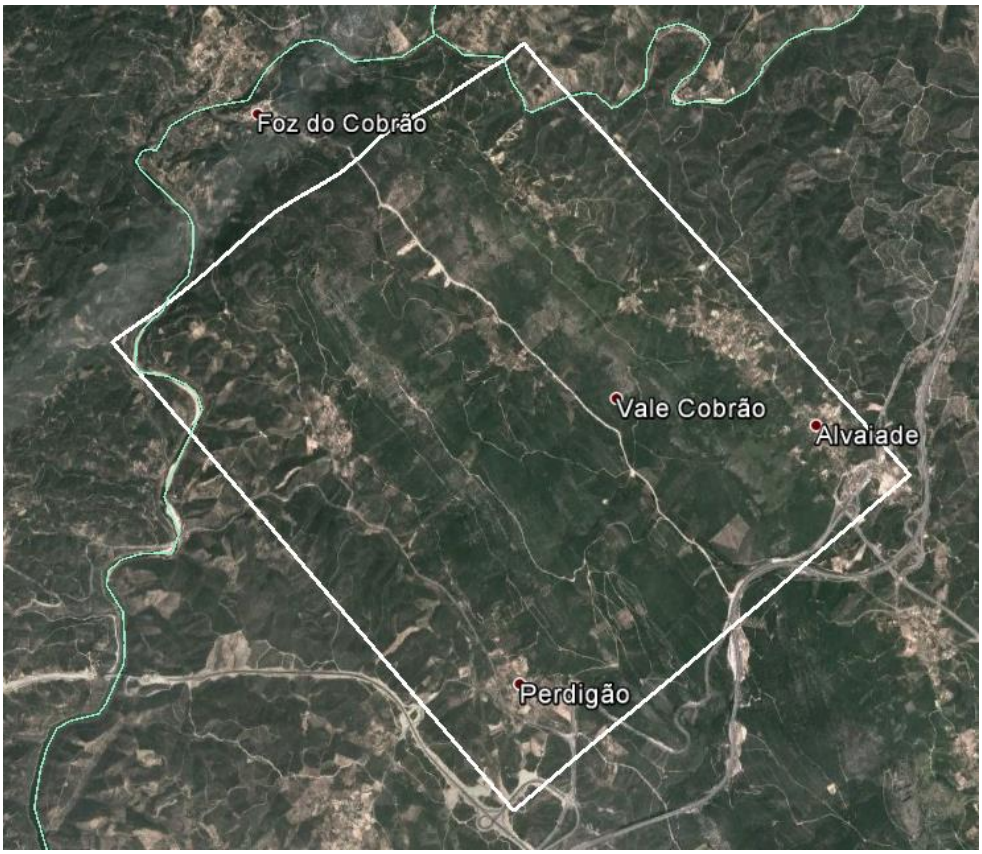
1.1 Background

This is a report of a helicopter airborne survey delivered by NIRAS with assistance from Blom TopEye in order to produce data for digital elevation model and ortho photo.

This delivery includes a LiDAR point cloud, and 5cm (plus 20cm) Ortho Photo.

2. Aerial survey information

The aerial survey was performed 150313 at an altitude of 500m with TopEye system S/N 444 The surveying was completed in one session..



Surveying area outlined in Google Earth.

2.1 LIDAR data

Total number of points is approximately 993 198 375 and the average point density inside the project area is 45 points/m2.

2.2 Aerial Photography

The photography was performed with a Phase One camera. The surveying altitude and the camera of choice give the following ground resolution distance:

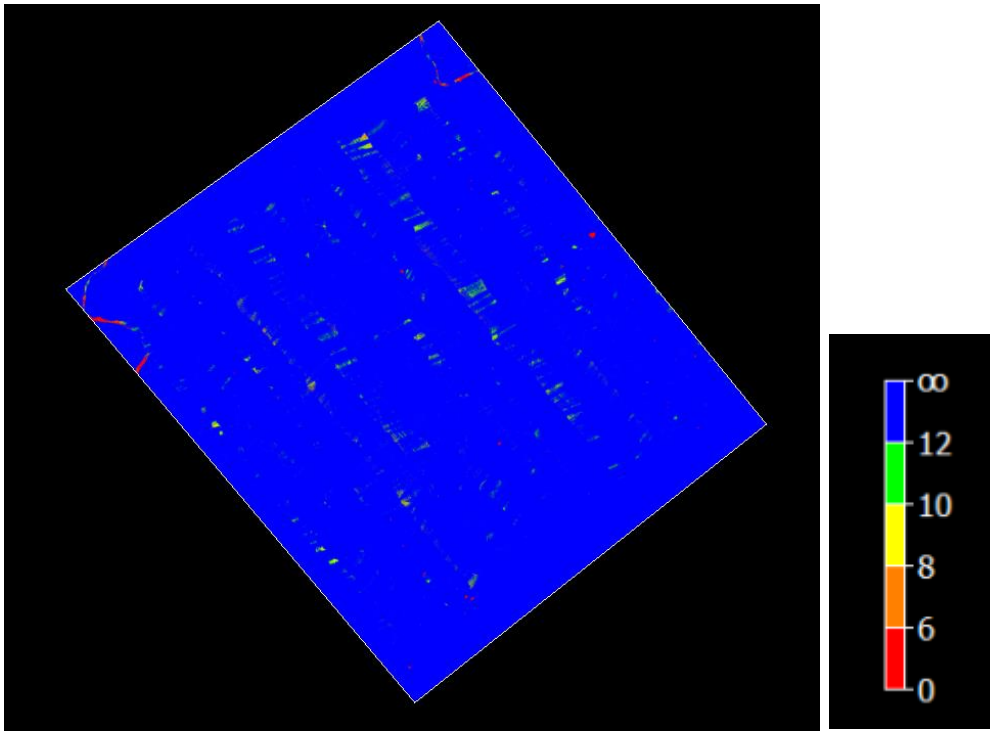
Camera type	Resolution (pixels)	Altitude (m)	GSD (cm)
iXA180	10328x7760	500	4.7

Total number of images: **851**

2.3 Coverage and point density verification

Coverage check for digital images has been made without remarks.

Coverage check for LiDAR data has been checked for point density control, TPDS (TopEye Point Density and Statistics). The area is fully covered by LiDAR data with exceptions for watersheds.



Density raster.

3. Primary data processing

3.1 GPS survey and processing

The GPS is processed using data from fixed reference stations.
The Portuguese National Mapping Agency Direção-Geral do Território, Divisão de Geodesia has assisted to switch on 1 sec registration for the 3 base stations named CBRA, MELR and PORT.

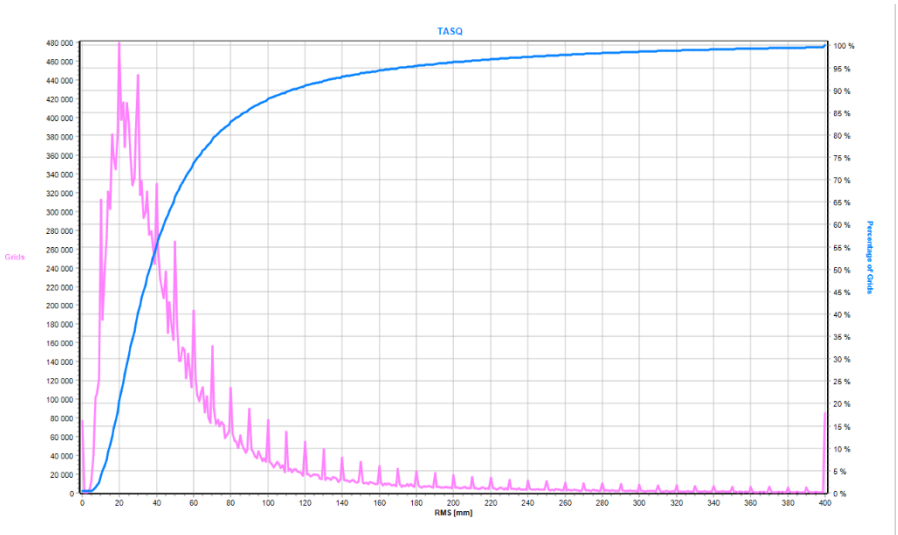
3.2 LIDAR processing

3.2.2 Verification of flight line alignment and adjustment (matching)

The table below presents statistics on discrepancies between flight lines, calculated on subareas of 1 m.

Global statistics	Before matching	After matching
Total RMS (dZ)	**0.081 m**	**0.061 m**
No of observations	**222 728 716**	**204 104 275**
Maximum deviation	**0.490 m**	**0.490 m**

RMS(dZ) statistics for each subarea can be plotted in a histogram:



TASQ histogram.

The histogram presents the deviation in elevation between flight lines. Red line represents number of subareas with a certain RMS(dZ)-value. Blue line represents percentage of subareas having a lower RMS(dZ) than a certain value.

4. LiDAR data classification

4.1 General

A standard macro has been used for automatic ground classification.
The data has the following classes:

1 Default
2 Ground
4 Medium vegetation
12 Overlapping points

5. Delivery information

6.1 Coordinate system in plane and height

PT-TM06/ETRS89 / Altimetric Datum from Cascais

6.2 File formats

Laserdata:
LAS 1.2

Ortho mosaic:
ECW