



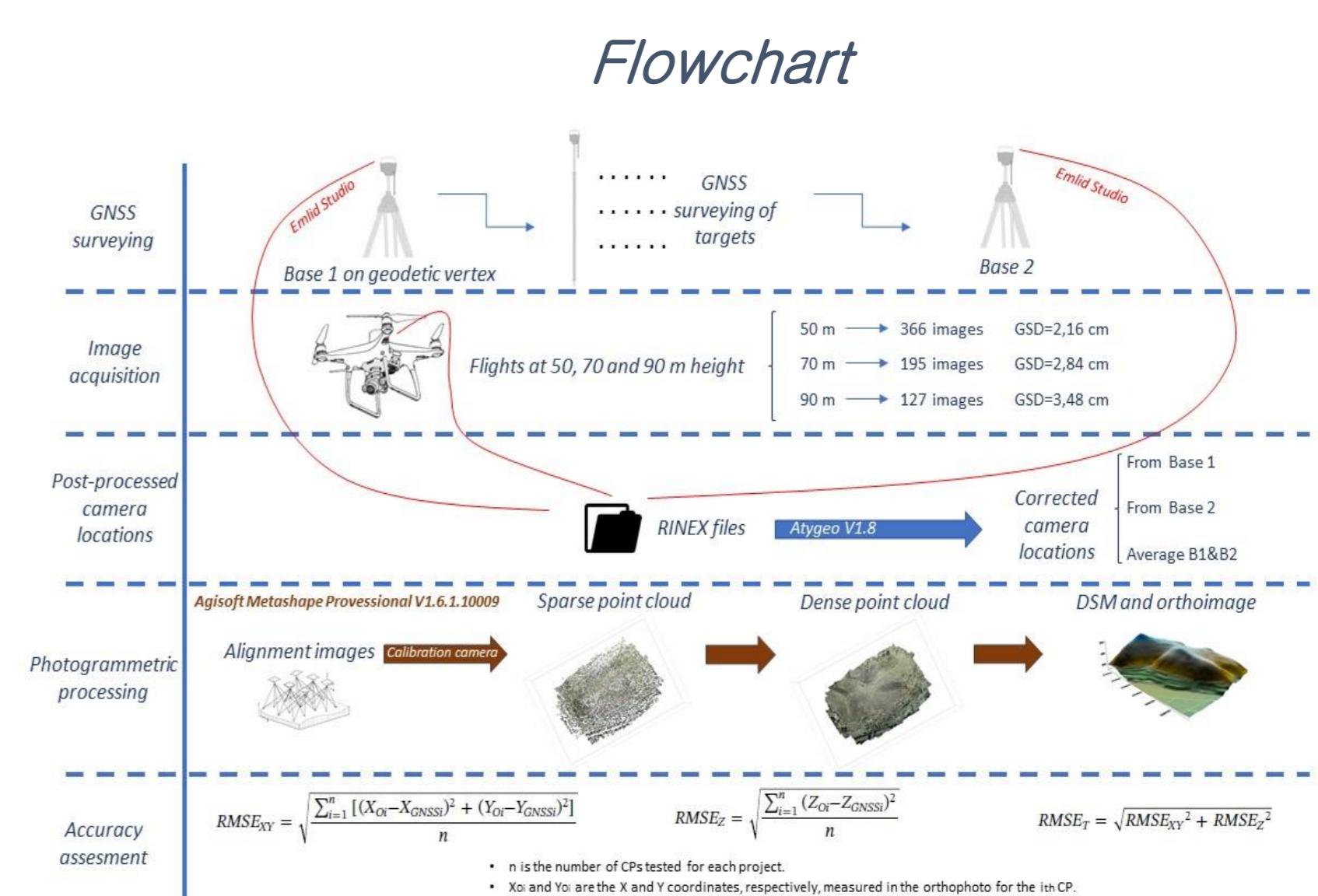
GEO 1002: Use of multiple fixed base stations to correct geolocalization data of photographs in UAV photogrammetry projects.

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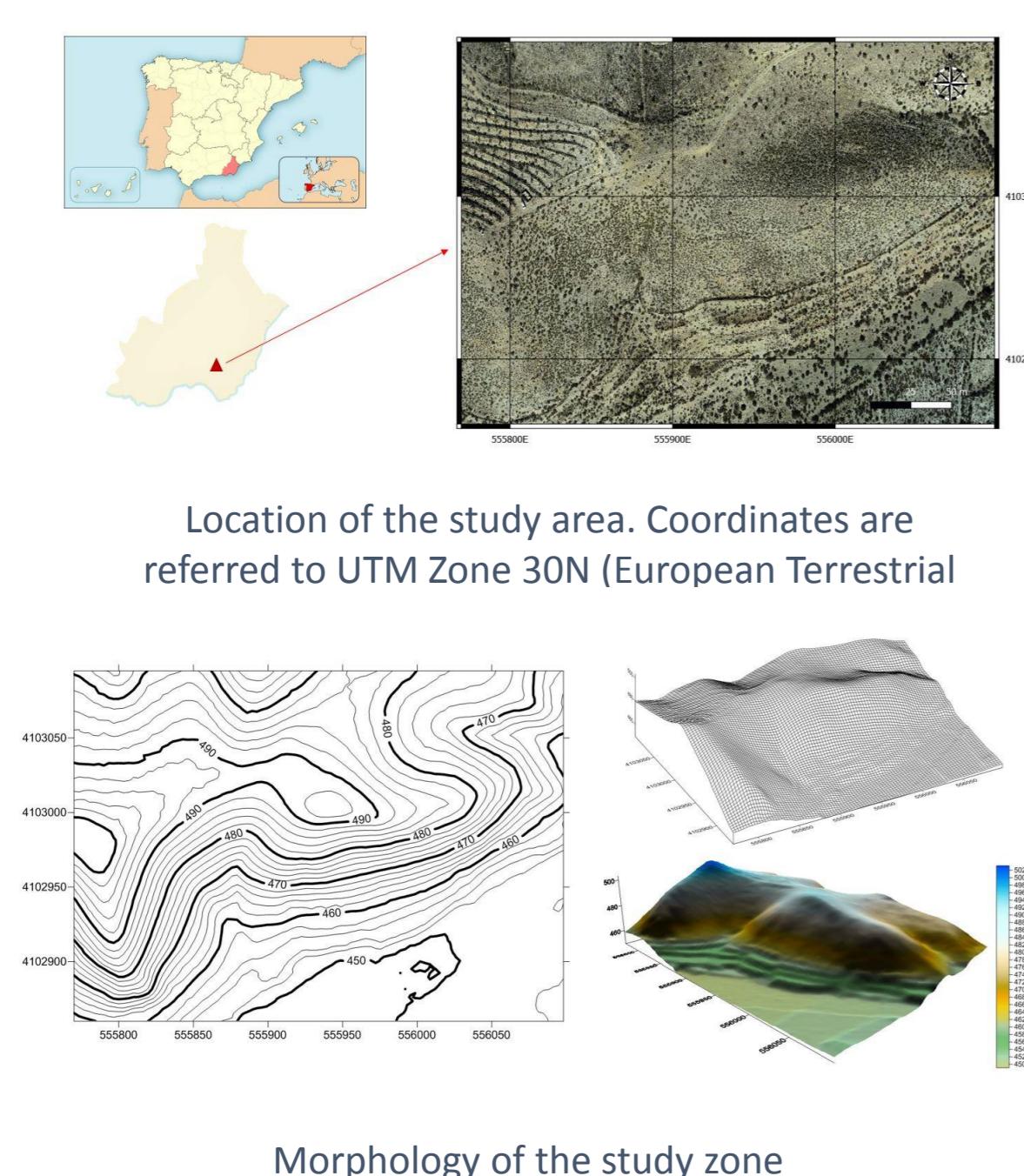
ABSTRACT

Unmanned aerial vehicles (UAVs) equipped with global navigation satellite system Real Time Kinematic (GNSS RTK) receivers are becoming increasingly common in surveying work. This equipment allows direct georeferencing of the photogrammetric project without the need to use ground control points (GCPs), which represents a significant advance in terms of time savings and safety for the operator. However, when exporting the point cloud after the photogrammetric process, significant errors have traditionally been observed in the elevation data due to poor determination of the camera calibration parameters. Previous research suggests that using ground control points (GCPs) or even oblique photographs significantly improves the results obtained. Our research has shown a complementary way to improve the accuracy of the elevation data, consisting of averaging the geolocation data of the photographs obtained by the UAV from the differential corrections from two fixed bases. The results show how this procedure improves the altimetric accuracy of the point cloud without the need to use GCPs or oblique photographs. The errors achieved are even below the ground sample distance (GSD) of the photogrammetric project. In addition, the total errors obtained with this methodology are similar to those obtained with different combinations of various GCPs.

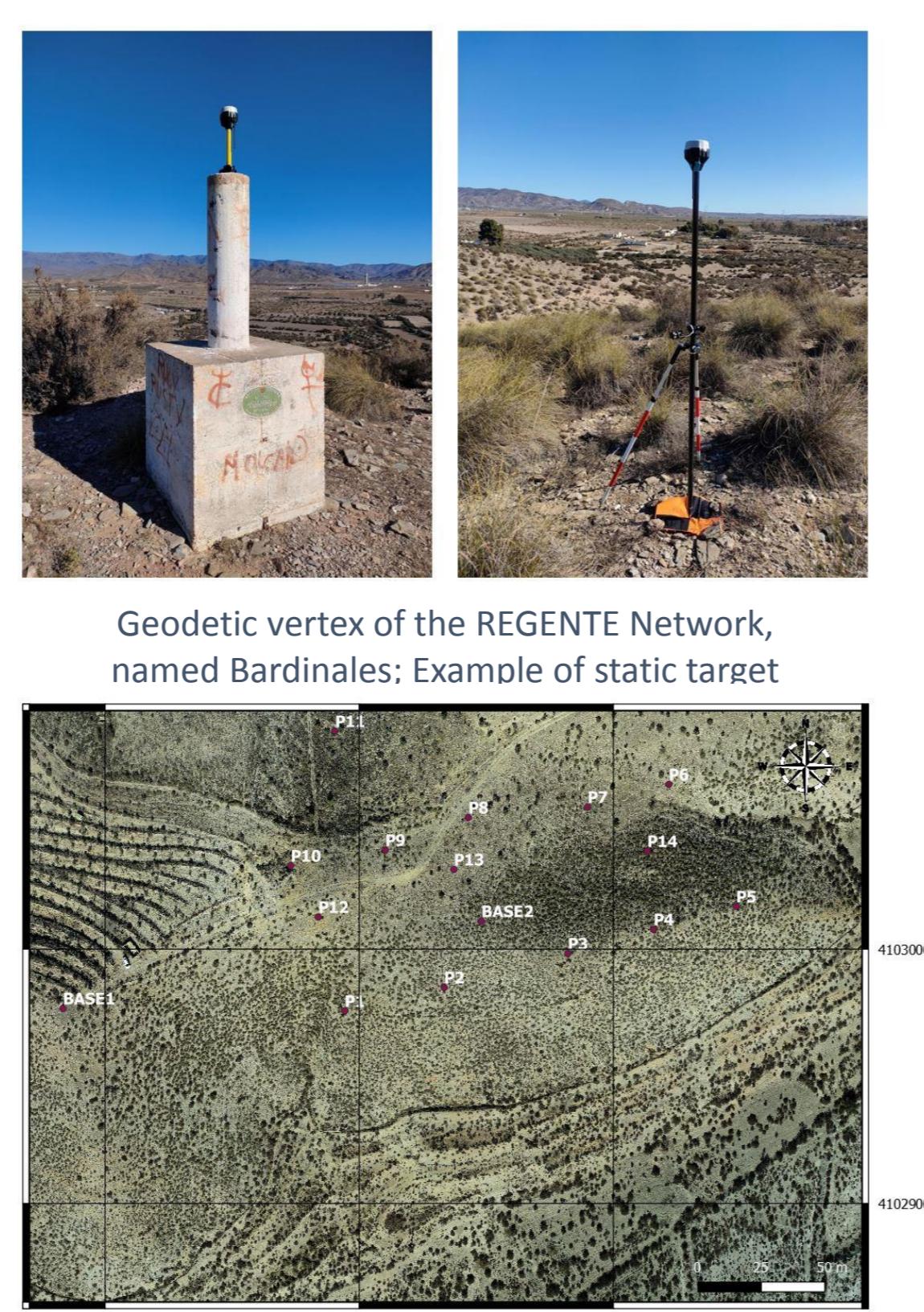


MATERIALS AND METHODS

STUDY SITE



GNSS SURVEYING OF GROUND CONTROL POINTS



UAV AND FLIGHT ROUTE

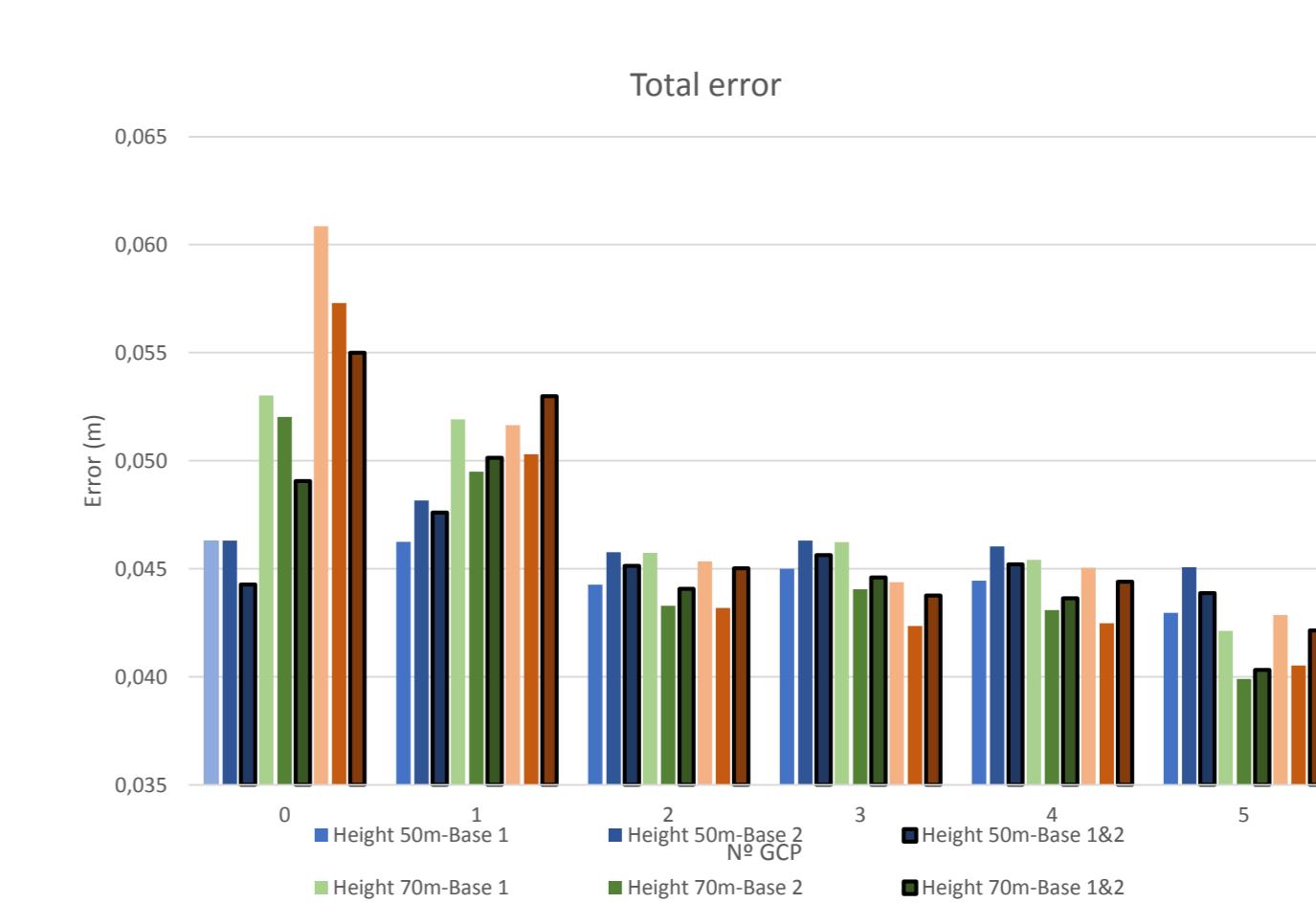
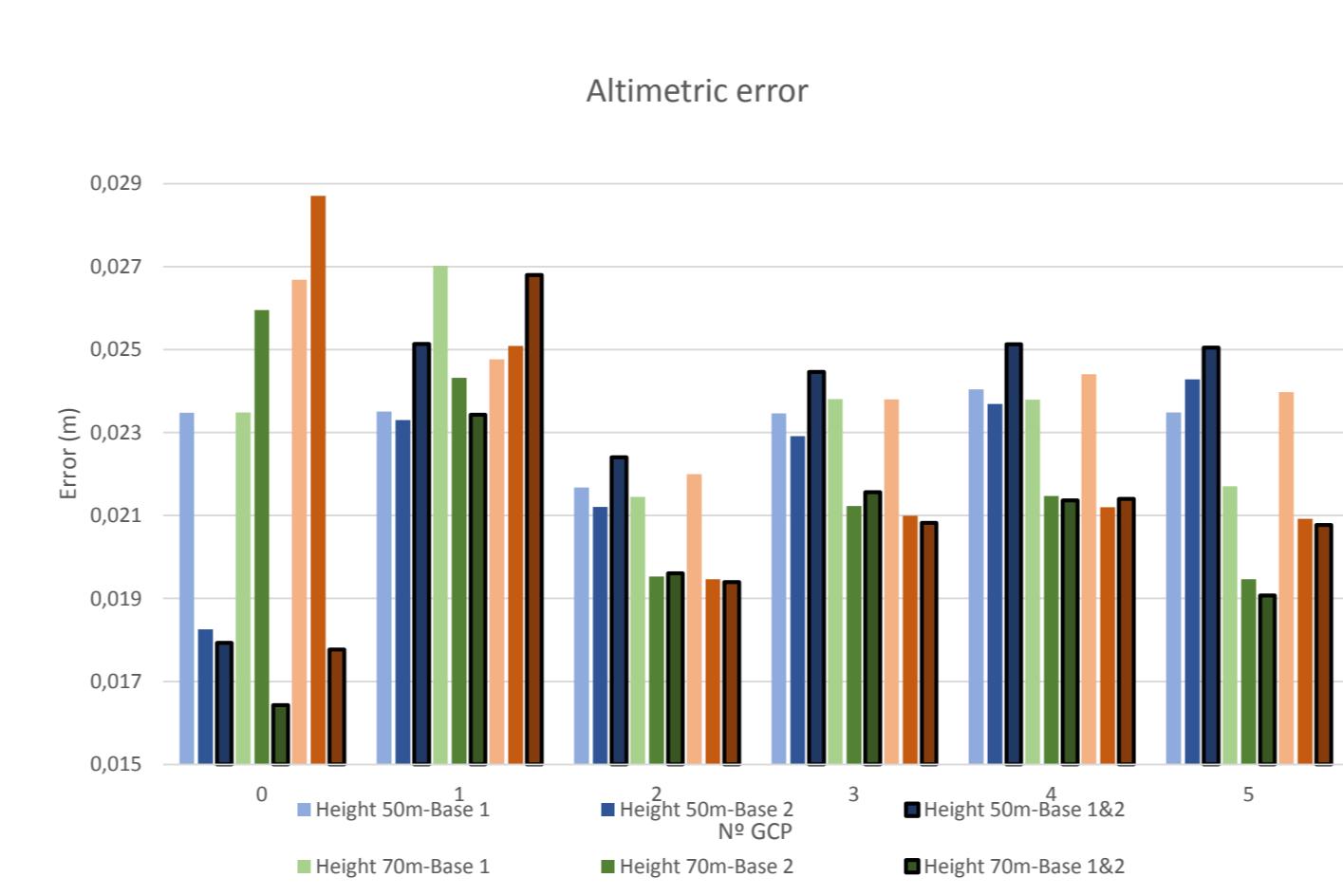
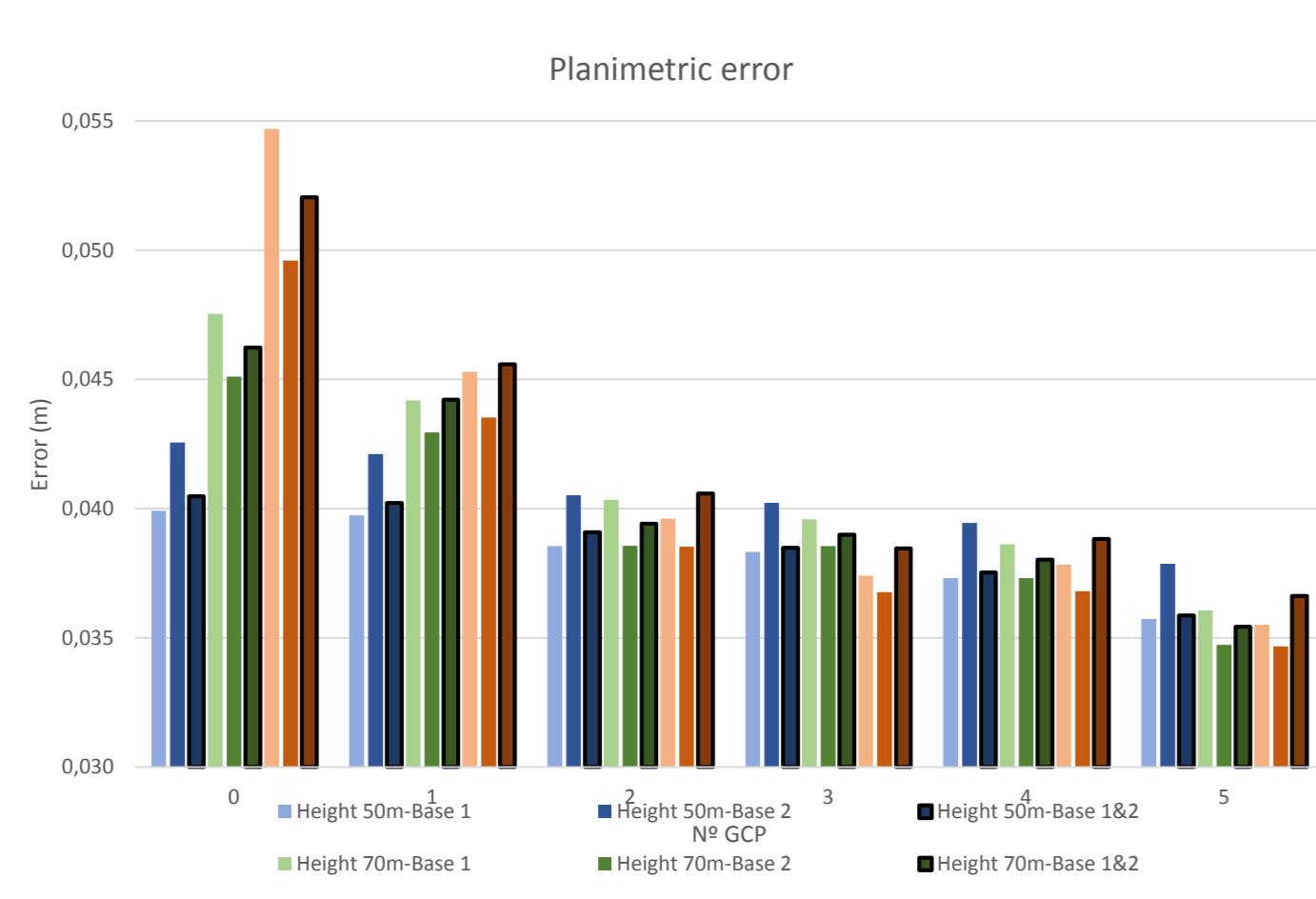


PHOTOGRAMMETRIC PROJECTS

Flying height	Fixed base station	Number of GCPs used	Repetitions
50 m	Base 1	0	—
70 m	Base 2	1	5
90 m	Average B1 and B2	2	5
		3	5
		4	5
		5	5

Summary of photogrammetric projects carried out

RESULTS



Results obtained as a function of flight altitude and number of GCP used.