UAV ASSIGNMENT

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GEODATA ACQUISTION

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CONTENTS

1. OBJECTIVES

1. Process UAV images.
2. Generate Orthomosaics and DSM
3. Measure the Goal size.

2. WORKFLOW

2.1 *Load and Align Photos*

The first step in the UAV image processing step by step, consist in adding the images to the “Agisoft” software, and align them through the “Aling Photos” tool. (**Figure 1**)

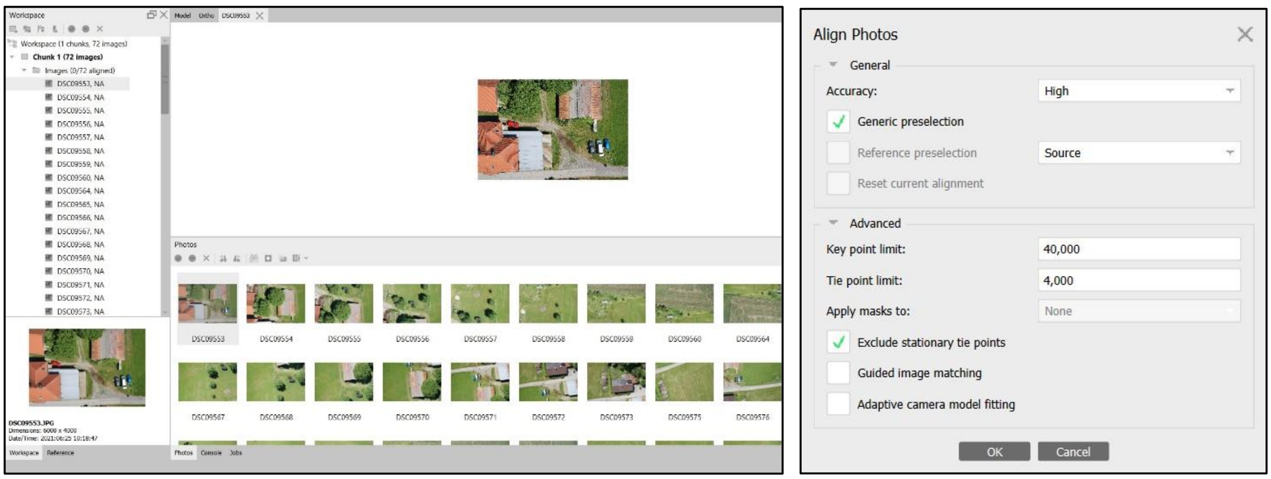

Figure 1. Left: 72 Images added to Agisoft. **Right:** “Align Photos” tool configuration

2.2 *GCP import and Placement.*

The next step consists of importing the provided Ground Control Points (EPSG code: 31255) and placing each of the 9 markers in the corresponding location. After each of the markers were placed, the min and max “Error (pix)” values were 0.834 and 1.271 respectively. (**Figure 2**)

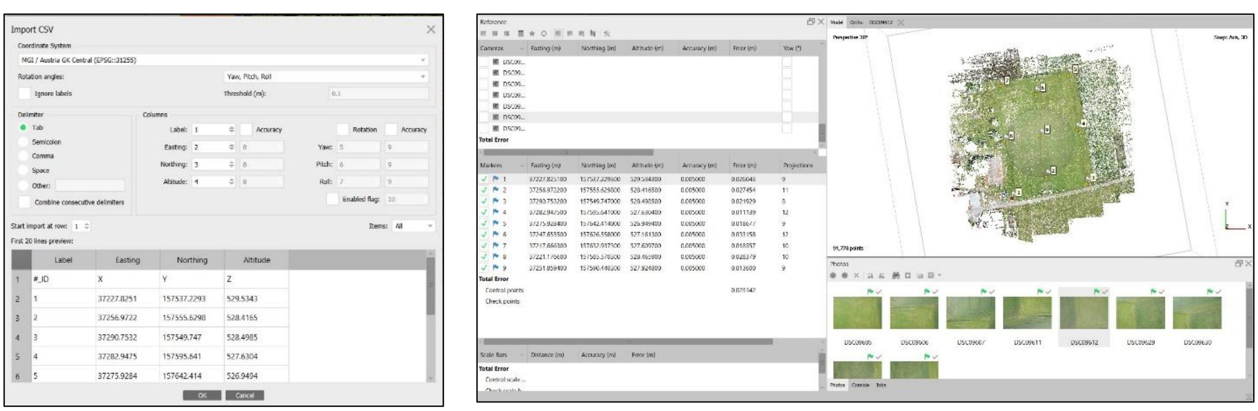

Figure 2. Left: “Import CSV” tool configuration. **Right:** Result after placing all the GCP markers.

2.3 *Build Point Cloud*

After placing the GCP properly, a point cloud was created using the "Build Point Cloud" tool with default parameters but with High quality. The resulting cloud point with 77,141,303 points can be checked in **Figure 3.**

Figure 3. Point Cloud.

2.4 *Derive Orthoimage and DSM*

Using the Point cloud created in the previous section, a Digital Elevation Model (DEM) was created using the "Build DEM" tool, with the "MGI / Austria GK Central" Coordinate System and a resolution of 0.018588 m. Finally, an Orthomosaic was created with the "Build Orthomosaic" tool, based on the DEM and with a resolution of 0.0092 m. (**Figure 4**)

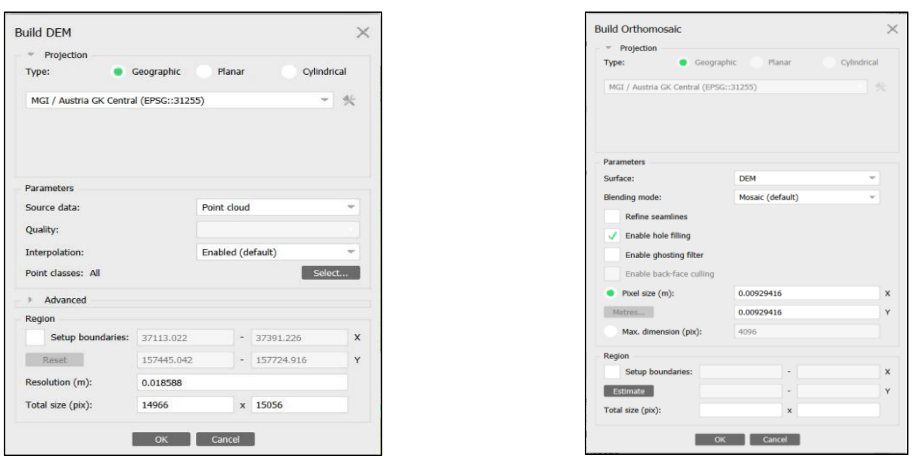

Figure 4. **Left:** "Build DEM" tool configuration. **Right:** "Build Orthomosaic" tool

The map with the resulting DEM, Orthomosaic, and 8 of the 9 Ground Control Point can be seen in **Figure 5**.

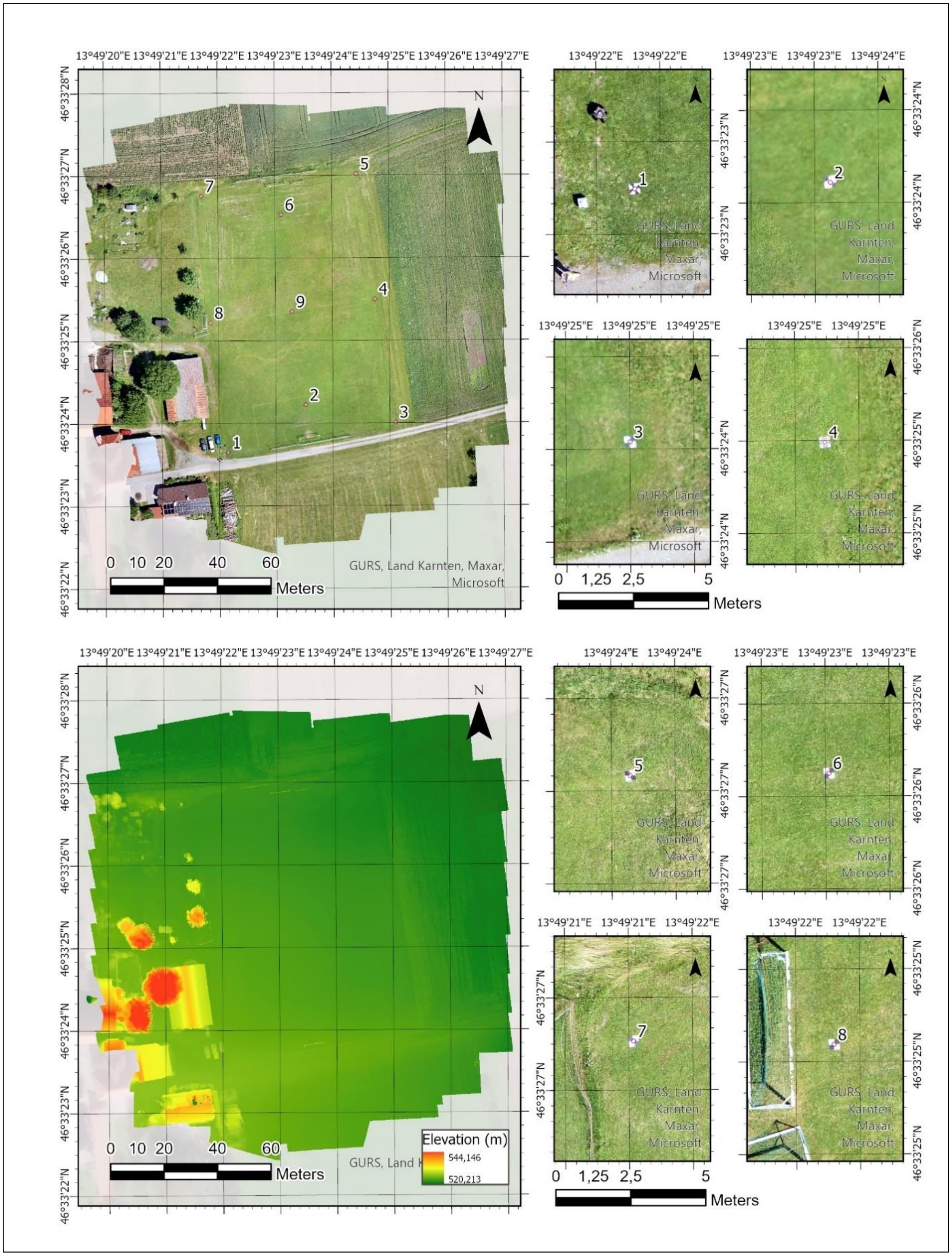

Figure 5. Orthomosaic, DEM, and Ground Control Points Map.

2.5 *Goal Size Measures*

Using ArcGIS Pro the height and longitude of the Goals were measured. In the case of the North Goal, the longitude was 7.5m, and the height (difference between the Goal highest point and the soil) was 2.37m based on an elevation profile (**Figure 6**). Finally, the South Goal evidenced a longitude of 7.49m and a height of 2.46m according to an elevation profile (**Figure 7**).

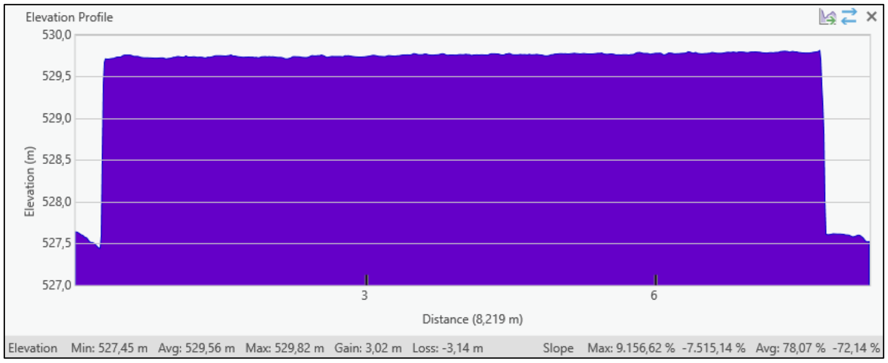

Figure 6. Elevation Profile – North Goal.

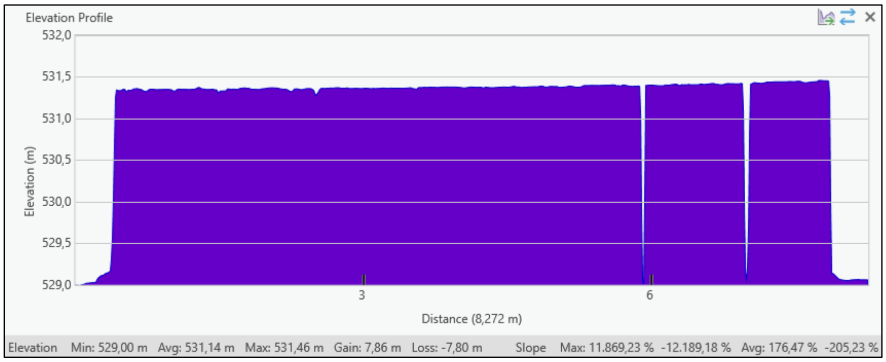

Figure 7. Elevation Profile – South Goal.

3. QUESTIONS

3.1 *Why Points Clouds were selected instead of mesh.*

Considering that the purpose of the Point Clouds or mesh is to be used as input for the generation of the DEM, based on the documentation, the Point Clouds will provide more accurate results and faster processing. In details, a Dense point clouds captures the surface as individual 3D points in space, while a mesh represents the surface with closed triangles that approximate the shape. As result, a point cloud store more detailed elevation information. Additionally, a Point Cloud doesn’t require additional processing steps like surface reconstruction and mesh optimization, making its creation faster.

3.2 *Quality of the results. Do they fit their ultimate purpose?*

Based on the Error (pix) values for the images and the Ground Control Points, we can observe good results, as all the values are below 1.2. Furthermore, considering that the official measures for a football goal are 7.32m for height and 2.44m for length, the values obtained for both goals are correct.

With these results, two factors could be affecting the development of a fair match. In the first place, the field seems tilted, as the soil high in the south goal is 529m while in the north goal is 527m. Consequently, the teams playing in the south goal would benefit from a steeper slope. And secondly, the south goal height is higher by 0.09m, thus, there is more space where the ball could come in.

3.3 *Data review, pros, and cons about their quality.*

In general terms, I consider that the data is suitable for this purpose. The images cover the Area of Interest, there is a considerable overlap of images and there are no gaps with no information. With respect to the pros, the main advantage is the simple structure of the data (images + GCP) which makes it easy to be handled by any software, then, there are plenty of options in the market to work with. Furthermore, the high-resolution of the resulting images contributes not only to this purpose but could be used for digitalization or image segmentation. Finally, the GCP is correctly located and the altitude values match.

Nevertheless, when exporting the resulting DEM and Orthomosaic, I noticed that the location of these products is not correct, as when opening them with ArcGIS Pro, there was a considerable miss alignment of hundreds of meters. This could be related to a misleading on the step-by-step or the data itself. This was easily addressed by georeferencing the image.