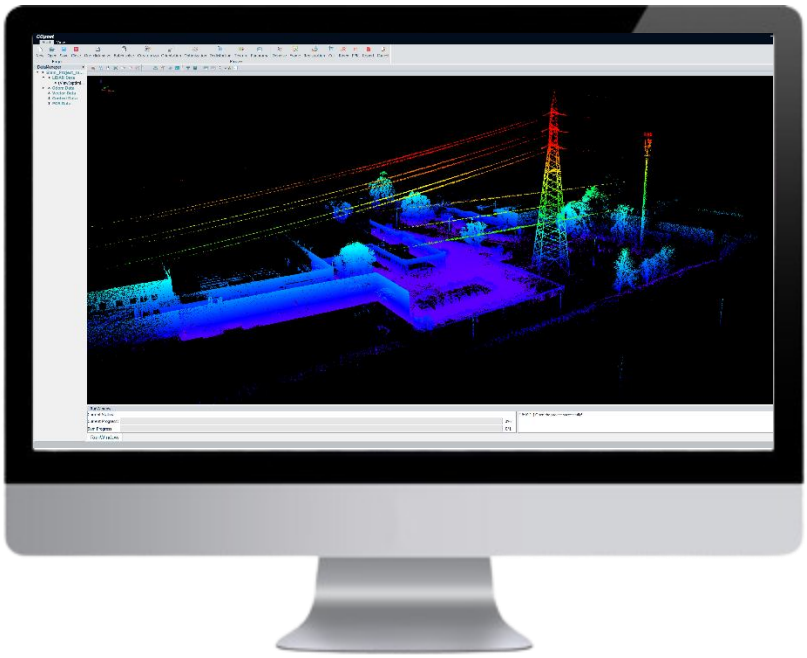
STONEX

STONEX® GO*post*

SLAM Processing Software

User Guide



(January 2026)-Ver.2.6

GOpost v 79

www.stonex.it

Contents

Changelog

GOpost	
Version 79	• Added global_benchmark, with GCP coordinates recalculated after orientation. • Added intensity filter. • Added operator obscuring function in panoramic images. • Limit on the maximum processing distance for each scanner. • Added control data removal button. • Removal of distortions for X200GO and X120GOv2 geotags. • Added global_geotag file with geotag coordinates after orientation. • Fixed minor bugs.
Version 77 - 78	• Added X120GOv2 support • Added offset for external camera X120GOv2 and X200GO. • Added different texture algorithm. • Fix orientation issue not saving pano images. • Fix Japanese geoid model issue • Support multiple echos processing X120GOv2 and X200GO.
Version 72	• Updated the occlusion detection module to resolve the issue of program crashes on certain computers (RTX 5080 graphics card). • Improved the efficiency of the coloring algorithm across all devices. • Fixed issues with the Japanese language. • Optimized the 3DGS pre-training module. • Adjusted the eccentric distance of the X200GO vehicle-mounted mode to match that of the backpack. • Fixed issues with special character set recognition. • Fixed issues in static mode on the X200GO, where some image mask extraction was incorrect. • Supported non-rigid orientation to output odometry files in TXT format.
Version 70-71	• X200GO drone support.

	• HQS render. • Time-shift for panoramic image support. • Added lidar range modification. • Fixed some bugs. • Fixed bug about orientation with panoramic images. • Improved texturing efficiency.
Version 68	• X200 support. • Software license now supports all devices. • Improved texture for X70GO and X40GO. • Fix bug about orientation not applied to the panoramic images. • Fix minor bugs.
Version 66	• X40GO Support • Geoids support • 7 Parameters and custom transformations • Density options (normal and dense) for optimisation • Upsampling • Multiple .e57 formats support • Desktop license support • Algorithm for map creation improved (TIP: default processing parameters are optimised for each device) • Translations added Japanese language • Automatic calibration for external panoramic camera (no need to request it to Stonex) • Added more platform configurations for accessories (RTK module, Insta 360, Backpack, combined, etc.) • Improved Orientation report • Color process speeded-up • Solved a bug that caused incorrect levelling and reconstruction of the scans
Version 61	• GCP names are now read in software. • Support geotag function. • Possibility to save untextured points after colorization. • Tunnel scene algorithm. • Export format *.e57, *.ptx (only for static X70GO). • Support to external panoramic camera. • Panoramic images measurement functions. • Changed navigation system.

	• Minor improvements. • Fixed known bugs.
Version 59-60	• Added scanner choice and setting • Improved orientation report and mapping report • Improved gcp editor. • Added some coordinate systems. • Improved bounding box. • New custom offset settings. • Added Italian language.
Version 58	• X70GO processing integration. • Possibility to post-process GNSS data and use them in Orientation step. • Writing log files after data processing. • Changed the filter that now deletes all objects in motion. • Added trajectory and panoramic images that can be opened in GOpost after orientation. • Fixed report for non-rigid orientation. • Added GCP coordinates after orientation in report. • Added check on correctness of input path. • Fixed some known bugs.
Version 57	• Fixed bug related to fast algorithm. • Added colorbars for elevation view. • Improved colorization algorithm. • Added refine_pos in colorization tool.
Version 56	• Added buttons for calculating angles and areas within the point cloud. • Added the "travel" button in the "view" window, which allows automatic navigation of the cloud based on the trajectory travelled. • Added an allign button in the 'edit GCP' window that allows automatic alignment of points. • It is now possible to perform a non-rigid orientation based on coordinates in a local system. • After the mapping drift error, the screen will be cleared before starting a new calculation iteration. • In the pano folder, a file called 'pano_pos_geo' will be saved with the

	coordinates of the panoramic images in a georeferenced system (after cloud orientation). • Added a 'report' button that allows the orientation report to be opened directly within gopost.
Version 55	• Fixed a bug in Japanese systems that caused the point cloud to be oriented backwards. • Added the ability to change the size of the points in the displayed point cloud

1. Legal Notice

1.1 Copyrights and trademarks

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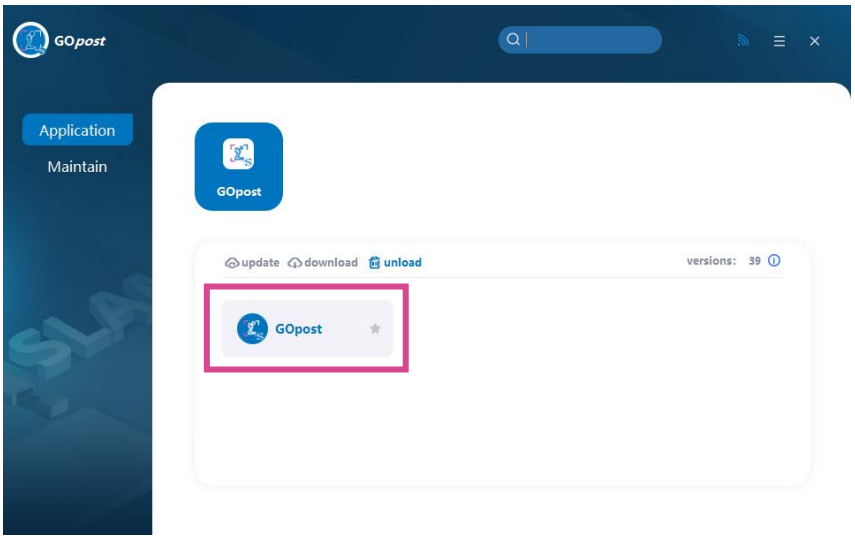
2. GO*post* software

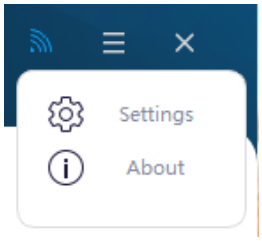
GO*post* software can post-process the data collected by Stonex slam scanners. It can produce high-precision point clouds, optimize point cloud results, color the point cloud, orientate it and produce local panoramas. You can also browse the point cloud and perform registration between different datasets. The final result can be exported to other platforms.

1. Download on PC from here: GO*post*
2. Follow the installation procedure.

When you click on the GO*post* icon, the following page is shown. To open the software, click on its icon.

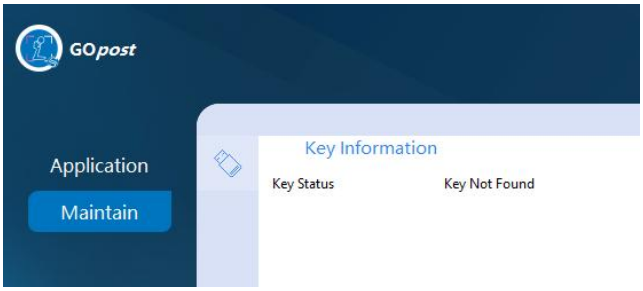


If you want to change software language, click on ☰ and *Settings*: English, Italian and Chinese are available.



Select *About* to check software version

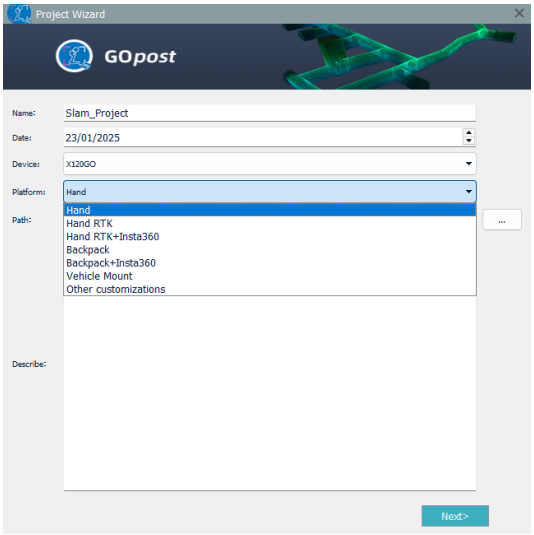
USB dongle license is provided in the carrying case. If the dongle is not inserted, the software cannot process the data properly. Check license status from *Maintain* page.



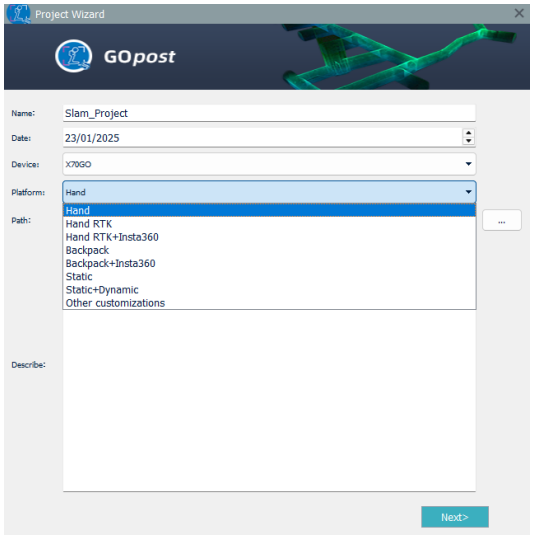
2.1 New project

Click *New*, set the project name, choose the device between X120GO, X70GO, X40GO and X200GO.
Choose the platform correct platform for your processing.

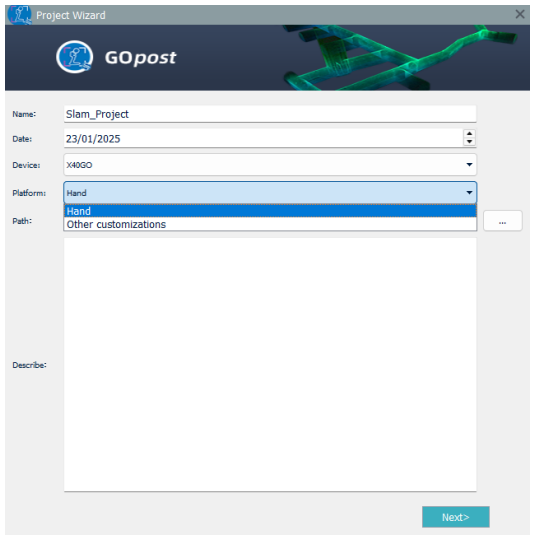
For X120GOv1, use hand if you only work with the instrument or the scanner plus the external camera, or select one of the other possible combinations of the accessories.



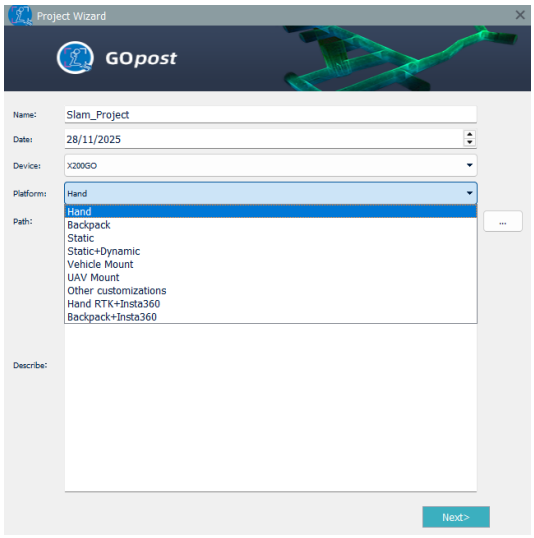
For X70GO select hand if you are using the scanner or the scanner with the external panoramic camera; Static if you want to process the static acquisition; If you are using any combination of accessories, you can select one of the available options.



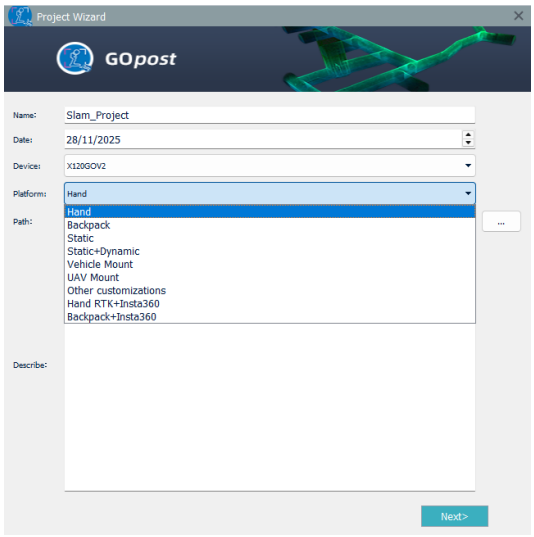
For X40GO select hand for the scanner or the combination of scanner and external camera.



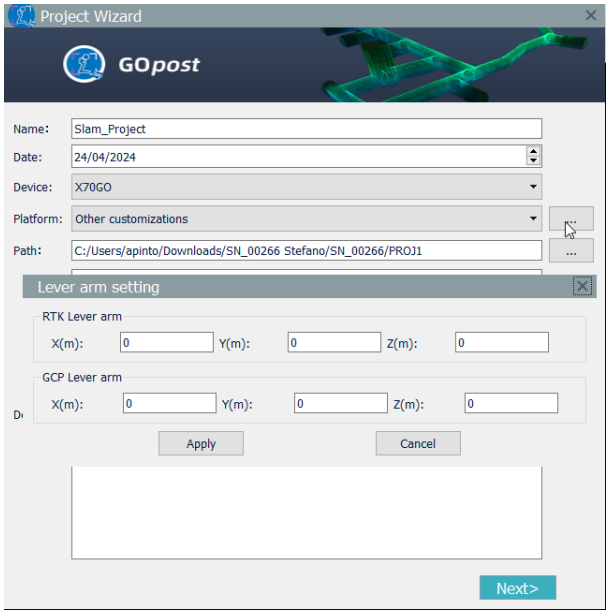
For X200GO select hand if you also want to use the RTK data to perform orientation or select one of the other platforms. If you use external camera select the platform with Insta 360.



For X120GOv2 select hand if you also want to use the RTK data to perform orientation or select one of the other platforms. If you use external camera select the platform with Insta 360.

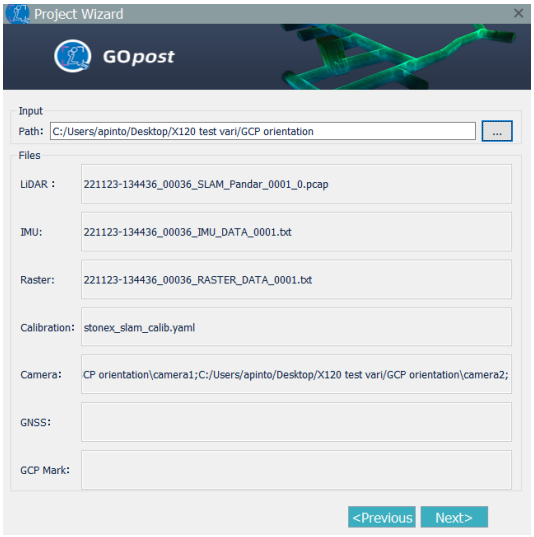


If other customisation is selected, the antenna offsets can be set when creating the project.



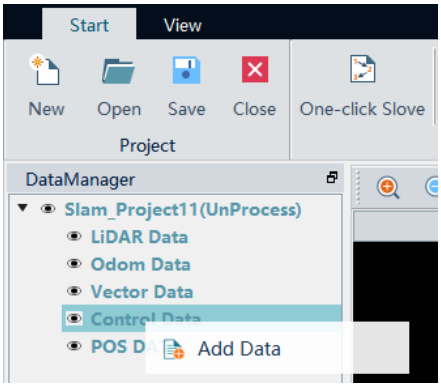
In Path select the saving path for the project, then click *Next*.

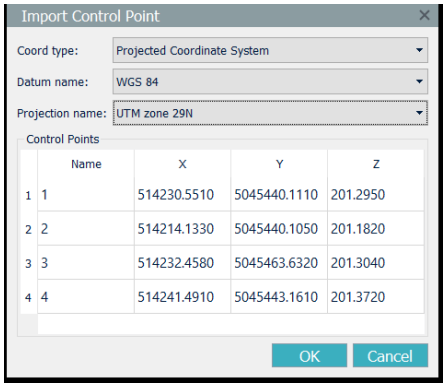
Select the folder path where the data file is located in the Input Path, that is the next lower path of the "SN_XXXXX", the software will automatically identify the data in the folder. Click *Next* and then click *Finish* to complete the project creation.



2.2 Import GCP

Right-click *Control Data* in the DataManager window, select *Add Data*, importing the organized GCP into the software. The software supports local coordinate system and the projected coordinate system.





NOTE: About GCP:

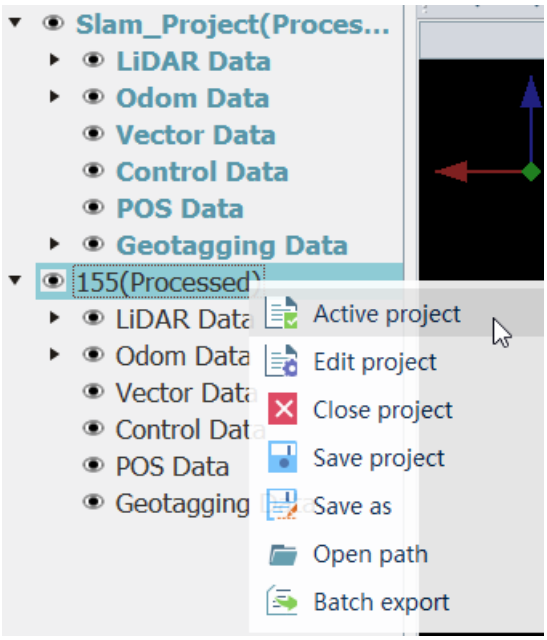
1. If there are no control points, you can ignore the step.
2. If you work with One-click solve the order of control points in GCP file must be consistent with the order and quantity of the scanner's actual acquired control points, otherwise the processing will result in an error in the orientation.
3. Is possible to perform orientation with the GCP at any moment of the elaborations.
4. The control point function does not support latitude and longitude for the time being and supports projected coordinates or spatial Cartesian coordinates. The control point file's format should be *.txt, in which contains four columns in order: ID, East Coordinates, North Coordinates, Elevation, separated by spaces or commas.

ID	East	North	Elev.
1,5	734.077,4	7421.254,-4.780	
2,5	755.409,4	7475.504,-4.784	
3,5	709.594,4	7488.166,-4.762	
4,5	654.184,4	7487.023,-4.813	
5,5	649.938,4	7439.035,-4.774	
6,5	694.595,4	7429.466,-4.774	

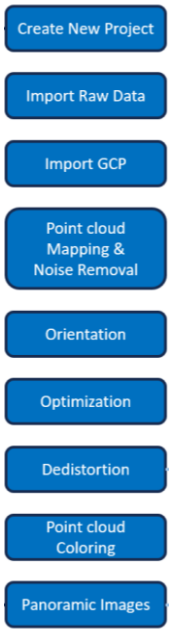
2.3 One-click processing

If there is only one project in Data Manager, the default status of the project is active, and the colours of project words are in blue. User can process the data directly.

If there are two or more projects in Data Manager, the default status of the first project is active, and others are inactive and in black. Please activate the project before processing it.

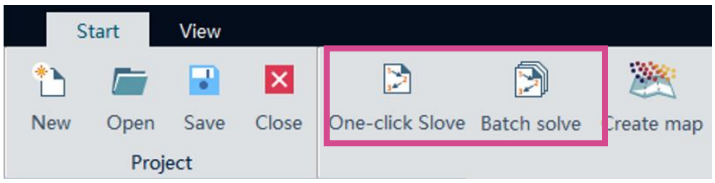


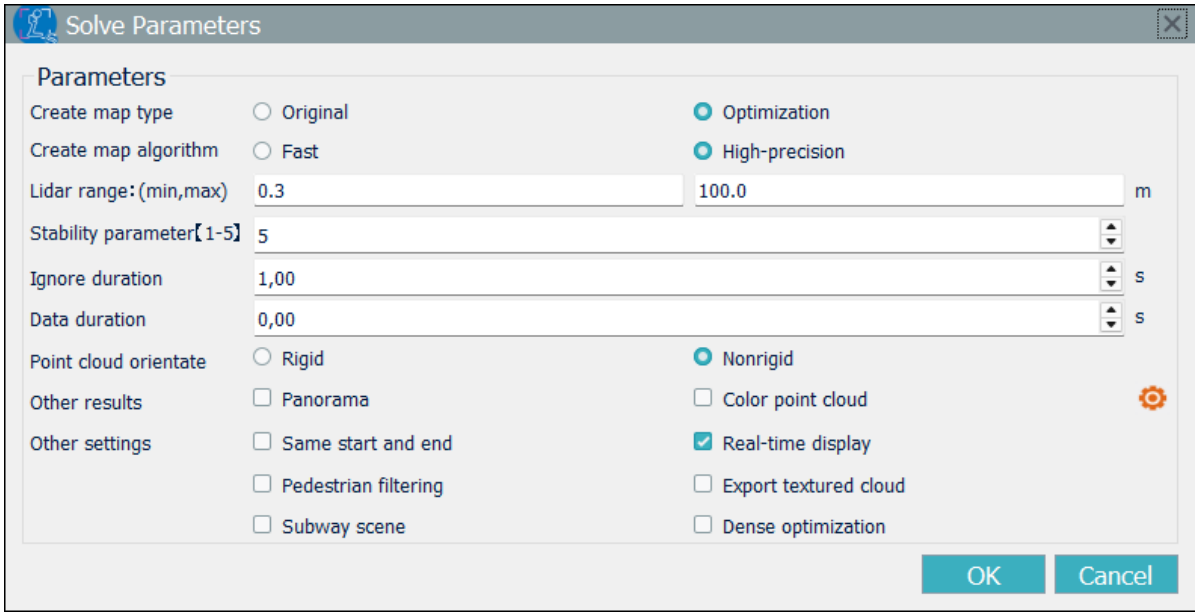
The software allows to elaborate data defining in a single window all the processing to do (like filtering, colouring, panorama calculation, and orientation).



You can do it for the active project only choosing *One-click solve*; or for all the project loaded using *Batch solve*. For instance, suppose you have 5 datasets, you can queue up to solve them with Batch solve, instead of processing one by one with One-click solve. When you use Batch solve, you don't need active project before solving.

Click *One-click Solve* or *Batch solve* in the data processing toolbar to set the Solve Parameters. The meanings of the parameters are explained as follows.





Create map type:

- *Original*: The only output is the original point cloud.
- *Optimization*: The outputs are the original point cloud and optimize the original point cloud, with denoising and thinning.

Create map model:

- *Fast mode*: For X40GO, X120GOv2 and X200GO this is the default suggested algorithm. In this mode, the software reconstructs the point cloud with a faster algorithm and in a more flexible way.
- *High-precision mode*: For X120GOv1 and X70GO this is the suggested default algorithm. In this mode, the software reconstructs the point cloud in a more rigid way, taking a time like the acquisition one. This method should be used always at first in the most common environment like indoor environment or outdoor environments with many features presents.

Lidar Range: Change the maximum and minimum range of the scanner to be processed in GOpost.

Stability parameter: This refers to the degree of variability of the scanning scene, not the stability of the instrument at the time of scanning. If the Fast-precision algorithm is used, the parameter must be low, 1 or 2. If the high-precision algorithm is used, the parameter can vary from 5 to 3. We suggest leaving it as 5 and lower it only if the final result show oddities.

NOTE: If the mapping fails for a drift error, the software will automatically restart the process by lowering the stability parameter.

Ignore duration: The software will ignore the first X seconds of the data acquired.

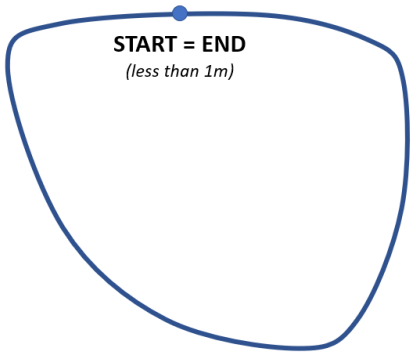
Data duration: This parameter is combined with the Ignore duration to solve the point cloud data of any time the user defined. For example, if the user wants to solve data for 10-70s, the ignore duration is 10s and data duration is 60s. If you leave it at 0s, the software will process all the data.

Point cloud orientate: Point cloud orientation includes rigid and non-rigid transformation. In non-rigid transformation, GCP will permit elastic compensation for point cloud to improve accuracy.

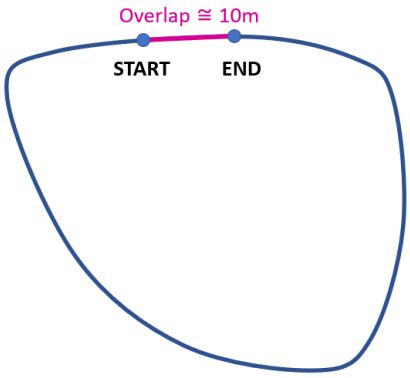
Other results: Choose if generate a Panorama or a textured point cloud. Click the orange gear to open the texturing parameters. See the texture tool information in the next chapter for more information.

Other settings:

- *Same start and end*: There is no need to select this checkbox when solving. Select it **only** if you collected data closing a loop (difference between start and end point is **within 10 cm**).



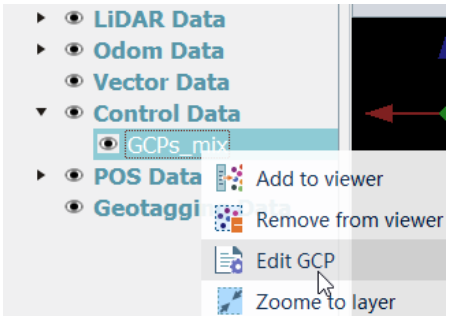
With an overlapping between the starting point and the endpoint around 10 meters, the software automatically recognises the closure: do not tick the option "Same start and end".



- *Real-time display*: Display the point cloud mapping process in display window.
- *Export textured*: automatically saves a textured cloud in .las format in the project's texture folder.
- *Subway scene*: algorithm to be used the scan is performed in a tunnel-type environment. This special algorithm improves the stability of the reconstruction in high precision.
- *Pedestrian filtering*: this version of the filter will try to remove all the moving objects noise present in the point cloud. This step can only be done during the map creation. It can take some minutes to be applied, depending on how much moving noise is present in the point cloud.
- *Dense optimization*: select this checkbox if you want the software to process the data with the denser optimization algorithm, which will create a denser final pointcloud.

2.4 GCP Edit

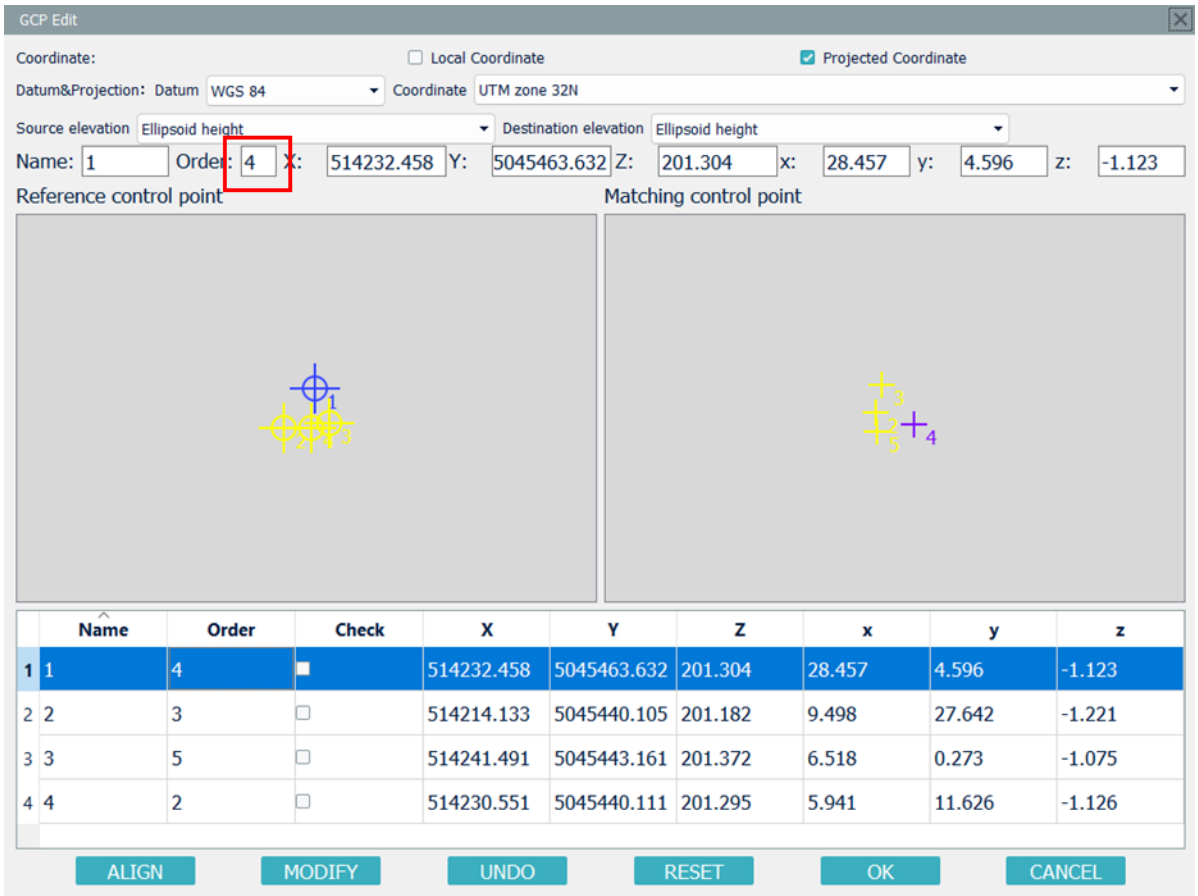
If you import GCP when the project is created, and the point cloud is not orientated after data processing, you need to use the GCP edit function. Right click on the GCP file name and select Edit GCP. You can also set the coordinate system in which those GCPs coordinate are saved.



In this window you can check the order between the points you saved with the scanner (on the right) and the points loaded in the project (on the left).

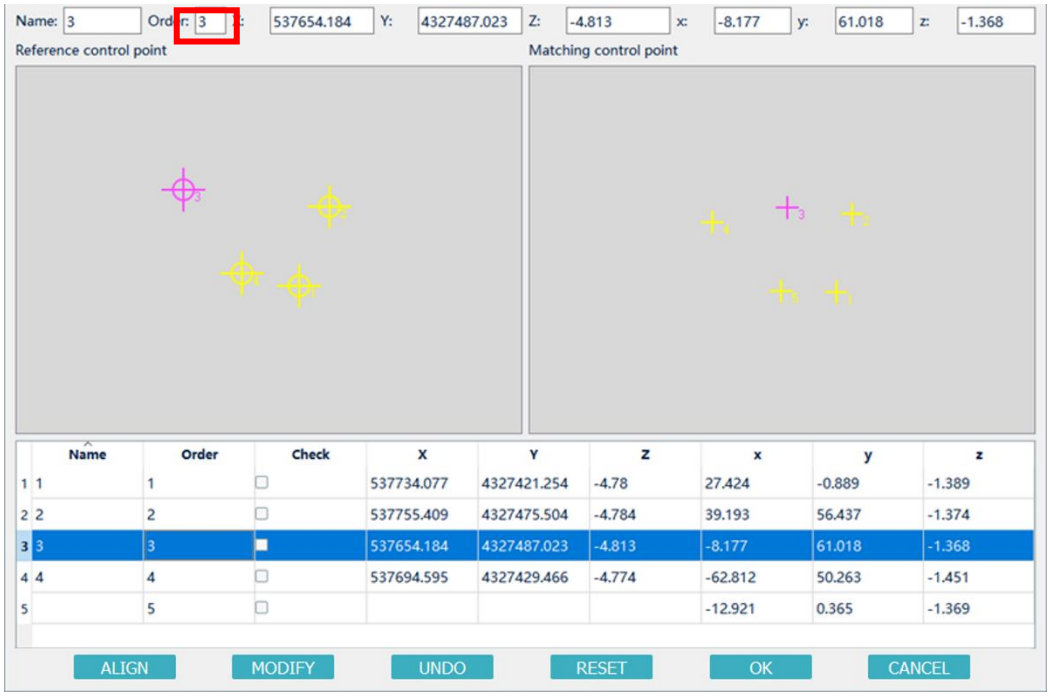
Is possible to modify the datum, projection and also the destination elevation model which can be corrected with geoid information.

To automatically align the points, press the *Align* button. The software will try to find the most correct order between the loaded points and the points saved by the scanner. If the automatic alignment is wrong, you can manually modify the order of the points by selecting a couple and modify the order number in the upper part of the window. Click *Modify* to carry out the order change. The *Reset* button restores the initial situation of the control points. *Undo* deletes the last step performed.



After the modification is complete, user can decide to consider some of the GCPs as a checkpoint. To do so, you can click next to GCP name and flag the check square. By doing so, the points checked will not be used in the orientation phase but will be evaluate the error on those points after the orientation.
There are two situations result in not-orientated points. We will explain them respectively. Right-click *Edit GCP* to enter the control point editing interface.

CASE 1: matching points are more than the control points. You can click the control point to be edited, modify the matching point sequence number at the upper toolbar, correspond the control point to the correct matching point, so that the excess matching point can be ignored at the end, and it will not participate in any calculation. Take figure below as an example, The correspondence between "GCP3" and "Matching point3" is wrong, and the correspondence between "GCP 3" and "Matching point4" is correct. Select this pair of points, then modify the order number from 3 to 4.

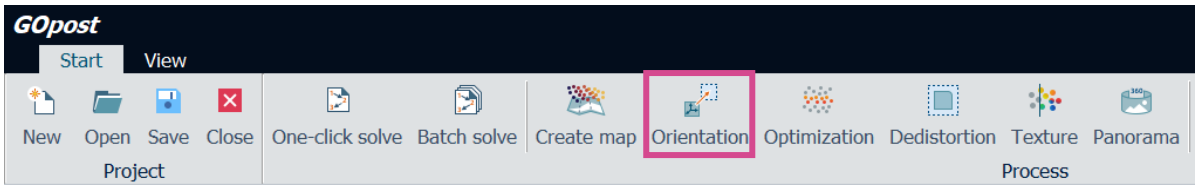


	Name	Order	Check	X	Y	Z	x	y	z
1	1	1	☐	537734.077	4327421.254	-4.78	27.424	-0.889	-1.389
2	2	2	☐	537755.409	4327475.504	-4.784	39.193	56.437	-1.374
3	3	3	☐	537654.184	4327487.023	-4.813	-8.177	61.018	-1.368
4	4	4	☐	537694.595	4327429.466	-4.774	-62.812	50.263	-1.451
5		5	☐				-12.921	0.365	-1.369

CASE 2: the number of matching points is less than the imported control point, user needs to edit the control point file and delete the surplus control points.

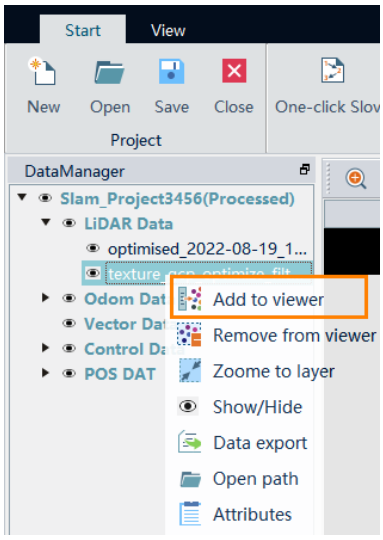
The source and destination elevation fields refer to the possibility of using a geoid for the final reference system. For more information on how to import a custom geoid, read the dedicated section in paragraph 3.1

Click *Orientation* to orient the point cloud. A report with errors will be generated after the process and will be available in the GCP subfolder project. Will also be created a new file "global_benchmark" with the coordinates of the GCPs in the new coordinate system.



2.5 Add result to view

Select the point cloud data in DataManager, right-click, and select *Add to Viewer* to add the point cloud to the display window. Other results can be viewed the same way as well.

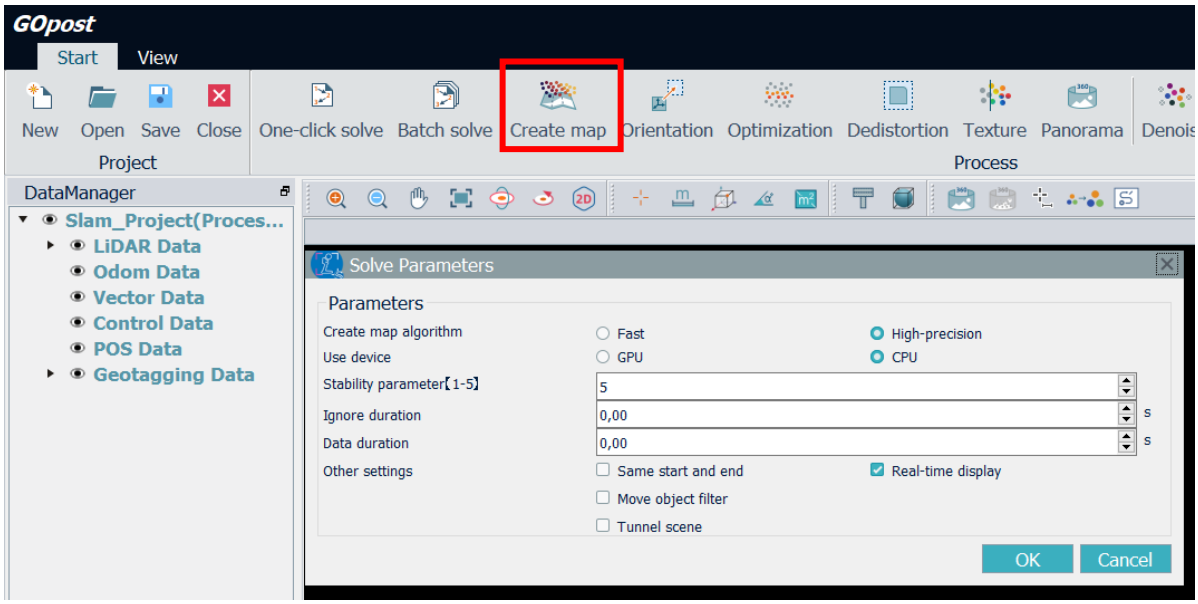


2.6 Step-by-step processing

The purpose of step-by-step processing is to give user choices to select the corresponding processing steps according to the needs. Can be done in different orders.

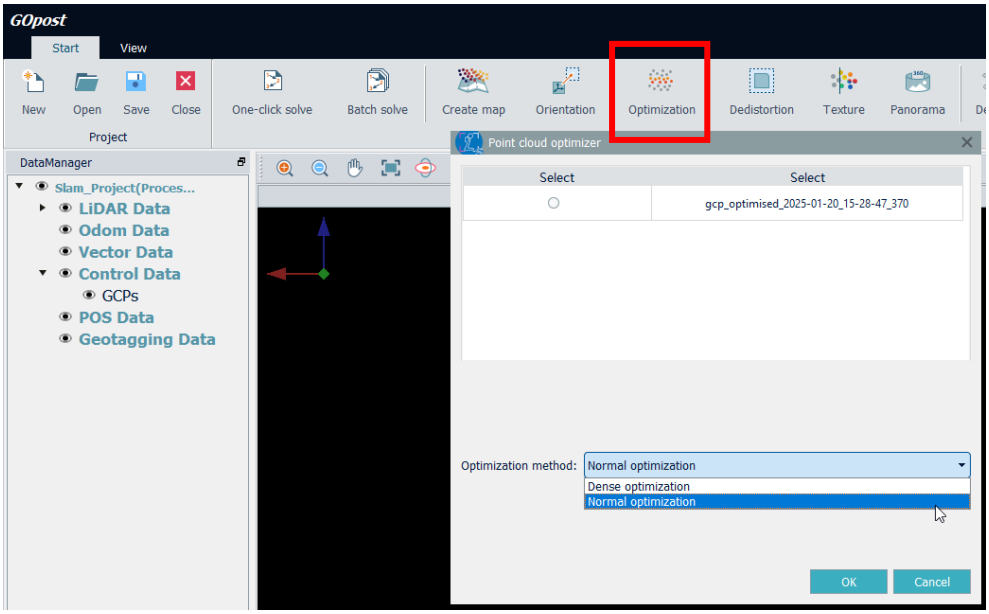
Create map

Activate the project, click *Create map*, select the algorithm type, and set the parameters; click OK to start the calculation. This step is to generate the original point cloud. Therefore, it may contain some noise. If you select *Pedestrian filtering*, the software will remove the noise of moving objects. This filter can take some minutes to be applied, depending on the moving noise present in the point cloud. Check *Subway scene* is the scans are made inside a tunnel. The processed result begins with the prefix 'optimised' in the file name under LIDAR Data in DataManager.



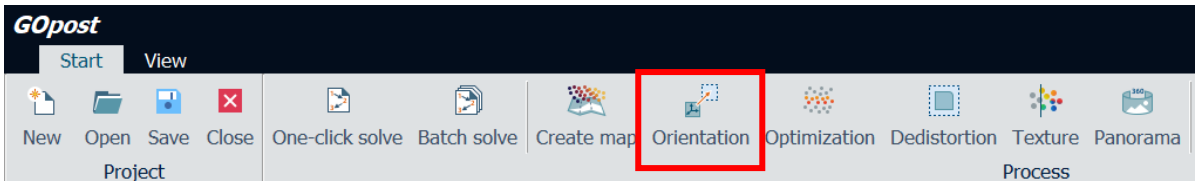
Optimization

This function will optimize and denoise the original point cloud to reduce the thickness of the point cloud and improve the accuracy of the point cloud. Click the Optimization tool and select the data you want to optimize. The optimize point clouds with the prefix 'optimize' in DataManager are optimization results. Choose between normal and dense. Dense will create a point cloud with around 3 times the points of a normal one.



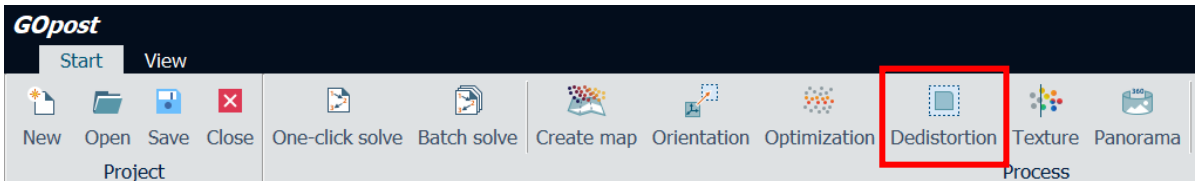
Orientation

This function transfers the point cloud to the absolute coordinate system in which the control point is located. Coordinate transformation is performed on the point cloud when the order and number between GCP and matching points are consistent. Orientation can be performed with rigid body transformation, which can be applied to any of the resulting point cloud, or with non-rigid body transformation, which will apply an elastic compensation to the whole project and will be applied only to the original point cloud.



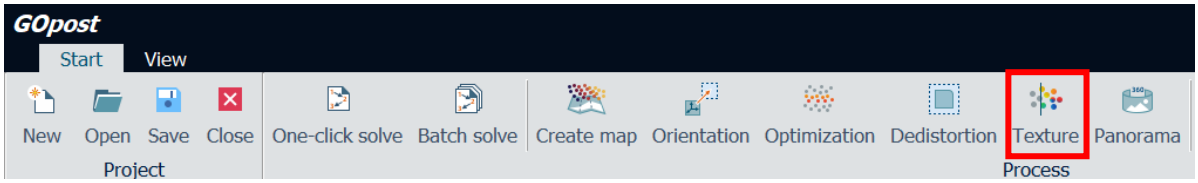
Dedistortion

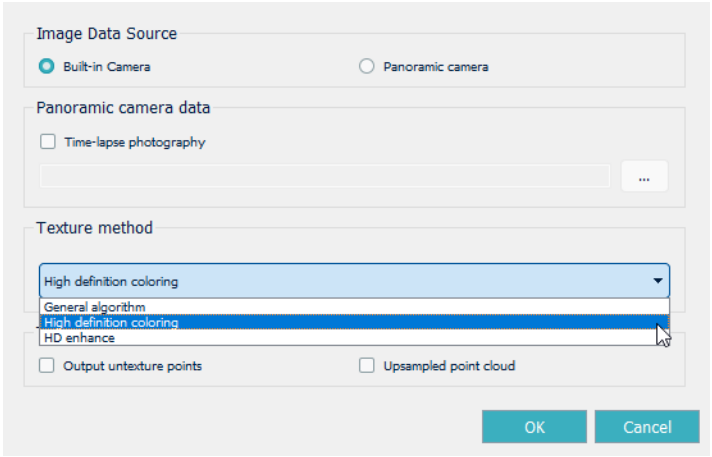
This function is designed to remove distortion from the image, and this step is necessary for subsequent point cloud colouring and panoramas. A single undistorted image is stored in a folder named “dimage”. Not available with X70GO data and X40GO.



Texture

This function uses the undistorted image, or the video frame, to colour the point cloud. Click *Texture* in the data processing toolbar and select existed point cloud to perform point cloud colouring. Point cloud with a prefix 'texture' are coloured point cloud. The option untextured points should be checked if you want to save in the textured point cloud the points that cannot be coloured.



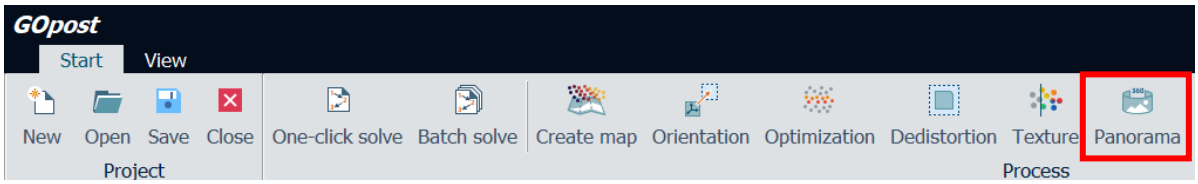


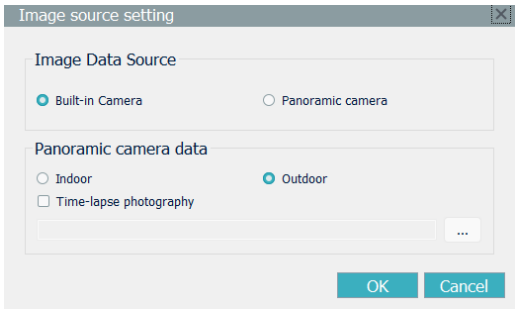
Select between Built-in camera and panoramic camera, see Chapter 4 for detail about panoramic camera processing. Select Time-lapse photography if was used this method for data acquisition. Select Output untextured points if you want to save in the final point cloud also the points which cannot be textured. Select Upsample point cloud, if you want to use the images to improve the overall density of the point cloud.
Choose between 3 texturing algorithms:

1. General algorithm: Optimize time of texturing and can overcome texturing issue coming from other algorithms.
2. High-definition colouring: Enhance the images by improving the clarity.
3. HD enhance: Improve images and also refine position of the cameras. Longer processing time, suitable for small environments where a high definition is needed.

Panorama

This function processes undistorted image to generate panorama. If you want to see panoramic images in georeferenced system, you need to use this function after you performed orientation. This function is working with Built-in cameras of X120GO and X200GO. Not available for X70GO and X40GO data without external camera.



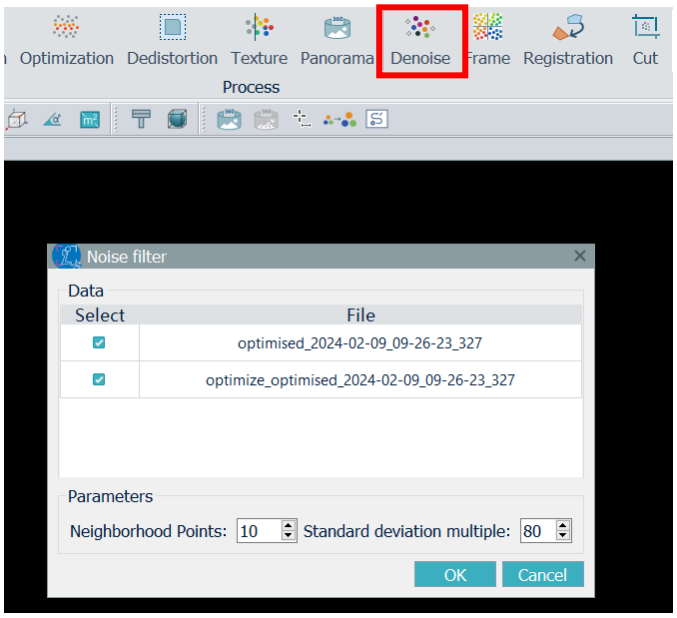


Select between Built-in camera and panoramic camera, see Chapter X for detail about panoramic camera processing. Select Time-lapse photography if was used this method for data acquisition.

2.7 Point cloud edit

Denoise

This function can remove noise by Statistical Outlier Removal algorithm. Select the point cloud you want to process and set neighbourhood points number and standard deviation multiple. The meanings of parameter are as following.



- Neighbourhood Points: This represents the required number of points within the neighbourhood to

calculate the average distance and standard deviation from each point.

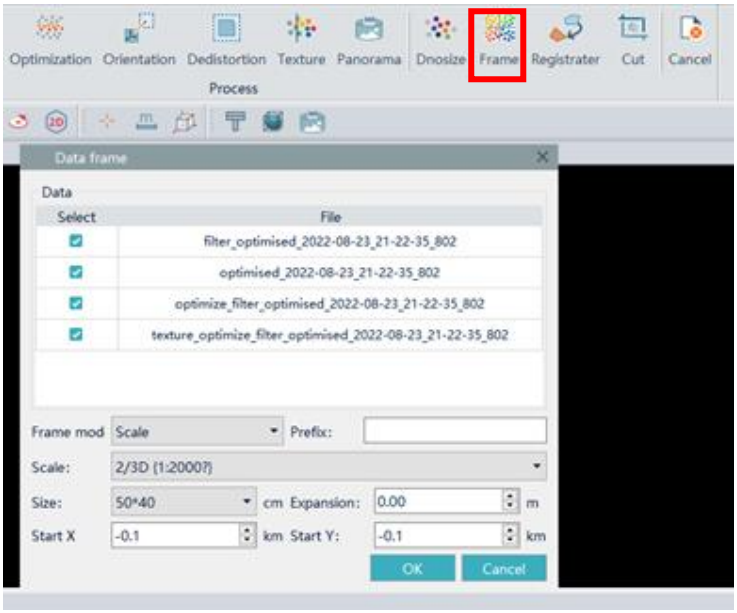
- Standard deviation multiple: This is the value multiplied by the standard deviation.

Frame

This function is for framing the point cloud.

The software will save different squares of point cloud with the dimensions that you set.

Select the framing method (scale bar or fixed size), prefix (will add a name to all the square), framing scale/ frame size (refers to dimension of the squares), expansion range and rang, etc. Then click *framing* to process the data in framing.



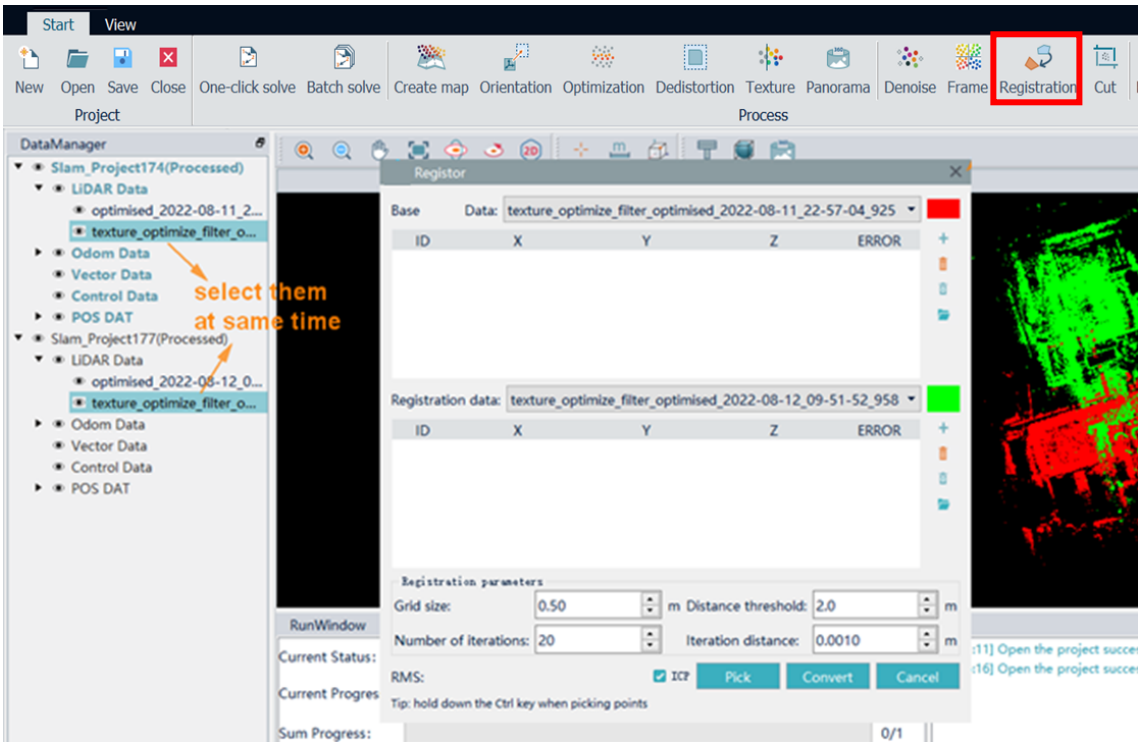
Registration

This function is used to put in the same reference system different point clouds.

Before point cloud registration, you need to add the basic point cloud and the registered point cloud to the display window.

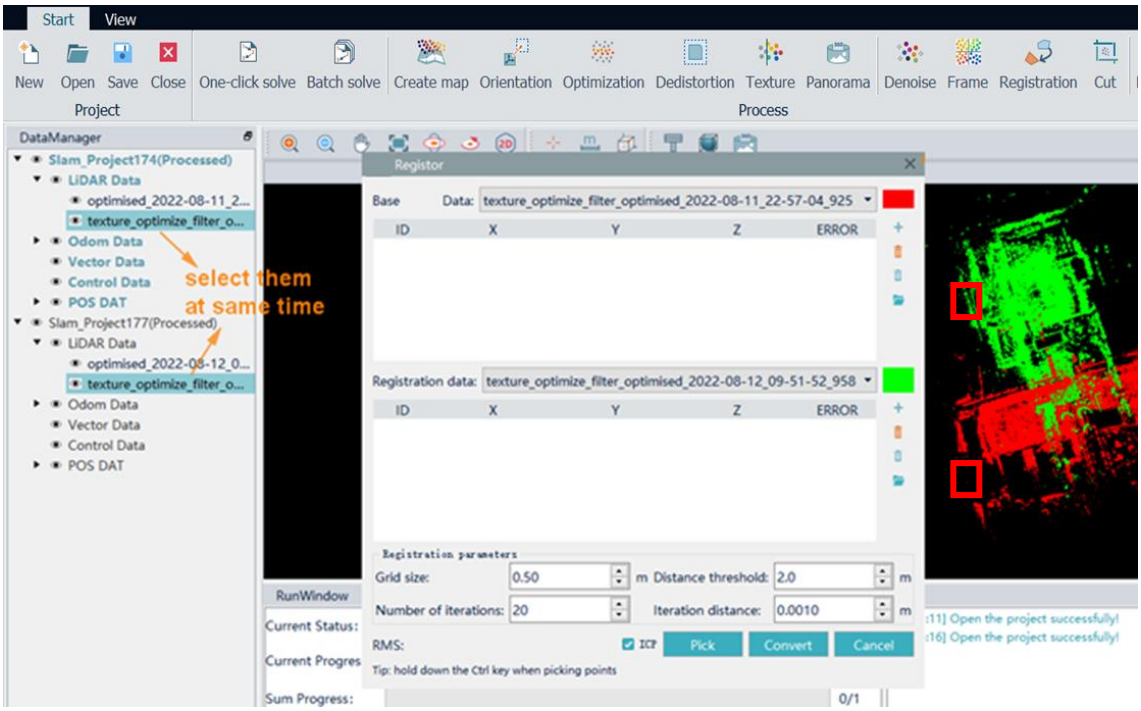
There are steps of registration:

- Add reference point cloud and the point cloud you want to register to display window.
- Select basic point cloud and registered point cloud at the same time, then click *Registration.*

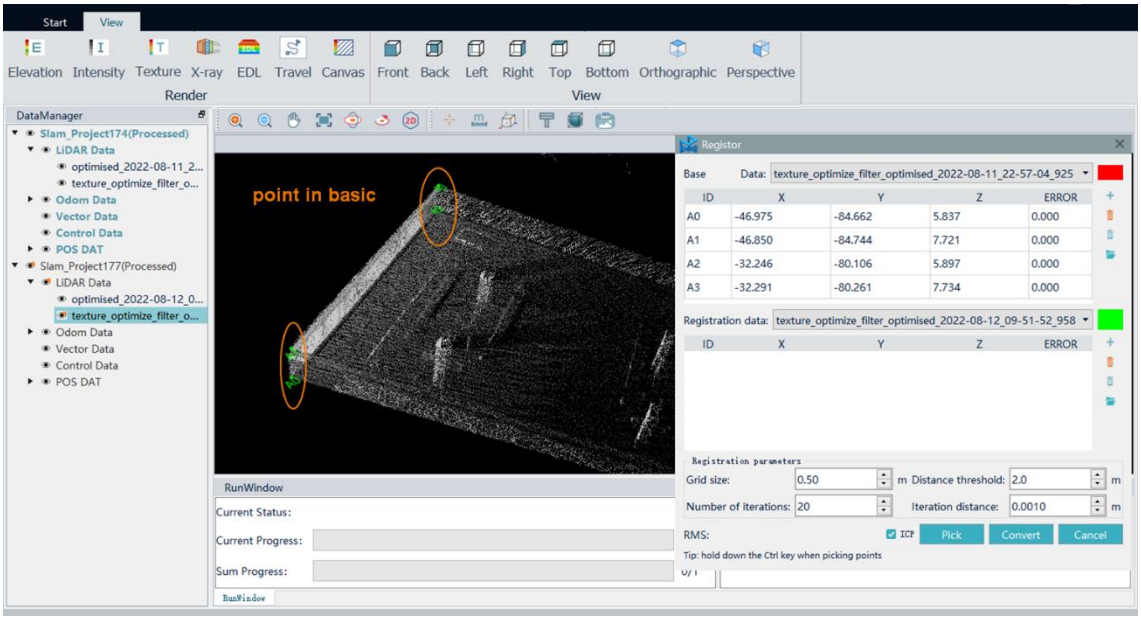


- If GCP were collected during the acquisition with a scanner, after the processing, in the GCP folder of the project will be present a file called “local_benchmark.txt”. Click on the folder icon in the registration window, to import this file with the GCP for each point cloud. Check that the order of the GCP is the same in both files. If the order is different, you have to modify the GCP file and then re-import it manually.

  NOTE: if you acquired the GCP while remaining still on the point, in the “local_benchmark.txt” the first GCP will be related to the initialization point. If you don’t want it to be counted as a GCP, delete the point from the file.



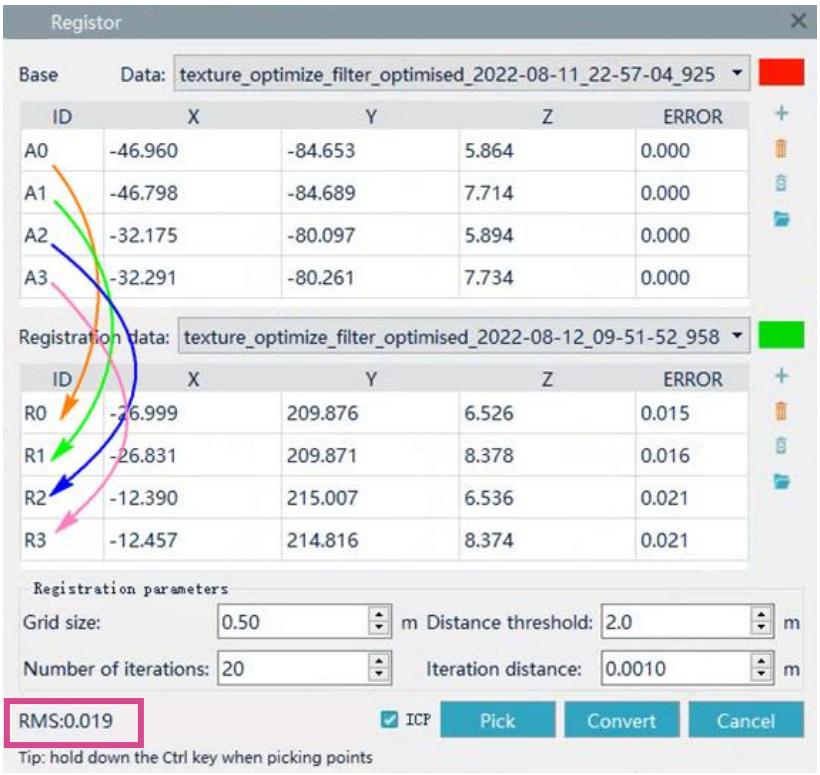
- If no GCP were collected, click *pick*， then select manually point pairs in the basic point cloud and registered point cloud. The order of the same name point must be consistent. To pick points, press Ctrl+left click of the mouse.



- Select at least 3 pairs of points with the same name in basic point cloud and registered point cloud, The order of same name point must be consistent.

- Adjust the registration parameter (ICP), when registration RMS of error meets precision requirements, click *convert* to complete registration. The meanings of ICP parameter are as follow：
  1. Grid size: Point cloud tile grid size.
  2. Number of iterations: The number of iterations of the ICP algorithm, generally 20.

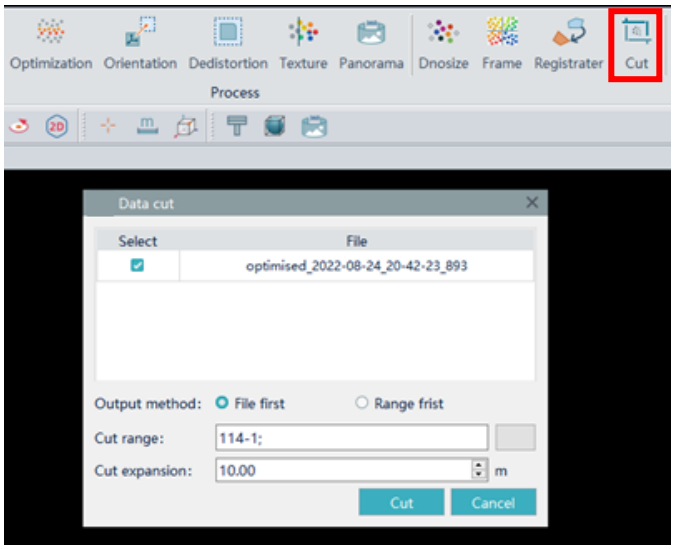
3. Distance threshold: the maximum distance between points with the same name. If the searched matching point is greater than the threshold, it will not participate in the calculation.
4. Iterative distance: the difference between the distances calculated before and after, if it is less than this value, exit the iteration.
5. RMS is the root mean square error related to registration.
6. At the end of the registration process, you will find a report with errors on the points in the folder of the project called *register*.



Cut

This function can clip the point cloud according to the range.

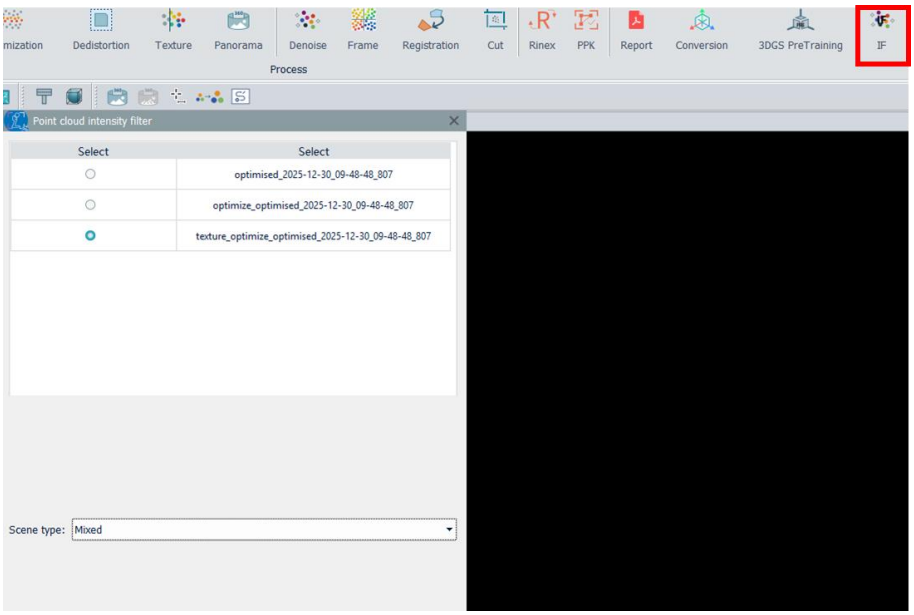
Select the data to be clipped, determine the output method, import the cropping range (vector files support shp, dxf, fmb, kml formats), and determine the expansion range.



Intensity Filter (IF)

The intensity filter is a filter that remove the duplications and reflections of windows in the point cloud.

To apply this this filter, first create the map, and select the point cloud you want to filter and the type of environment of the acquisition. A new filtered point cloud will be created.

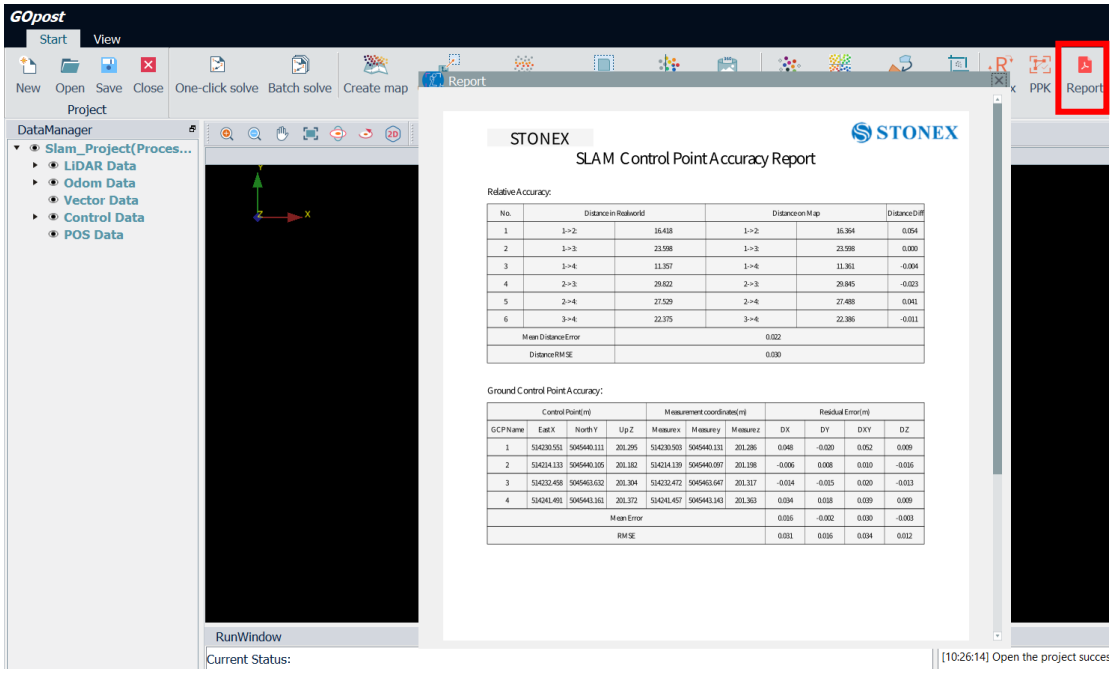


Rinex and PPK

See Chapter 3 for more information about those buttons.

Report

Press the report button to display the orientation report within GOpost. This function only works after orientating the cloud.

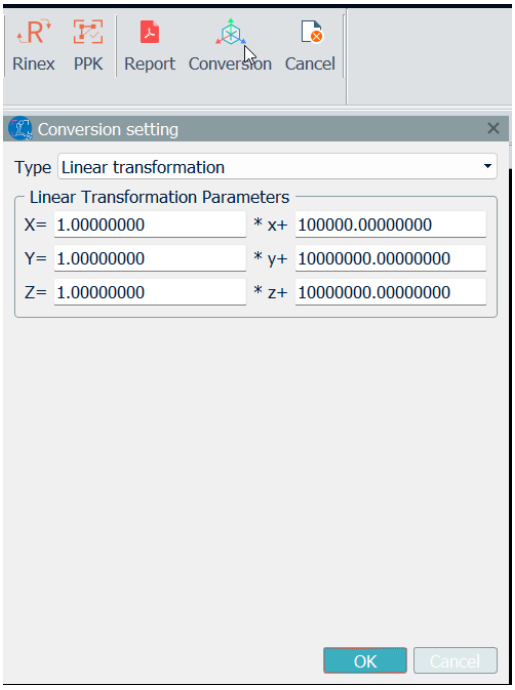


Conversion

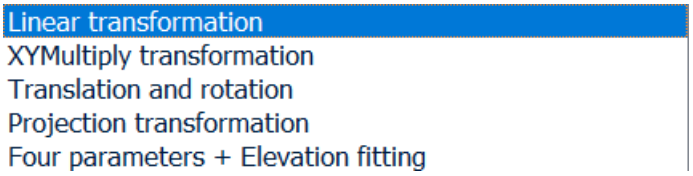
This tool allows you to apply custom transformations to the point cloud.

The transformation will be applied during the orientation step, so remember to set the transformation parameters **before** orientation.

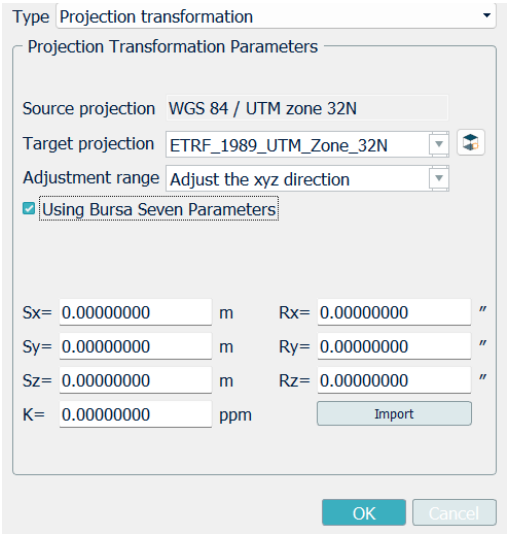
Click on the "Conversion" button.



First, choose the type of transformation you want to apply between the available ones. For each transformation, you will be able to modify the parameters.



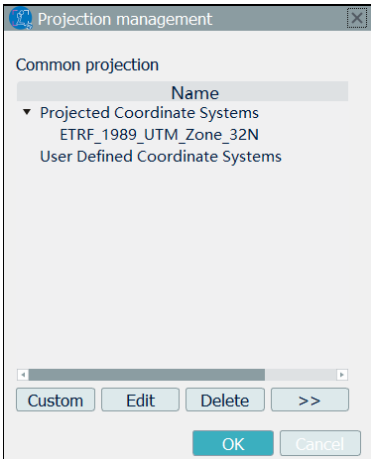
If you have RTK and want to perform a projection transformation select the corresponding transformation.



The source projection will be the one you chose when creating the project.

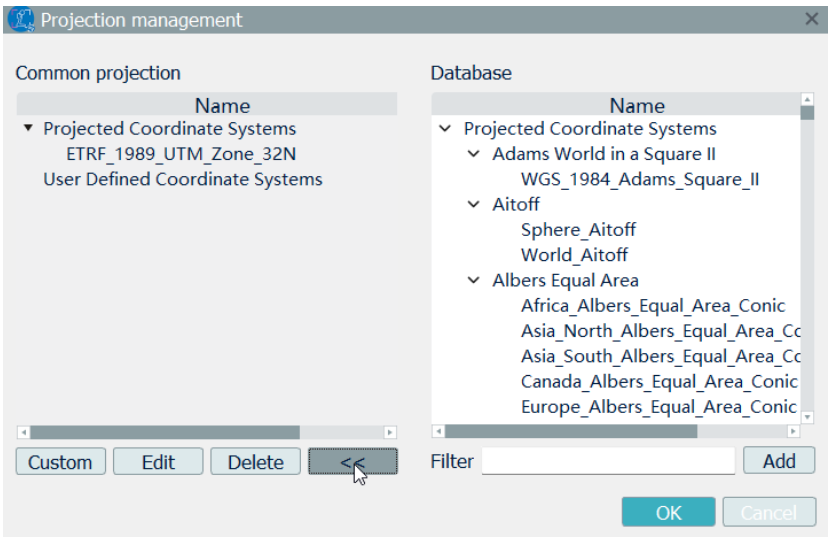
The target projection is the final coordinate system. If you click on the square next to it a new page will open

where you can customize this parameter.

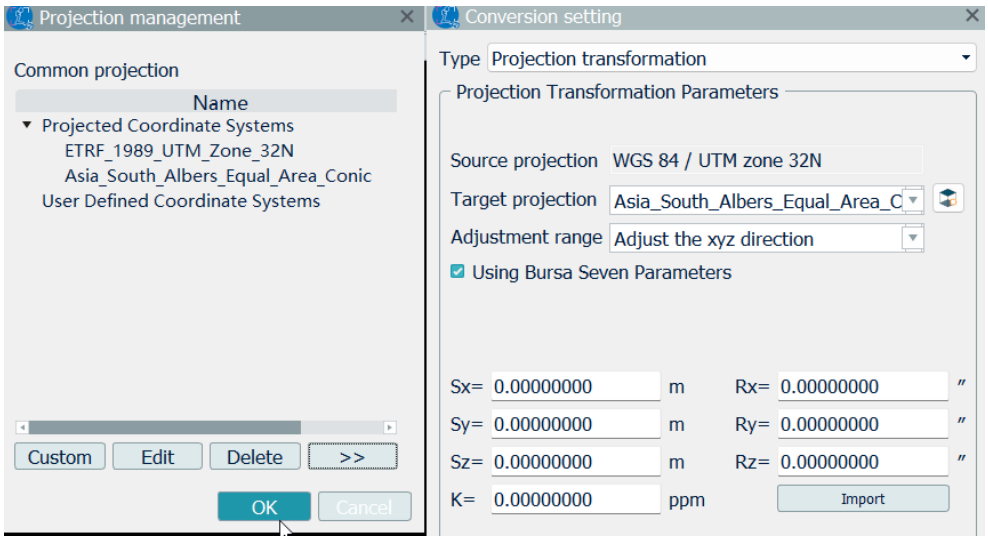


The target projection can be selected from a database already present in GOpost or can be edited manually by the customer.

To select an already present projection, click the right lower button and search in the list for the projection name. You can scroll or use the filter during your search.



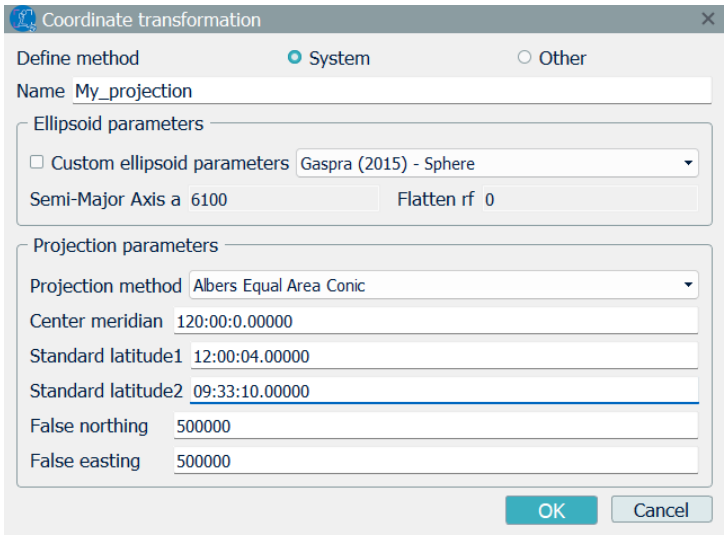
When the final projection is found click “add” to add the projection in the projection management window and once you select it click “OK” to import it in the conversion setting tab.



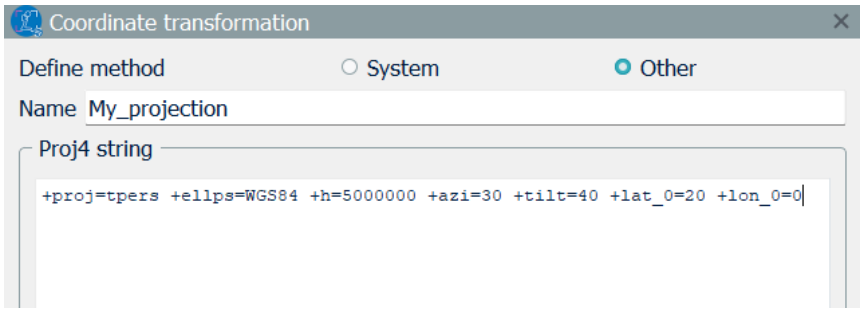
If the target projection is not available in the list, you can create your custom projection system. In projection management click “custom”, and a new tab will open.

In this new tab, you can edit the projection information to add them in GOpost.

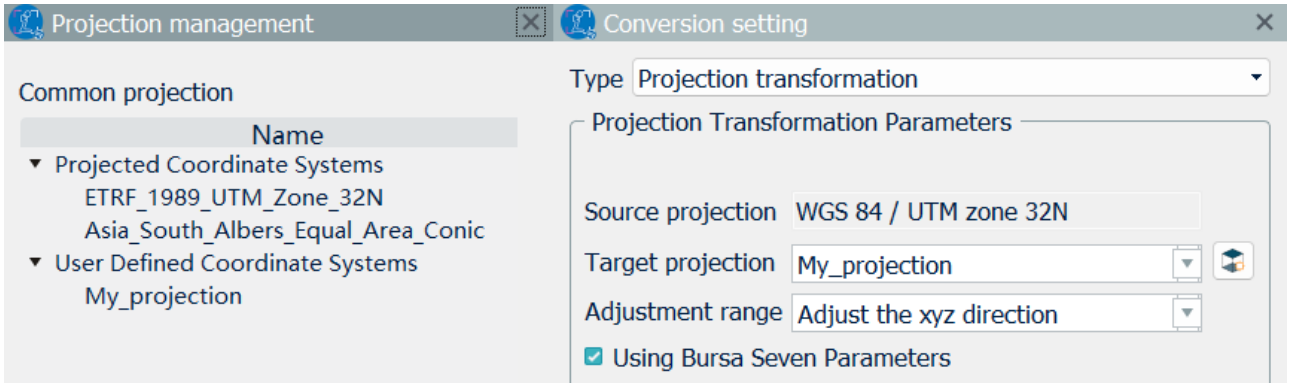
If you select “system” you will be able to manually modify all the parameters of the projection.



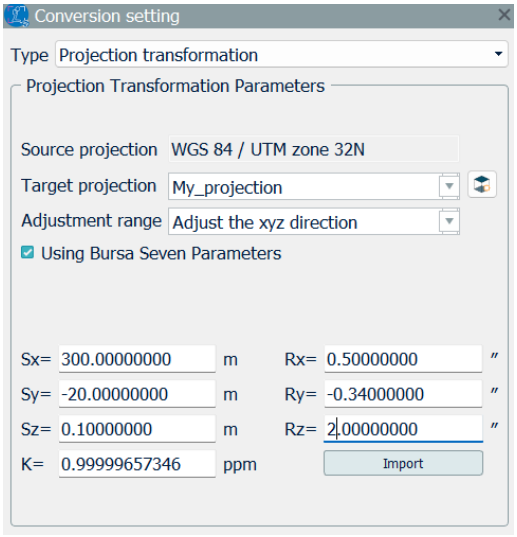
If you select “other” you will be able to write the projection information in “proj4” command line format.



Now in the projection management will be available your local projection and by selecting it and clicking “OK” you will open it in the conversion setting.



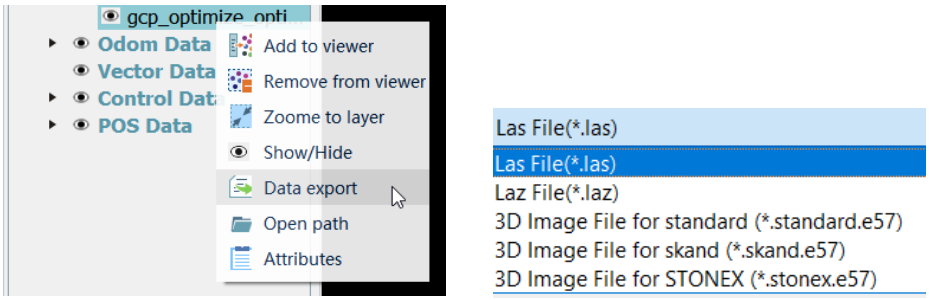
Now in conversion settings, you can decide the last parameters, and if needed when working with local projection you can also use the Bursa 7 parameters by editing the fields.



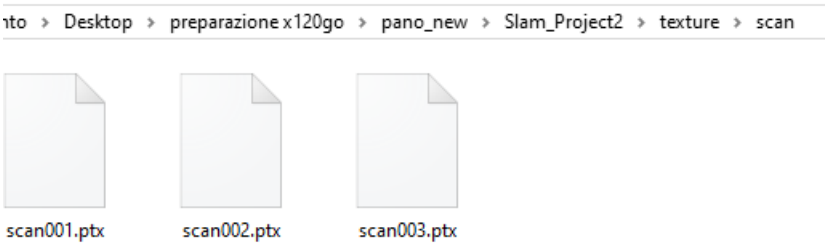
If you prefer you can create a textural file with the extension ".config" and the information of each field.
Once the transformation is defined click "OK" and perform the orientation

2.8 Data export

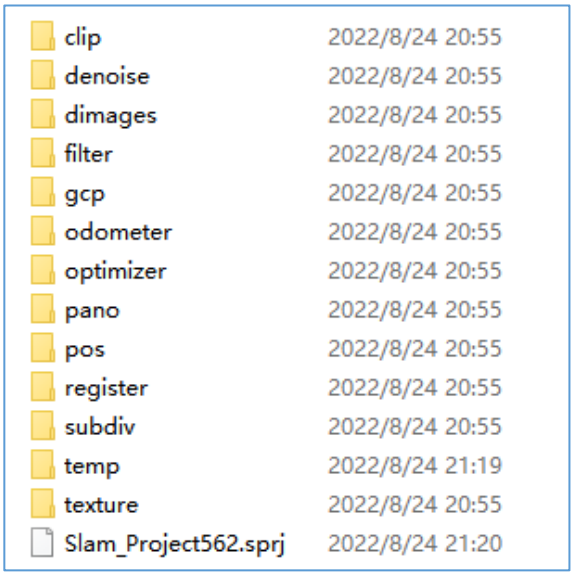
After the elaborations you will need to save the point cloud in a *.las, *.laz or *.e57 format. Choose stonex format of *.e57 if you want to open it in one of our partner software.
Open the LiDAR Data list, choose the result you want to save and right click on it. Then go to data export, in the next window you will be able to choose the name and path where to save the point cloud.



If you collected data with X-Whizz mode and processed it with static platform, you will find one *.ptx file for each static you collected. Those files are available in the texture folder of the project.



2.9 Description of the result catalog



- Clip: Clipped point cloud data.
- Denoise: Point cloud data after denoising.
- Dimages: Single image without distortion.
- Frames**:** present only for X70GO, her are saved frames extracted from the video.
- Filter: Point cloud data after removing moved object.
- GCP: GCP files, oriented Point Cloud and orientation report.
- Log: inside there is a log file of the processing.
- Odometer: Odometer data, in which HF_odometry.txt is the high frequency odometry, LF_odometry.txt is the sparse odometer, and optimized_odometry.txt is the optimized odometer.
- Optimizer: Point cloud data after optimization.
- Pano: panorama images and panoramic images position files.
- Pos: Image POS data, where camera_pos.txt is the image POS file, camera_trajectory.txt is the camera trajectory file, lidar_trajectory.txt lidar trajectory file.
- Register: Point cloud data after registration and registration report.
- Subdiv: Point cloud data after framing.
- Temp: Project temporary folder, containing project information, original point cloud data and log. If users face problems, pls give log to Technical Engineer.
- Texture: Point cloud data after colouring. With X70GO you will find .ptx files here.
- .sprj: Project file

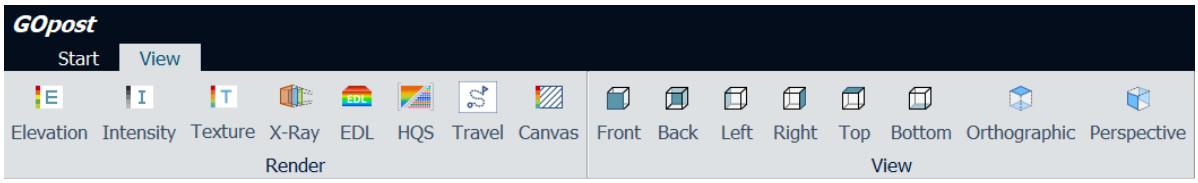
2.10 Results browsing

Select the point cloud you want to browse and right-click - Add to View.

User can change display methods that contain elevation, intensity, texture and canvas. In addition, user also can change display view angle, such as front, top, etc.

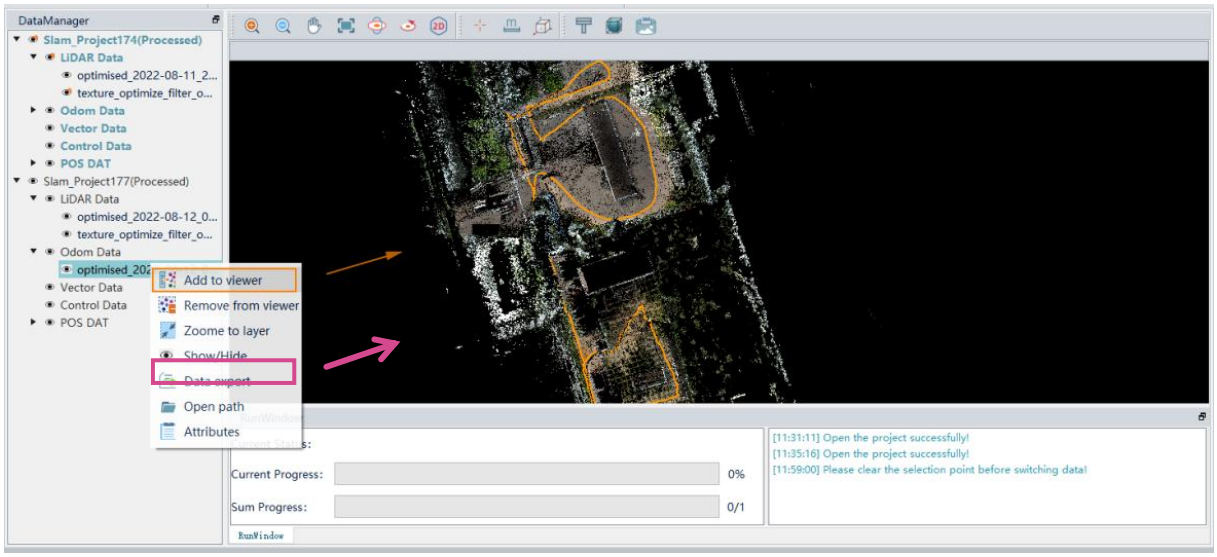
If you click on the elevation button, you can change between colorbars and set the minimum and maximum height reference.

An X-ray view and EDL view are also available. HQS is a n improved render of the point cloud.
With the Travel button, an automatic cloud tour can be started based on the trajectory followed.



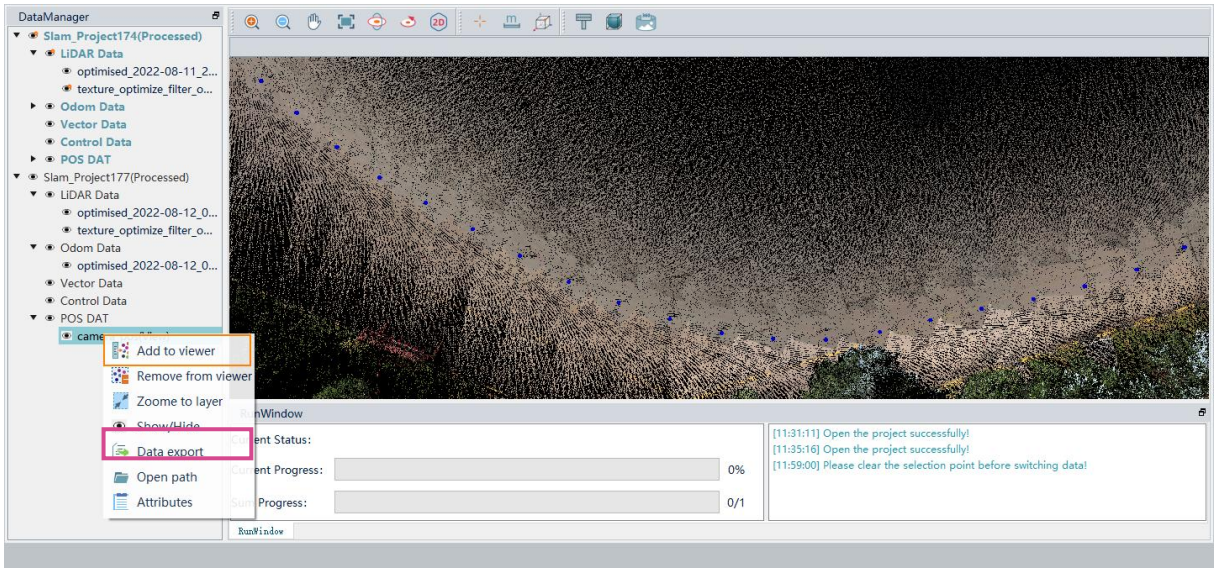
2.11 Trajectory

Select Odom Data and right-click - Add to Viewer. The points in orange are the odometer trajectory.
If you perform non rigid orientation, will be created also a file with the trajectory in the global reference system.

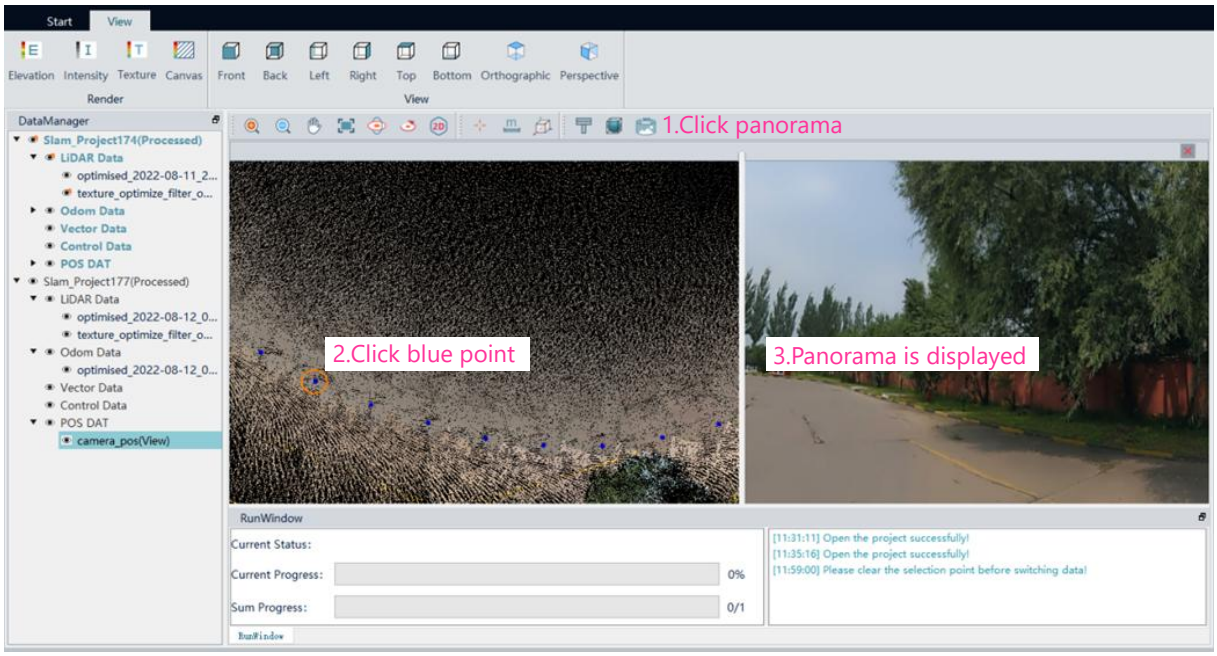


2.12 Panorama browsing

Select the cam_pos and right-click - Add to Viewer. The point in blue is the odometer trajectory. If you elaborate the panoramic images after the orientation, you can also view the images on the oriented point cloud by loading cam_pos_ori file.
If the panoramic images are created using a X200GO, the result will be a full 360 degrees image. So you can refer to Chapter 4 for 360 degreees pano browsing.

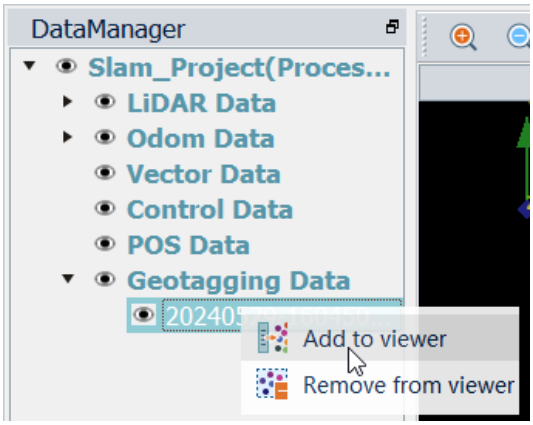


Hold down the left button and move the mouse to browse the panorama.

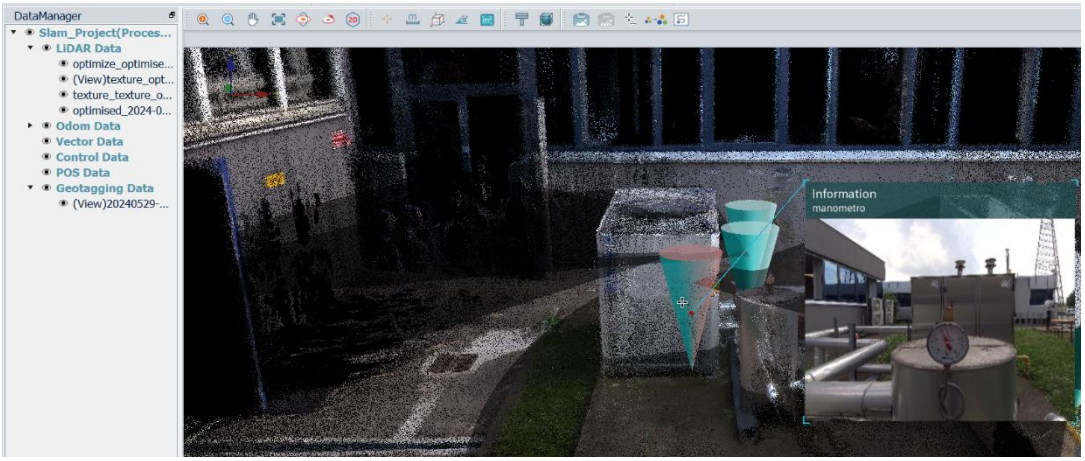


2.13 Geotag visualization

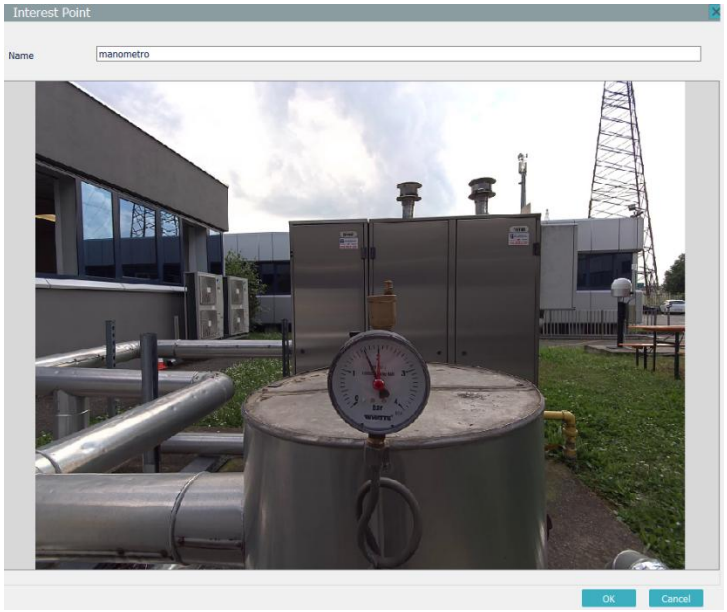
If images were saved as geotags during acquisition, it will be possible to add geotags to the viewer after map creation. Open the geotagging data section and right-click above the displayed name to add to the viewer. After opening the geotags in GOPost, images and a CSV file with the coordinates will be generated in the corresponding data folder.



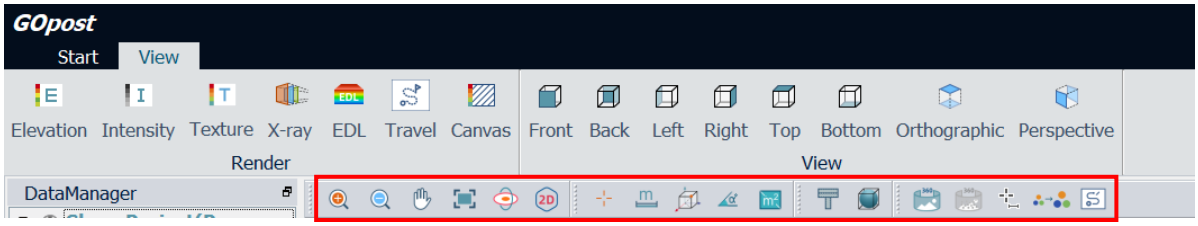
Cones will now be visible within the cloud at the positions where the geotags were captured. Press the pick button and select one of the cones. A preview of the saved image will open.



Double-click on the image to open it large. In this screen you can zoom into the image with the mouse gear and you can also change the name of the geotag.

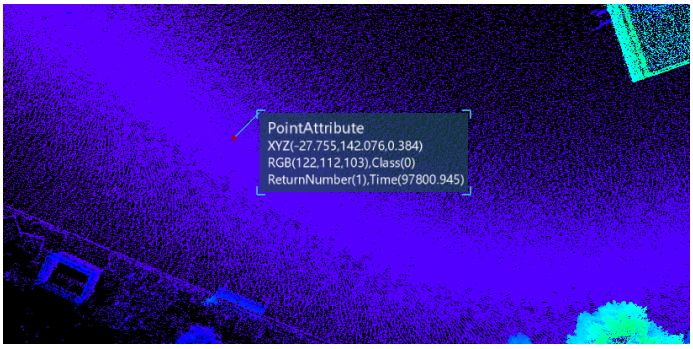


2.14 Tool bar

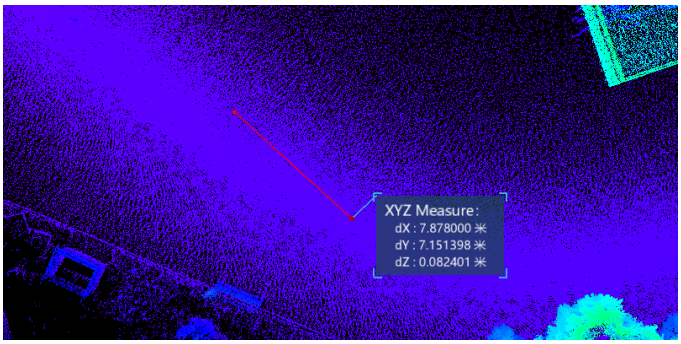


Here are meaning of tools:

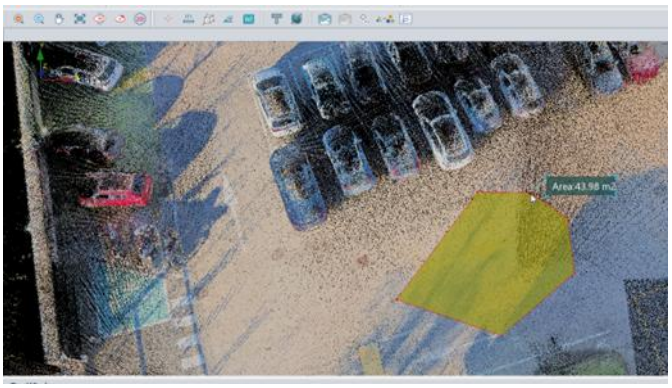
- Zoom in: Zoom in on the point cloud
- Zoom out: Zoom out on the point cloud
- Pan: Pan the point cloud
- Extent: Zoom to layer
- Rotation: rotate point cloud
- Rotation centre: change rotation centre for easy browsing
- 2D: Lock the plan view
- Pick point: pick single point to show its information



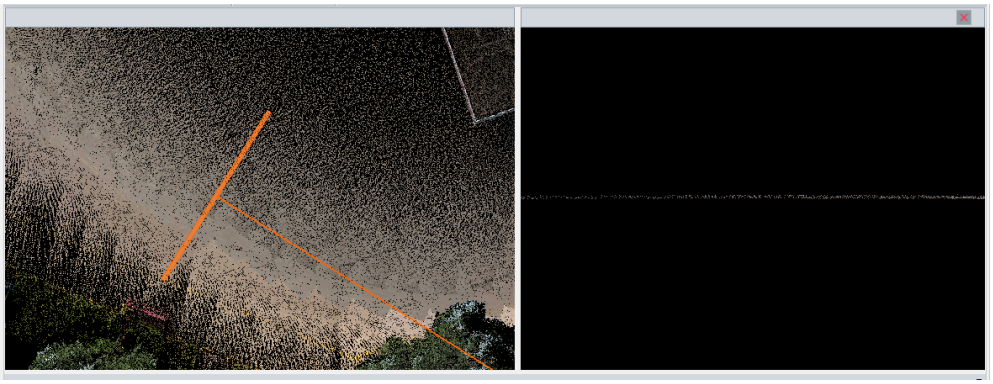
- Measure distance: measure 3D distance between two points.
- Measure XYZ: measure distance between two points in XYZ Axis.



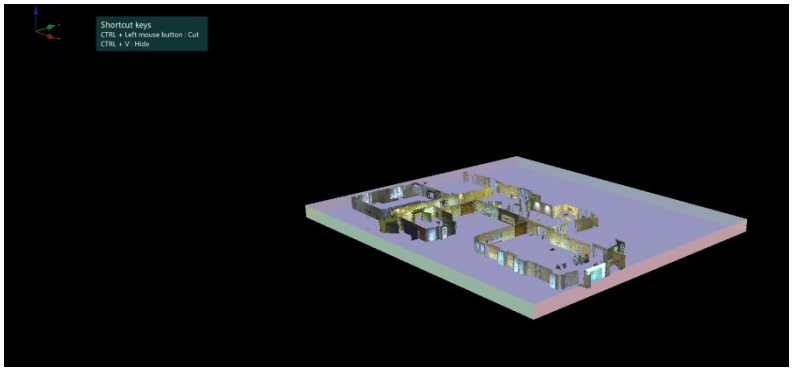
- Angle: Measures the inclination between two points.
- Area: Measure the area inside a polygon. Select polygon points by clicking on the points in the cloud. Double-click to close the polygon.



- Profile: Show point cloud details in a cross-sectional view



- Plan cut: Show point cloud details by change box boundary. To move box sides, press the control button and left click on one of the arrows. You will be able to move it.



- Panorama: refer to previous chapter
- PanoCloud: view the point cloud overlapped with panoramic image.
- Pano distance: measure distance on the panoramic image.
- Point Size: change the size of point in the point cloud visualization.
- Video: You can see the video recorded with X70GO.

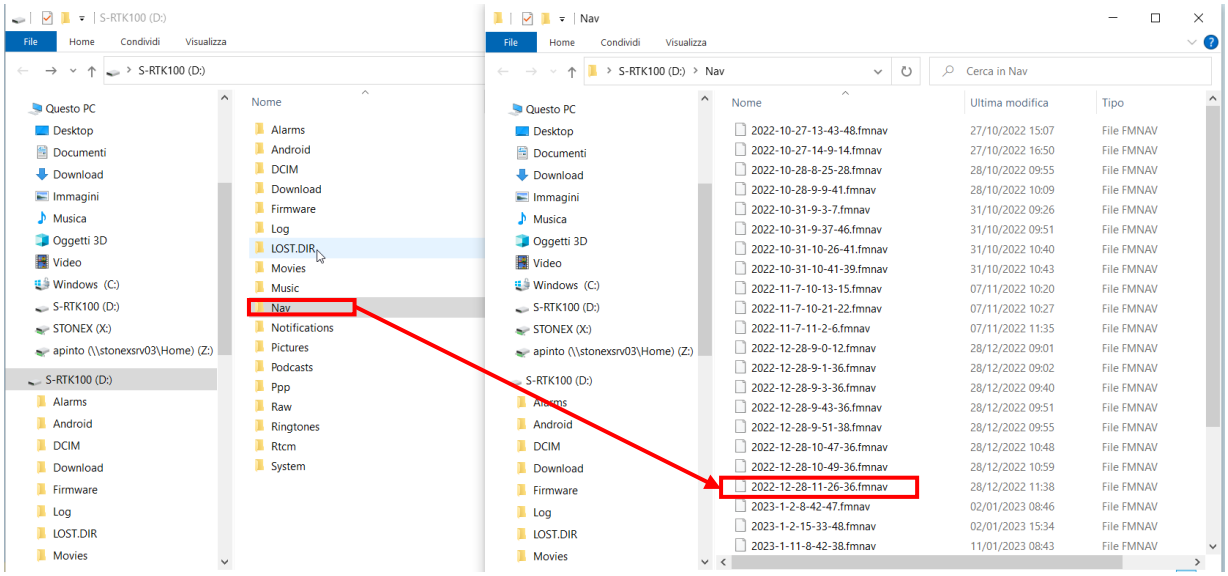
3. Process with RTK data

3.1 RTK processing

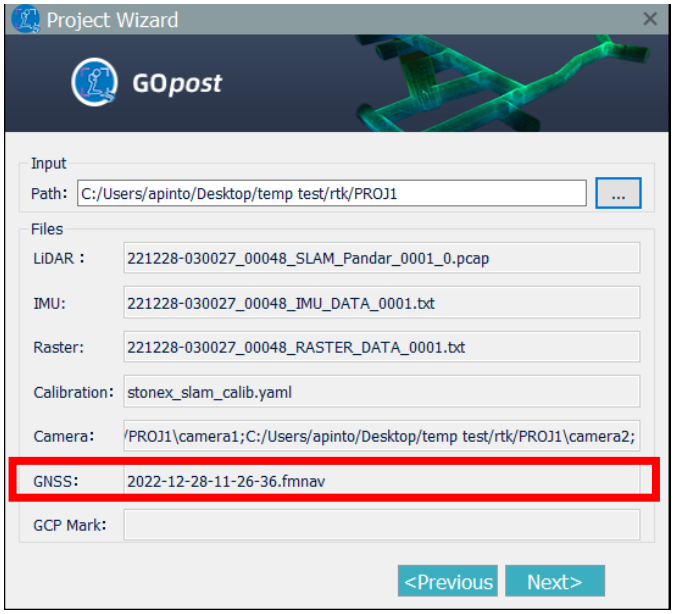
After the acquisition, insert you SD card of the RTK device in your PC to download the data relative to your project. In the memory of the SD card, select the Nav folder, then search for a file with the extension *.fmnav. This file contains the RTK information of the scan. The files are named with the following format:

YEAR-MONTH-DAY-HOUR-MINUTE-SECOND

Select the corresponding file with the same date of the scan you want to process. Copy this file in the project folder of your scan. For example, will be selected the file of the 28 December 2022, at time 11.26.



Open GO*post* and click New to create a new project. Choose the name and the save path, then choose the input path. Please check that in the GNSS section in the input screen there is the *.fmnav file.
If you are using the X200GO with the RTK module working, in the raw data folder will be directly saved the *.fmnav file for that scan.

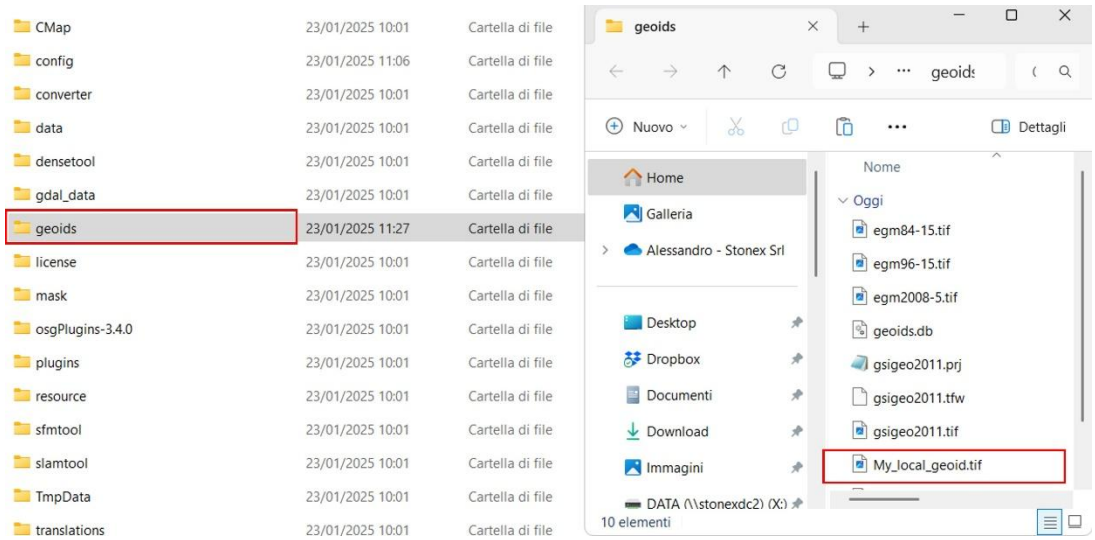


Click *Next*, the software will ask the type of coordinates and the reference system. It should recognize it automatically. If the information are correct, click *Next*.

Geoids integration

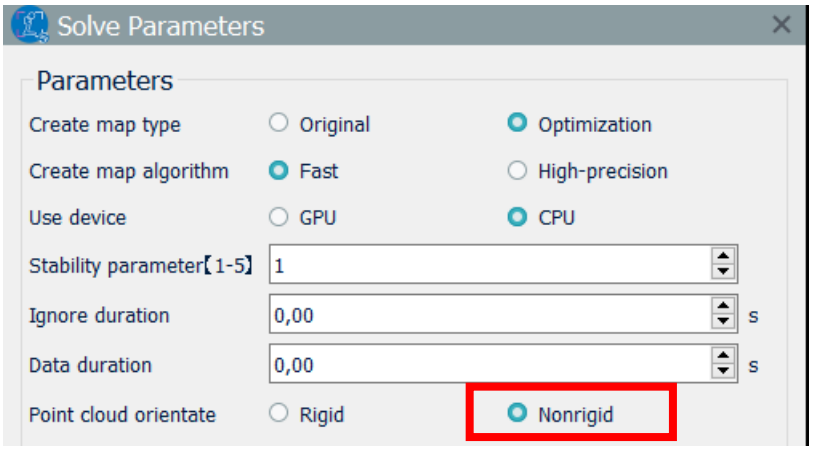
It is possible to load your local geoids in GOpost. The supported format is the ".tif" format.

Once you have the geoid file, open the path of GOpost, and search for the folder called "geoid". Here you need to copy the geoid file.



Now when you launch GOpost, and search for the geoids, the file name will be visible.

Now you can process as for the other case the data, with the One-Click-Solve or with the Step-By-Step procedure. To better use the RTK information, in the orientation phase is preferrable to use the non-rigid body method.



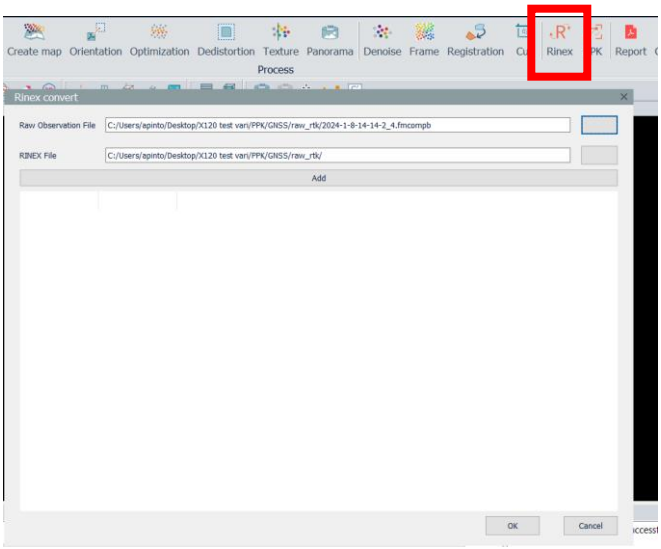
After the processing, the point cloud in the GCP subfolder of the project and all the subsequent point clouds, like the textured one, will be orientate in the reference system of the RTK data.

3.2 PPK post processing

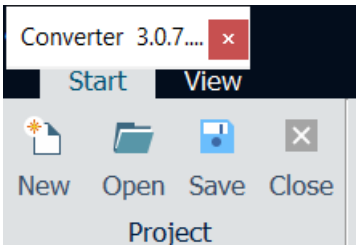
GOpost can let you post process data coming from the RTK module, in order to perform orientation also when you can't get corrections from a base. This procedure should be done before the data processing, and you need to have base data saved in rinex format.

First you need to transform raw data in Rinex format. Copy in a local folder the ".fmcompb" file from the SD card of the RTK. If using X200GO the file *.fmcompb will be saved directly in the raw data folder.

Open GOpost and click on Rinex button. In this window in the "Raw observation file" you need to select the path to the* .fmcompb file. In the "Rinex file" you insert the path where to save the rinex data.

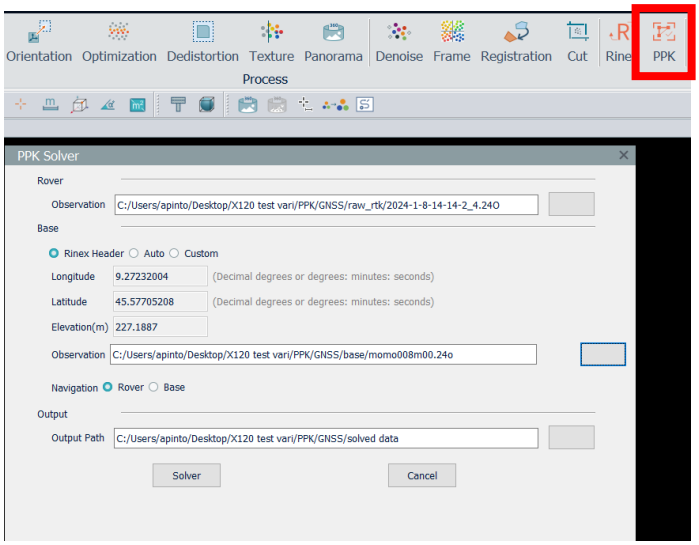


Click Ok. On the upper corner should open a window. If it does not close automatically after few seconds, click the x button and close t. Now the software will save the rinex data.



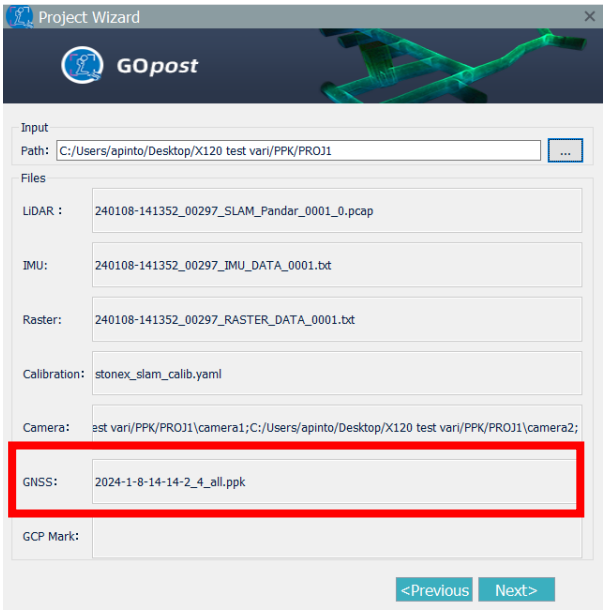
Now click PPK button, The PPK solver window will open. Load in rover observation the file with .O format coming from the RTK processed data.

In base observation load the .O format file from your base. Select the output path and click solver and wait the end of the processing.



In the output path you will find a file with the extension .ppk. This file is the one that will be used to perform non rigid orientation. Copy this .ppk file in the folder with the scanner data.

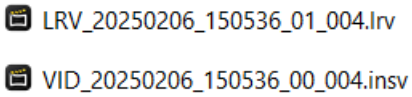
Create a new project, select as platform RTK120GO, and load the data of your project. In the GNSS row check that the .ppk file has been loaded.



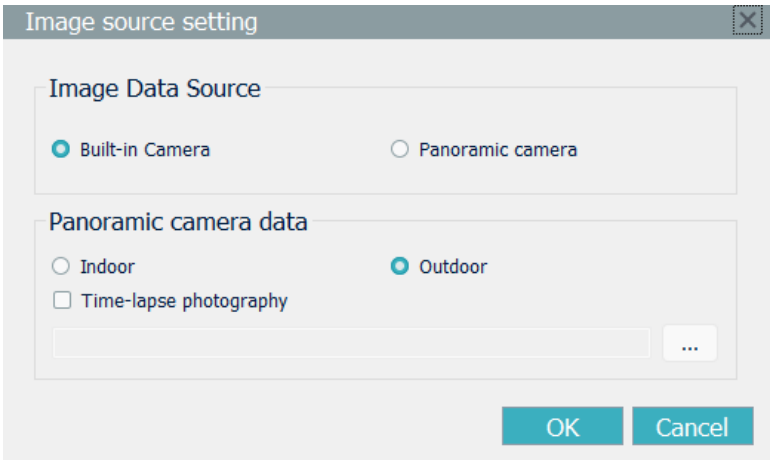
After the successful import, process the data normally.

4. Process with external camera

If you collected data using the external camera, first you need to convert the raw video of the camera.
Remove the SD card from the camera or use the cable to connect the camera to a PC.
Copy the *.lrv file and the *.insv file locally.



The panoramic camera calibration file is already inside GOpost.
Create a new project. If you use the one-click-solve button, select the orange gear. A pop-up window will open. Select *Panoramic camera*, choose between indoor or outdoor environment, check *Time-lapse photography* and select the path to the folder where you save the *.insv.



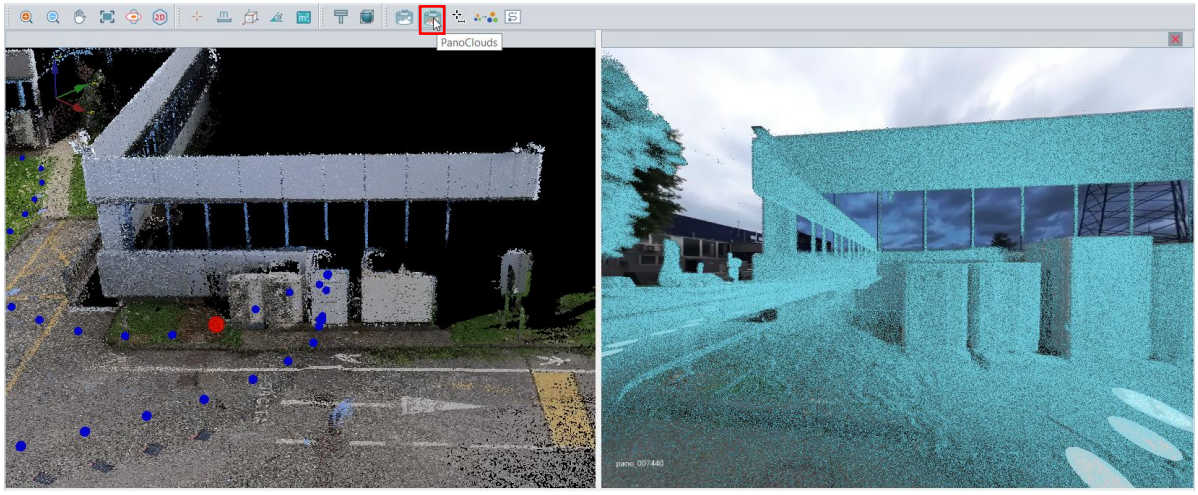
After the settings, start the processing and the software will use the panoramic images to apply texture to the point cloud.

If you choose the step-by-step solution, when you click on texture and panorama button, the same pop-up window will open. Choose the same parameters to process the data.

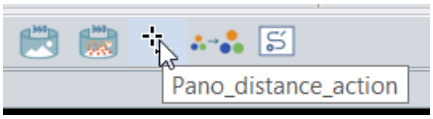
If you elaborate panoramic images, load the panoramic images position by adding to the view the pano_pos.

Click the panoramic button in the tools section and select one position to open the associated panoramic image.

You can navigate the panoramic image. You can also visualize the overlap between the image and the point cloud by selecting PanoClouds button.



You can also take measurement on the images. Select the pano measure tools.



Navigate the image and left click with your mouse to start a measure. Double left clicks with your mouse to end a measure. The final distance will be displayed in the LogWindow.

The 360 panoramic images are saved in the pano folder inside the pano folder of the project.

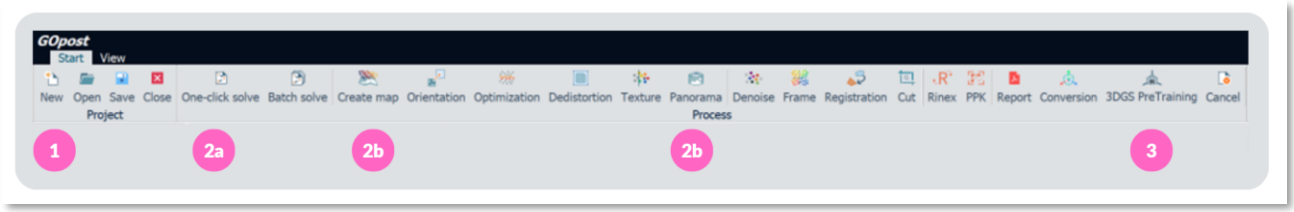
To export a point cloud with panoramic images already saved in the file, select one of the available *.e57 formats. The ".stonex.e57" is the one to be selected if you are using one of the Stonex software for post processing.

5. 3D Gaussian Splatting with Stonex SLAM and Pano Camera

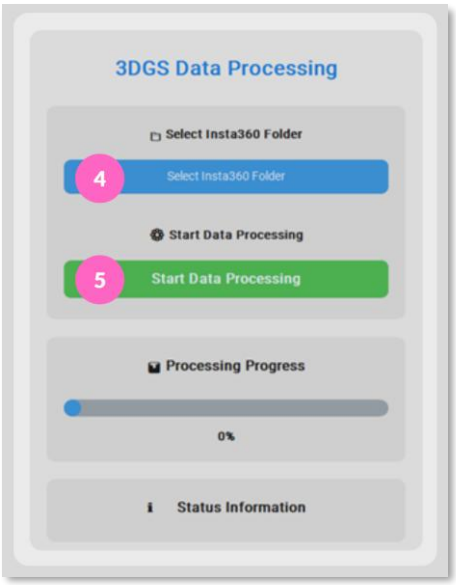
Processing

GOpost

1. Create a project, select the used device and platform and choose the path of saving and raw data
2. Process your data as usual, or just “Create Map” + “Panorama



3. Click on 3DGS PreTraining
4. Select the folder where Insta360 data is saved
5. Click on Start Data Processing



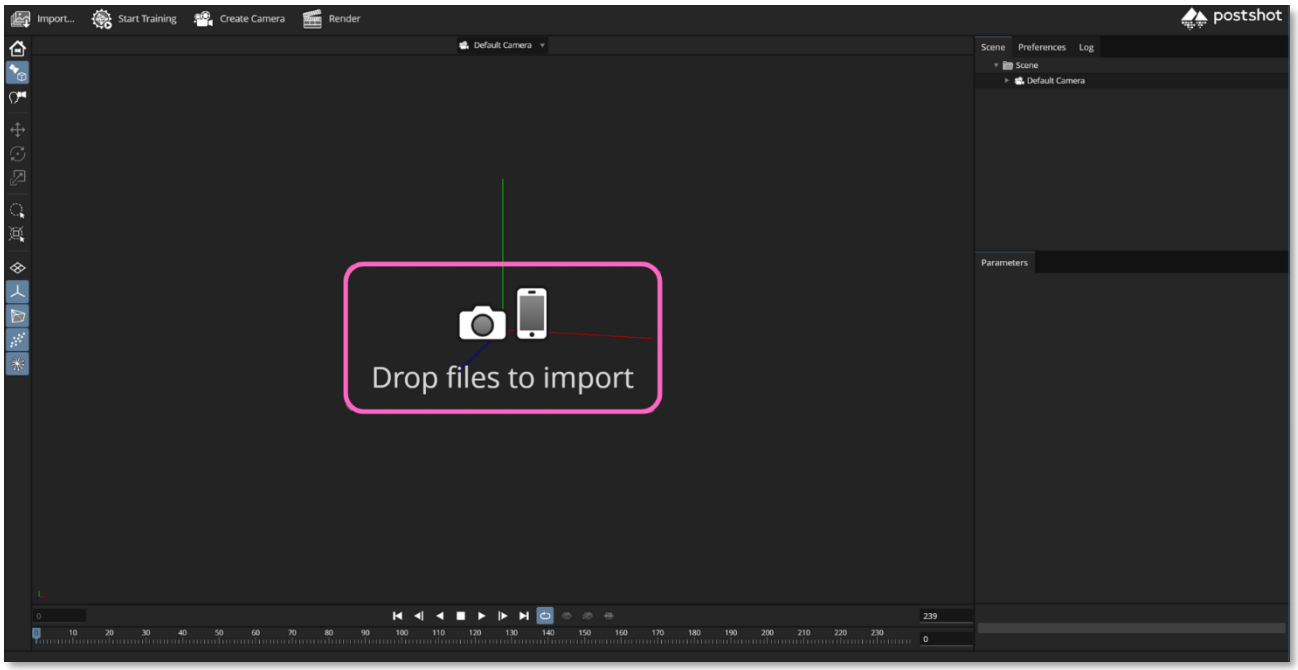
5. When Processing is finished, click OK.

PostShot

a. Install PostShot [Download Link]

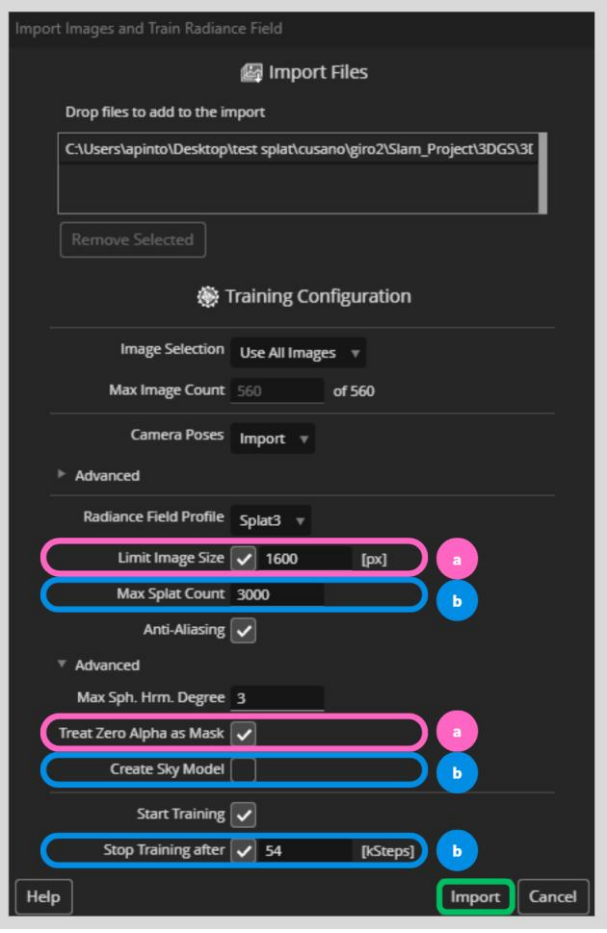
b. In the main page, drop the folder containing the pre-trained data:

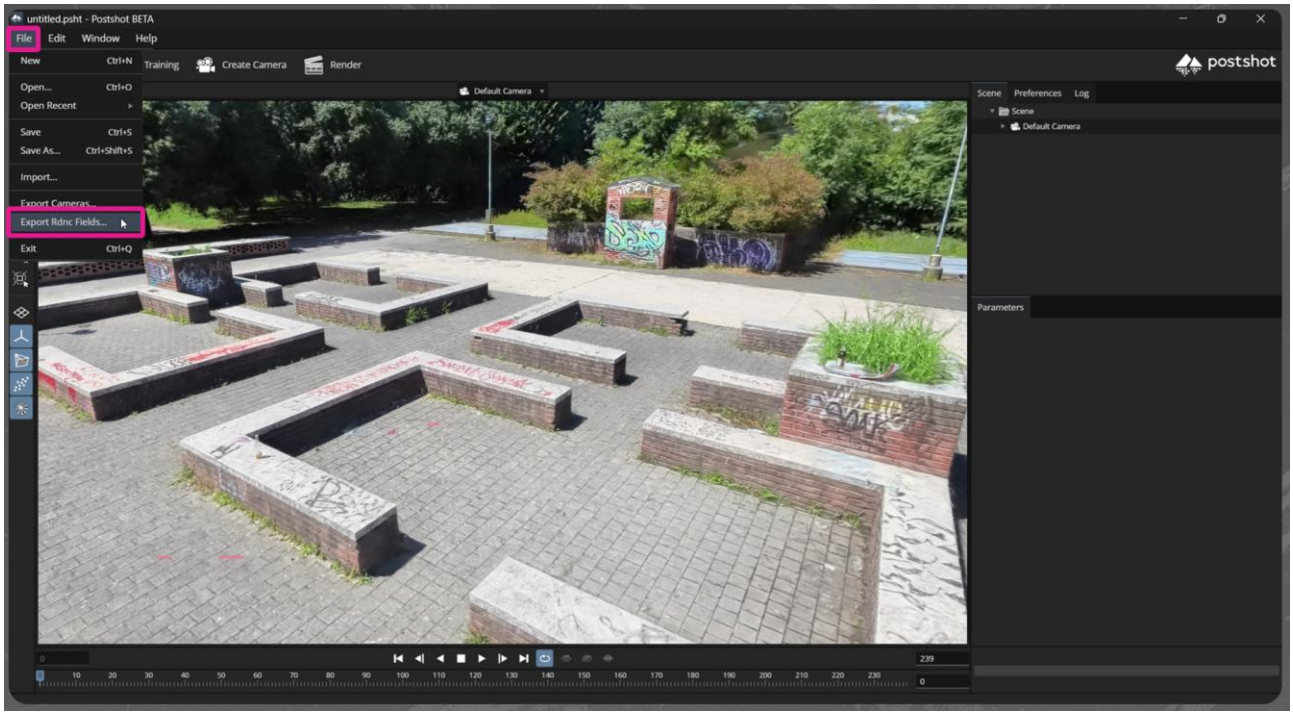
*C:\Users************************\Slam_Project\3DGS\3DGS\sfm_pos\3DGS*



c. In the following menu, set the *pink (a)* parameters as in the image, while the ***blue (b)*** parameters depend on the PC performance and user preferences.

d. Click on Import, and the software will automatically process the data.





3DGS Export & Visualization

When the processing is finished, click on File, then click on Export Rdnc Fields, to save the **.ply** Gaussian Splats file.

Import the .ply 3DGS in any software or online visualizer that can manage this type of data.

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