Autel Mapper

User Manual

V1.1.0 2023.04

AUTEL ROBOTICS

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Recommendations

Autel Robotics provide users with the following materials for best use practices of Autel Mapper:

1. "**Autel Mapper Installation Guide**"
2. "**Autel Mapper Quick Start Guide**"
3. "**Autel Mapper User Manual**"
4. It is recommended that users first use the "**Autel Mapper Installation Guide**" to understand how to install the software and check hardware compatibility; browse the "**Autel Mapper Quick Start Guide**" to facilitate users to quickly understand how to use the software and perform 2D and 3D reconstruction tasks, and finally utilize the "**Autel Mapper User Manual**" for a detailed explanation of both beginner and advanced techniques for using the software, and explanations of technical terms within the software.

Documentation

※The following guide is subject to update without prior notice. It is recommended to visit the official website of Autel Robotics to confirm you are using the latest version of this documentation.

Or

Click Icon To Download

This manual is written based on Autel Mapper V1.1.0. If it is inconsistent with the version of the software you are actually running, please update the software to the latest version. If some operations are inconsistent with the manual description due to a newer software version, please refer to the actual software. This manual is for reference only.

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Product Overview

This chapter introduces the basic functions of Autel Mapper, the performance requirements of software and hardware, and how to obtain an Autel Mapper account.

1. Product Introduction

Autel Mapper is a PC application independently developed by Autel Robotics Co., Ltd. (hereinafter referred to as Autel, or Autel Robotics) for various industries and applications. It utilizes the latest in reconstruction technology for cutting-edge 2D and 3D map and model reconstruction capabilities.

1.1 Download Autel Mapper

Using your computer, please visit the following link to download the latest version of the software:

https://www.autelrobotics.com/download/594.html.

2. Usage Requirements

For the best possible experience and to avoid poor performance, Autel Mapper needs to meet certain software and hardware requirements.

Note:

- Autel does not provide any computer hardware alongside Autel Mapper, the software is provided alone, and it is up to the user to ensure their hardware meets the requirements as stated in this section.

2.1 Operating System

- Windows 10 64-bit or Windows 11 64-bit.

2.2 Hardware Requirements

Specification	2D/3D Reconstruction	
Hardware	**Lowest Supported Model**	**Recommended Model**
CPU	Intel Core i5 8 series AMD Ryzen 5 3000 series	Intel Core i7 11 series or newer AMD Ryzen 7 5000 or newer
GPU	NVIDIA GeForce GTX1070	NVIDIA GeForce RTX 2080 Ti or higher
VRAM	6GB	8GB or higher
RAM	16GB	32GB or higher
Storage	200GB of usable hard drive space	256GB SSD+2TB Enterprise HDD
Display	1280×1024	1920×1080 or higher

Notes:

- Please keep your computer operating system up-to-date, including drivers, to get the most out of your hardware.
- It is recommended to use a higher-end desktop processor for the best possible performance.
- The graphics processor must use an NVIDIA graphics card with a computing power of 3.0 or higher, and the graphics card driver version is required to be 471.11 or later.
- Please configure memory and storage reasonably according to the actual data set to be processed. Among them, memory should be about 500 sheets/GB, and storage should be 5 times the size of the data set.
- Lower requirements than the minimum configuration may result in poor experience of the software, crashes, or a failure to boot the program.
- The official recommended configuration of Autel Robotics is for reference only, and large-scale data sets may need to upgrade to a higher configuration.

2.2.1 Installation Precautions

During the software installation process, if you encounter any security popups or blocks, please choose to agree or allow the program or setup to run. For details, please refer to the "Autel Mapper Installation Guide".

2.2.2 Graphics Card Update Guide

Please refer to the "Autel Mapper Installation Guide".

3. Autel Mapper Account

Autel Mapper accounts are divided into two versions - CN and General Version.

3.1 Select Account Type

The login page will pop up automatically when you run Autel Mapper for the first time. Users can choose the domestic version or the international version to register and log in according to their needs. The registration methods of the two types of accounts are different, and all functions of the Autel Mapper software can be used after logging in.

Tips:

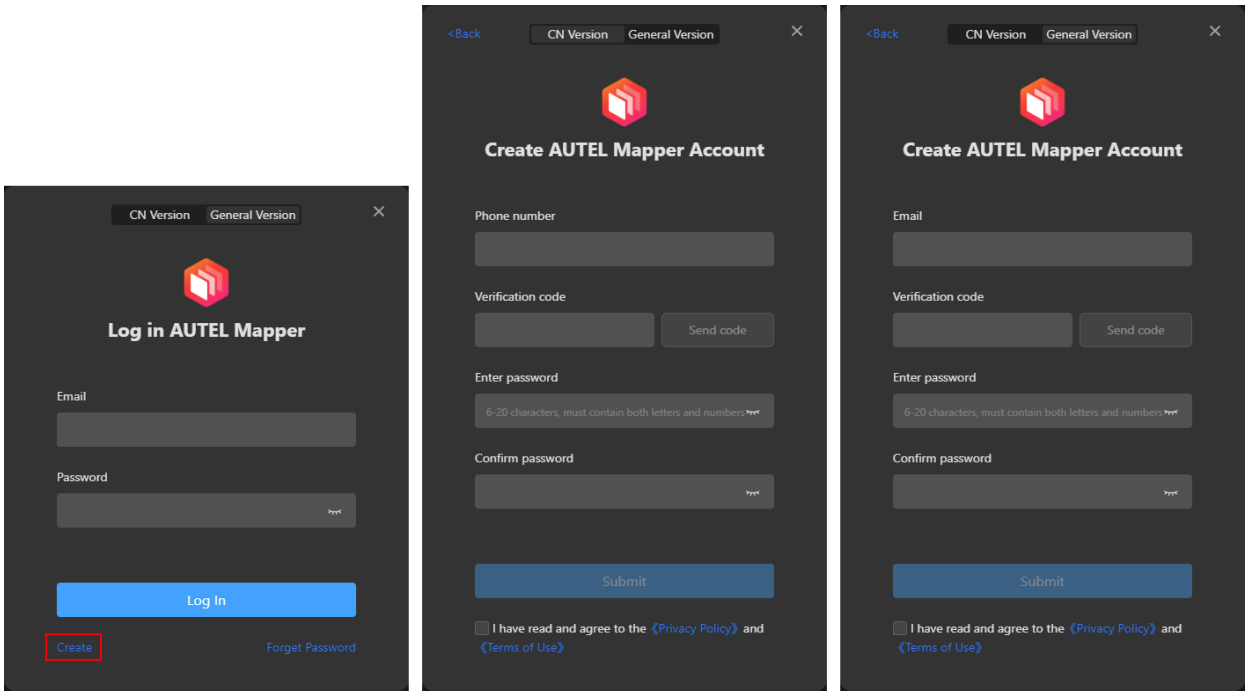
- The two versions are not interoperable, please choose carefully.
- In a non-login state, users can only use some functions of Autel Mapper, and cannot use the complete functions of the software.

3.2 User Registration

Click [**Create**] in the lower left corner of the login page, and enter the relevant registration information on the corresponding account registration page to complete the registration.

Tips:

- Upon registering for the first time, you will get a 3-month trial period to use the software for free, allowing all functions of Autel Mapper. After the trial period ends, users need to purchase an Autel Mapper account membership to continue to use the software.



3.3 User Login

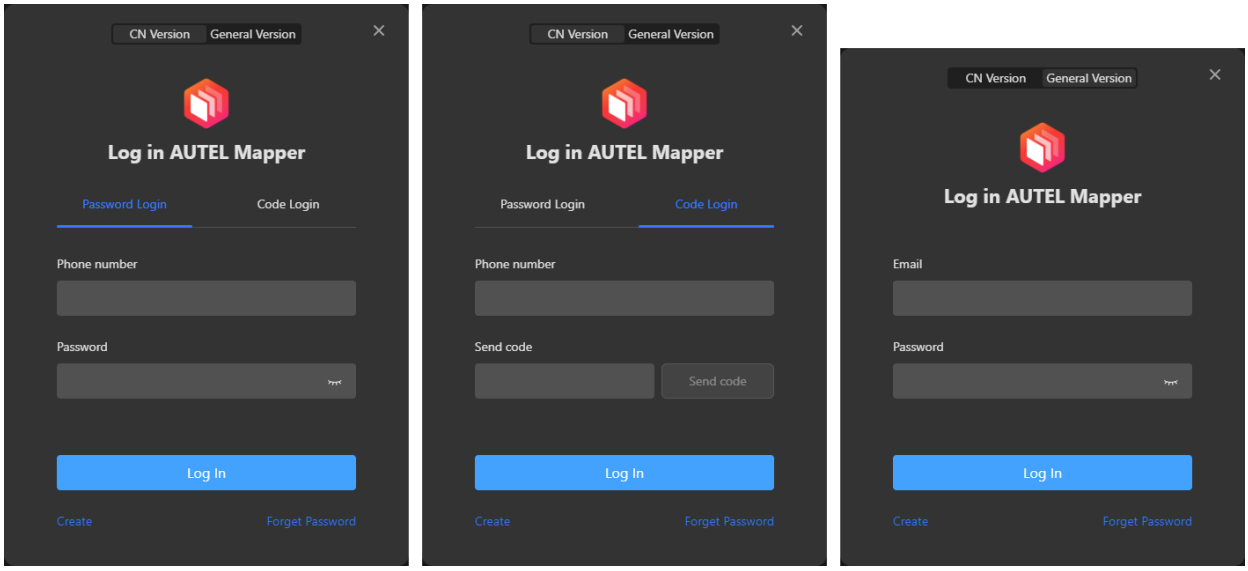
CN account users can freely choose two login methods: **password login** or **SMS login**.

General Version users must log in through email verification.

Note:

- Password login is in the form of registered mobile phone number + password; SMS login is in the form of registered mobile phone number + SMS verification code.

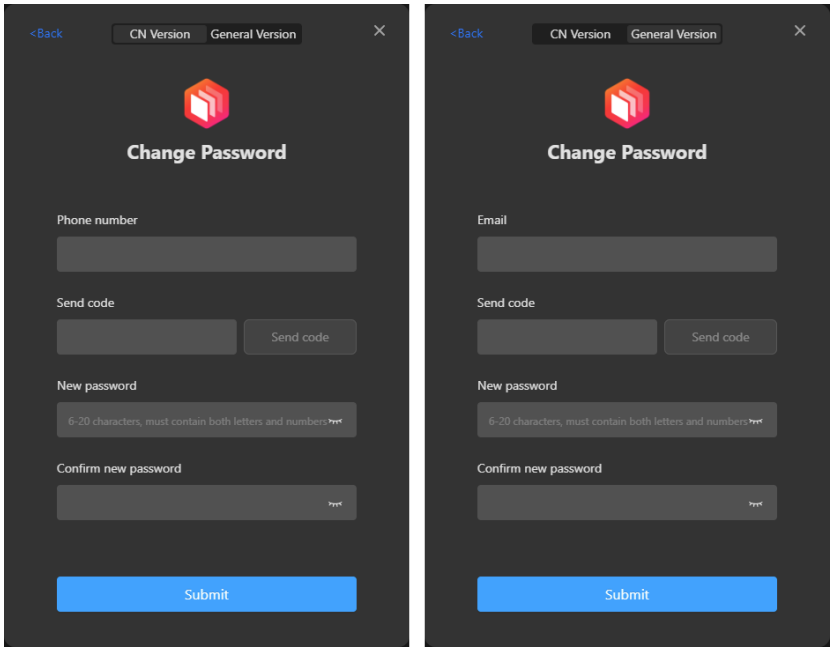
➢ Email verification is in the form of registered email address + password.



3.4 Forgot Password

If a user forgets the password of their Autel Mapper account, simply click [**Forgot Password**] in the lower right corner of the login page to reset the password.

CN version users can enter their mobile phone verification code to reset the password, and General Version users can reset the password through email.



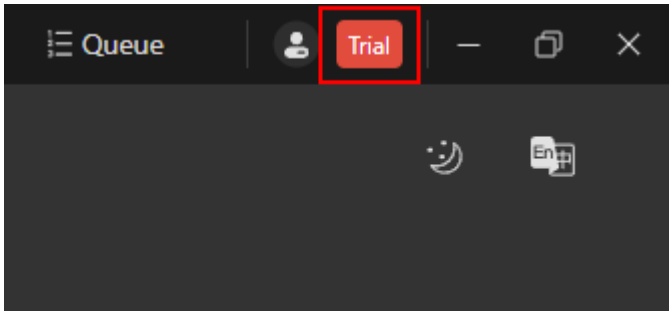
3.5 Purchasing A License

After the user logs in to the Autel Mapper account, click the [Trial] button in the upper right corner on any interface of the software, and fill in the relevant information to complete a purchase application. After submitting the application, Autel Robotics will follow up and grant a license to

use the software.

Tips:

- When the mouse hovers over the [Trial] button, it will switch to a [Buy Now] button.
- Purchase application reviews take time. In order to avoid affecting normal use, if you are willing to purchase, please submit a license application more than 3 working days in advance before the end of the trial period.



4. Glossary

Acronym	Full Phrase	Meaning
GCP	Ground Control Point	Describes the specific geographic information of a point on the ground with a specific identifier.
POS	Position and Orientation System	A specific geographic location.
DSM	Digital Surface Model	Detail and data of ground models
DOM	Digital Orthophoto Map	A model derived from data (orthophotos)
LOD	Levels of Detail	Hierarchical, used for processing and rendering based on position / distance from nodes

Project Management

This chapter introduces Autel Mapper's functions related to project management, including creating new projects, exporting and importing projects, switching project display formats, renaming, deleting, sorting, searching, and switching topics.

1. New Project

1.1 Creating A New Project

Users can use either of the following two ways to create a new project.

- Create a new project with image files: Create a new project by importing images, and there is no need to import images separately after completion.
- Create a new project without Image files: Create a new project directly, and you need to import images separately in the project after completion.

Note:

➢ Autel Mapper only supports images in a .jpg format.

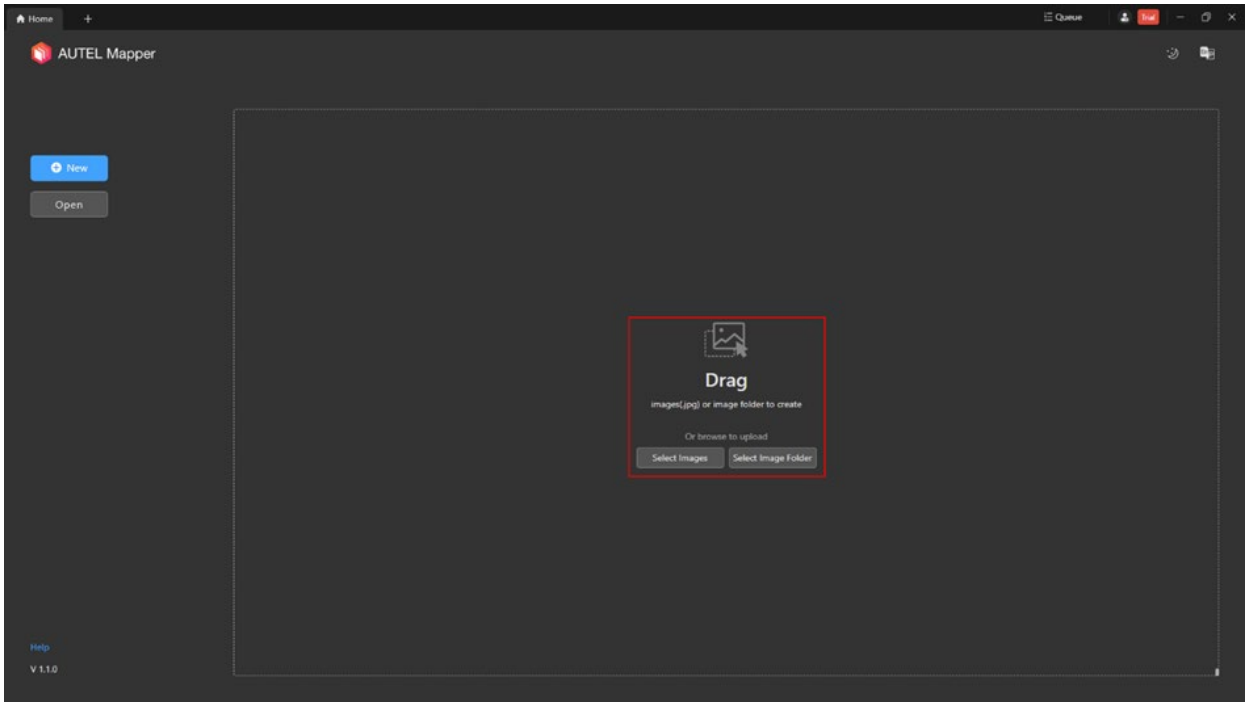
1.1.1 Creating A New Project With Image Files

After opening Autel Mapper:

- Drag and drop the image files onto the computer's local disk or directly to the homepage to begin a new project.
- Drag and drop the image folder in the local disk of the computer directly to the homepage to begin a new project.
- Click the [**Select Images**] button on the home page to select an image from the computer's local disk to begin the new project.
- Click the [**Select Image Folder**] button on the home page to select the image folder from the local disk of the computer (all image files in the folder will be imported into the project) to begin the new project.

Note:

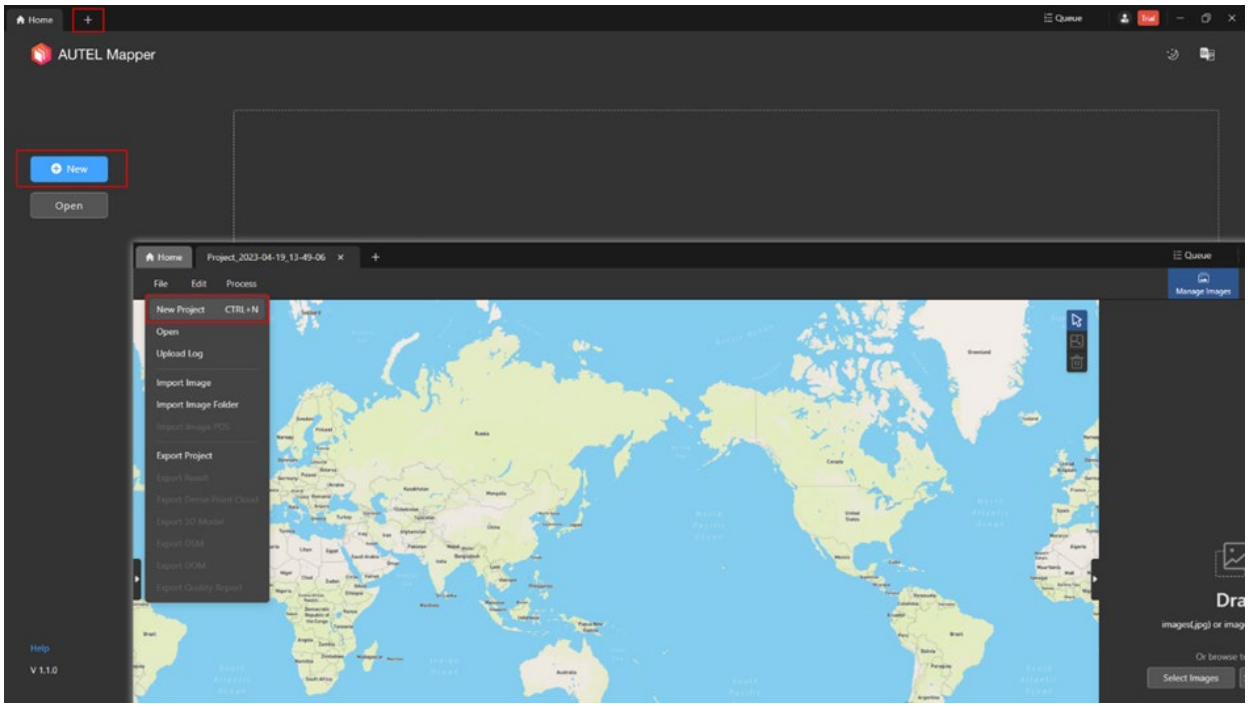
➢ When you choose to create a new image folder, the image files in the subfolders within the folder will also be imported into the project.



1.1.2 Creating A New Project Without Image Files

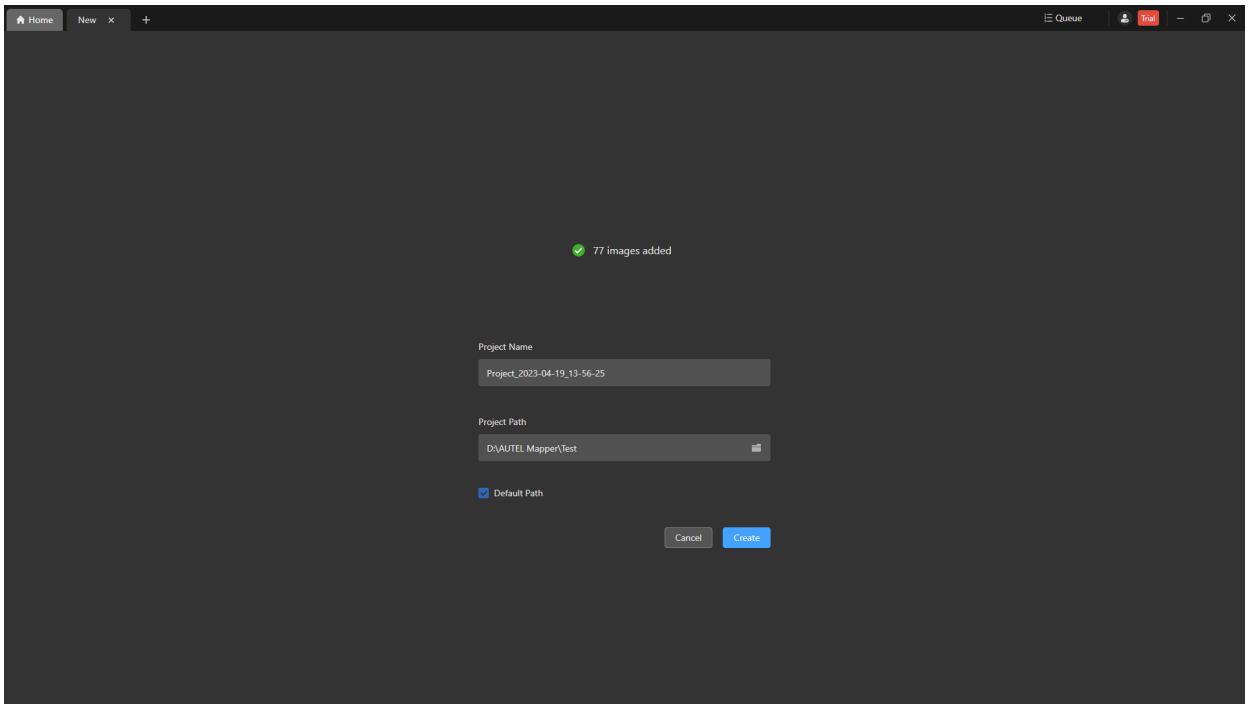
After opening Autel Mapper:

- Click the [**New**] button on the homepage.
- Use the shortcut key [**Ctrl+N**] to begin a new project.
- Click the [+] icon on the top tab to start a new project.
- Click [**File**-> **New Project**] on the menu bar in any open project page to start a new project.



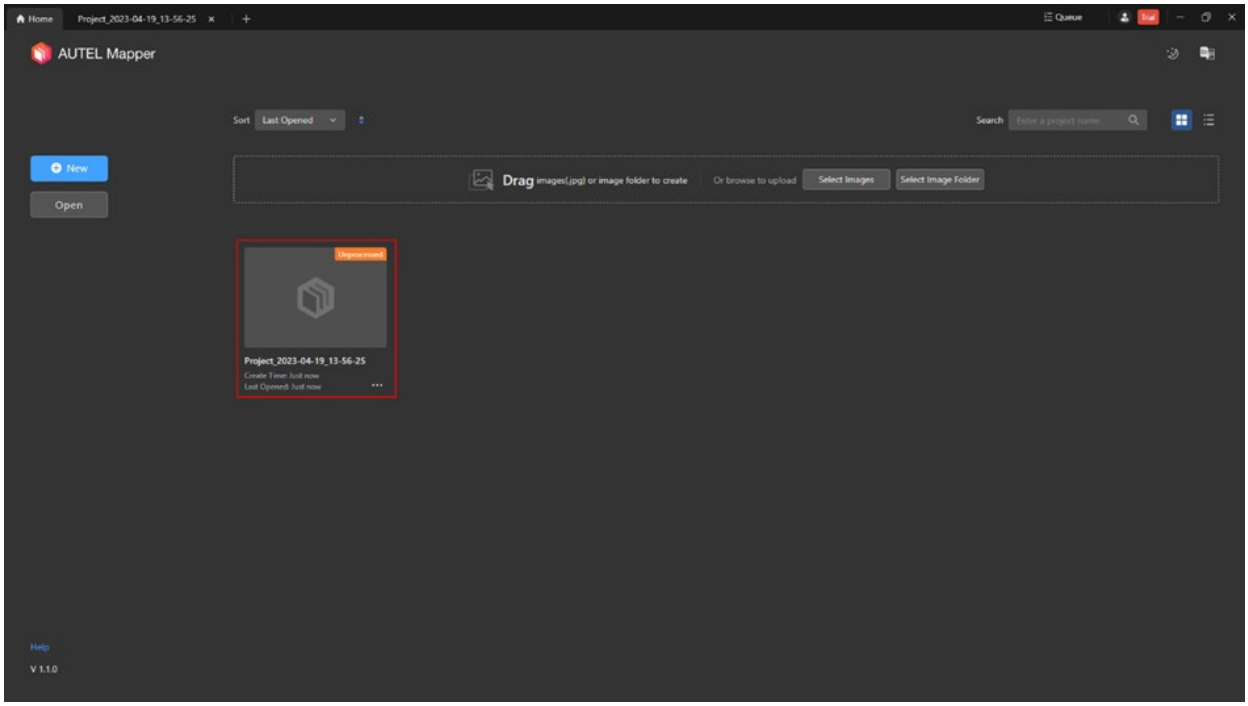
1.2 New Product Page

When creating a new project, the new project page will pop up automatically. Enter the project name and project path in this page to complete the creation of the project folder, allowing for easier management of the project later.



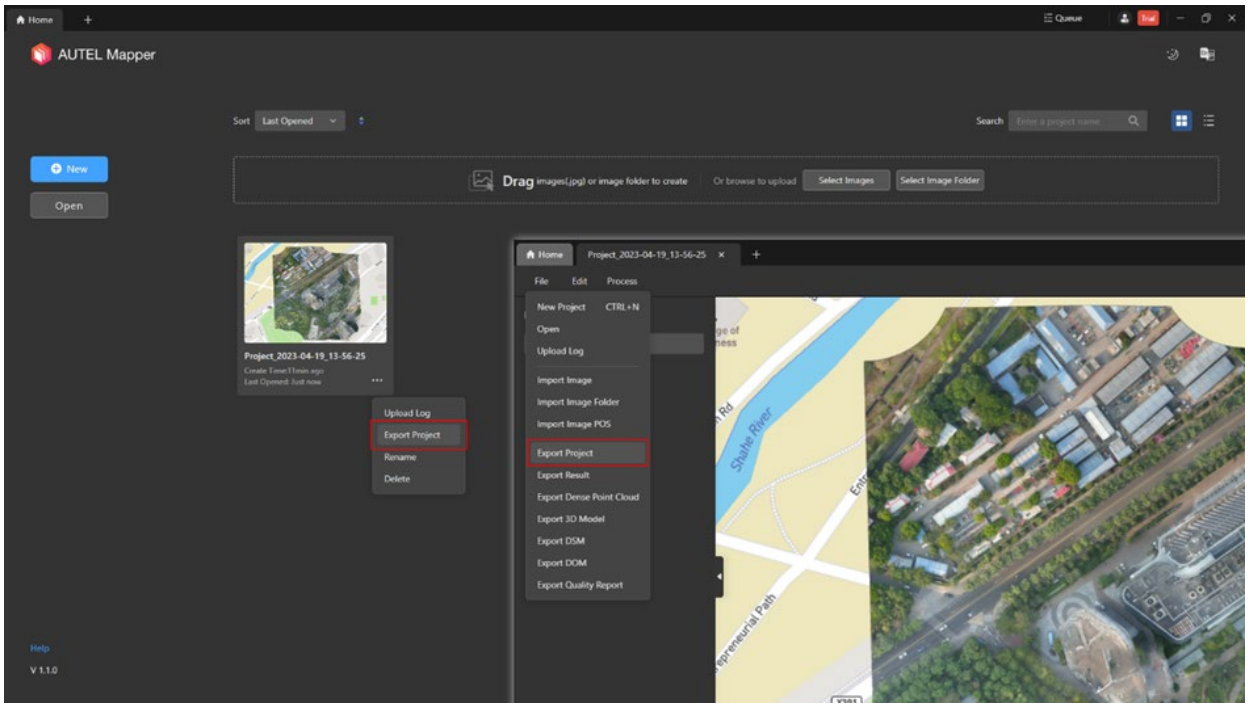
Notes:

- If you create a new project with image files, it will display how many images have been added on the new project page.
- **Project name**: the name of the project folder can be customized by the user. By default, the current year, month, day, hour, minute, and second are displayed (the length is limited to 64 characters).
- **Project path**: The path where the current project folder is saved. The original data and reconstruction results of the project are all saved in the project folder.
- **Default path**: After checking the default path, the project folders of subsequent new projects will be saved in the same path as the current project folder, otherwise, the user needs to manually select the project path every time a new project is created.
- Click [**Cancel**] to cancel the new project and return to the home page, and click [**Create**] to enter the project page.
- After the new project is successfully created, you can view the created project in the project list on the home page.

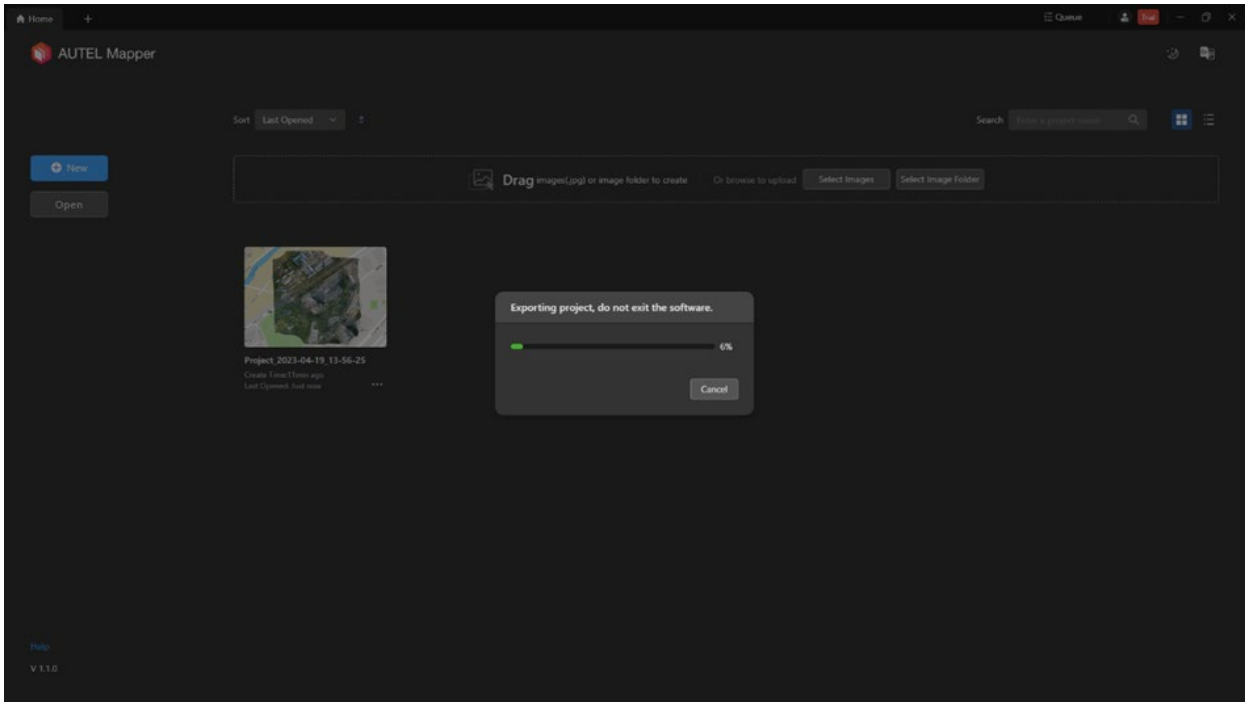


2. Export Project

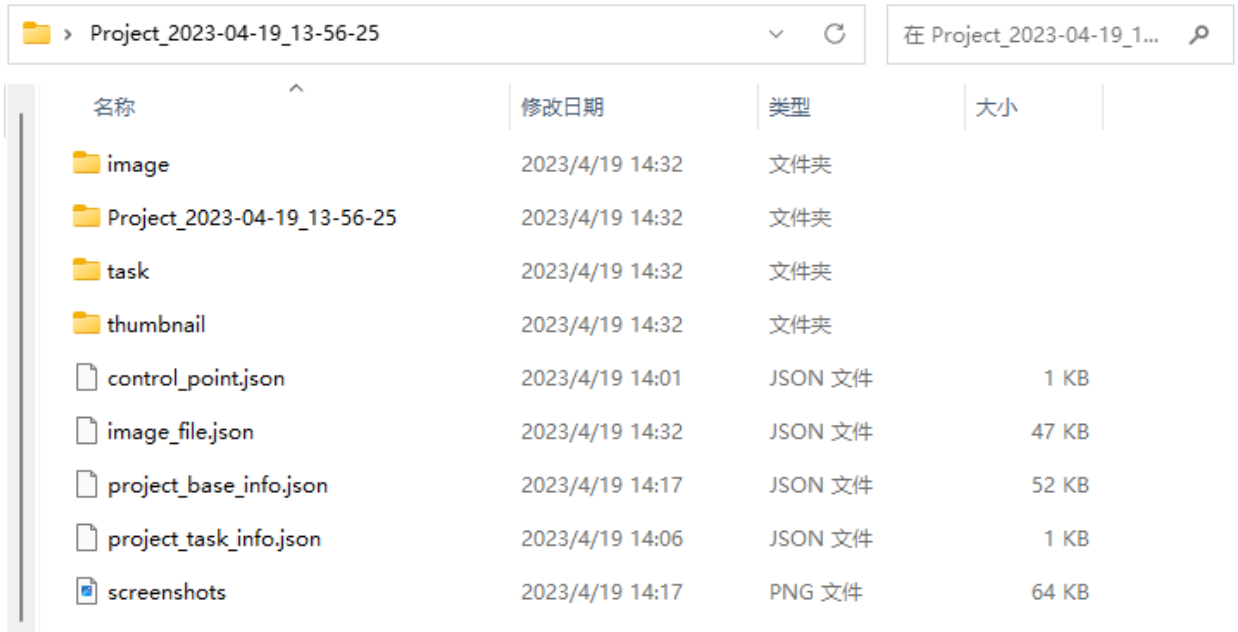
In the project list on the home page, click the [**...**] icon in the project and select [**Export Project**] in the pop-up menu or click the menu bar [**File->Export Project**] on the project page.



After selecting the export path, the export progress bar pop-up window will pop up automatically, click [**Cancel**] to cancel the export.



After the export is successful, you can view the project folder under the selected export path, which contains project pictures and reconstruction results.



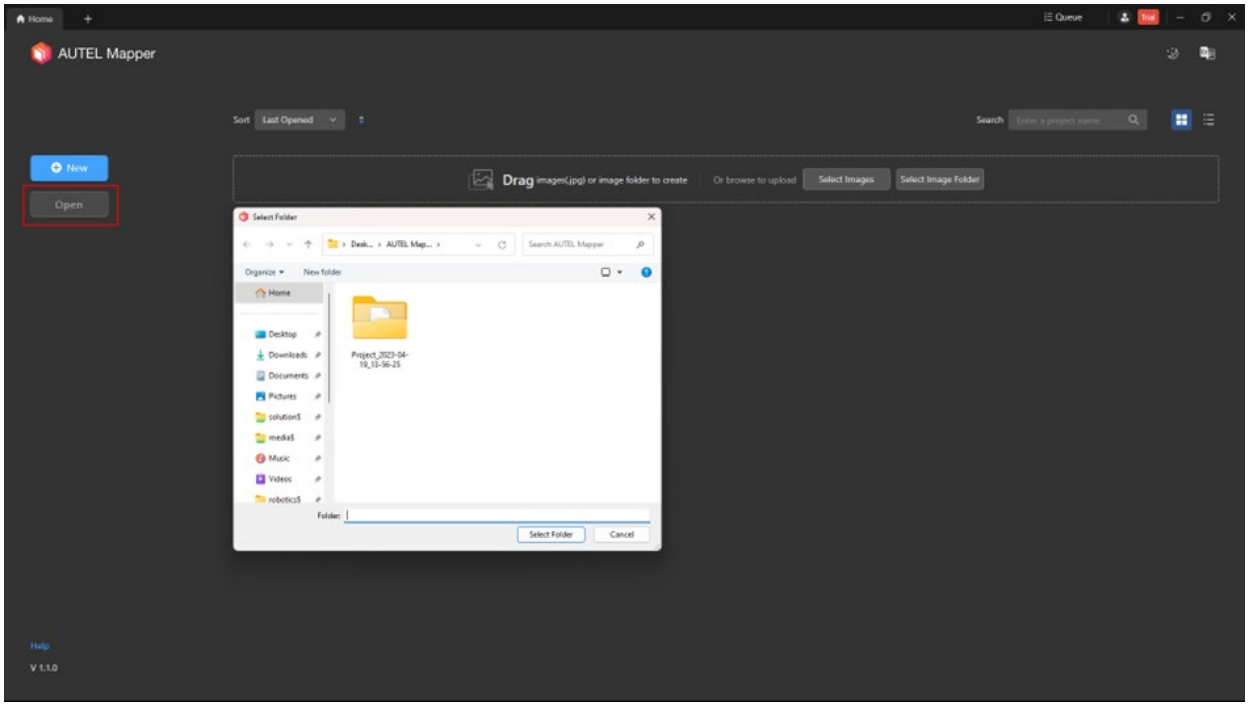
3. Importing A Project

Click the [**Open**] button on the home page to open the system file explorer, select the project folder to complete the import project operation.

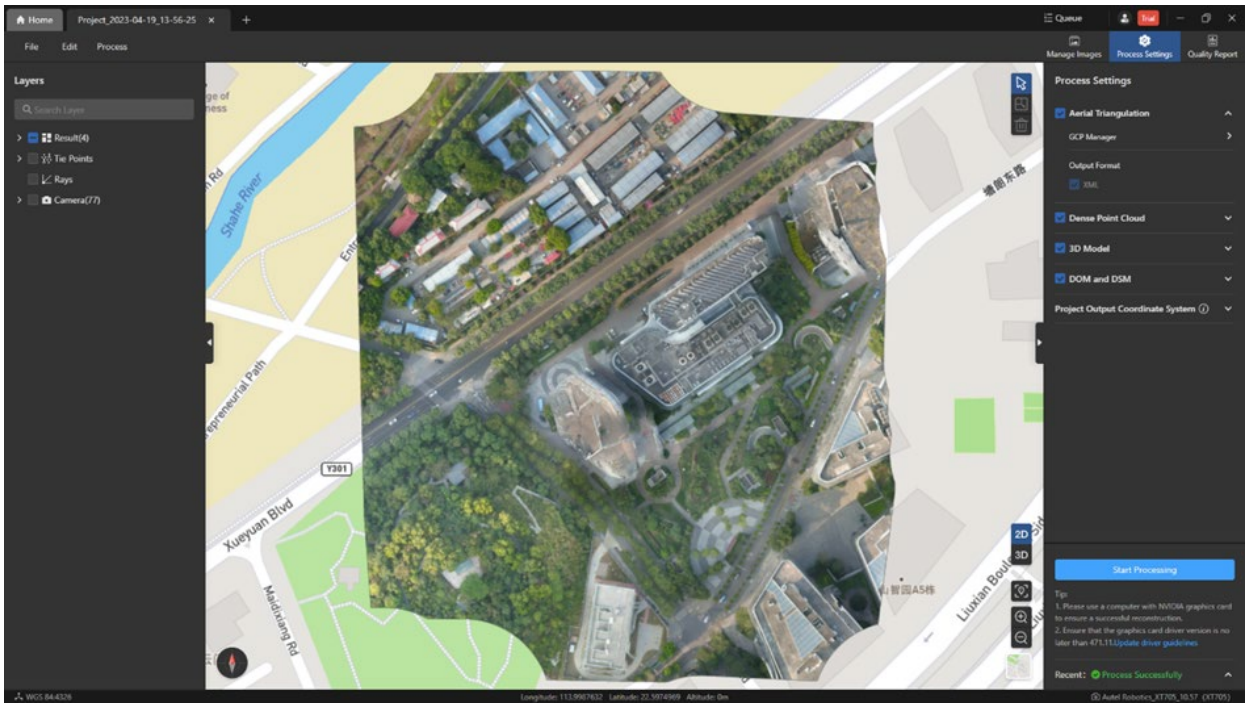
To successfully import a project, the following must be met:

- The selected folder must be an eligible project folder.
- The name of the project folder must not be the same as a project already in the

homepage project list.



After the import is successful, it will automatically enter the corresponding project page and display the existing processing results.



4. Toggle Project View Options

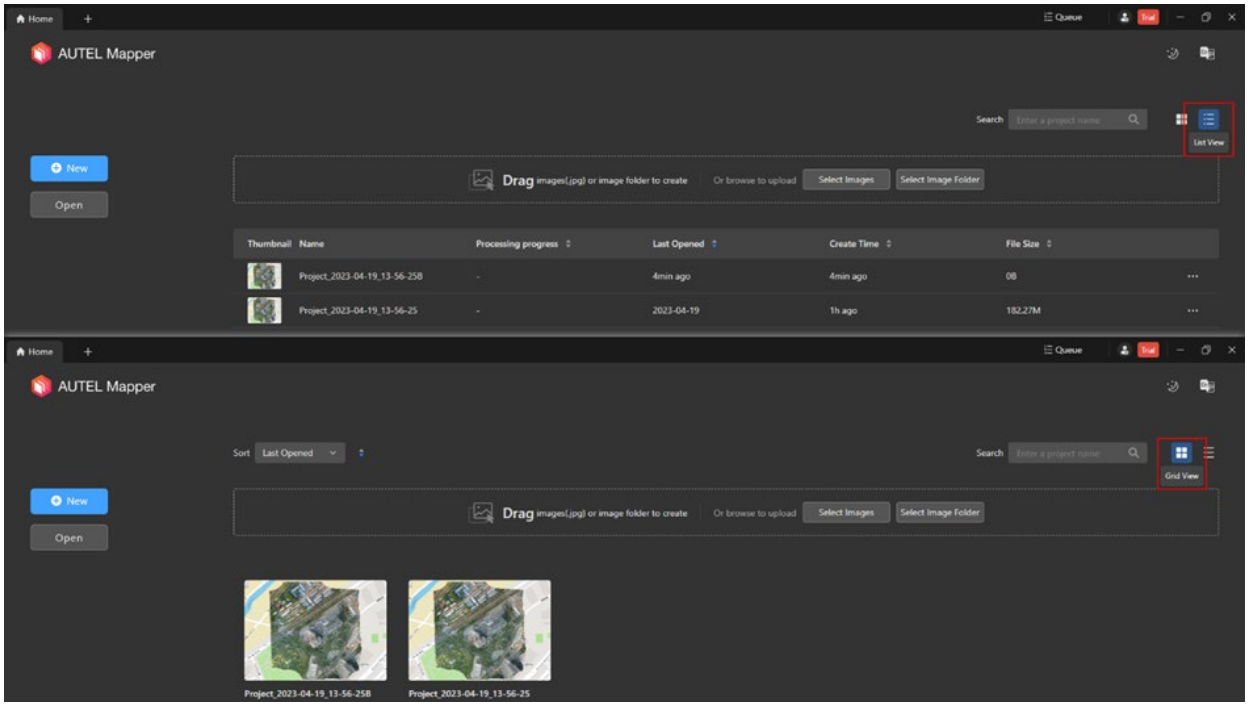
The item list display forms are divided into [**Grid View**] and [**List View**], the default being [**Grid View**].

Click the [**List View**] icon or the [**Grid View**] icon next to the search bar on the right side of

the homepage to switch the item list to the corresponding display format.

Notes:

- Operations such as [**Upload Log**], [**Export Project**], [**Rename**], and [**Delete**] in the two forms are the same.
- The file size of each item is displayed in list form.

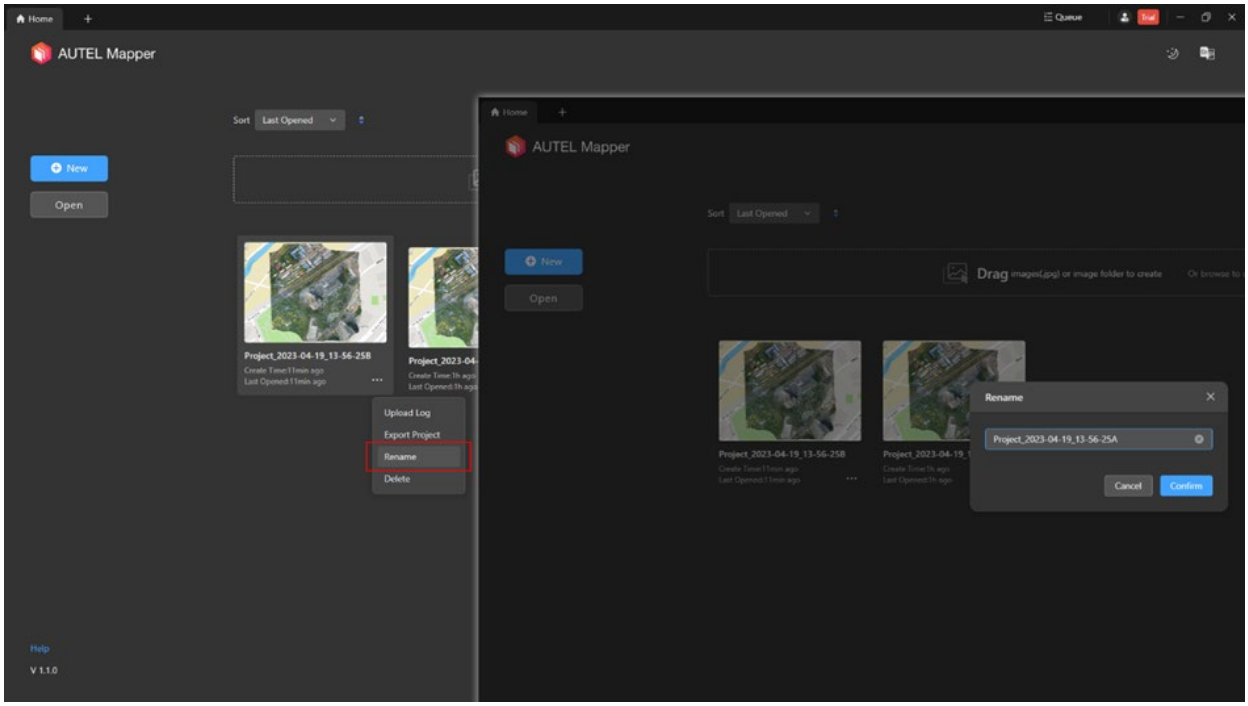


5. Renaming

In the project list on the home page, click the [**...**] icon in the project and select [**Rename**] in the pop-up menu. In the pop-up window, enter the new project name (it must not be the same name as the project in the project list) and click [**Confirm**], the file will be renamed.

Note:

- The renamed project name must not be the same as an existing project in the project list.

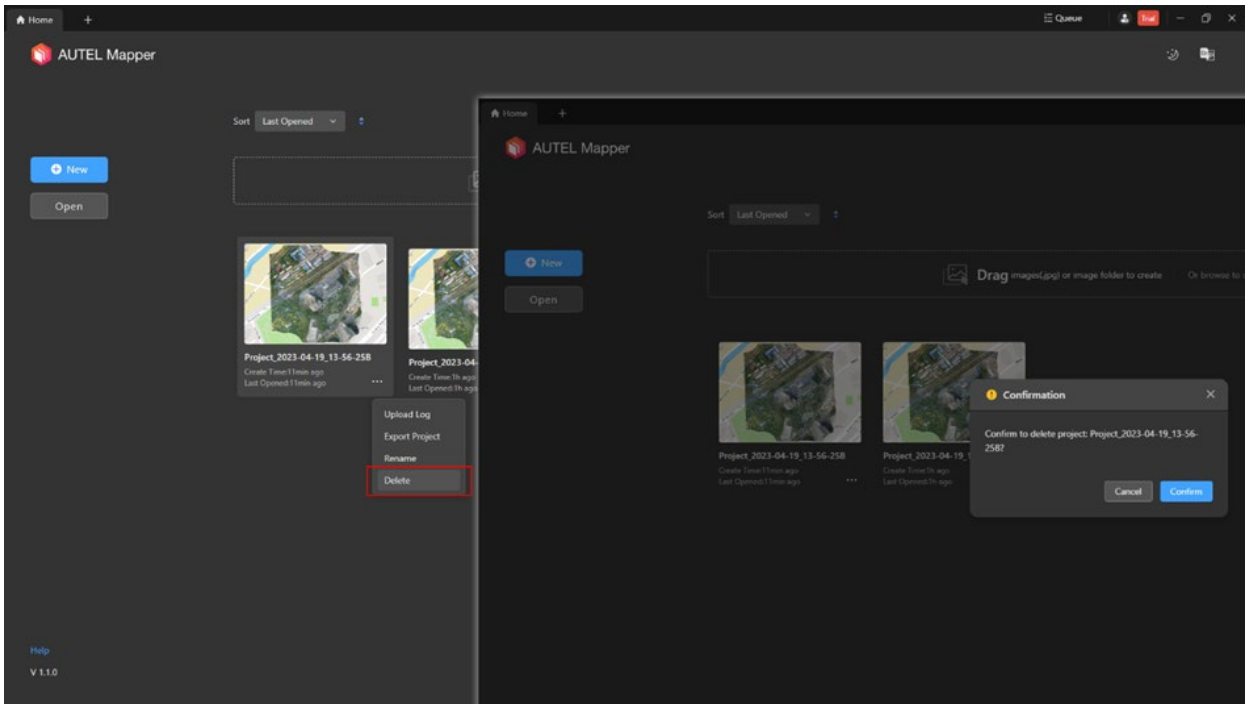


6. Deleting

In the project list on the homepage, click the [...] icon in the project and select [**Delete**] in the pop-up menu to delete the corresponding project.

Tips:

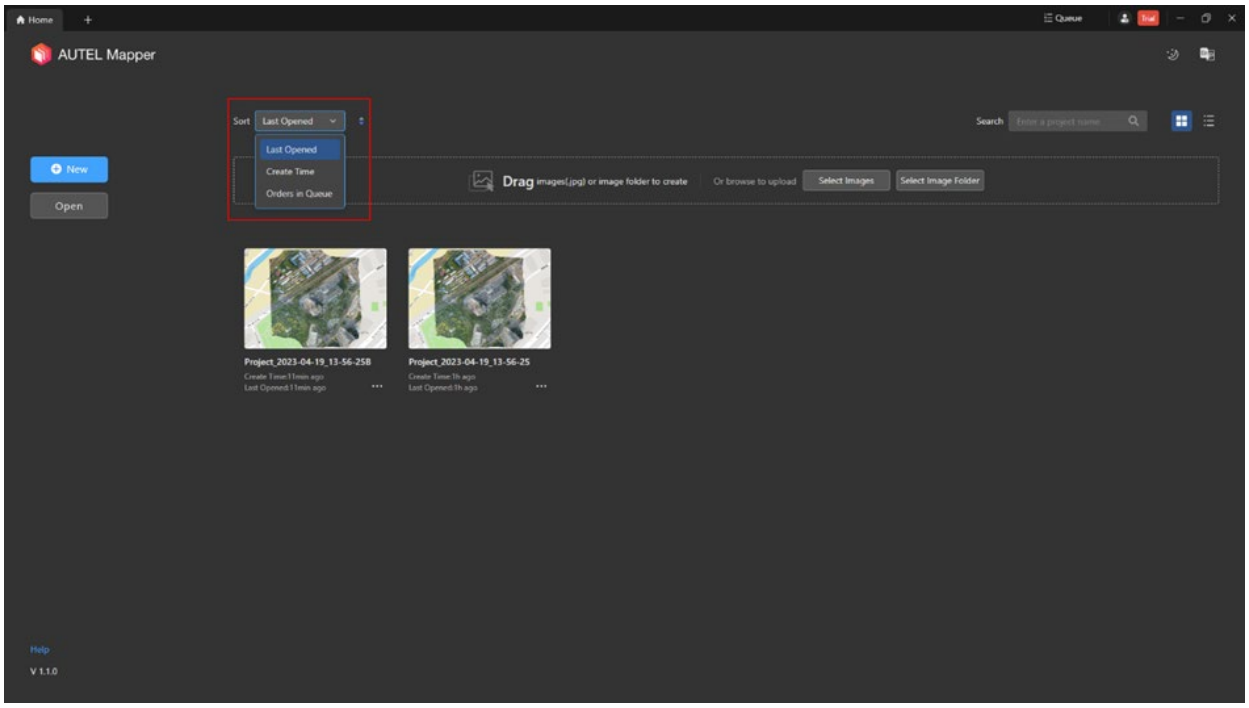
- The [**Delete**] operation will delete the corresponding project folder at the same time, before deleting, always confirm you are aware of what you are deleting.



7. Sorting

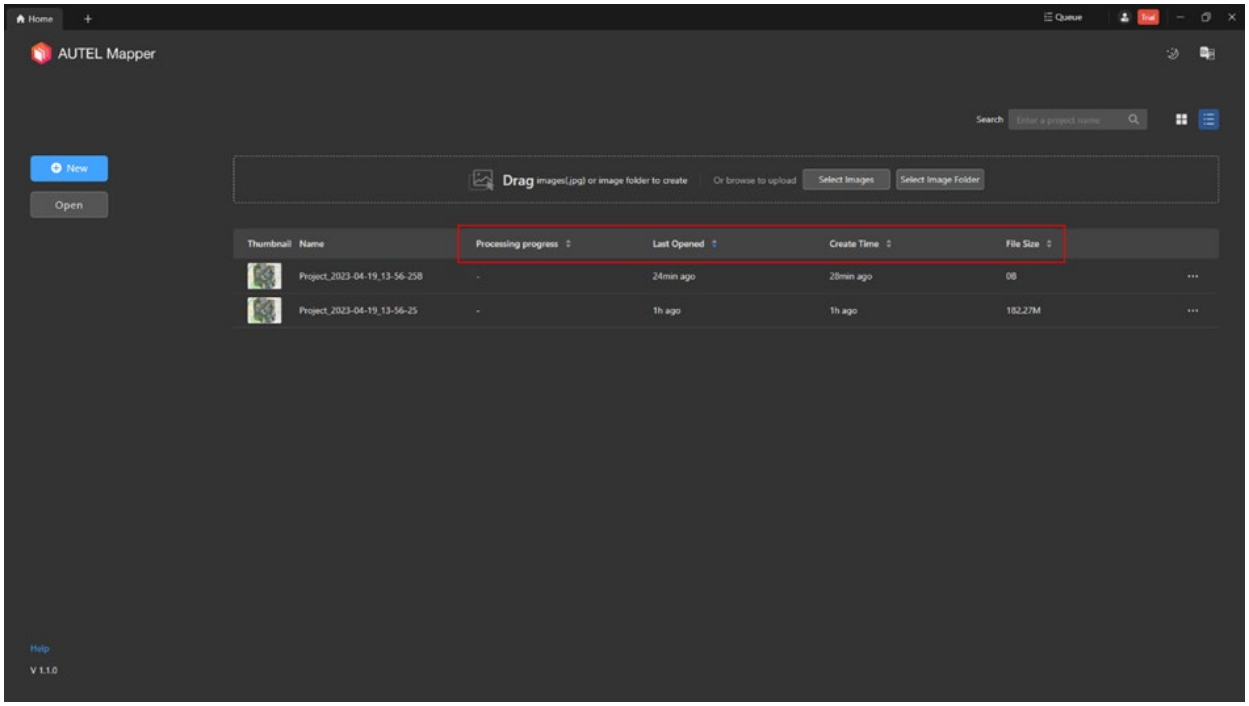
7.1 Sorting With Grid View

When the item list is displayed in the grid view form, it supports three methods: [**Last Opened**], [**Create Time**], and [**Orders in Queue**].



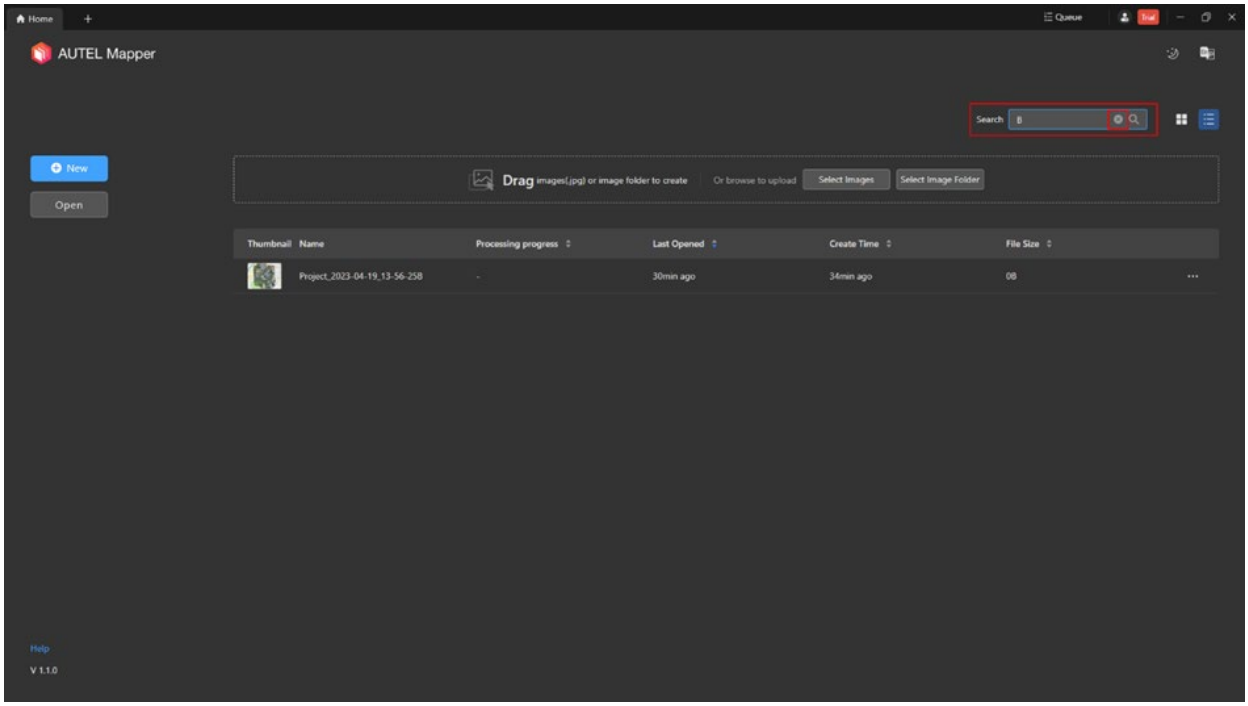
7.2 Sorting In List View

When the project list is displayed in the form of a list, it supports four methods for sorting: [**Processing Progress**], [**Last Opened**], [**Create Time**], and [**File Size**].



8. Searching

Enter the project name in the search bar on the right side of the home page to query the project, supporting exact match or relative match.



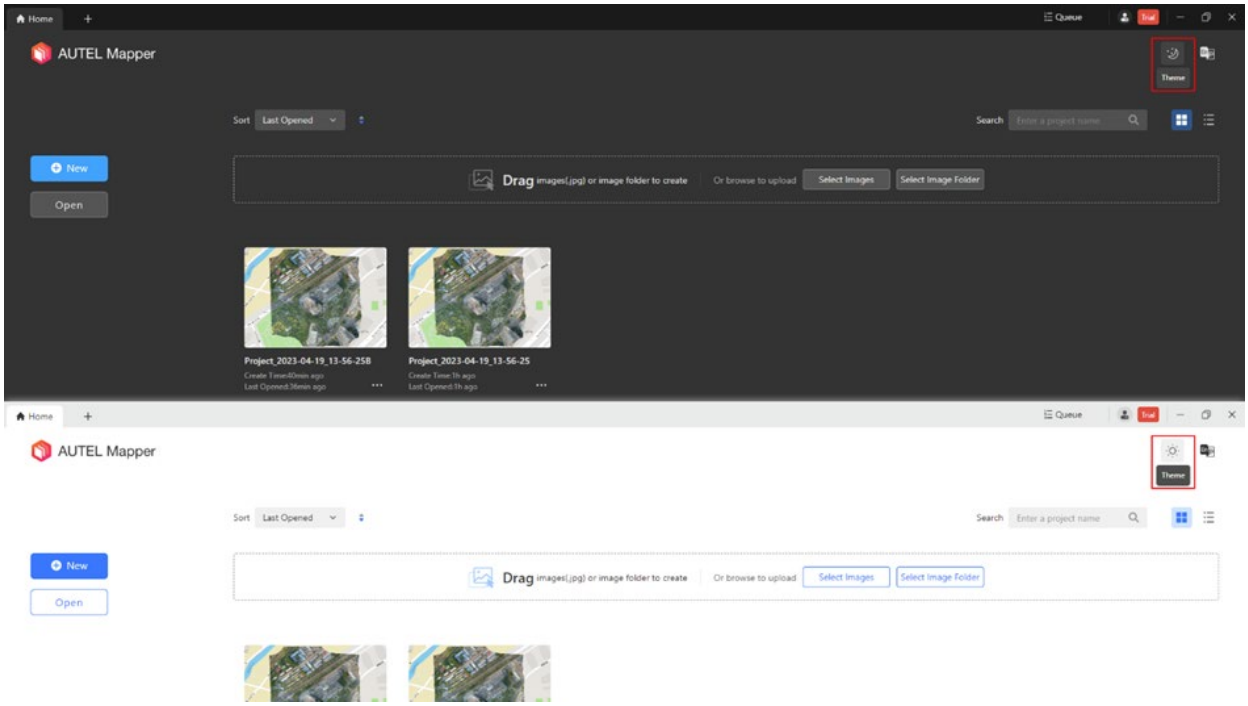
Tips:

- After performing the search operation, only the corresponding search results are displayed in the project list area. At this time, you can press the [**ESC**] key on the keyboard or click the [**X**] button in the search bar to return to the project list overview, and the search box will be automatically cleared.
- When the search keyword cannot find a relative match, "Data not found" will be shown.

9. Switching Themes

Autel Mapper currently supports a dark theme and light theme, with the default is dark theme.

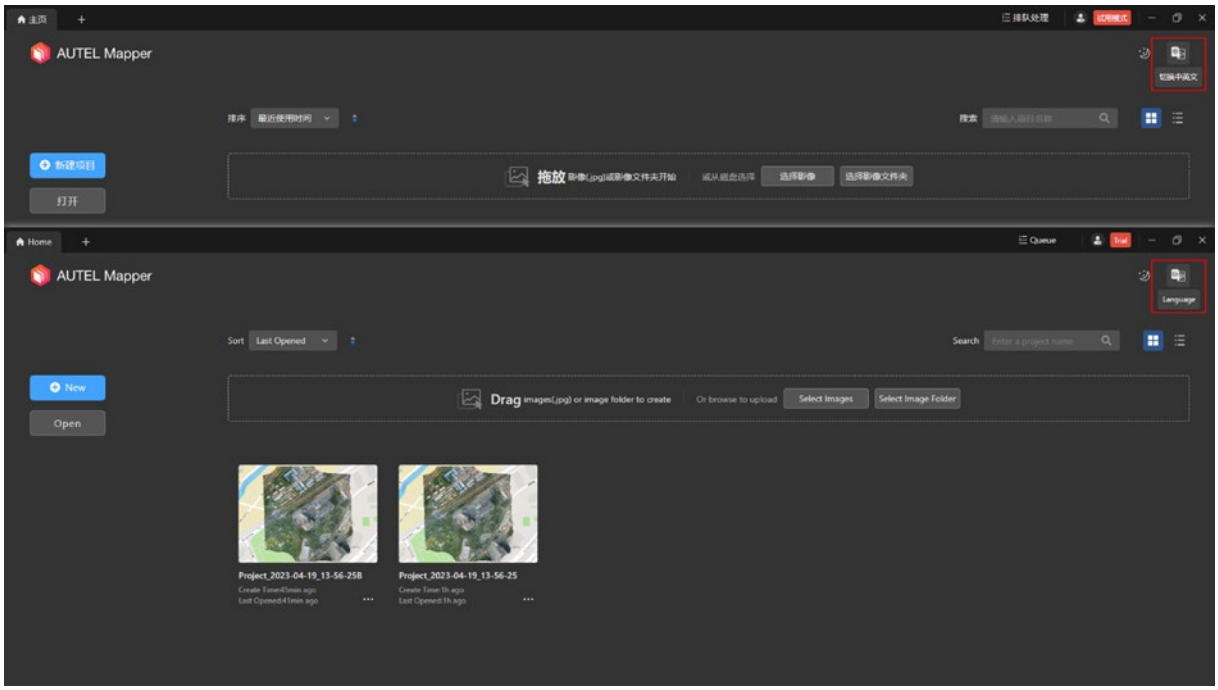
Click the [**Theme**] icon in the upper right corner of the homepage to switch back and forth between the two themes.



10. Switching Language

Autel Mapper supports two interface display languages: **Simplified Chinese** and **English**.

Click the [**Language**] icon in the upper right corner of the home page to switch between the two display languages.



Applying And Using Data

This chapter introduces the relevant data operations of Autel Mapper, including image management, POS data management, camera management, and setting the output coordinate system.

1. Adding Images

When creating a new project without image files, you need to add an image separately on the project page.

Tips:

This operation can be ignored by creating a new project without image files.

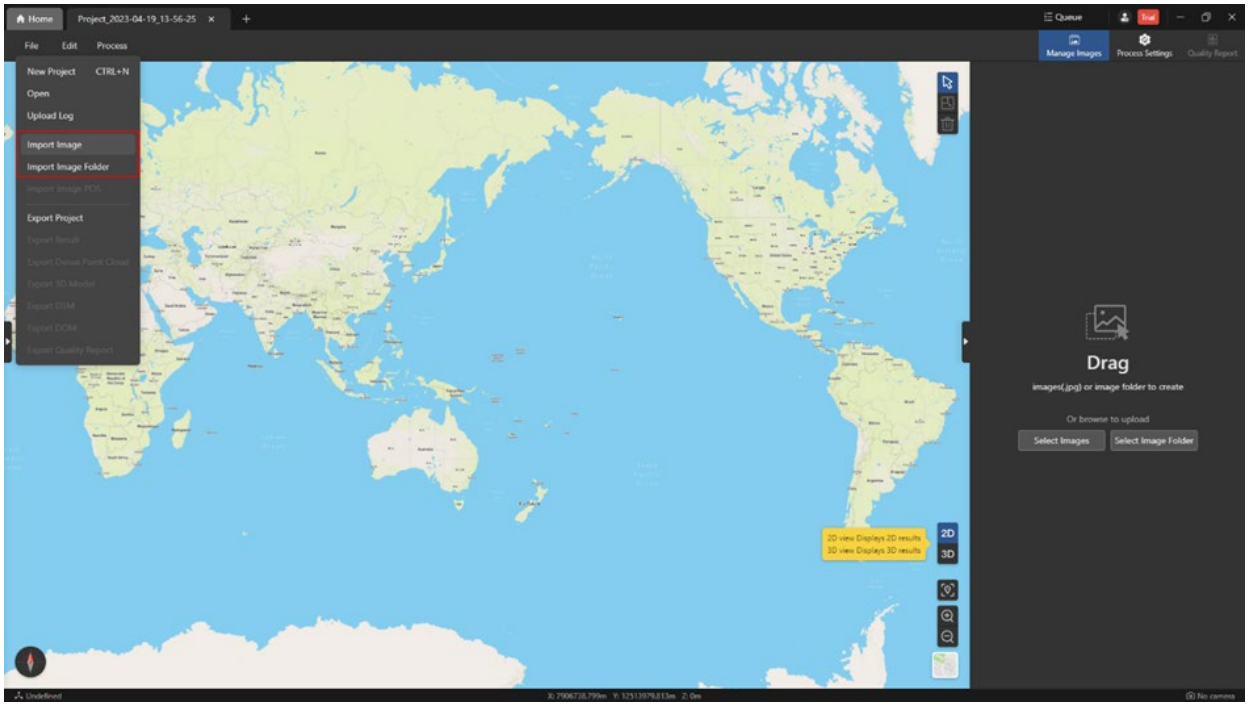
1.1 How To Add Images

After creating a new project without image files, on the project page:

- Click [**File->Import Image**] or [**File->Import Image Folder**] in the menu bar to import image files from the local disk of the computer.
- Click the [**Select Images**] button or the [**Select Image Folder**] button on the right [**Manage Image**] page to import image files from the local disk of the computer.
- Drag and drop images or image folders from your computer's local disk directly into the project page.

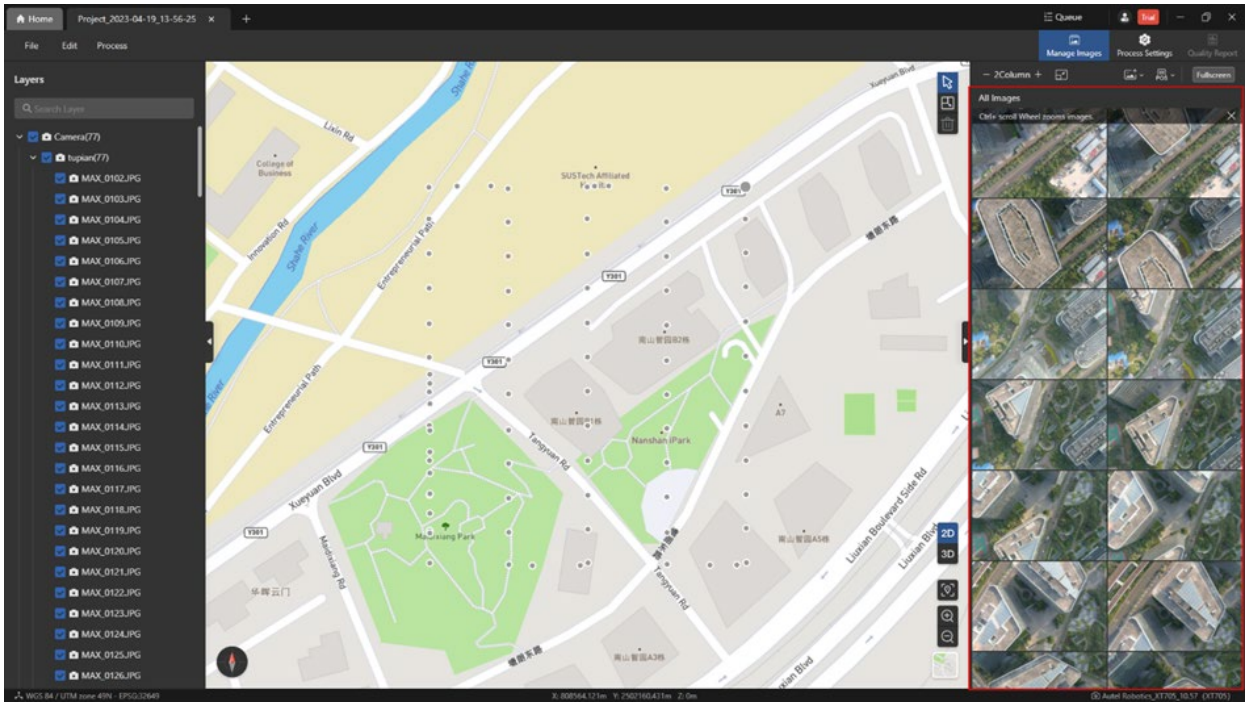
Note:

- When an image folder is selected, image files in subfolders within the folder will also be imported into the project.

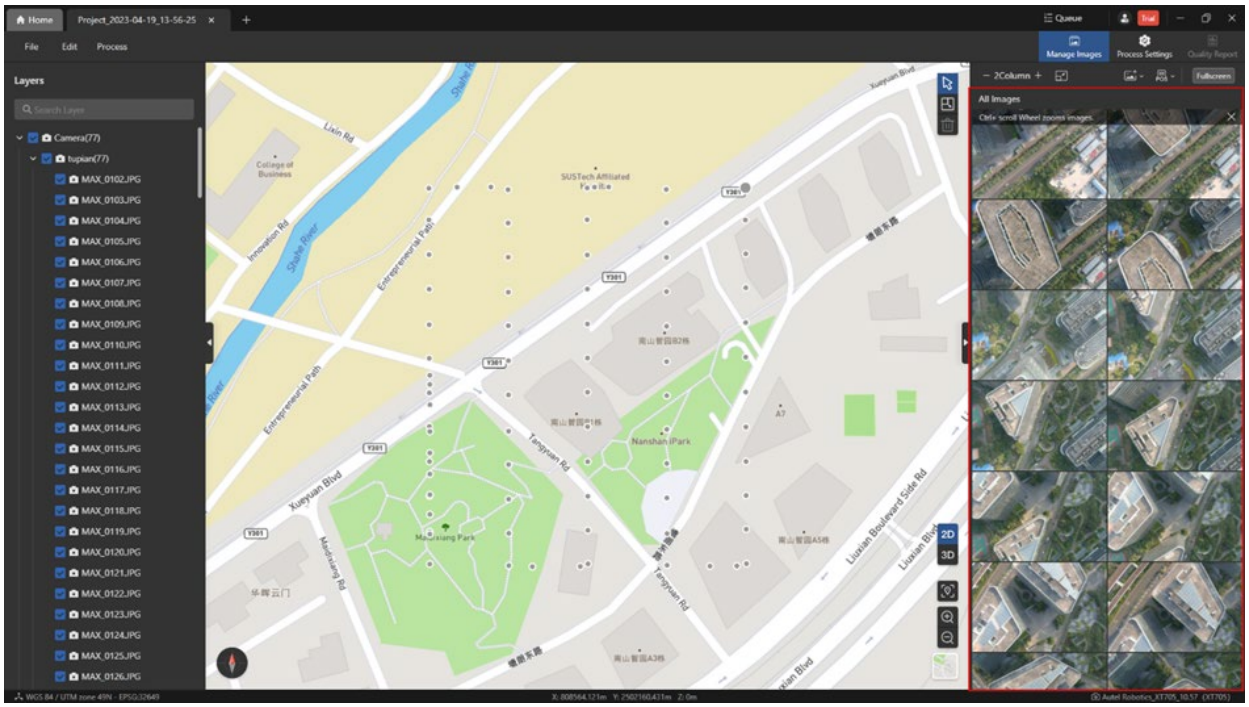


1.2 Image Management

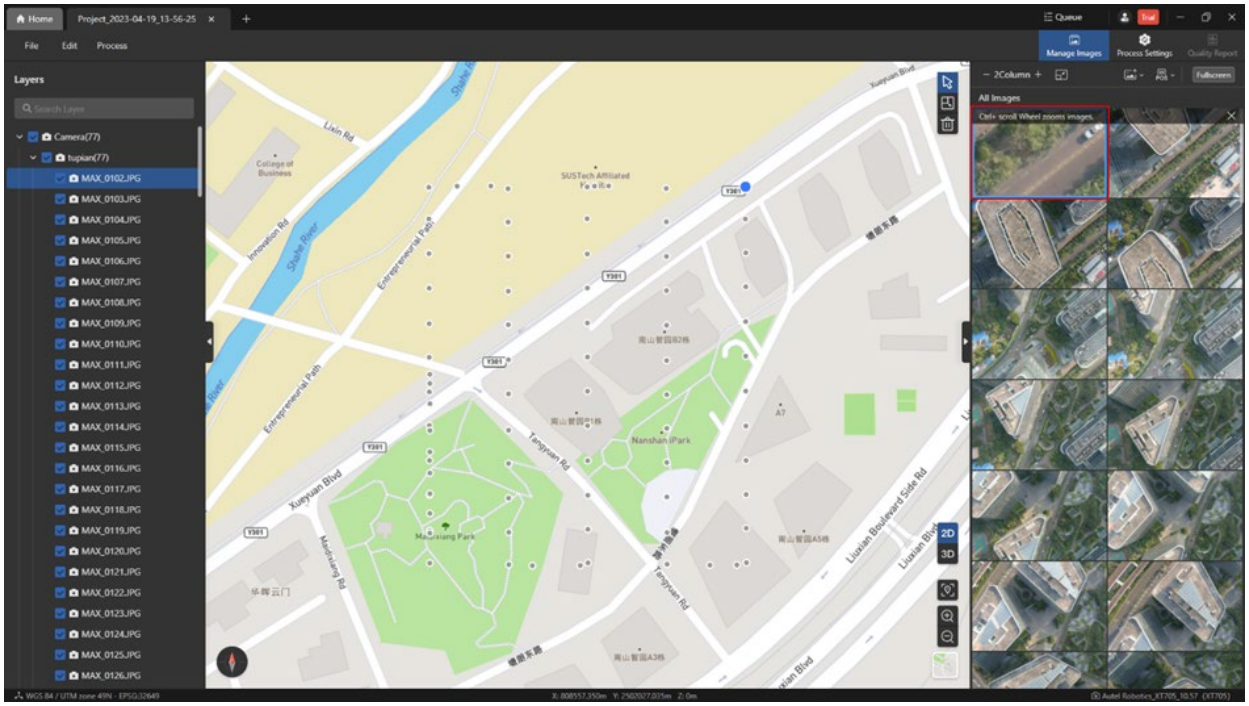
After successfully adding images, the added images will be displayed on the [**Manage Images**] page on the right.



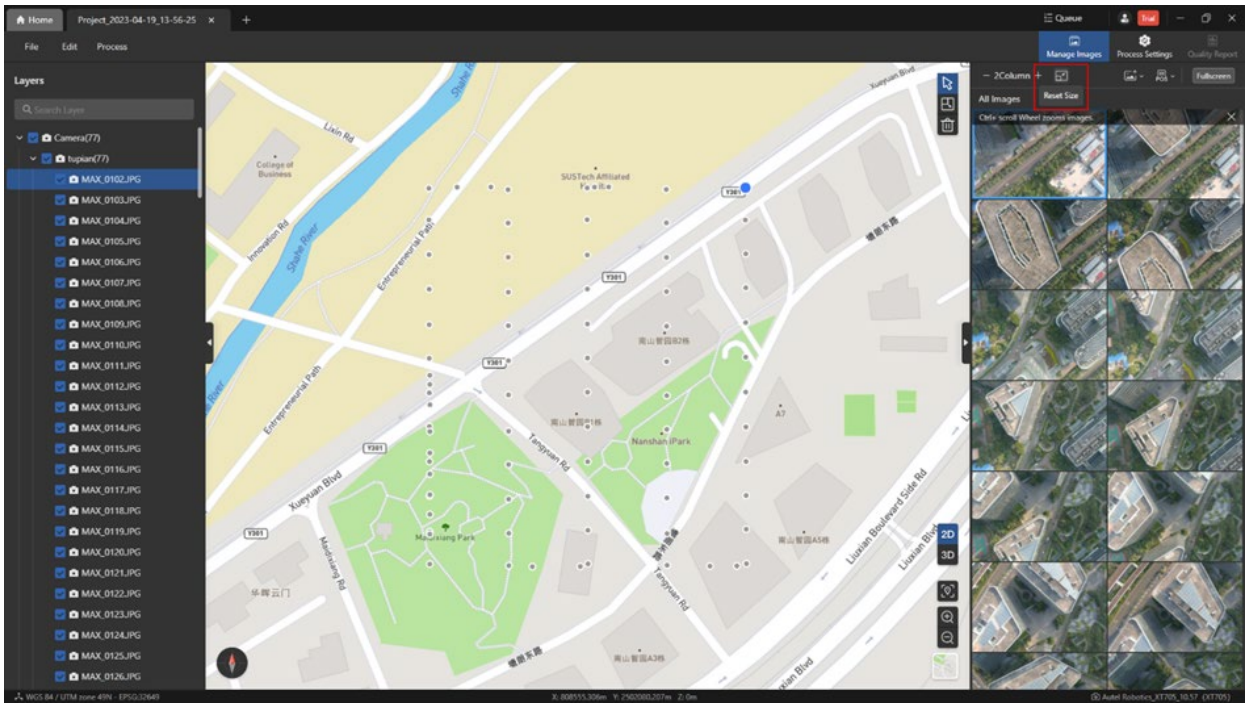
Click the [-] icon or the [+] icon in the upper left corner of the [**Manage Images**] page to modify the number of columns displayed in the image management page. The default is 2 columns, this can be adjusted from 1 to 5 columns.



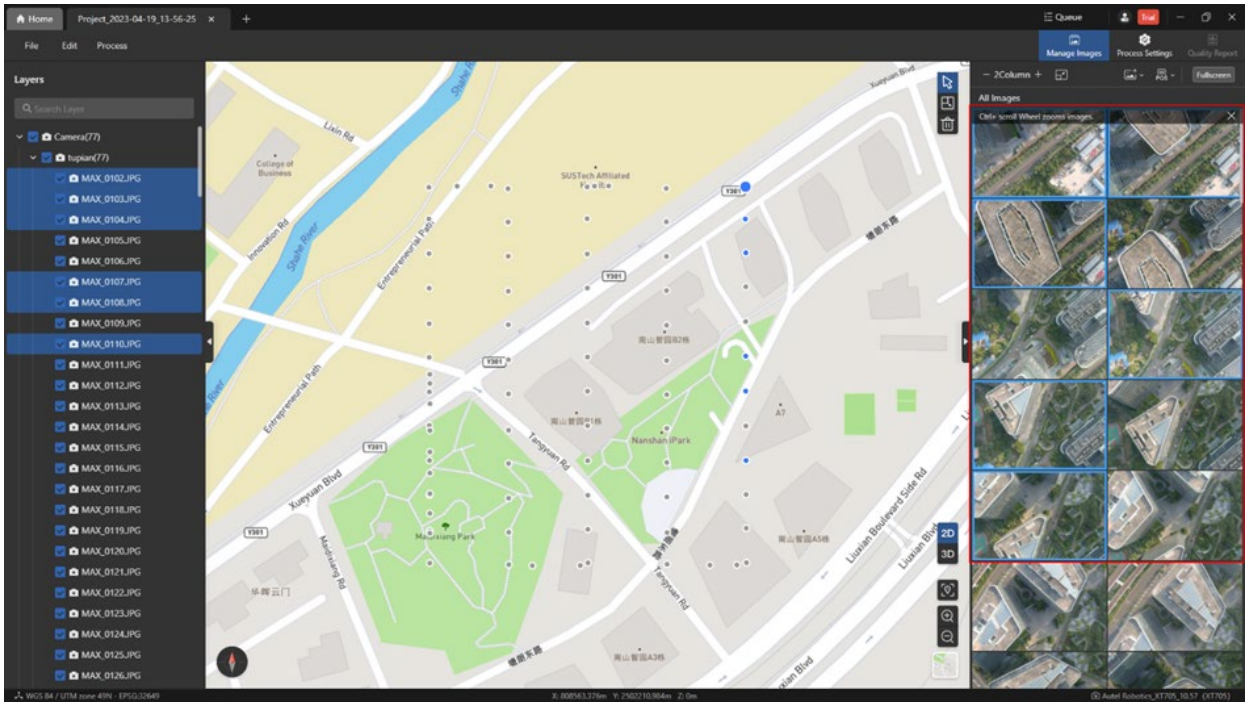
Use【**Ctrl+Scroll**】to zoom in/out of the currently selected image.



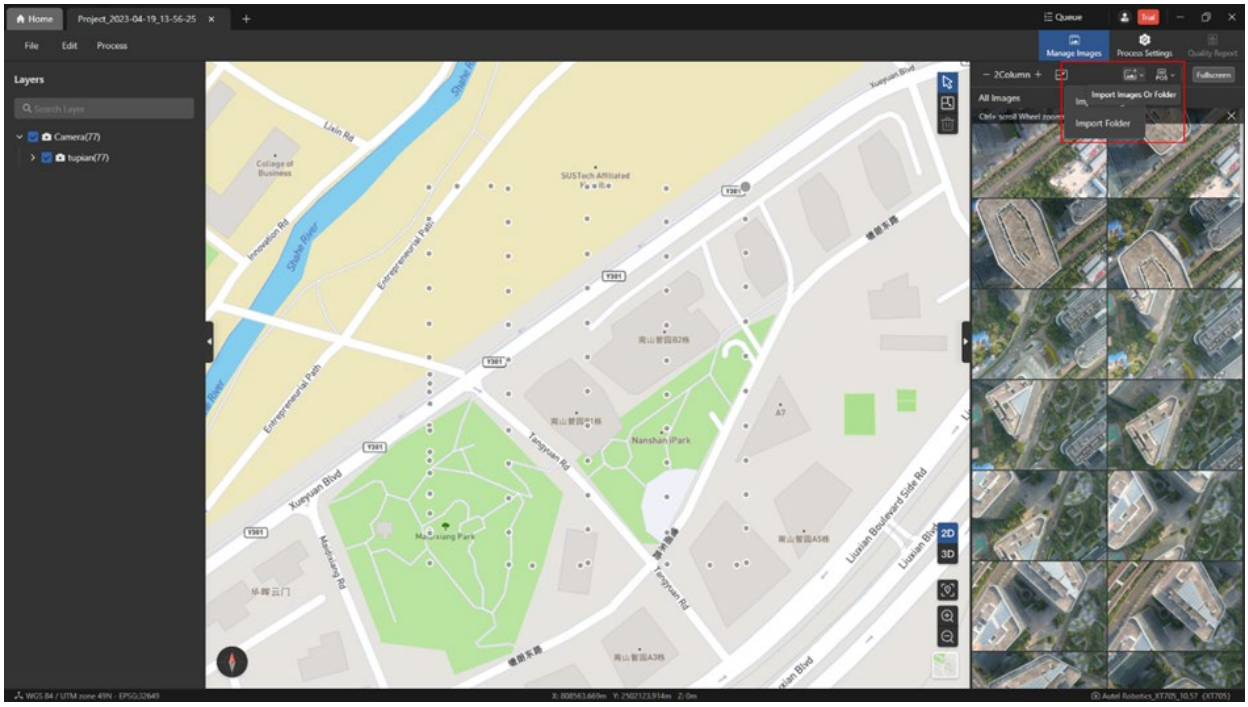
Click the [**Reset Size**] icon to restore the zoomed image to the default display size.



In the [**Manage Images**] page, use the keyboard [**Up**], [**Down**], [**Left**], [**Right**] arrow keys to switch and select a single image. Use [**Ctrl + mouse click**] or [**Shift + mouse click**] to select multiple images at the same time.



Click the [**Import Image Or Folder**] icon in the upper right corner of the [**Manage Images**] page to import new images, and display them in the form of folders on the left [**Layers**] page.

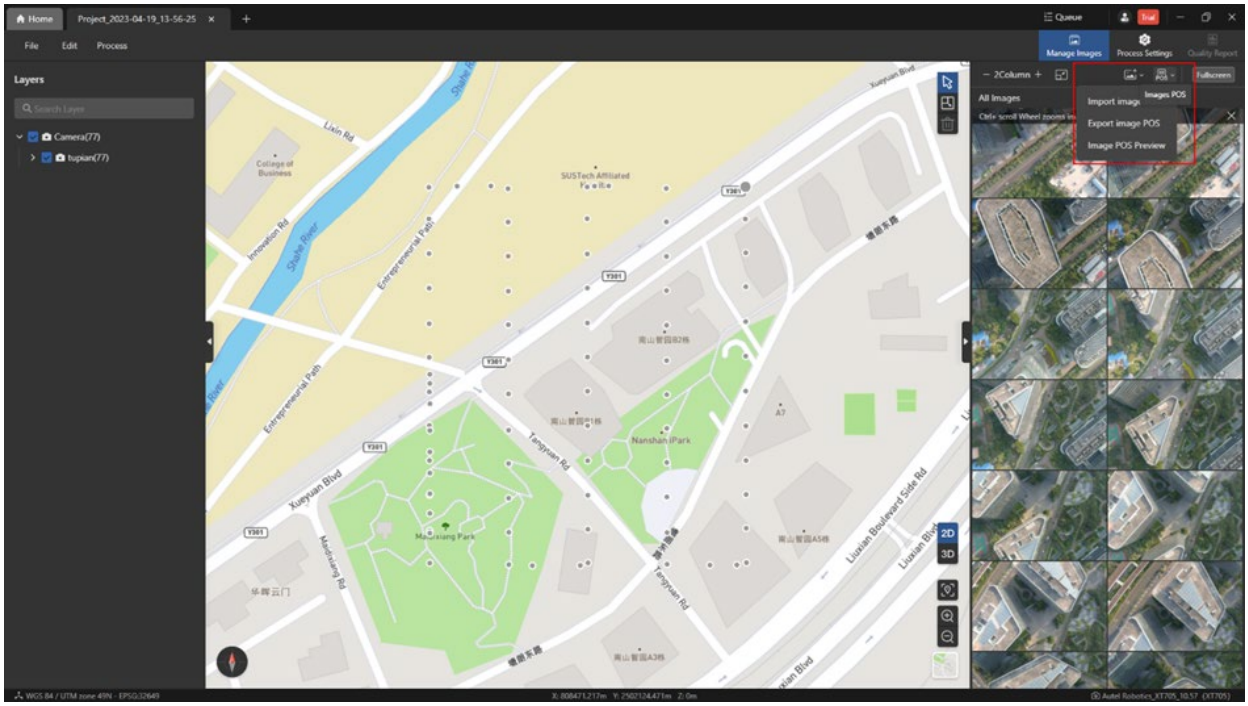


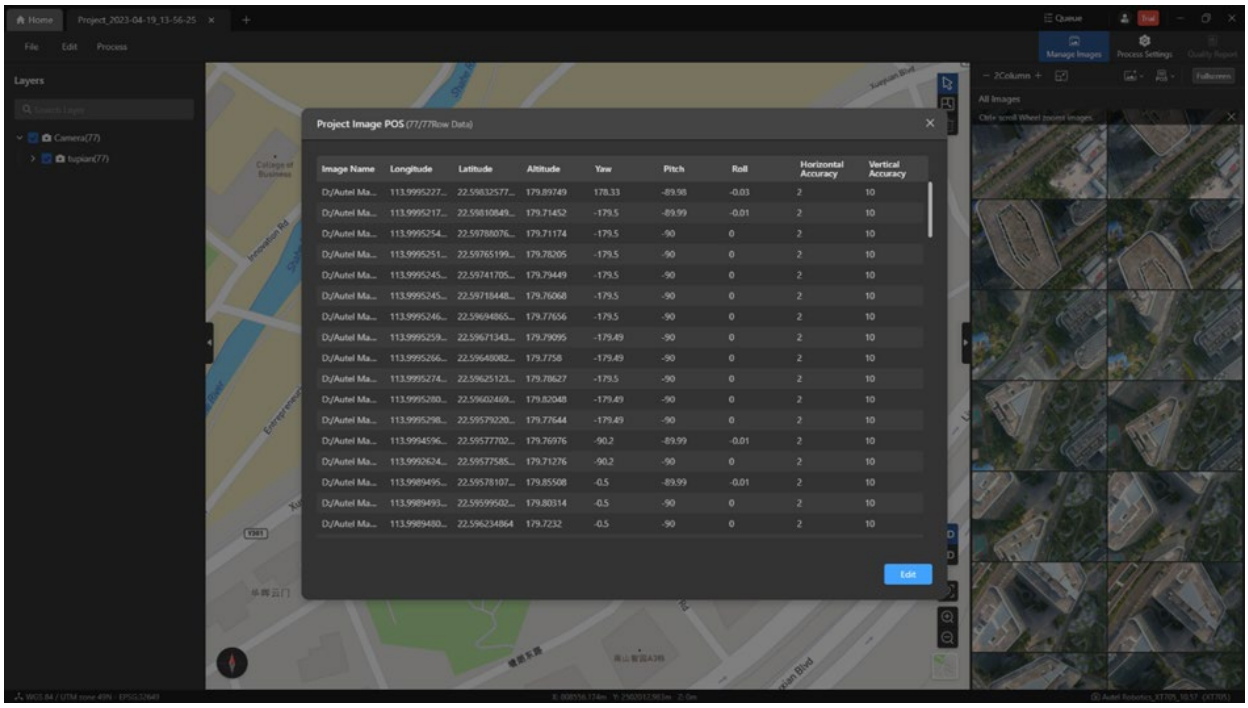
Click the [**Images POS**] icon in the upper right corner of the [**Manage Images**] page to import, export, and view image POS.

Tips:

- **Import Image POS**: select the image POS file from the local disk of the computer and import it, supporting .txt or .csv formats.
- **Export Image POS**: Export the POS information of all images in the current project to the computer in .csv format.

- **Image POS Preview**: Click to preview the POS information of all current images.



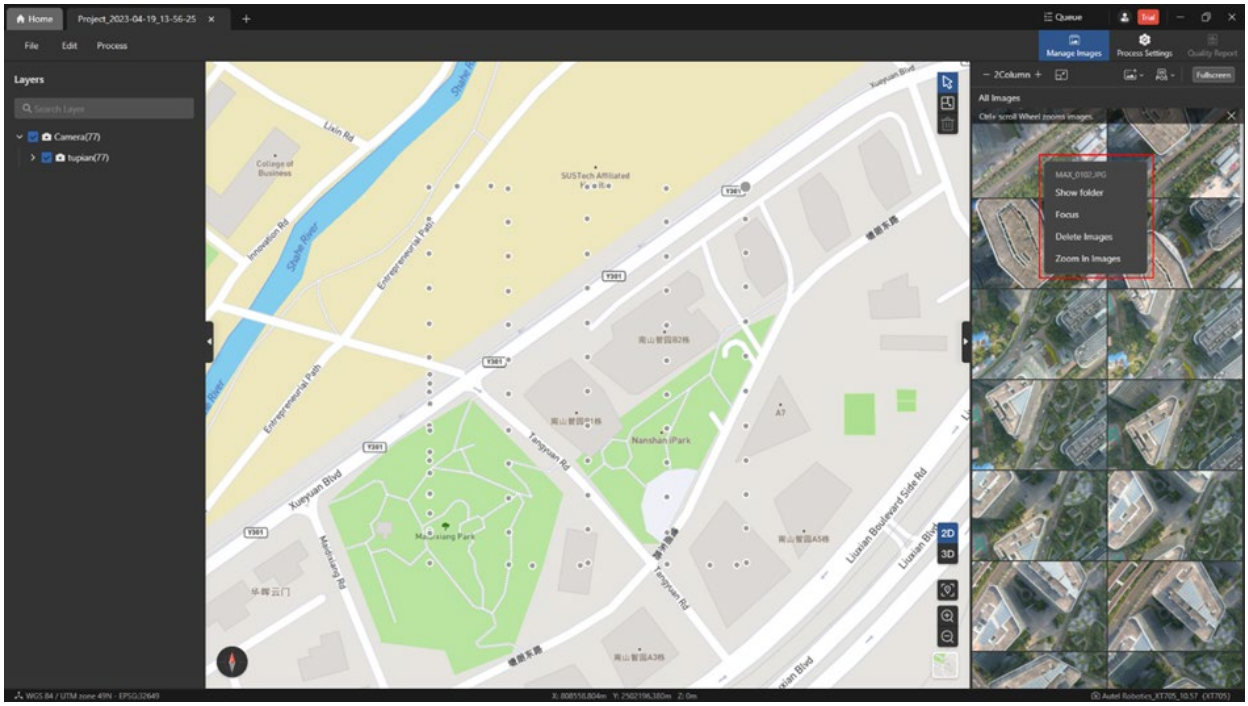


Right-click any image on the [**Manage Images**] page to perform four operations: [**Show folder**], [**Focus**], [**Delete Images**], and [**Zoom In Images**].

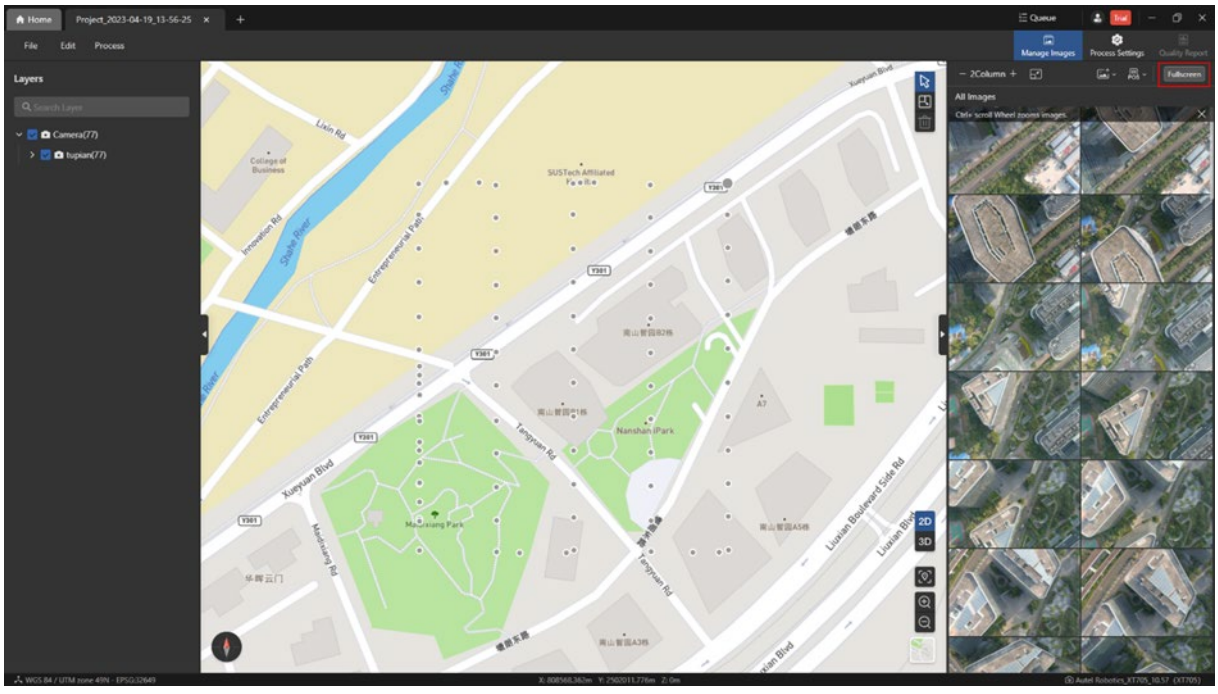
Notes:

- [**Show folder**]: Click to open the local folder where the current image is located.
- [**Focus**]: After clicking, the shooting location of the current image in the 2D view.
- [**Delete Images**]: Click to delete the current image. If the image has been reconstructed, a window will pop up to confirm the deletion; if the image has not been reconstructed, it will be deleted directly.

- [**Zoom In Images**]: After clicking, you can view the image in full screen mode through [**Large View**].



Click the [**Fullscreen**] button in the upper right corner of the [**Manage Images**] page to switch the image management page to full-screen mode, and click the [**Exit Full Screen**] button in full-screen mode to exit the full-screen mode.



In full-screen mode, images can be displayed in three ways: [**Column Mode**], [**Gallery View**], and [**Large View**].

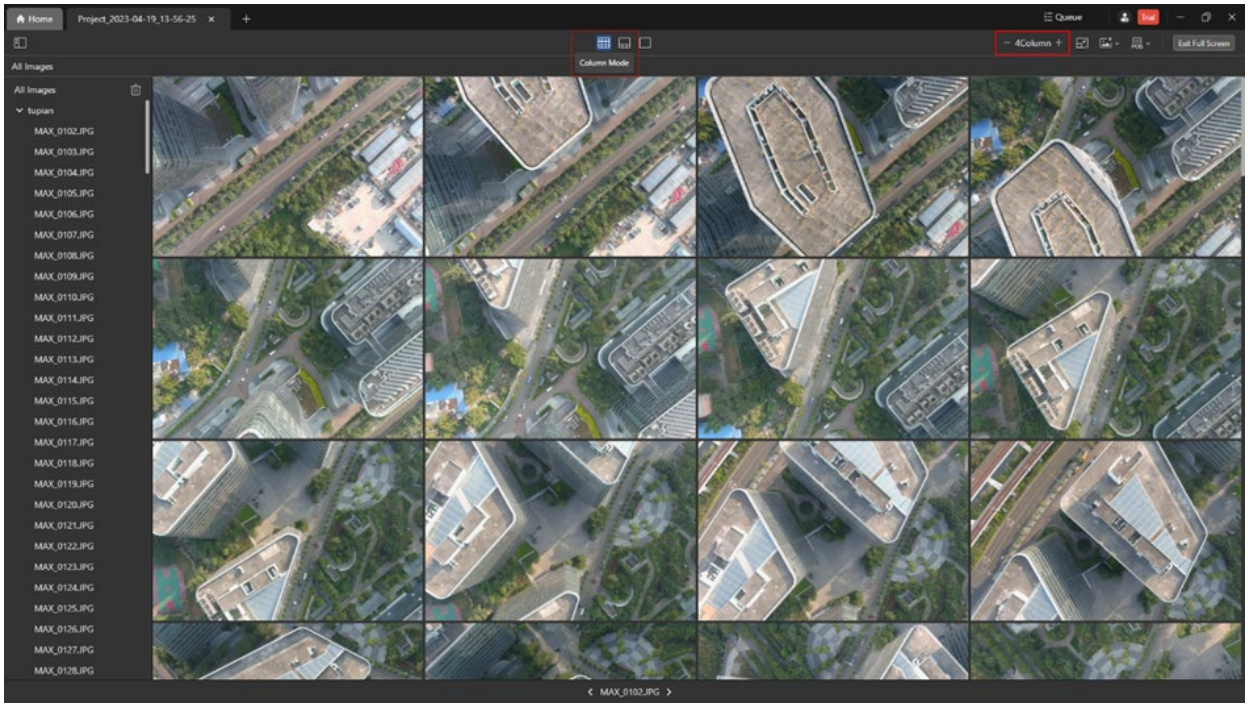
In [**Column mode**], you can click the [**-**] icon or [**+**] icon in the upper right corner of the page to modify the number of image display columns. The default is 4 columns, which can be adjusted between 1-8 columns.

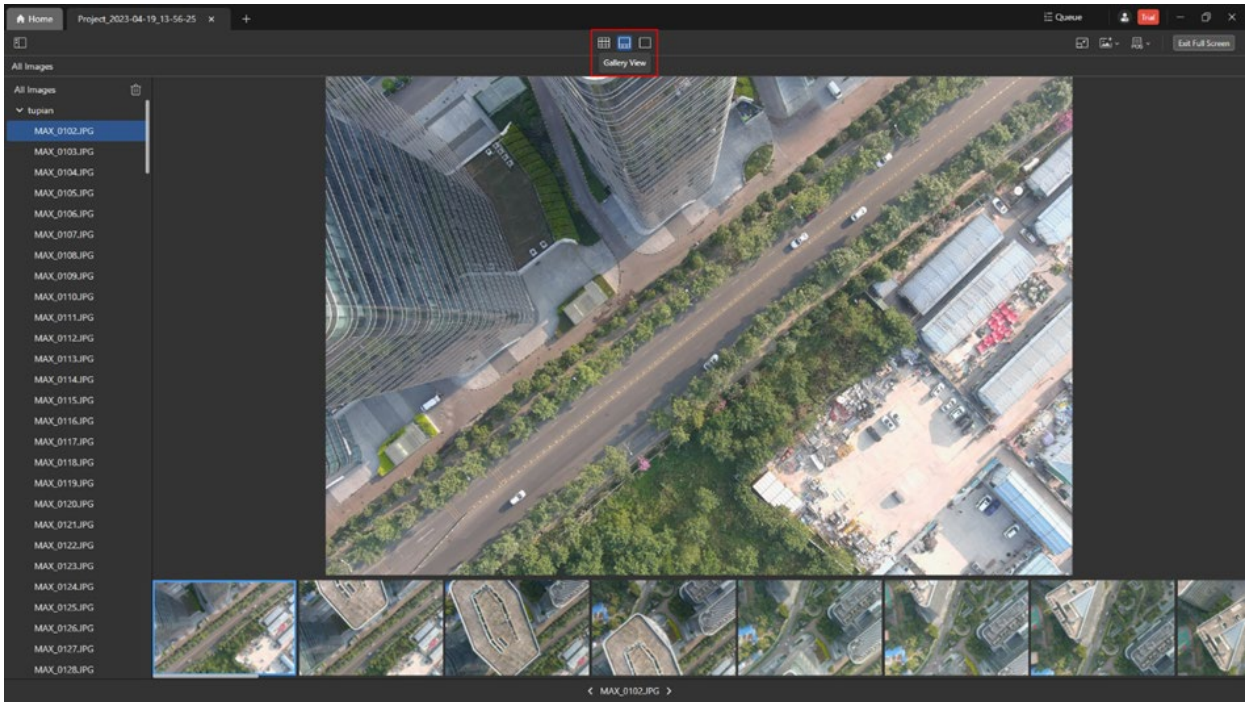
In full-screen mode, click the [**Image List**] icon in the upper left corner of the page to choose to display or hide the list of media.

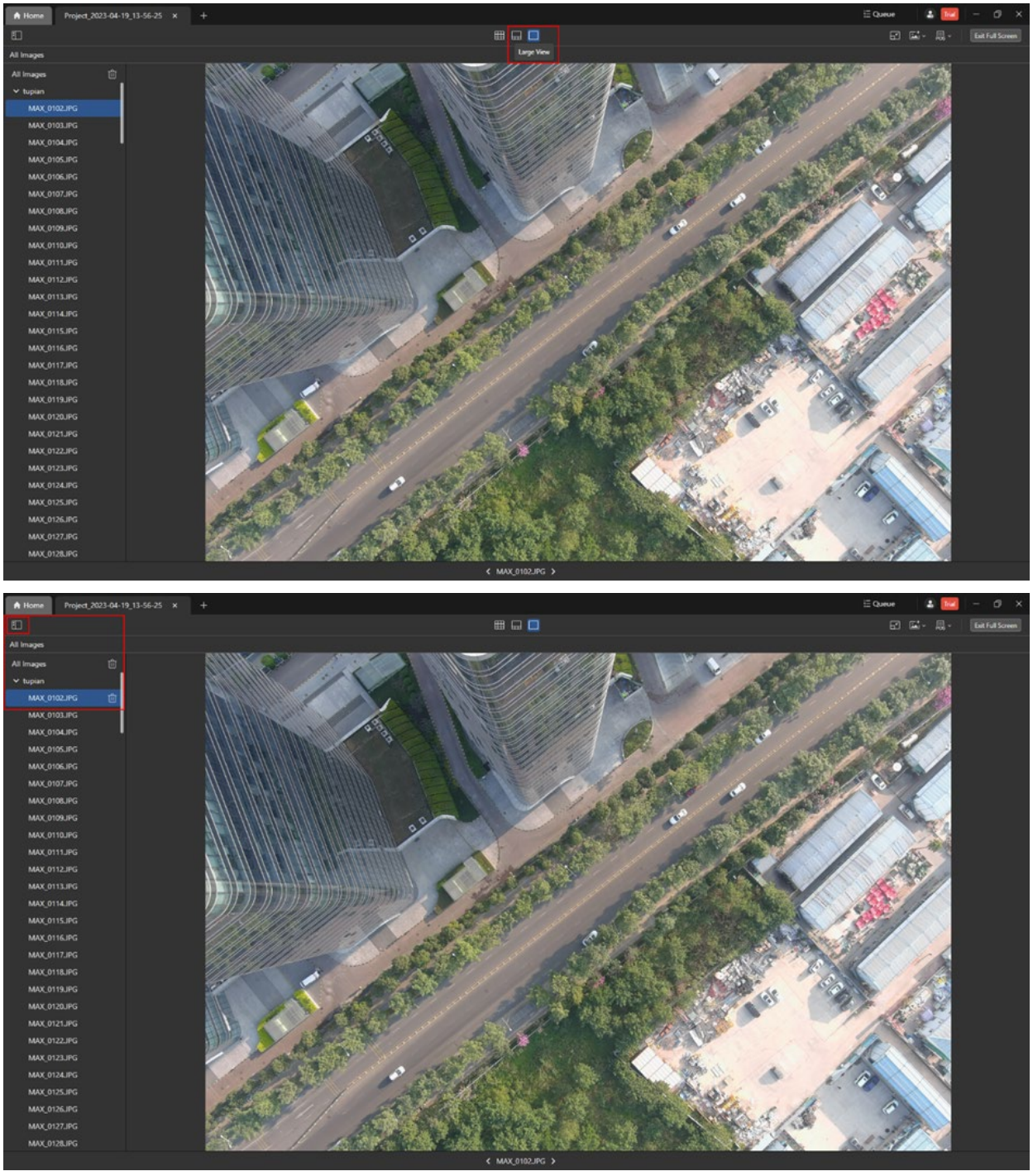
Click the Delete icon in the image list page to delete the image.

Note:

- The [**Focus**] function is not supported by right-clicking in fullscreen mode, however other operations are the same as in non-fullscreen mode.



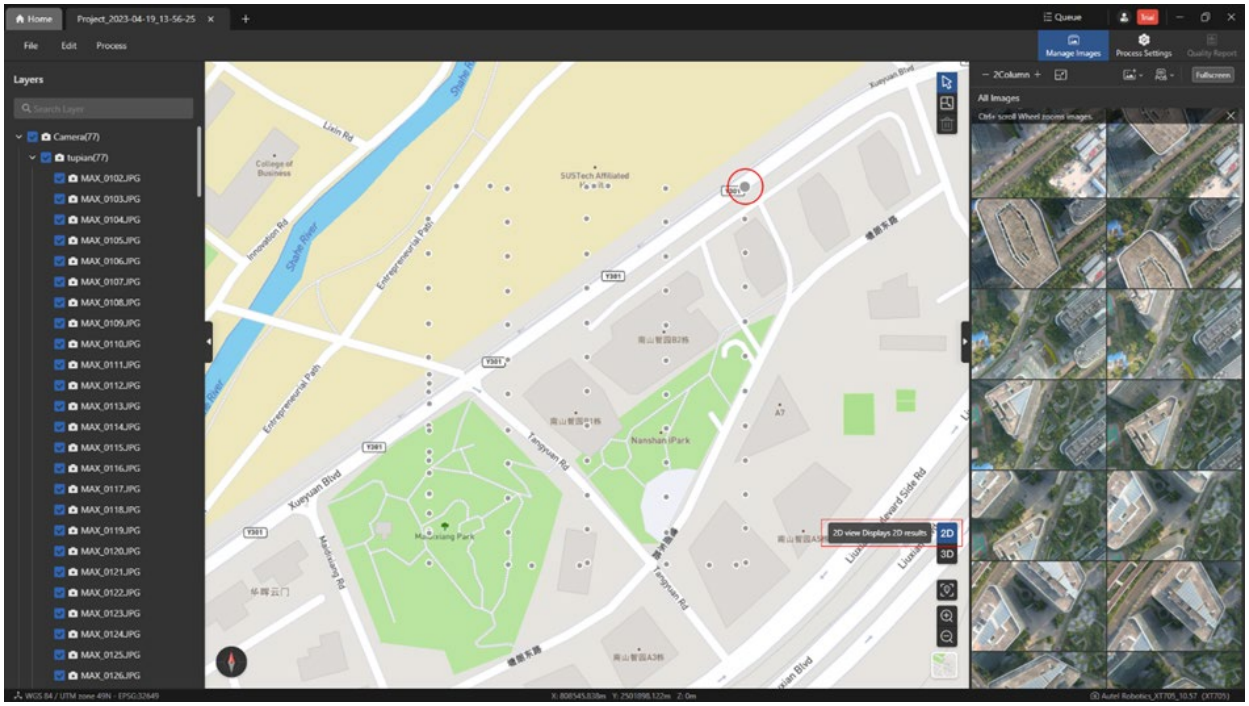


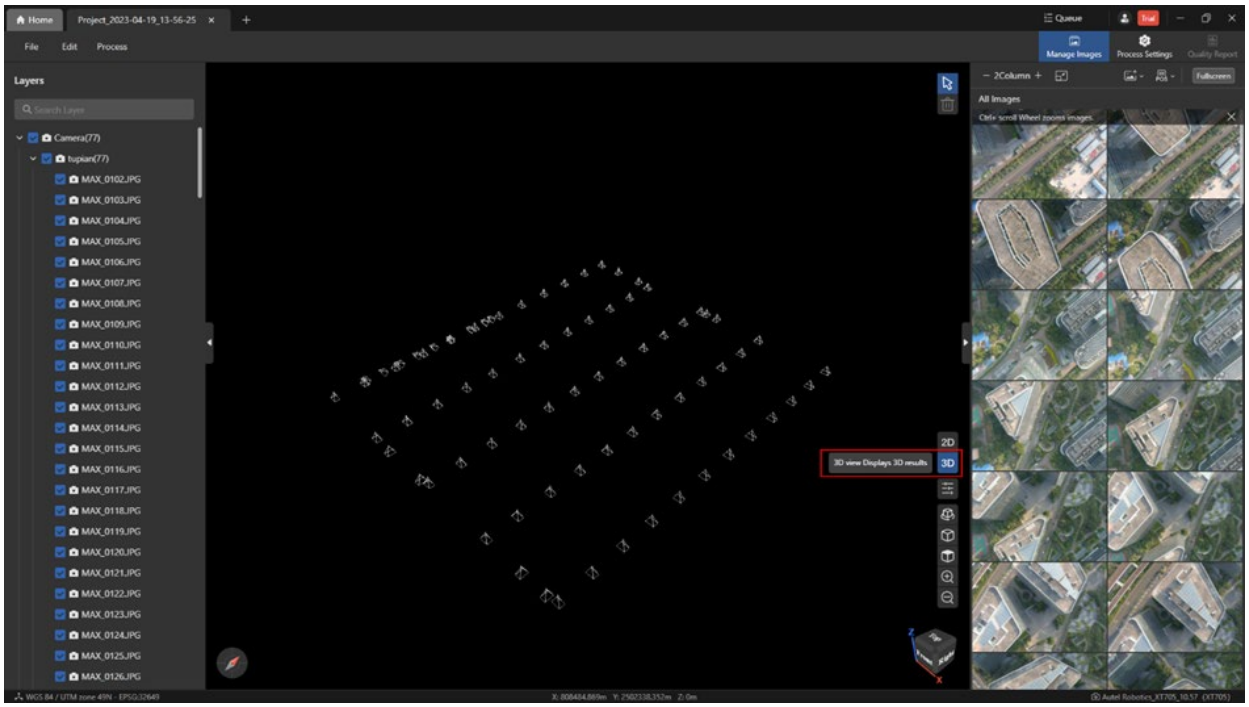


1.3 Map View

After adding the image, you can view the camera's track points in 2D view, the largest point becoming the initial position.

Click the [**2D**] or [**3D**] icon in the lower right corner of the view page to switch between 2D or 3D view.



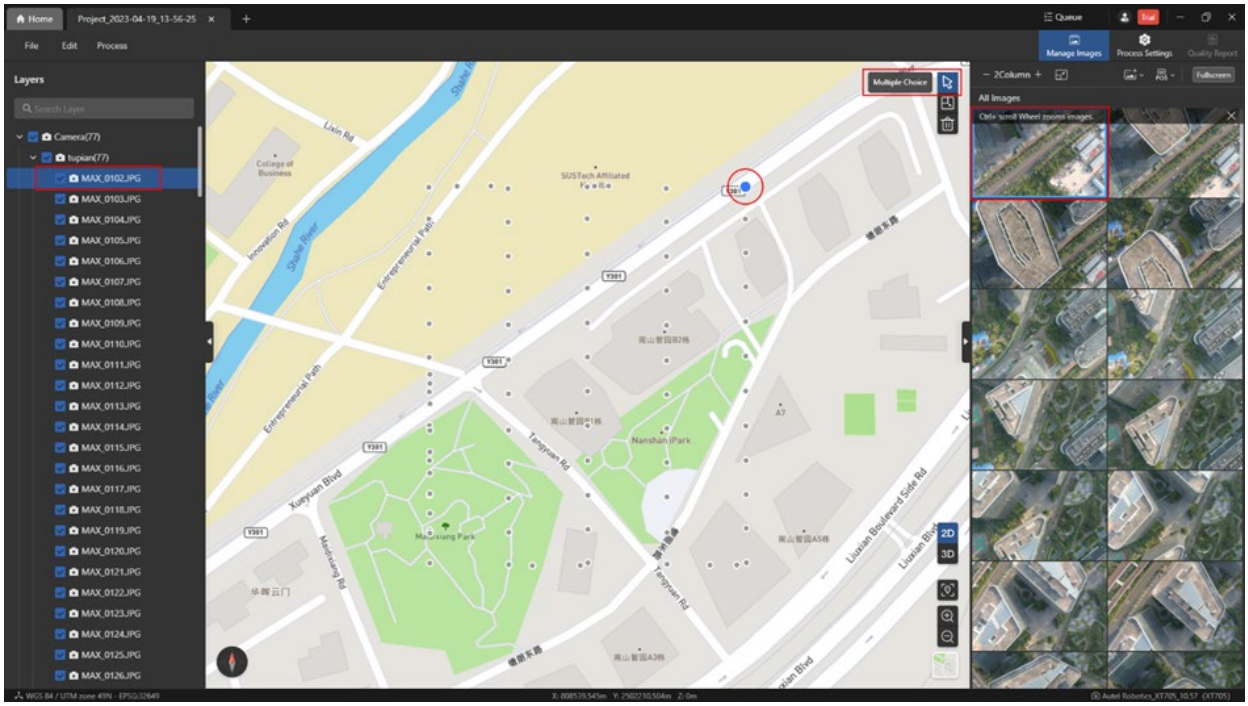


1.3.1 2D View

Click the [**Multiple Choice**] icon in the upper right corner of the 2D view to enter the single selection mode. At this time, you can click to select any track point in the view.

Notes:

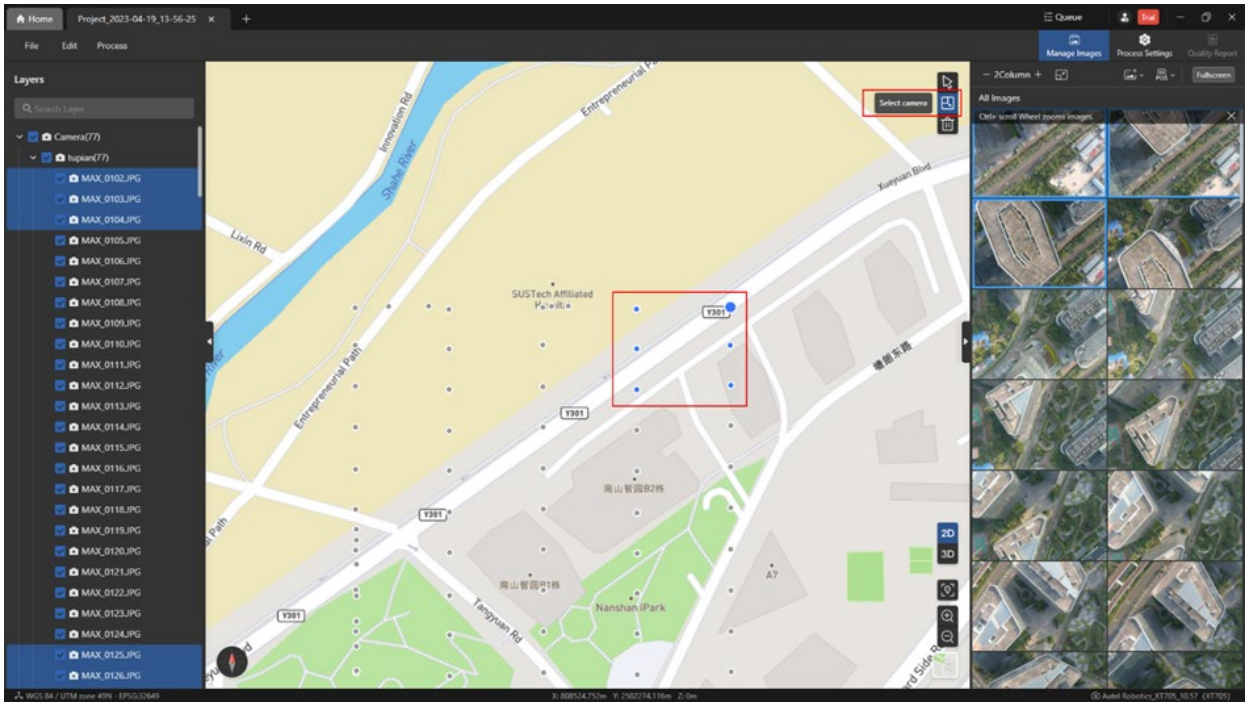
- The color of the selected track point will turn blue.
- After selecting any track point, it will automatically locate the corresponding image file name on the [**Layers**] page on the left and the image on the [**Manage Images**] page on the right.



Click the [**Select camera**] icon in the upper right corner of the 2D view to enter the marquee mode. At this time, you can select multiple adjacent track points in the view through a rectangular selection area.

Notes:

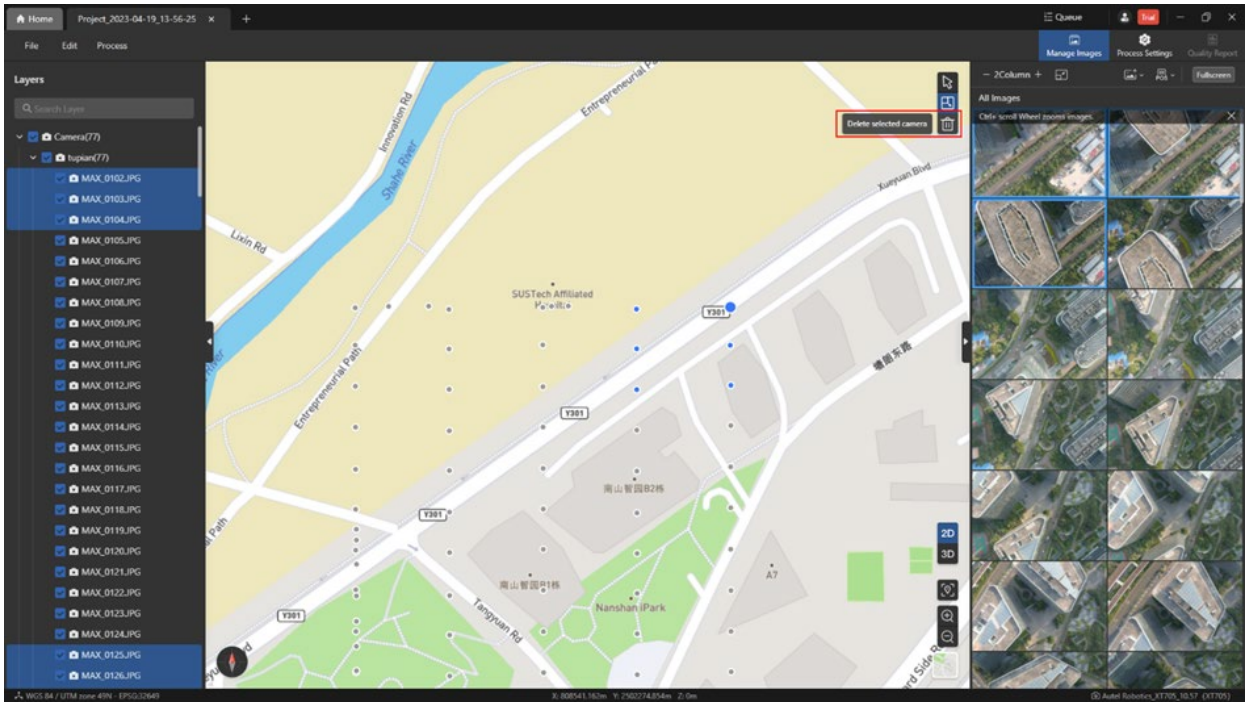
- The color of the selected track point will turn blue.
- After selecting multiple track points, the corresponding image file name on the [**Layers**] page on the left and the image on the [**Manage Images**] page on the right will be automatically linked.
- Only the 2D view supports the [**Select camera**] function.
- When hiding all the track points in the view on the [**Layers**] page, the [**Select camera**] icon is grayed out and cannot be clicked, and the [**Select camera**] function cannot be enabled.



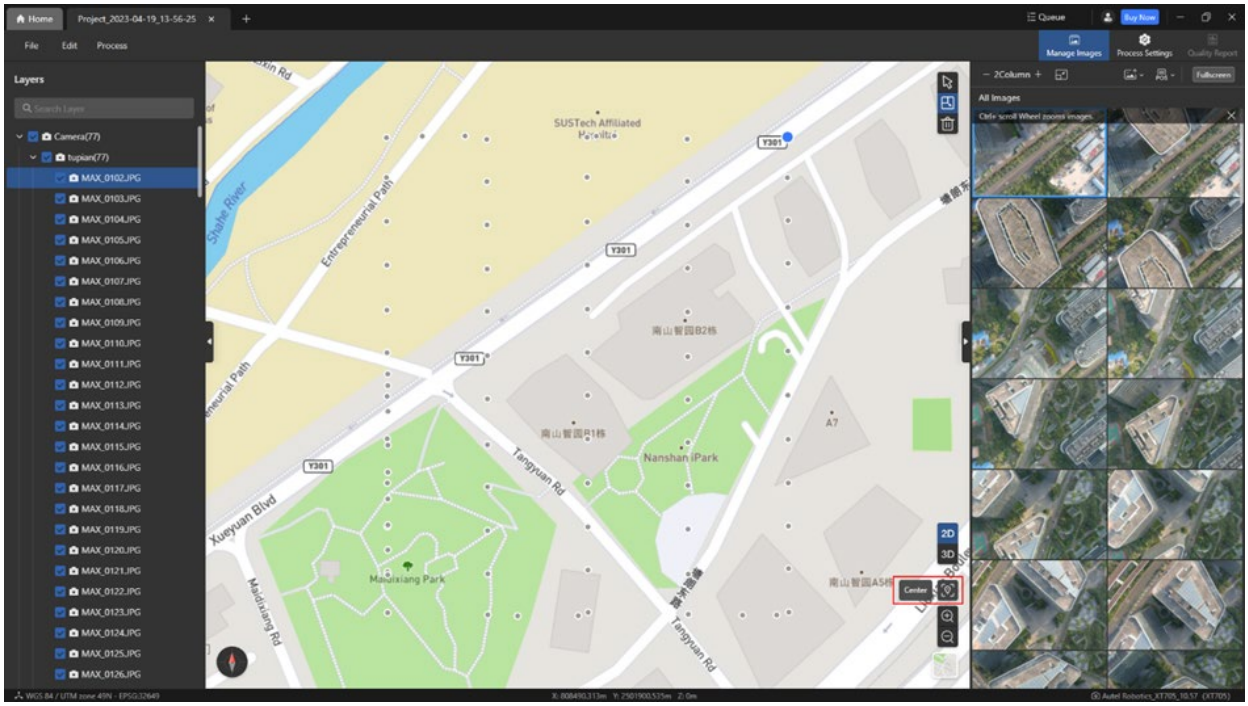
After selecting the track point, click the [**Delete selected camera**] icon to delete the selected track point.

Notes:

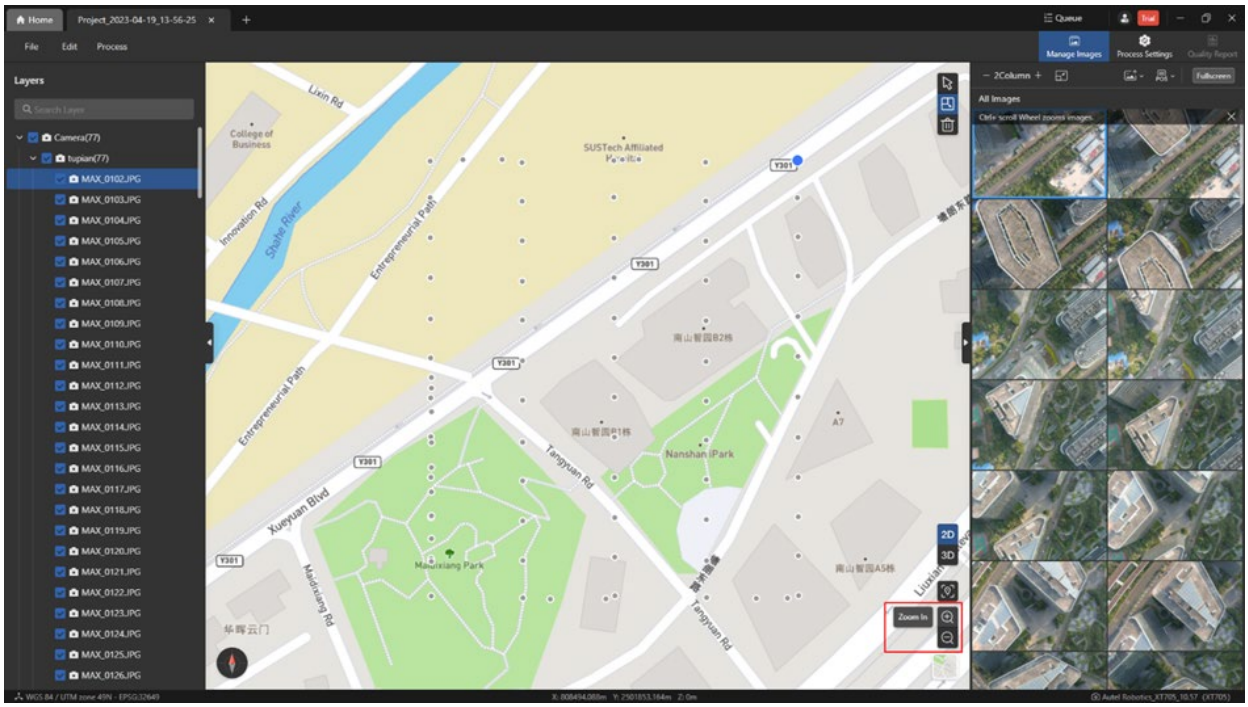
- After clicking the [**Delete selected camera**] track point, the corresponding images in the [**Layers**] page and [**Manage Images**] page will be deleted synchronously.
- When the track point is not selected, the [**Delete selected camera**] icon is grayed out and cannot be clicked.



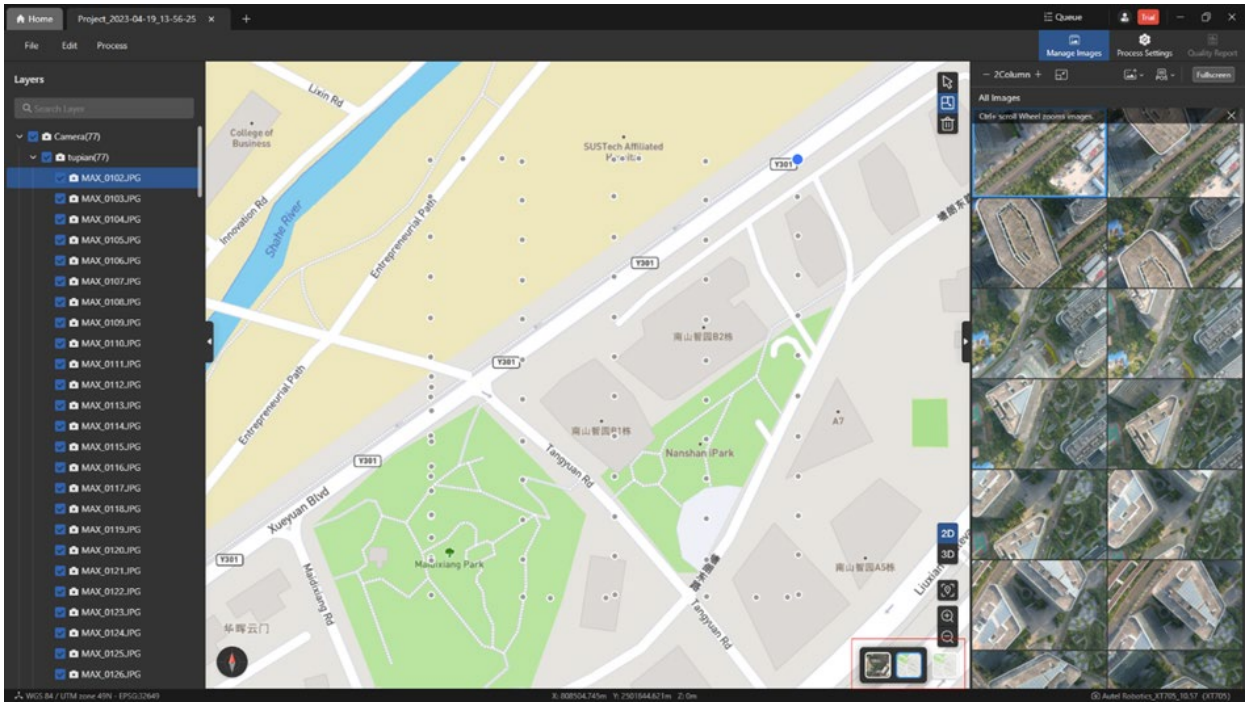
Click the [**Center**] icon in the lower right corner of the 2D view to focus the viewing angle on the center of the track point.



Click the [**Zoom In**] and [**Zoom Out**] icons in the lower right corner of the 2D view to zoom in or zoom out the viewing angle.



Click the map icon in the lower right corner of the 2D view to switch the map background, supporting satellite or electronic maps.



When the mouse moves in the 2D view, the coordinate value of the current mouse position will be displayed in the bottom coordinate system bar below the view. For details, please refer to section 4.3 of this chapter.

After the reconstruction process is completed, when [**DSM**] is checked in the [**Result**] column on the left [**Layers**] page, the DSM will be displayed synchronously on the 2D view page, and the relevant elevation legend color blocks will be displayed on the bottom left of the view. By sliding the control color block left and right, you can adjust the elevation range displayed by DSM.

Notes:

- The default coverage of the elevation legend is from the lowest altitude to the highest altitude of the project's imagery data.
- When adjusting elevation, uncovered areas will be hidden in the DSM.

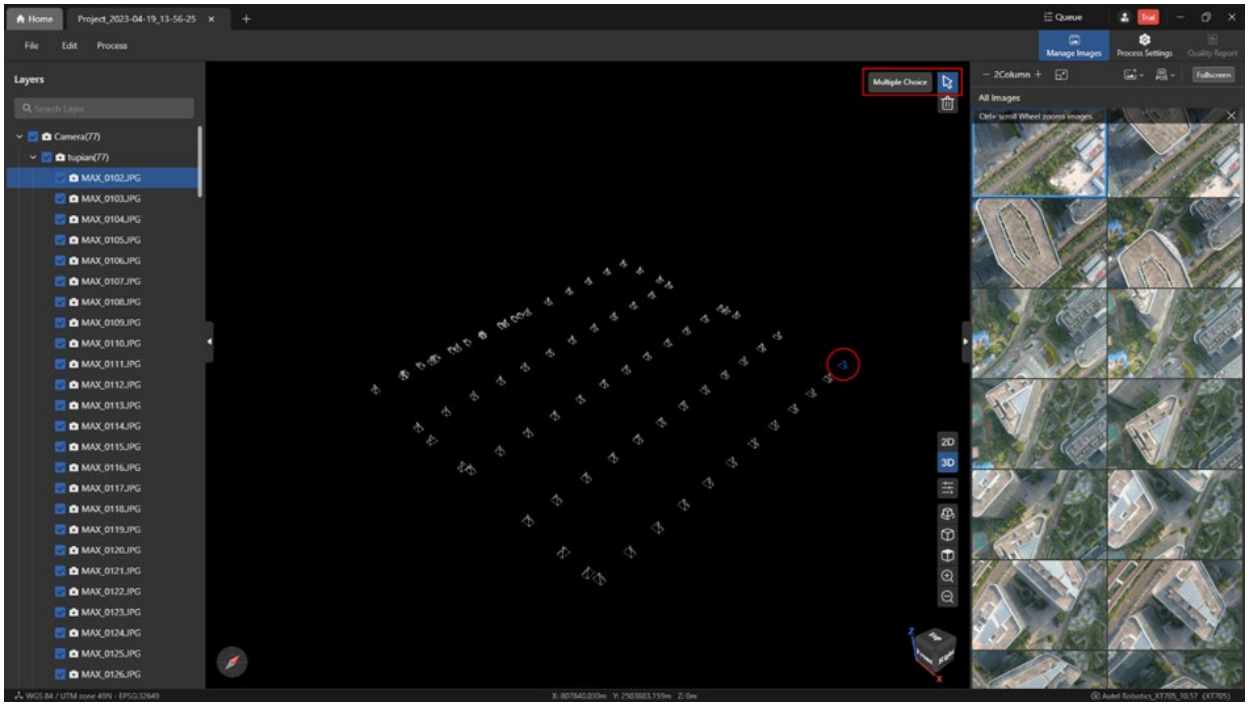
1.3.2 3D View

The pose angle of the camera can be checked in a 3D view.

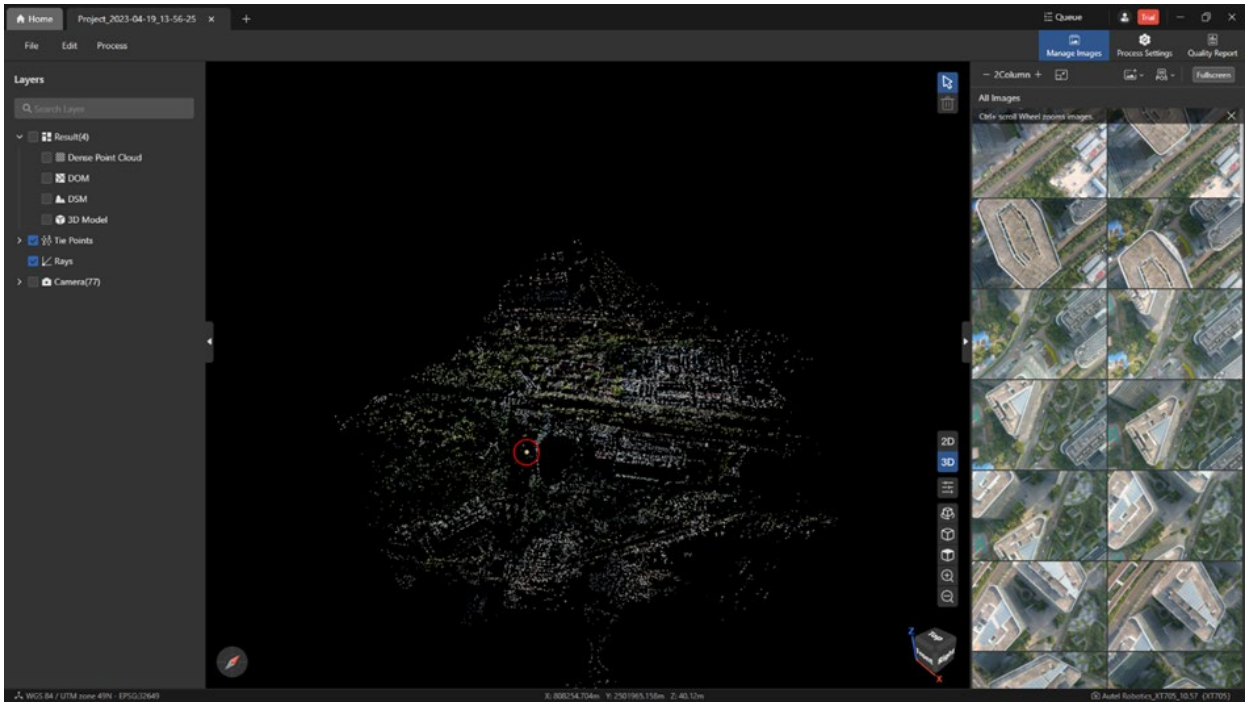
Click the [**Multiple Choice**] icon in the upper right corner of the 3D view to select any track point in view.

Notes:

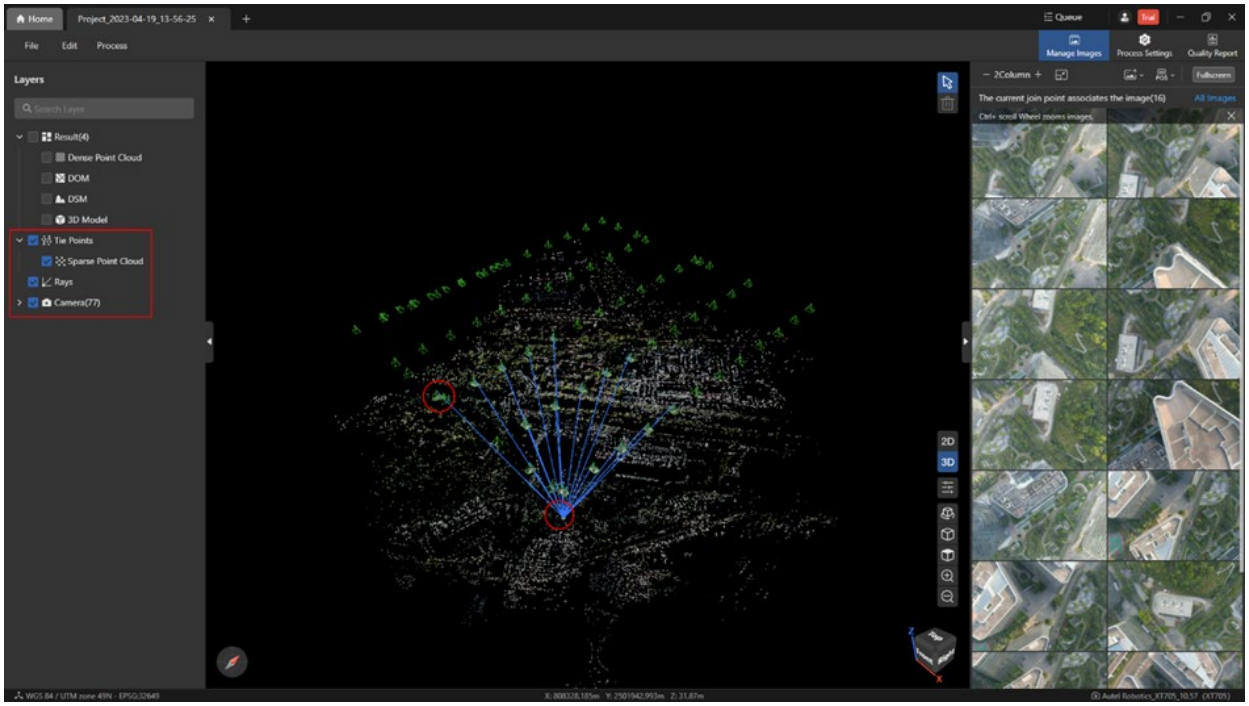
- The color of the selected track point will turn blue.
- After selecting any track point, it will automatically locate the corresponding image file name on the [**Layers**] page on the left and the image on the [**Manage Images**] page on the right.



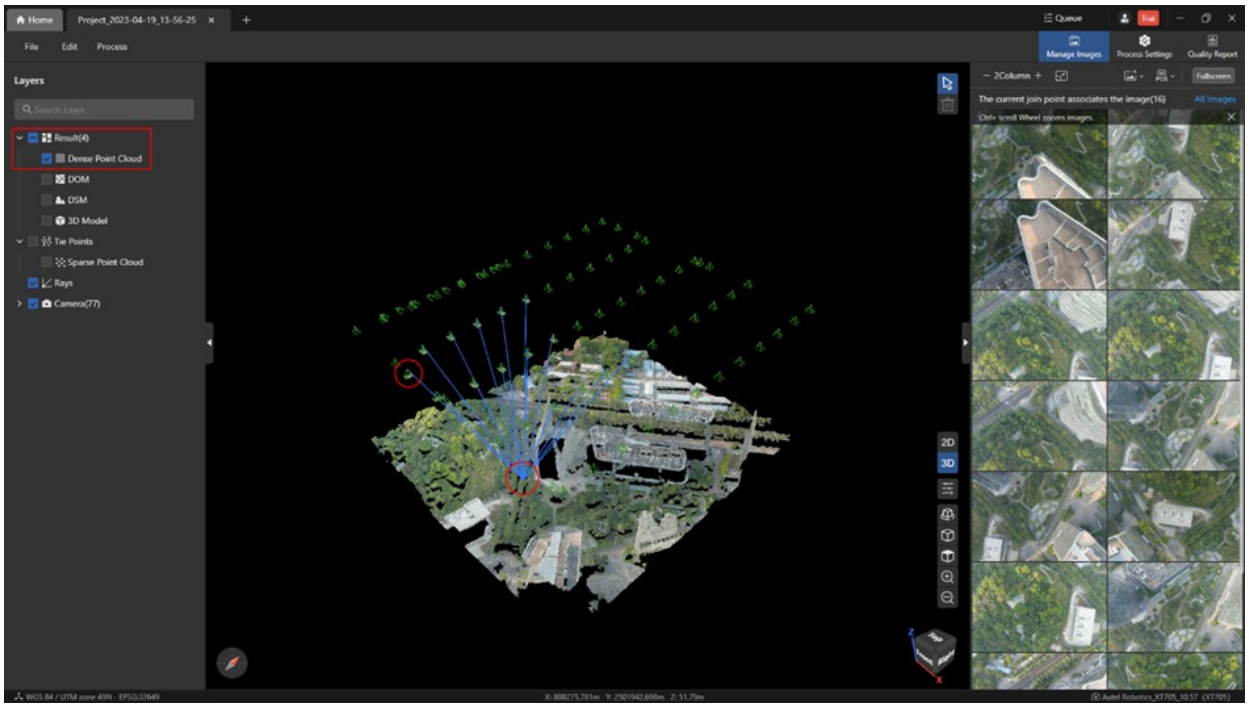
After the reconstruction is complete, check the [**Tie Points**] and [**Rays**] in the [**Layers**] page, and when the mouse hovers over the sparse point cloud, these can be enlarged.

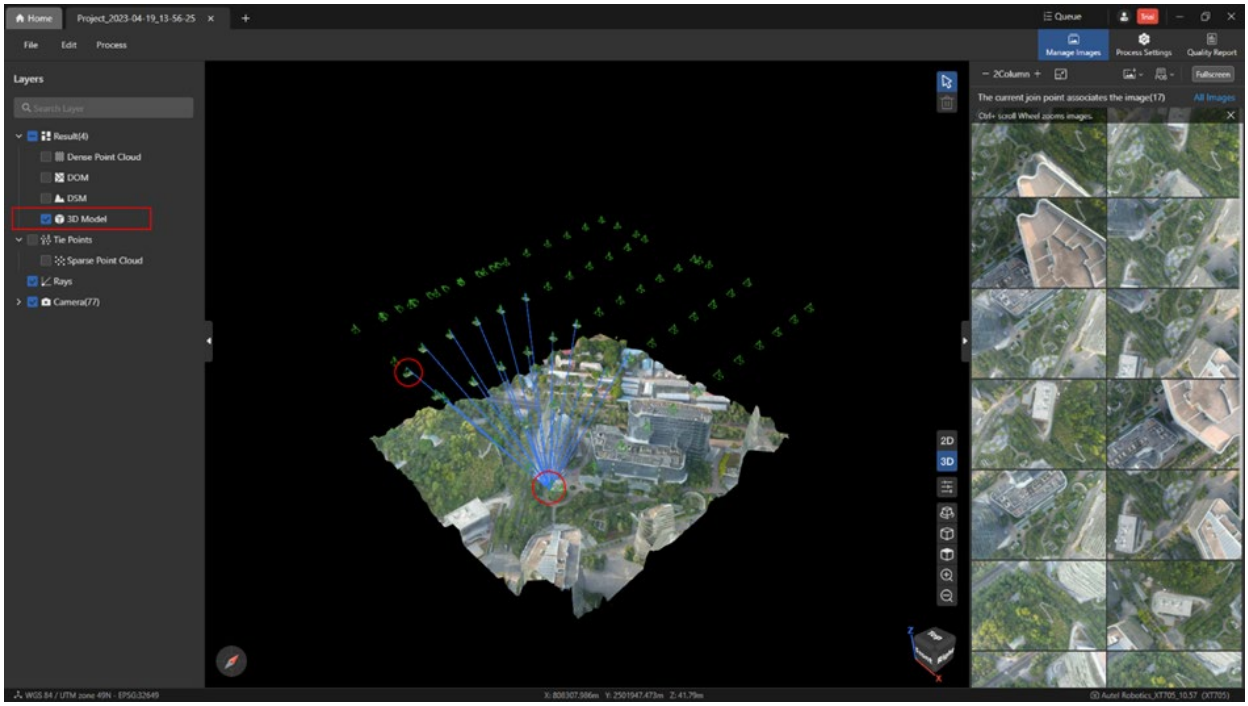


When the mouse clicks on a sparse point, it will connect the sparse point and all associated POS points with a ray, and display a thumbnail of the POS point.

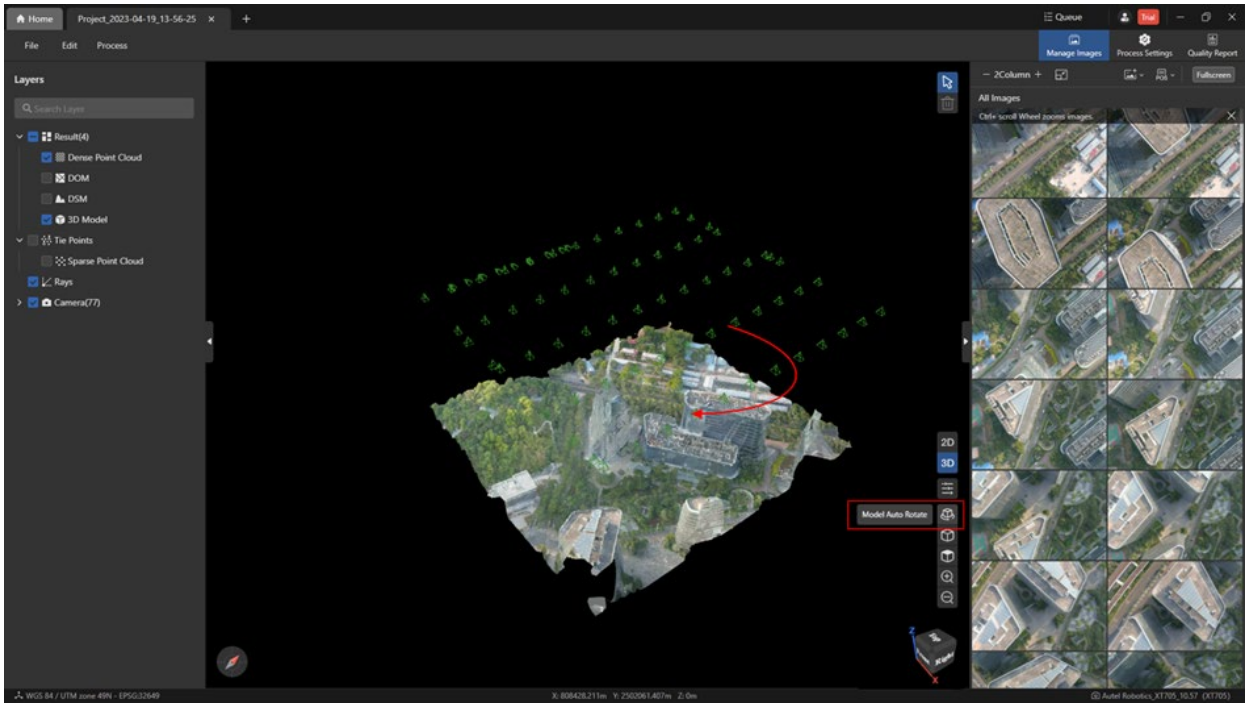


Clicking any point on the dense point cloud or 3D model with the mouse will also associate all relevant POS points with rays, and display the thumbnail of the POS point.

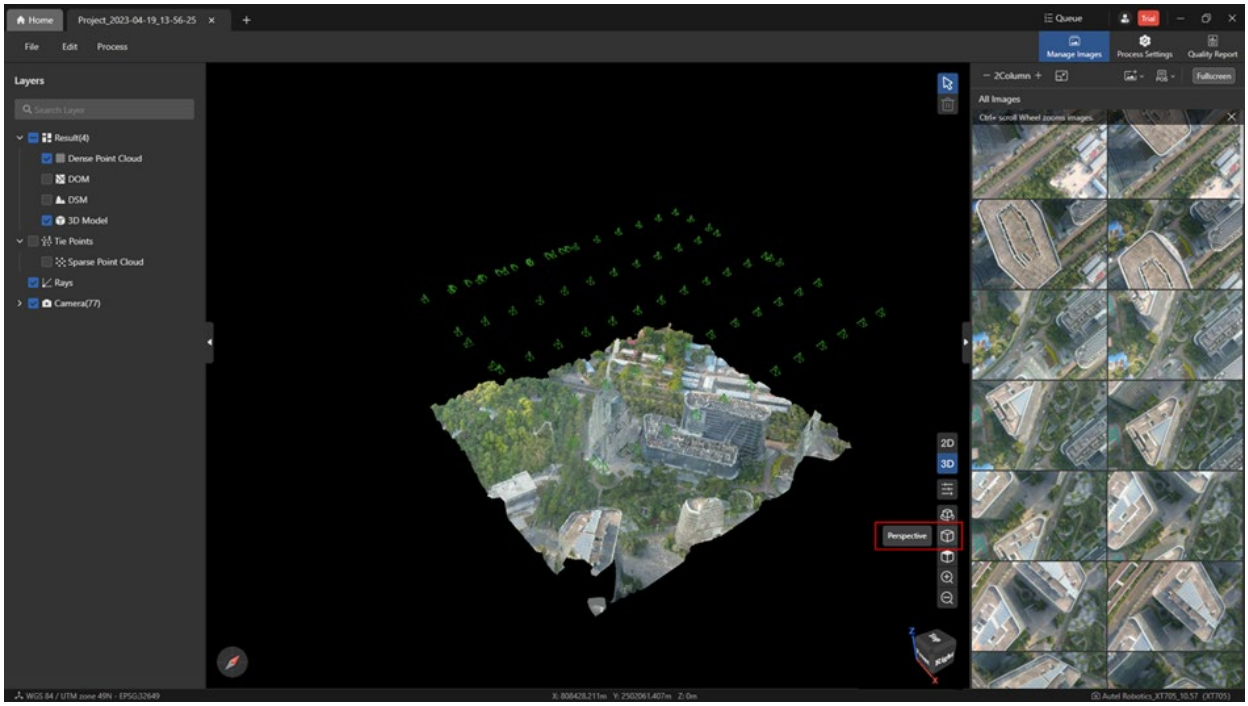




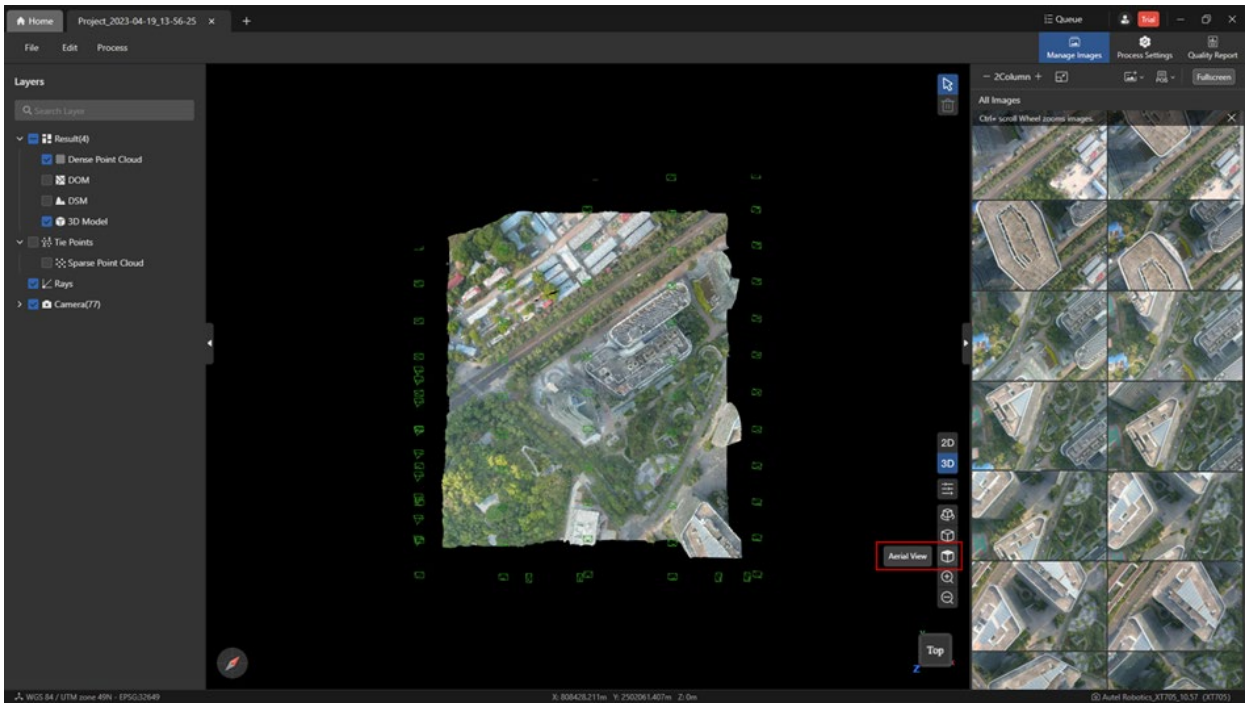
Click the [**Model Auto Rotate**] icon in the lower right corner of the 3D view, and the scene will rotate the map clockwise according to the relative position and orientation of the current camera and the view data center. You can click the [**Model Auto Rotate**] icon again or drag the mouse in the view or scroll the wheel to zoom out of the model auto-rotate as you wish.



Click the [**Perspective**] icon in the lower right corner of the 3D view to see through the 3D results.



Click the [**Aerial View**] icon in the lower right corner of the 3D view to view the entire 3D result from top to bottom.



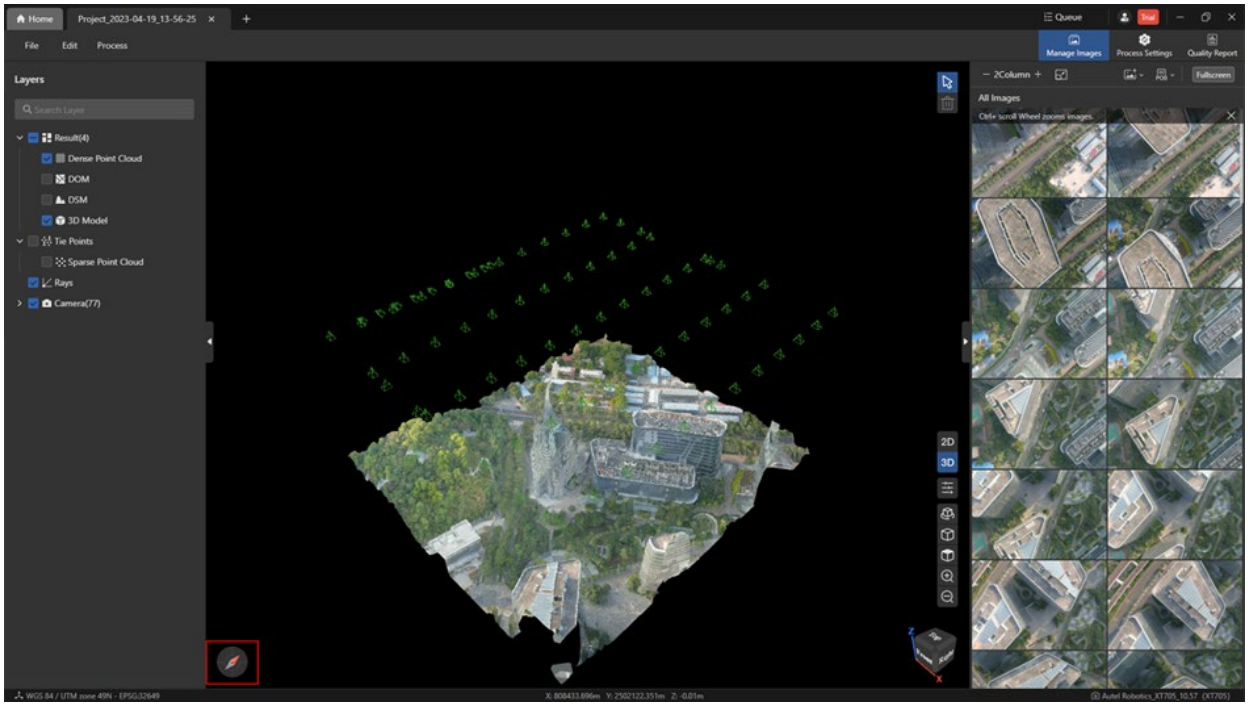
Click the [**3D View Setting**] icon in the lower right corner of the 3D View to expand the 3D View Settings page.

Notes:

- **Dot Size**: The size of point clouds can be adjusted.
- **Camera Size**: You can adjust the size of the camera displayed in the 3D view.
- **Background**: You can switch the background of the 3D view to black, gray, and white.

- **3D Map**: 3D map, can be switched on/off.
- **Sky**: The sky can be switched on/off.
- **Center**: When enabled, the coordinate axis of the ENU coordinate system with the view data center as the origin is displayed, and the camera is always locked at the local center, with the scene only able to be rotated or zoomed in/out.

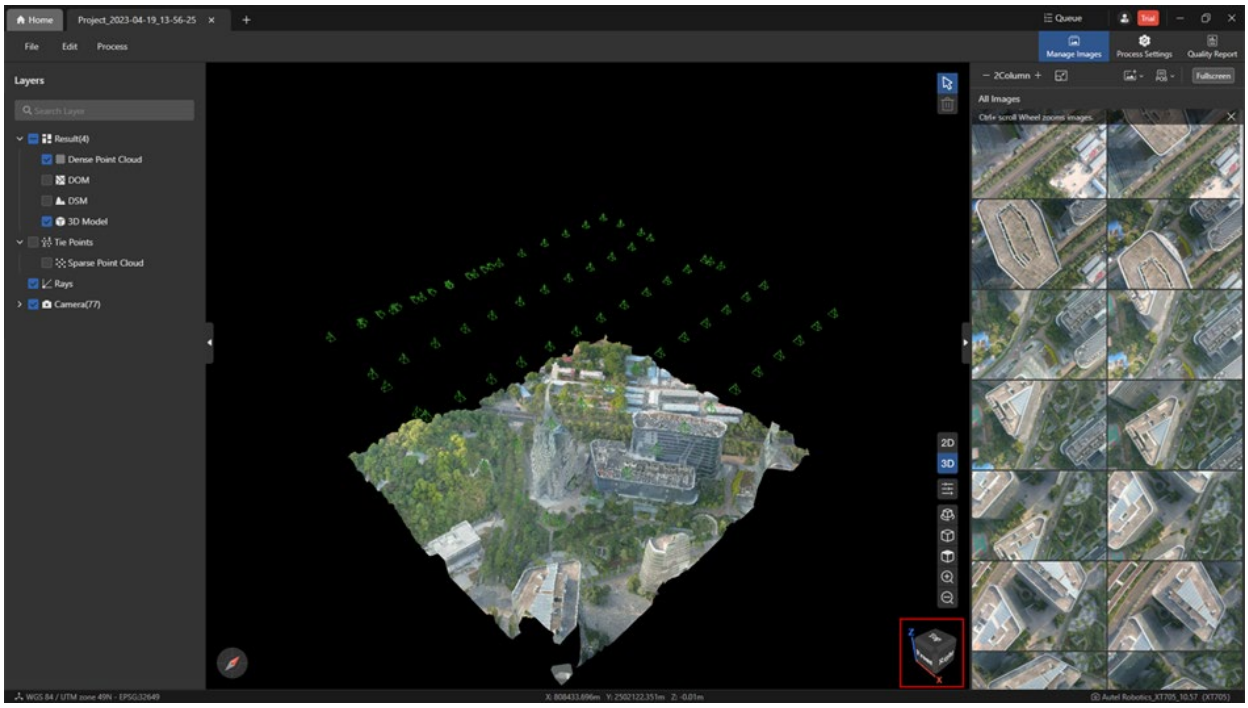
［**Compass**］Icon: Located in the lower left corner of the view, the red pointer points to the true north of the current 3D view.



[**Rotating Cube**] 3D icon: Located in the lower right corner of the view, it can be used to manipulate the data observation angle in the 3D view.

Notes:

- **Coordinate axis**: Display the orientation of the coordinate axis of the data ENU coordinate system in the current 3D view.
- **Six sides**: Click any side of the [**Rotating Cube**] with the mouse, and the data will be observed from the front, back, left, right, top, bottom, and front sides according to the current position and attitude of the camera and data center.
- **Twelve edges**: Click any edge of the [**Rotating Cube**] with the mouse, and observe the data from the middle position between the two sides of the edge according to the current position and attitude of the camera and the data center.
- **Eight vertices**: Click any vertex of the [**Rotating Cube**] with the mouse, and observe the data from the effective orientations specified.
- **Other interactions**: double-click the "face, edge, vertex" of the [**Rotating Cube**] to restore the initial perspective of the 3D view, and drag the cube to rotate with the mouse.

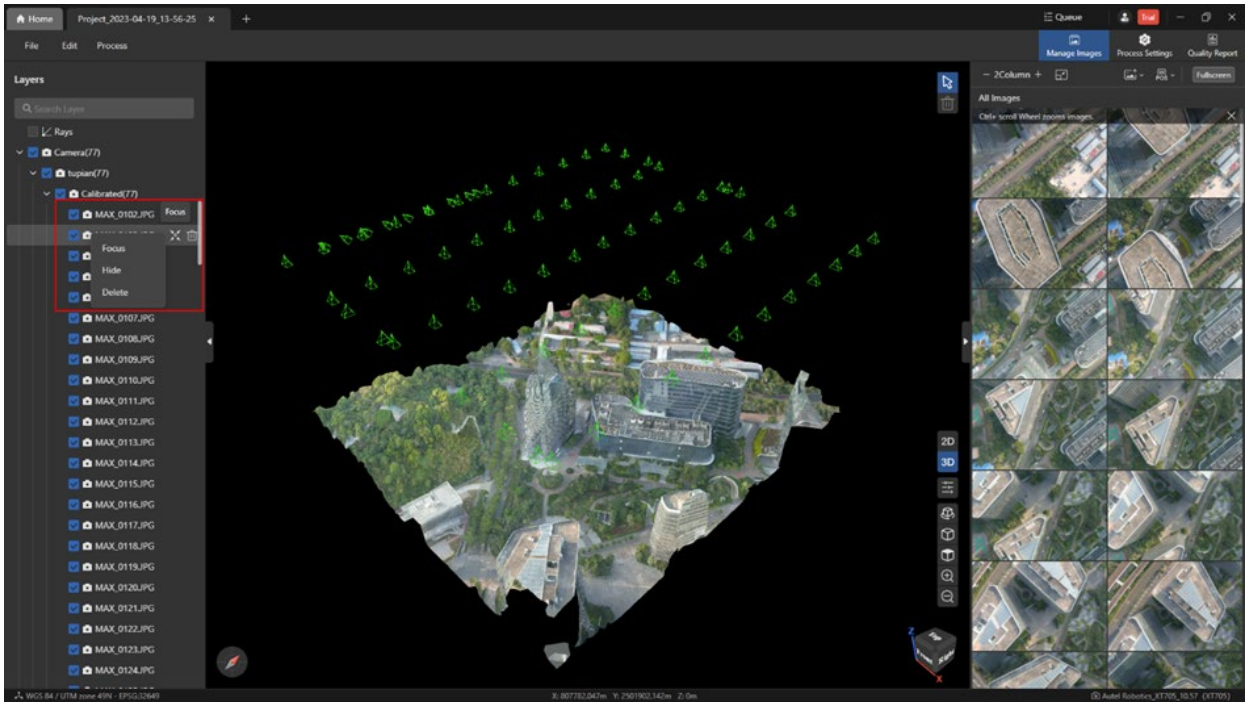


1.4 Layers

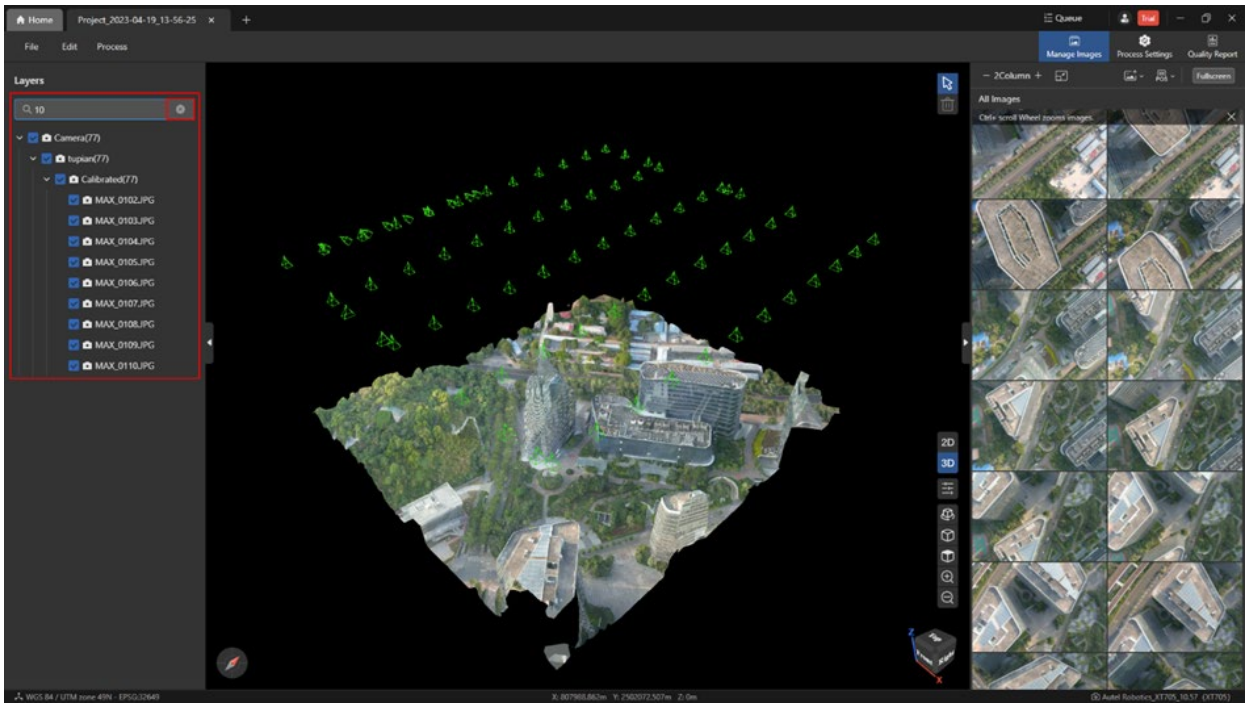
After adding an image, the image will be automatically displayed in the [**Camera**] column on the [**Layers**] page, and all images support [**Focus**] and [**Delete**] operations.

[**Focus**]: Hover the mouse over an image in the [**Camera**] column and click the [**Focus**] icon or right-click on the image and select [Focus] to automatically focus on the image in the view.

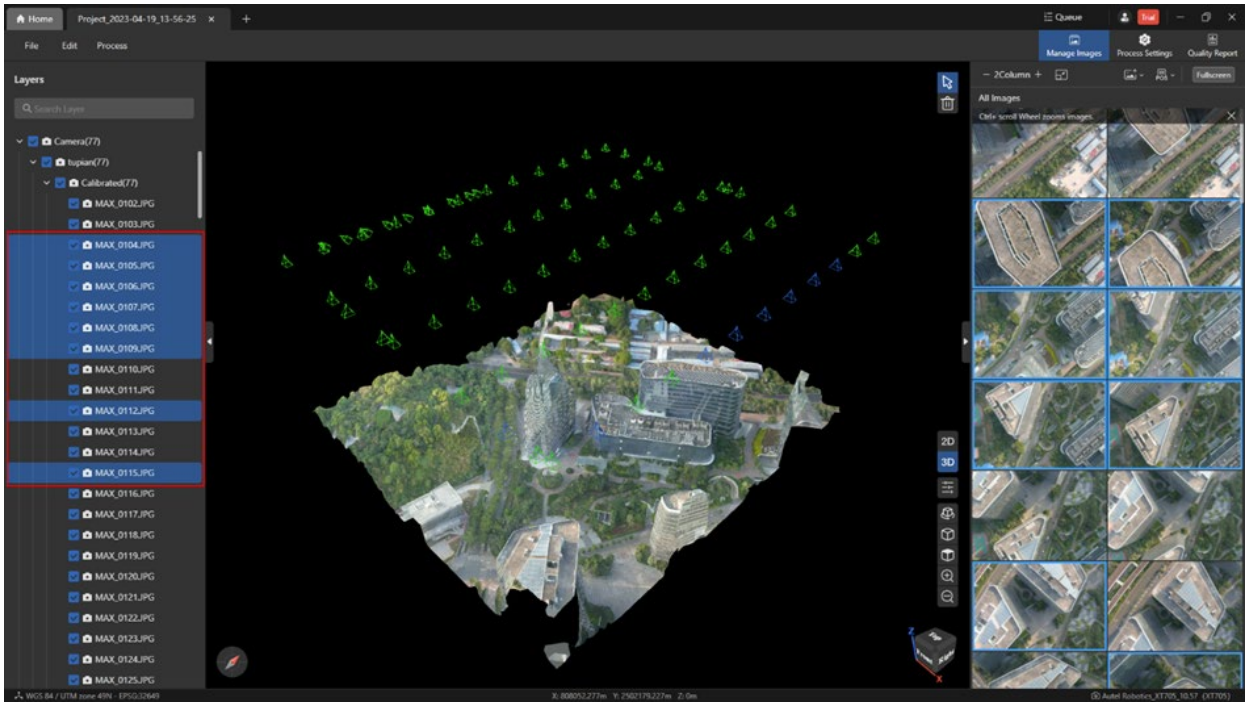
[**Delete**]: Hover the image in the [**Camera**] bar and click the [**Delete**] icon or right-click the image and select [**Delete**] to delete the selected image.



Search layer: Enter the name of a layer, folder, or image in the search bar on the [**Layers**] page to search and display the corresponding results under the current item.



Use [**Ctrl + mouse click**] or [**Shift + mouse click**] in the [**Layers**] page to select multiple images at the same time.



2. Importing Image POS Data

2.1 Image POS Data Overview

The image POS data records the geographic location, attitude angle information and other auxiliary positioning information of each image. Accurate POS data can improve the reconstruction speed and result accuracy, and can also avoid incorrect reconstruction results or even reconstruction failures due to POS data problems.

Note:

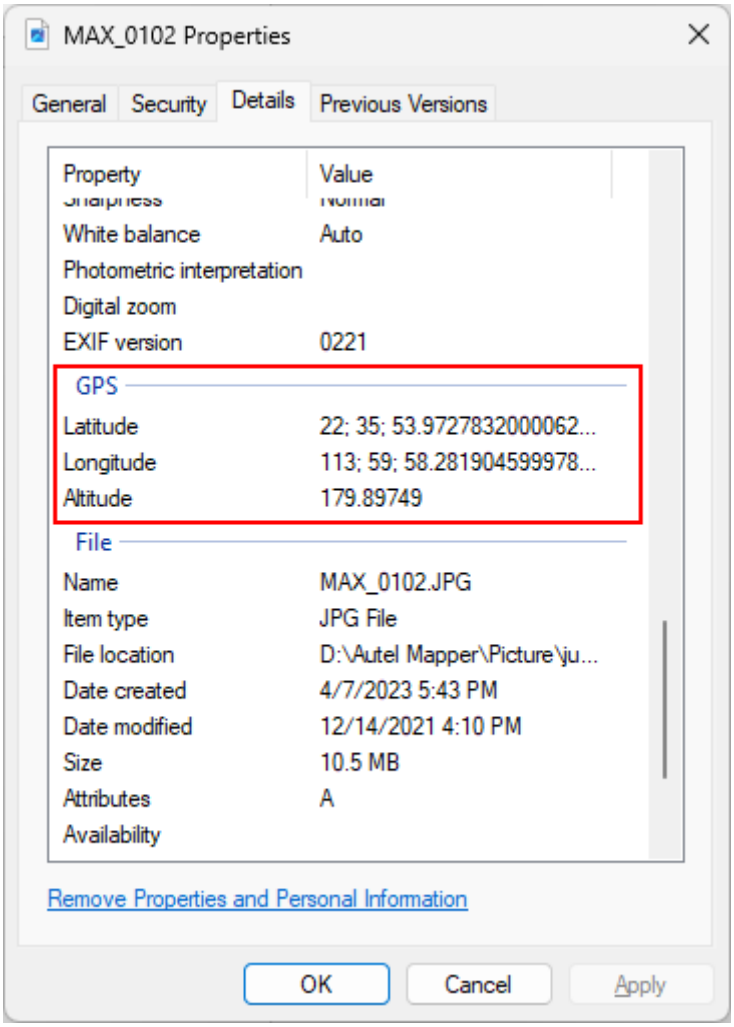
The images taken by Autel drones will write the POS data into the image by default, users do not need to manually import POS data in this case.

2.2 Checking POS Data

Before importing images, check whether the images have built-in POS information.

This can be achieved by:

1) Right-click the image to be imported in the computer, select [**Properties**], click [**Details**], and find the [**GPS**] column from the pull-down.
2) If the [**GPS**] column is found and the specific latitude, longitude, and altitude are displayed, the image contains POS information, and there is no need to manually import POS data again.
3) If the [**GPS**] column is not found, it means that the image has no POS information, and the POS data needs to be imported manually.



2.3 Importing Image POS Data

2.3.1 Prepare POS files

Autel Mapper supports importing image POS files in txt format and csv format.

Notes:

The POS file needs to include: image name (absolute path + image name and format), longitude (X), latitude (Y), altitude (Z) and other information.

The image name contained in the imported image POS file must be consistent with the name and storage path of the actual image.

Tips:

- Users can export the POS file of the image with built-in POS information in Autel Mapper in advance, and then make the required POS file according to the exported POS file format, so as to avoid the failure of POS file import due to format errors.
- Method 1: After importing the image with built-in POS information in the project, click [**Edit->Image Position and Attitude**] to open the image position and attitude data page, and click the [**Export POS**] button to obtain the POS file.
- Method 2: After importing the image with built-in POS information into the project, click

the [**Images POS**] button on the image management page and select [**Export image POS**] to obtain the POS file.

2.3.2 Setting POS Parameters

- Using RTK to locate photos, the horizontal accuracy is 0.03m and the vertical accuracy is 0.06m.

Notes:

- Phase-free data must be set to this item, otherwise it will have a great impact on the accuracy of the results.
- Using non-RTK positioning photos, the horizontal accuracy must be 2m and the vertical accuracy 10m.

For image POS data in .csv format, please refer to the figure below:

	Image Name	Longitude	Latitude	Altitude	Yaw	Pitch	Roll	Horizontal Accuracy	Vertical Accuracy
2	D:/Autel Mapper	113.999523	22.5983258	179.89749	178.33	-89.98	-0.03	2	10
3	D:/Autel Mapper	113.999522	22.5981085	179.71452	-179.5	-89.99	-0.01	2	10
4	D:/Autel Mapper	113.999525	22.5978808	179.71174	-179.5	-90	0	2	10
5	D:/Autel Mapper	113.999525	22.597652	179.78205	-179.5	-90	0	2	10
6	D:/Autel Mapper	113.999525	22.5974171	179.79449	-179.5	-90	0	2	10
7	D:/Autel Mapper	113.999525	22.5971845	179.76068	-179.5	-90	0	2	10
8	D:/Autel Mapper	113.999525	22.5969487	179.77656	-179.5	-90	0	2	10
9	D:/Autel Mapper	113.999526	22.5967134	179.79095	-179.49	-90	0	2	10
10	D:/Autel Mapper	113.999527	22.5964808	179.7758	-179.49	-90	0	2	10

The image POS data in .txt format can use the following figure as an example:

```
Image Name,                          Longitude,  Latitude,   Altitude, Yaw,   Pitch, Roll,Horizontal Accuracy,Vertical Accuracy
D:/Autel Mapper/Picture/MAX_0104.JPG,113.9995254,22.59788077,179.71174,-179.5,-90,   0,   2,                  10
D:/Autel Mapper/Picture/MAX_0105.JPG,113.9995252,22.59765199,179.78205,-179.5,-90,   0,   2,                  10
D:/Autel Mapper/Picture/MAX_0106.JPG,113.9995245,22.59741706,179.79449,-179.5,-90,   0,   2,                  10
D:/Autel Mapper/Picture/MAX_0107.JPG,113.9995246,22.59718449,179.76068,-179.5,-90,   0,   2,                  10
D:/Autel Mapper/Picture/MAX_0108.JPG,113.9995246,22.59694865,179.77656,-179.5,-90,   0,   2,                  10
D:/Autel Mapper/Picture/MAX_0111.JPG,113.9995274,22.59625123,179.78627,-179.5,-90,   0,   2,                  10
```

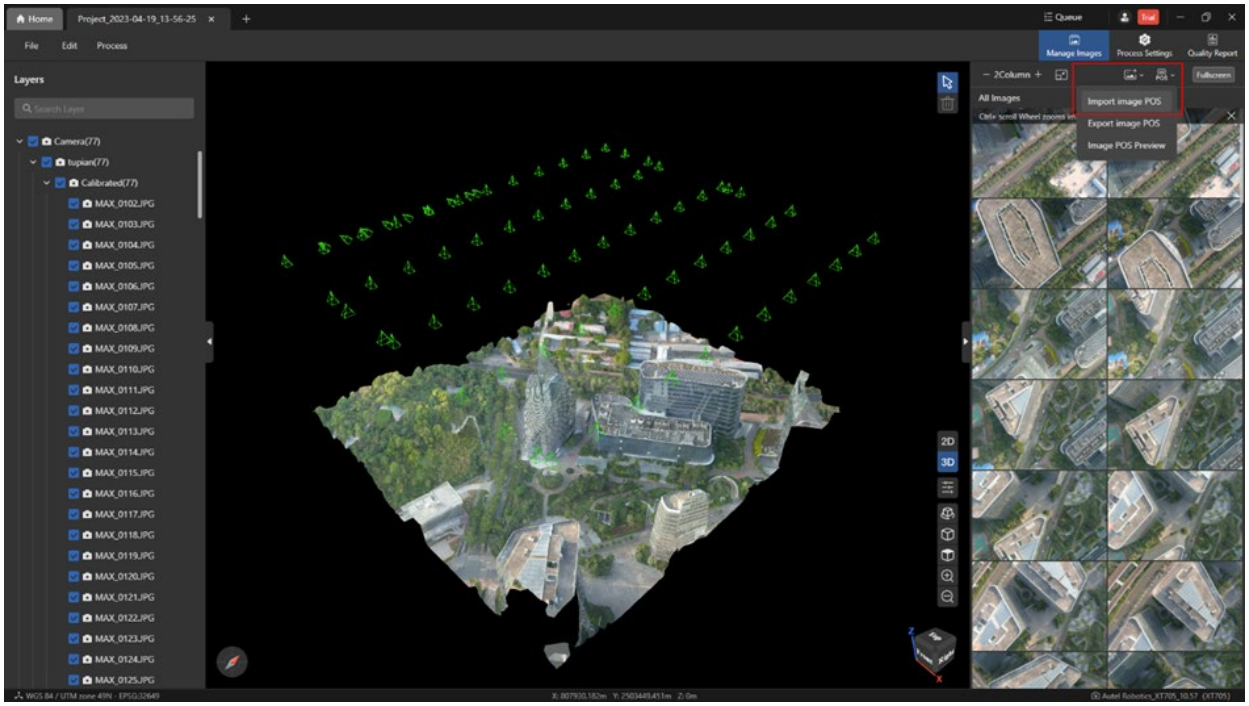
Tips:

- For image POS files in txt format, it is recommended that the data in each line be separated by English commas (,), and the decimal points be represented by (.).

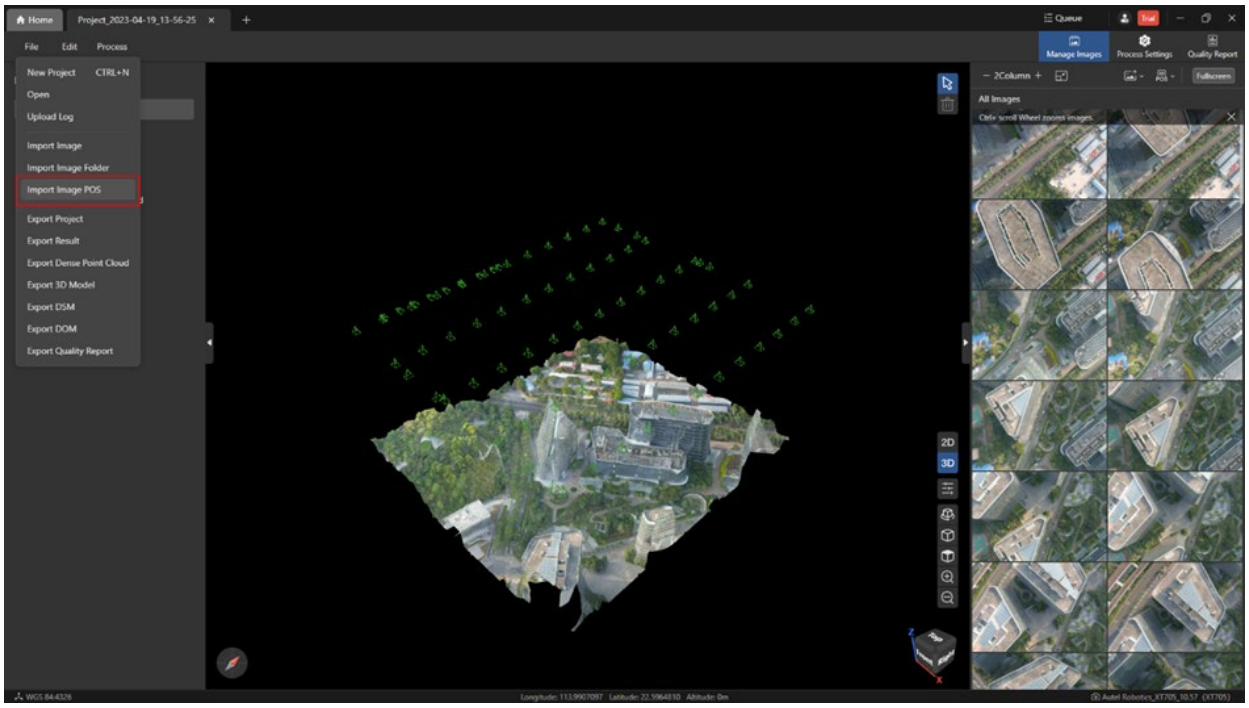
2.3.3 Importing POS Files

In Autel Mapper, image POS files can be imported for projects in the following ways.

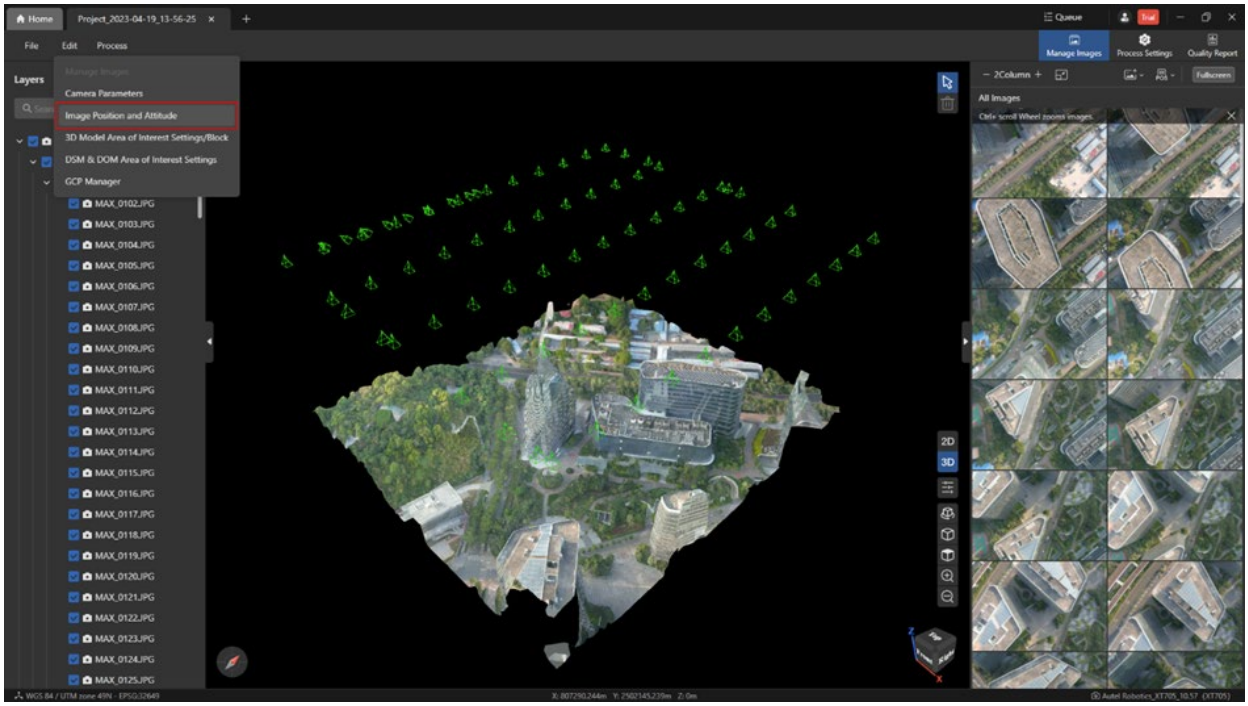
- Click the [**Images POS**] icon in the upper right corner of the [**Manage Images**] page and select [**Import image POS**] to import.

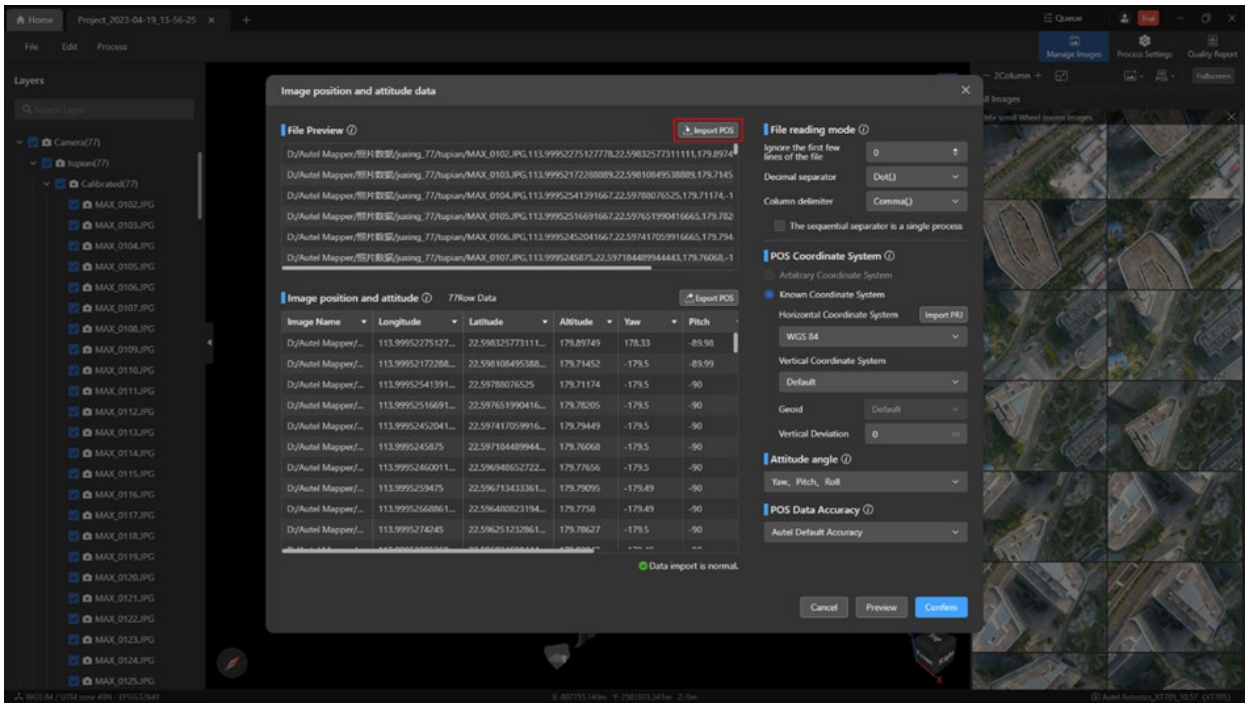


- Click [**File->Import Image POS**] in the menu bar to import.



- Click [**Edit->Image Position and Attitude**] in the menu bar to open the [**Image position and attitude data**] page, and click the [**Import POS**] icon to import.





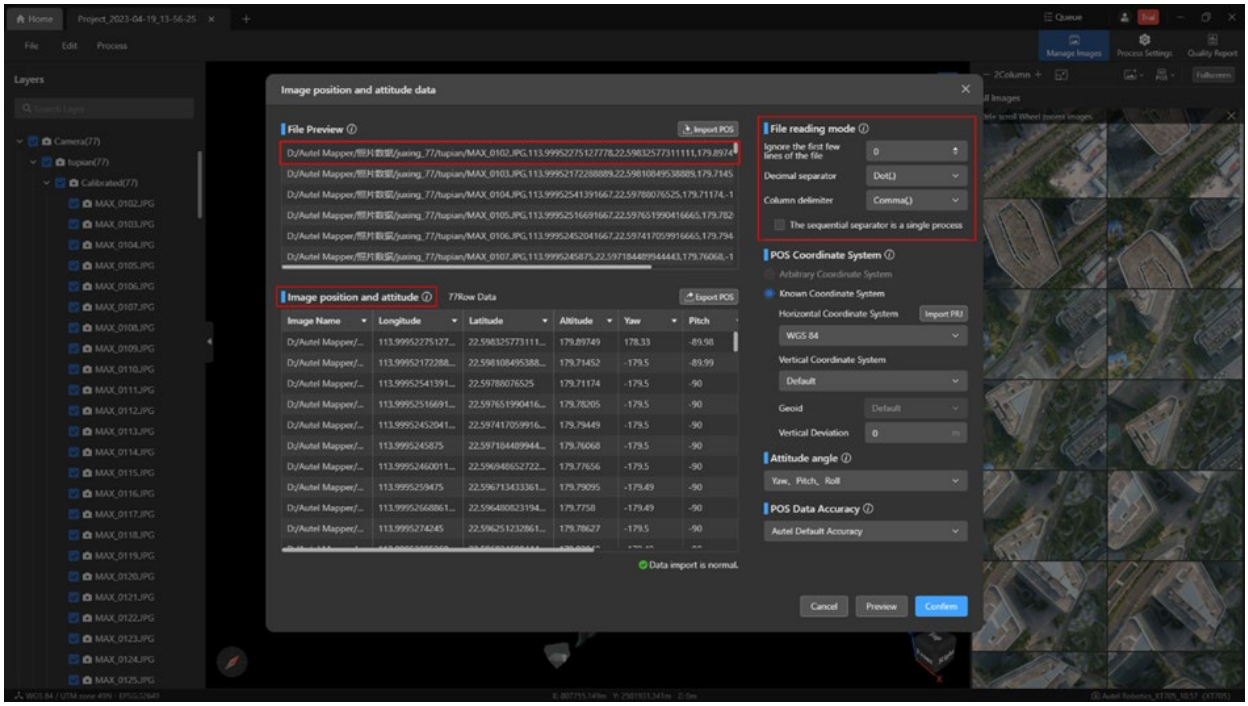
In the [**File reading mode**] column, set [**Ignore the first few lines of the file**], [**Decimal separator**], [**Column delimiter**], and [**The sequential separator is a single process**] according to the format of the imported POS file.

Tips:

- The data in the [**Image position and attitude**] list is displayed according to the set [**File reading mode**] rules.
- [**Ignore the first few lines of the file**] is used to eliminate invalid data in the header.
- [**Decimal separator**] is used to set the display form of the decimal point.
- [**Column delimiter**] is used to set the separation form between multiple forms of data in

each row.

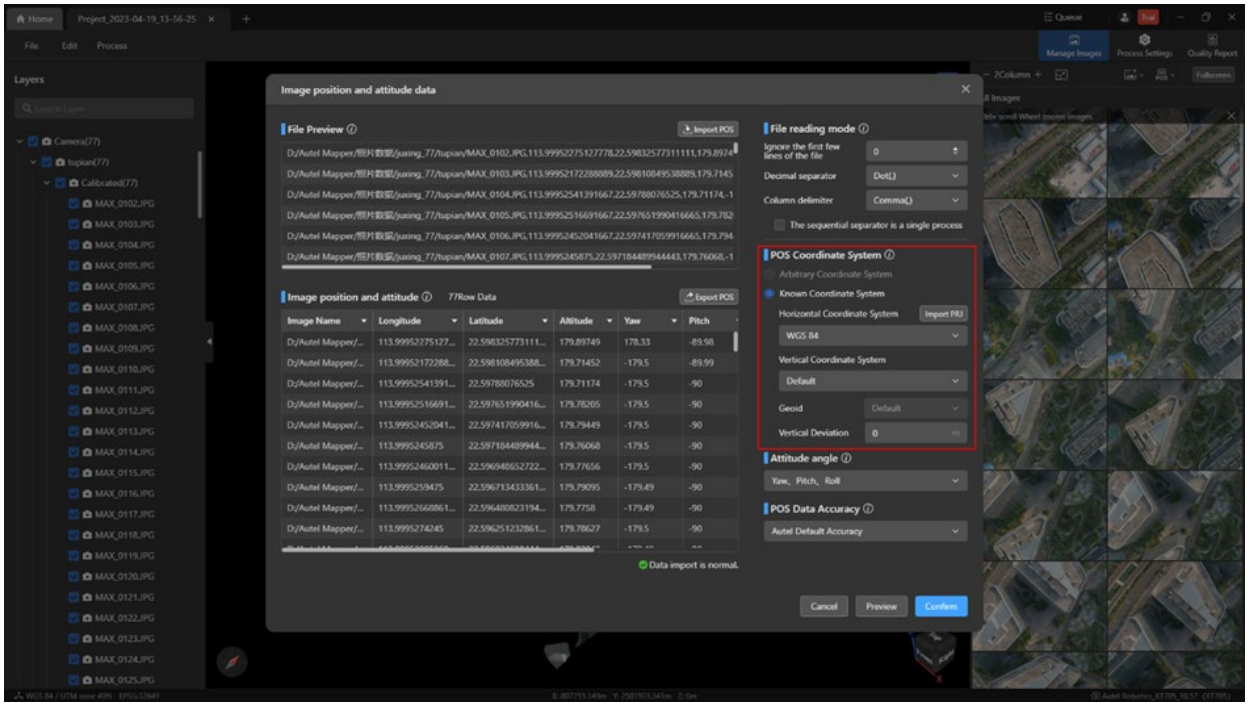
- [**The sequential separator is a single process**] is used to eliminate repeated symbols between two data.



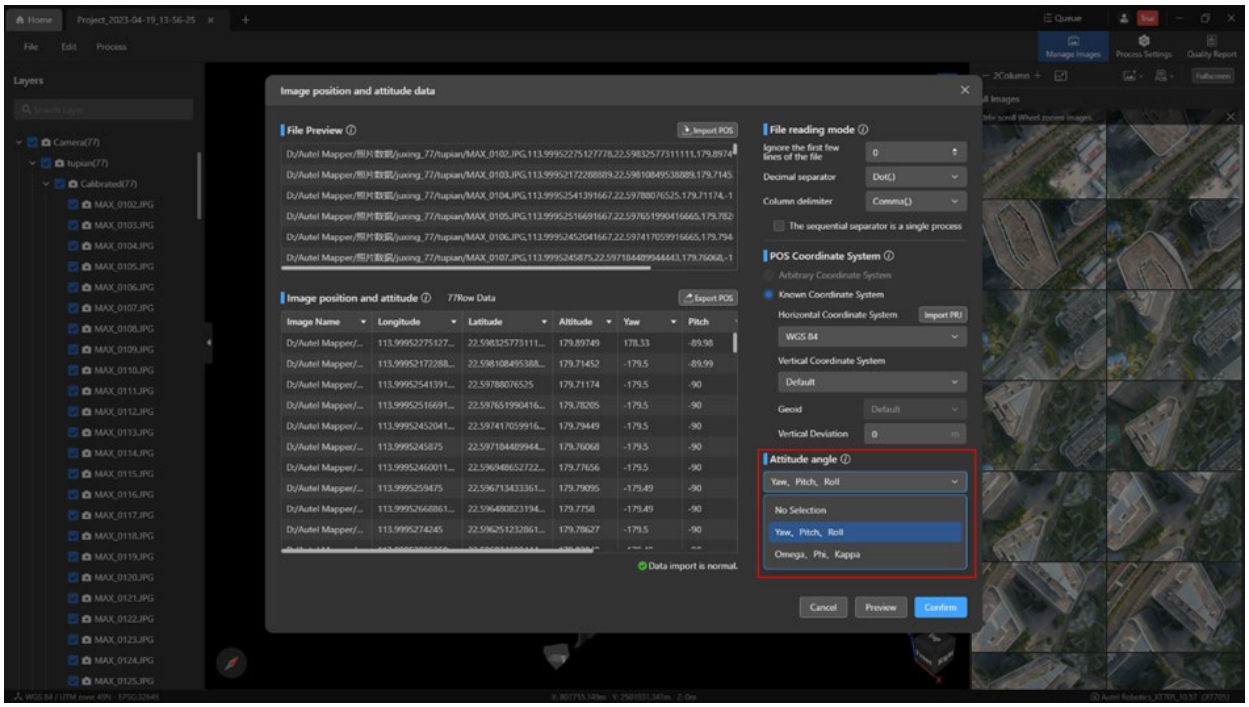
In the [**POS Coordinate System**] column, you can set the horizontal coordinate system, elevation coordinate system and elevation offset.

Tips:

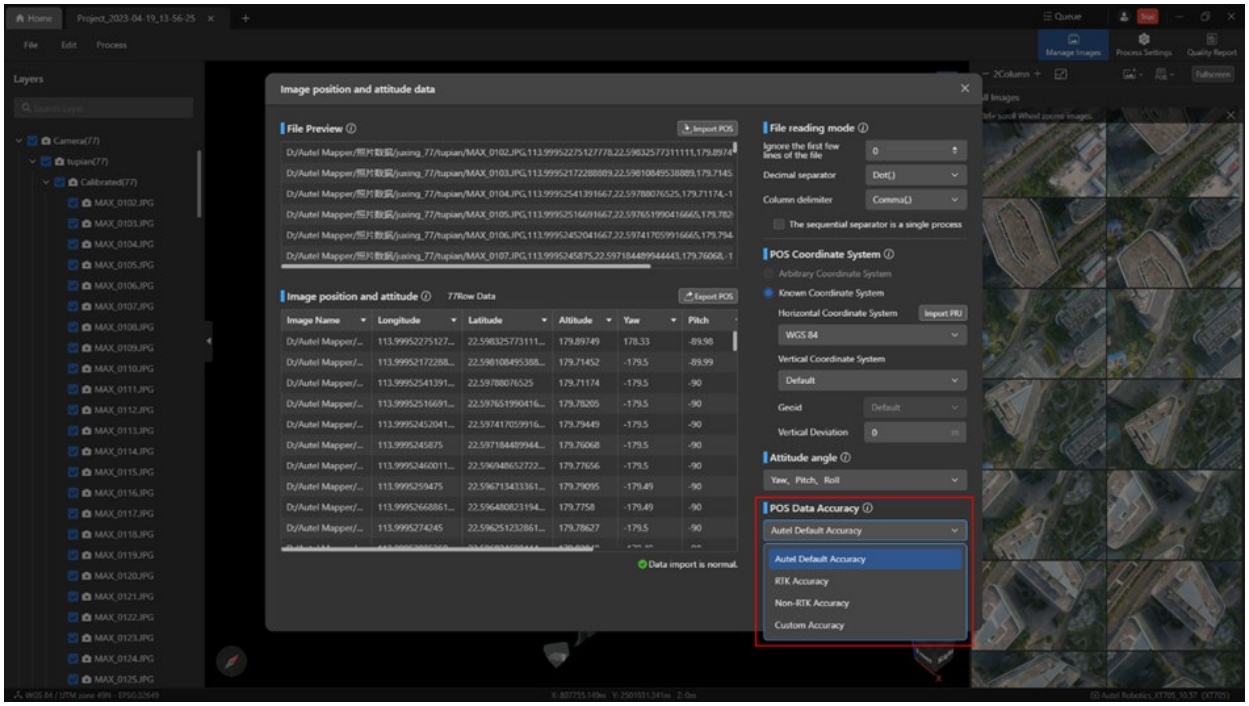
- [**Horizontal Coordinate System**]: It supports the selection of ground coordinate system and projection coordinate system; if you import a custom POS, you can click the [Import PRJ] button to set this. You can query and select different horizontal coordinate systems in the horizontal coordinate system drop-down menu.
- [**Vertical Coordinate System**]: The elevation coordinate system is the default value, and the user can manually change it according to the actual situation. Different elevation coordinate systems can be selected in the elevation coordinate system drop-down menu.
- [**Vertical Deviation**]: It is mainly used to increase or decrease the overall height. When there is an error between the ellipsoid height and the altitude, you can adjust the ellipsoid height to the altitude by setting this parameter.



In the [**Attitude angle**] column, you can select the attitude angle information, which supports Yaw, Pitch, Roll format and Omega, Phi, Kappa format attitude angle.



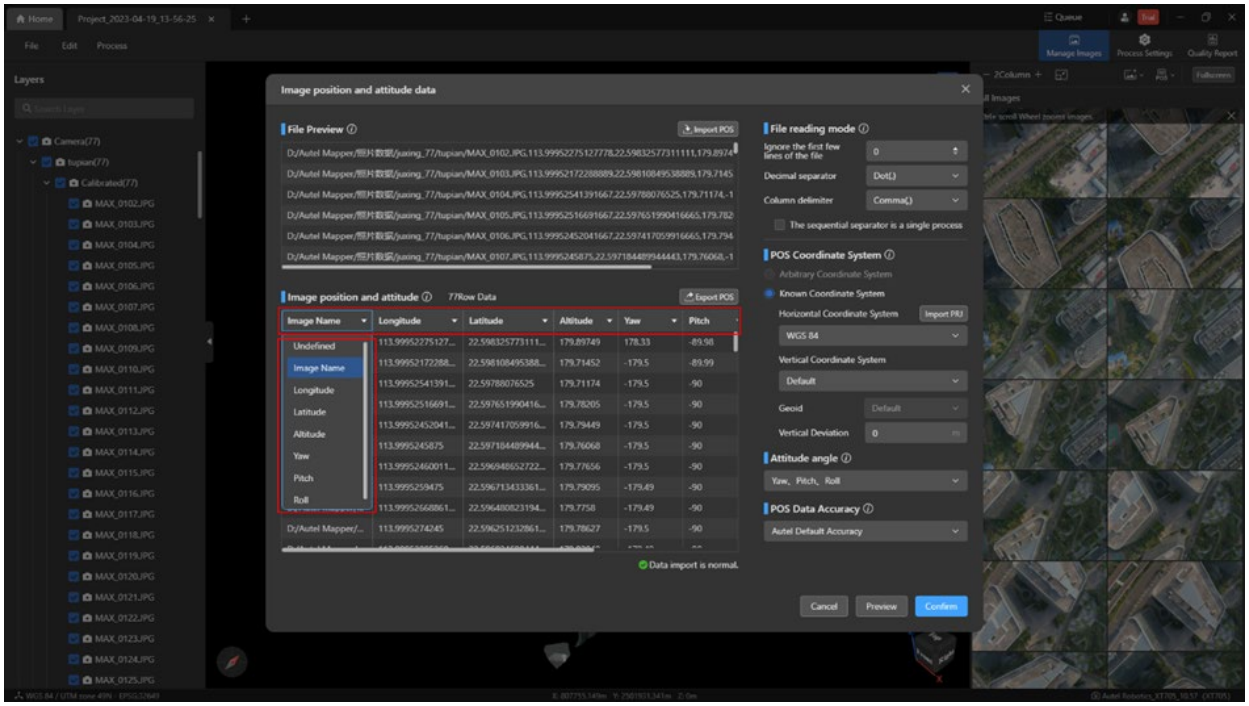
In the [**POS Data Accuracy**] column, you can set the precision type, including four types: Autel Default Accuracy, RTK Accuracy, Non-RTK Accuracy, or Custom Accuracy.



In the [**Image position and attitude**] list, you can modify the header of each column to make it correspond to the value in the column.

Tips:

- Image name, longitude (X), latitude (Y), altitude (Z) are required values, and the same header cannot be selected.
- When the selected coordinate system is a ground coordinate system, it displays longitude, latitude, and height; when the selected coordinate system is a projection coordinate system, it displays X, Y, and Z.
- After importing the image POS file, click the [**Preview**] button to preview the latest image POS data.
- After checking that the image POS data is correct, click the [**Confirm**] button to complete the image POS data import.



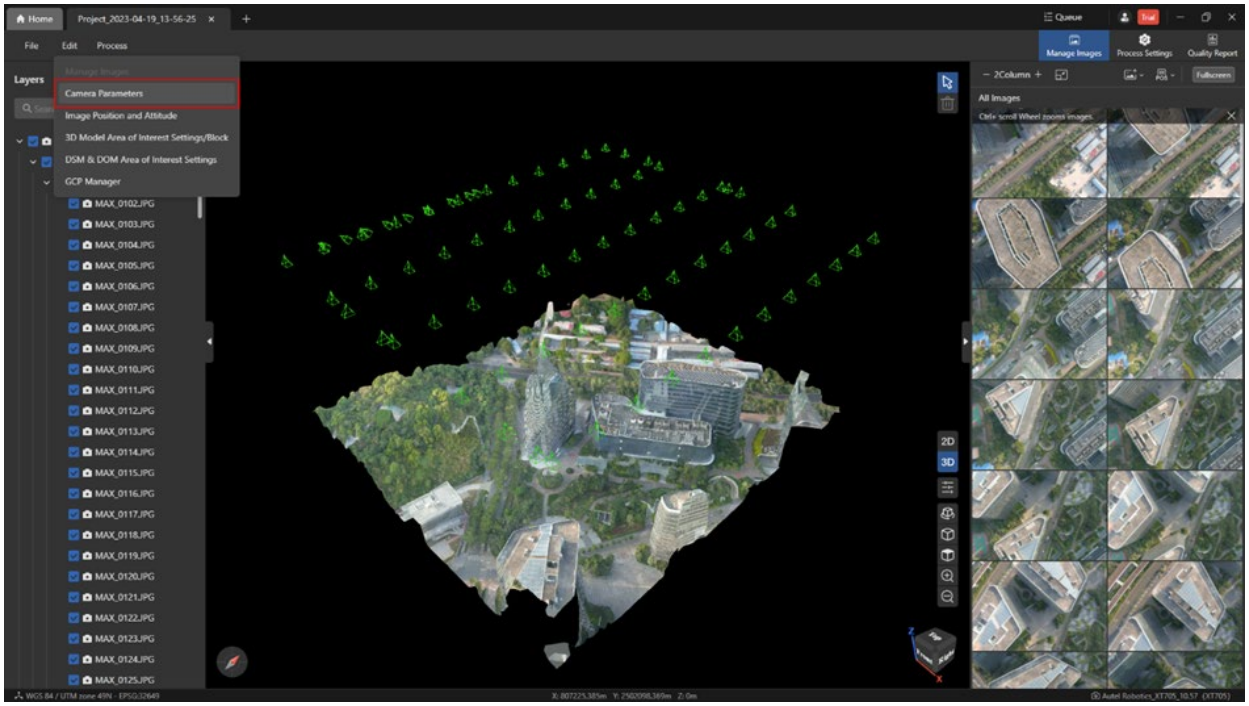
3. Camera Management

Camera management includes modifying camera parameters, adding templates, importing templates, exporting templates, and managing templates.

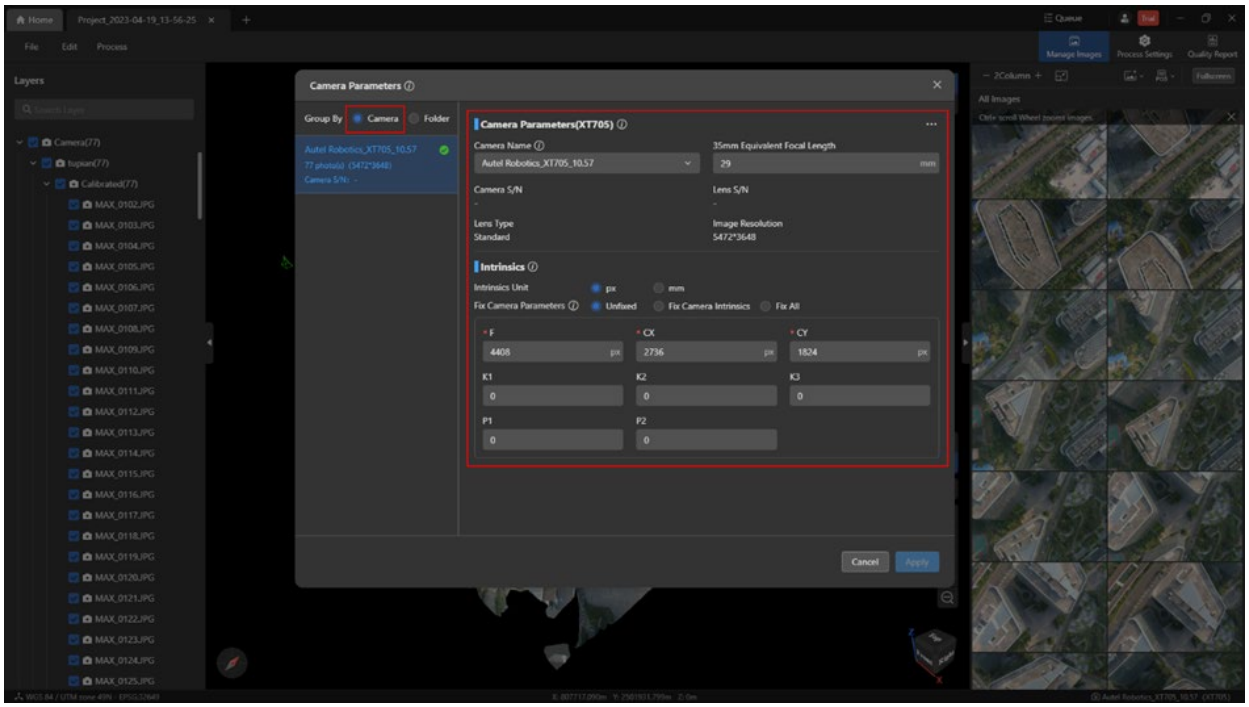
3.1 Modifying Camera Parameters

Autel Mapper supports automatic identification of camera parameter information built into images. When there is a problem with the built-in camera parameters of the image or the lack of camera focal length information in the camera parameters makes it impossible to perform reconstruction processing, etc., it is necessary to manually modify the camera parameters before reconstruction processing.

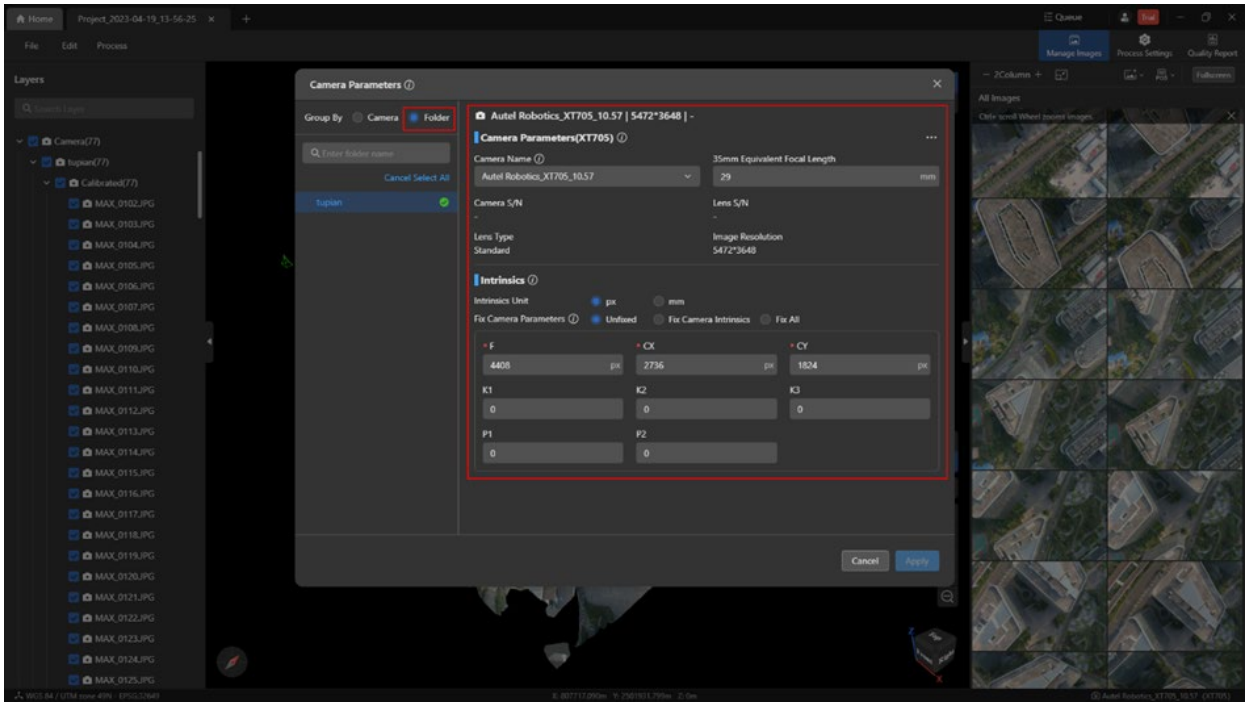
Click [**Edit->Camera Parameters**] in the menu bar to open the [**Camera Parameters**] page.



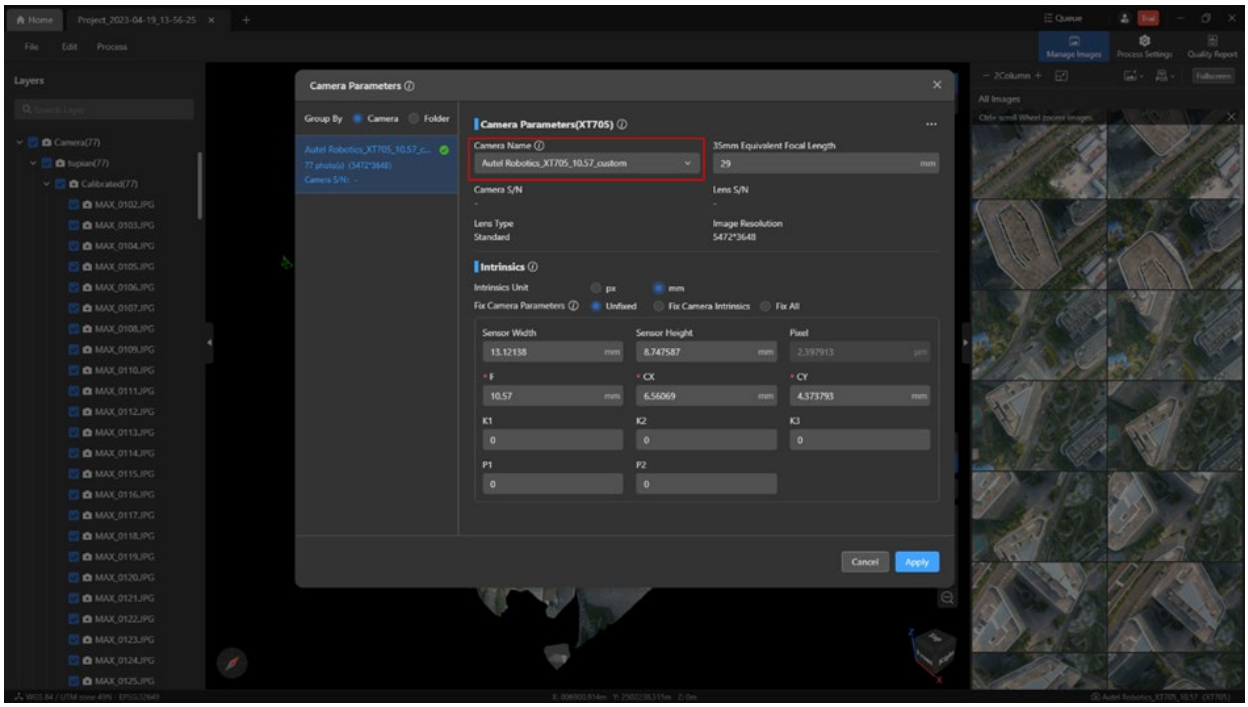
Select the [**Camera**] column on the left side of the [**Camera Parameters**] page, and select the camera in the camera list below to modify the parameters of the selected camera in the [**Camera Parameters**] column and [**Intrinsics**] column on the right.



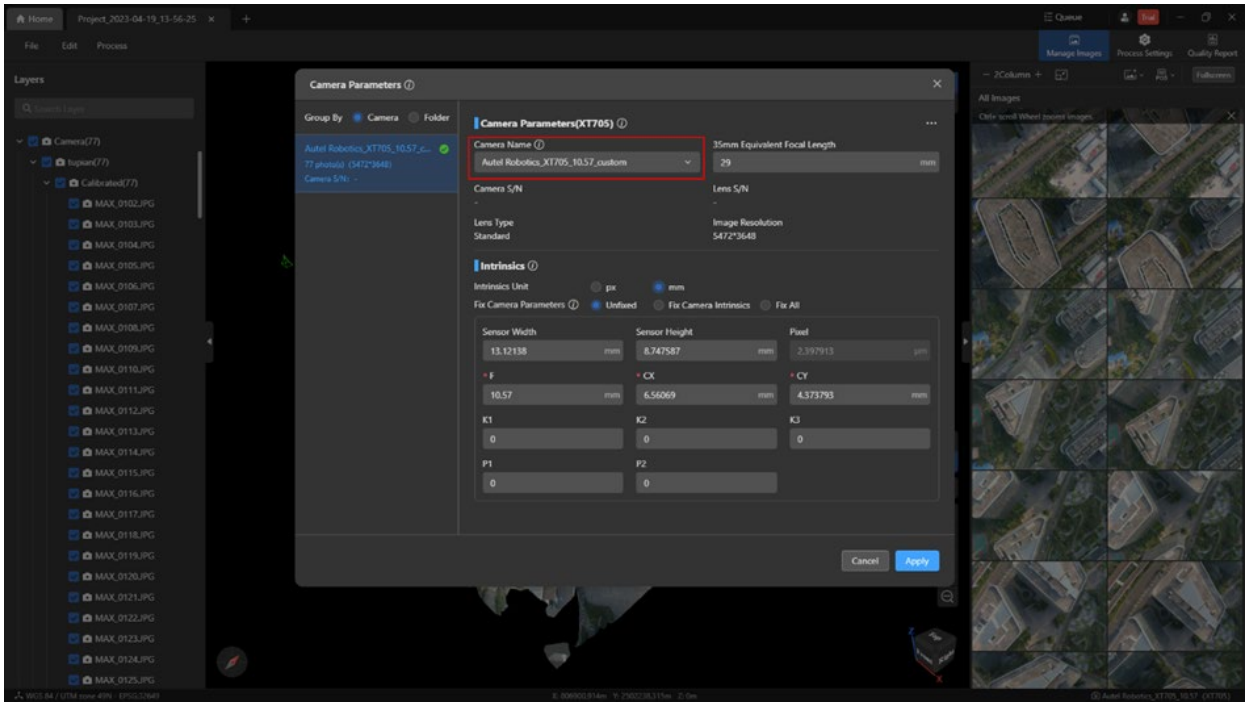
Select the [**Folder**] column on the left side of the [**Camera Parameters**] page to display camera categories in the form of image folders. After selecting a folder, you can uniformly modify the camera parameters of the images in the entire folder.



After modifying the camera parameters, the suffix "**_custom**" will be added after the current camera name. You need to click the [**Apply**] button to use the processed parameters in the reconstruction.

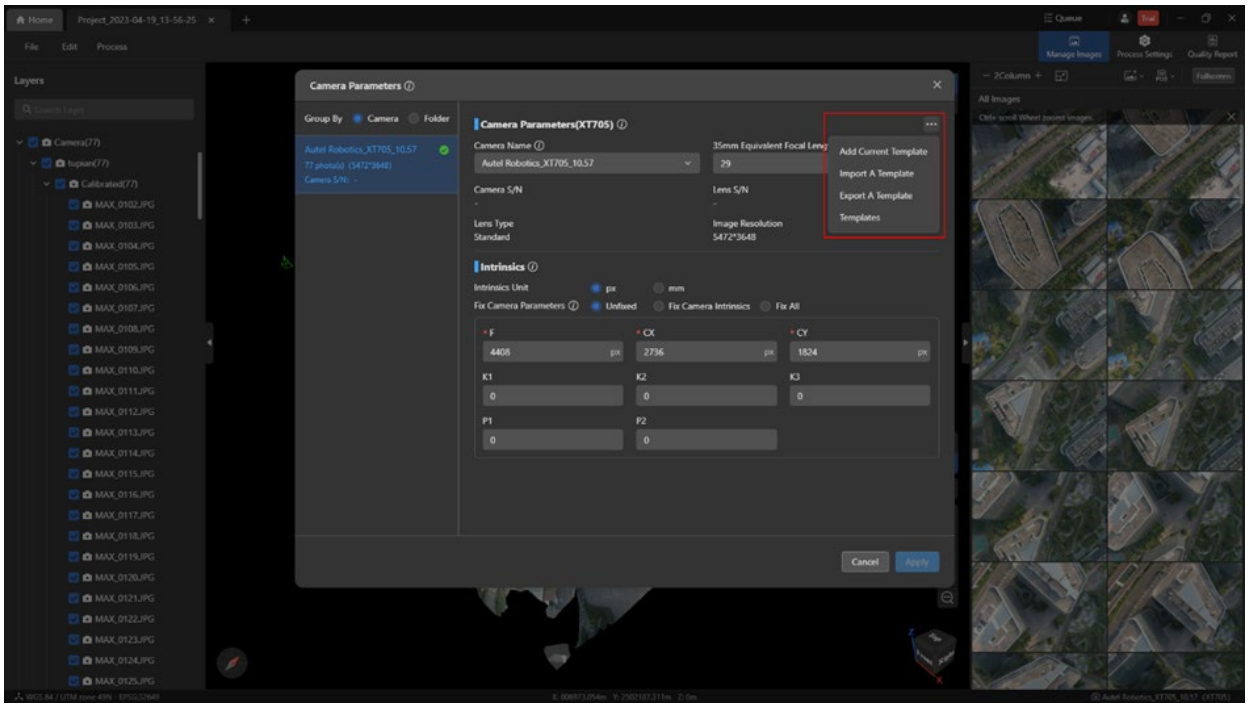


In the [**Camera Parameters**] column, click [**Camera Name**] to select a preset camera template from the drop-down menu. Please make sure that the selected camera parameters are correct.

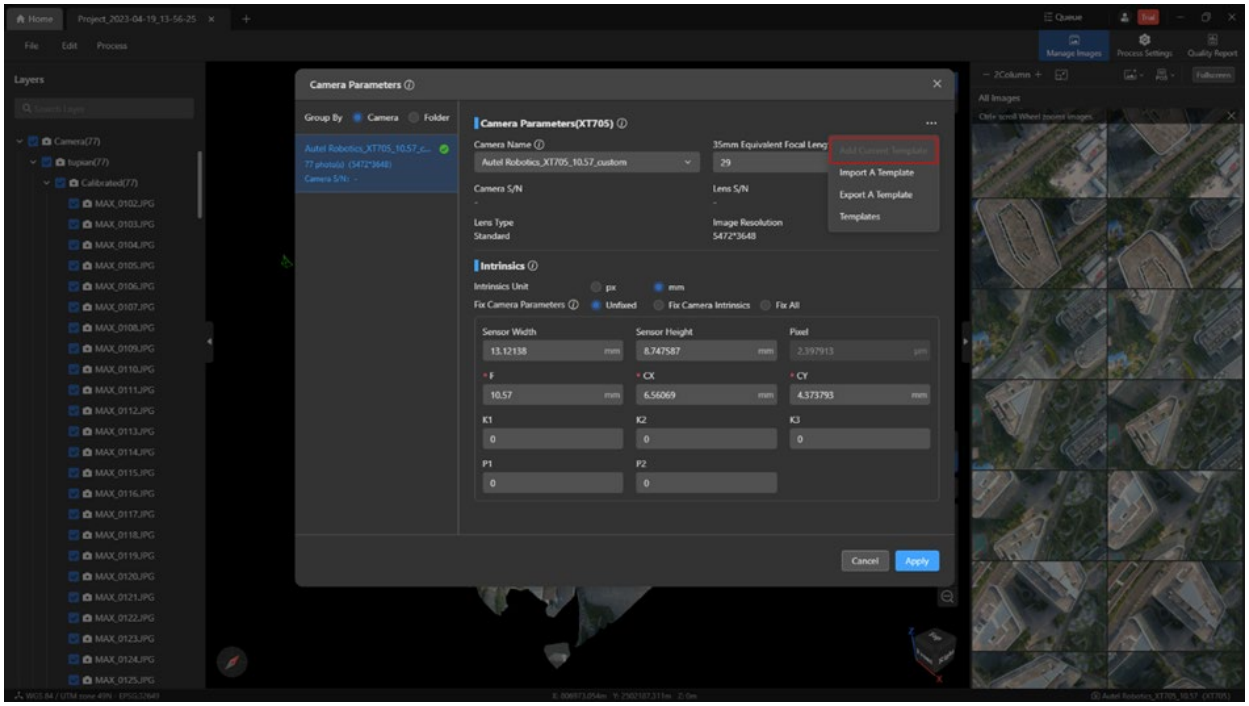


3.2 Adding A Template

Click the [**...**] icon in the upper right corner of the [**Camera Parameters**] page to perform four operations: [**Add Current Template**], [**Import A Template**], [**Export A Template**], and [**Templates**].



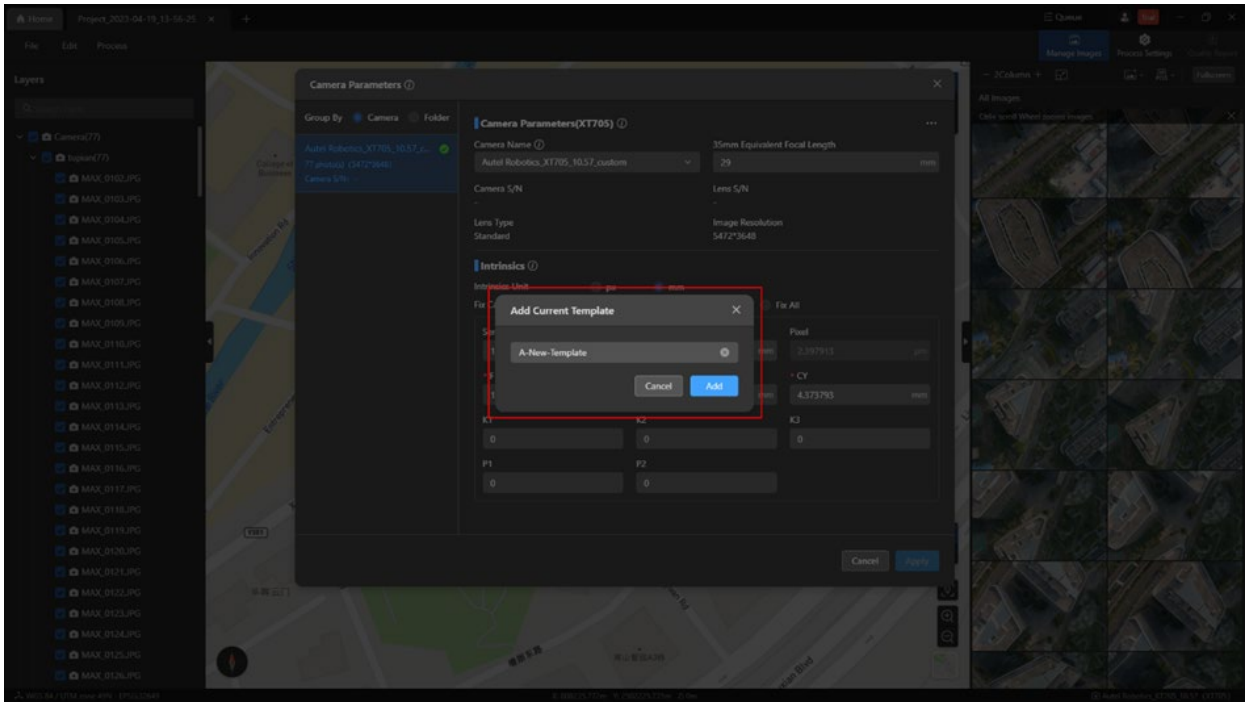
When the camera parameters are modified and the [**Apply**] button is not clicked, [**Add Current Template**] is grayed out and cannot be clicked.

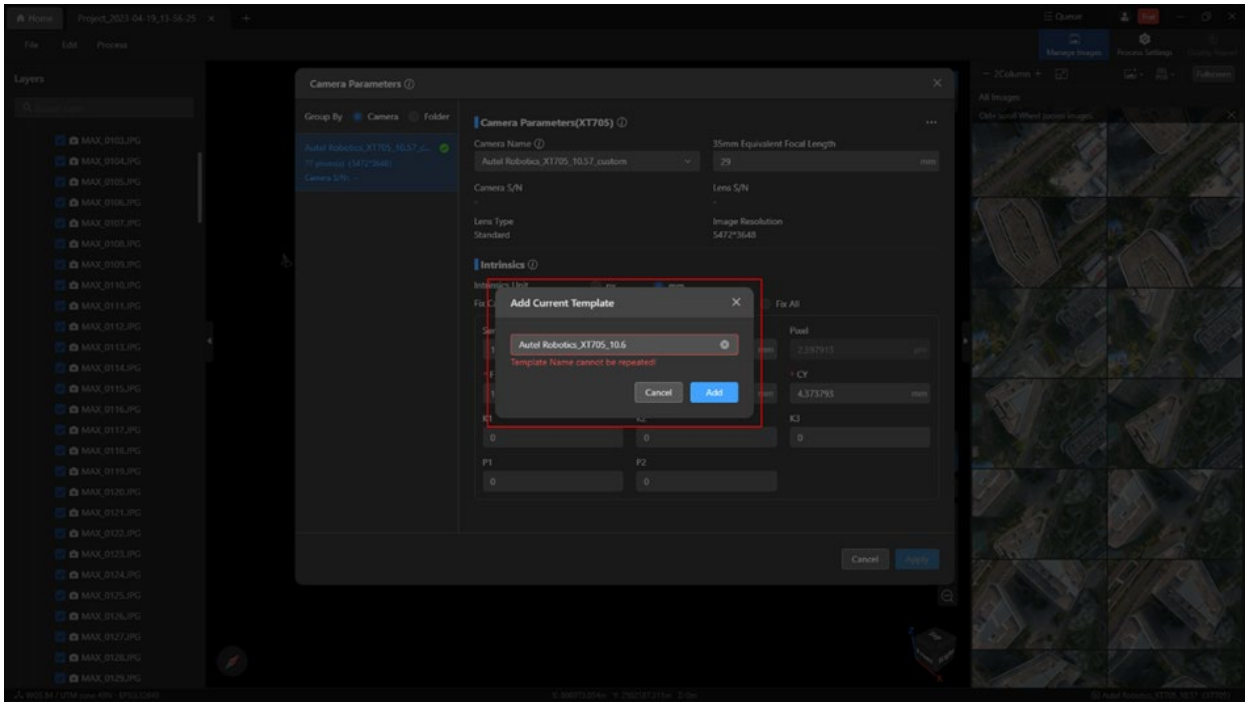


After saving the camera parameters, click [**Add Current Template**], and the corresponding pop-up window will pop up, enter the template name in it and click the [**Add**] button to complete the addition.

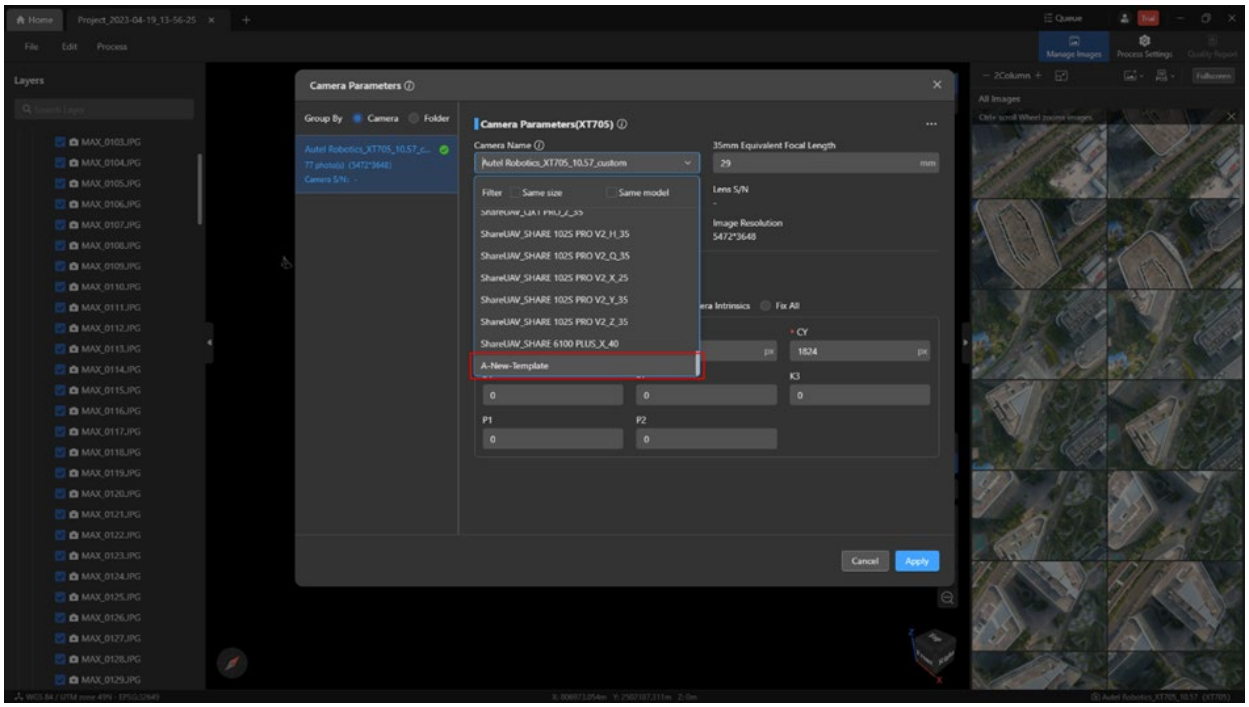
Note:

- The entered template name cannot be the same as an existing template.





After the addition is successful, the [**Camera Name**] in the [**Camera Parameters**] column is also changed to the name of the added template. The camera template can be seen in the drop-down menu, and the camera template can also be used in other project pages.

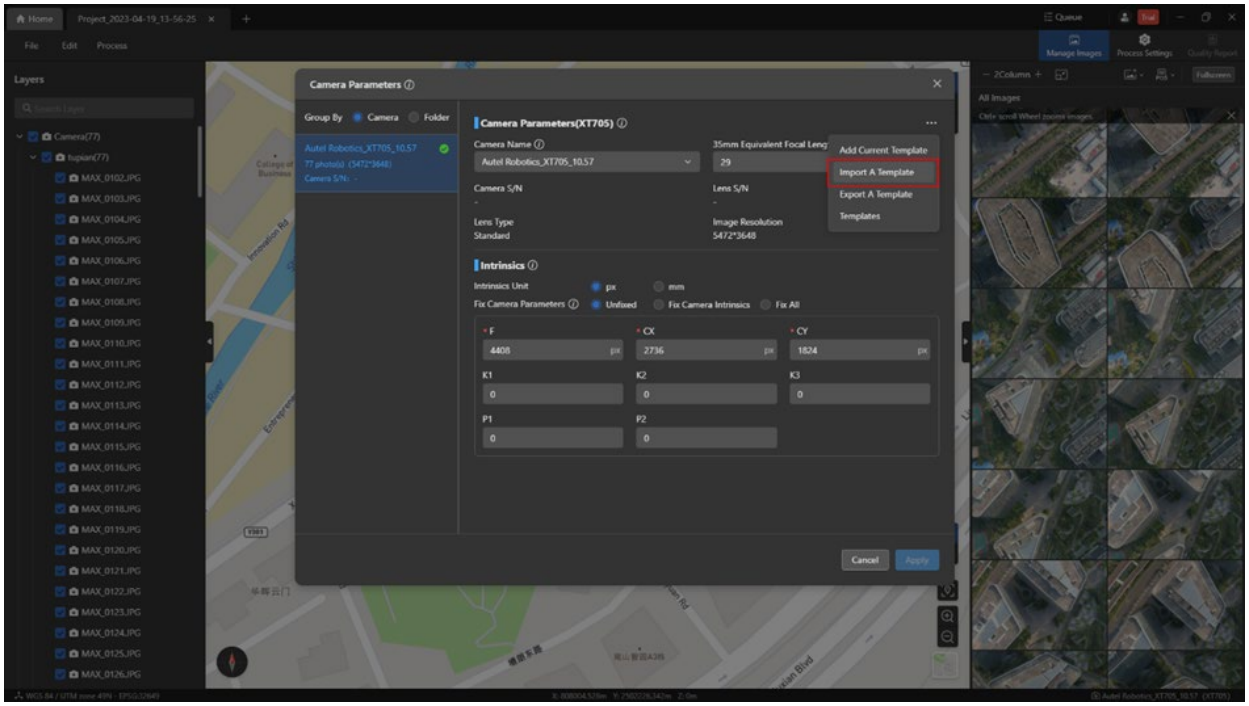


3.3 Importing A Template

Click the [**...**] icon in the upper right corner of the [**Camera Parameters**] page and select [**Import A Template**] to import the camera template file.

Tips:

- Camera template files only support .json format.

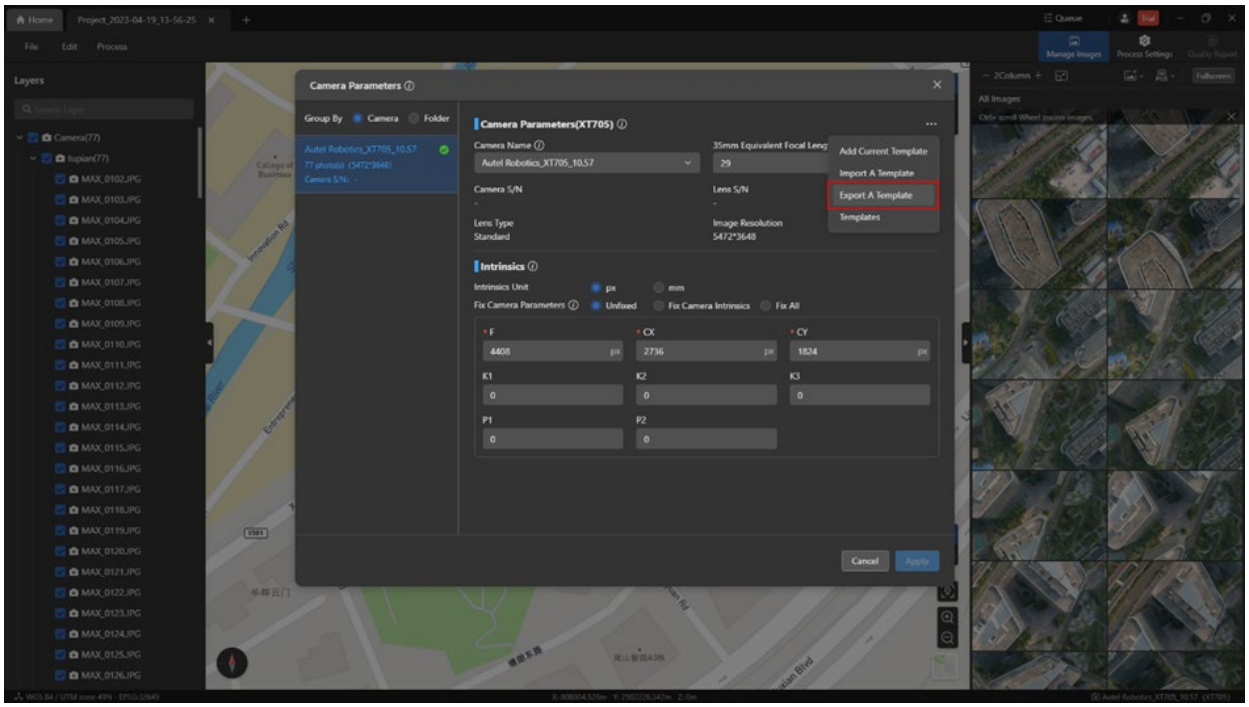


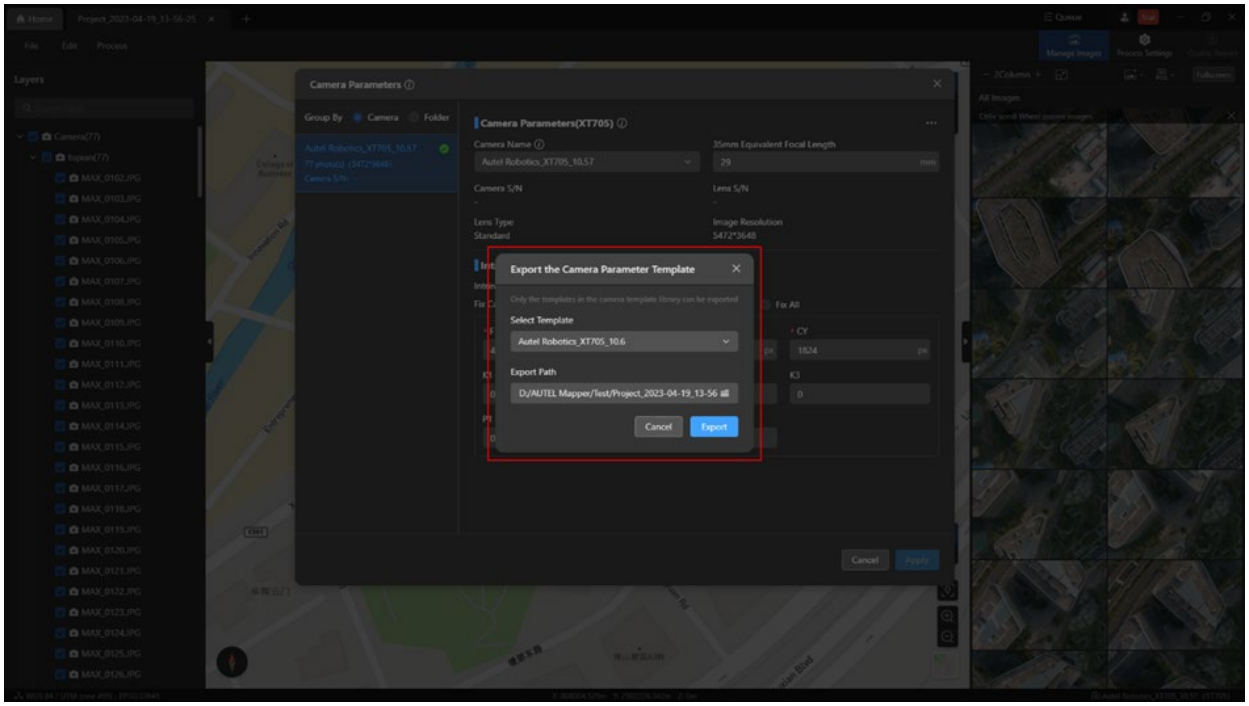
3.4 Exporting A Template

Click the [**...**] icon in the upper right corner of the [**Camera Parameters**] page and select [**Export A Template**] to export the camera template file. In the pop-up [**Export the Camera Parameter Template**] pop-up window, select the template and the export path, and click the [**Export**] button to export the camera template to the local disk of the computer.

Notes:

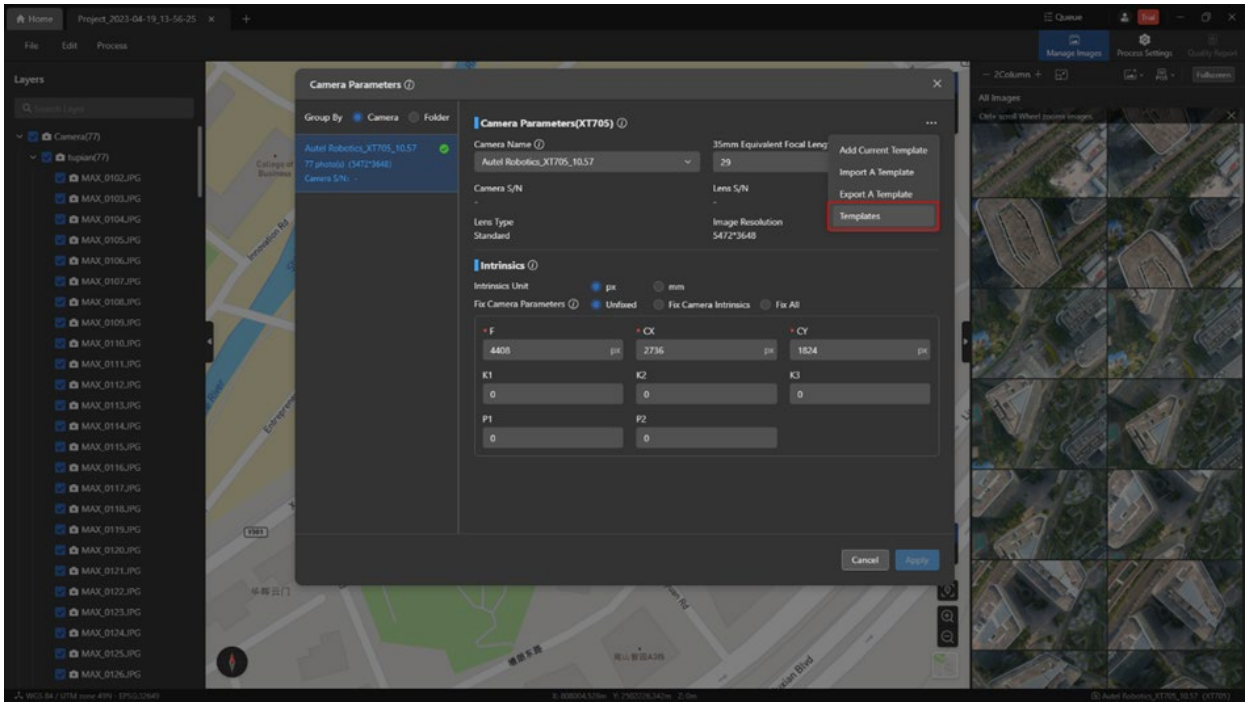
- Only templates in the camera template library are exported.
- The exported template is in .json format and cannot be modified.





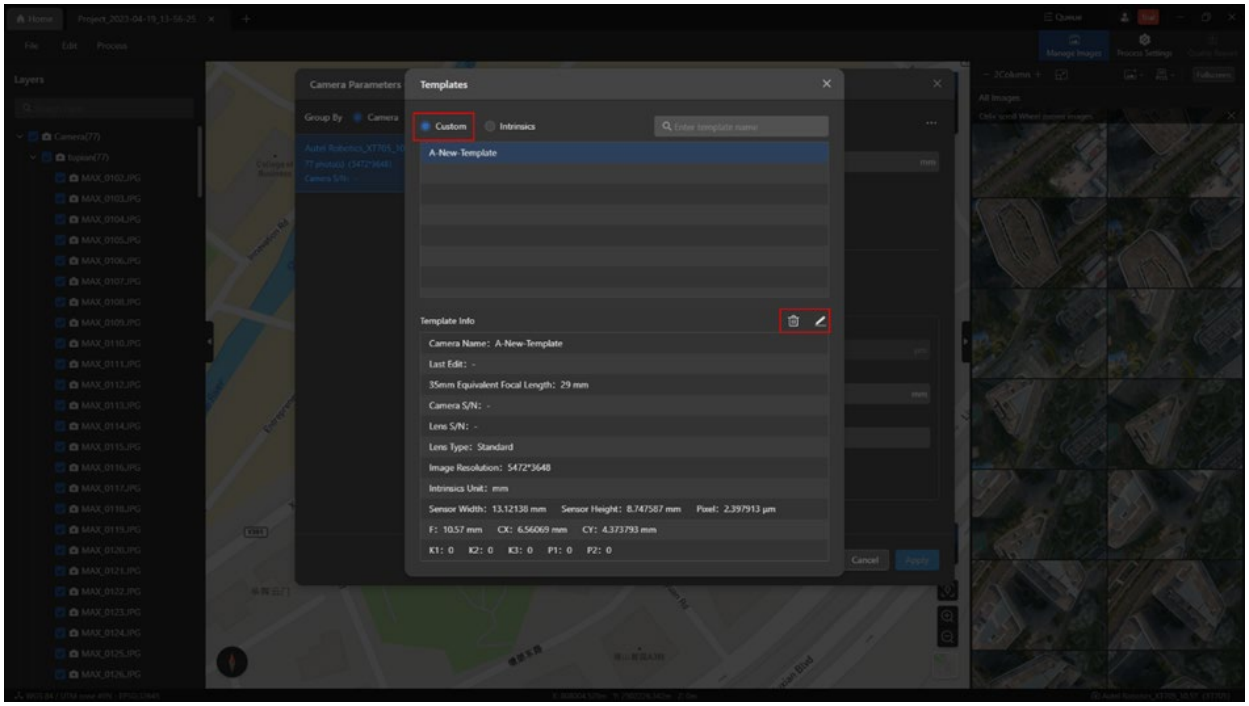
3.5 Managing Templates

Click the [**...**] icon in the upper right corner of the [**Camera Parameters**] page and select [**Templates**] to view all camera templates.

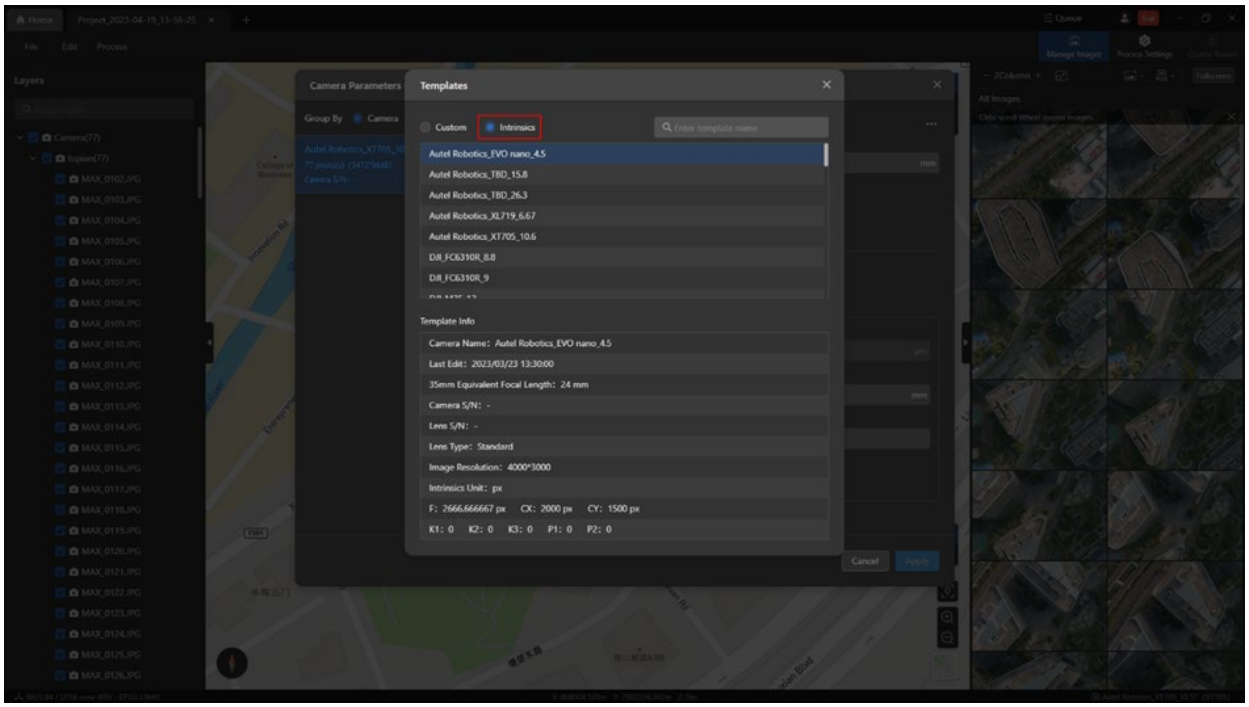


The camera template library is divided into [**Custom**] templates and [**Intrinsics**] templates.

In the camera template library, [**Custom**] templates can be deleted and edited.



The [**Intrisics**] template only supports viewing camera parameter information, and cannot be edited.



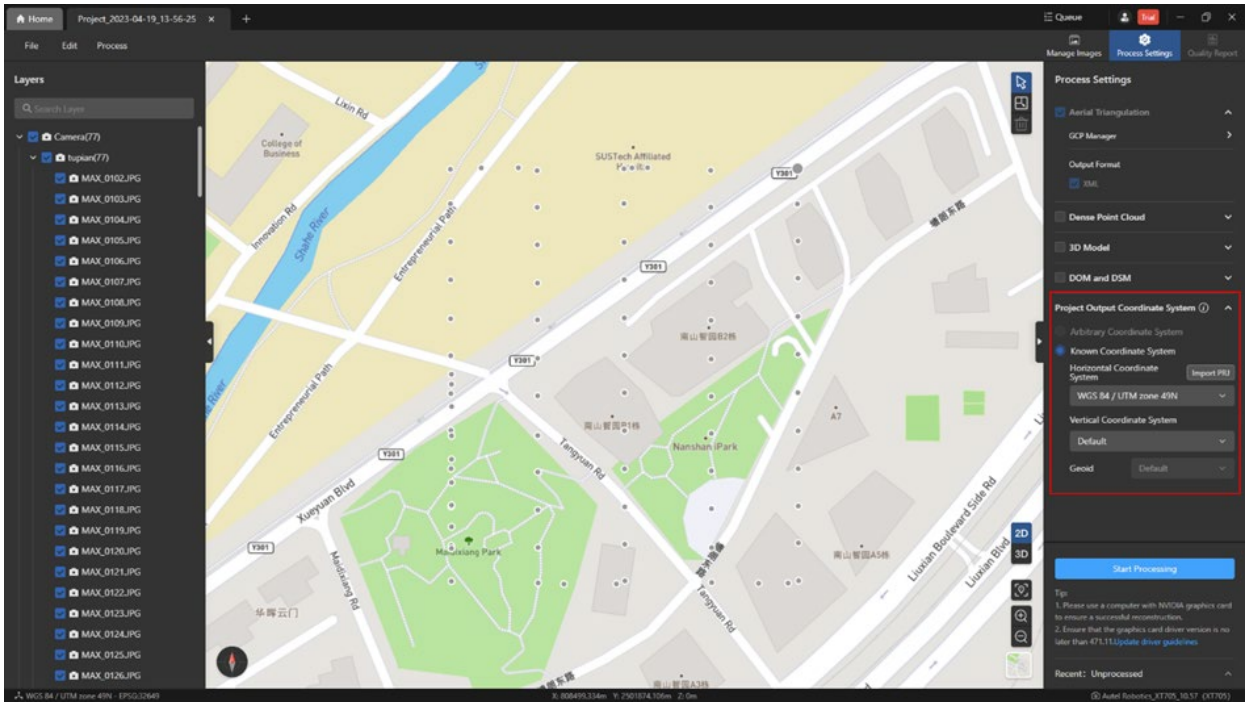
4. Setting the Project Output Coordinate System

4.1 Project Output Coordinate System Overview

During 2D reconstruction and 3D reconstruction, the user can set the project output coordinate system in the [**Project Output Coordinate System**] column of the [**Process Settings**] page. The default coordinate system is a projection coordinate system from the recognized photo, and the ground control point (GCP) coordinate system and the project output coordinate

system are consistent with this.

After setting the project output coordinate system, the coordinate system of OSGB, DOM and DSM output for 2D and 3D reconstruction will also be synchronized to the set coordinate system.

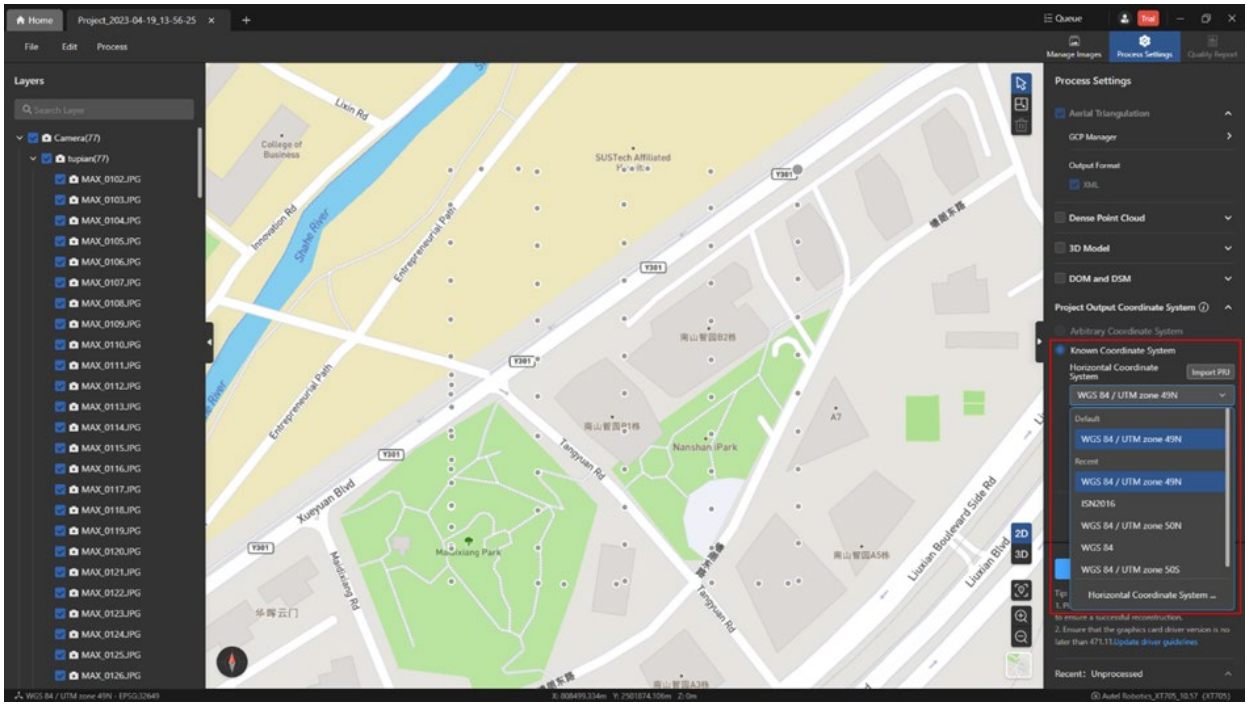


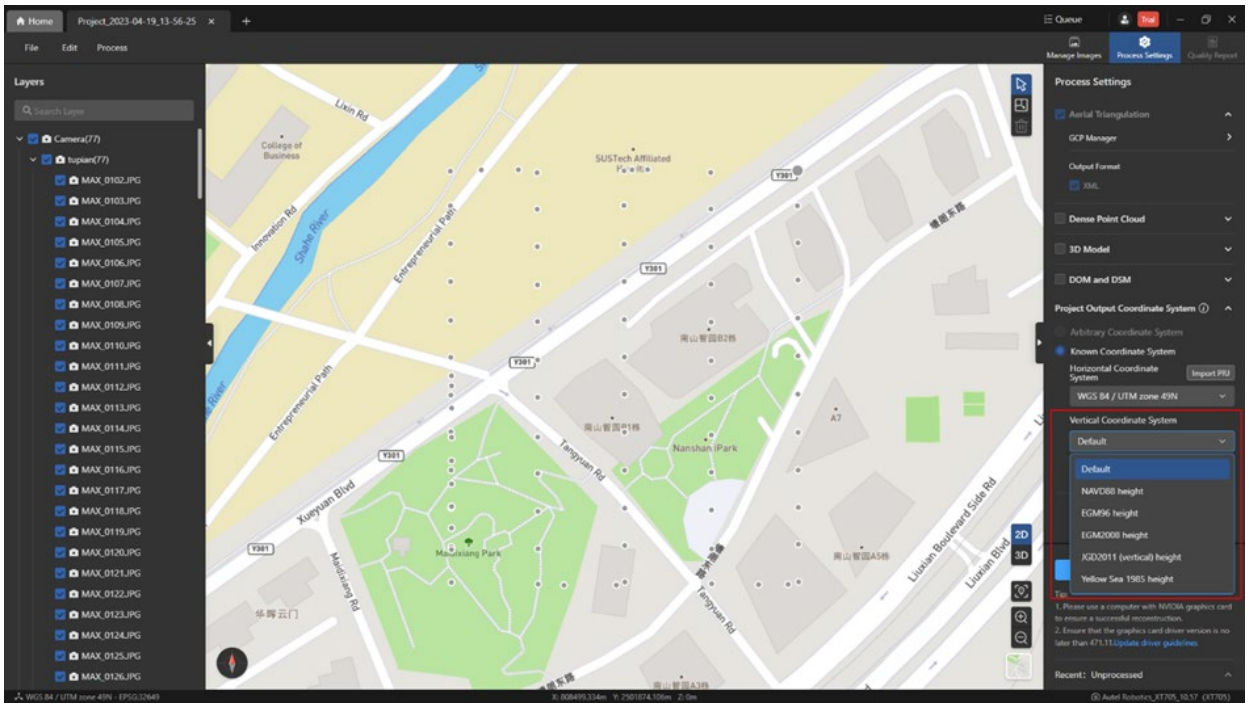
4.2 Setting Coordinate System

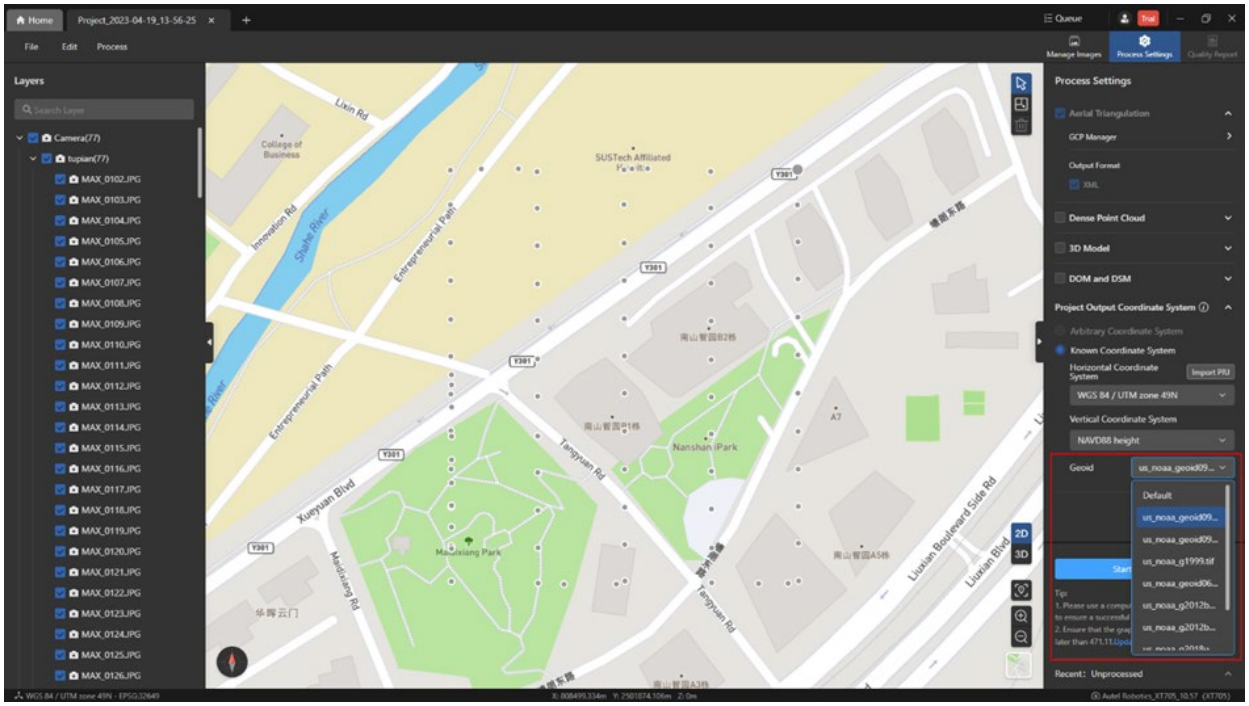
Click the [**Project Output Coordinate System**] button on the [**Process Settings**] page to expand the project output coordinate system setting bar.

Note:

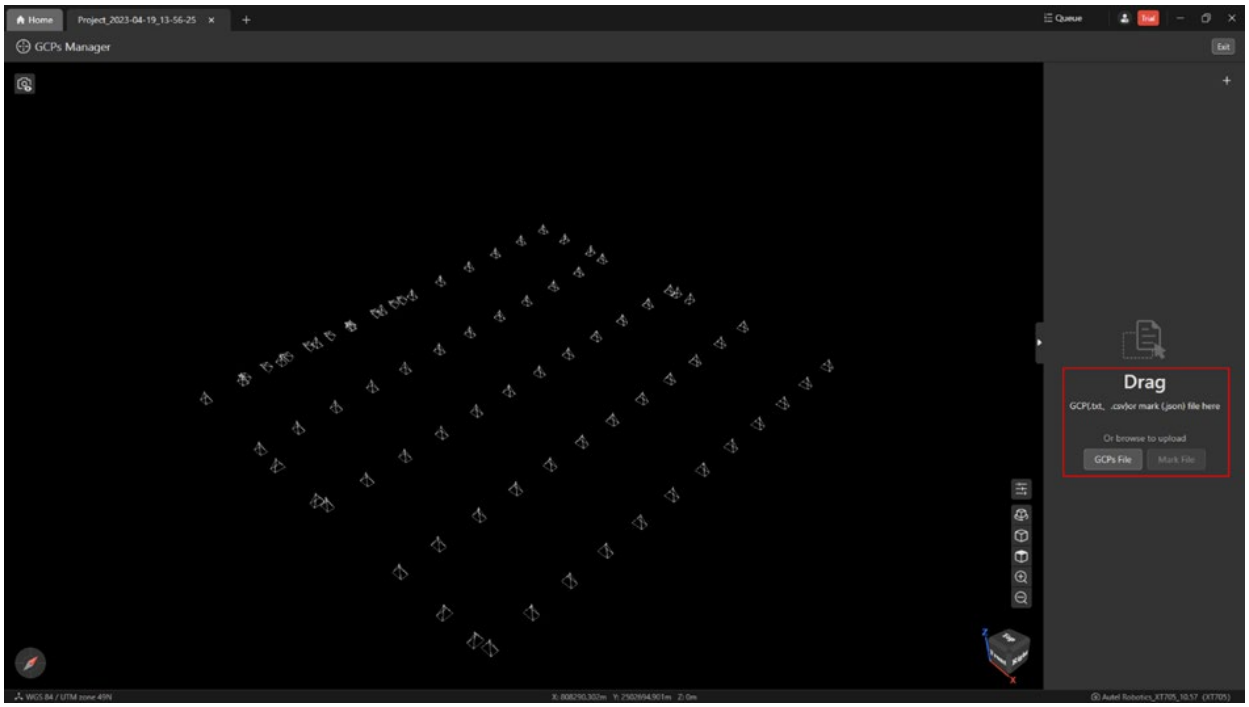
- **Arbitrary Coordinate System**: The [**Arbitrary Coordinate System**] option is grayed out and cannot be modified in the current version.
- **Horizontal Coordinate System**: Automatically identify the projection coordinate system corresponding to the photo, the horizontal coordinate system can be modified through the drop-down menu, and it supports modification to a ground coordinate system or a projected coordinate system.
- **Vertical Coordinate System**: The default elevation coordinate system is the geoid, and it supports modification to other elevation coordinate systems.
- **Geoid**: After modifying the elevation coordinate system, the corresponding geoid can be selected according to the selected elevation coordinate system.

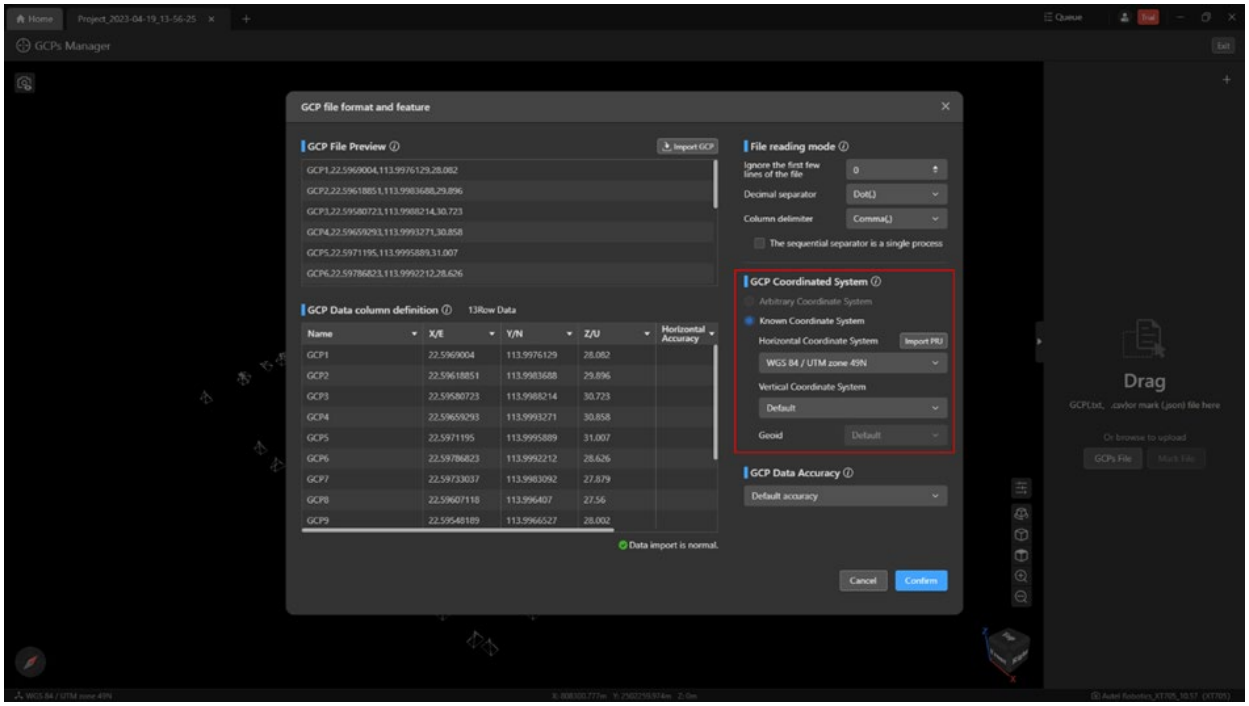

Home
Project_2023-04-19_13-56-25
File
Edit
Process
Queue
Trial
Manage Images
Process Settings
Quality Report
Layers
Camera(77)
tupian(77)
Process Settings
Aerial Triangulation
GCP Manager
Output Format
XML
Dense Point Cloud
3D Model
DOM and DSM
Project Output Coordinate System
Arbitrary Coordinate System
Known Coordinate System
Horizontal Coordinate System
Import PRJ
WGS 84 / UTM zone 49N
Default
Recent
ISN2016
WGS 84 / UTM zone 50N
WGS 84
WGS 84 / UTM zone 50S
Horizontal Coordinate System ...
Recent: Unprocessed
Lixin Rd
College of Business
Innovation Rd
Shahe River
Entrepreneurial Path
SUSTech Affiliated
Y301
Nanshan iPark
Xueyuan Blvd
Maofushang Rd
Tangyuan Rd
Liuxian Boulevard Side Rd
Liuxian Blvd
2D
3D


Home
Project_2023-04-19_13-56-25
File
Edit
Process
Queue
Trial
Manage Images
Process Settings
Quality Report
Layers
Camera(77)
tupian(77)
Process Settings
Aerial Triangulation
GCP Manager
Output Format
XML
Dense Point Cloud
3D Model
DOM and DSM
Project Output Coordinate System
Arbitrary Coordinate System
Known Coordinate System
Horizontal Coordinate System
Import PRJ
WGS 84 / UTM zone 49N
Vertical Coordinate System
Default
NAVD88 height
EGM96 height
EGM2008 height
JGD2011 (vertical) height
Yellow Sea 1985 height
Recent: Unprocessed
Lixin Rd
College of Business
Innovation Rd
Shahe River
Entrepreneurial Path
SUSTech Affiliated
Y301
Nanshan iPark
Xueyuan Blvd
Maofushang Rd
Tangyuan Rd
Liuxian Boulevard Side Rd
Liuxian Blvd
2D
3D



Click [**Edit->GCP Manager**] in the menu bar, enter the [**GCPs Manager**] page, import the ground control point file, and then modify the coordinate system of the ground control point file, you can also modify the project output coordinate system.





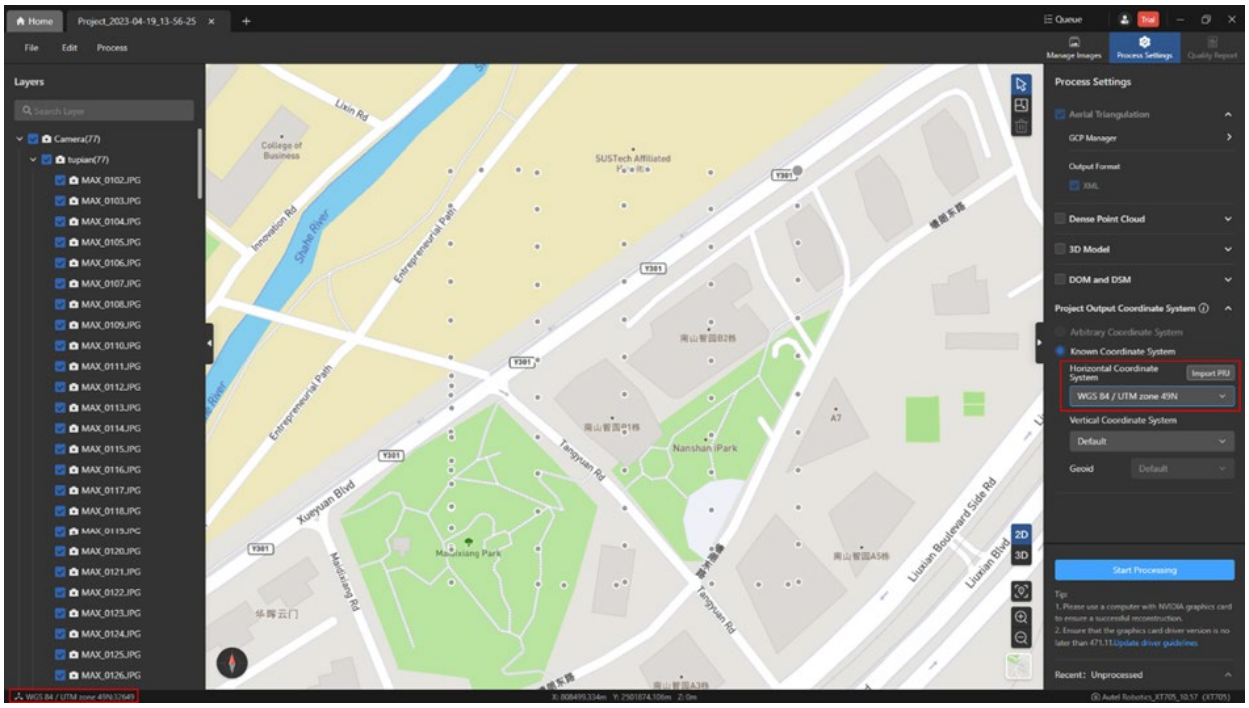
4.3 Horizontal Coordinate System

The horizontal coordinate system defaults to the WGS 84/UTM projection coordinate system.

Tips:

- The default coordinate system may be different for different images.

After modifying the project output coordinate system to EPSG:32649, the coordinate system at the bottom also becomes EPSG:32649 synchronously, and the geographic information at the bottom becomes X, Y, Z (projected coordinate system values).



Reconstruction Process

This chapter mainly introduces the related reconstruction process of Autel Mapper, including aerial triangulation, point clouds, 3D reconstruction and 2D reconstruction.

1. Reconstruction Introduction

Reconstruction includes 2D reconstruction and 3D reconstruction, in which 2D reconstruction can generate a digital surface model (DSM) and digital orthophoto (DOM) of the photographed area. 3D reconstruction produces a 3D model.

2. Aerial Triangulation

2.1 Aerial Triangulation Introduction

Aerial triangulation refers to the use of the spatial geometric relationship between the aerial image and the captured object in photogrammetry to calculate the position and attitude of the camera at the moment of camera imaging and the sparse point cloud of the captured object through the corresponding relationship between the image point and the captured object.

After processing aerial triangulation, it is possible to quickly judge whether the quality of the original data meets the project delivery requirements and whether images need to be added or deleted.

Both 2D and 3D reconstruction must rely on the result of aerial triangulation, so it must be processed by this method first. During the reconstruction process, on the [**Process Settings**] page, it can be configured to process together with the aerial triangulation, or processed first, and then the 2D or 3D reconstruction is performed separately.

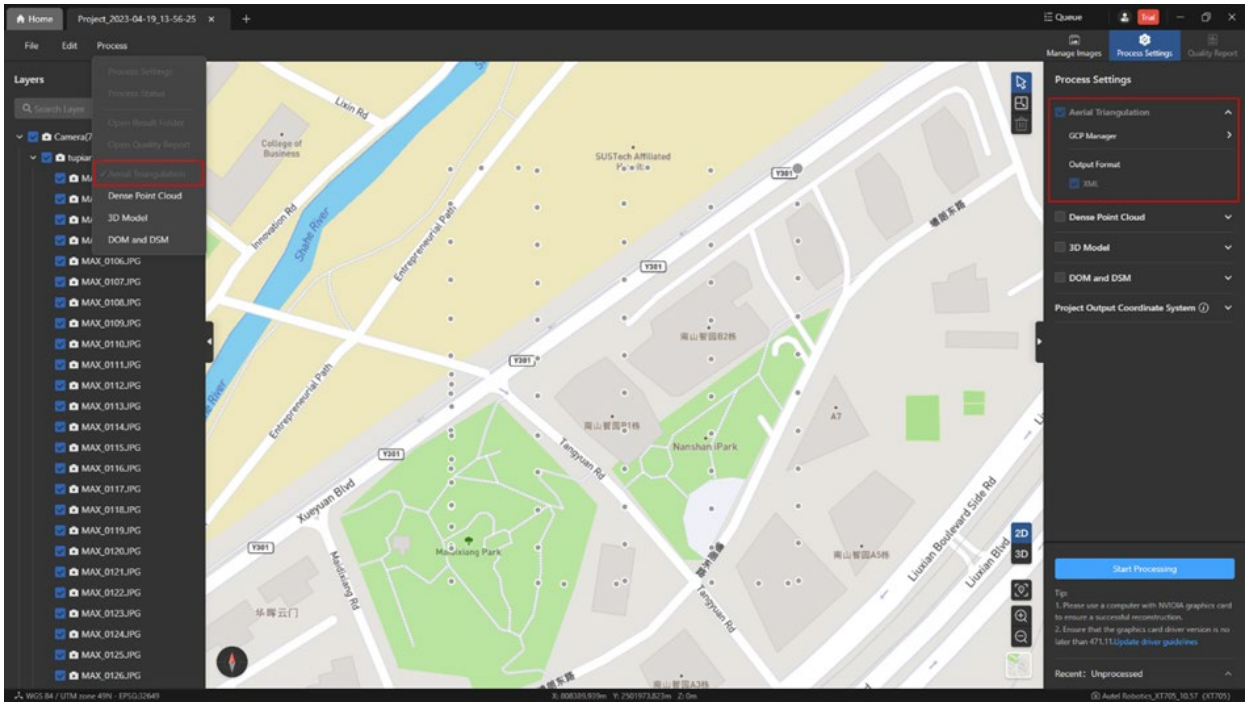
2.2 Aerial Triangulation Processing

2.2.1 Aerial Triangulation Selection

- Click the [**Process Settings**] icon to switch to the [**Process Settings**] page, and check the [**Aerial Triangulation**] option.
- Click [**Process->Aerial Triangulation**] on the menu bar and check the [**Aerial Triangulation**] option.

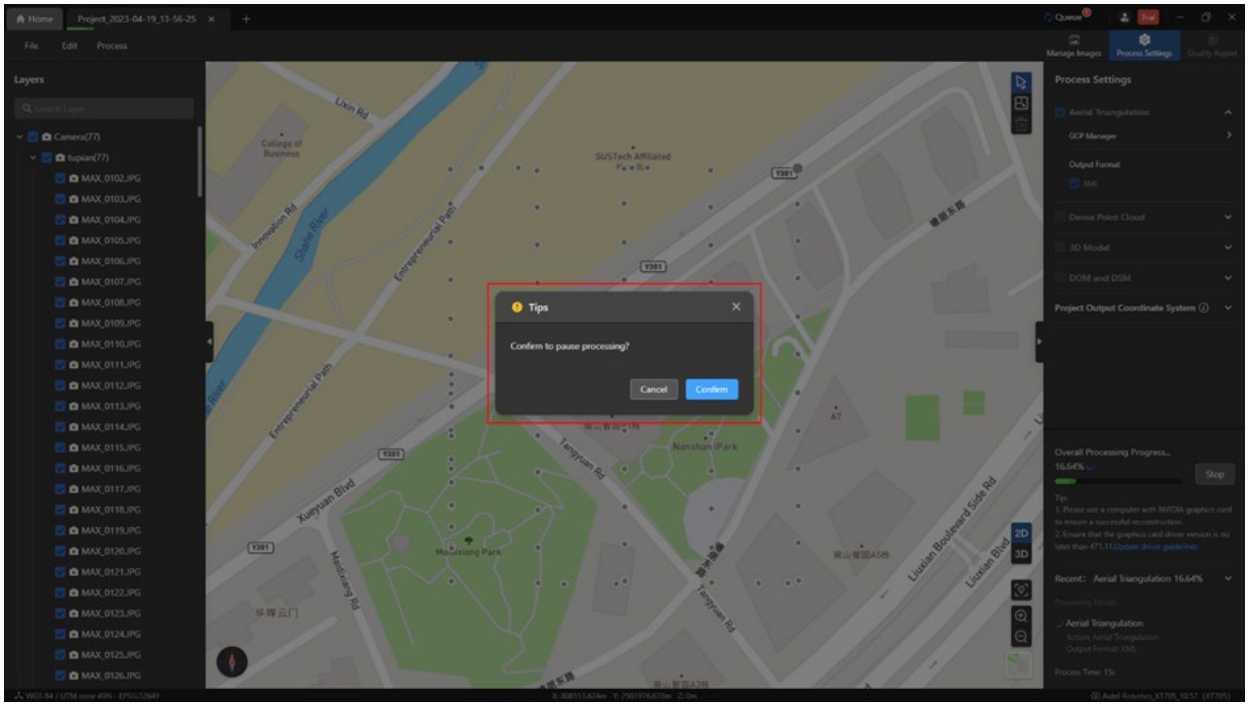
Note:

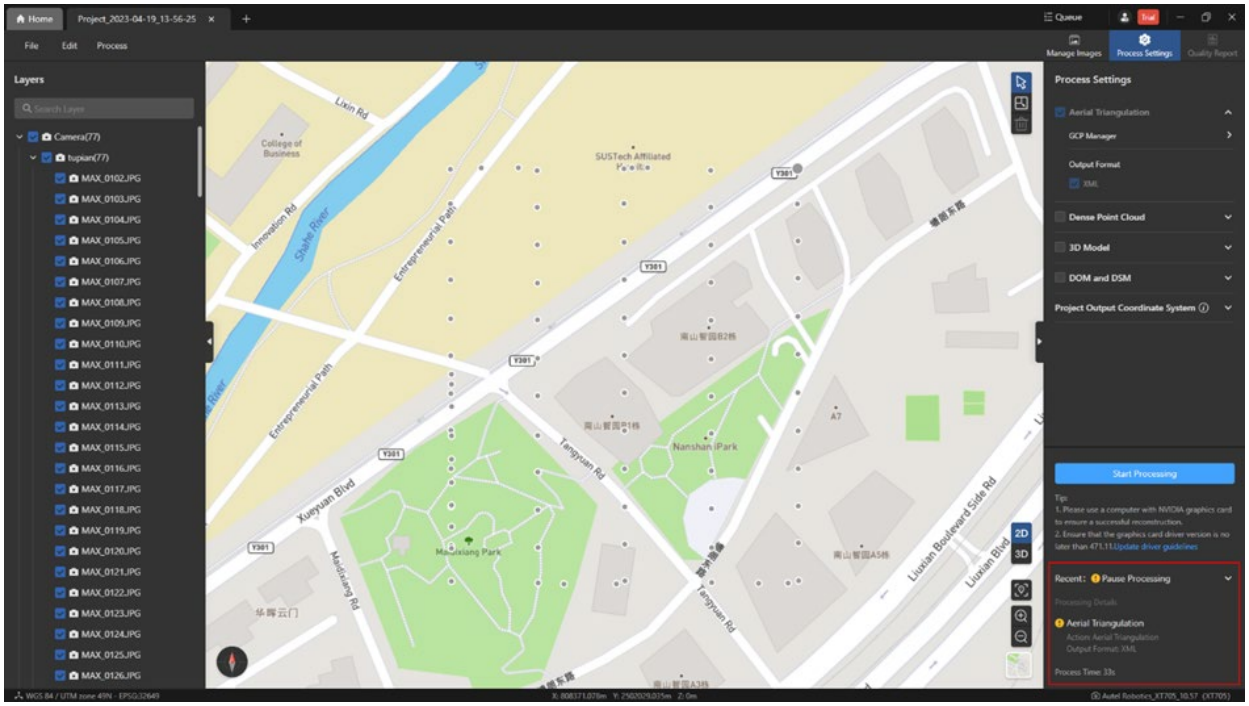
- The [**Aerial Triangulation**] option is checked by default before the aerial triangulation process and cannot be unchecked by graying it out.
- The output format of the aerial triangulation is in .XML format and cannot be cancelled.



2.2.2 Aerial Triangulation Steps

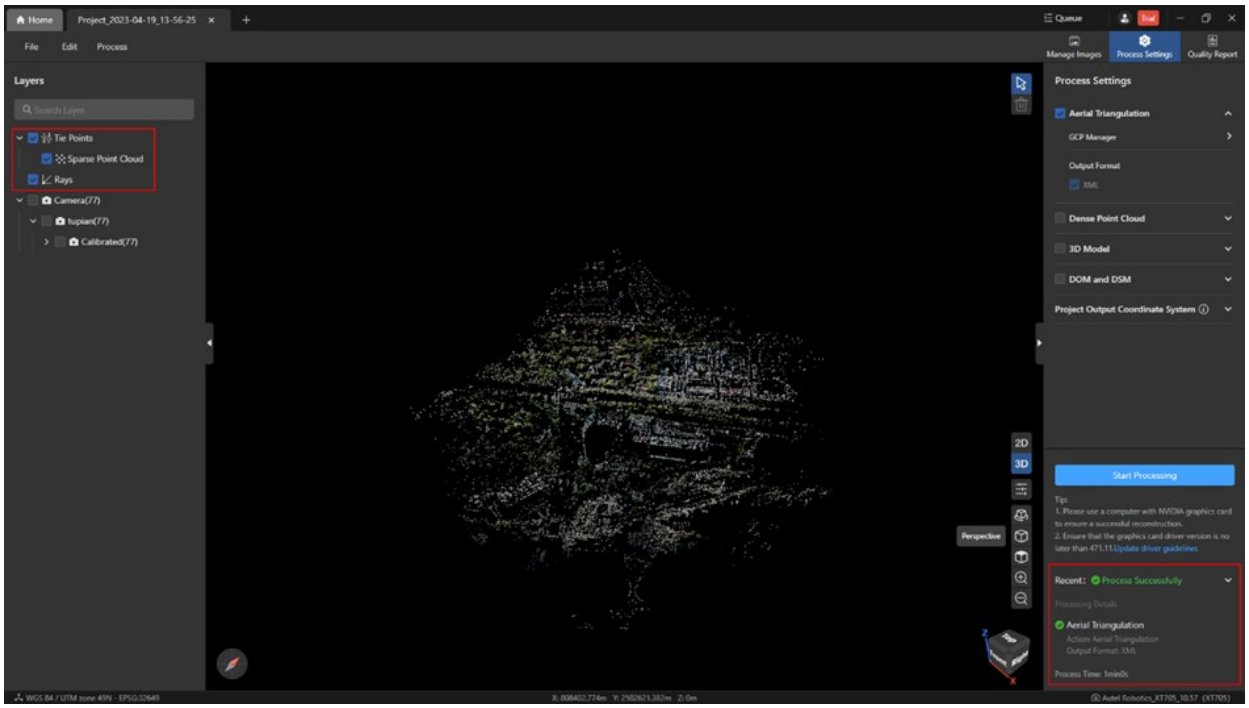
1. [**Aerial Triangulation**] is checked by default after creating a new project, and it cannot be unchecked.
2. In the [**Process Settings**] page, after [**Aerial Triangulation**] is checked by default, click the [**Start Processing**] button.
3. During the processing, you may click [**Stop**] button to cancel any processing. After stopping, you can modify the image, coordinate system, POS and other information and start processing again.





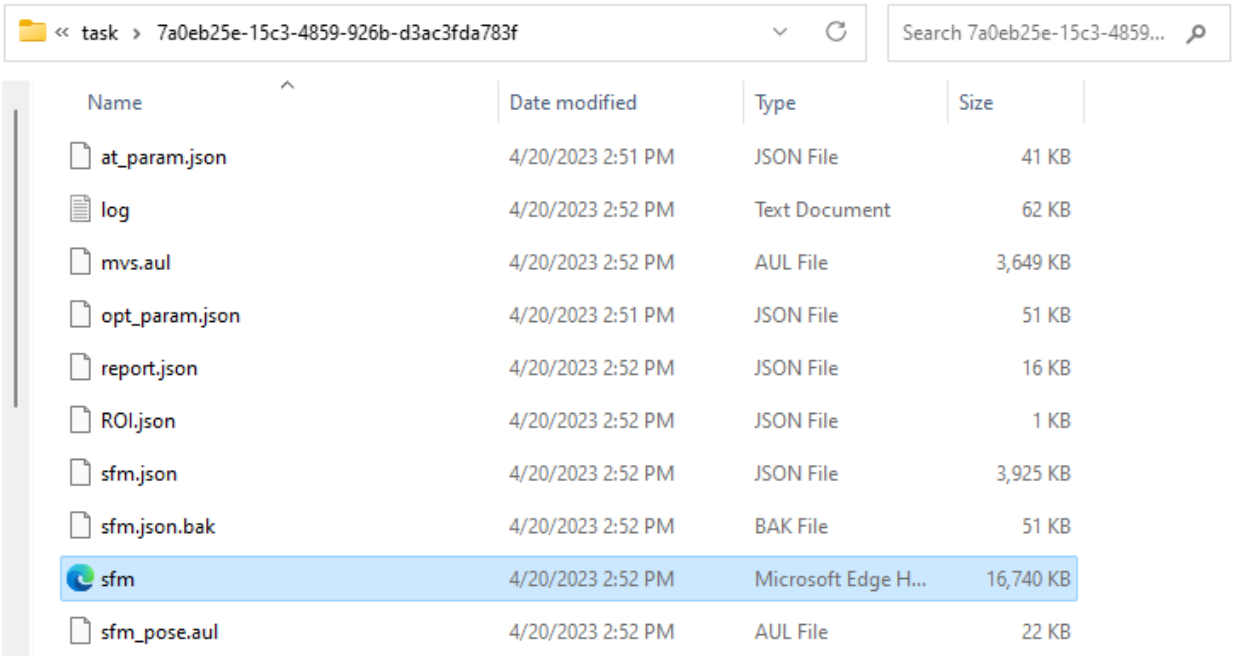
When processing starts again after stopping, processing will continue on the same basis.

After the aerial triangulation processing is completed, sparse point clouds and rays are generated. At this time, [**Aerial Triangulation**] can be unchecked, and this isn't needed subsequently.



2.2.3 Aerial Triangulation Results

After the aerial triangulation process is completed, the result will be generated in the task subfolder of the project folder, and the processed result file is as shown in the figure below. Among them, sfm.xml is the output result file.



2.3 GCP Manager

2.3.1 GCP Introduction

Ground control point (GCP) is a marked point with obvious characteristics on the ground, and the geographic information generated by the image can be adjusted through it.

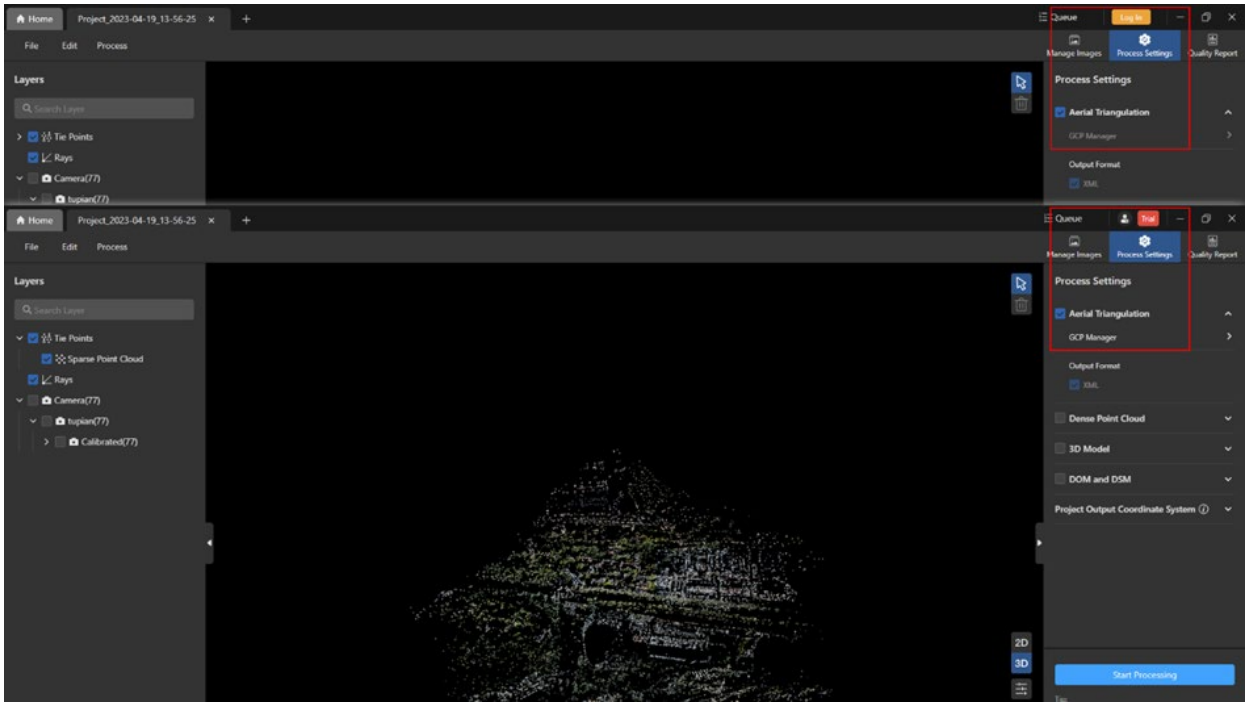
When conducting UAV aerial survey operations, you can use RTK, total station and other measurement tools to obtain iconic real coordinate points in the photographed area, and then compare the real coordinate points with the photographed area by importing GCPs and marked points. The point in the image is associated to adjust the coordinate system of the point and improve the precision and accuracy of the aerial triangulation.

Note:

- Ground control points are divided into control points and checkpoints. The control points are mainly used to optimize the accuracy of the aerial triangulation and improve the accuracy of the model; the checkpoints are mainly used to check the accuracy of the aerial triangulation, so as to measure the aerial triangulation results.

2.3.2 Using GCPs

Before importing any GCPs, you need to log in to Autel Mapper, otherwise the [**GCP Manager**] function will be grayed out and cannot be used.



Note:

- GCP files support .txt format and .csv format.
- For files in .txt format, it is recommended that the data in each line be separated by English commas (,), and the decimal points be represented by (.).
- The GCP file must contain:

1) Ground coordinate system: name, longitude, latitude, altitude.
2) Projection coordinate system: Name, X, Y, Z.

- GCP files can import horizontal precision and vertical precision, or not. If not imported, the default value is 0.005.

An example in .csv format is pictured below:

	A	B	C	D
1	Name	Longitude	Latitude	Altitude
2	GCP1	113.998	22.5969	28.082
3	GCP2	113.998	22.5962	29.896
4	GCP3	113.999	22.5958	30.723
5	GCP4	113.999	22.5966	30.858
6	GCP5	114	22.5971	31.007
7	GCP6	113.999	22.5979	28.626
8	GCP7	113.998	22.5973	27.879
9	GCP8	113.996	22.5961	27.56

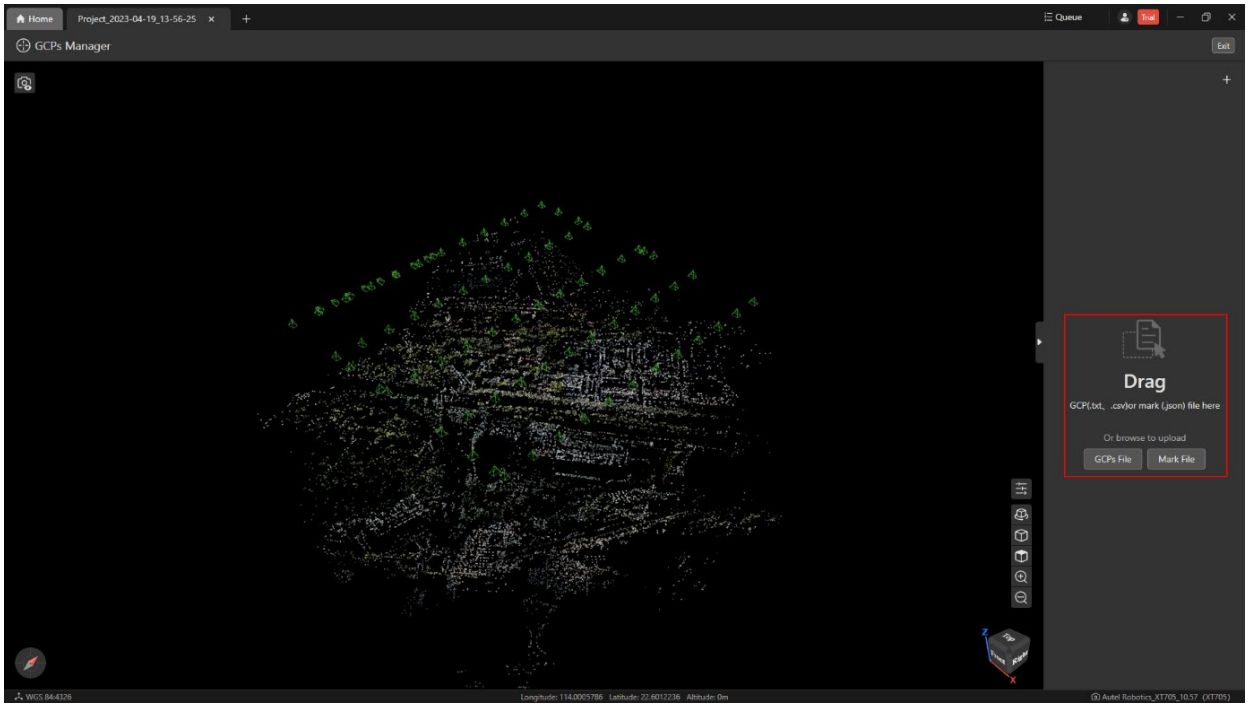
An example in .txt format is pictured below:

```
Name,Longitude,  Latitude,   Altitude
GCP1,113.9976129,22.5969004, 28.082
GCP2,113.9983688,22.59618851,29.896
GCP3,113.9988214,22.59580723,30.723
GCP4,113.9993271,22.59659293,30.858
GCP5,113.9995889,22.5971195, 31.007
GCP6,113.9992212,22.59786823,28.626
GCP7,113.9983092,22.59733037,27.879
GCP8,113.996407, 22.59607118,27.56
```

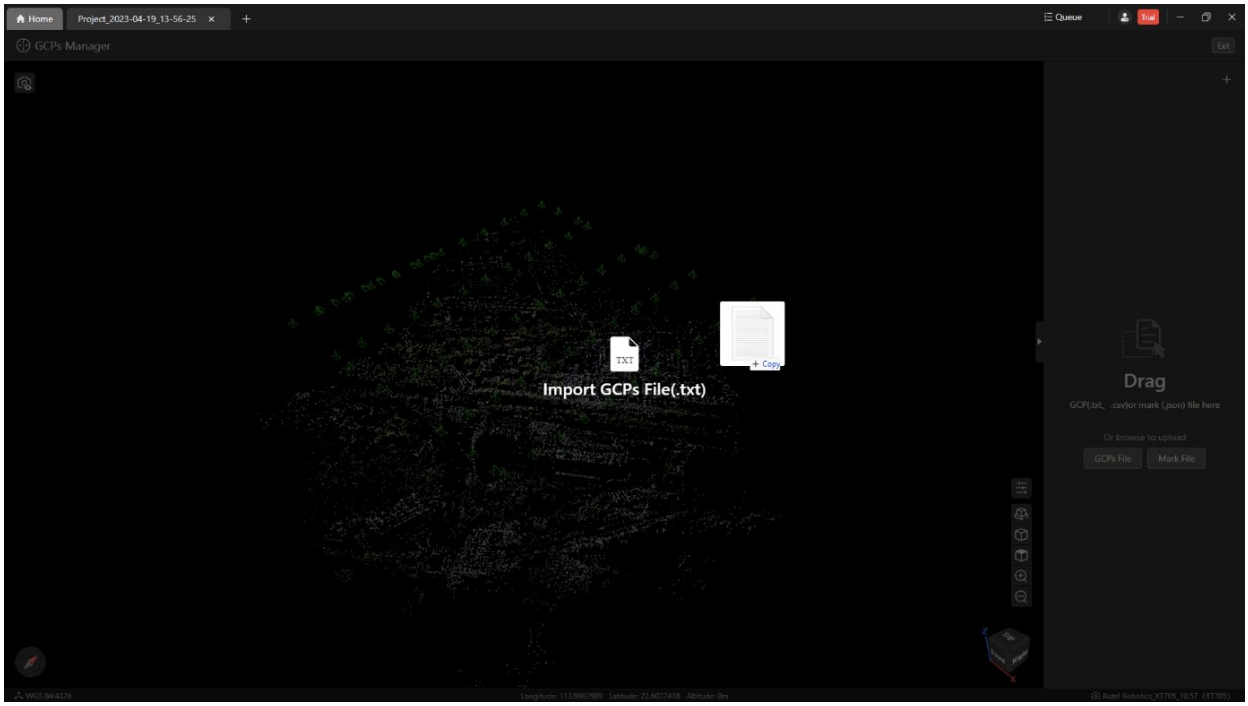
Ways to import GCP files:

Click the [**GCP Manager**] button on the [**Process Settings**] page or the menu bar [**Edit->GCP Manager**] to enter the [**GCPs Manager**] page.

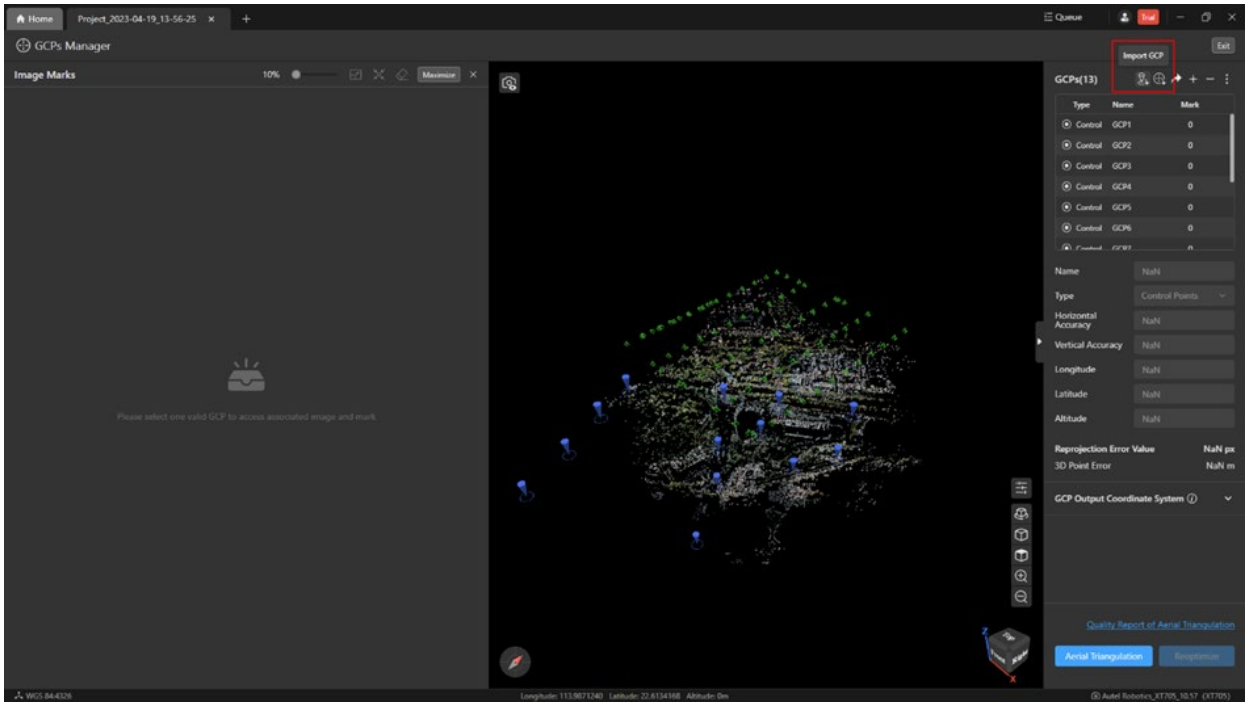
Click the [**GCPs File**] button on the [**GCPs Manager**] page to import the file from the local disk of the computer.



Drag and drop the ground control point file from the local disk of the computer to the [**GCPs Manager**] page to complete the import.



After adding the ground control point, click the [**Import GCP**] icon on the right side of the [**GCPs**] list on the [**GCPs Manager**] page to import the file.

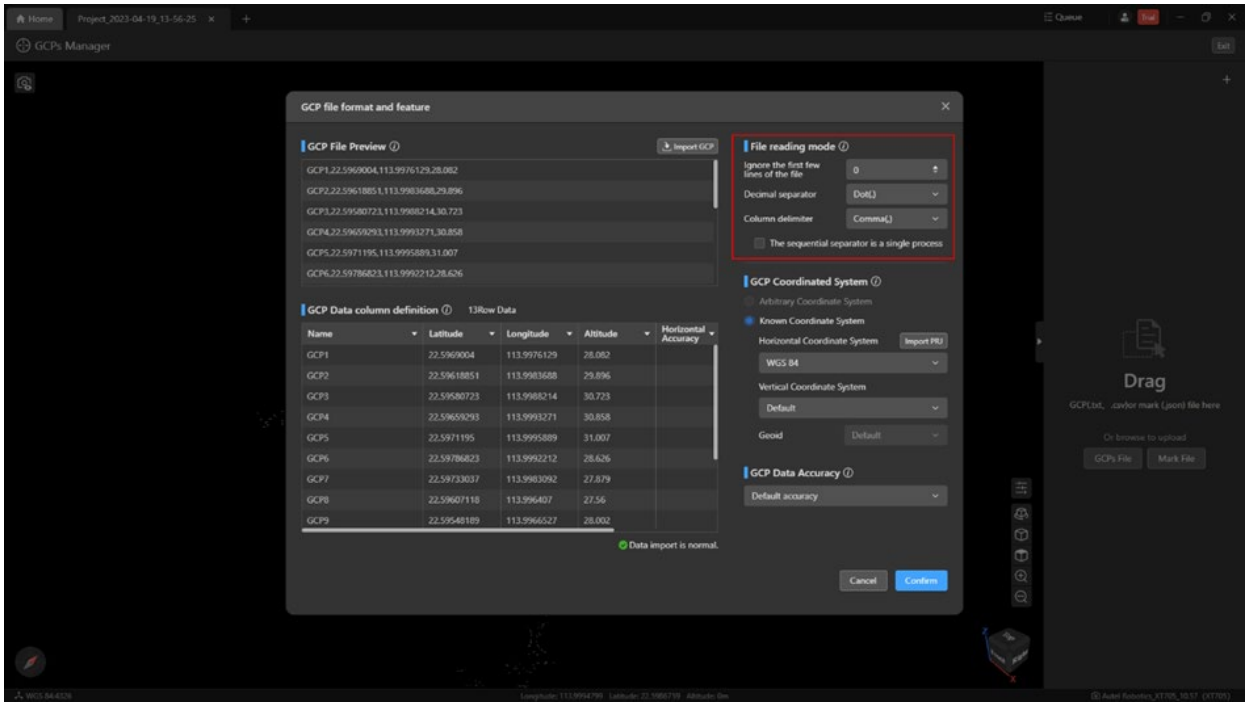


In the [**File reading mode**] column, set [**Ignore the first few lines of the file**], [**Decimal separator**], [**Column delimiter**], and [**The sequential separator is a single process**] according to the format of the imported GCP file.

Notes:

- The data in the [**GCP Data column definition**] list is displayed according to the set [**File read mode**] rules.
- [**Ignore the first few lines of the file**] is used to eliminate invalid data in the header.

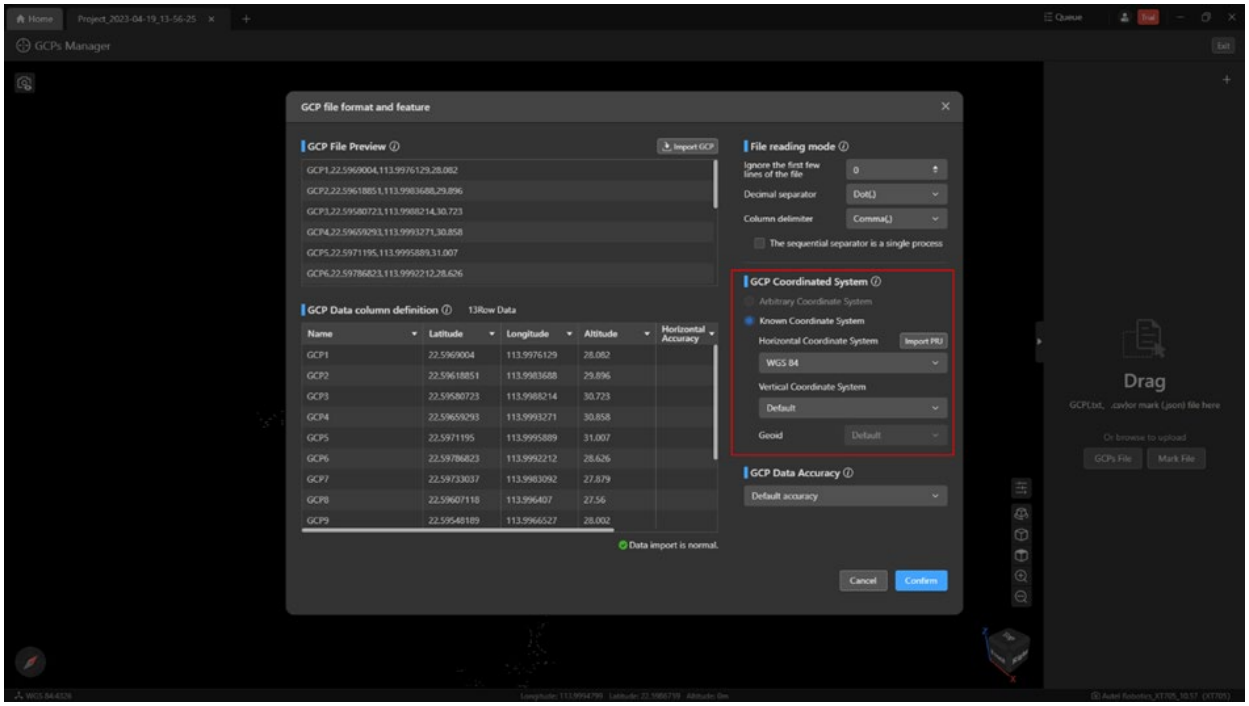
- [**Decimal separator**] is used to set the display form of the decimal point.
- [**Column delimiter**] is used to set the separation form between multiple data forms in each row.
- [**The sequential separator is a single process**] It is used to eliminate repeated symbols between two data.



In the [**GCP Coordinate System**] column, you can set the horizontal coordinate system, the vertical coordinate system and the geoid.

Tips:

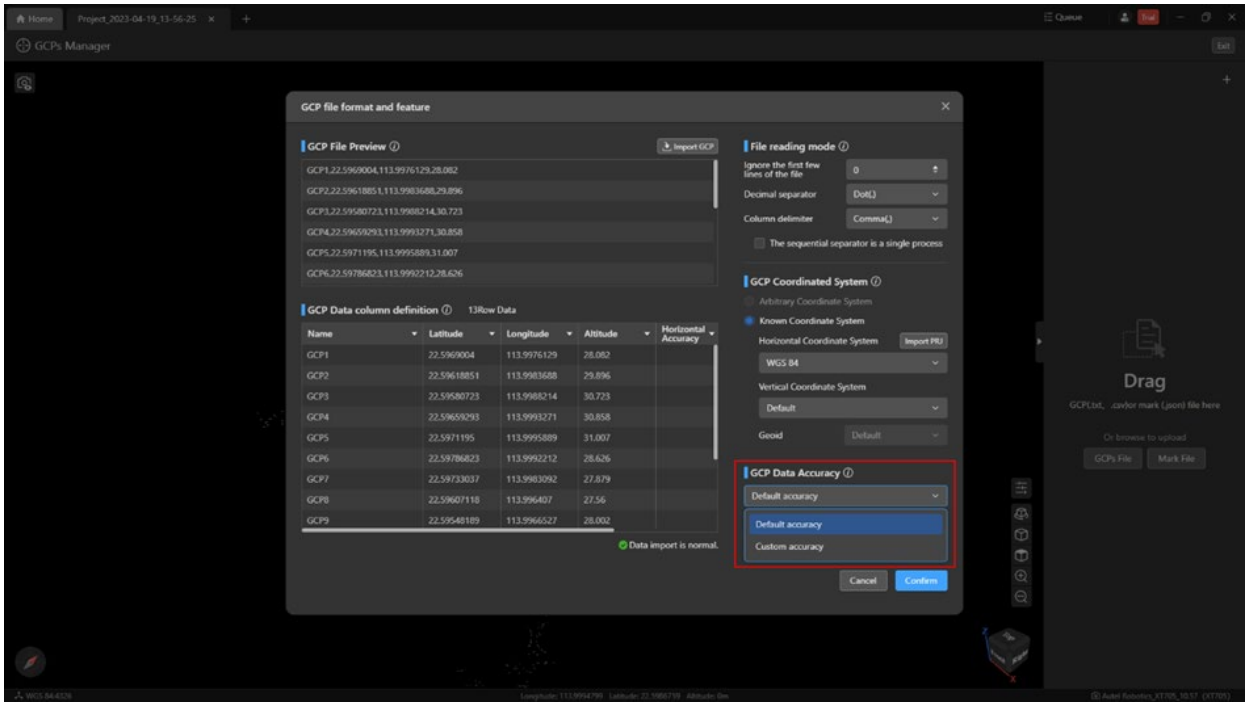
- [**Horizontal Coordinate System**]: supports selection of ground coordinate system and projection coordinate system; if you import a custom GCP, you can click the [Import PRJ] button to set. You can query and select different horizontal coordinate systems in the horizontal coordinate system drop-down menu.
- [**Vertical Coordinate System**]: The elevation coordinate system is the default value, and the user can manually change it according to the actual situation. Different elevation coordinate systems can be selected in the elevation coordinate system drop-down menu.
- [**Geoid**]: Geoid is the default value. After modifying the elevation coordinate system, the corresponding geoid can be modified.



You can set the precision type in the [**GCP Data Accuracy**] column, including using default accuracy or a custom accuracy.

Notes:

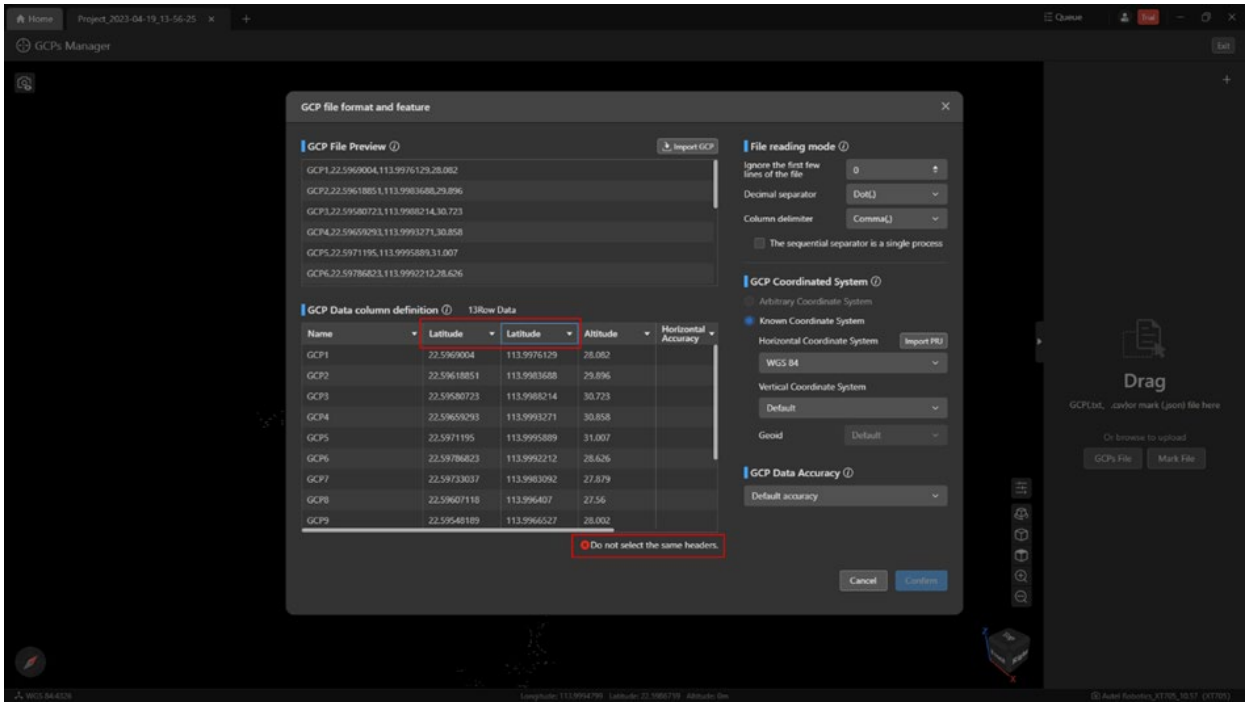
- [**Default accuracy**], the default accuracy is 0.005 for horizontal and vertical precision.
- [**Custom accuracy**], the imported accuracy is used as the precision of the GCP file.

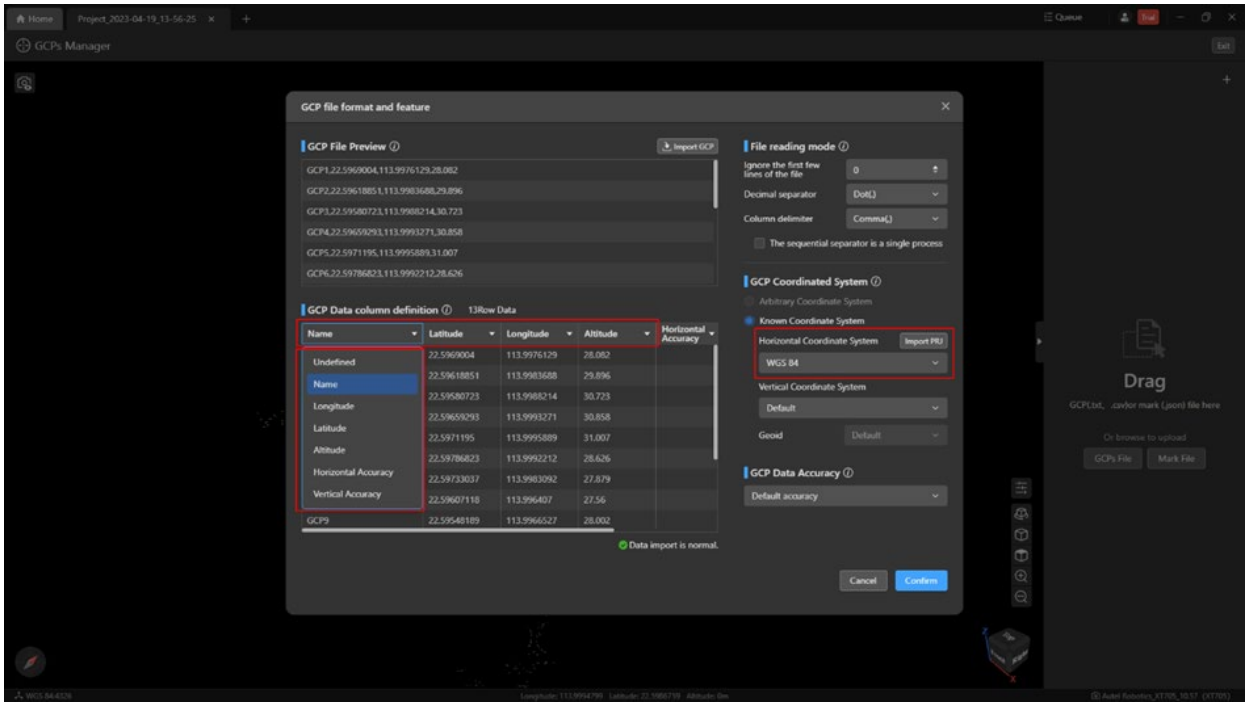


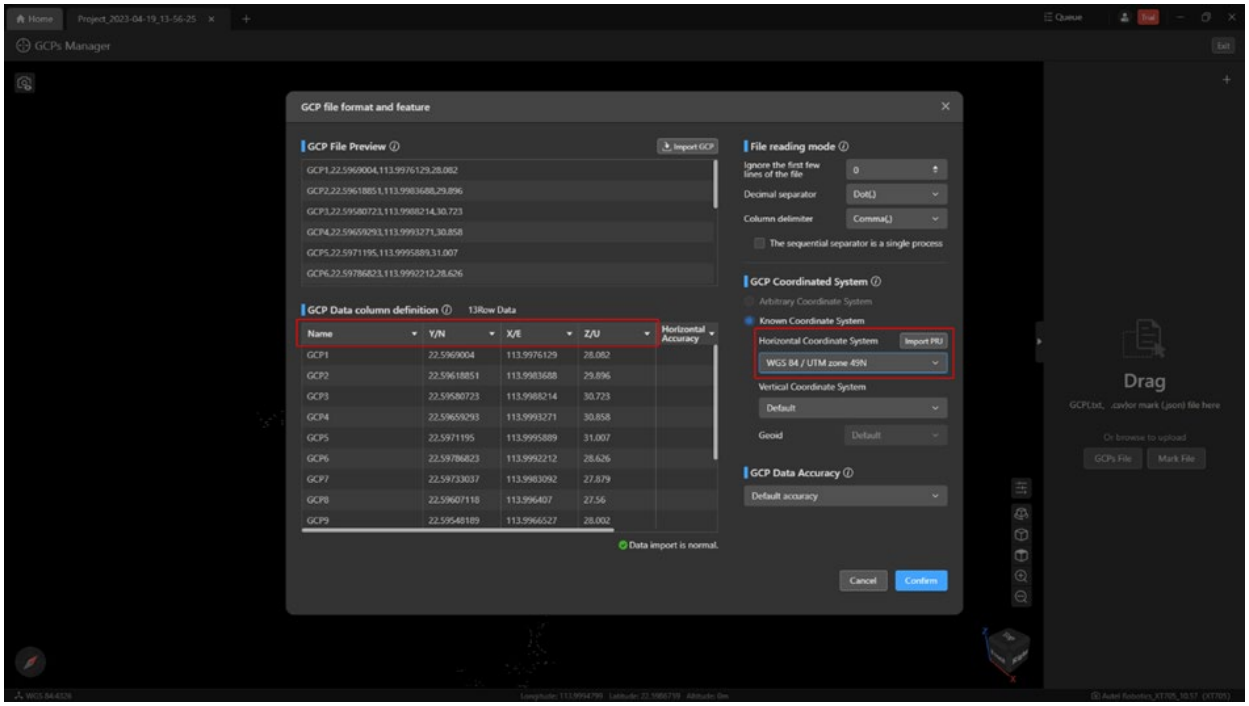
In the [**GCP Data column definition**] list, you can modify the header of each column so that it corresponds to the value in the column.

Tips:

- Name, Longitude (X), Latitude (Y), Altitude (Z) are required values, and the same header cannot be selected.
- When the selected coordinate system is a ground coordinate system, it displays longitude, latitude, and height; when the selected coordinate system is a projection coordinate system, it displays X, Y, and Z.

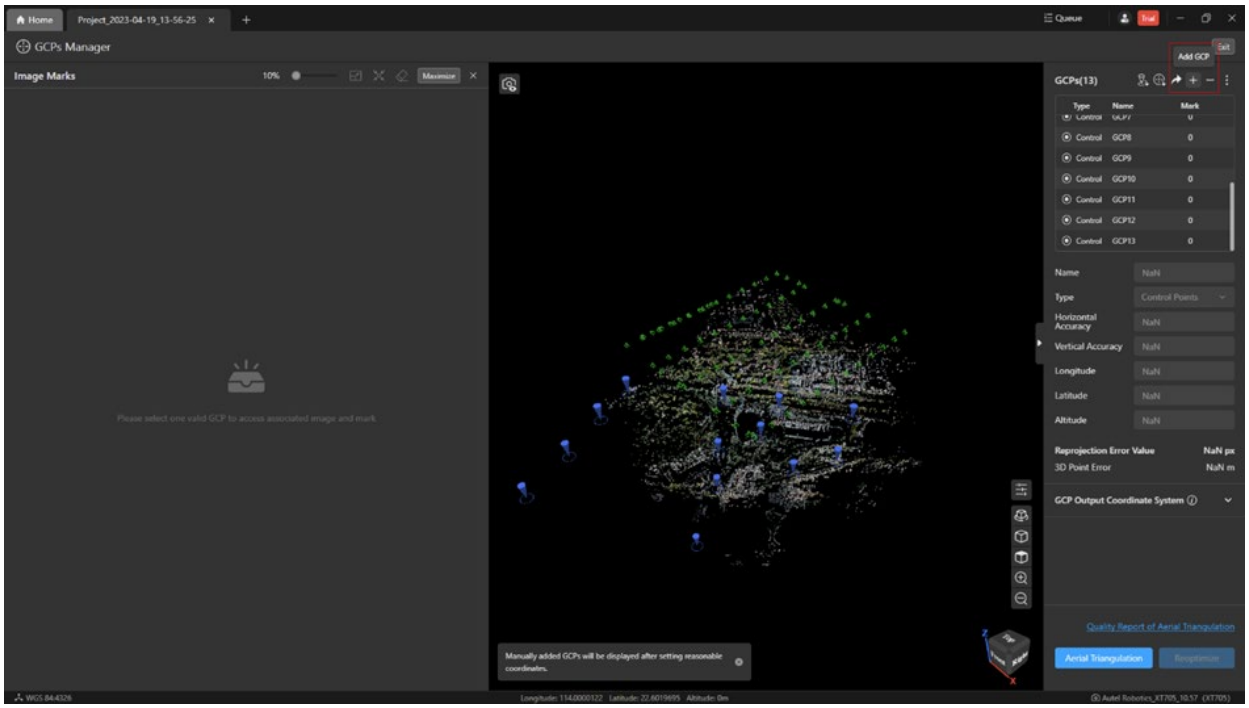






Add a single handle:

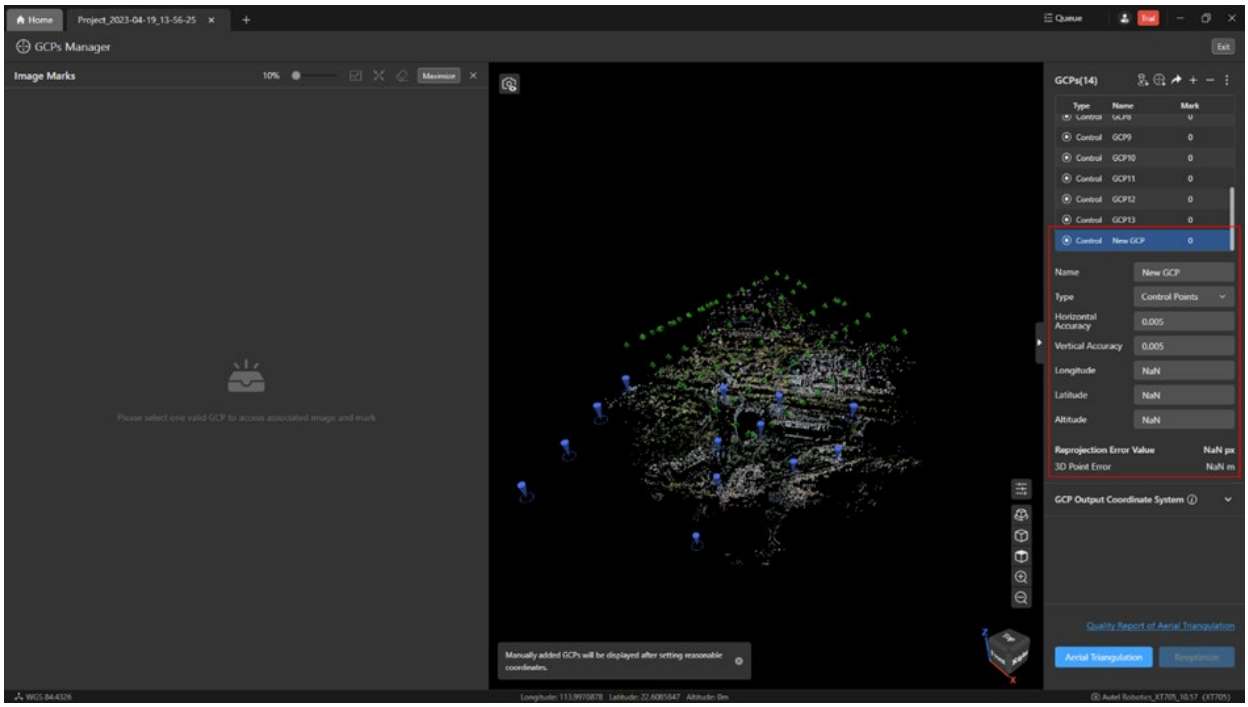
Click the [+] icon in the upper right corner of the [**GCPs Manager**] page and add a line of ground control points to be input in the [**GCPs**] list. After entering the information, it will be added immediately.



Inputting GCP information:

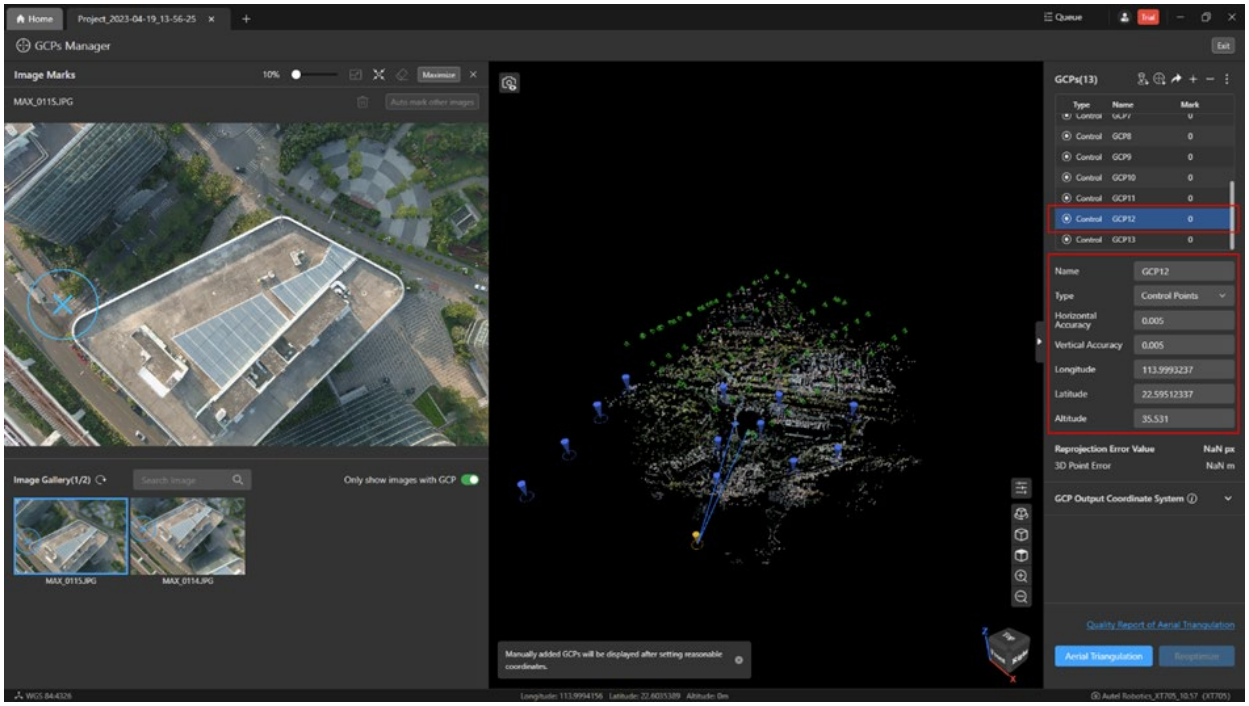
- **Mark**: Number of marks marked, input not supported.
- **Type**: The type is divided into control point and checkpoint. The default is control point, which can be modified to checkpoint.
- **Name**: The name of the image handle needs to be unique.

- **Longitude**: Enter the longitude of the control point.
- **Latitude**: Enter the latitude of the control point.
- **Altitude**: Enter the height of the control point.
- **Horizontal Accuracy**: The horizontal accuracy is 0.005 by default and can be modified to an accurate accuracy.
- **Vertical Accuracy**: The vertical accuracy is 0.005 by default and can be modified to accurate accuracy.
- **Reprojection Error Value**: The point is automatically calculated after marking more than two points, input is not supported.
- **3D Point Error**: The point is automatically calculated after marking more than two points, and input is not supported.



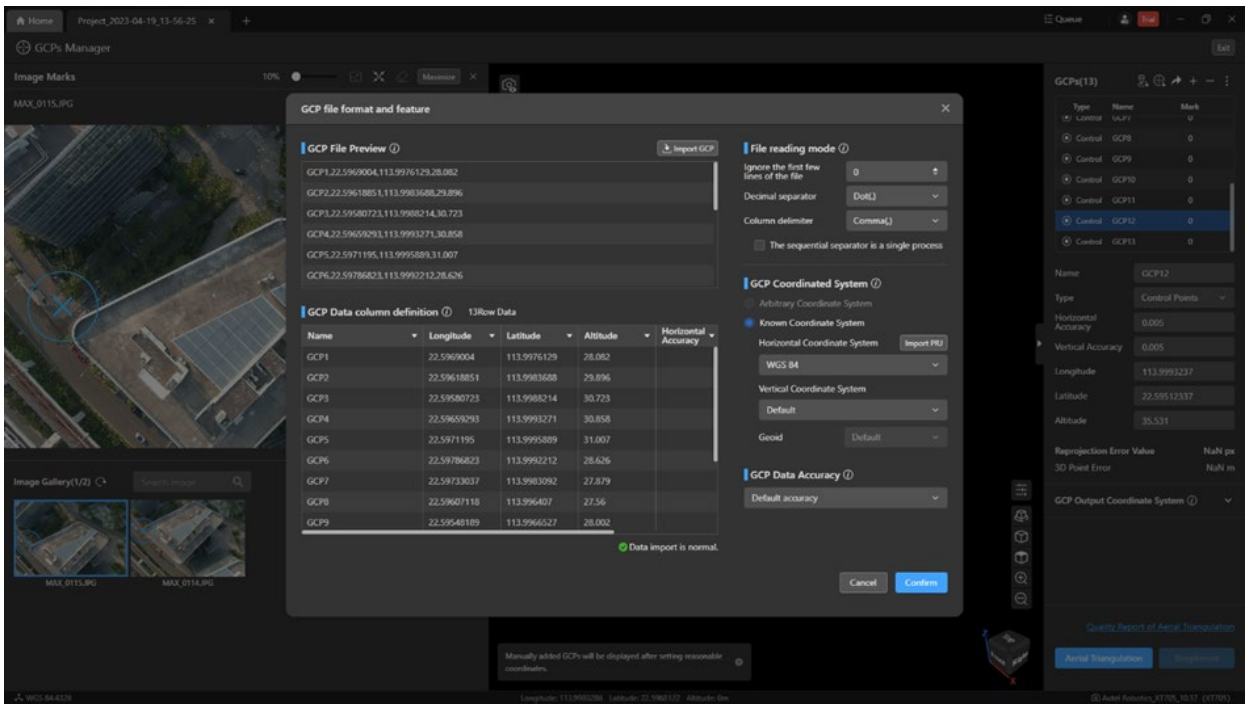
To edit a single GCP:

- Click any ground control point in the [**GCPs**] list to enter the edit mode of the ground control point. You can modify the ground control point type, name, longitude, latitude, height, horizontal precision, vertical precision.
- When the edited ground control points have been marked and reoptimized, the punctuated points of the original ground control points will be deleted after editing and all the result files will be deleted (except the results of aerial triangulation).



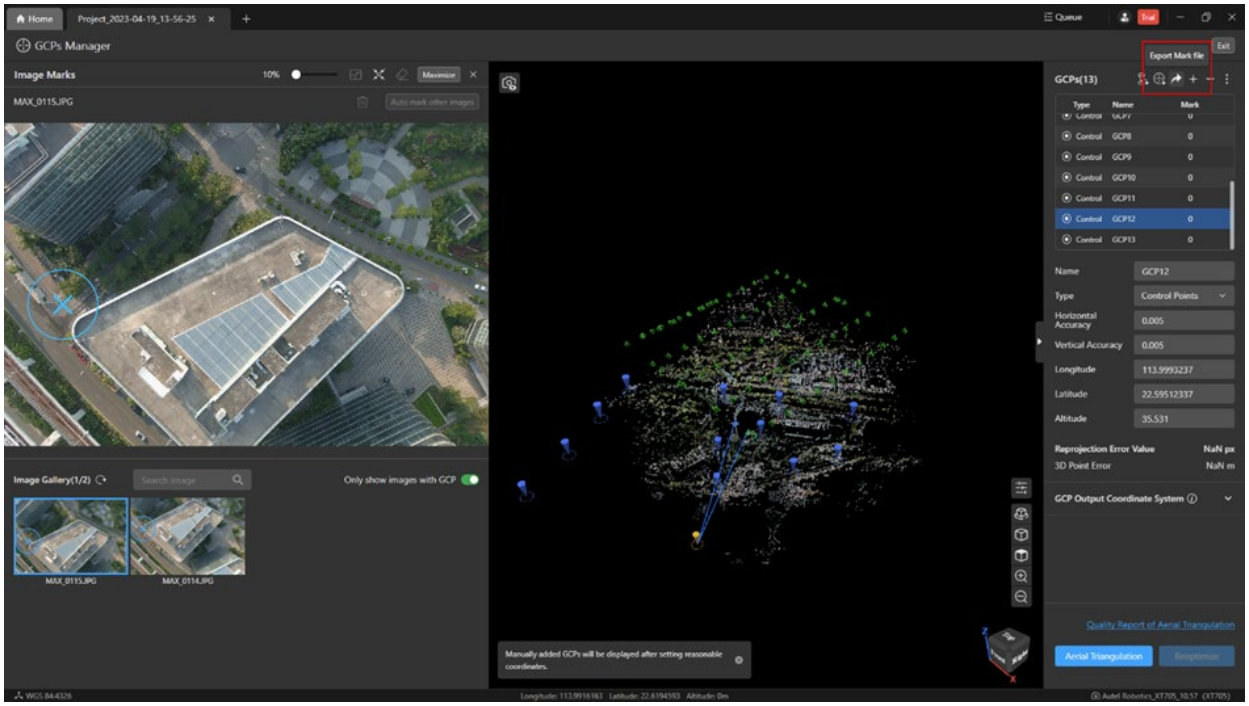
To edit multiple GCPs:

- Add additional pins by importing new pin files.
- When the imported image handle has the same name as the existing image handle, the original image handle will be overwritten.
- Edit ground control point information by modifying [**File reading mode**], [**GCP Coordinate System**], [**GCP Data column definition**].
- When the edited ground control point includes the control point that has been marked, and has been reoptimized, the original will be deleted after editing.



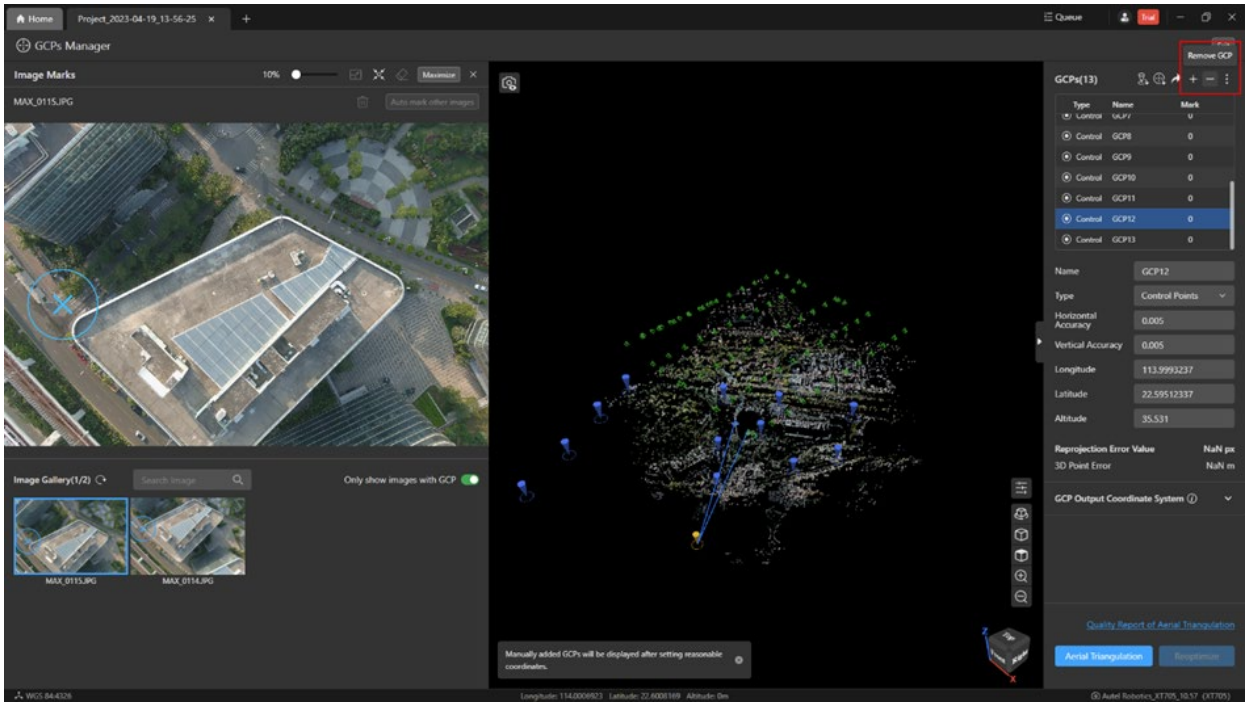
Export the mark file:

- After the control points have been created, click the [**Export Mark file**] icon in the upper right corner of the [**GCPs Manager**] page to export the mark file of the ground control points.
- The export format is in .json format.
- The exported control point includes: name, longitude (X), latitude (Y), height (Z), type, horizontal accuracy, vertical accuracy, reprojection error value, 3D point error, marked point information, and GCP coordinate system.



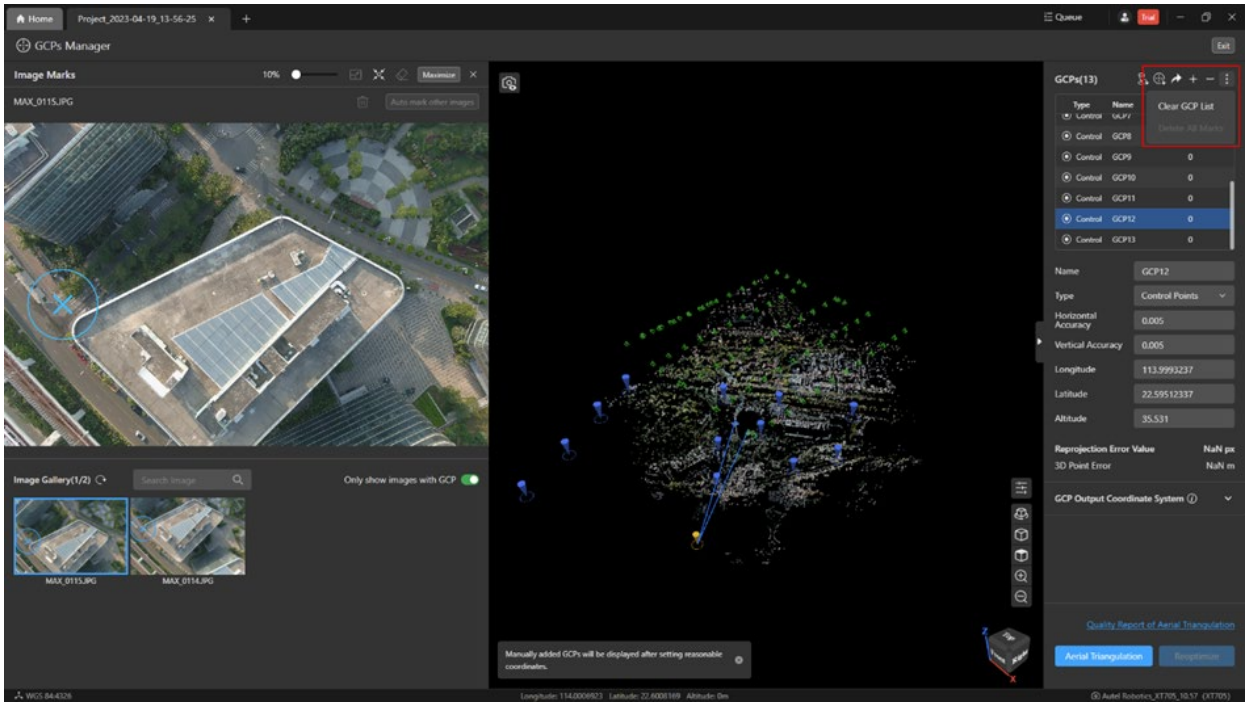
Delete a single GCP:

- Select any ground control point in the [**GCPs**] list and click the [**-**] icon in the upper right corner of the [**GCPs Manager**] page to delete it.
- When the deleted ground control points have been marked and reoptimized, the results will be deleted simultaneously.



Delete multiple GCPs:

- Click the plus icon in the upper right corner of the [**GCPs Manager**] page and select [**Clear GCP List**] to delete in batches.
- When there are marked points in the ground control points and have been reoptimized, all the results will be deleted.



2.4 Marked Points And Re-optimization

2.4.1 Marked Points Description

The punctuated point is to mark the real geographic coordinates of the collected ground control point to the corresponding position in the image associated with this point, so as to adjust the geographic information of the photo; whether it is a control point or a checkpoint, if it is to work, it needs to be done mark point operation.

2.4.2 Marked Points And Re-optimization Processes

The process of marking point and re-optimization is mainly:

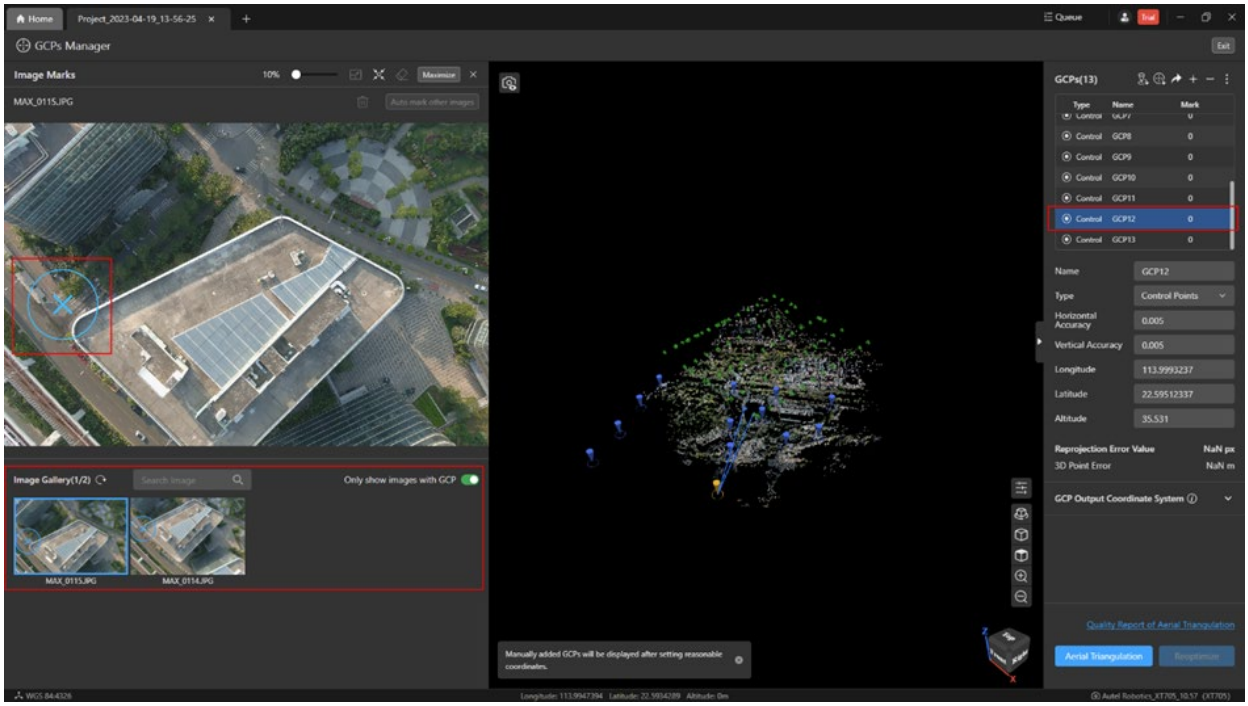
Aerial Triangulation -> **Import GCP** -> **Marking Points** -> **Re-optimization**.

2.4.3 Using Image Marks

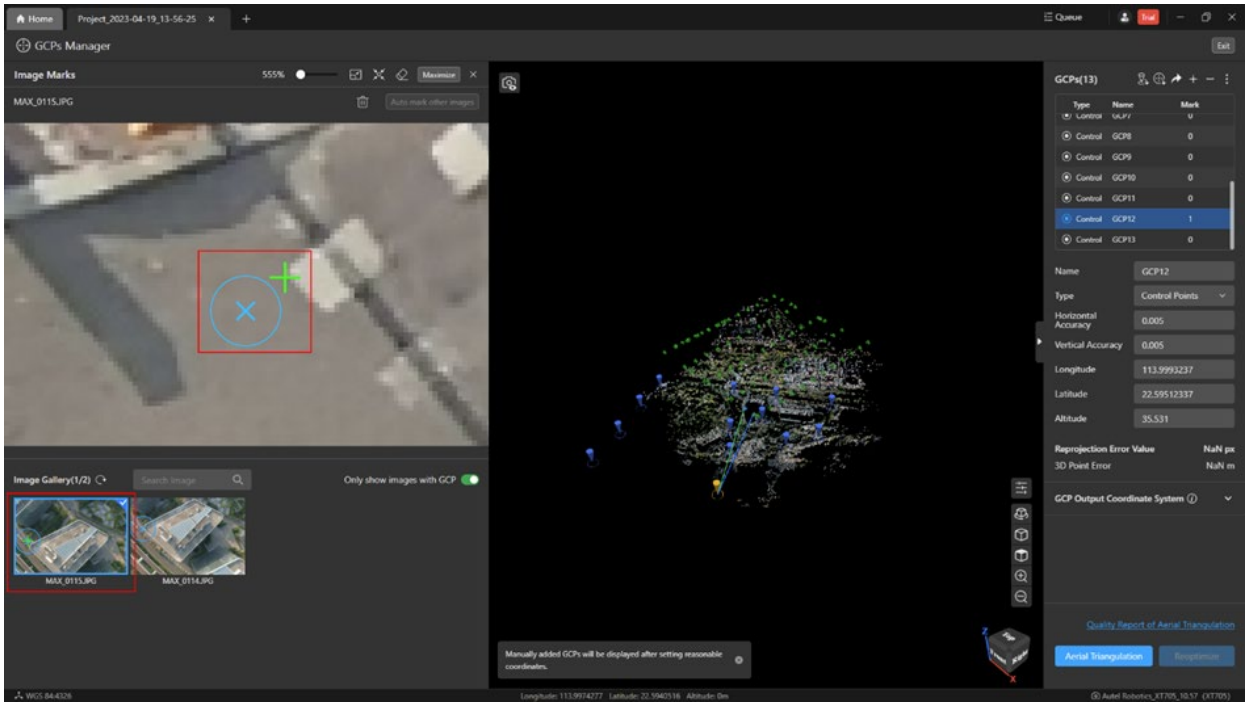
In the [**GCPs Manager**] page, click any ground control point in the [**GCPs**] list on the right to enter the marking mode of the ground control point, and automatically click on the [**Image Gallery**] column in the [**Image Marks**] sub-page on the left. Display the image associated with the GCP, and display the calculated GCP position in the associated image with a [**Blue ×**] mark.

Tips:

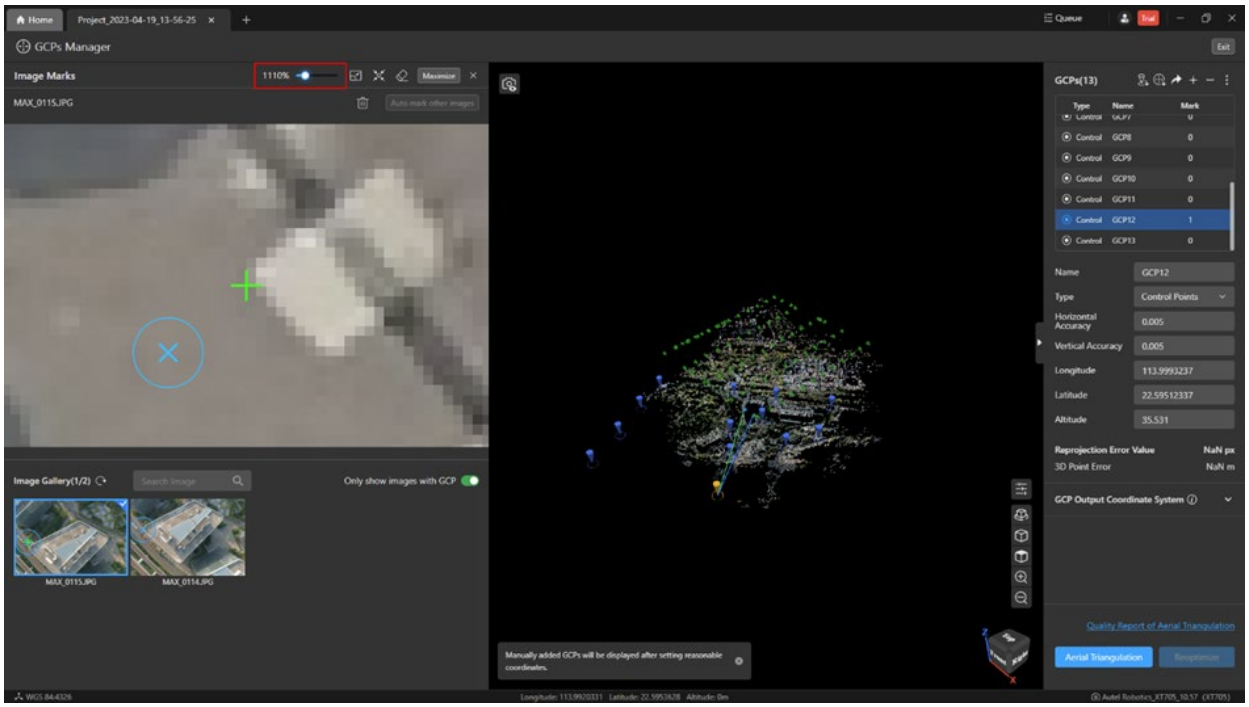
- [**Blue ×**] marks the calculated ground control point position, which may deviate from the actual position.



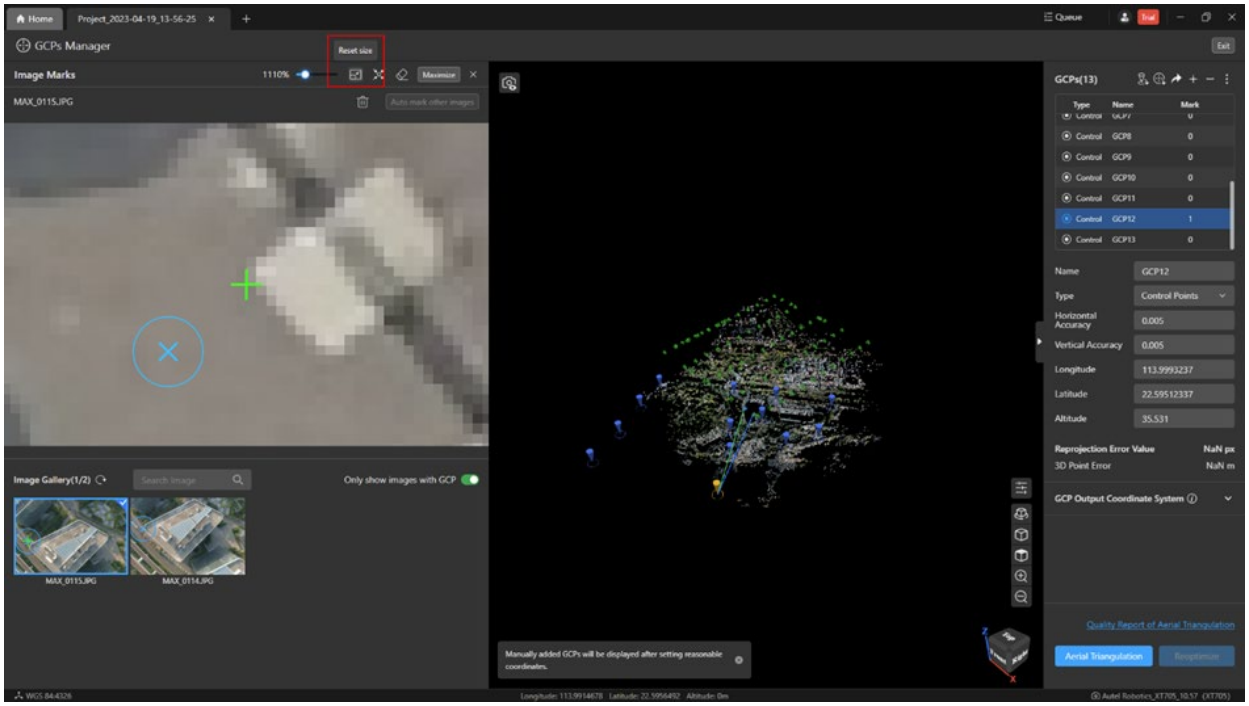
Use the mouse wheel to enlarge the selected image. After zooming in, click the point where the ground control point is actually located in the image to mark the point. The marked point will be displayed as a [**Green +**] mark.



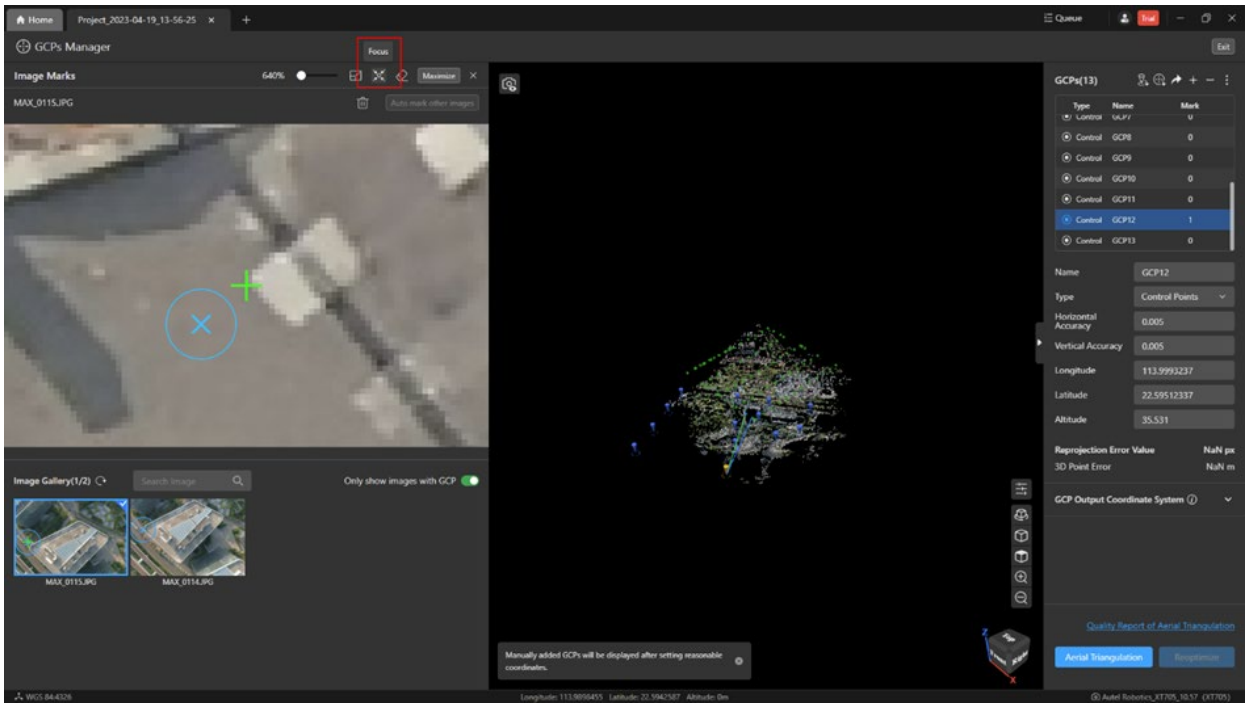
Slide the scale on the upper right side of the [**Image Marks**] subpage to adjust the zoom factor of the image displayed in the lower window.



Click the [**Reset Size**] icon to restore the image to the default display size of the window.



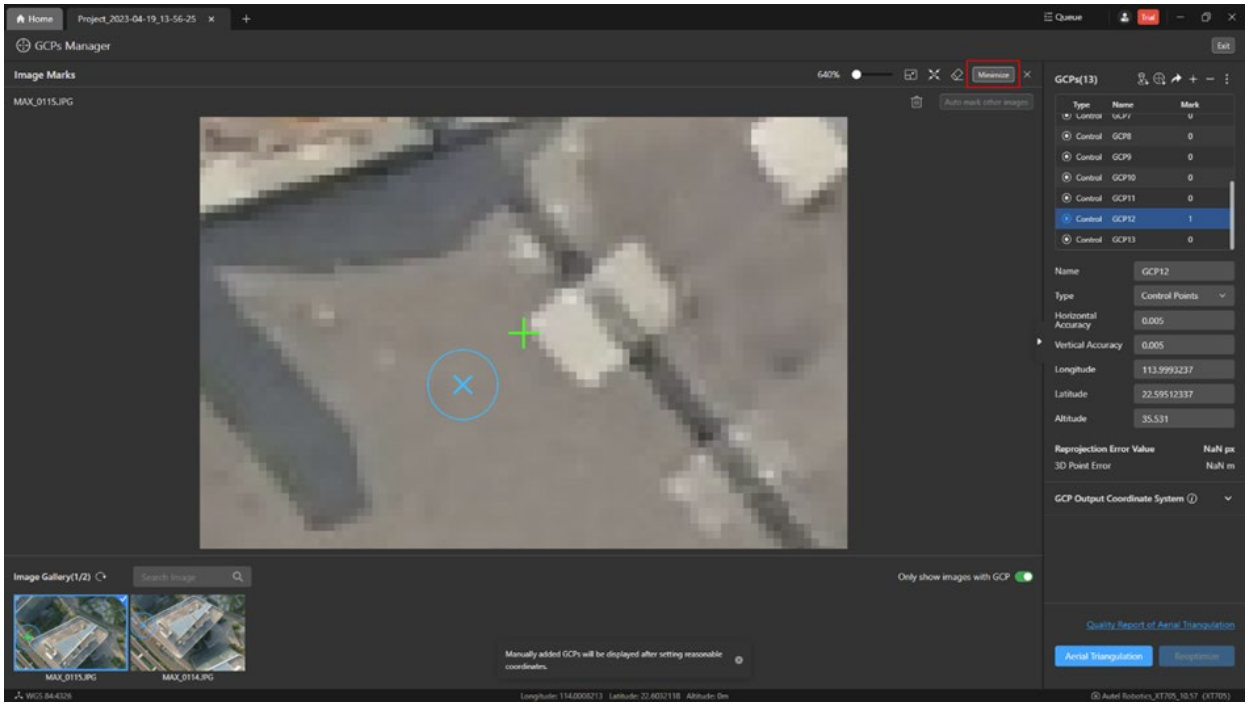
Click the [**Focus**] icon to focus the image on the pierced point and display it in the center with the current zoom factor.



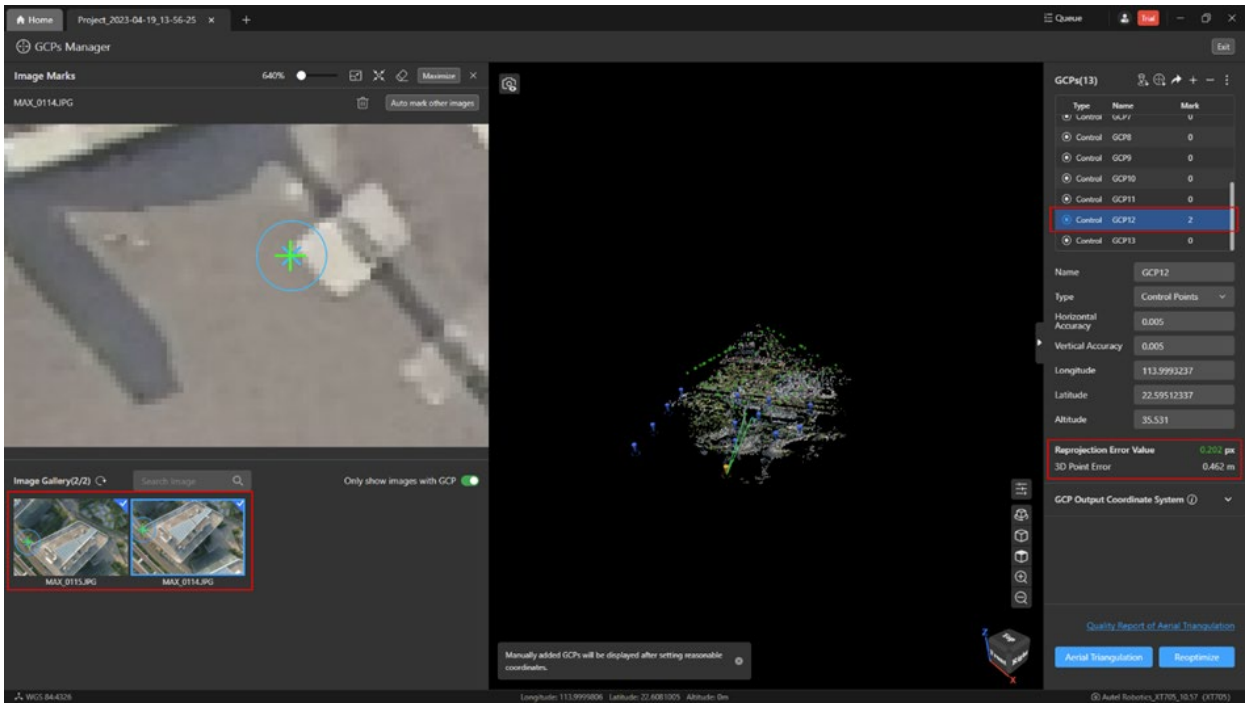
Click the [**Maximize**] button to switch to full-screen mode and perform marking.

Note:

- After entering the full-screen mode, the [**Maximize**] button becomes the [**Minimize**] button, which can be restored to the original page size after clicking.

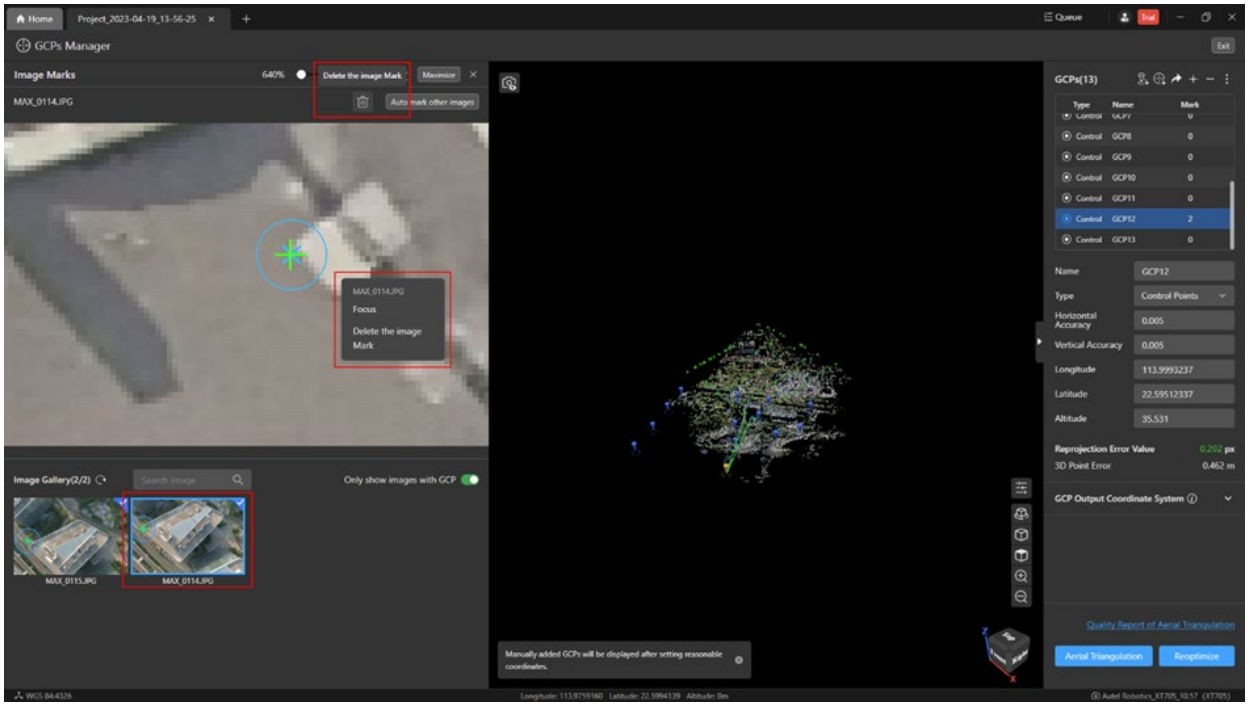


After marking, the number of markers, reprojection error value, and 3D point error value of the corresponding control point will be automatically displayed in and below the [**GCPs**] list.



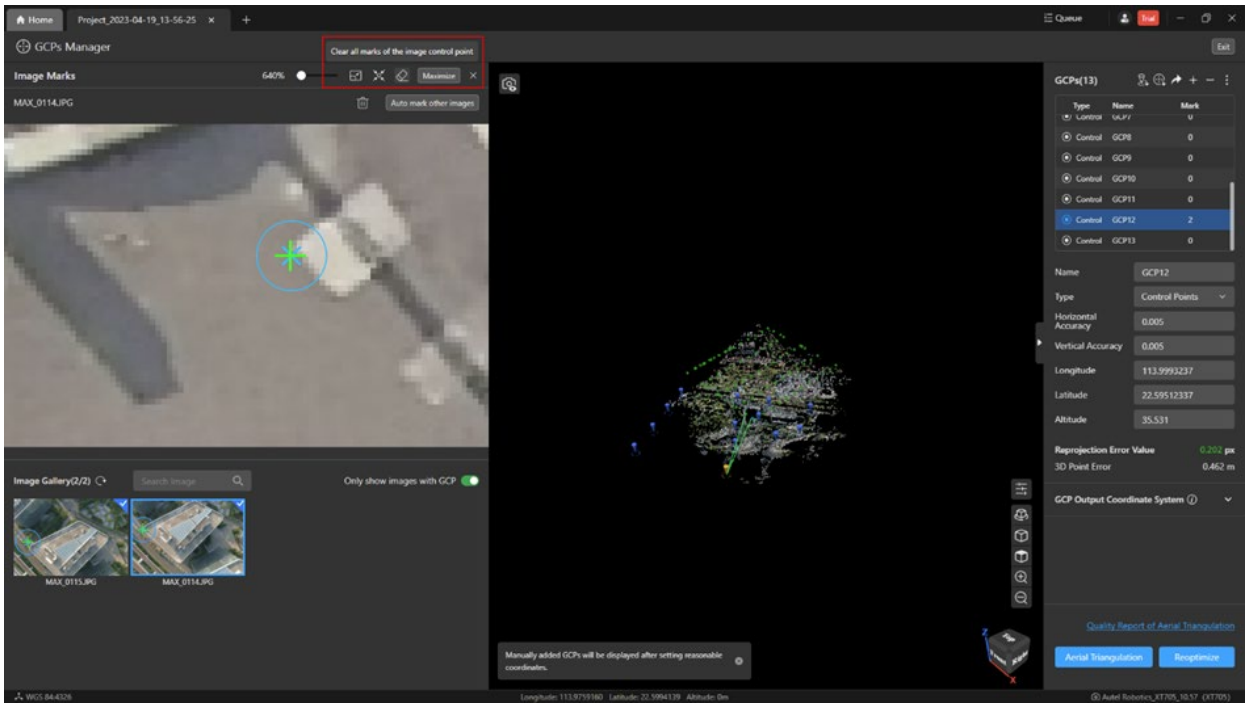
Deleting a single mark:

- Right-click the marked image and select [**Delete the Image Mark**] or click the [**Delete the Image Mark**] icon in the upper right corner of the image display window to delete the mark of the current image only.



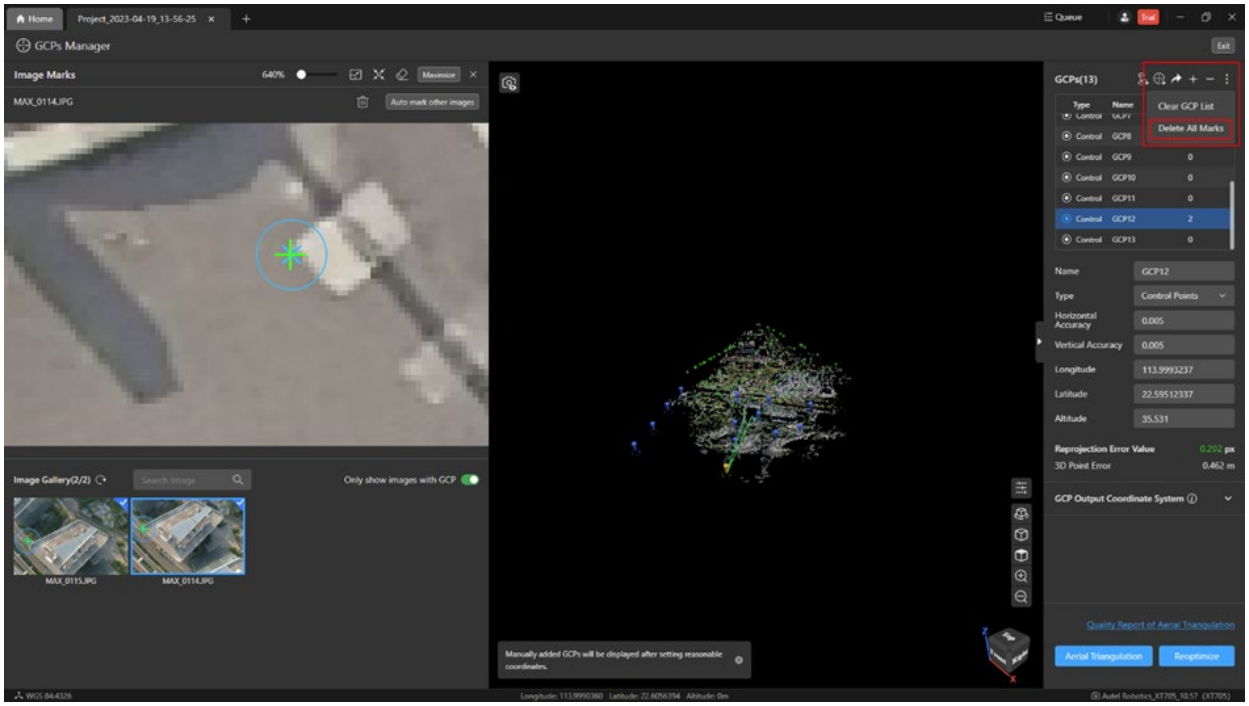
Delete multiple marks:

- Click the [**Clear all marks of the image control point**] icon in the upper right corner of the [**Image Marks**] subpage to clear all marks of the ground control point.



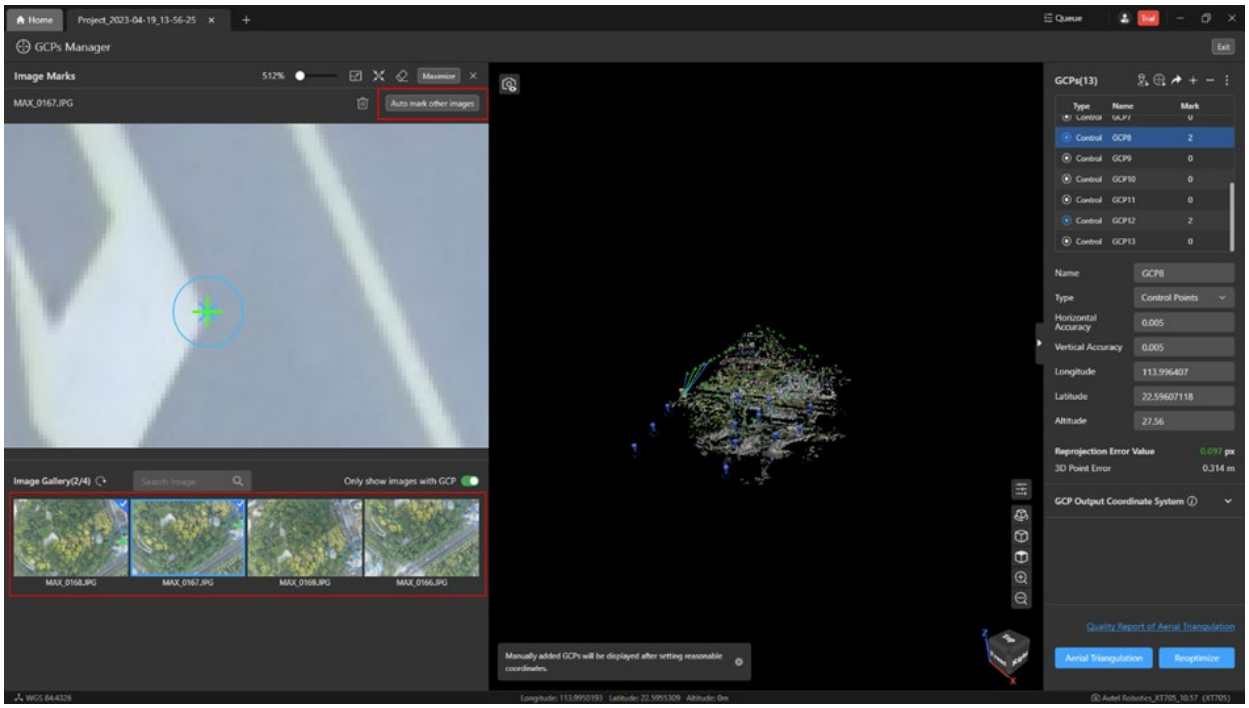
Remove all marks:

- Click more icons in the [**GCPs**] list and select [**Delete All Marks**] to delete all marks of all ground control points.



Auto-marking:

- After manually marking two points on the ground control point, you can click the [**Auto mark other images**] icon in the upper right corner of the window to perform automatic marking on all the remaining images associated with the ground control point.

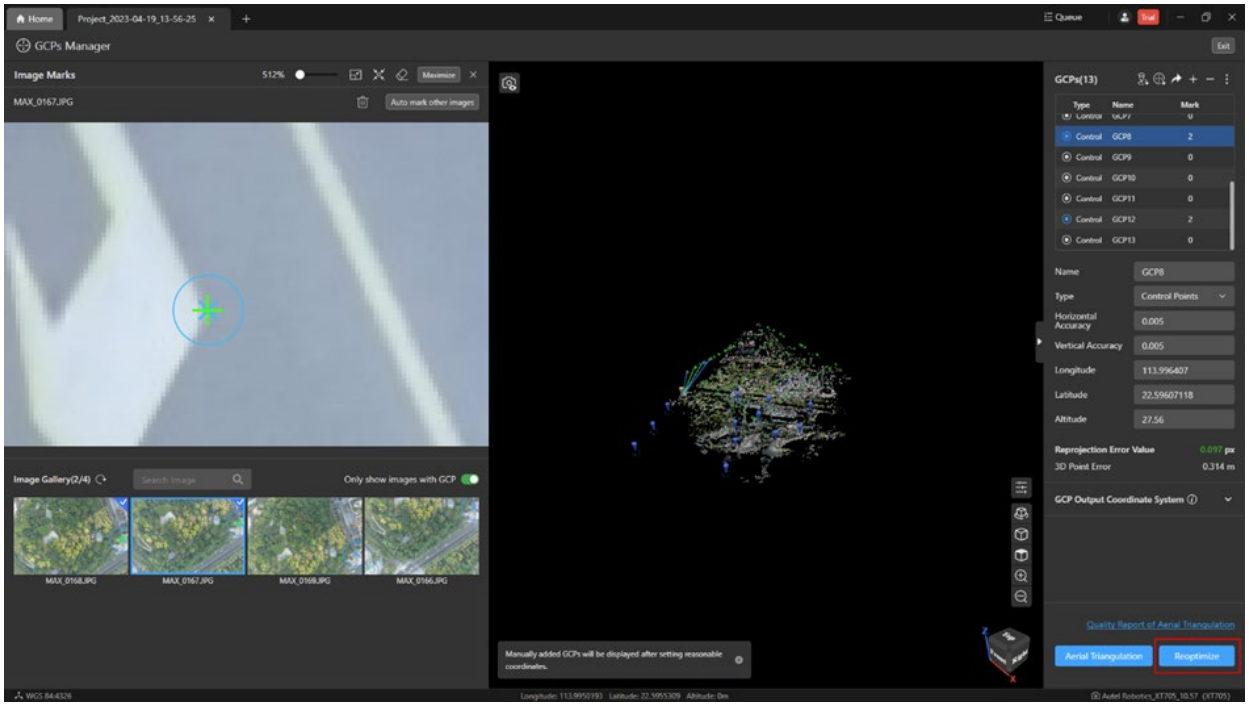


2.4.4 Re-optimization

When two or more points are marked by one image control, the [**Reoptimize**] button under the [**GCPs**] list becomes clickable.

Tips:

In order to ensure the accuracy of re-optimization, it is recommended to mark all images associated with all ground control points in the [GCPs] list before re-optimization.

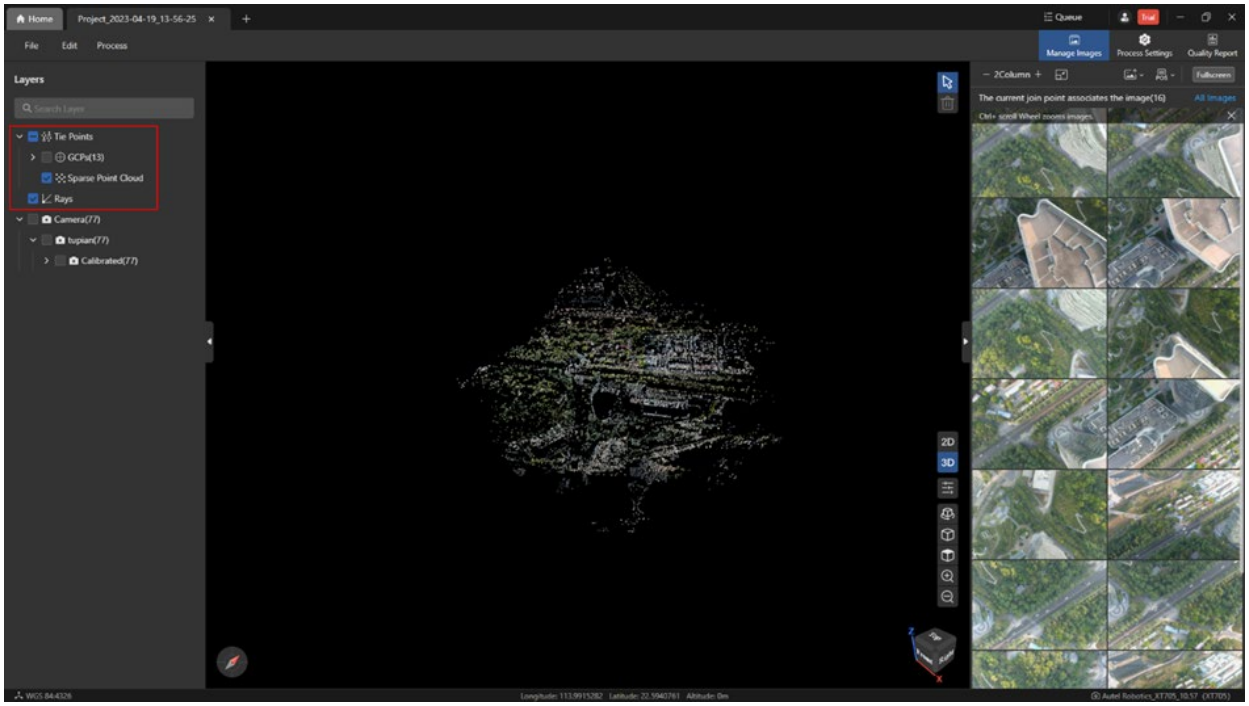


2.5 Layer Tree, Map View

2.5.1 Layer Tree

After performing Aerial Triangulation, generate sparse point clouds and rays, and the sparse point clouds are displayed under the [**Tie Points**] layer in the [**Layers**] page.

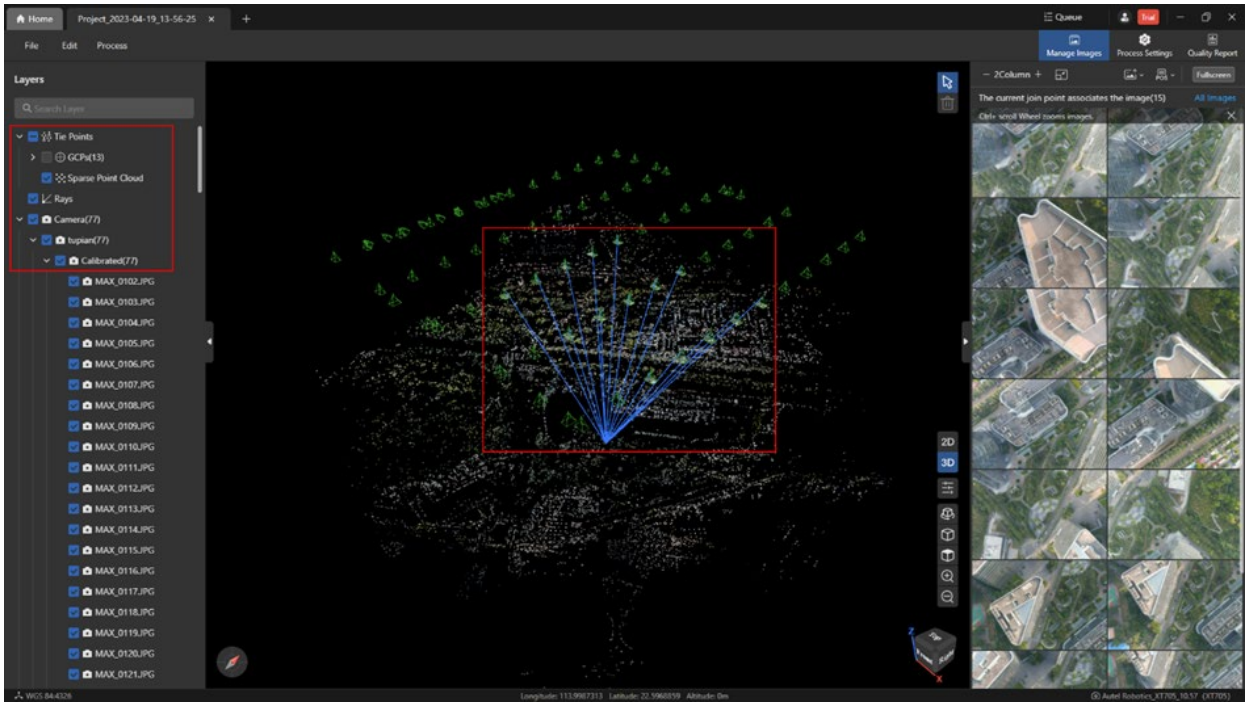
Sparse point clouds and rays can only be selected from [**Show**] or [**Hide**], and cannot be deleted manually.



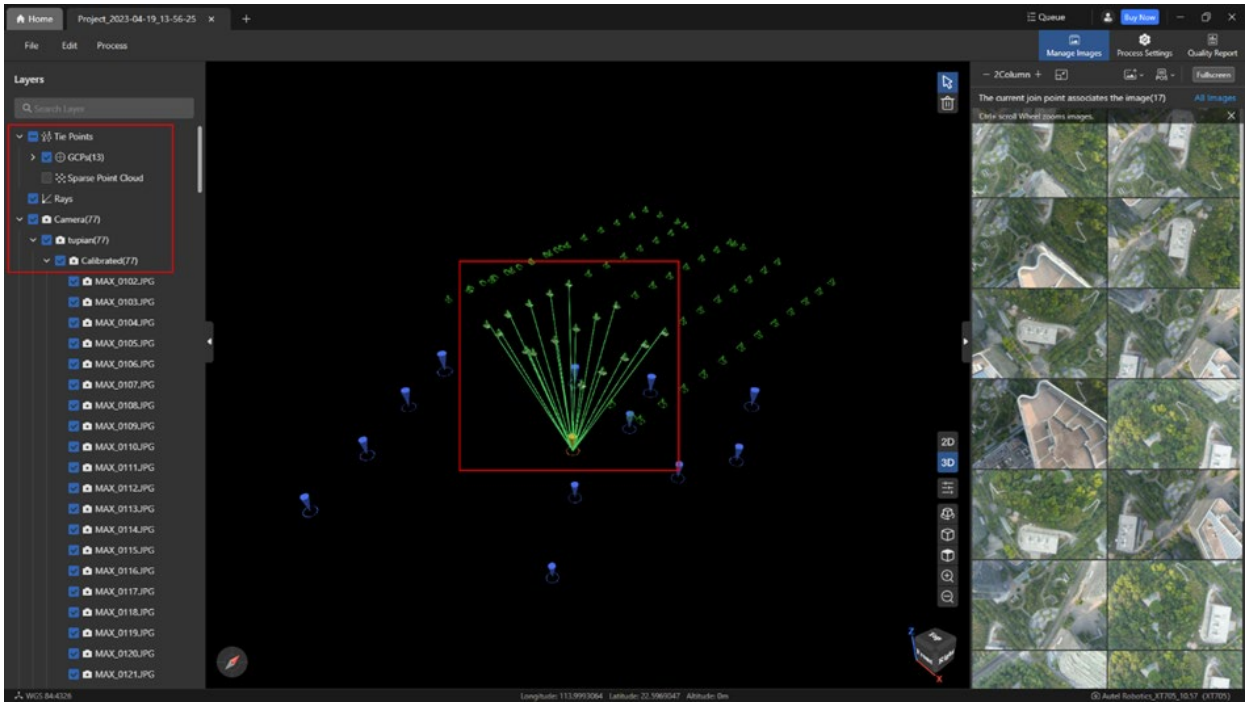
2.5.2 Map View

Check [**Sparse Point Cloud**] to display the generated sparse point cloud in the map view.

Check [**Sparse Point Cloud**], [**Rays**], [**Camera**], click any sparse point to see the ray displayed between the sparse point and the image.



Check [**GCPs**], [**Rays**], [**Camera**], and click any control point to see the ray displayed between that point and the image.



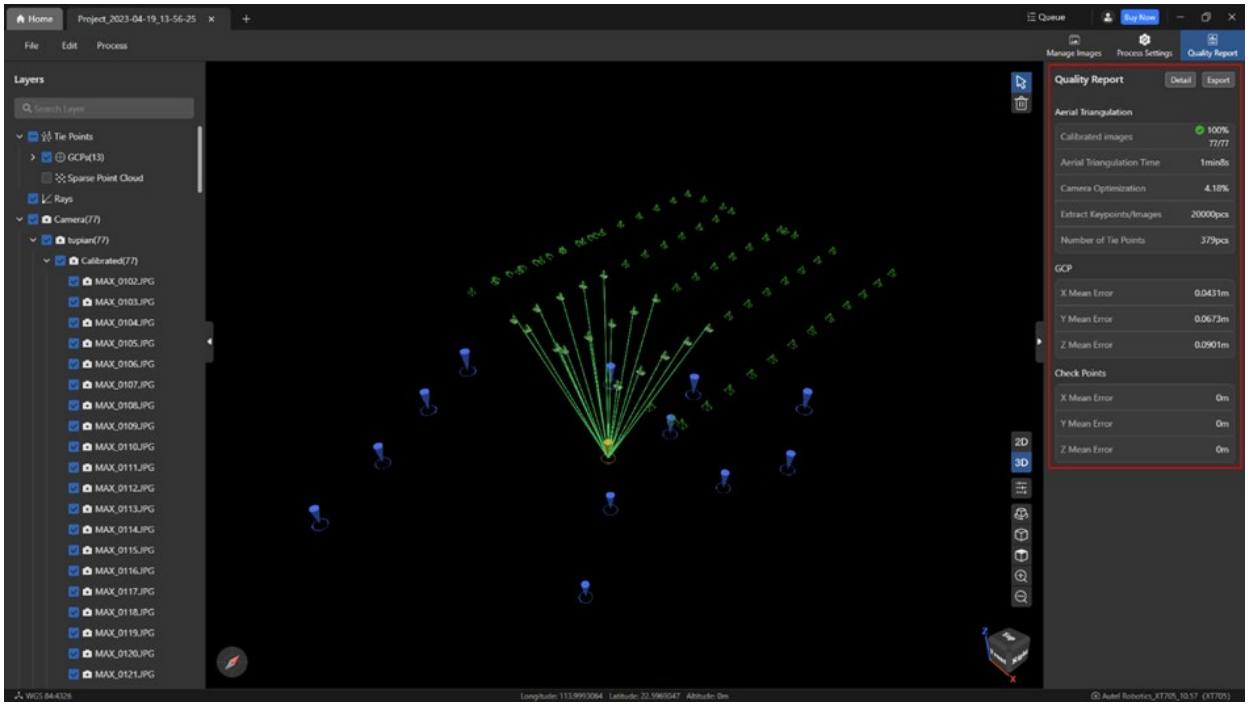
2.6 Aerial Triangulation Quality Report

The aerial triangulation quality report is divided into a summary and a detailed analysis, with the latter showing a comprehensive report.

2.6.1 Summary

Click the [**Quality Report**] icon in the upper right corner of the project page to open the quality report summary page.

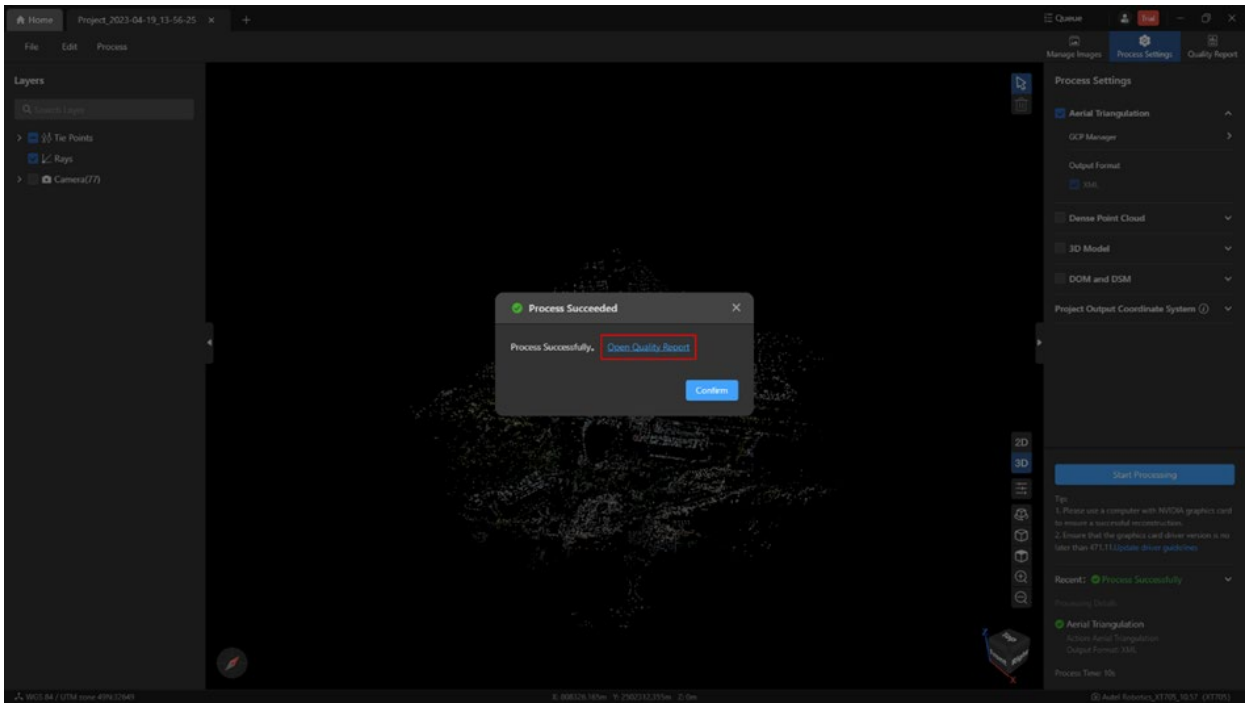
Aerial Triangulation, GCPs errors, and check points errors will be displayed on the［**Quality Report**］summary page.



2.6.2 Details

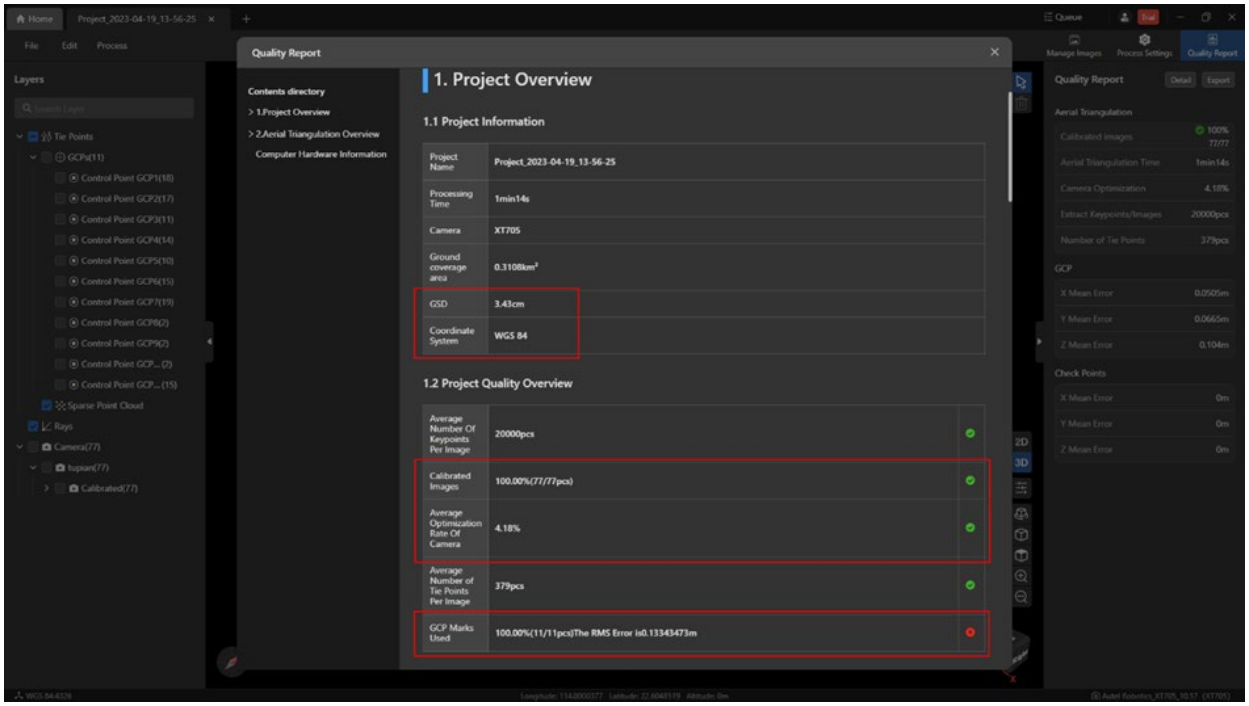
To open the comprehensive report, complete the following steps:

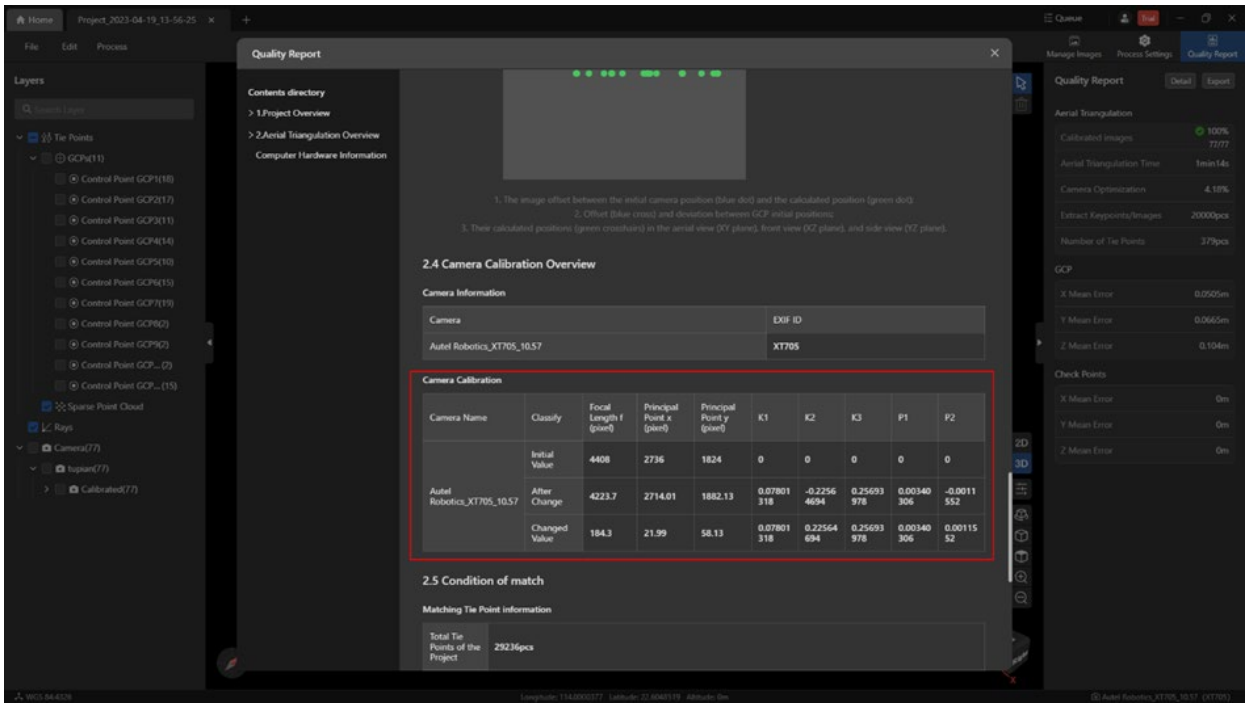
- When the processing is successful, click [**Open Quality Report**] in the pop-up prompt box.
- Click the [**Detail**] button in the [**Quality Report**] summary page.
- Click on the menu bar [**Process->Open Quality Report**].



Description of Aerial Triangulation Quality Report:

- **GSD**: Ground resolution is the ability to identify the minimum size of ground objects on the image.
- **Coordinate System**: The coordinate system is the default WGS 84. If the GCP/project output coordinate system is modified, only empty three is processed, and the coordinate system is still the default value.
- **Calibrated Images**: The number of images that can be used to actually generate a sparse point cloud. If the number is less than the number of imported images, it means that there are images that cannot be used to generate a sparse point cloud. If the area where the image is captured is mainly texture-free or weakly textured, or the area where the image and other images do not overlap, calibration may not be possible, and aerial triangulation must be performed after re-shooting.
- **Error Rate of GCP Marks Used**: This error represents the error value between the imported control point and the actual calculated geographic location. The smaller the value, the more accurate the location.
- **Camera Calibration**: Camera calibration information mainly checks the change values of focal length f, image principal point x, and image principal point y before and after aerial triangulation of the camera. Generally, the change value does not exceed 50 pixels.
- **Average Optimization Rate Of Camera**: The change value of the camera focal length/the initial value of the camera focal length, which represents the optimization ratio of the front and rear cameras of the aerial triangulation. If the value is too large, it means that the camera has changed a lot, and the reason needs to be analyzed; if the images used for aerial triangulation are all orthographic or oblique, you can add images from different shooting angles.





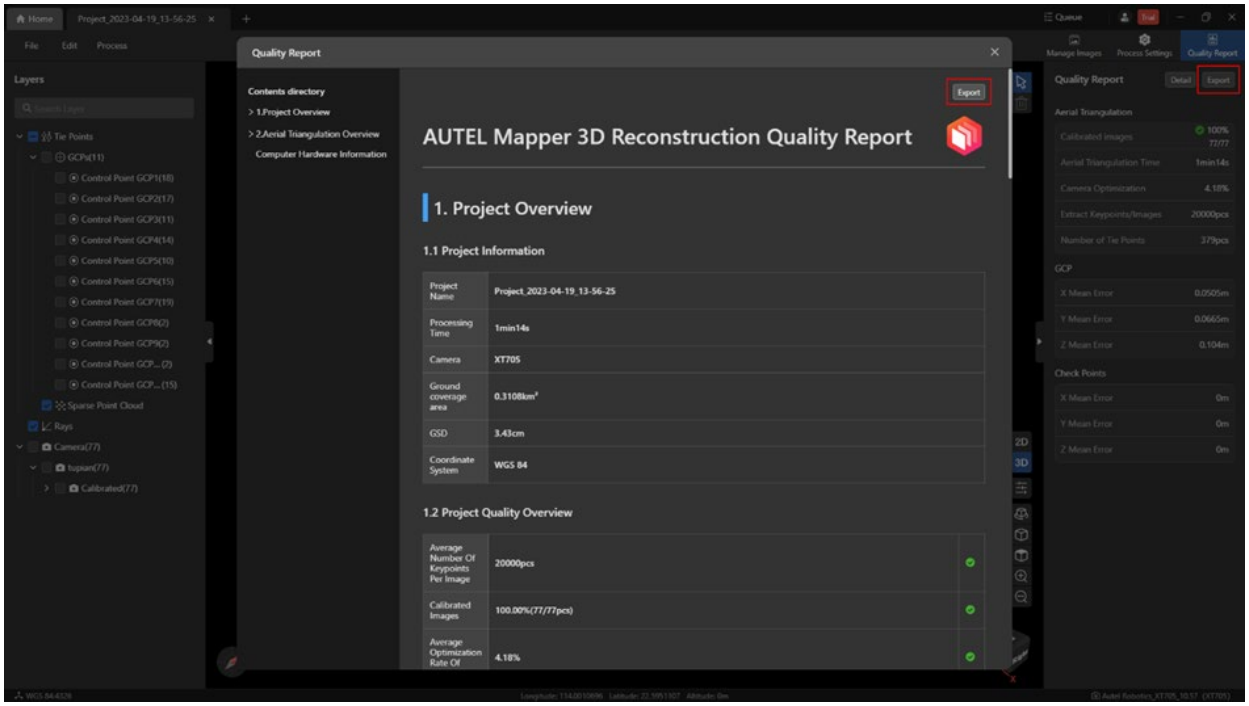
2.6.3 Export A Quality Report

On the [**Quality Report**] summary page, you may export a quality report to the local disk of the computer.

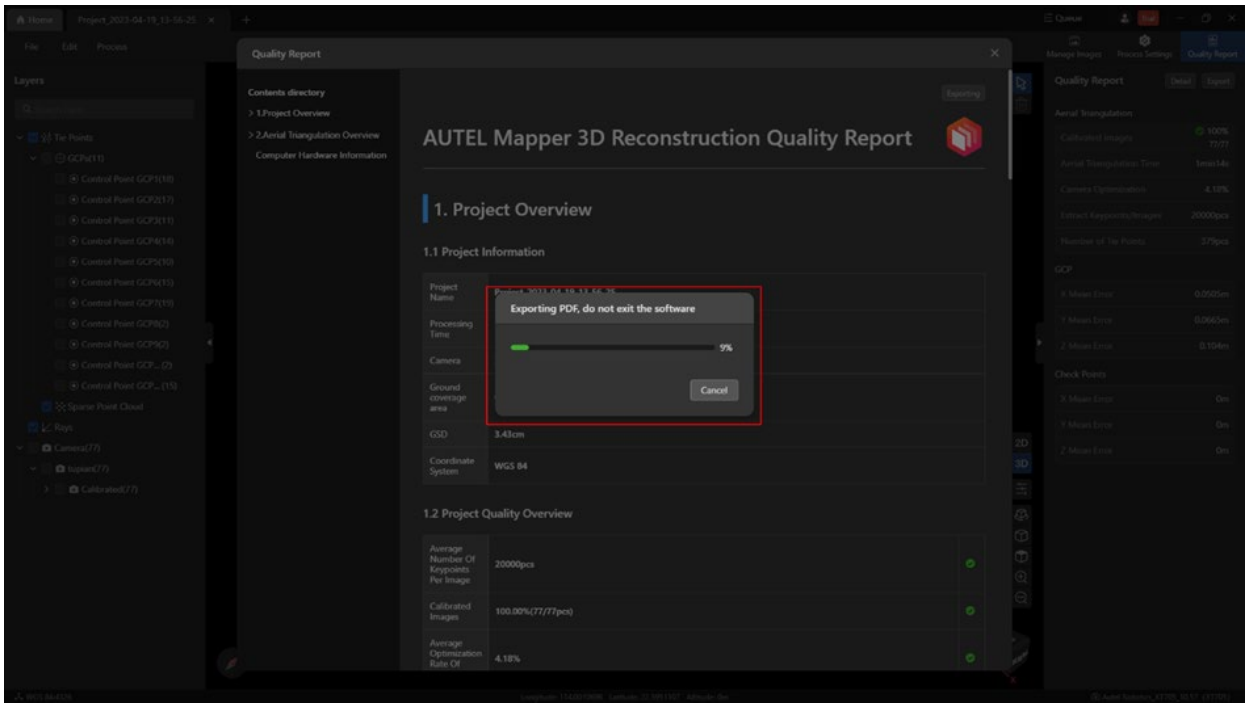
Click the [**Export**] button in the quality report details to export the quality report to the local disk of the computer.

Note:

- The exported quality report format is in .PDF.



When exporting a quality report, you can click the [**Cancel**] button to cancel the export.



3. Dense Point Cloud

3.1 Dense Point Cloud Overview

Dense point clouds are carried out following the results of aerial triangulation, mainly to increase the number of extracted points with the same name and improve the connectivity of images.

The reconstruction quality of dense point clouds is divided into three levels: high, medium

and low. Generally, the appropriate dense point cloud method is selected according to the results of aerial triangulation. When there is a high amount of weak textures, high-quality is generally used, but this method has a large amount of data and therefore takes a long time to process.

Dense point clouds can solve lacking a number of points with the same name in weak areas and the inability to match between points with the same name. It can effectively avoid holes and deformations in the 3D model, and ultimately improve the accuracy and quality of the 3D model.

3.2 Using Dense Point Clouds

3.2.1 Dense Point Cloud Configuration

Reconstruction quality is divided into three levels: high, medium and low, and the default is medium quality. With different reconstruction qualities, the number of generated point clouds is different, and the processing time will also be different.

Notes:

- High: The original resolution of the image.
- Medium: 1/4 of the original resolution of the image, and 1/2 of the original image in width and height.
- Low: 1/16 of the original image resolution, and 1/4 of the original image's width and height.

Result Format:

- PNTS format: LOD point cloud format, checked by default and must be checked, used for display in the program after generation.
- LAS format: Non-LOD point cloud format, unchecked by default, can be checked.
- XYZ format: Non-LOD point cloud format, unchecked by default, can be checked.

3.2.2 Dense Point Cloud Processing Steps

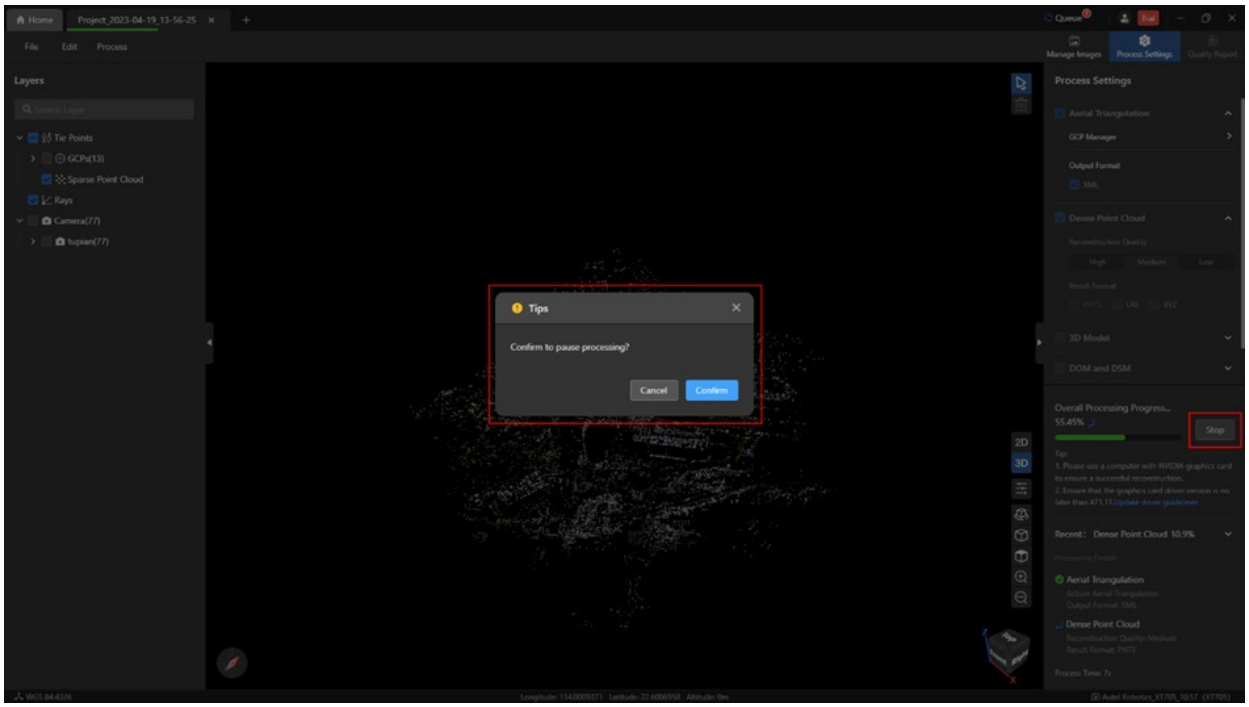
These must rely on aerial triangulation results. It can be processed together with the aerial triangulation, or the dense point clouds can be processed separately after the aerial triangulation is completed.

On the [**Process Settings**] page, check [**Dense Point Cloud**], and set the reconstruction quality and result format, and click the [**Start Processing**] button to start the reconstruction process.

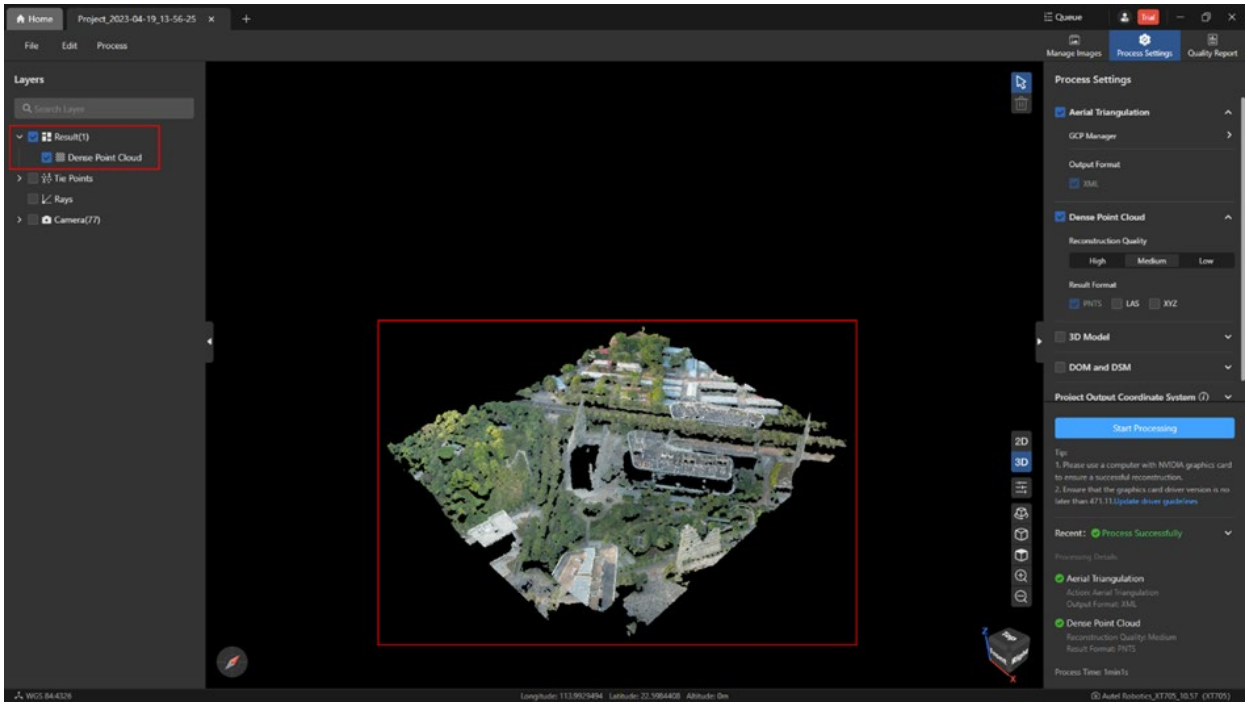
Note:

- Dense Point Cloud is not checked by default and needs to be checked manually.

During the processing, you can click the [**Stop**] button to stop the processing, modify the reconstruction quality or the result format before processing, or restart the processing directly without modifying any parameters.



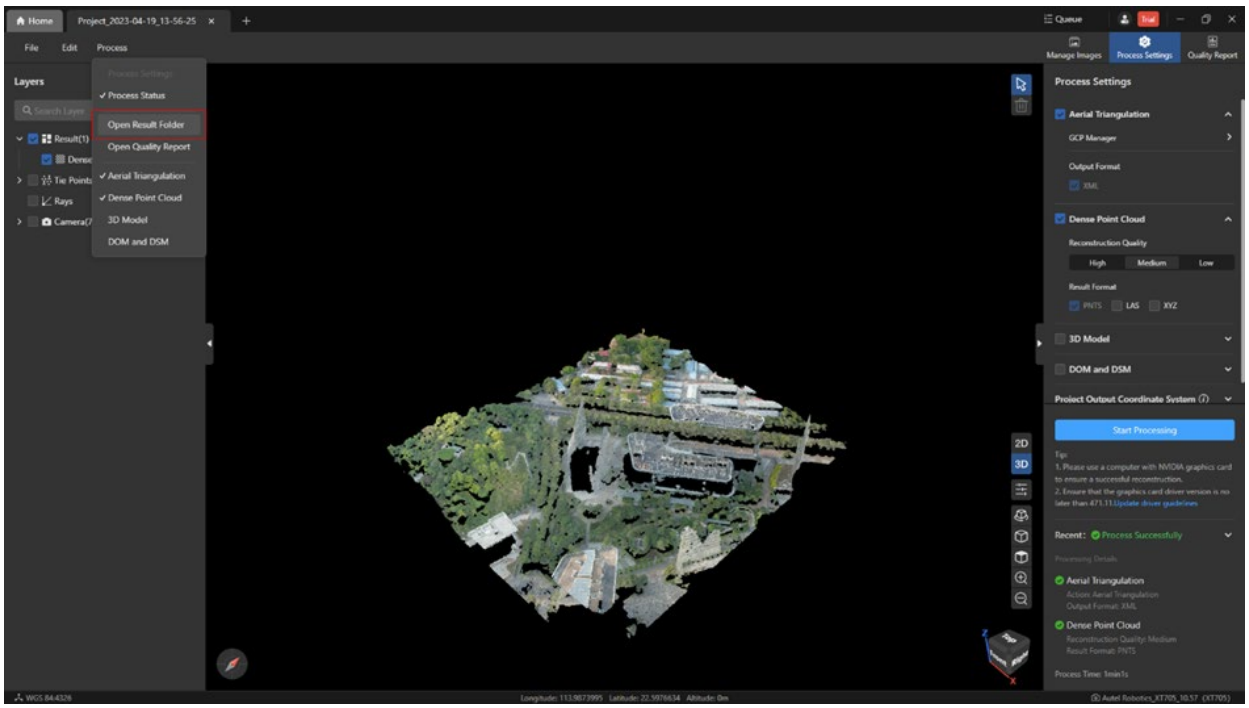
After the processing is completed, you can view the results of the dense point cloud in the layer tree and 3D view of the [**Layers**] page.



3.3 View Results And Export

3.3.1 View Results

You can open the system directory where the result file is located through the menu bar [**Process->Open Result Folder**]. If no result (Dense point cloud, 3D result, 2D result) has been generated, [**Open Result Folder**] will be grayed out.

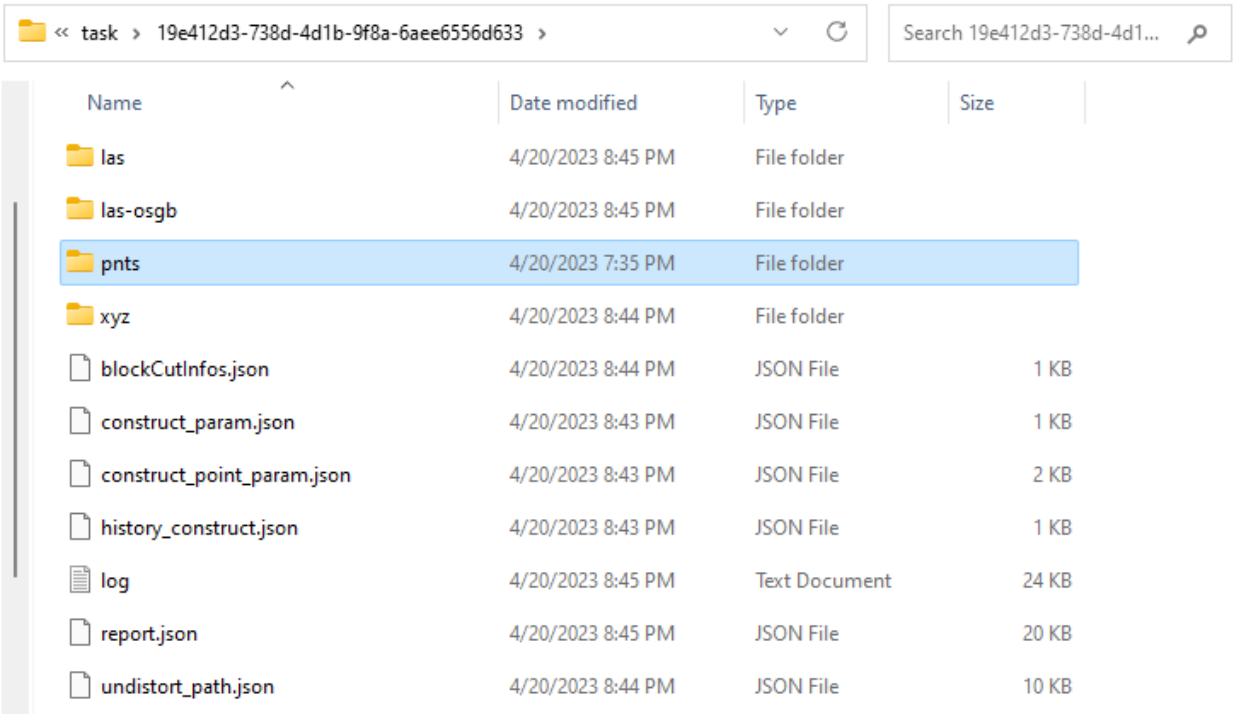


You can also find the directory where the result file is located in the local disk of the computer according to the path where the project folder is located.

In the result folder, you can see the pnts, las, xyz result folders.

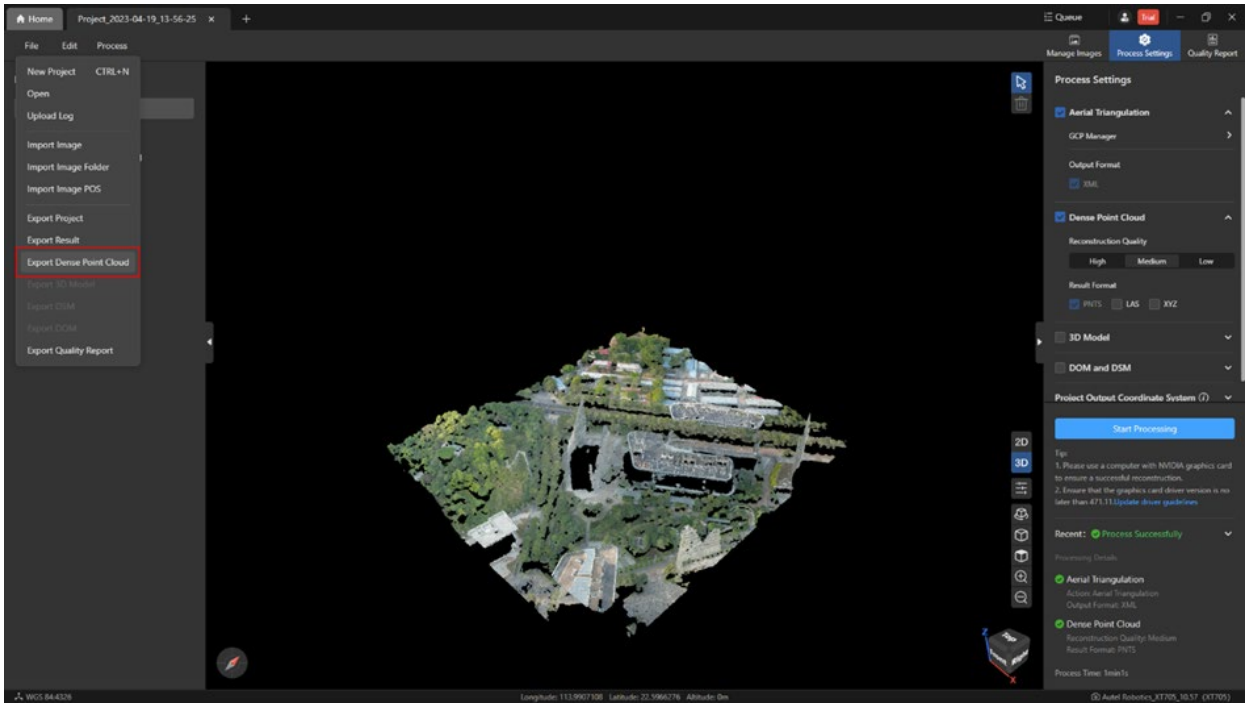
Tips:

- The tileset.json file in the pnts folder is the result of dense point cloud. After generating this file, it means that the pnts format of dense point cloud has been processed, and the frontend renders the result of dense point cloud in the program.

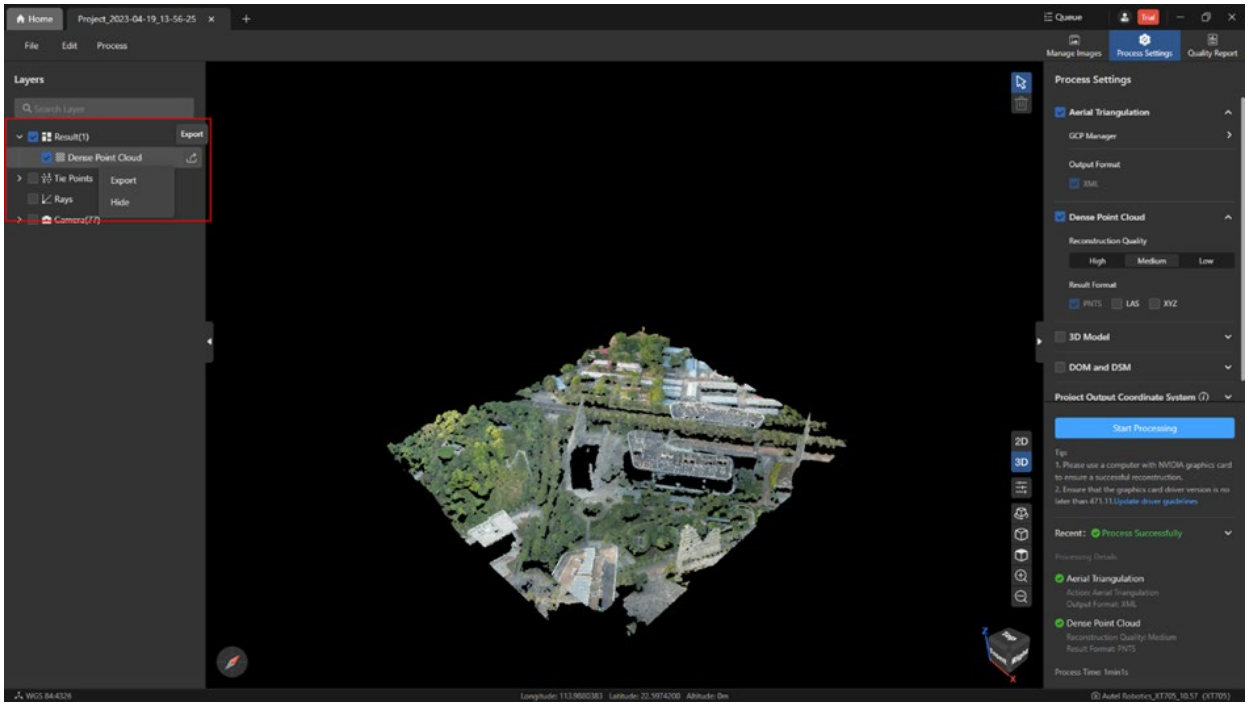


3.3.2 Export Results

Click [**File->Export Dense Point Cloud**] in the menu bar to export the results of dense point cloud.



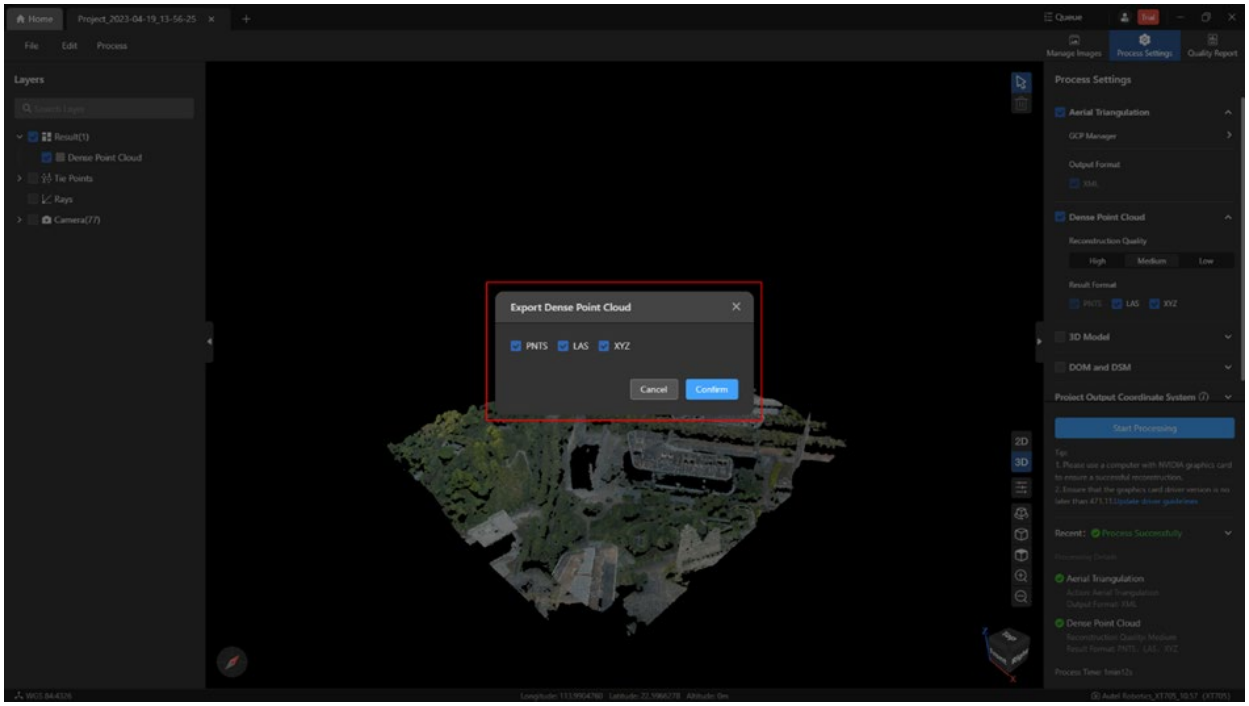
On the [**Layers**] page, right-click [**Dense Point Cloud**] under the layer tree or click the [**Export**] icon on the right to export the results of dense point cloud.



The export results support the option to export results in PNTS, LAS, and XYZ formats.

Tips:

- All existing output formats are checked by default.
- If the corresponding result format is not checked during dense point cloud processing, the corresponding format cannot be selected when exporting.



3.4 Dense Point Cloud Quality Report

After the dense point cloud is processed, the quality report details page will add dense point cloud processing information, including: Reconstruction Quality, Result Format, and Processing Time.

4. 3D Reconstruction

4.1 3D Reconstruction Overview

3D reconstruction refers to the combination and splicing of the generated dense point cloud to generate a 3D model of the captured object.

4.2 3D Reconstruction Processing

4.2.1 3D Model Options

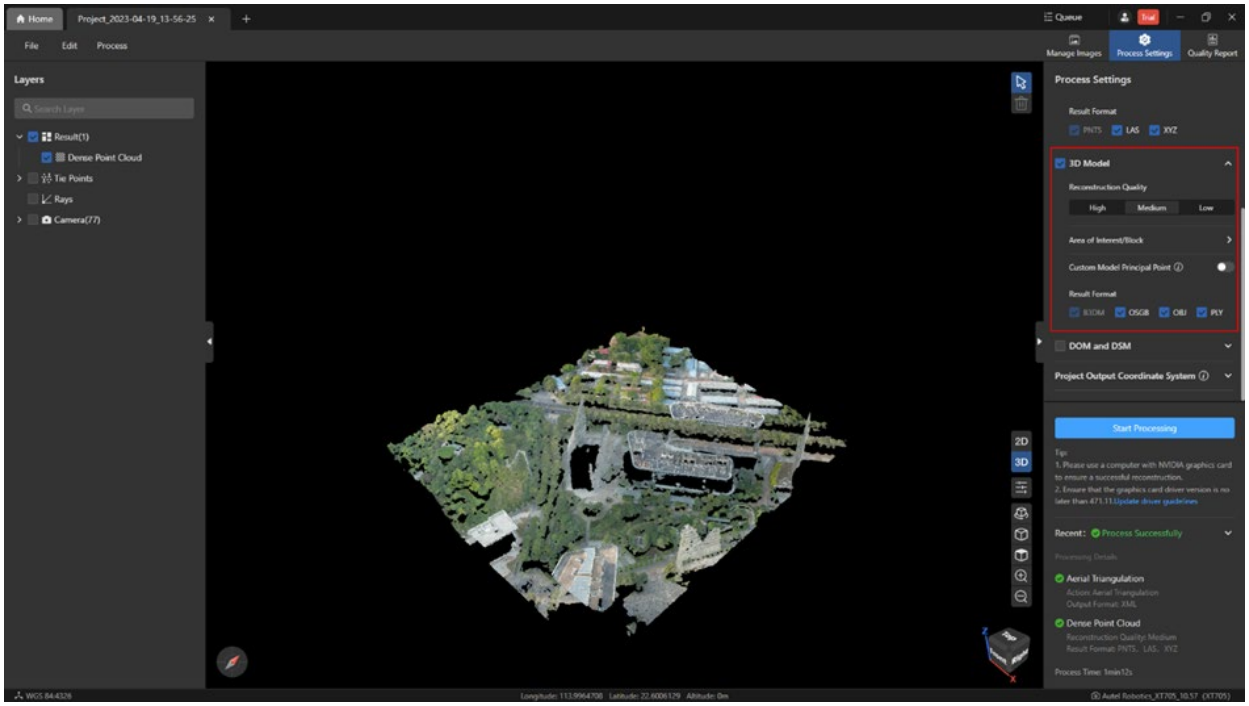
The reconstruction quality is divided into three levels: high, medium and low, and the default is medium quality. With different reconstruction qualities, the definition of the generated 3D model is different, and the processing time will also be different.

Note:

- High: The original resolution of the image.
- Medium: 1/4 of the original resolution of the image, and 1/2 of the original image in width and height.
- Low: 1/16 of the original image resolution, and 1/4 of the original image's width and height.

Result format:

- B3DM format: LOD model format, checked by default and must be checked, used to display in the program after generation.
- OSGB format: LOD model format, unchecked by default, can be checked.
- OBJ format: Non-LOD model format, unchecked by default, can be checked.
- PLY format: Non-LOD model format, unchecked by default, can be checked.



4.2.2 3D Model Processing Steps

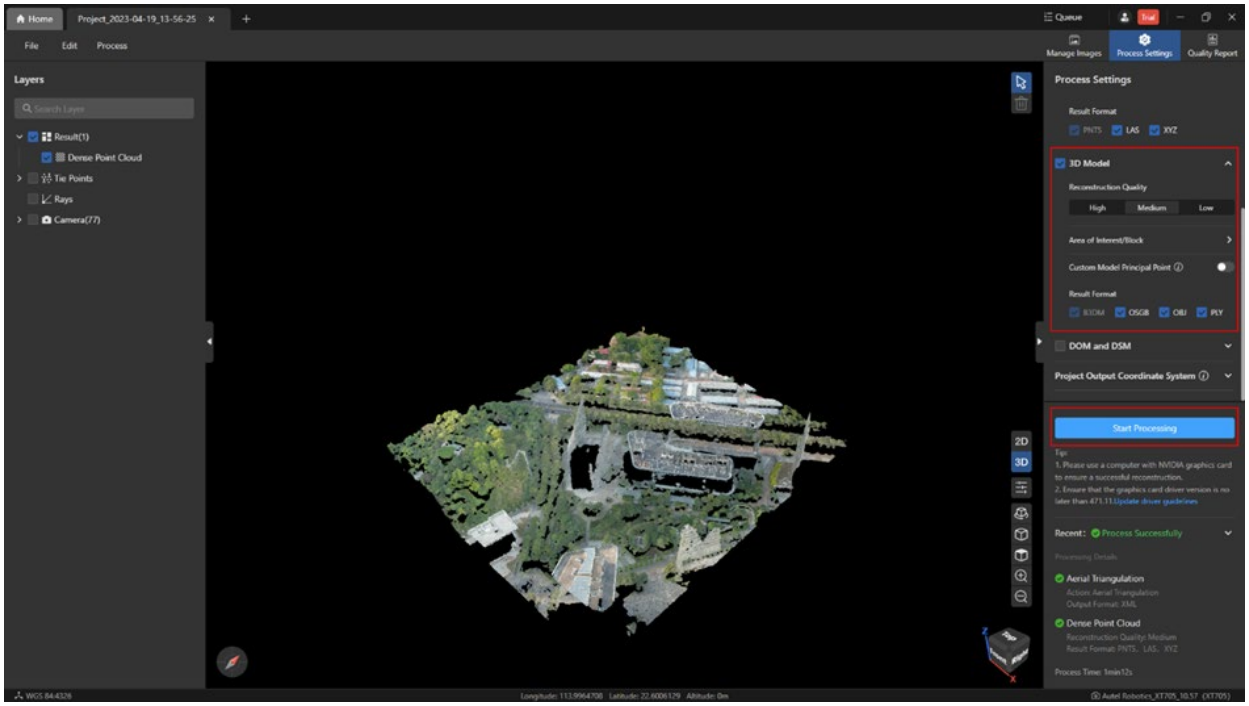
The 3D model depends on the results of the aerial triangulation, and the Aerial Triangulation can be performed first, and then the 3D model can be processed separately, or the aerial triangulation can be processed together with the 3D model.

The 3D model and dense point cloud can be processed simultaneously or separately.

On the [**Processing Settings**] page, check [**3D Model**], and set the reconstruction quality and result format, and click the [**Start Processing**] button to start the reconstruction process.

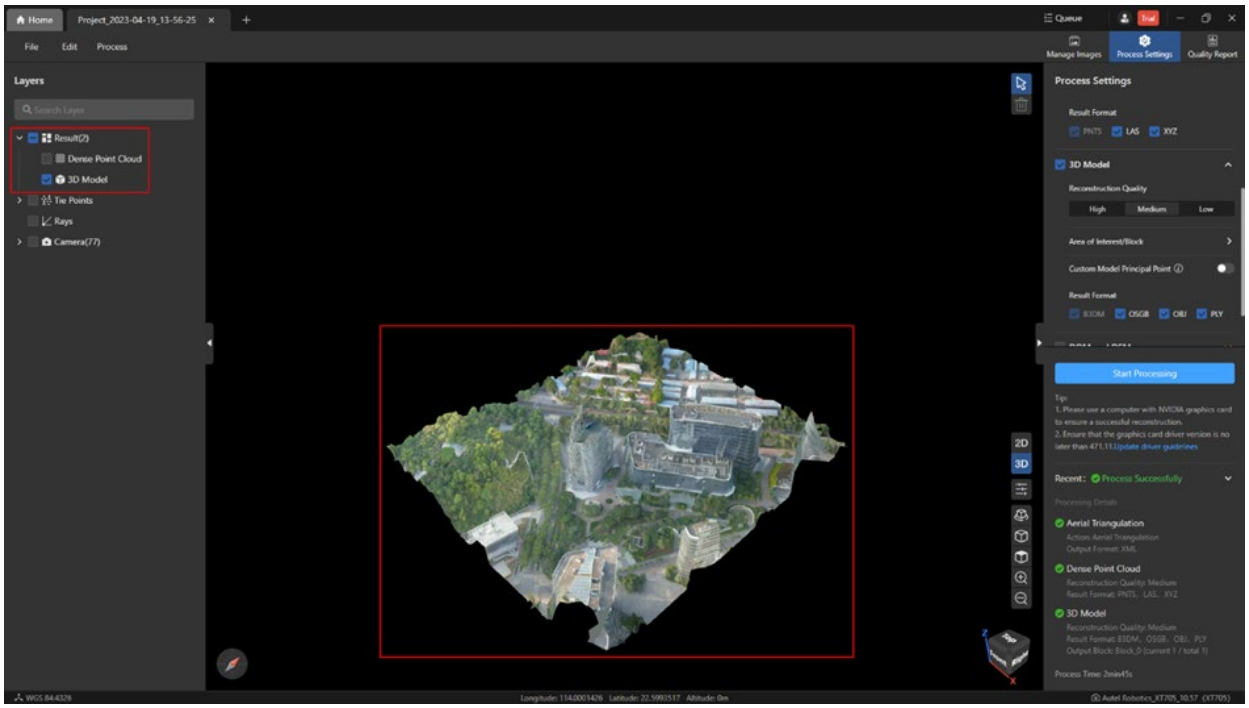
Tips:

- The [**3D Model**] column is not checked by default and needs to be checked manually.
- If the Autel Mapper account is not logged in or the account validity period expires, or if the newly created project has not been run in aerial triangulation, the 3D model reconstruction function cannot be performed.



During processing, you can click the [**Stop**] button to stop processing, and modify the reconstruction quality or result format before processing.

Check the [**3D Model**] in the layer tree on the [**Layers**] page, and view the results of the 3D model in the 3D view.



4.3 Area of Interest

The Area of interest reduces the running time of the task or improve the accuracy. Before running the 2D or 3D reconstruction task, enter the area of interest in the corresponding mode to draw an area of focus. After saving successfully, running the corresponding task will only

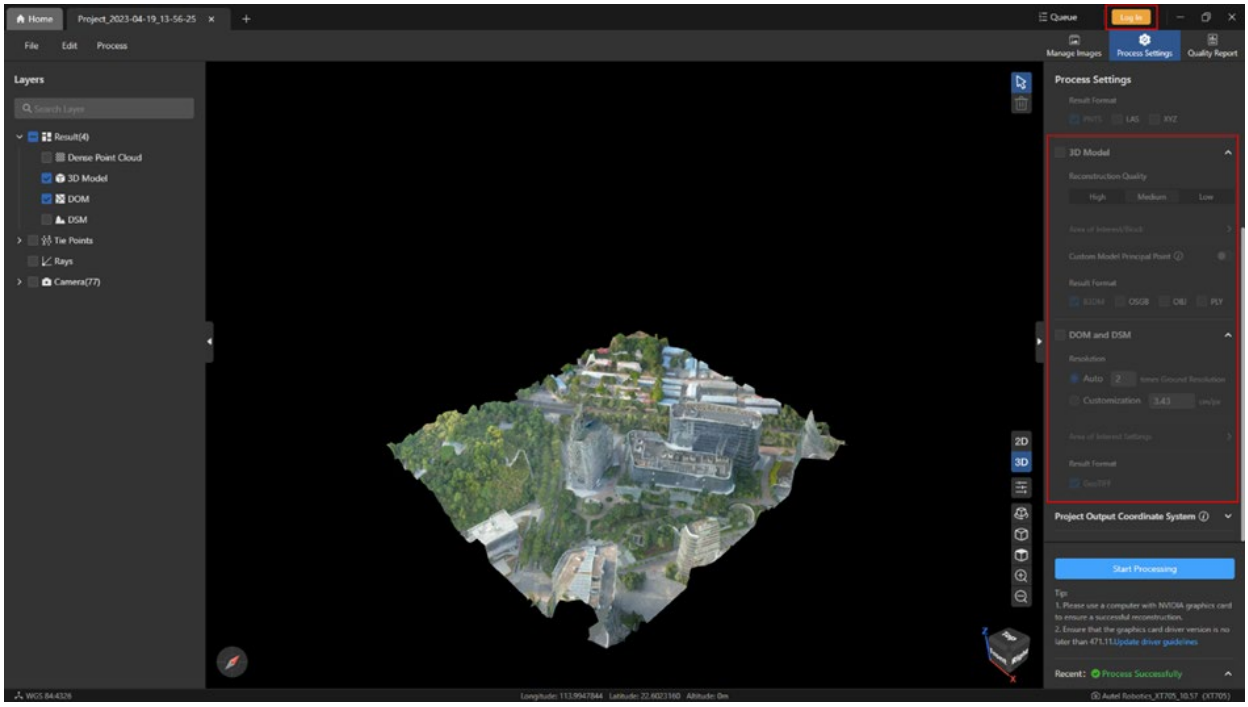
generate the area of interest in the results.

Note:

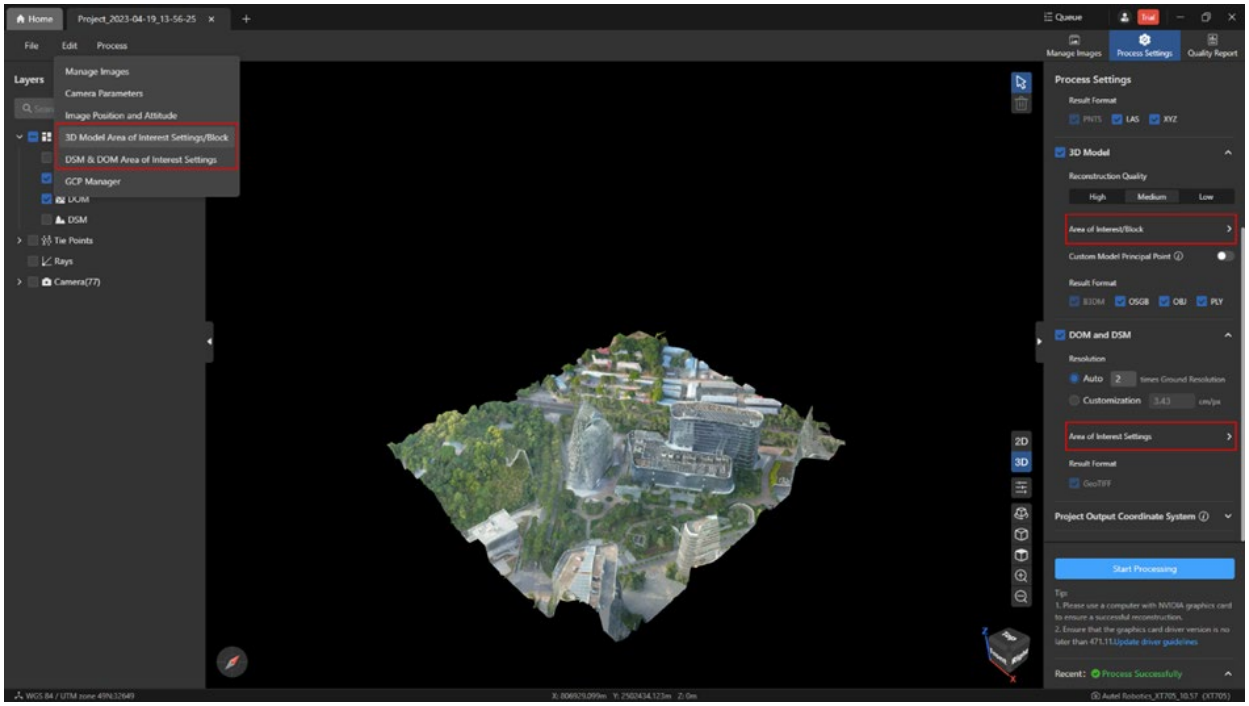
- The area of interest is a regular spatial polygon, and its surface is vertical or parallel to the plane. The default is a rectangular hexahedron.

4.3.1 Using Area of Interest

If you have not logged into the Autel Mapper account or the account validity period has expired, or if the newly created project has not completed aerial triangulation, the [**Area of Interest/Block**] button and the [**DOM and DSM**] buttons are grayed out and cannot be entered.

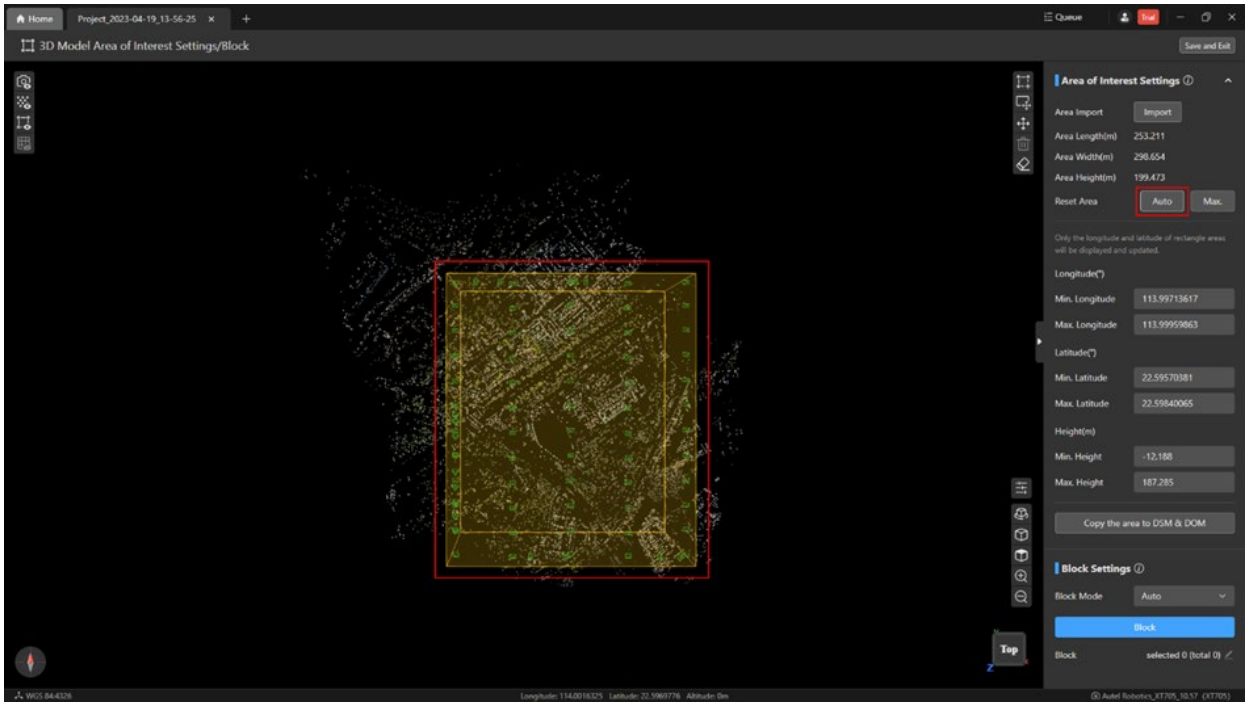


When logging in to the Autel Mapper account and the account is within the validity period, click the [**Area of Interest/Block**] button under the [**3D Model**] in the [**Process Settings**] page to enter the [**3D Model Area of Interest Settings/Block**] page, click [**Area of Interest Settings**] button under [**DOM and DSM**] in the [**Process Settings**] page to enter the [**DOM and DSM Area of Interest Settings**] page. Alternatively, click [**Edit->3D Model Area of Interest Settings/Block**] and [**Edit->DSM & DOM Area of Interest Settings**] on the project page to enter the [**3D Model Area of Interest Settings/Block**] page and [**DOM and DSM Area of Interest Settings**] respectively.



4.3.2 Get An Automatic Area of Interest

When entering an area of interest for the first time, an automatic area of interest is generated by default. If the area of interest is cleared, if you want to get an automatic area of interest, you can click the [**Auto**] button in the [**Area of Interest Settings**] column on the right.

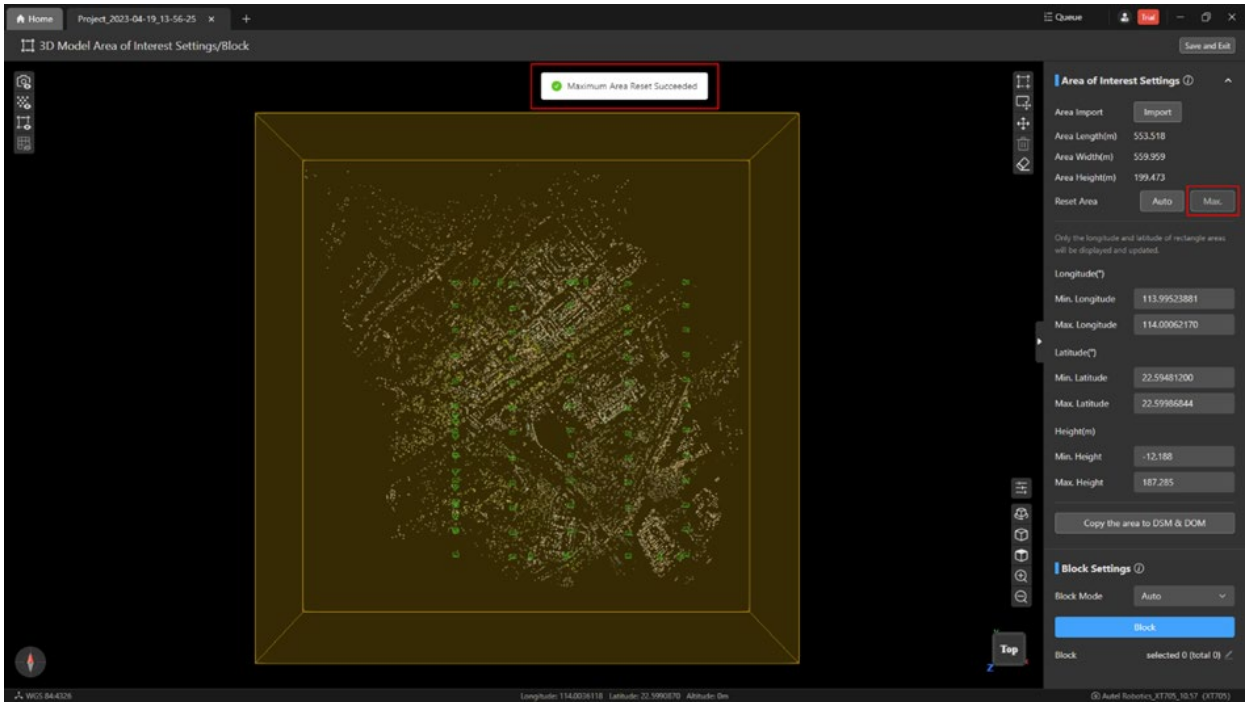


4.3.3 Acquire Largest Area of Interest

Click the [**Max.**] button in the [**Area of Interest Settings**] column on the right to clear the current area of interest and draw the largest area of interest.

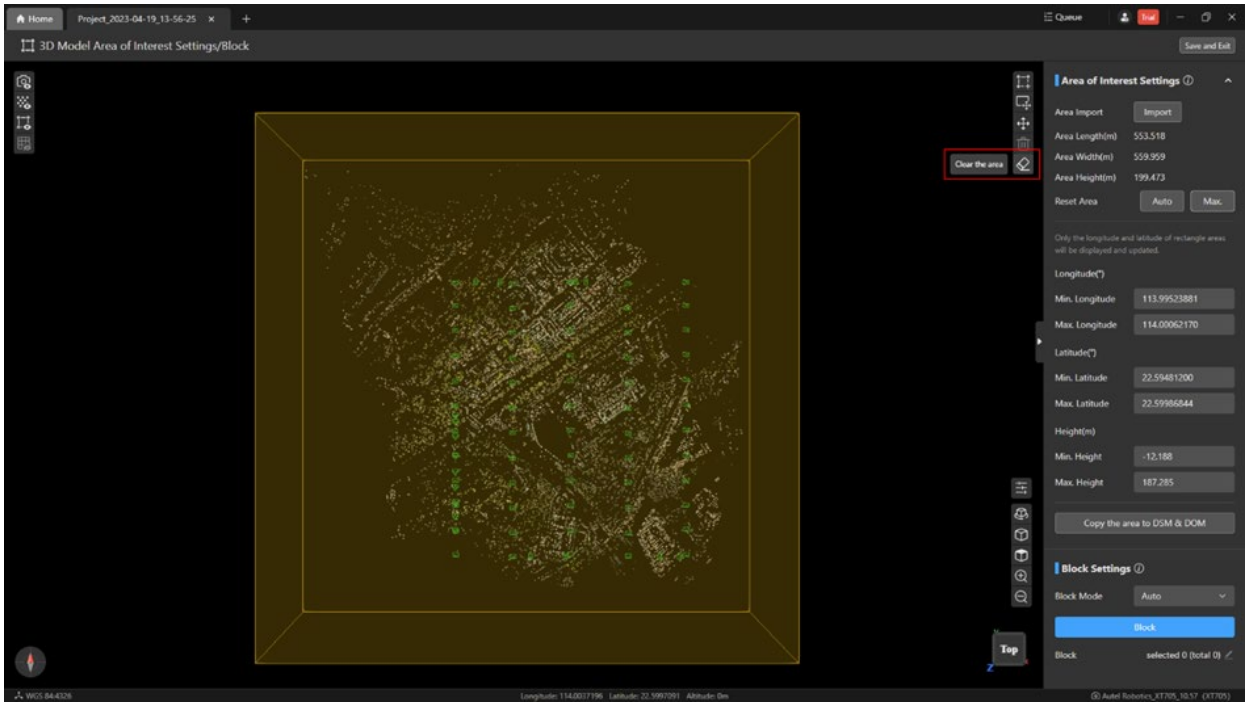
Note:

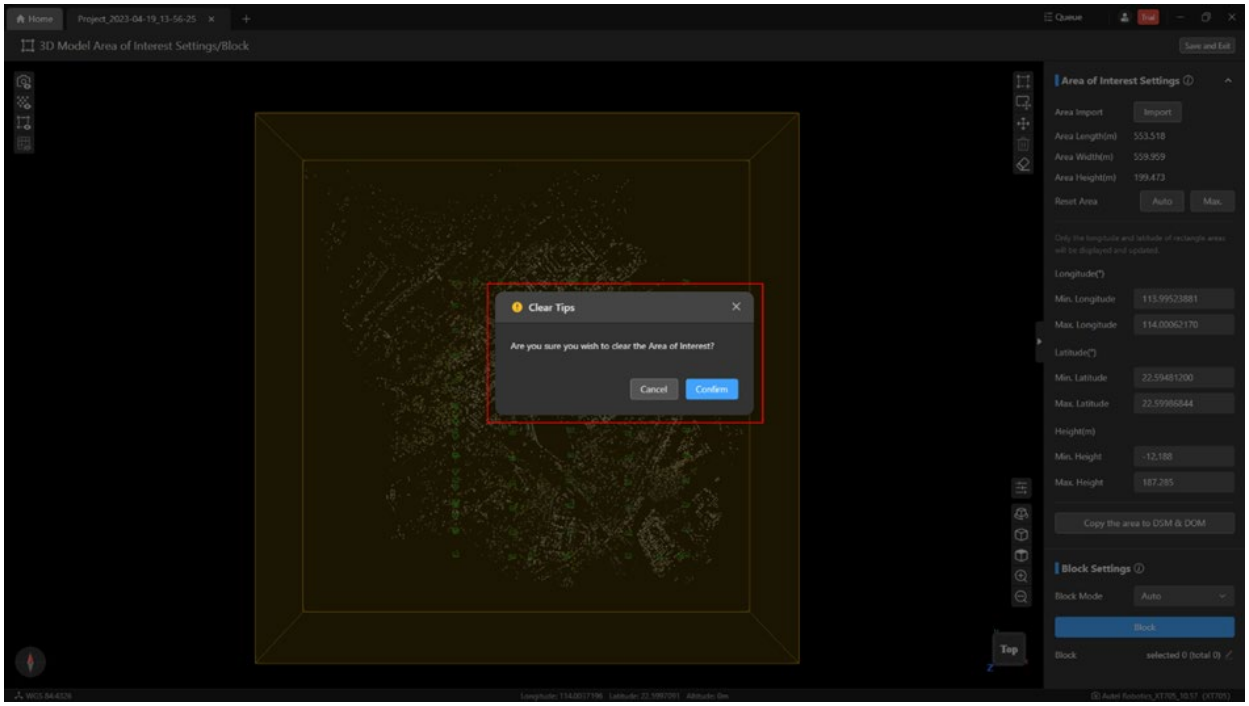
- According to the range of the largest bounding box of the sparse point cloud generated by the imported image, Autel Mapper will generate the largest area of interest.



4.3.4 Clear Area of Interest

Click the [**Clear the area**] icon in the upper right corner of the [**3D Model Area of Interest Settings/Block**] page to clear the area of interest.



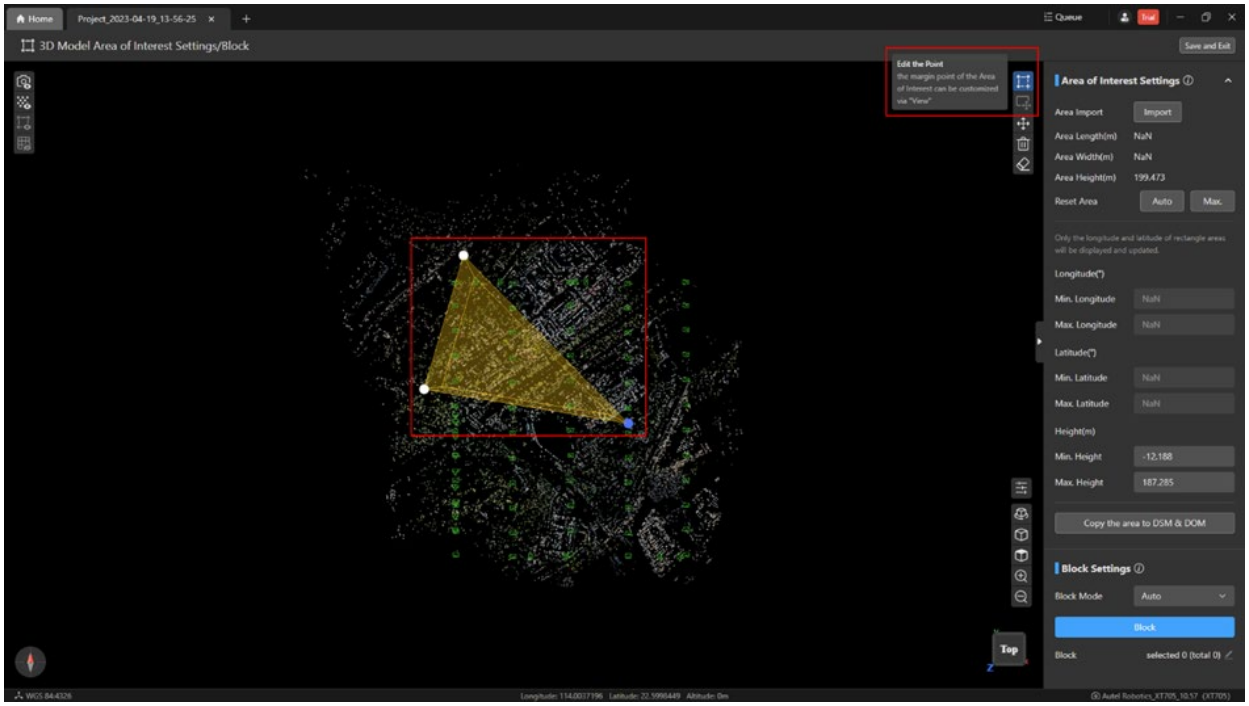


4.3.5 Add Vertex

After clicking the [**Edit the Point**] icon in the upper right corner of the [**3D Model Area of Interest/Block**] page, you can continuously click the mouse in the view to customize the boundary vertices of the area of interest.

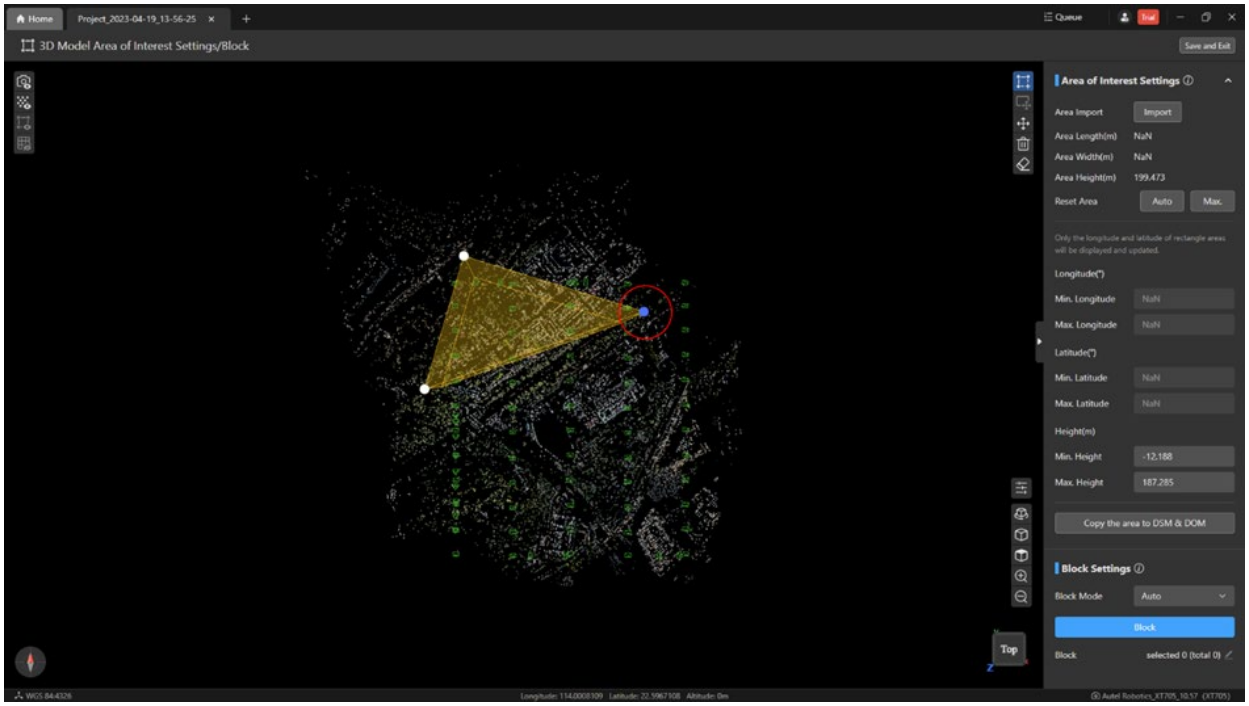
Tips:

- At least three vertices in different positions are required to generate the top surface of the area of interest.
- The selected vertex color changes to blue.



4.3.6 Move Vertices

Select the vertices to be moved on the [**3D Model Area of Interest Settings/Block**] page, press and hold the left mouse button and move the mouse to move the selected vertices.

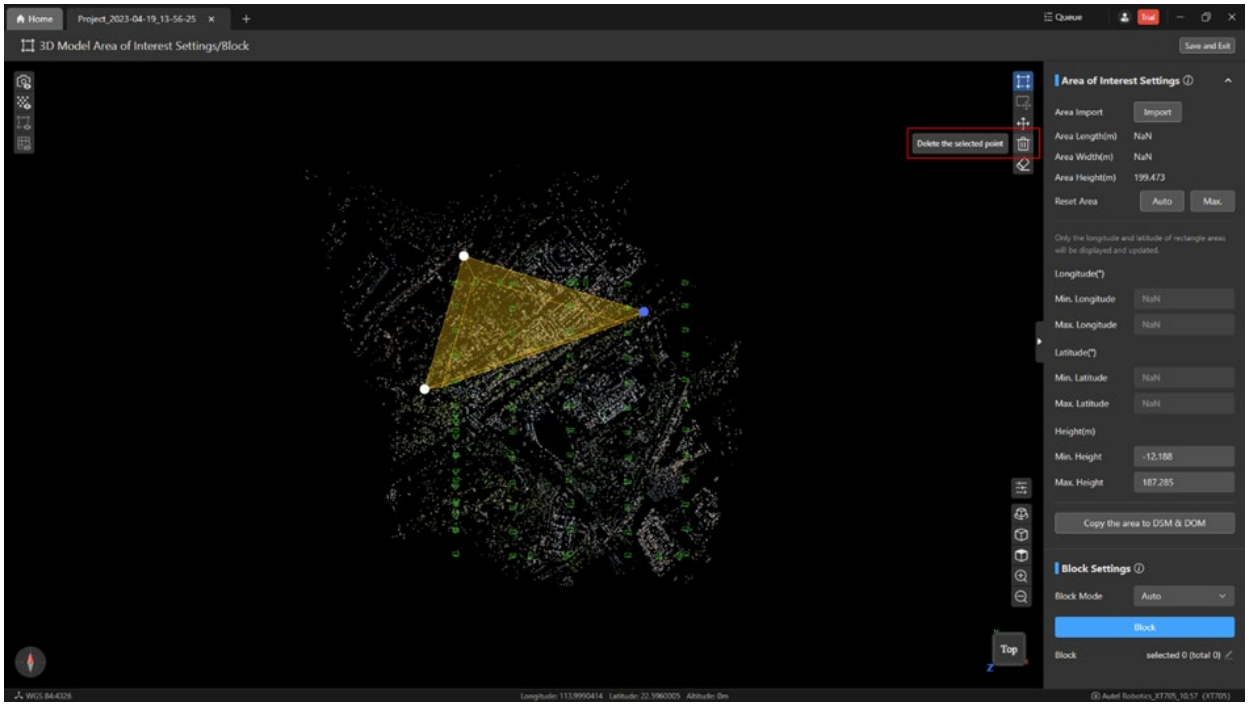


4.3.7 Delete Vertex

Select the vertices to be deleted on the [**3D Model Area of Interest Setting/Block**] page, and click the [**Delete the selected point**] icon in the upper right corner to delete the selected vertices.

Tips:

- After deleting a vertex, the remaining vertices automatically generate a new top surface of the area.
- When the number of vertices in the view is deleted to less than 3, the generated area of interest disappears.



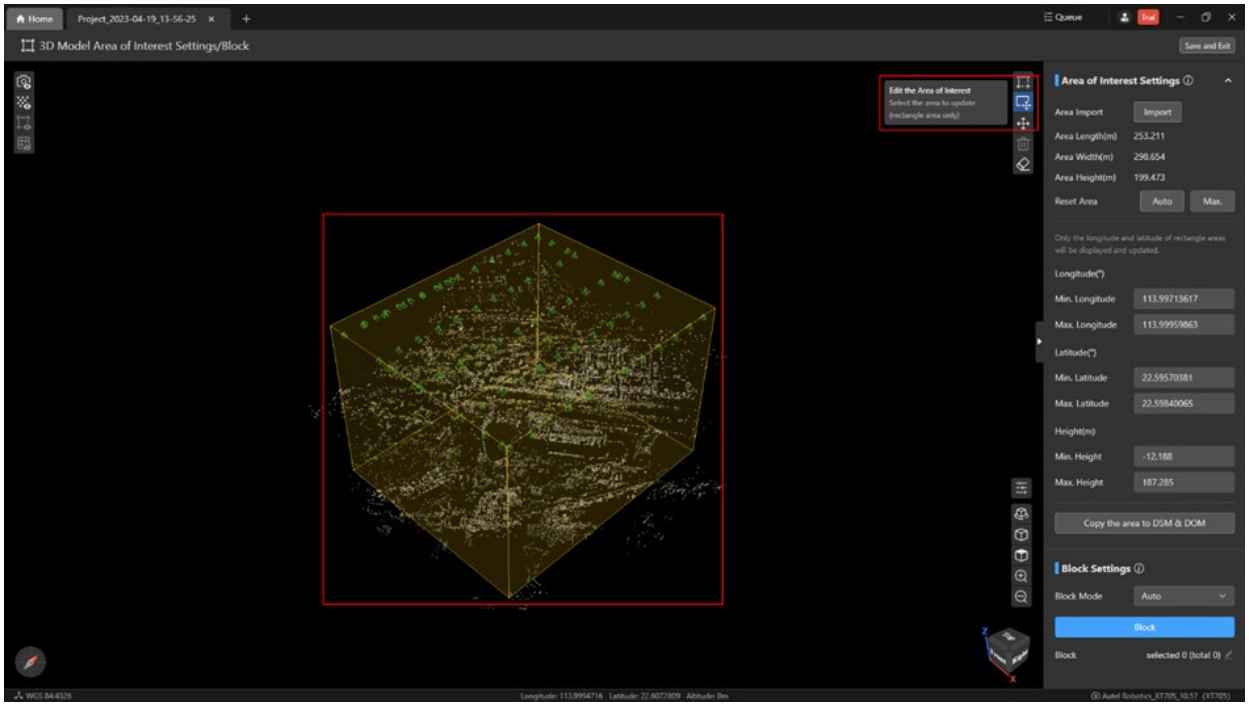
4.3.8 Edit Area of Interest Polygon

Click the [**Auto**] or [**Max.**] button in the [**Area of Interest Settings**] column to generate an area of interest.

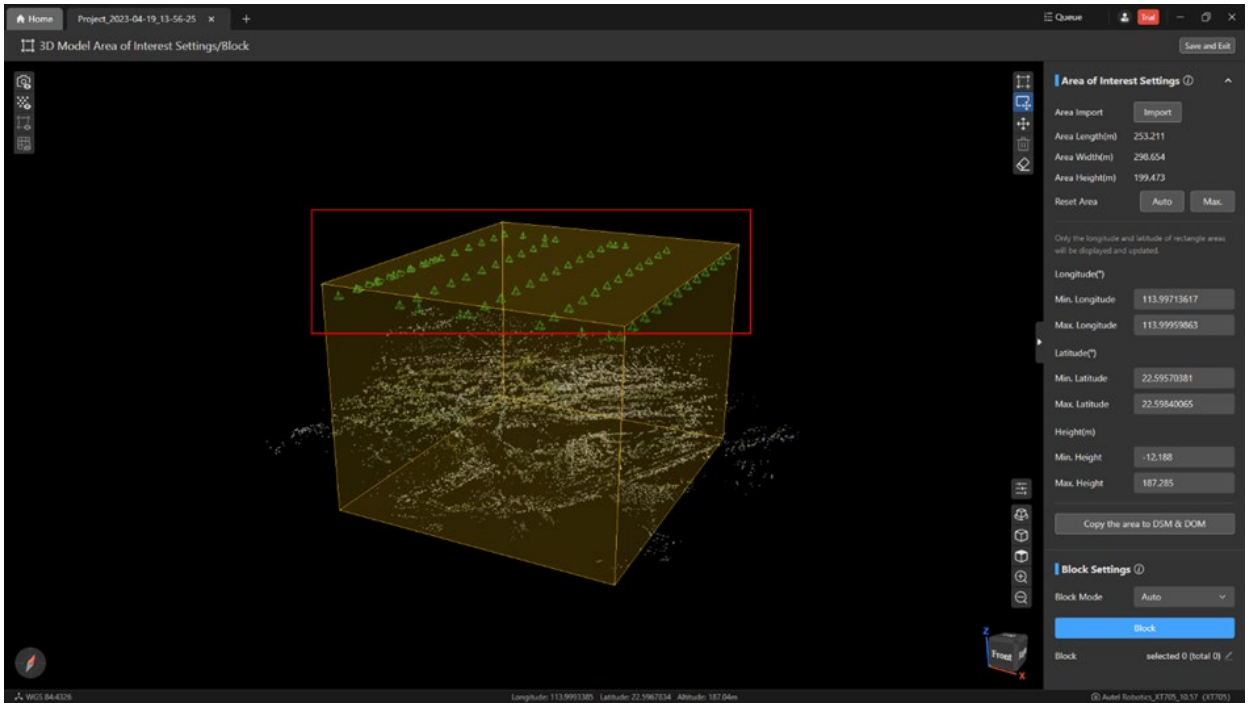
Then click the [**Edit the Area of Interest**] icon in the upper right corner of the [**3D Model Area of Interest Settings/Block**] page to edit the area of interest surface. At this time, the area of interest view will automatically adjust the 3D perspective.

Note:

- The boundary of the area of interest must be parallel to the latitude and longitude direction before it can be edited. When editing, you can drag the selected surface.
- Currently, editing the area of interest only supports the adjustment of the area of interest under either automatic area or maximum area.

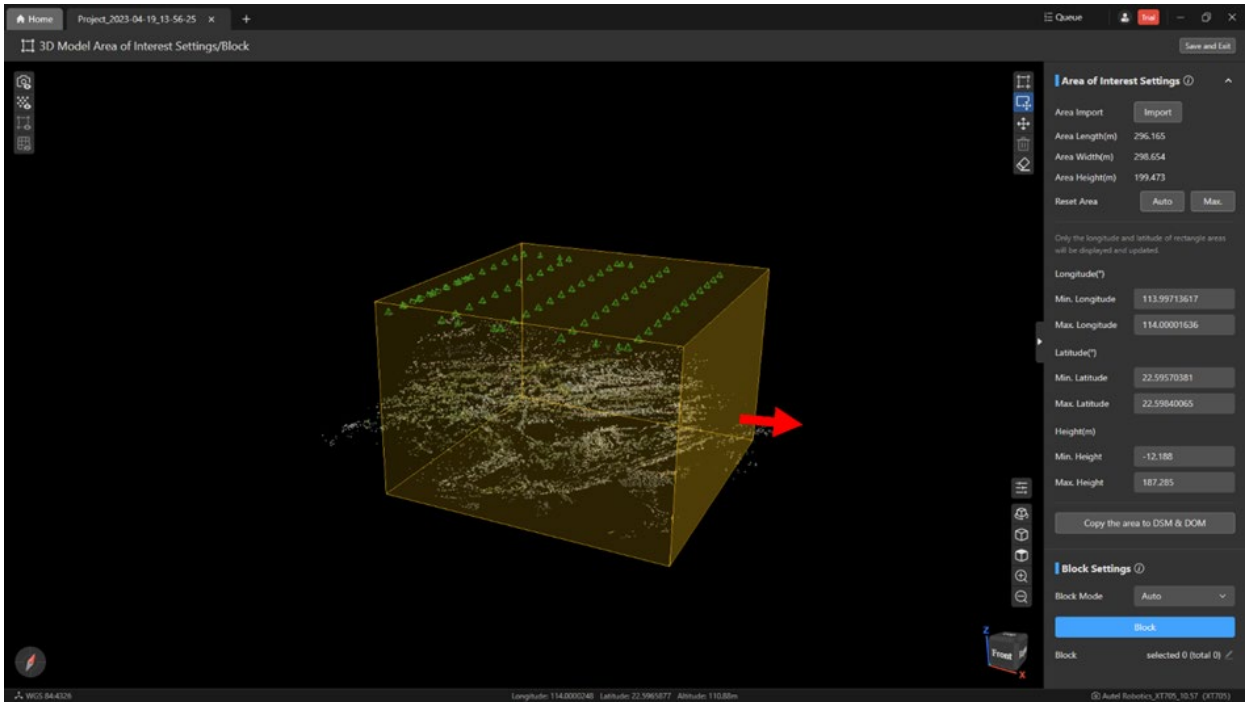


Move the mouse to the area you want to adjust, the area will be highlighted, press and hold the mouse and move the mouse in the direction to be adjusted, the geometry formed by the area of interest will change in the corresponding direction, release the left mouse button to stop the current movement.



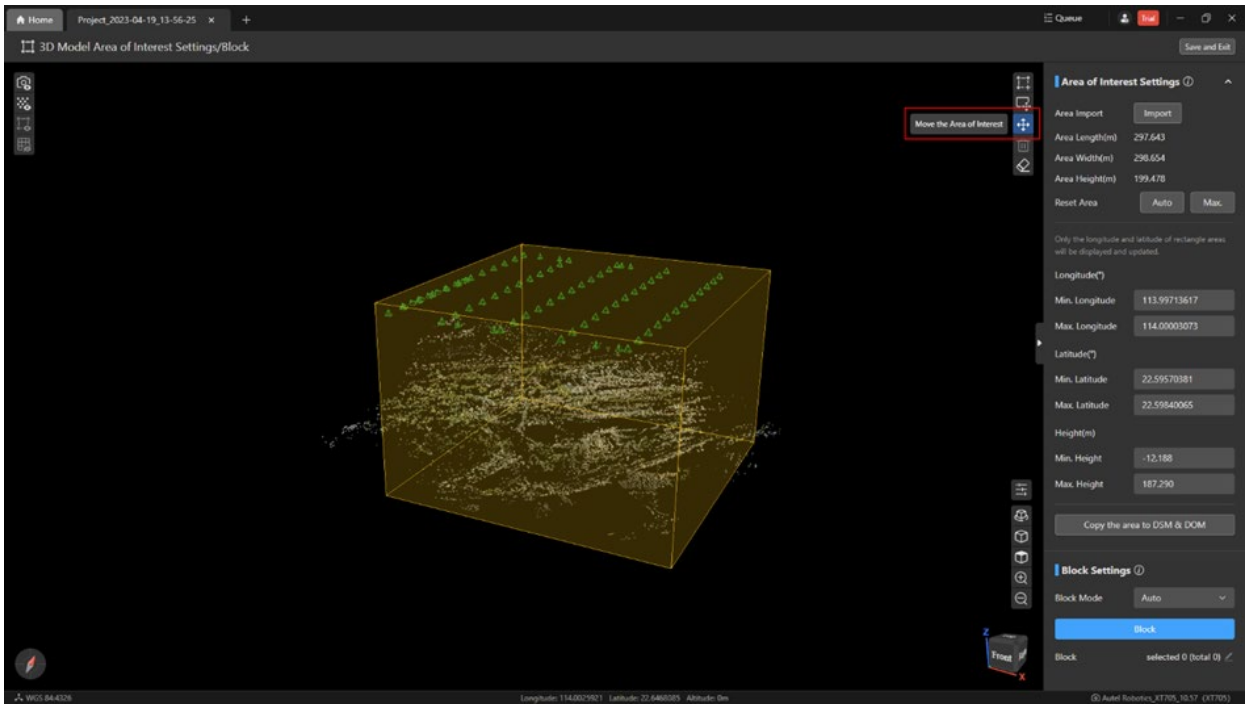
Tips:

- All six faces of the geometry formed by the area of interest support edit movement.
- Turn the [**Rotating Cube**] in the lower right corner of the view to adjust the stereoscopic perspective of the area.

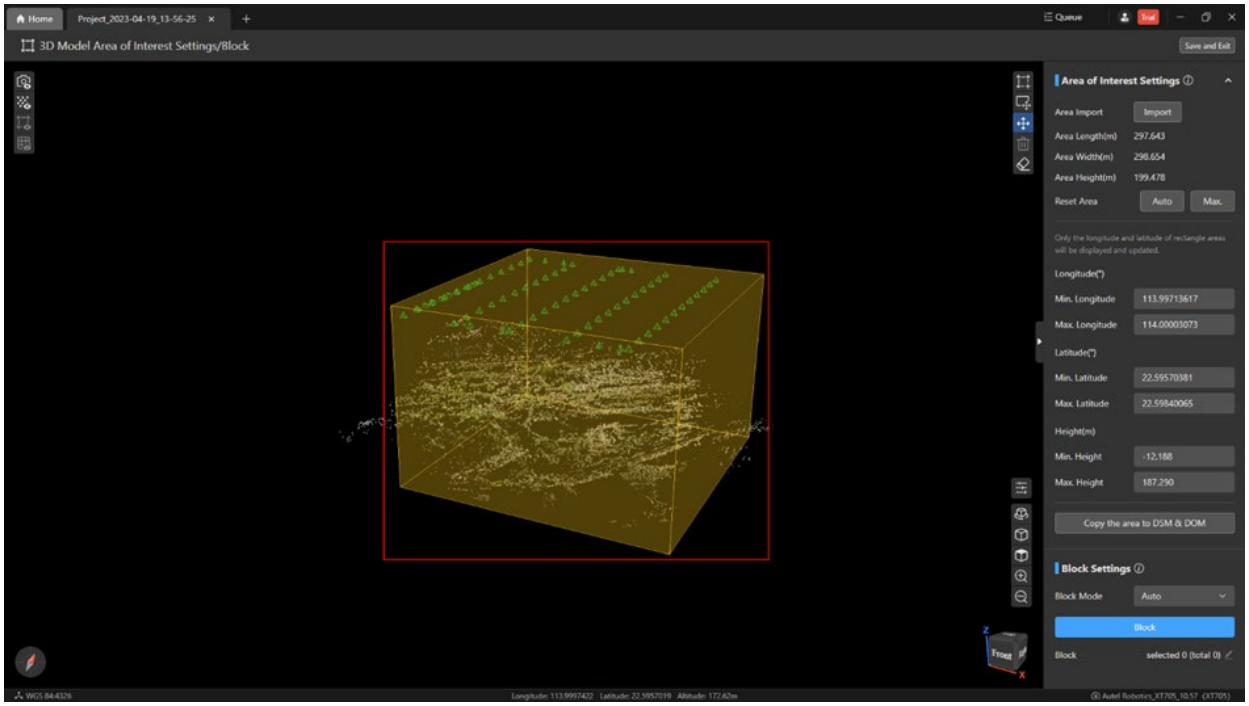


4.3.9 Mobile Area of Interest

Click the [**Move the Area of Interest**] icon in the upper right corner of the [**3D Model Area of Interest Settings/Block**] page to enable the function of moving the area.

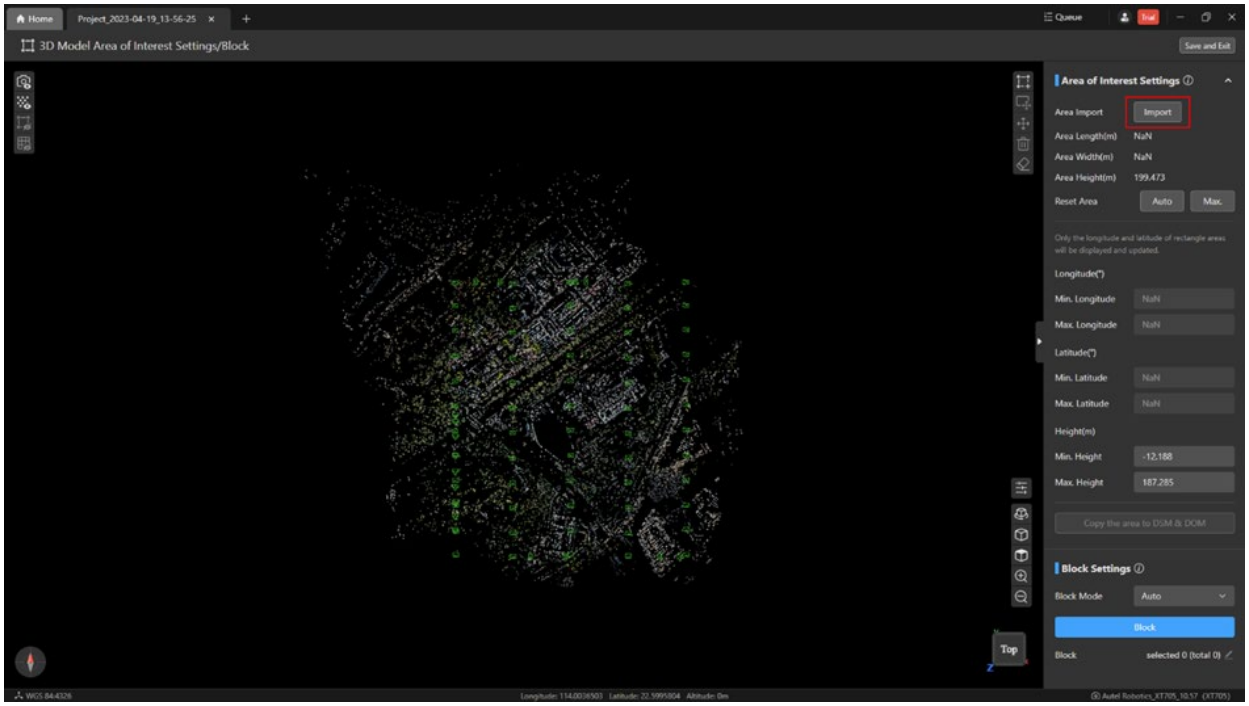


Place the mouse on the area of interest, it will become highlighted, press and hold the left mouse button, move the mouse in the direction you want to move the area of interest, release the left mouse button to stop.



4.3.10 Importing KML

Click the [**Import**] button in the [**Area of Interest Settings**] column, select a KML file with a point within the range of the imported image, and draw the corresponding area of interest based on the KML.



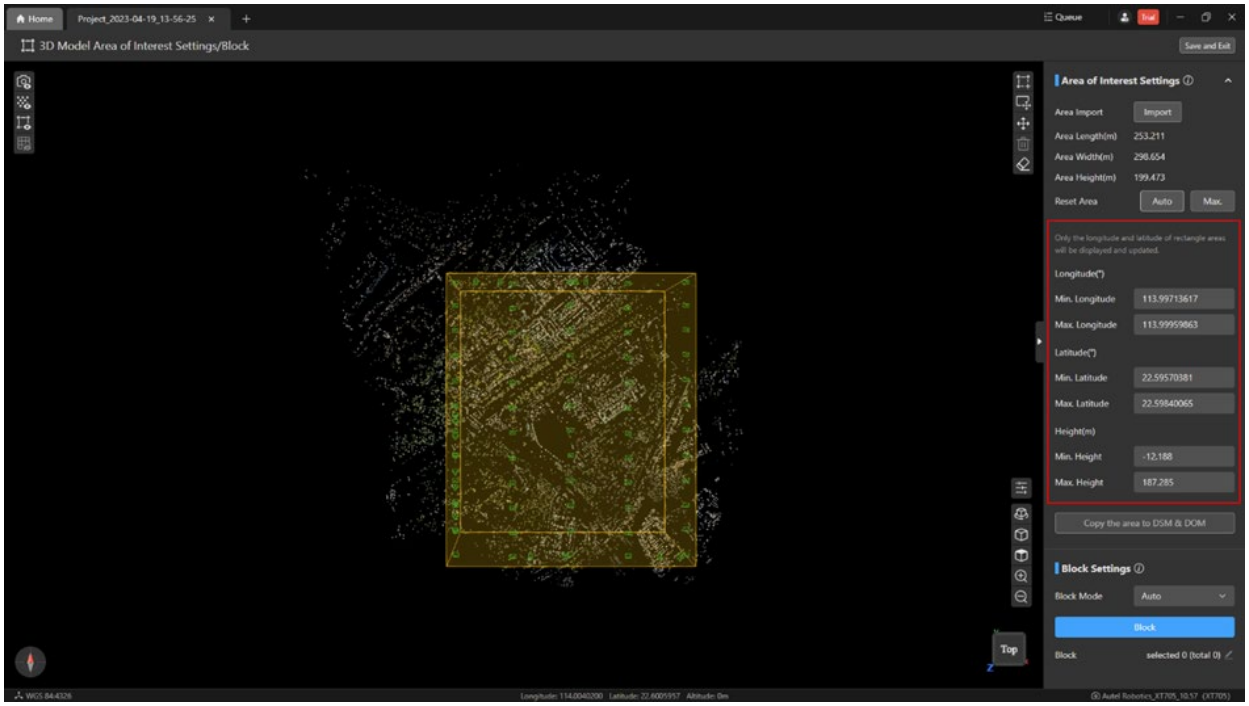
4.3.11 Adjust Longitude, Latitude, Height

Enter the corresponding values in the [**Longitude**], [**Latitude**], and [**Height**] text boxes below the [**Area of Interest Settings**] column, and the area of interest can be redrawn according to the

filled values.

Tips:

- Adjusting longitude, latitude and height only supports the adjustment of area under Auto Area and Max Area.

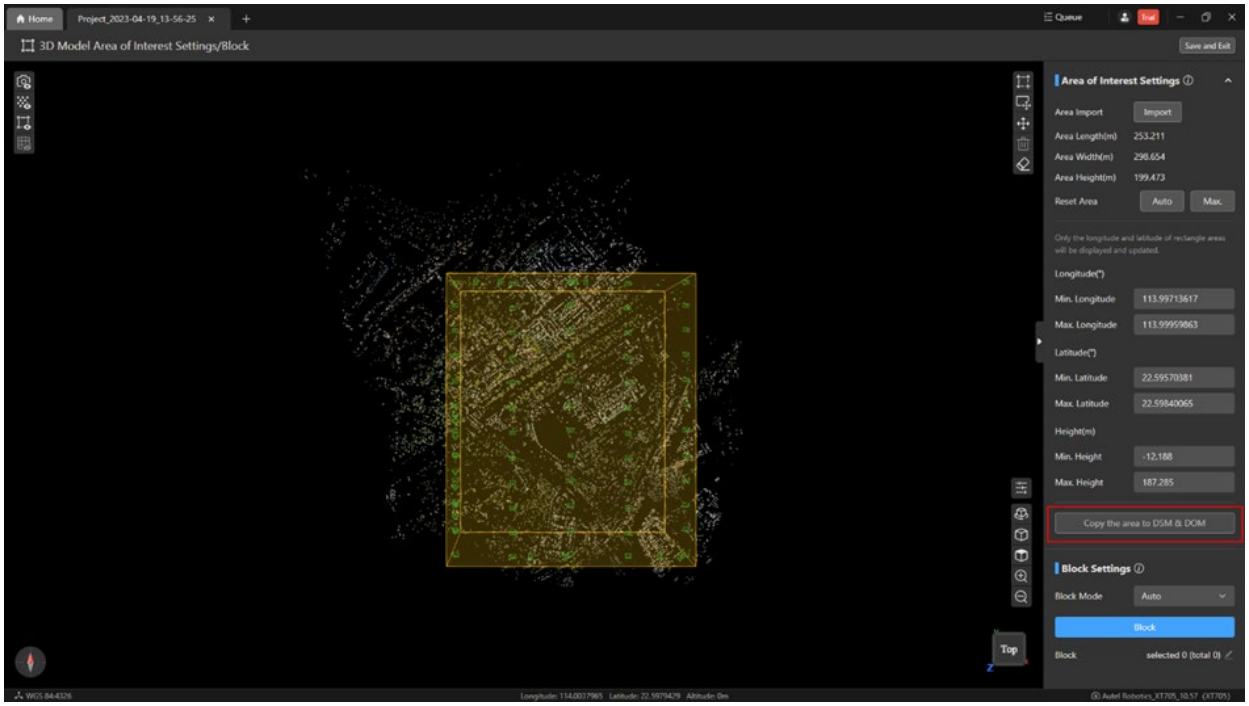


4.3.12 Copy An Area of Interest

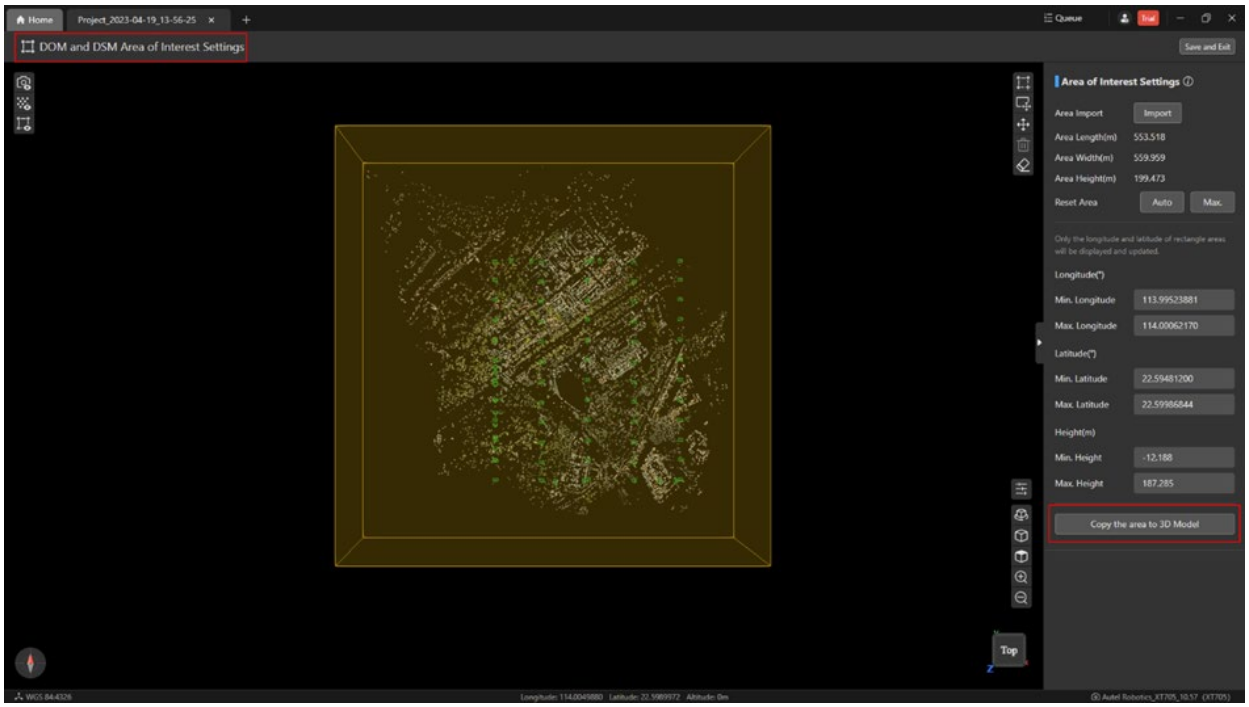
After drawing the area of interest in 3D mode, click the [**Copy the area to DSM & DOM**] button at the bottom of the [**Area of Interest Settings**] column to apply the drawn area of interest to the area of interest of the 2D model.

Note:

- When copying regions to DSM and DOM, only polygonal areas with four or more sides are supported.

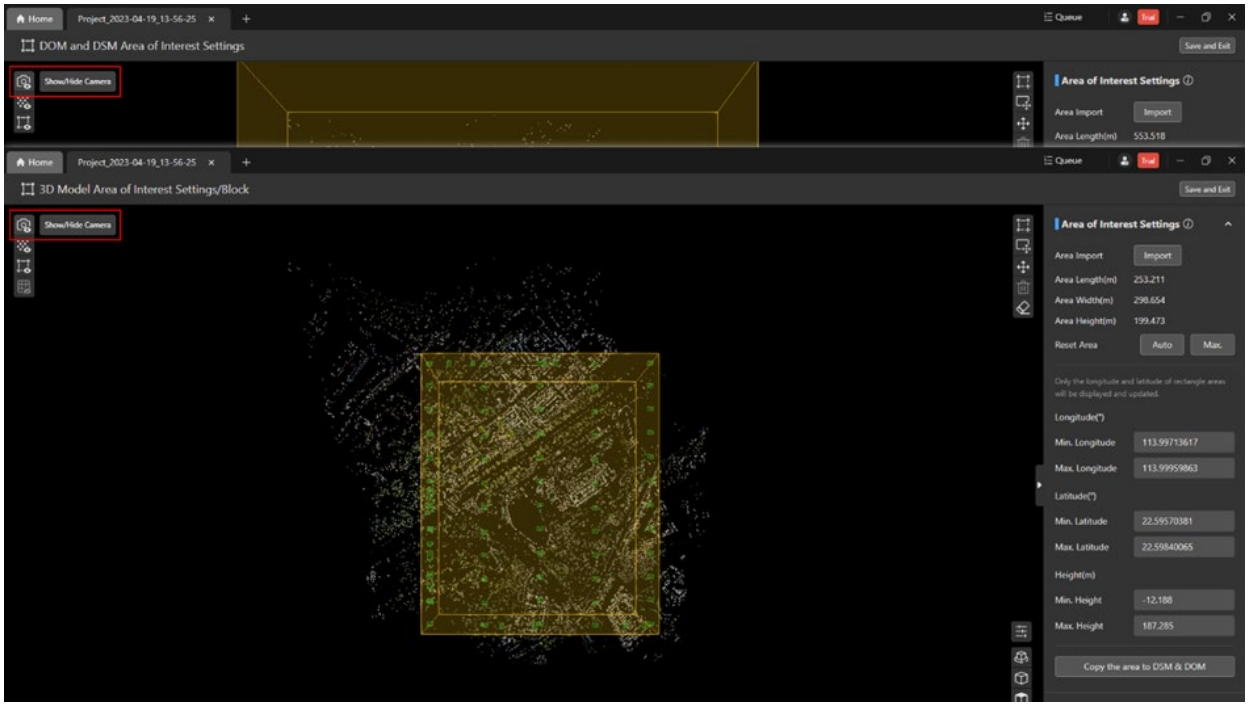


After drawing the area of interest in 2D mode, click the [**Copy the area to 3D Model**] button at the bottom of the [**Area of Interest Settings**] column to apply the drawn area of interest to the area of interest of the 3D model.



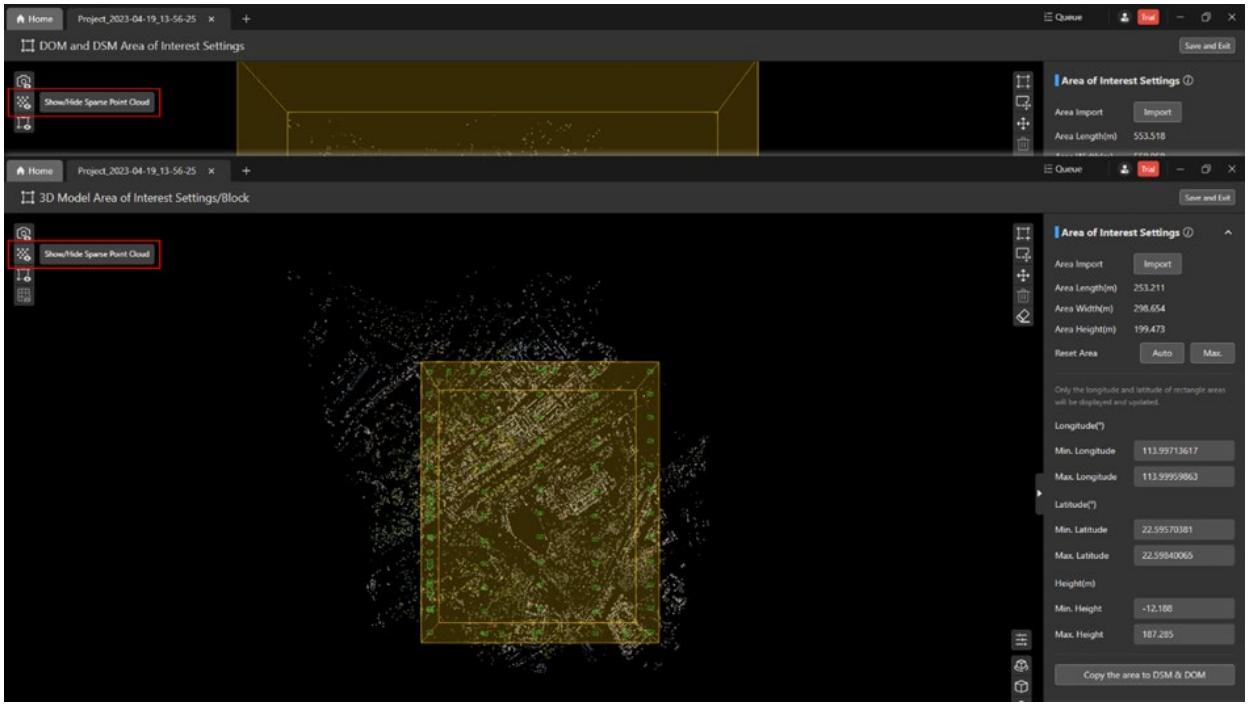
4.3.13 Toggle Show/Hide Camera

Click the [**Show/Hide Camera**] icon in the upper left corner of the [**3D Model Area of Interest Settings/Block**] page or the [**DOM and DSM Area of Interest Settings**] page to control whether the camera is displayed or hidden in the view.



4.3.14 Toggle Show/Hide Sparse Point Clouds

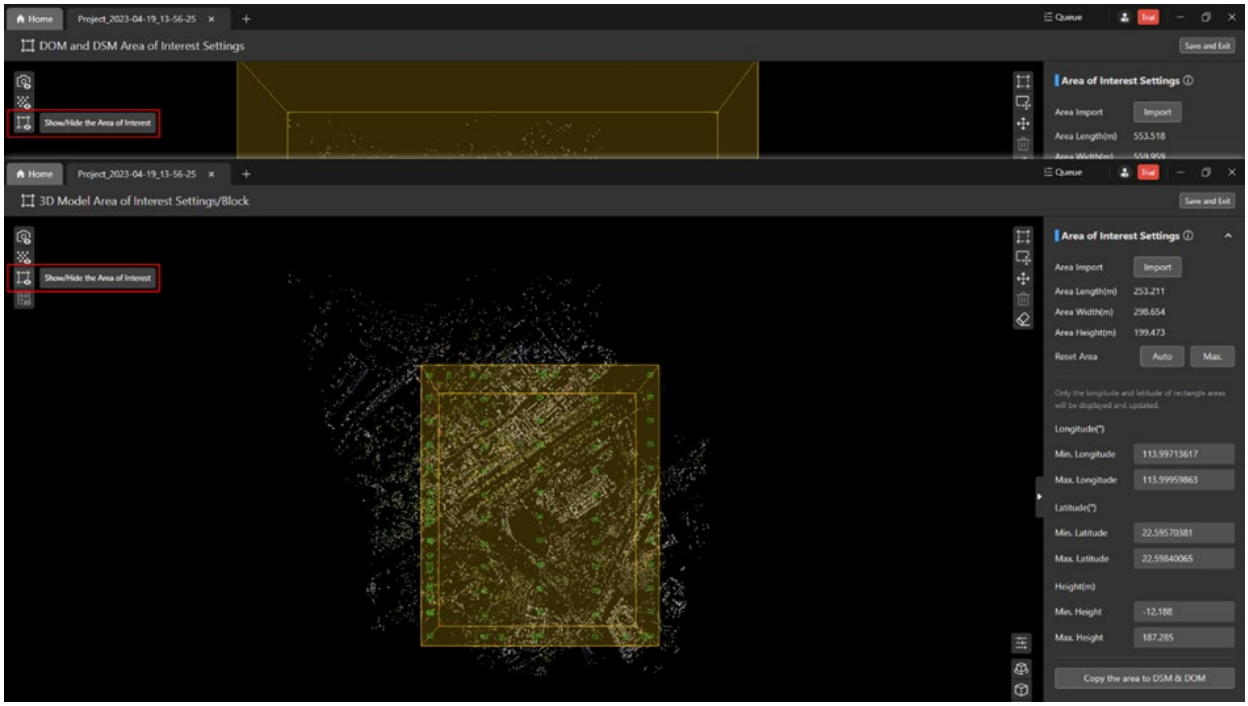
Click the [**Show/Hide Sparse Point Cloud**] icon in the upper left corner of the [**3D Model Area of Interest Settings/Block**] page or the [**DOM and DSM Area of Interest Settings**] page to control the display or hiding of sparse point clouds in the view.



4.3.15 Toggle Show/Hide Areas of Interest

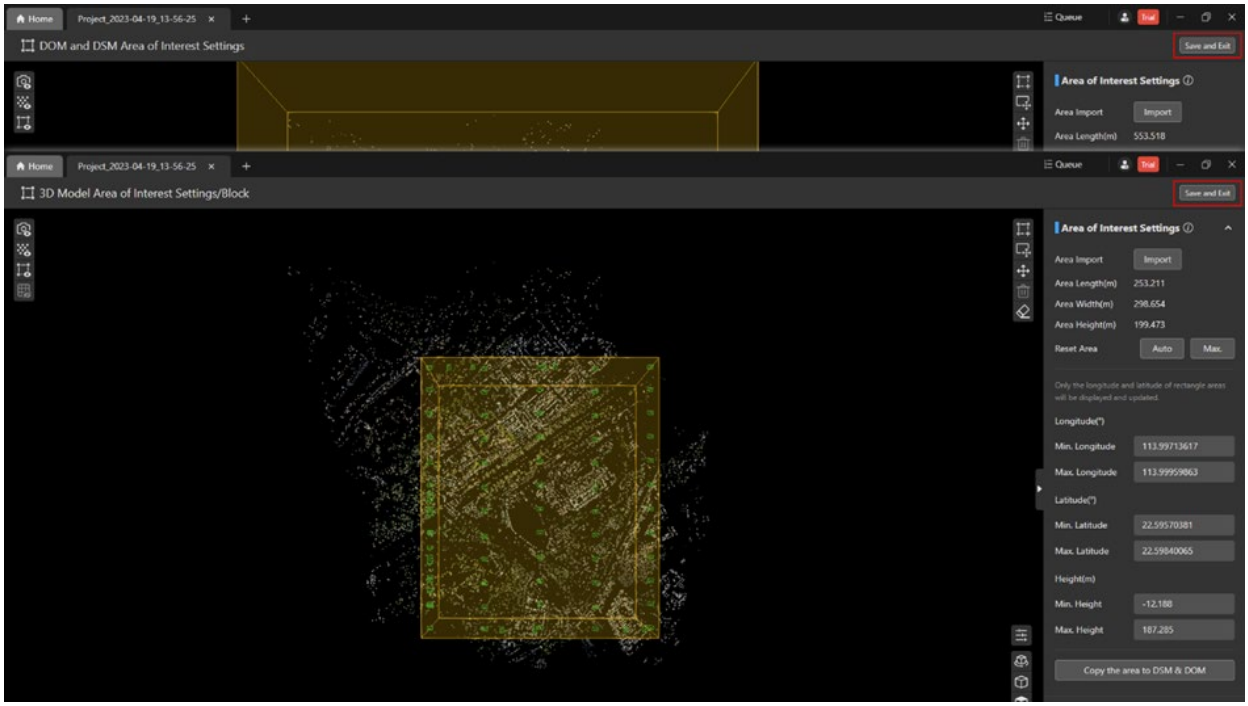
Click the [**Show/Hide the Area of Interest**] icon in the upper left corner of the [**3D Model Area of Interest Settings/Block**] page or the [**DOM and DSM Area of Interest Settings**] page to

control whether the area is displayed or hidden in the view.



4.3.16 Save An Area of Interest

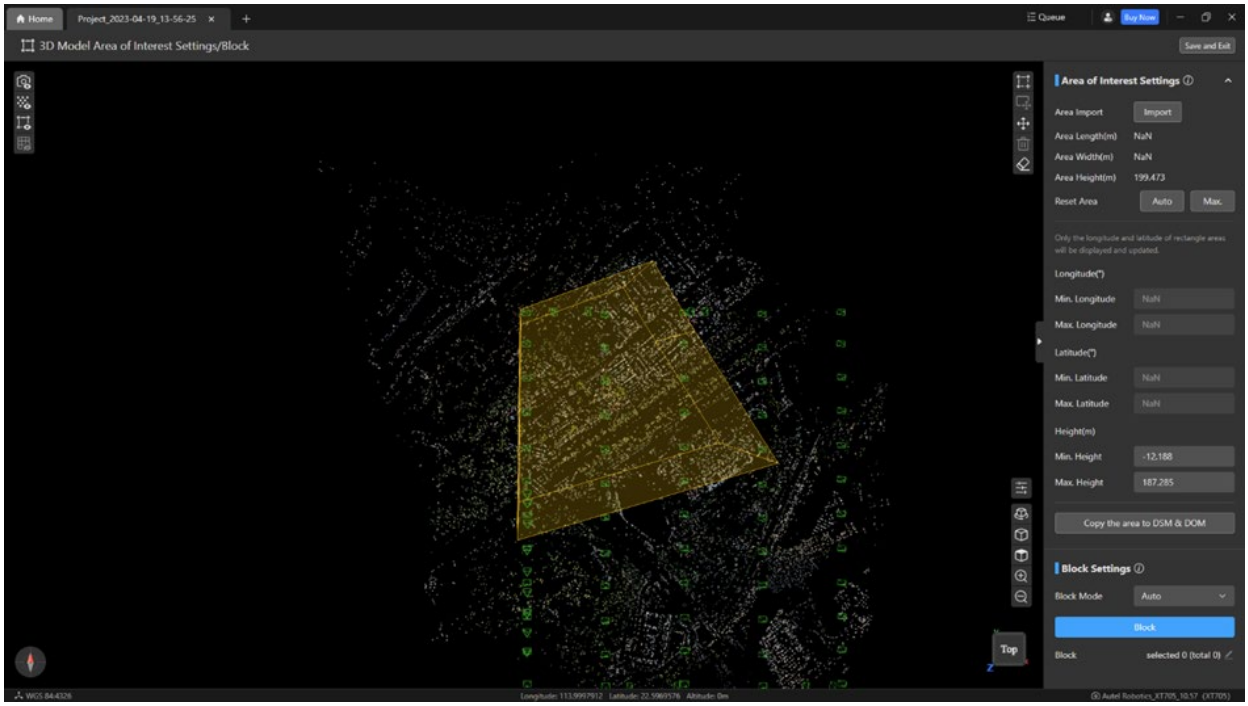
Click the [**Save and Exit**] button in the upper right corner of the [**3D Model Area of Interest Settings/Block**] page or the [**DOM and DSM Area of Interest Settings**] page to save the currently drawn area of interest and exit the mode.

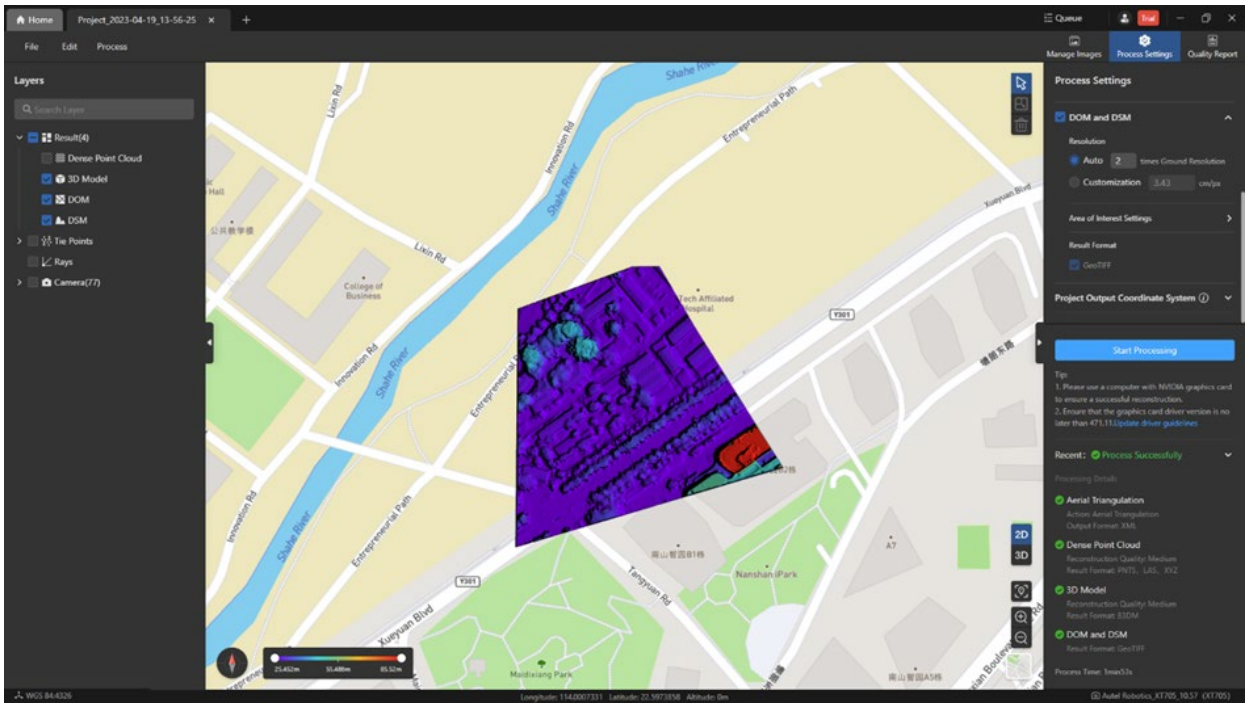


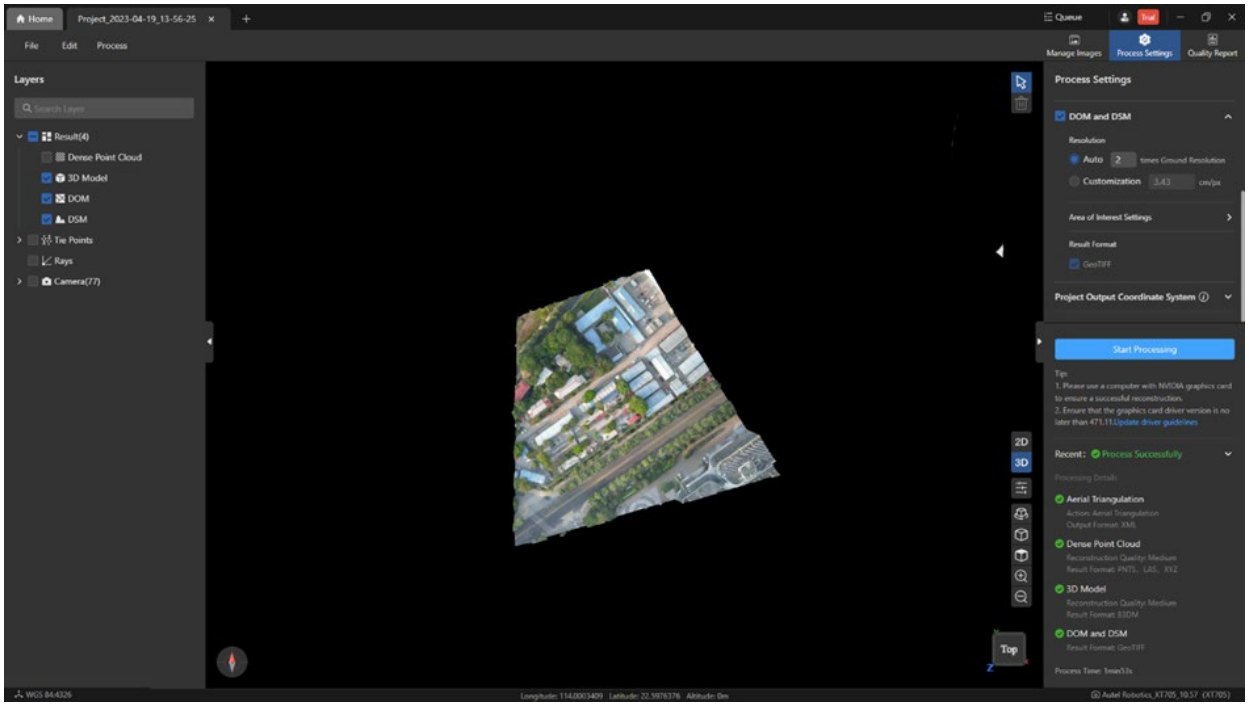
4.3.17 Run Tasks Based On Area of Interest

After exiting the Area of Interest settings, click the [**Start Processing**] button on the [**Process**

Settings] page to perform a reconstruction.





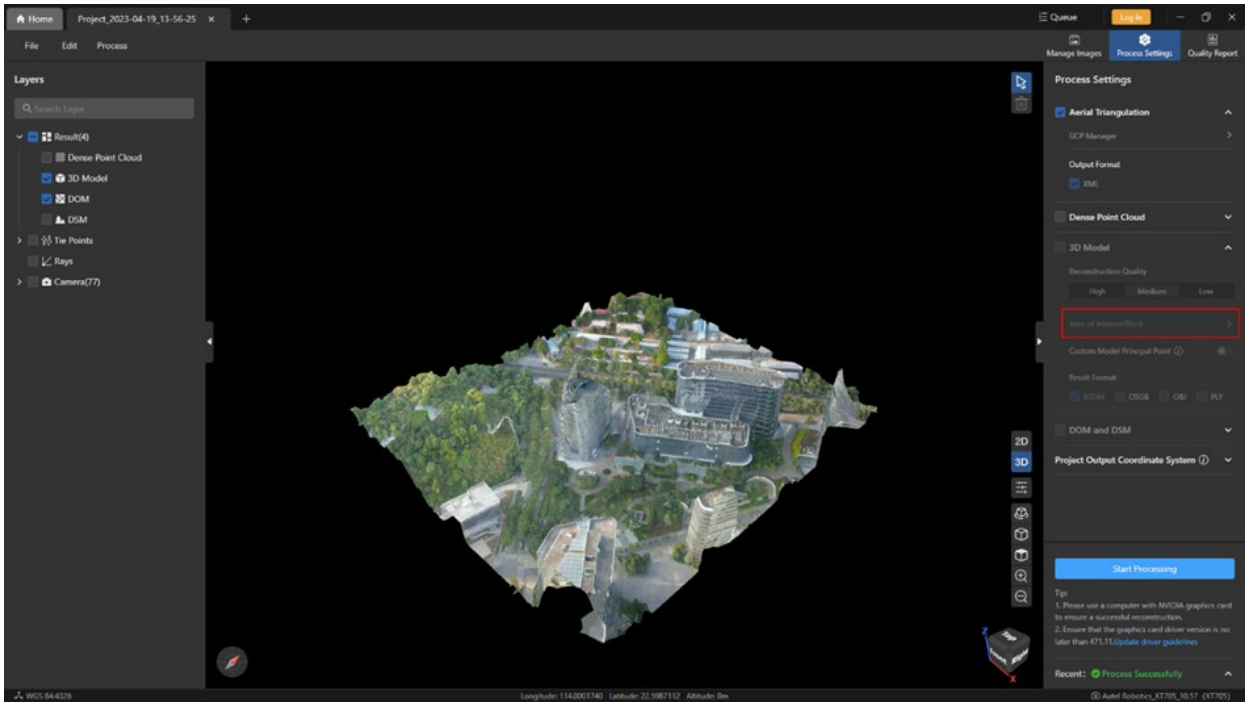


4.4 Model Blocks

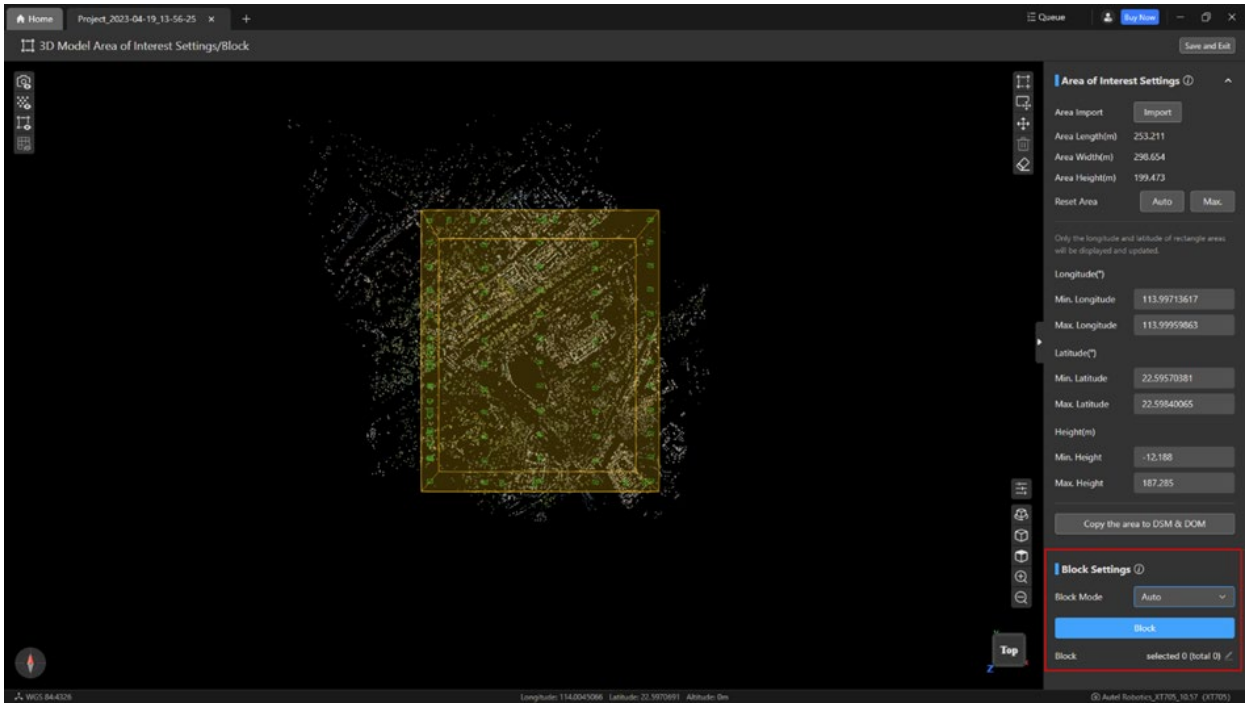
Model blocks refer to dividing a large 3D model into multiple small blocks for more efficient loading, rendering and management. This can improve the rendering efficiency of 3D models and reduce loading time, while also improving the performance and scalability of the application. In large scenes, use model tiling to better manage and render large numbers of 3D models while reducing memory usage and rendering latency.

4.4.1 Using Blocks

If the Autel Mapper account is not logged in or the account validity period expires, or if the newly created project has not run through the aerial triangulation, the [**Area of Interest/Block**] button under the [**3D Model**] in the [**Process Settings**] page is grayed out and cannot be accessed.



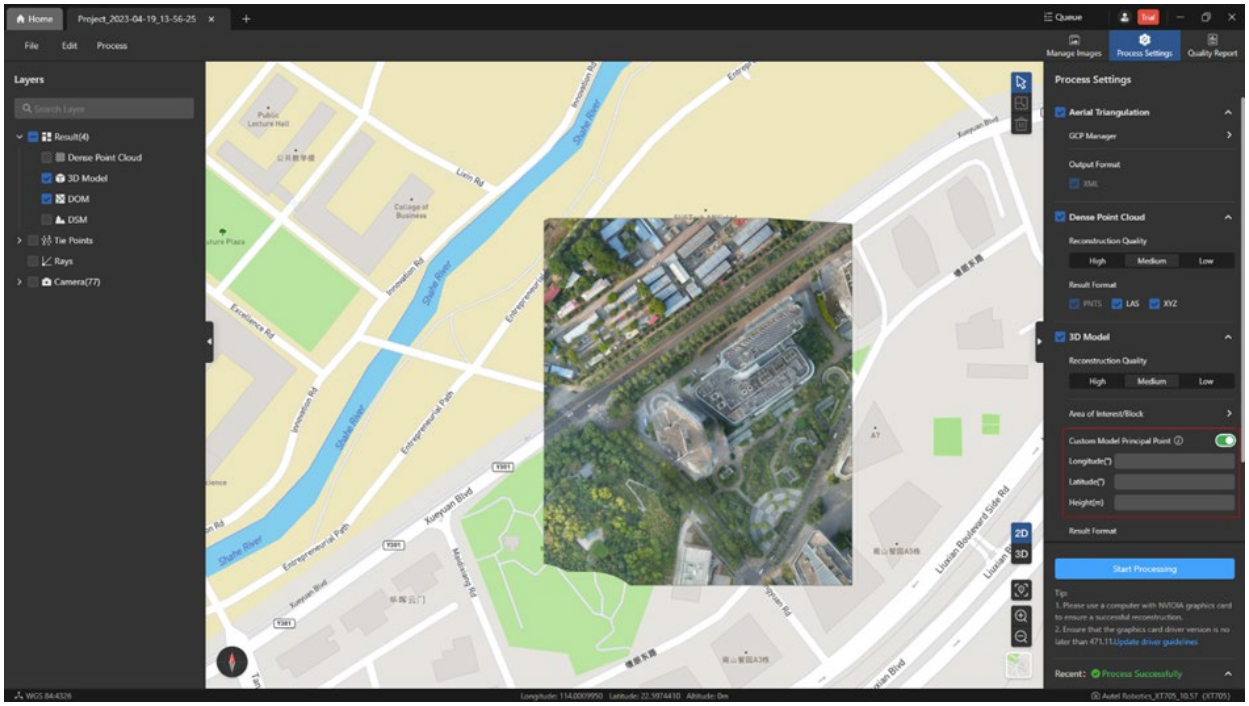
When logging in to an Autel Mapper account, and the account is within the validity period, click the [**Area of Interest /Block**] button under the [**3D Model**] in the [**Process Settings**] page to enter the [**3D Mode Area of Interest Settings/Block**] page, in this page model block settings can be changed.



4.4.2 Model Custom Origins

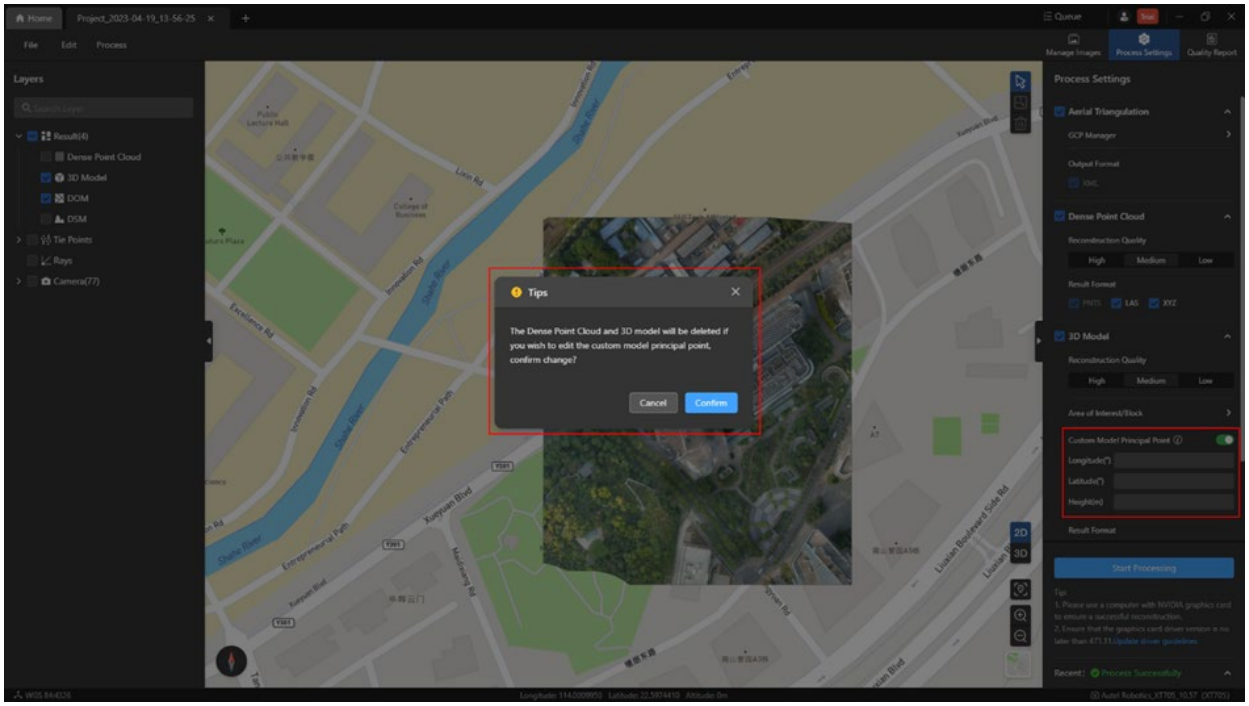
If you need to merge 3D models of different projects or update local data later, you can turn on the [**Custom Model Principal Point**] switch on the [**Process Settings**] page to adjust the principal point to ensure consistency.

Turn on the [**Custom Model Principal Point**] switch and enter the corresponding point value. After clicking the blank space with the mouse, the model principal point can be changed.



Note:

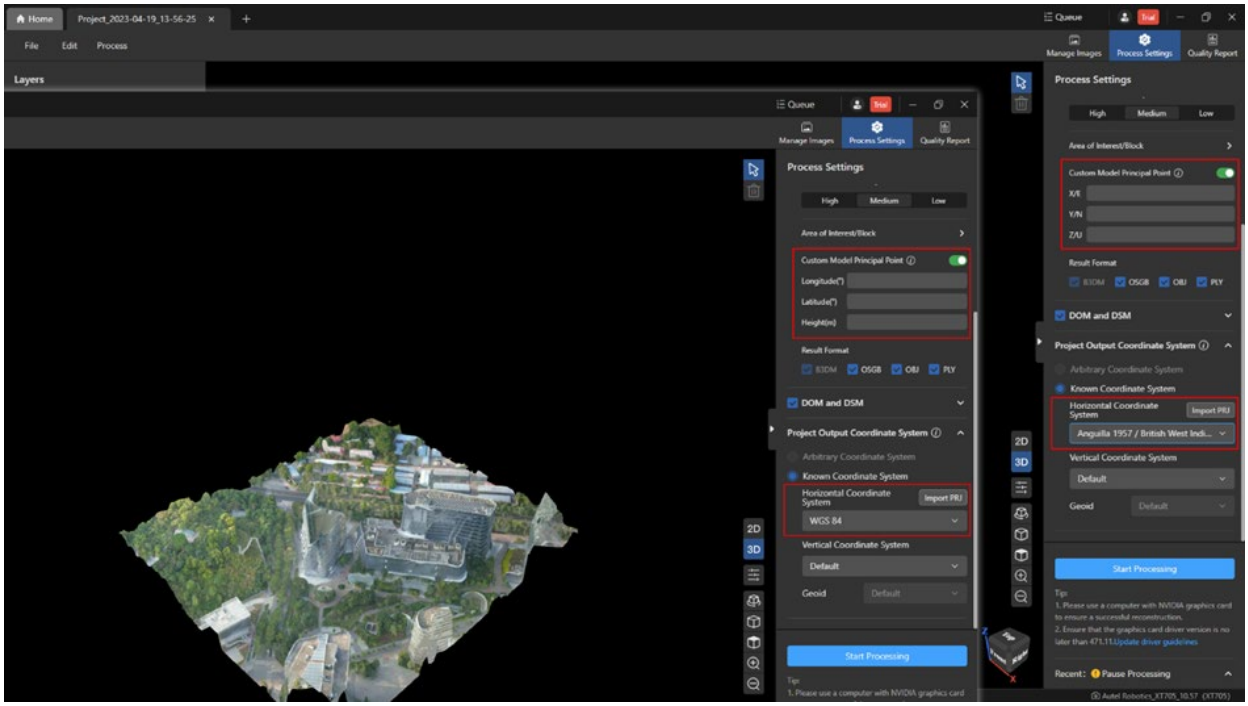
- If you want to customize the principal point, a pop-up window will prompt to delete the dense point cloud and 3D model results.



After selecting the corresponding project output coordinate system, the principal point input item will also change accordingly. The ground coordinate system corresponds to X/E, Y/N, Z/U, and the projection coordinate system corresponds to longitude, latitude, and altitude.

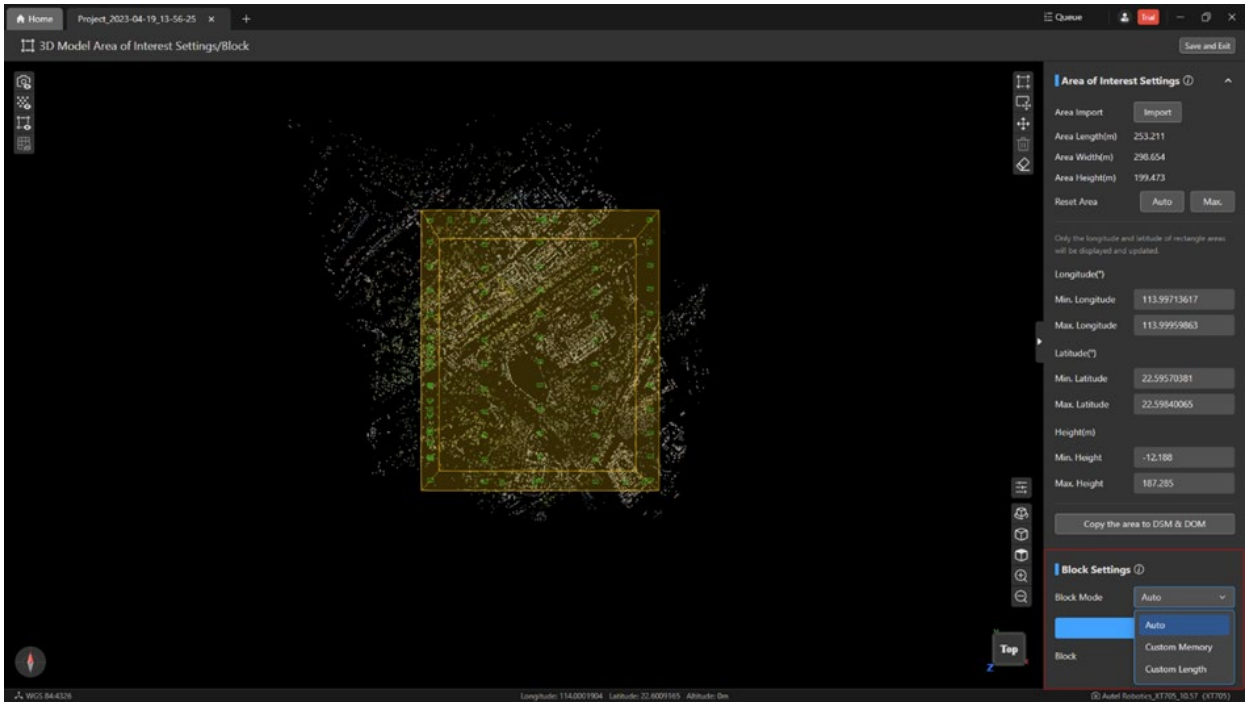
Tips:

➢ Changing the project output coordinate system after rebuilding will delete all results.



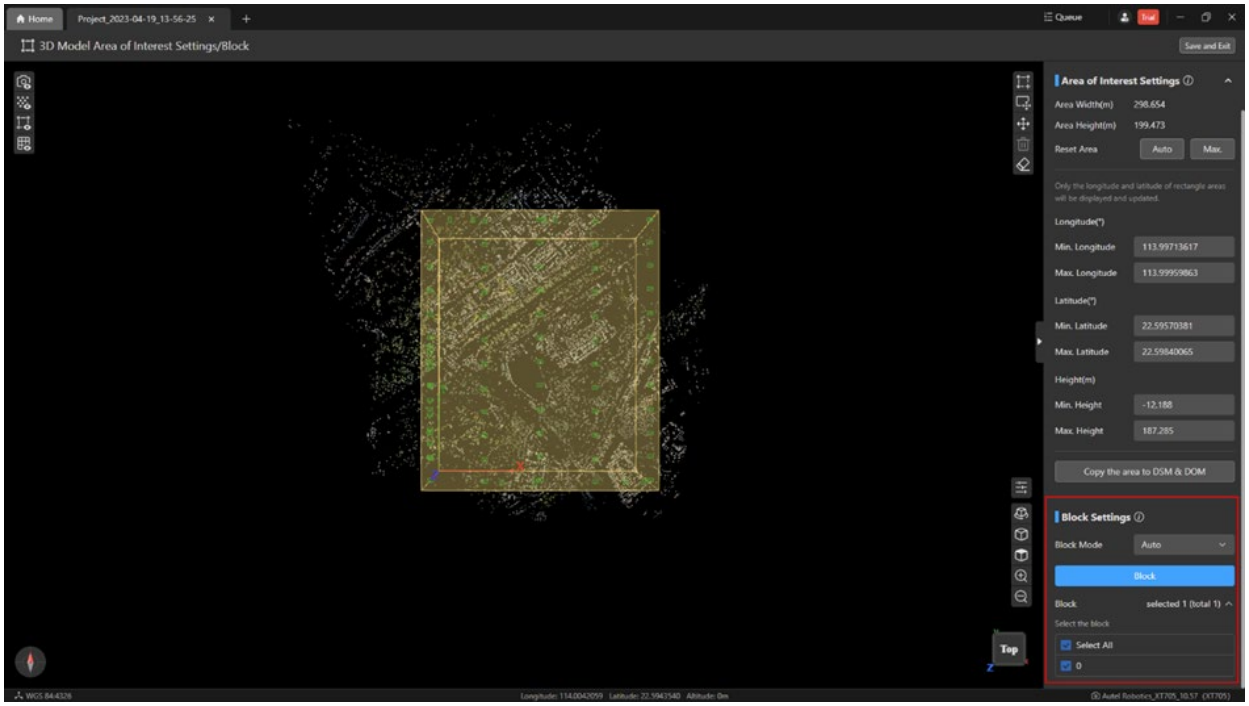
4.4.3 Configure Model Blocks

In the drop-down menu of [**Block Mode**] in the [**Block Settings**] column, you can choose three block modes: [**Auto**], [**Custom Memory**], and [**Custom Length**].



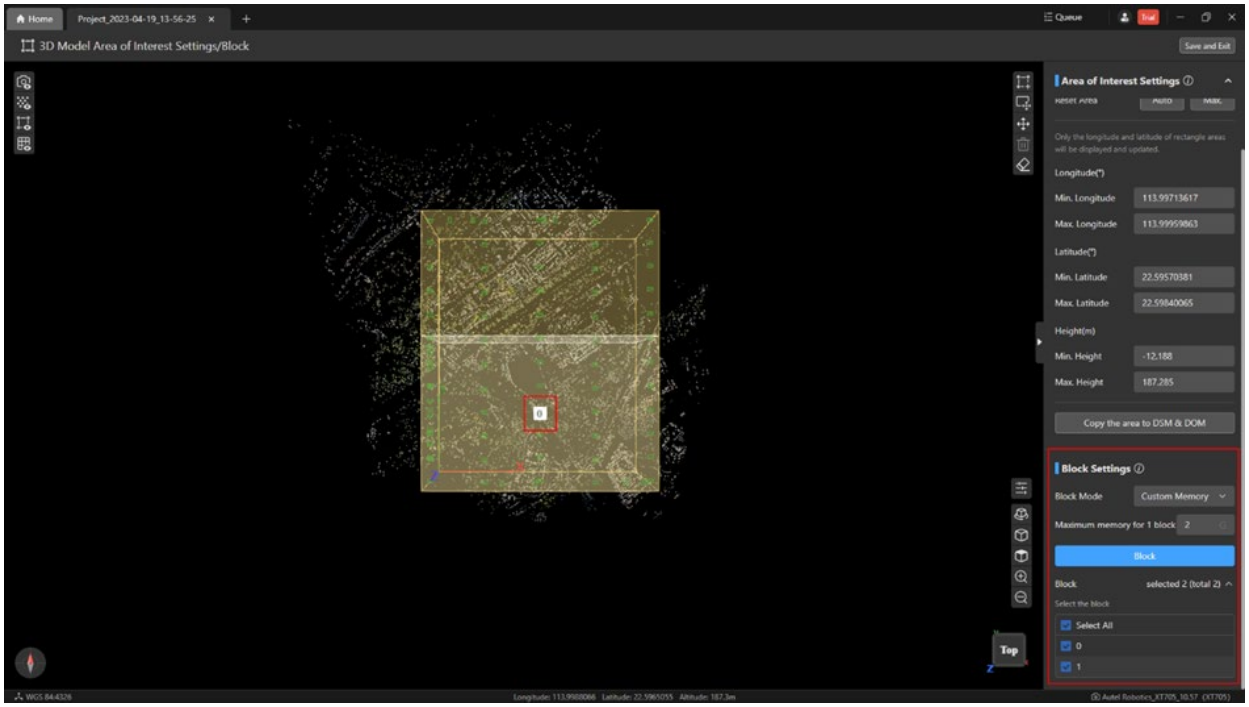
Automatic blocks:

➢ The default block mode is [**Auto**], click the [**Block**] button to start automatically arranging the blocks.



Custom blocks:

- Select [**Custom Memory**] block, enter [**Maximum memory for 1 block**], and click the [**Block**] button to start the process.
- The minimum setting for the maximum allocated memory of a single block is 2GB.

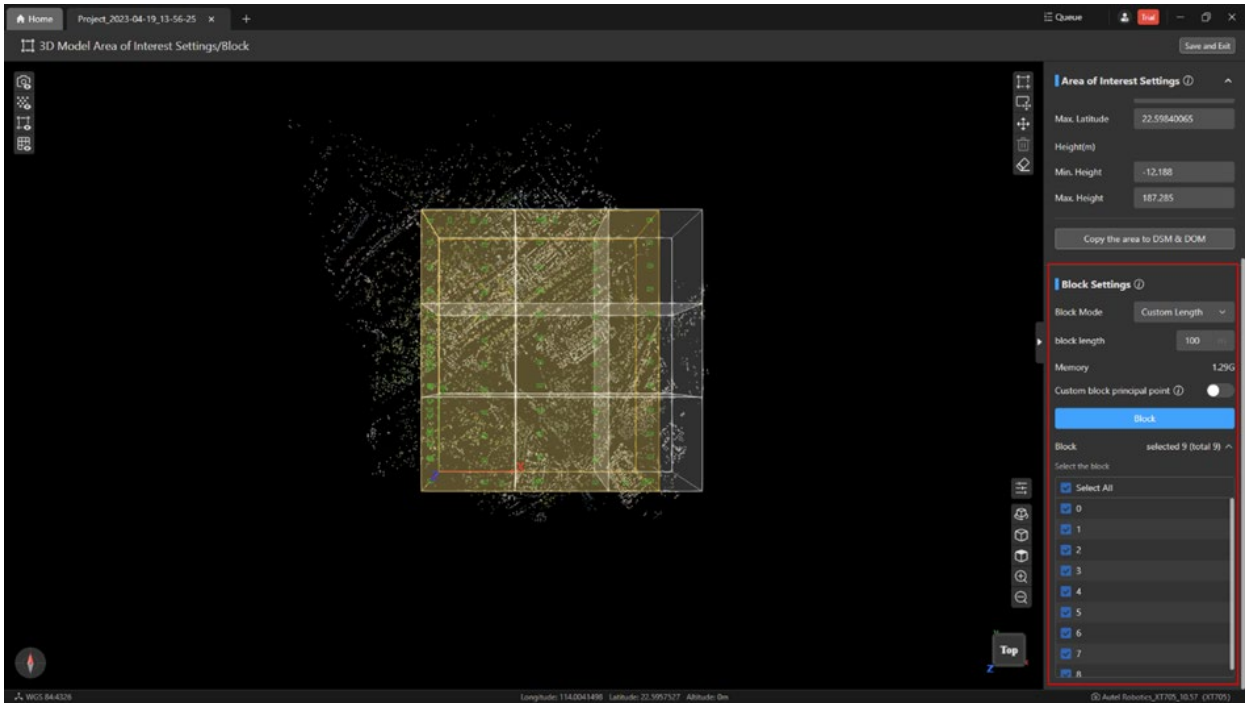


Tips:

- Check the desired tile in the [**Block**] list, hover the mouse over the 3D model, you can view the number of the corresponding selected tile and highlight the tile.
- Unselected tiles will display the tile number on hover.

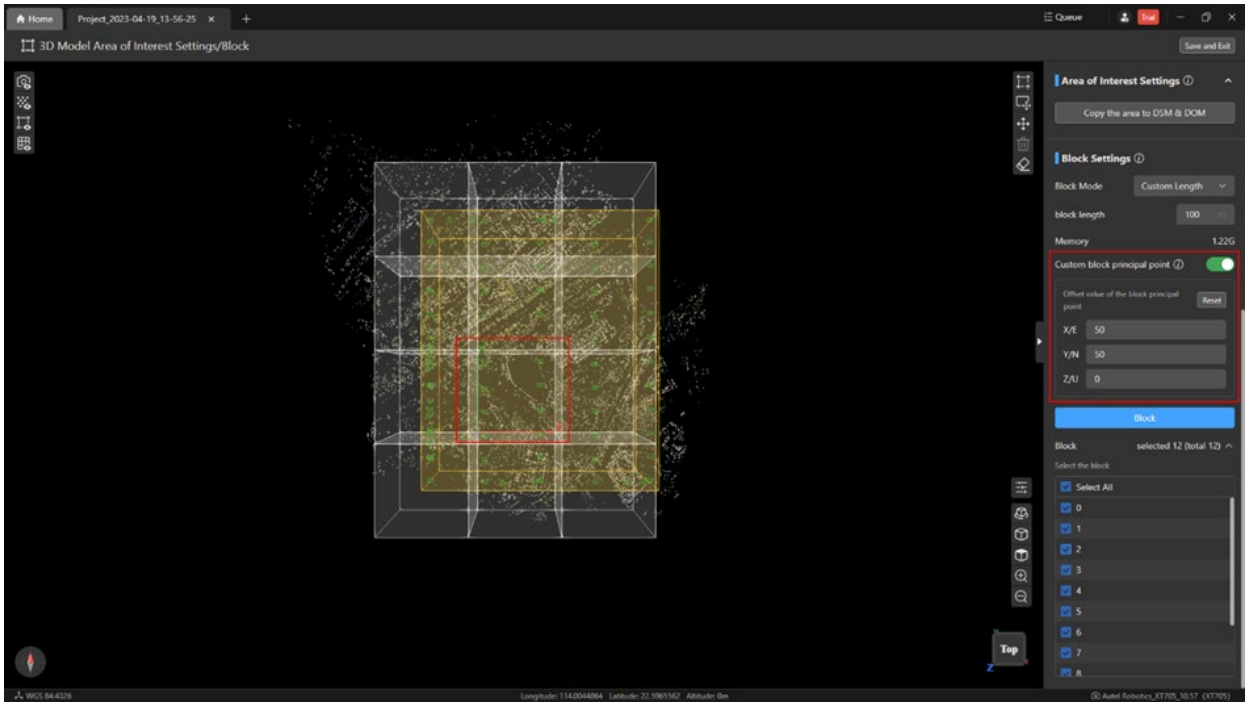
Custom Length Blocks:

- Select the [**Custom Length**] block and enter the [**block length**], and click the [**Block**] button to start the block.
- The block variable length needs to be set at least 100 meters and must be an integer.



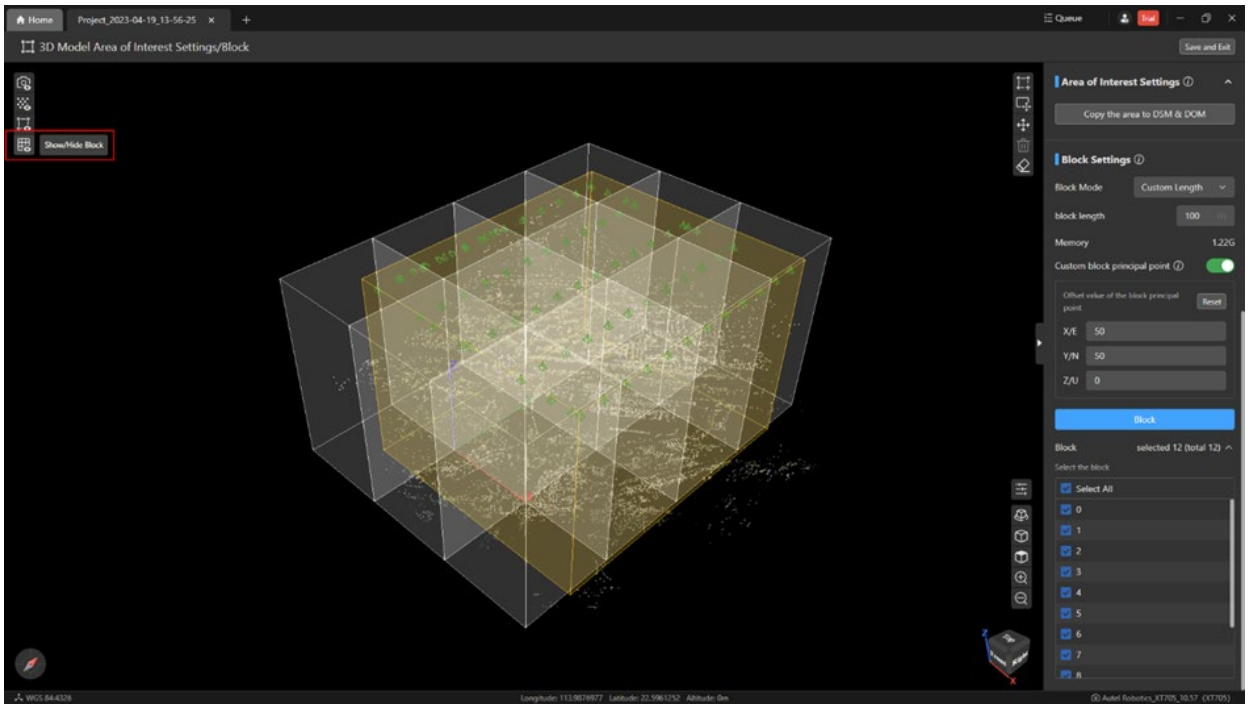
When Selecting the [**Custom Length**] block, you may configure the offset value of each point, using X, Y or Z in the [**Custom block principal point**] column.

Turn on the [**Custom block principal point**] switch, enter the offset value, then click the [**Block**] button.



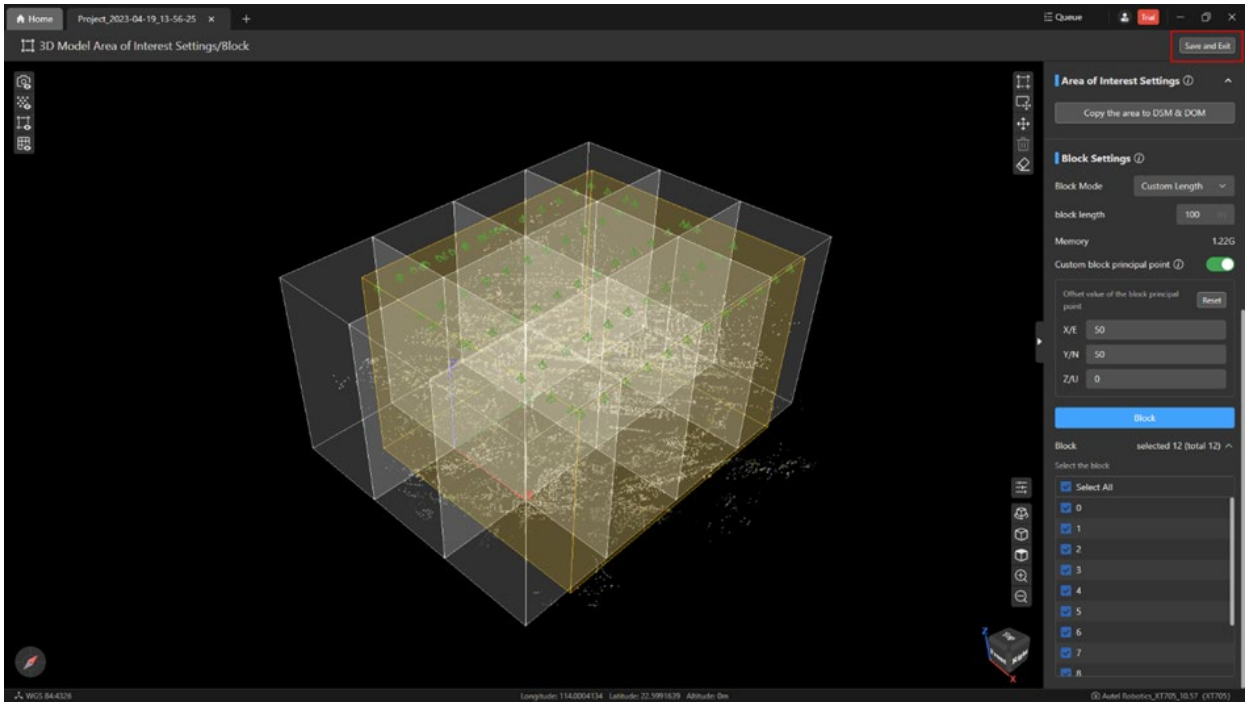
4.4.4 Show/Hide Block Layers

Click the [**Show/Hide Block**] button in the upper left corner of the [**3D Model Area of Interest Settings/Block**] page to control the display and hiding of the block layer in the view.



4.4.5 Save Block Settings

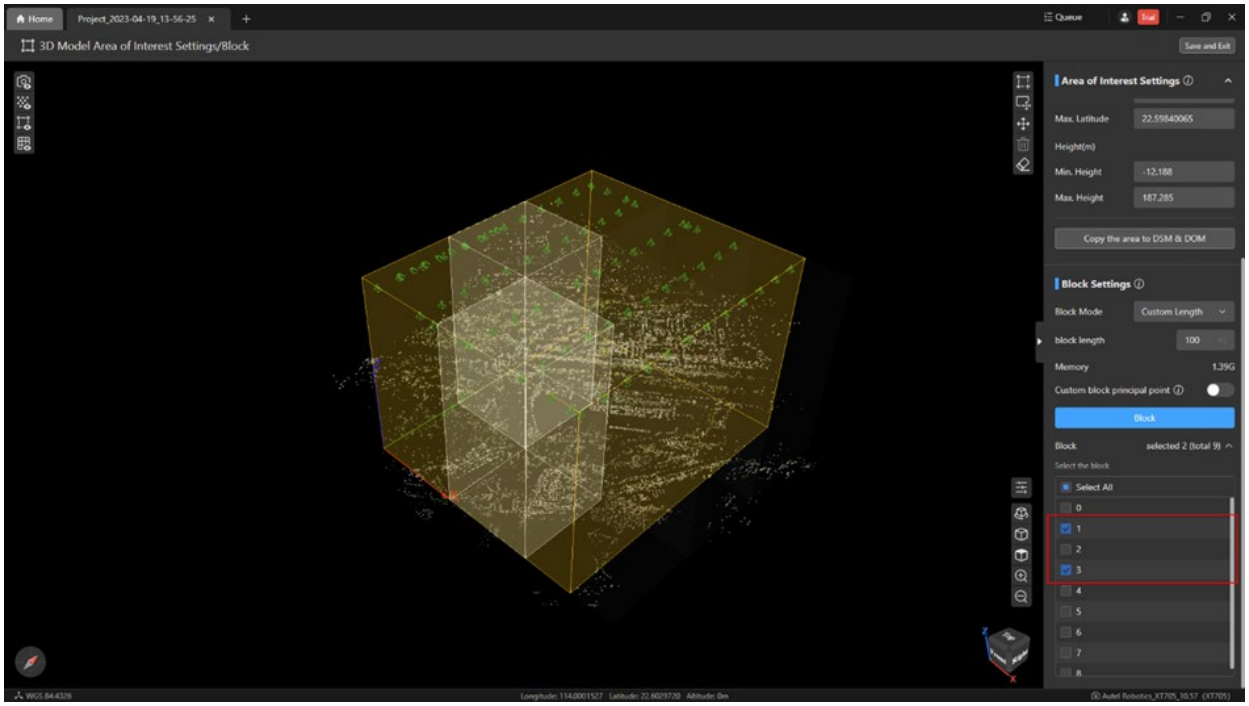
Click the [**Save and Exit**] button in the upper right corner of the [**3D Model Area of Interest Settings/Block**] page to save the corresponding block settings.



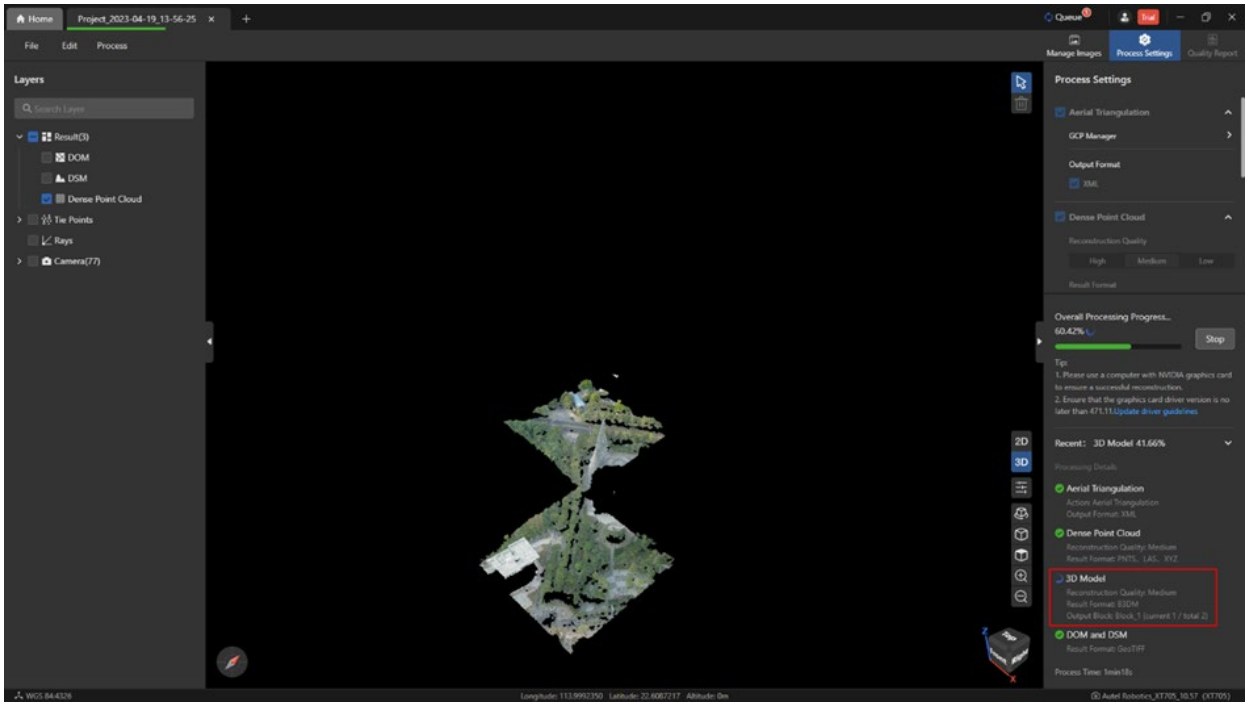
4.4.6 Run Tasks Based On Block Settings

After exiting the Area of Interest setting mode, click the [**Start Processing**] button on the [**Process Settings**] page to process the task.

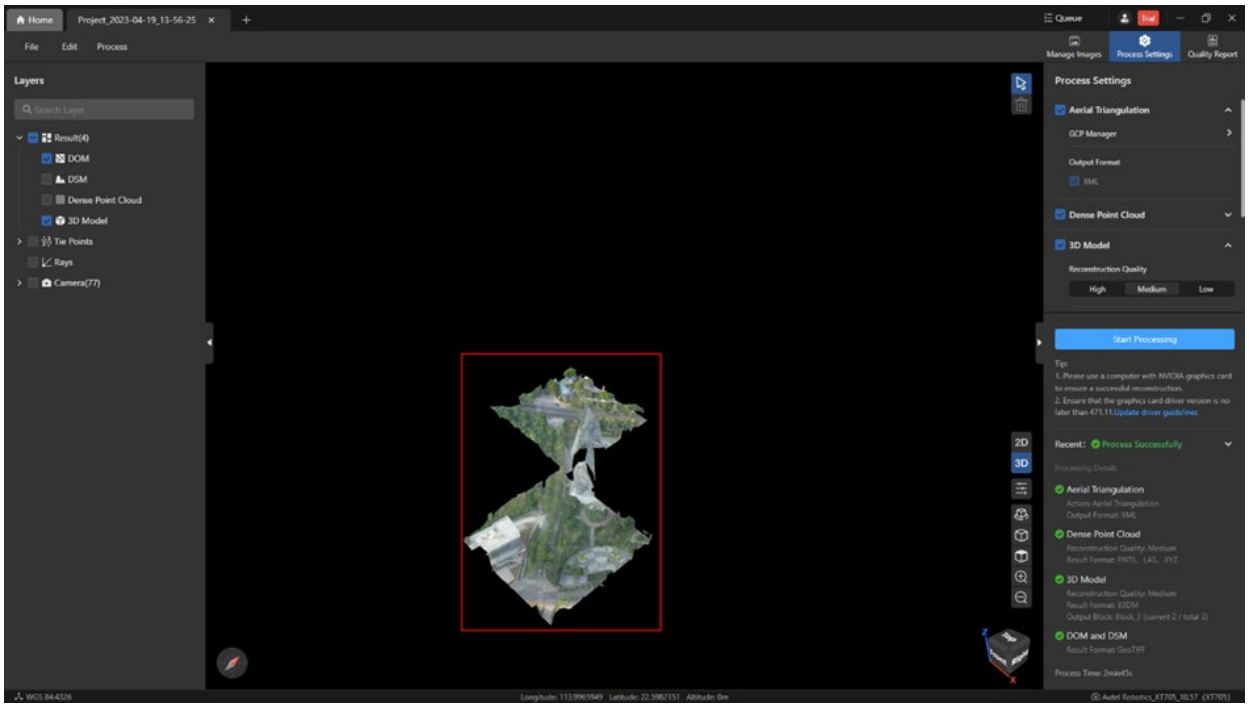
As shown in the figure below, select two blocks, 1 and 3, for task processing:



You can view the progress under "**Processing Details - 3D Model**" in the lower right corner of the [**Process Settings**] page.



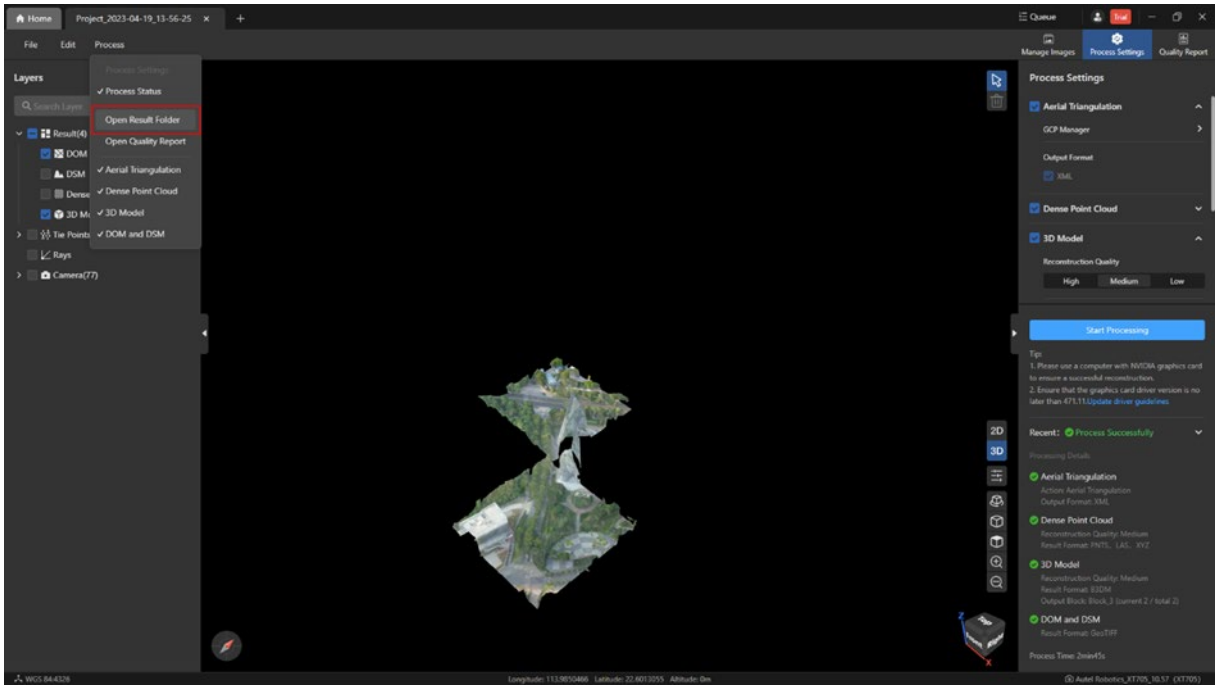
The final processing results are as follows:



4.5 View Results And Export

4.5.1 View Results

You can open the system directory where the result files are located through the menu bar, via [**Process->Open Result Folder**].

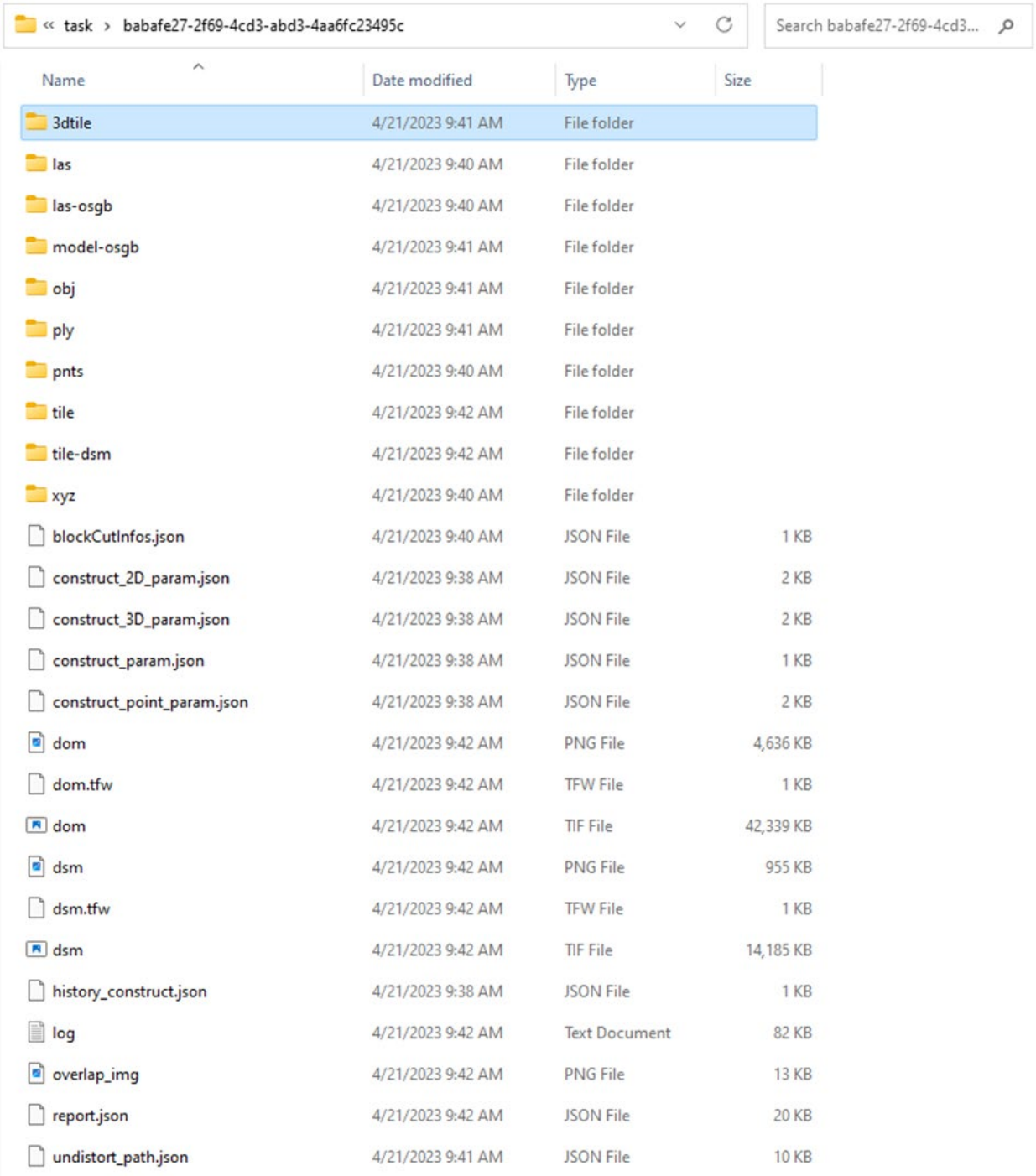


You can also find the directory where the result file is located in the local disk of the computer according to the path where the project folder is located.

In the result folder, you can see the 3dtile, model-osgb, obj, and ply result folders.

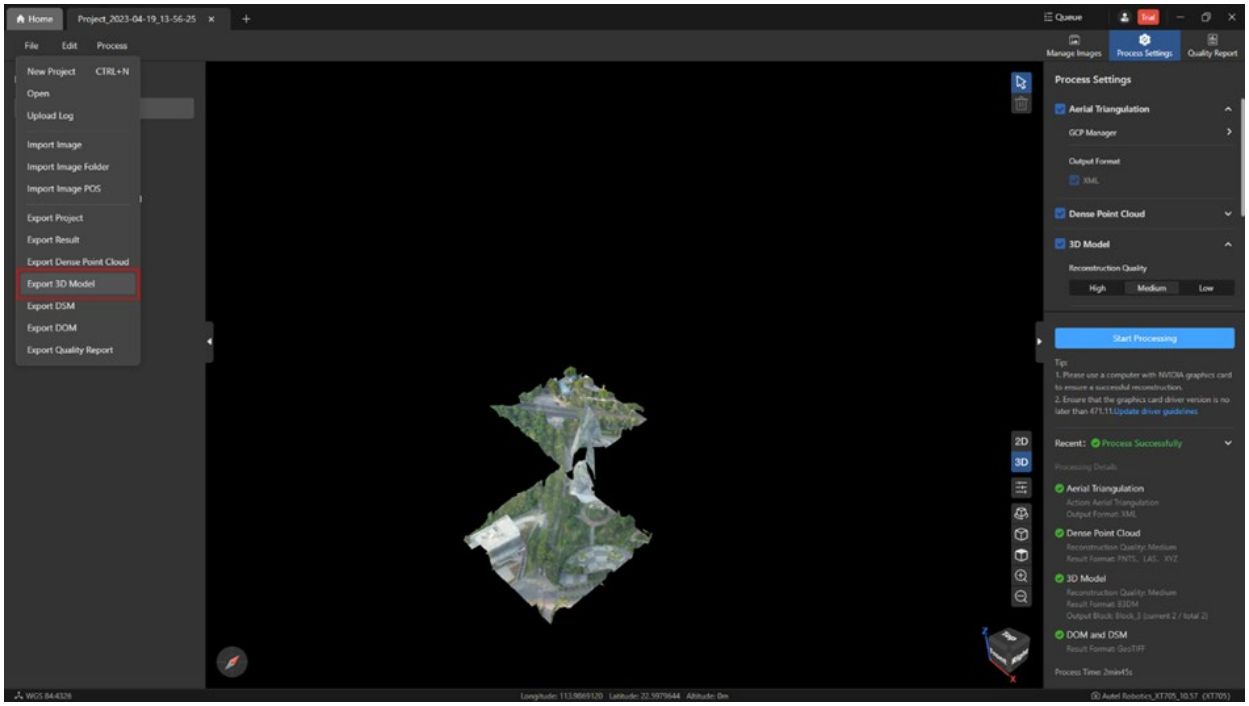
Tips:

- The tileset.json file in the 3dtile folder is the result format of the 3D model. After generating this file, it means that the b3dm format of the 3D model has been processed, and the front end renders the result of the 3D model in the program.

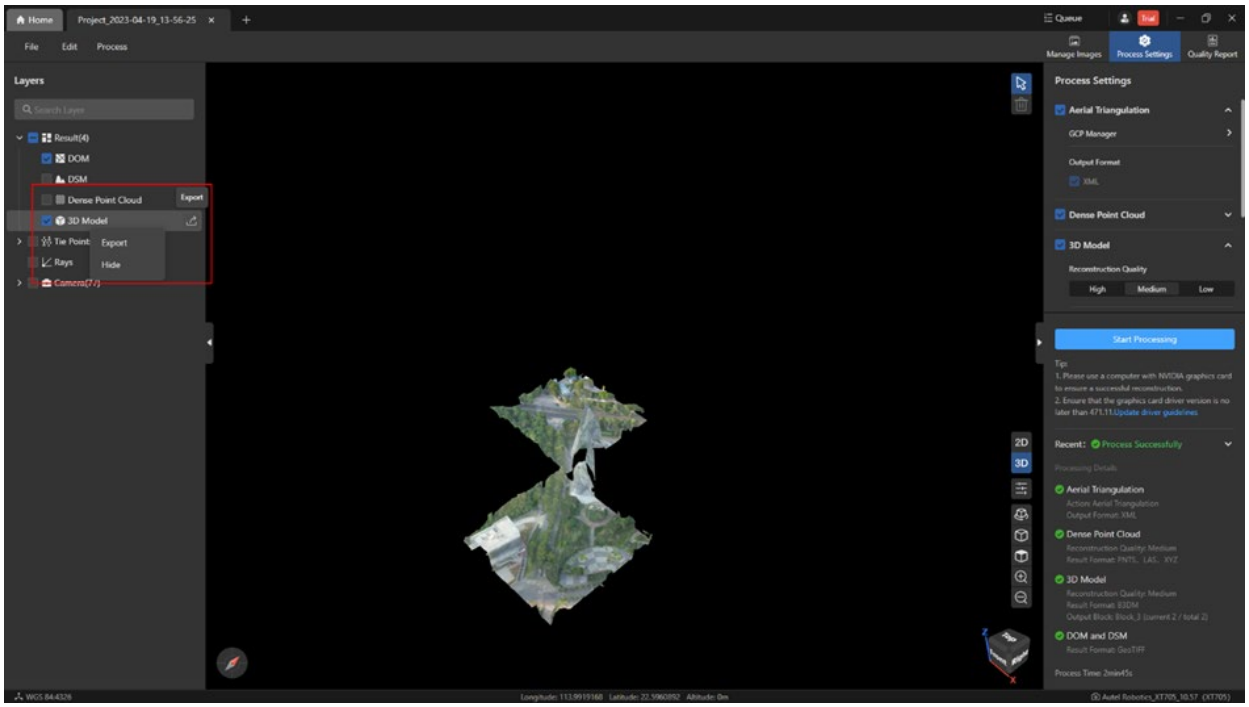


4.5.2 Export Results

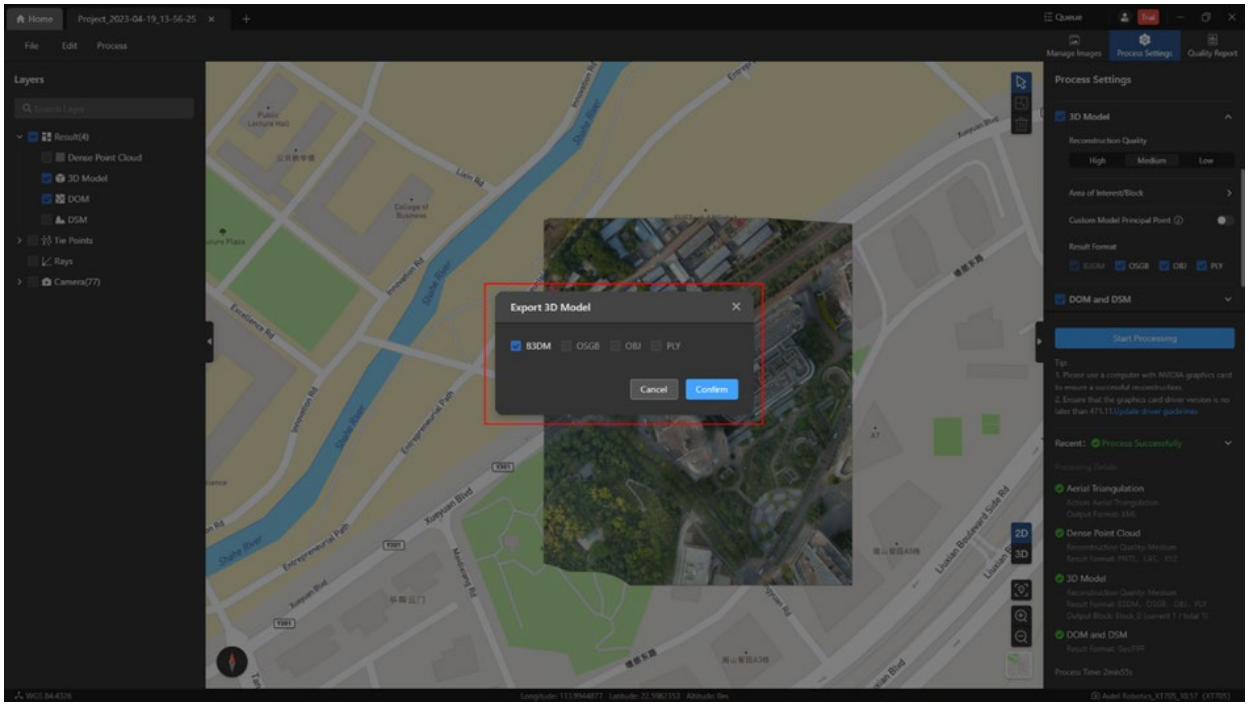
Click [**File->Export 3D Model**] in the menu bar to export the results of the 3D model.



Click the [**Export**] icon on the right side of [**3D Model**] under the layer tree in the [**Layers**] page to export the results of the 3D model.



The export results support the selection of B3DM, OSGB, OBJ, and PLY formats. If the corresponding result format is not checked when processing the 3D model, the corresponding format cannot be selected when exporting.



4.6 3D Reconstruction Quality Report

After the [**3D Model**] is processed, the quality report details page will add the processing information of the 3D model, including: reconstruction quality, result format, and processing time.

3.3 3D models processing information

Reconstruction Quality	Medium
Result Format	obj、ply、osgb、b3dm
Processing Time	3min32s

5. 2D Reconstruction

5.1 2D Reconstruction Overview

2D reconstruction is to generate the digital surface model (DSM) and digital orthophoto (DOM) of the captured area using images collected by drone.

5.2 2D Reconstruction Process

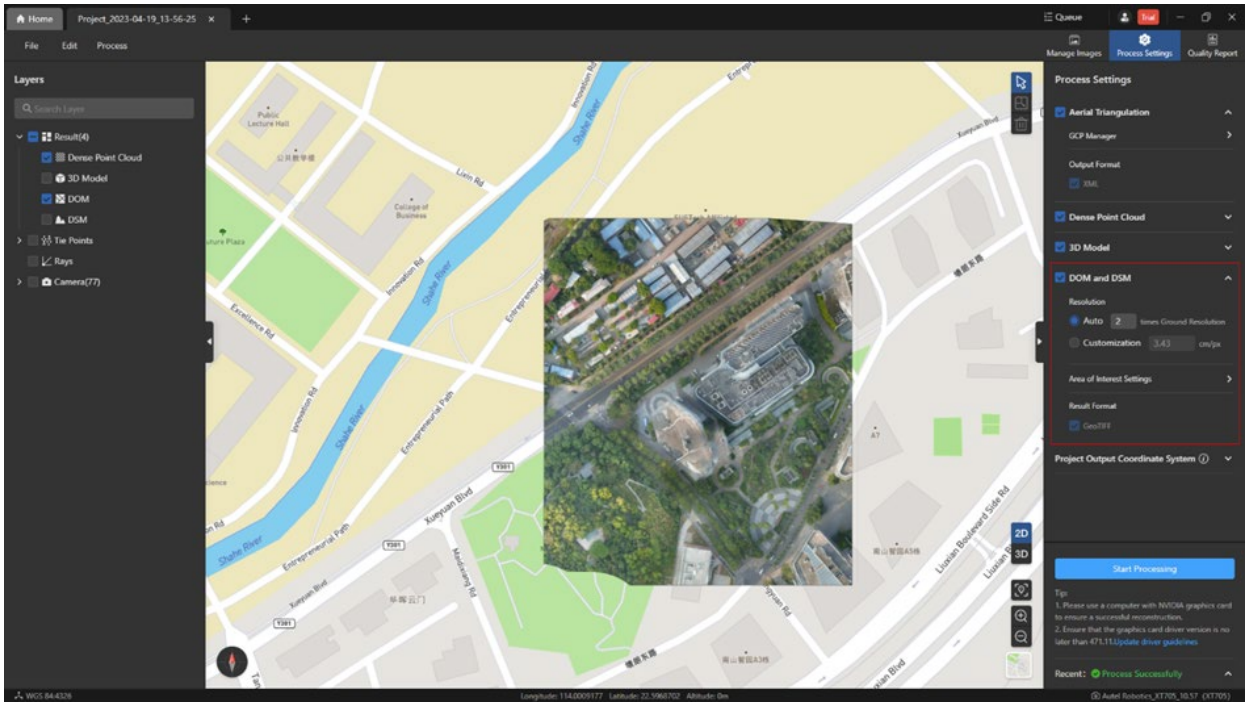
5.2.1 Selecting DOM And DSM

Resolution:

- Can be divided into N times the ground resolution or the resolution can be set manually. The default is the resolution configured by the system.

Result Format:

- GeoTIFF format: Checked by default and must be checked for display in the program after generation.



5.2.2 DOM And DSM Processing Steps

DOM and DSM need to rely on the results of aerial triangulation. You can perform aerial triangulation first, and then process DOM and DSM separately; you can also choose aerial triangulation, DOM and DSM to process together.

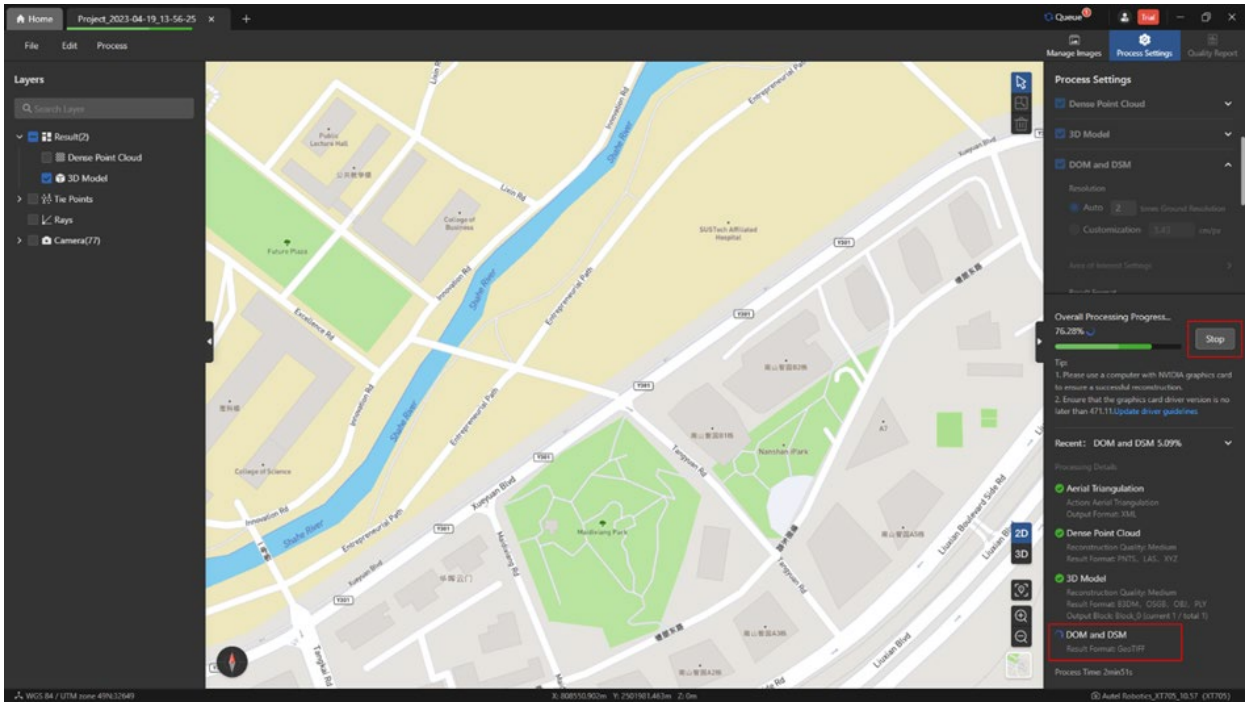
DOM and DSM can be processed simultaneously with the 3D model or separately.

After checking [**DOM and DSM**] on the [**Process Settings**] page, and setting the resolution, click the [**Start Processing**] button to process.

Tips:

- [DOM and DSM] column is not checked by default, it needs to be checked manually.

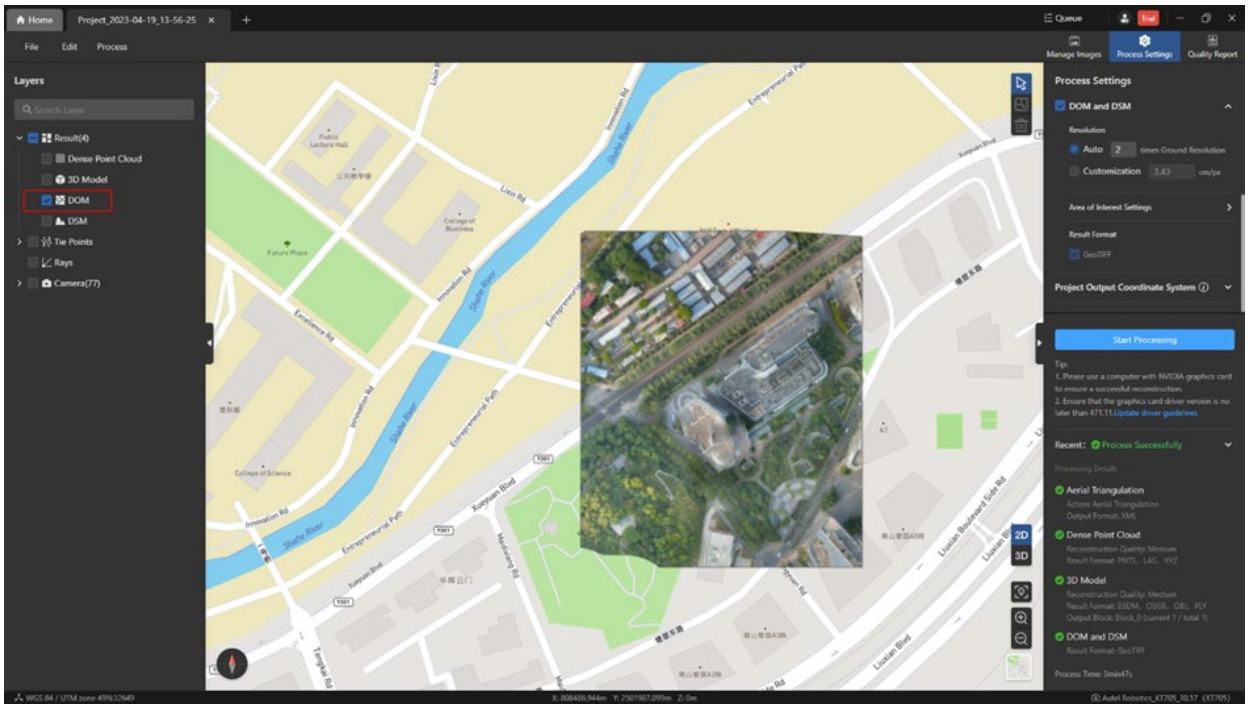
During processing, you can click the [**Stop**] button to stop processing.

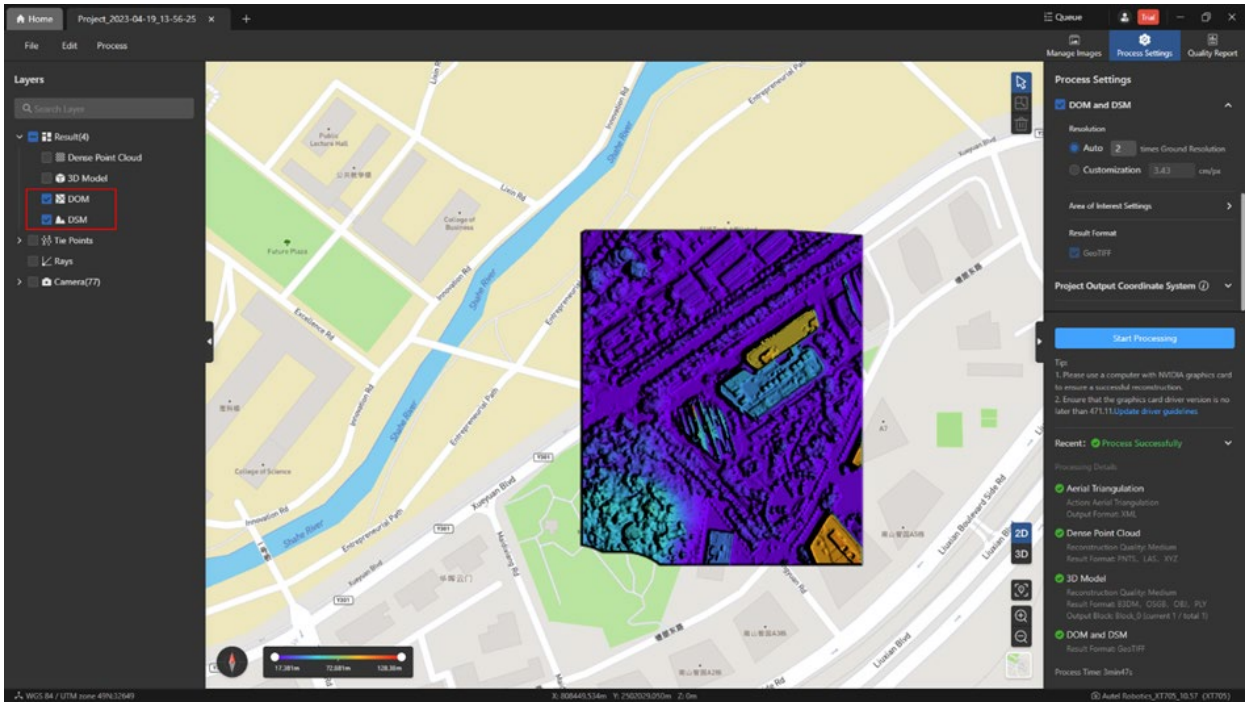


The results of DOM and DSM can be viewed in the layer tree and 2D view of the [**Layers**] page.

Tips:

- When DOM and DSM are selected at the same time, only DSM is displayed in the view.





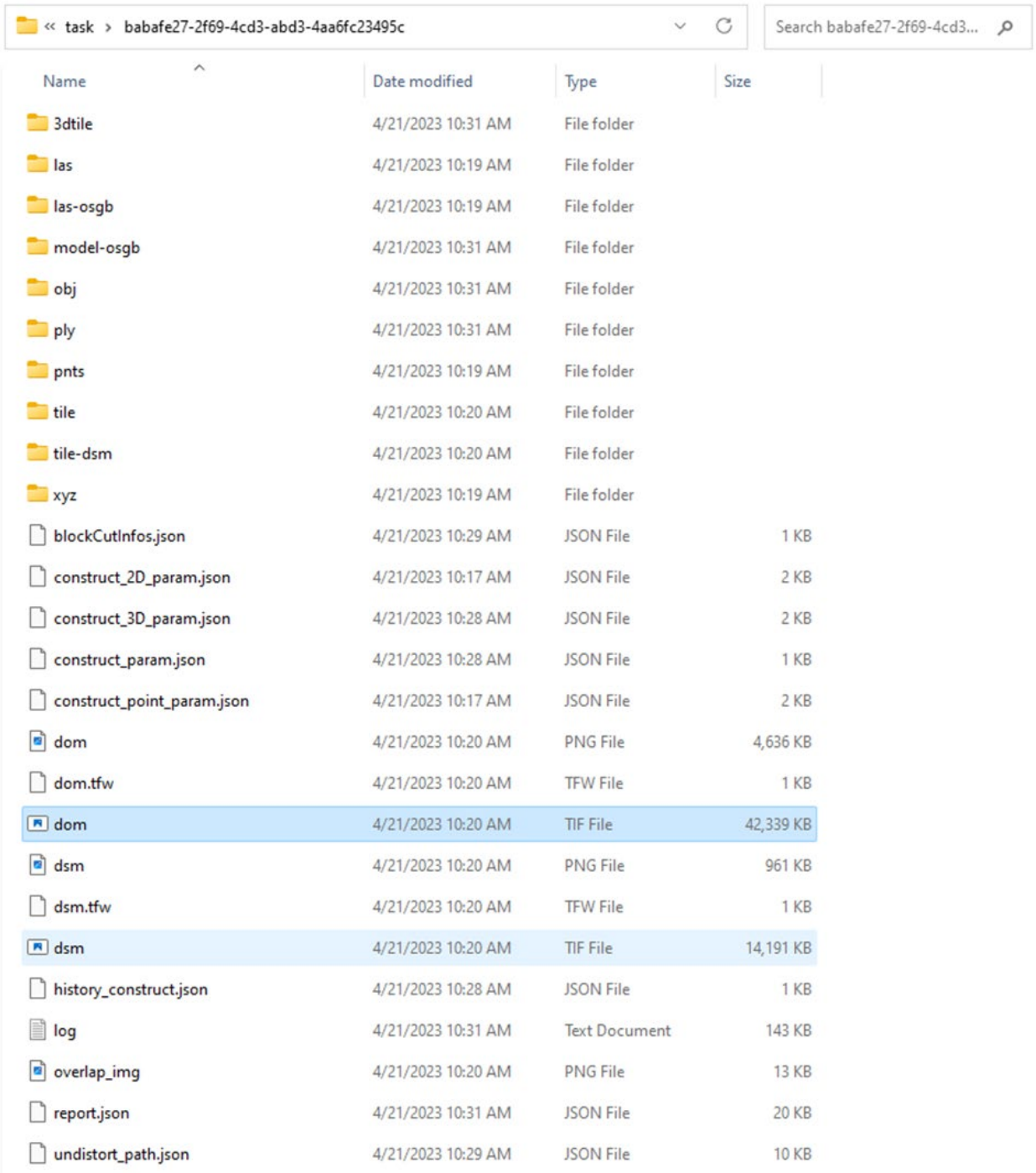
5.3 View Results And Export

5.3.1 View Results

Click [**Process->Open Result Folder**] on the menu bar to open the system directory where the results file is located.

You can also find the directory where the result file is located in the local disk of the computer according to the path where the project folder is located.

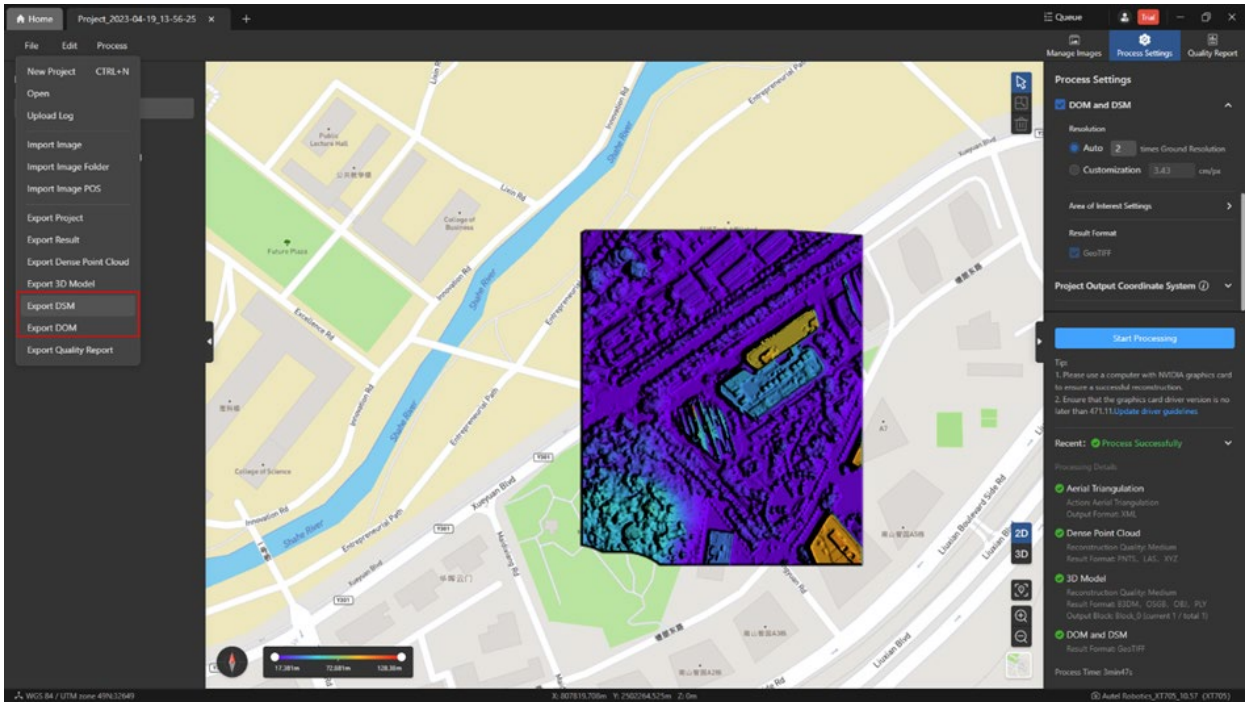
You can see the dom.tif and dsm.tif result files in the result folder. After the file is generated, it means that the 2D reconstruction has been processed, and the front end renders the DOM result in the program.



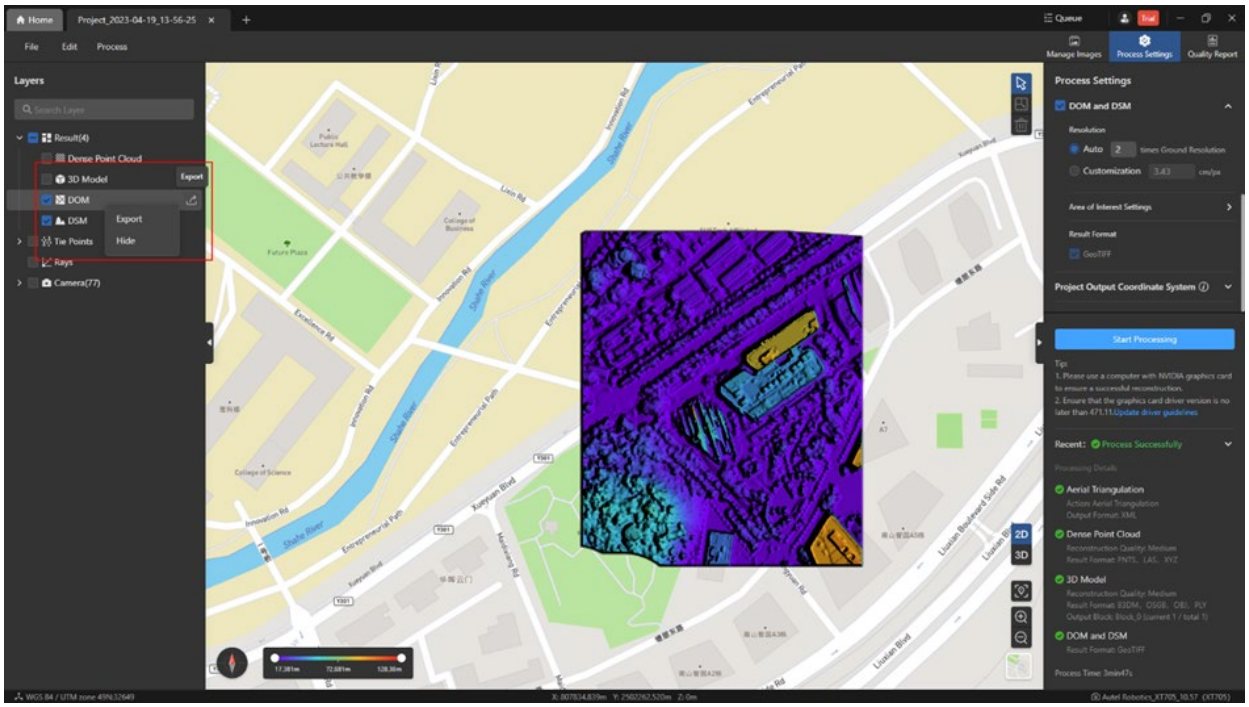
Name	Date modified	Type	Size
3dtile	4/21/2023 10:31 AM	File folder	
las	4/21/2023 10:19 AM	File folder	
las-osgb	4/21/2023 10:19 AM	File folder	
model-osgb	4/21/2023 10:31 AM	File folder	
obj	4/21/2023 10:31 AM	File folder	
ply	4/21/2023 10:31 AM	File folder	
pnts	4/21/2023 10:19 AM	File folder	
tile	4/21/2023 10:20 AM	File folder	
tile-dsm	4/21/2023 10:20 AM	File folder	
xyz	4/21/2023 10:19 AM	File folder	
blockCutInfos.json	4/21/2023 10:29 AM	JSON File	1 KB
construct_2D_param.json	4/21/2023 10:17 AM	JSON File	2 KB
construct_3D_param.json	4/21/2023 10:28 AM	JSON File	2 KB
construct_param.json	4/21/2023 10:28 AM	JSON File	1 KB
construct_point_param.json	4/21/2023 10:17 AM	JSON File	2 KB
dom	4/21/2023 10:20 AM	PNG File	4,636 KB
dom.tfw	4/21/2023 10:20 AM	TFW File	1 KB
dom	4/21/2023 10:20 AM	TIF File	42,339 KB
dsm	4/21/2023 10:20 AM	PNG File	961 KB
dsm.tfw	4/21/2023 10:20 AM	TFW File	1 KB
dsm	4/21/2023 10:20 AM	TIF File	14,191 KB
history_construct.json	4/21/2023 10:28 AM	JSON File	1 KB
log	4/21/2023 10:31 AM	Text Document	143 KB
overlap_img	4/21/2023 10:20 AM	PNG File	13 KB
report.json	4/21/2023 10:31 AM	JSON File	20 KB
undistort_path.json	4/21/2023 10:29 AM	JSON File	10 KB

5.3.2 Export Results

Click [**File->Export DOM**] and [**File->Export DSM**] in the menu bar to export the results of DOM and DSM, and the format of the results is tiff format.



Right-click [**DSM**] or [**DOM**] under the layer tree in the [**Layers**] page or click the [**Export**] icon on the right to export DSM or DOM results.



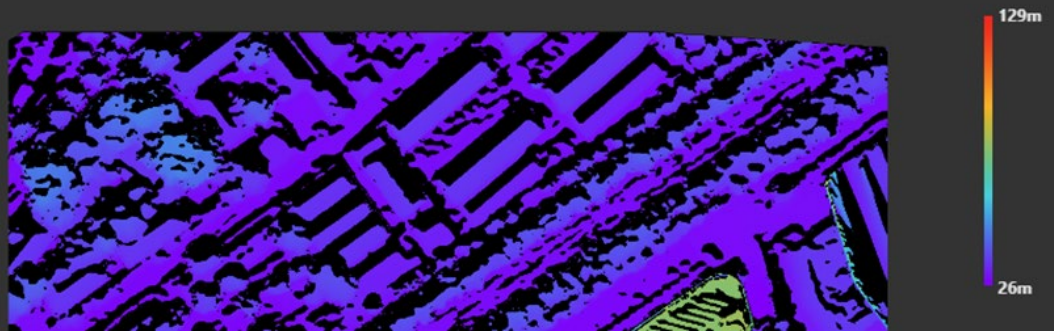
5.4 2D Reconstruction Quality Report

After processing [**DOM and DSM**], the quality report details page will add DOM and DSM processing information, including: DSM result format, DOM result format, processing time, DSM preview, DOM preview.

3.1 DOM and DSM processing information

DSM Result Format	geotiff
DOM Result Format	geotiff
Processing Time	2min10s

DSM Preview



Task Queue Management

This chapter mainly describes the reconstruction task queue management within Autel Mapper.

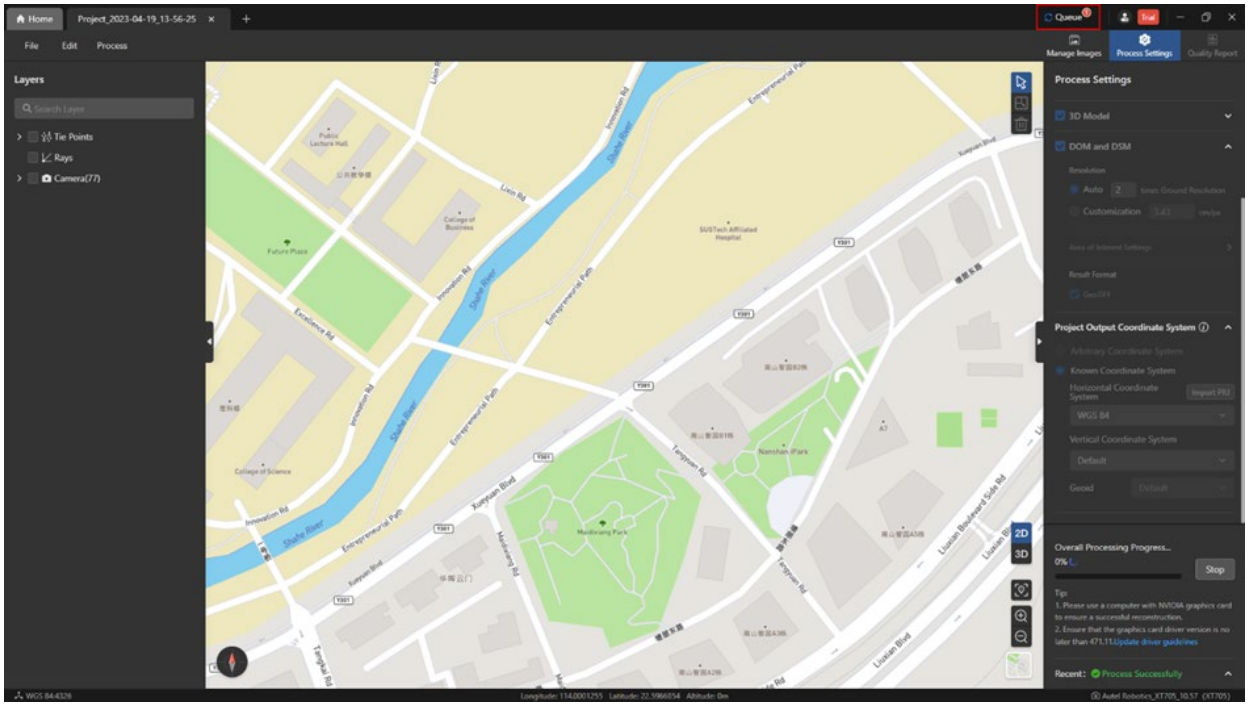
1. Introduction To Task Queues

Autel Mapper supports the creation of multiple quality reconstruction tasks (can be a combination of [**Aerial Triangulation**], [**Aerial Triangulation**] and [**Dense Point Cloud**], [**3D Model**], [**DOM and DSM**], etc. After completion, the task combination of [**Dense Point Cloud**], [**3D Model**], [**DOM and DSM**], etc.) is put into a task queue for queuing processing, and the tasks put into the task queue can be prioritized, canceled or suspended.

2. Task Queue Management

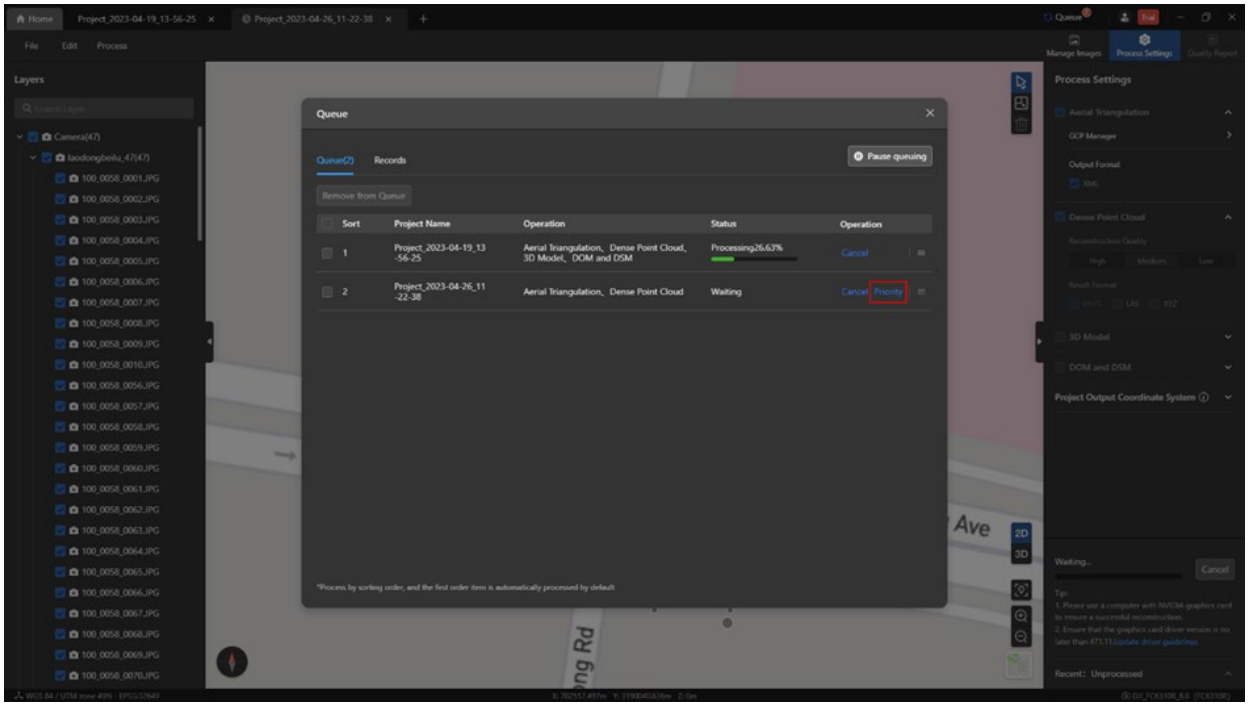
2.1 Add Task

After checking the tasks that need to be rebuilt on the [**Process Settings**] page, click the [**Start Processing**] button, and the tasks will be automatically added to the task queue. You can click the [**Queue**] icon in the upper right corner to view the task queue.

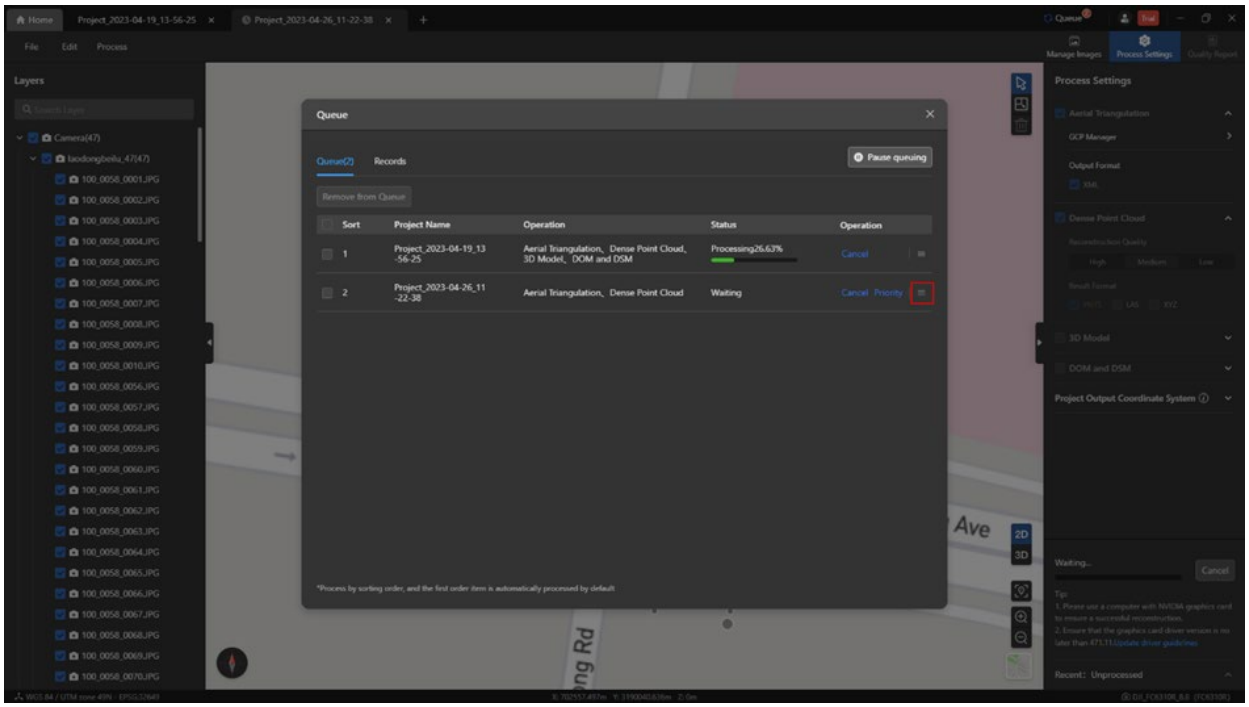


2.2 Task Prioritization

Click the [**Priority**] button in the corresponding item operation column on the [**Queue**] page to set the item to the top.

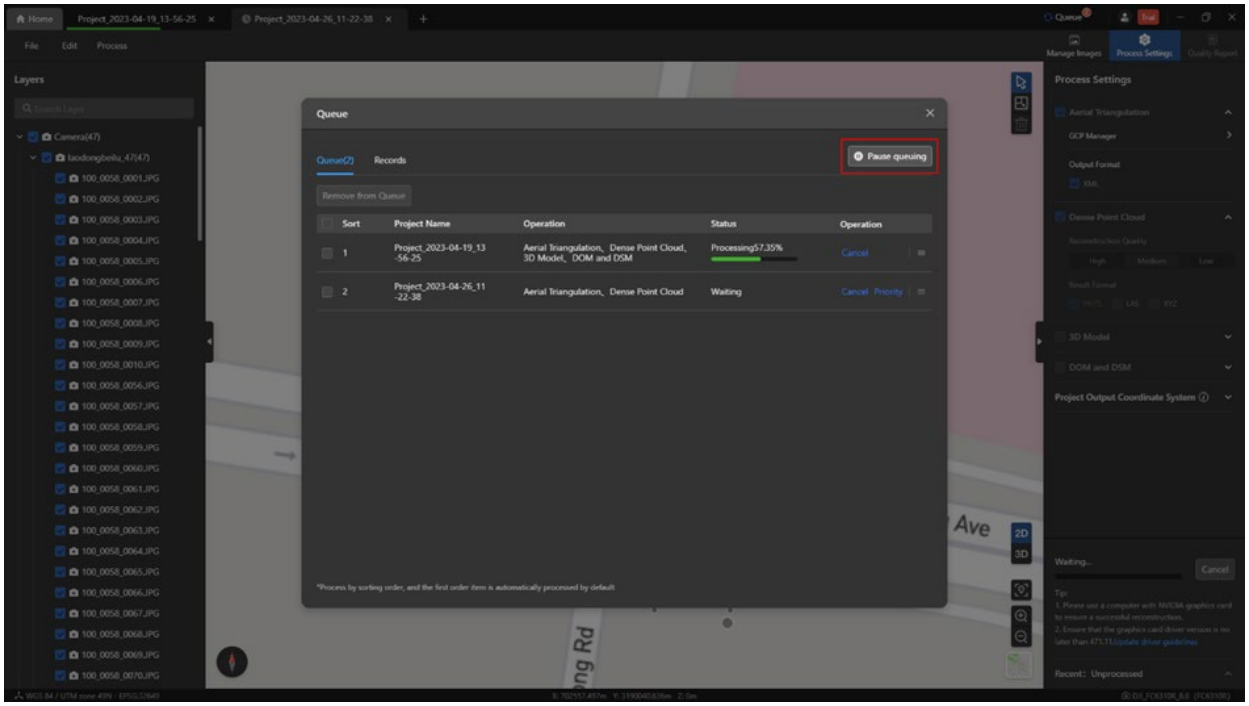


You can also click and hold the drag icon on the right side of the [**Priority**] button of the corresponding item operation column on the [**Queue**] page to perform upward or downward sorting management.

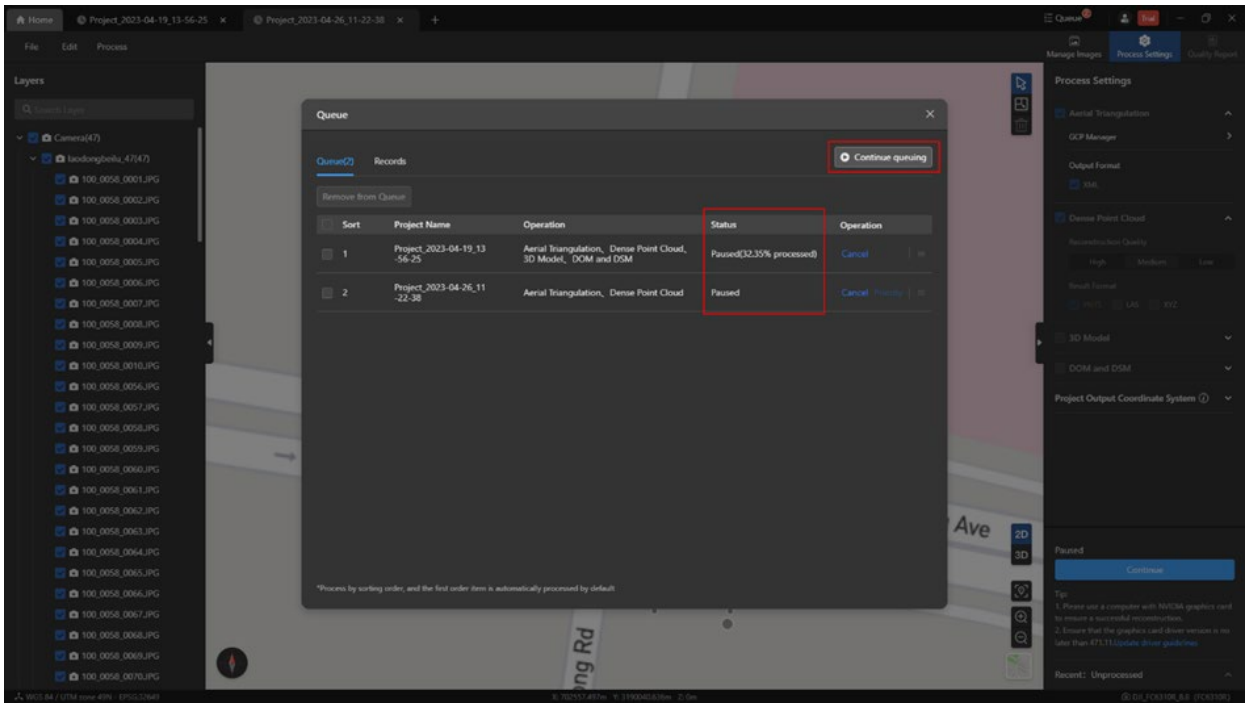


2.3 Suspend Task

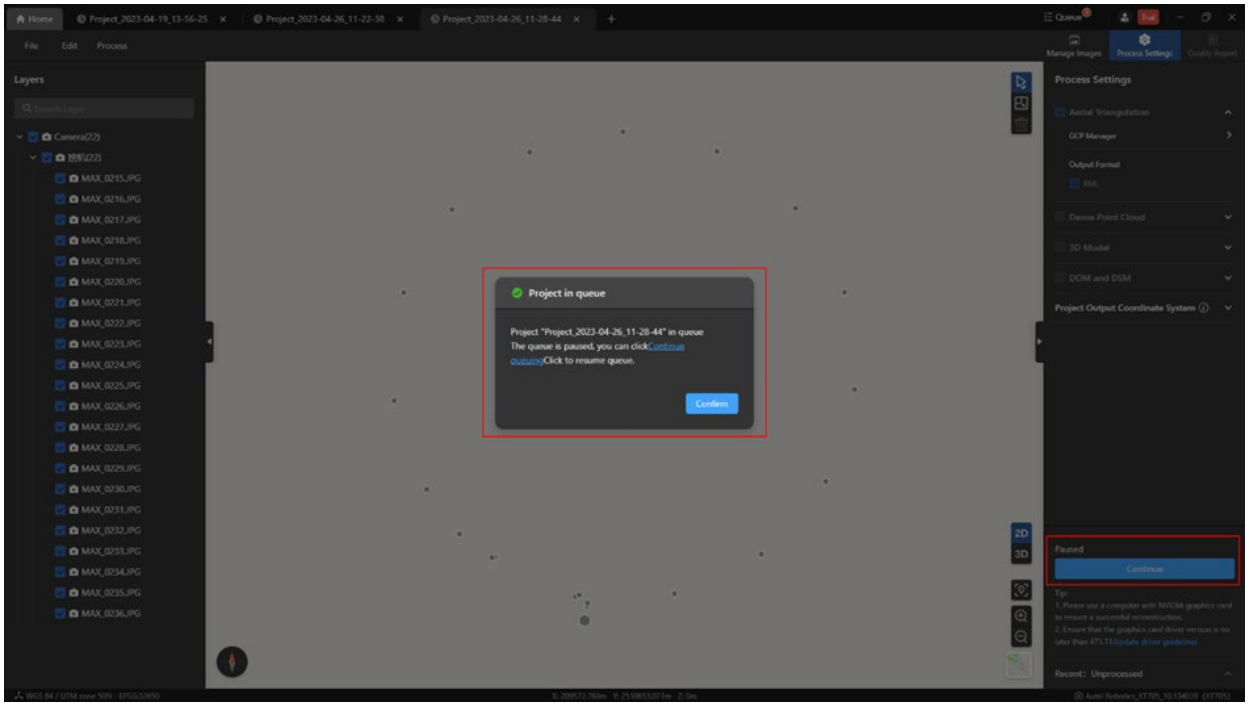
Click the [**Pause queueing**] button in the upper right corner of the [**Queue**] page to pause the operation.



Click the [**Continue queueing**] button in the upper right corner of the [**Queue**] page to resume the operation.



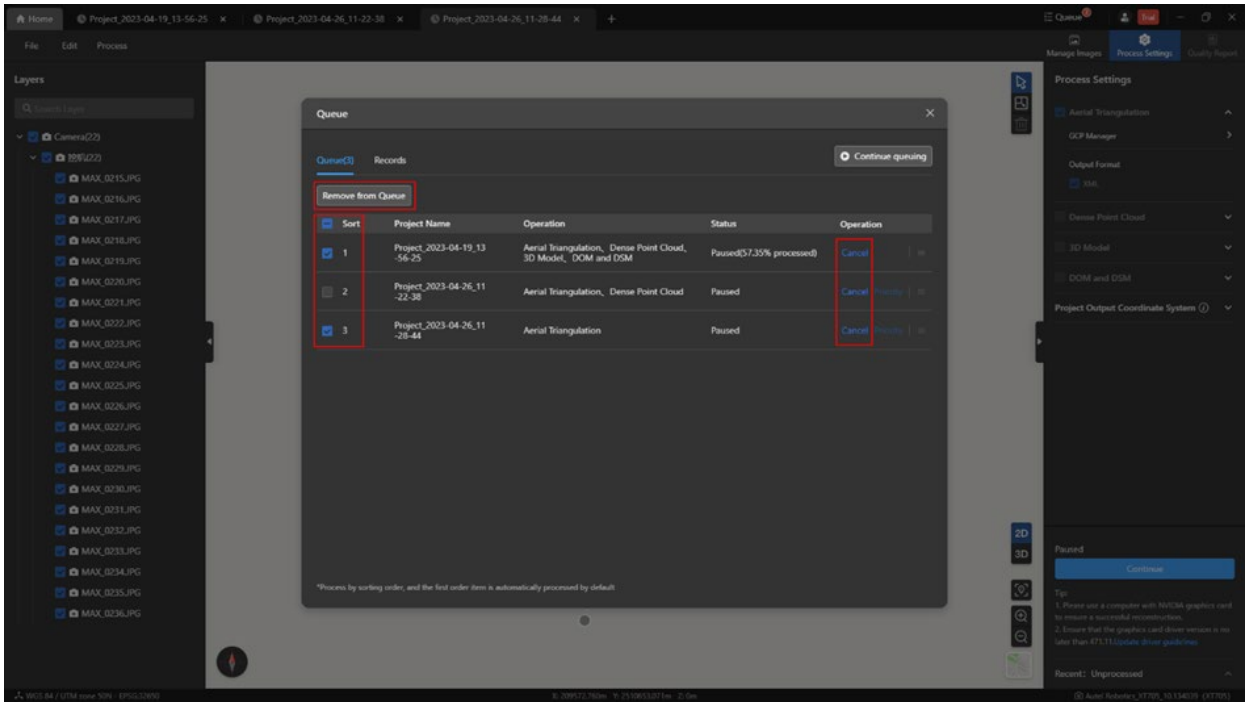
After clicking the [**Pause queuing**] button in the upper right corner of the [**Queue**] page to pause the operation, the newly created reconstruction task can be added to the bottom of the task queue for queuing. At this time, you can click [Continue] button in the [**Process Settings**] page to resume task queue processing.



You can also go back to the [Queue] page and click the [Continue Queuing] button in the upper right corner to resume task queue processing.

2.4 Cancel Task In Queue

- Click the [**Cancel**] button in the corresponding column on the [**Queue**] page to delete the project task from the task queue.
- You can check the square brackets before the sequence number of the corresponding project on the [**Queue**] page, and then click the [**Remove from Queue**] button on the upper left to delete the project task from the task queue.
- You can check the square brackets in front of the sorting column on the [**Queue**] page to select all project tasks, and then click the [**Remove from Queue**] button on the upper left to delete all project tasks from the task queue.

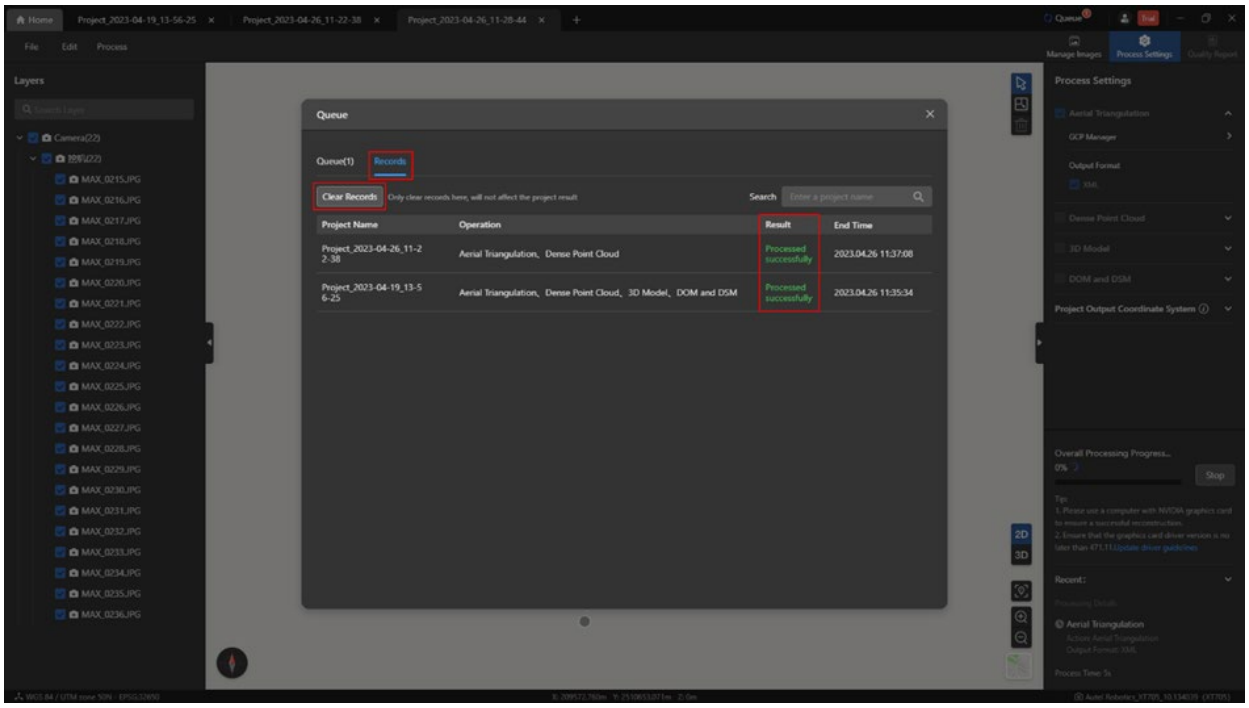


2.5 Task Queue Result Record

The task queue results record can view completed and canceled tasks, and supports task searching. Re-opening after the software is closed will clear the records before the software was closed previously.

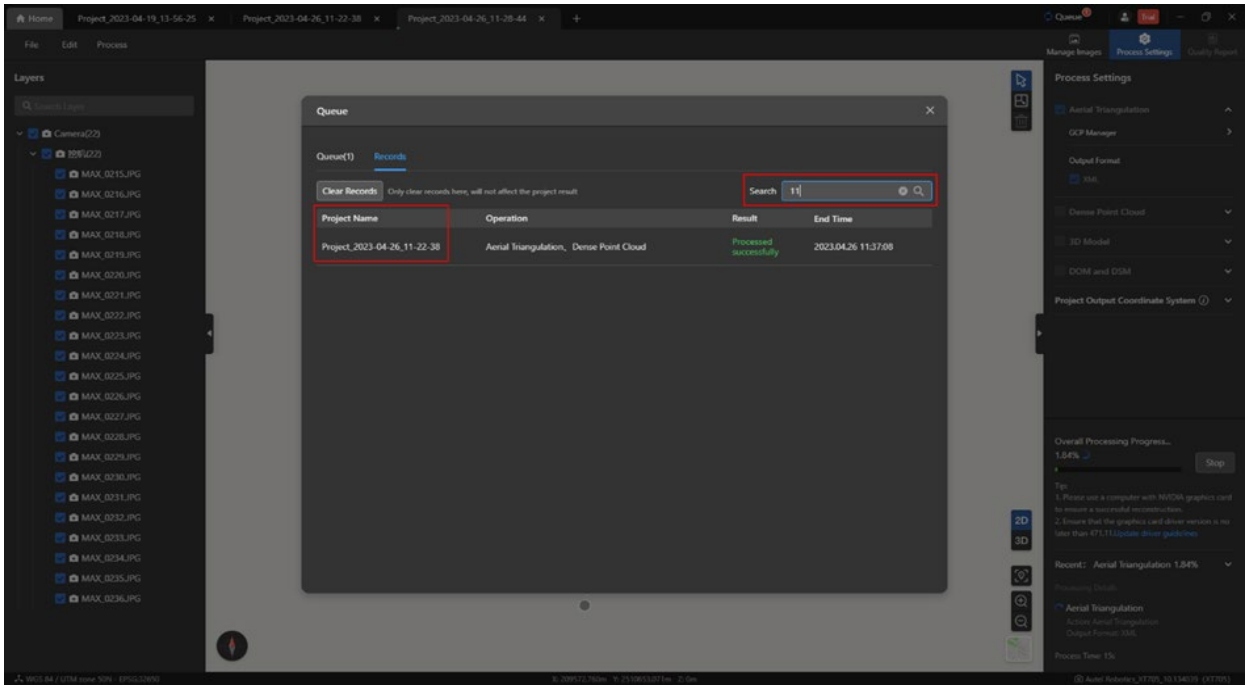
You can view the corresponding records in the result record for tasks added to the task queue, canceled or completed.

Click the [**Clear Records**] button on the [**Records**] page to clear the project processing record.



You can search for specified project task records in the search bar on the [**Records**] page,

which supports exact match search and relative search.



Log Uploading

This chapter describes uploading logs through Autel Mapper.

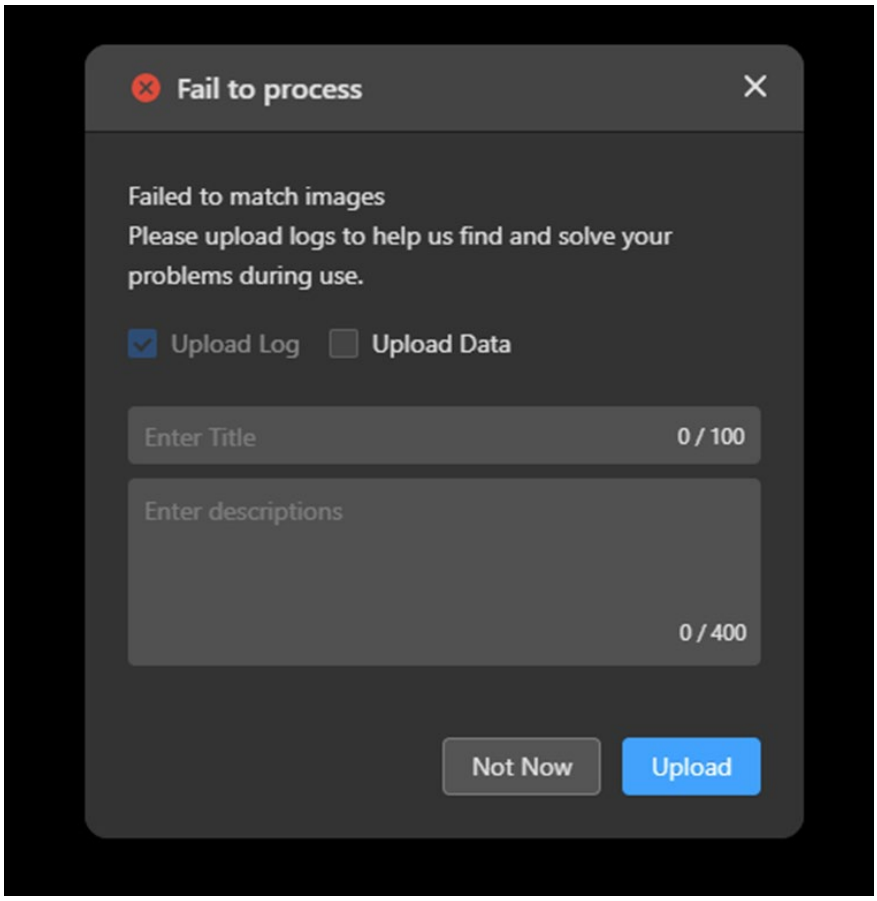
1. Introducing Log Uploads

Uploading logs can help developers and technical support personnel better understand the reasons for client failures, so that they can solve problems faster, and help Autel intelligently improve the stability of Autel Mapper.

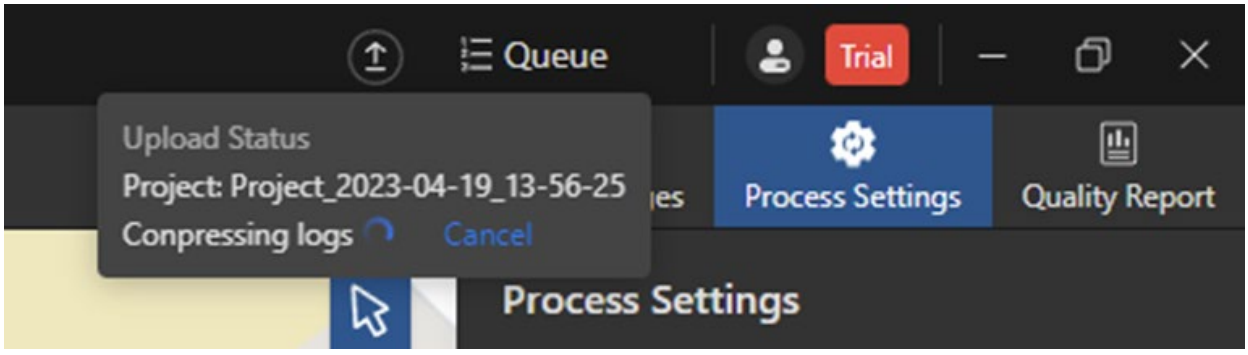
2. Upload Log

2.1 Uploading Log When Task Fails

When a project processing fails, a floating window of the log will pop up, and the user can choose whether to upload the data or not.

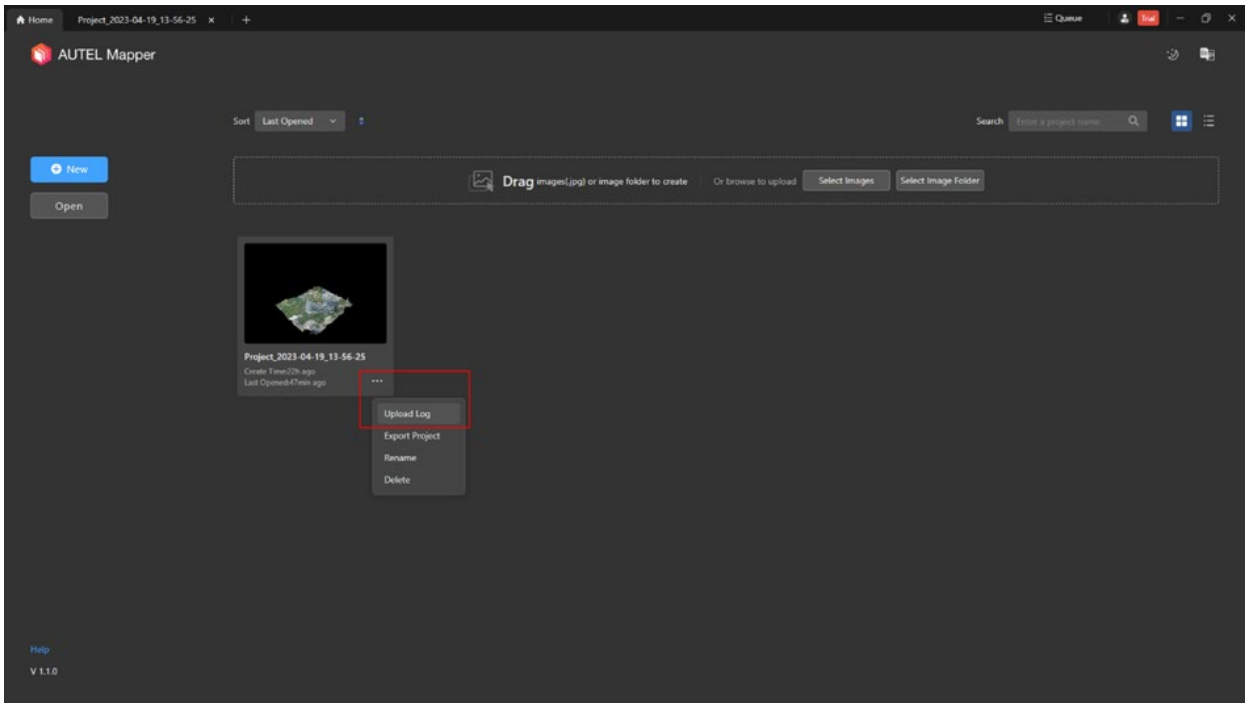
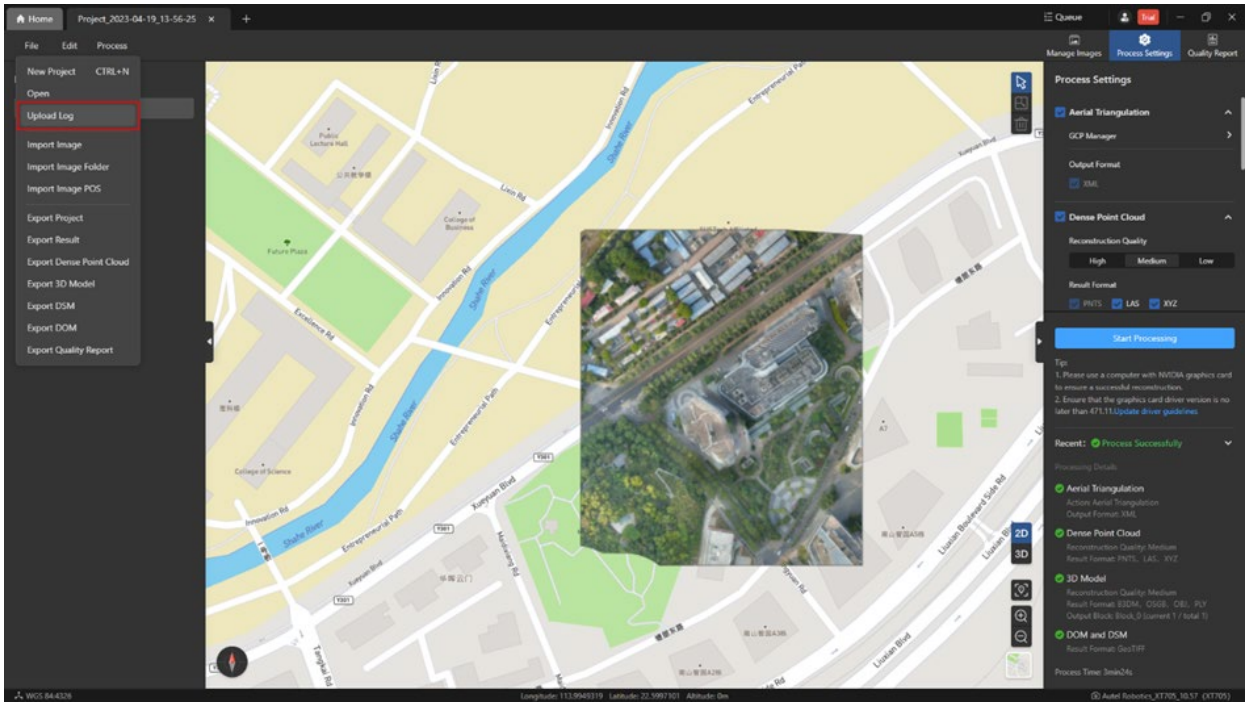


You can view the upload progress in the upper right corner of the page, note that the client cannot be closed during the upload process.



2.2 Upload Specific Log From Project

In the project list on the homepage, click the [...] icon in the project and select [**Upload Log**] in the pop-up menu to upload the project log.



Click [**File->Upload Log**] in the completed project to upload the log of the project.