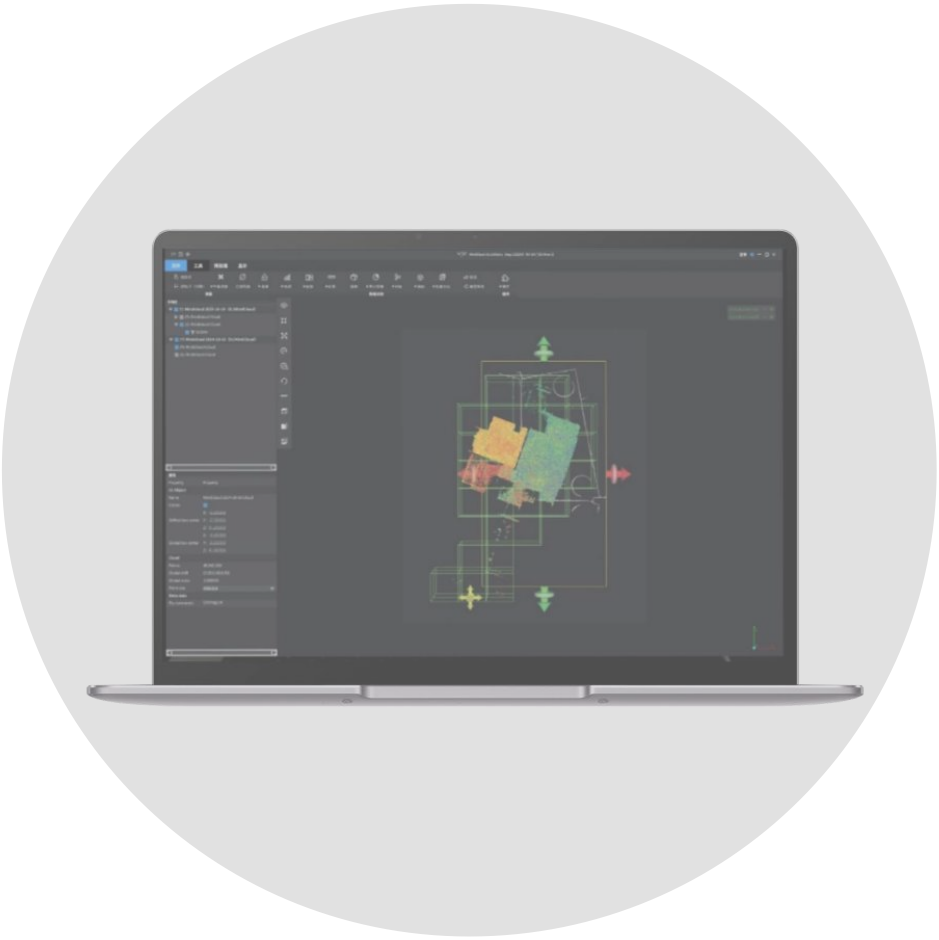
MindCloud Studio

User Manual v1.8.26_EN



Manifold Tech Limited
2026.10

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1. Introduction

Welcome to MindCloud Studio.

MindCloud Studio is a professional 3D point cloud processing software independently developed by Manifold Tech Ltd., compatible with all of the company's scanner devices. Specifically designed for handling'.lx 'point clouds and'.olx 'files generated by Manifold Tech Ltd.'s products, it accurately analyzes the data, fully unlocks its value, and lays a solid foundation for subsequent data processing.

In terms of functional features, it boasts robust data processing capabilities, including the following:

- The loading and processing of point cloud data are highly efficient, while advanced algorithms ensure optimal point cloud quality.
- An intelligent sampling strategy that adjusts the sampling density based on data characteristics to optimize storage and rendering speeds.
- Its advanced filtering algorithm accurately removes noise while preserving details, thereby enhancing data quality.
- Supports real-time interactive analysis, allowing users to receive immediate data feedback for flexible strategy adjustments.
- The interface features a clean and intuitive design with a well-organized layout, clear icons and text labels that make it easy for both beginners and professionals to use.
- The software features a linear and smooth operation workflow, supports exporting data in mainstream formats, offers simple parameter settings, and provides real-time preview for easy adjustments.

With its superior compatibility and powerful features, MindCloud Studio has become a pivotal tool for point cloud processing, significantly driving technological innovation and business expansion across multiple domains. It stands out uniquely in the industry, offering exceptional practical value and competitive advantages.

2. Download and Authorization

2.1 Recommended computer configuration

MindCloud Studio is recommended for use on computers running Windows 10 or later (64-bit) that meet specific configuration requirements.

Minimum Requirements	
Operating System	Windows 10 or later
Processor	Intel Core i5 or better
Installed Memory	16 GB DDR4 or better
Video Card	NVIDIA GeForce RTX 2050 or better
Storage Space	256 GB or more

Recommended Requirements	
Operating System	Windows 10 or later
Processor	Intel Core i7 or better
Installed Memory	32 GB DDR5 or better
Video Card	NVIDIA GeForce RTX 3050 or better
Storage Space	512 GB or more

2.2 Download and Install

Users who have purchased products from Manifold Tech Ltd. can visit the version management page of the software to download the latest version of MindCloud Studio at the following URL: https://version.manifoldtech.cn/download/mcs, or scan the QR code below to access the corresponding download page.



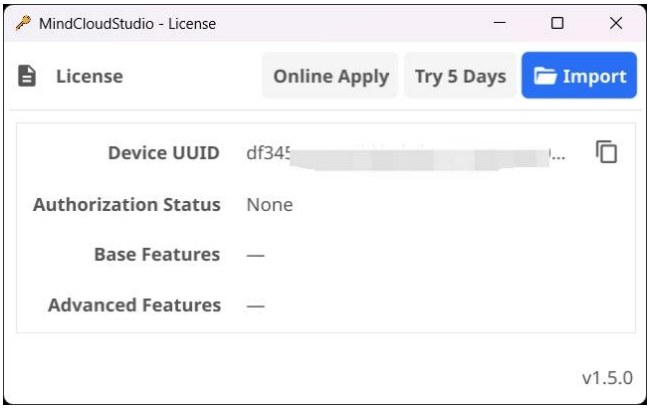
2.3 Software License Agreement

MindCloud Studio has undergone a comprehensive upgrade. To ensure seamless integration between this software and products, Manifold Tech Ltd. has decided to issue a license for MindCloud Studio.

After software installation, please contact the dealer or manufacturer's staff to complete online or local authorization and obtain the corresponding license, and industry applications associated with advanced features also require separate authorization..

(1) Network Authorization: Click "Online Apply", fill in the required information, and wait for backend confirmation to complete the authorization immediately.

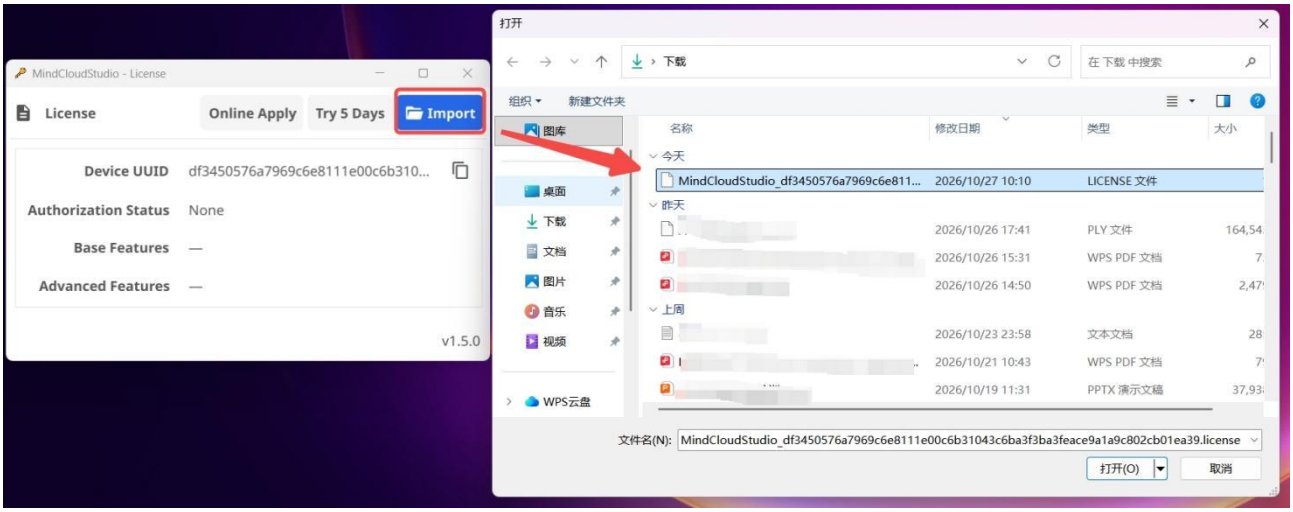
(2) Local Authorization: Send the Device UUID code to the distributor or manufacturer personnel to generate the license file offline. On the computer, click "Import Authorization File" and manually import the license.



Software License



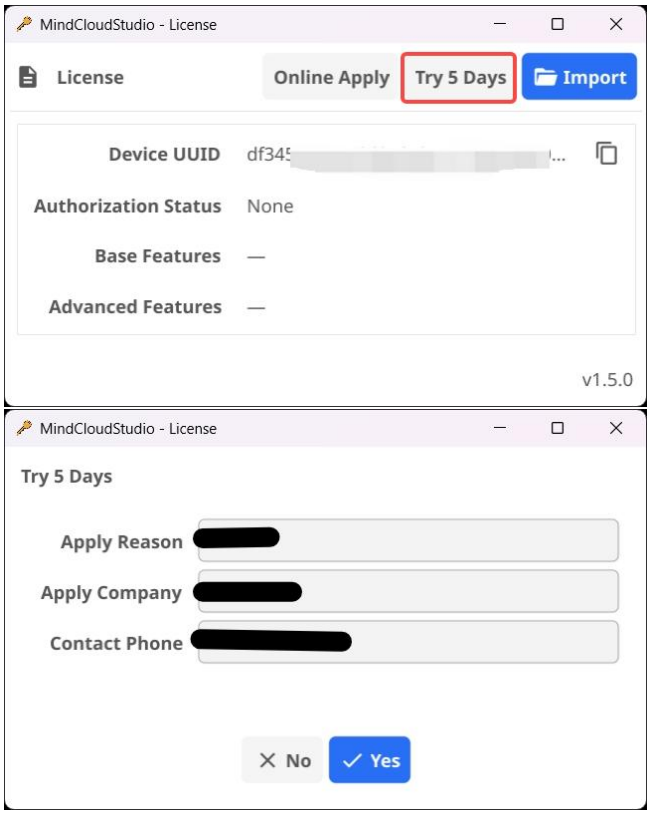
Network Authorization



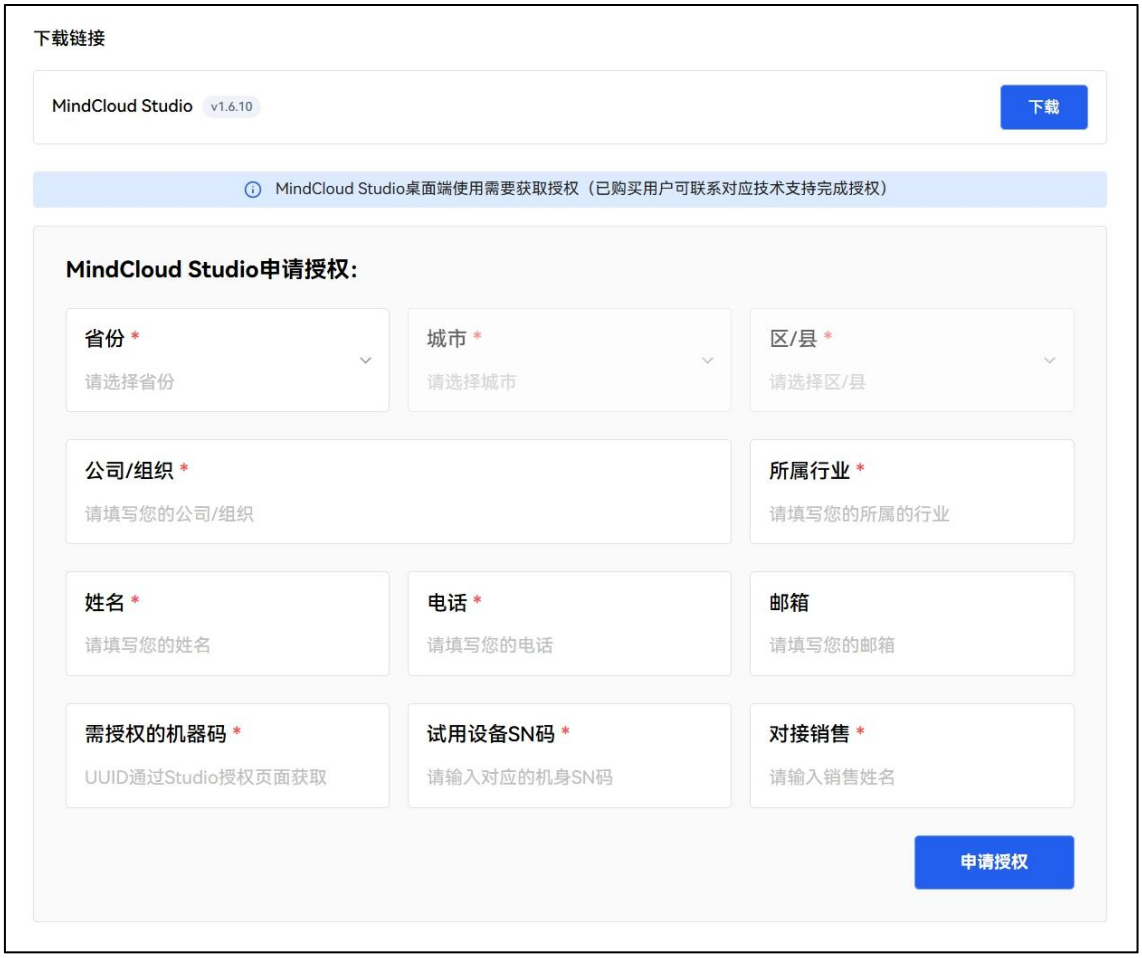
Local Authorization

2.4 Trail

Customers who are trying the software for the first time, evaluating loaner Manifold products, or who have not yet purchased Manifold products but need to trial the software, can click "Try 5 Days" on the authorization interface after installing the software to obtain a 5-day usage period for MindCloud Studio. Alternatively, you can visit the official Manifold website at https://www.manifoldtech.cn/download, fill out the application form, and download the trial installation package; or contact the sales channel to obtain the Manifold software and case study data.



Try 5 days

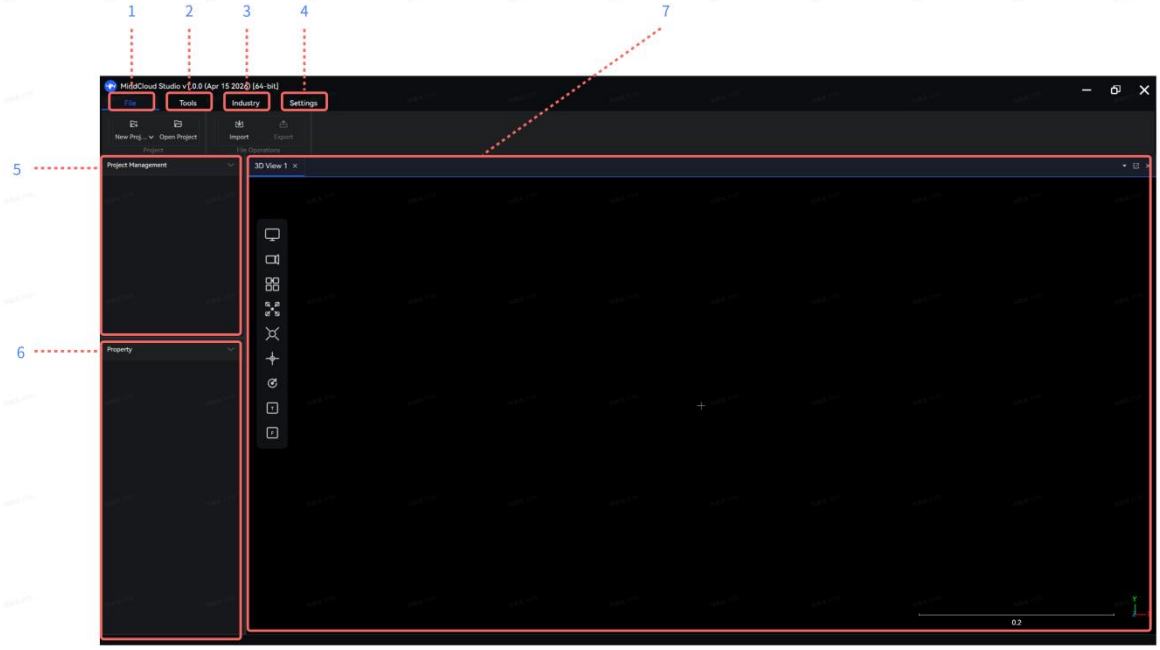


Official Site

3. Software Interface Introduction

3.1 Main Interface

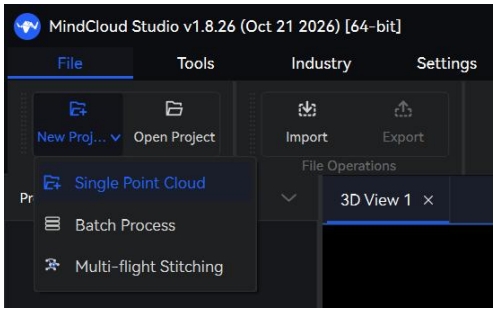
The main interface of MindCloud Studio can be simply divided into seven major sections, as shown in the figure below:



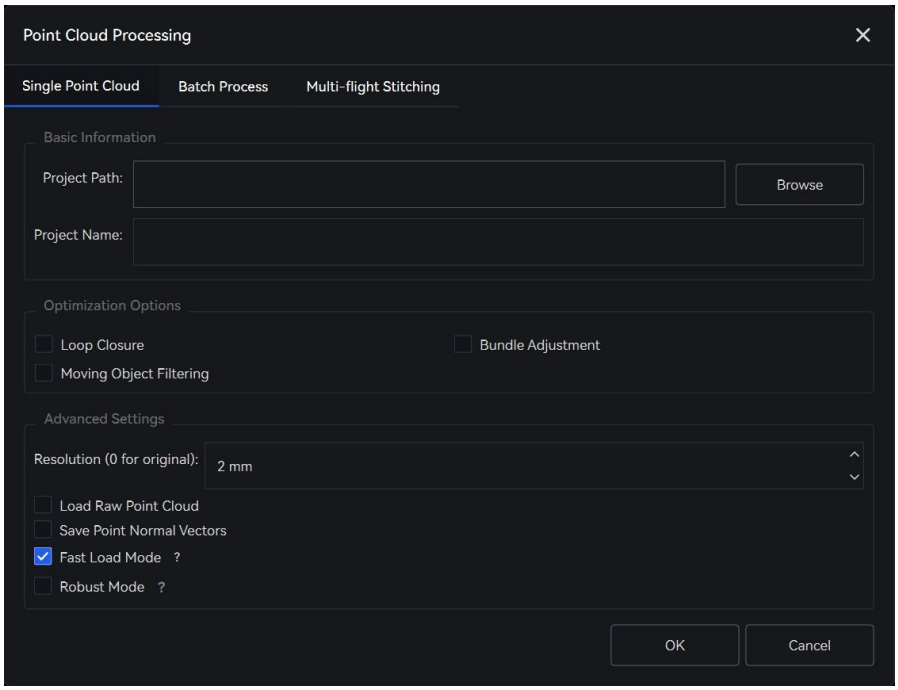
main interface

region	name	content
1	File bar	Guide and create point cloud projects, and import and export files
2	Tools bar	Includes common point cloud editing features such as measurement, cropping, sectioning, registration, and merging.
3	Industry bar	It includes advanced industry features such as mesh generation, building construction, forestry surveying, pile measurement, and intelligent robotics.
4	Settings bar	View and configure the software's window information and authorization details
5	Project Management directory	Show the various data objects loaded by the software
6	Property directory	Show the relevant attributes of the selected data object
7	3D View window	Show all loaded data objects

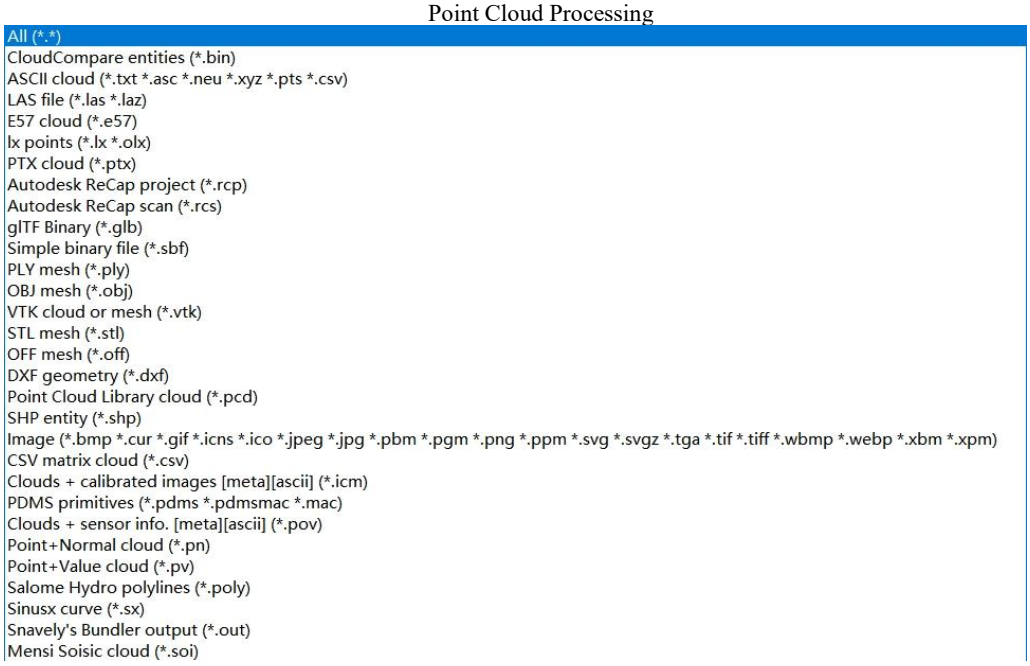
3.2 File bar



For new projects, you can load and optimize point clouds, open and view existing projects, and import or export data in various other formats, as shown below:

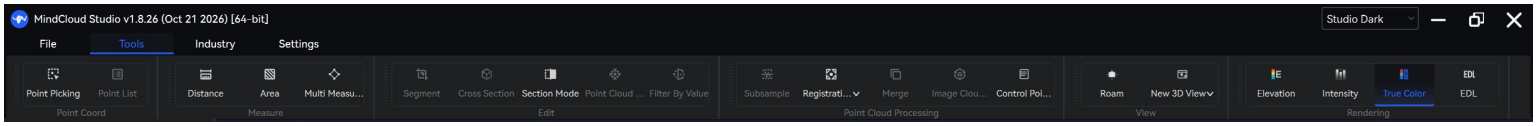


Point Cloud Processing



Import data format

3.3 Tools bar

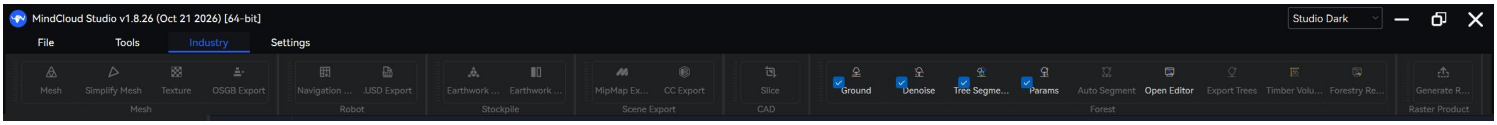


The toolbar includes the following features:

- Point Picking: Annotate points in the point cloud and view individual point attributes.
- Point List: Annotate points in the point cloud and record their attribute information in a list format for easy manual selection of control points.
- Distance: Measures the distance between two points.
- Area: Measures the area of a triangle formed by three points.
- Multi Measurement: Measuring the segment length of polylines and the area of polygons.
- Segment: Polygon crop point cloud, save internal/external region..
- Cross Section: Manually control the bounding box of the point cloud, adjust the length and angles of its six axes, and save the point cloud within the box to create point cloud slices.
- Section Mode: Use a rectangle of specified thickness to section the point cloud from a top view, and display the measurements in another view.
- Point Cloud Orientation: Reorient the position and orientation of the point cloud through translation and rotation.
- Filter By Value: Segment the point cloud before and after based on its attributes.
- Subsample: Use different methods to reduce the point cloud density by decreasing the number of points.
- Registration: Includes "Align (point-to-point selection)" and "Fine Registration (ICP)", allowing manual stitching and alignment of point clouds.
- Merge: Combine the selected multiple point cloud datasets.
- Image Cloud Fusion: Integrates standalone high-definition or panoramic photos into a point cloud view.
- Control Point Report: This can be optimized for GCP. After optimizing the control points, their accuracy is verified and a report file is generated.
- Roam: Use the WASD keys to move the view freely, just like controlling a character

- New 3D View: Adjust the number, position, and relationships of multiple window views.
- Elevation: Render the color of the point cloud based on its height attribute.
- Intensity: Render the color of the point cloud based on its intensity attribute.
- True Color: Render point cloud colors through the RGB attributes of the point cloud.
- EDL: The new EDL rendering mode utilizes visual enhancement technology to highlight the edges of point cloud particles, improve lighting, and make the overall point cloud more three-dimensional.

3.4 Industry bar



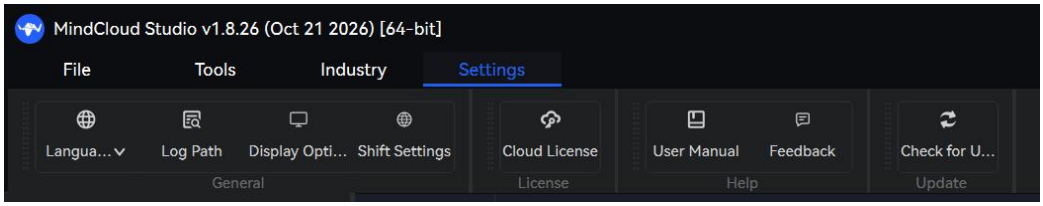
The industry functions include the following:

- Mesh: Convert the point cloud into a triangular mesh model.
- Simplify Mesh: Reduce the number of grid model patches.
- Texture: Map photos to a mesh model to create a texture effect.
- OSGB Export: Export triangular mesh models as OSGB tiles.
- Navigation Map: Generates a repositioning map for embodied intelligent products, enabling navigation, obstacle avoidance, and other functions.
- .USD Export: Convert point cloud data or other 3D data into USD format, compatible with the NVIDIA Omniverse simulation platform.
- Earthwork Measurement: Calculate the volume difference between the stack and the reference plane, and measure the volume.
- Earthwork Comparison: Calculate the volume difference between the pile surface surfaces obtained from the two scans, and measure the fill and excavation volumes.
- MipMap Export: Convert photos saved by the Liuxing Space Intelligent Product into a distortion-free data structure compatible with the mipmap software, enabling third-party Gaussian rendering.
- CC Export: Convert photos captured by the Liuxing Space intelligent product into a distortion-free data structure compatible with the iTwin software (formerly CC, ContextCapture), enabling third-party mesh reconstruction.
- Slice: By adjusting the slice thickness and the height of the slice, it is possible to intelligently extract the building site line and generate a floor plan.
- Ground: The first stage of forestry functions. Ground extraction and elevation normalization to separate ground point clouds from tree point clouds.
- Denoise: The second stage of forestry functions. Filter out outliers and perform statistics to improve the

morphological consistency of individual trees.

- Tree Segmentation: The third stage of forestry functions. Extract and segment the tree point cloud into individual tree point clouds.
- Params (Parameter Calculation): The fourth stage of forestry functions. Perform calculations for all individual trees to obtain parameters such as quantity, density, tree height, DBH (diameter at breast height), and crown width, as well as further derived parameters such as volume and carbon stock.
- Auto Segment: Automatically process the selected forestry point cloud through the four stages to obtain individual tree point clouds and a result report.
- Open Editor: Open the individual tree editing workbench, where you can delete, merge, or add specified individual tree point clouds.
- Export Trees: Independently export all individual tree point clouds with PNG preview images.
- Timber Volume (Calculation): Calculate the timber volume of stacked logs or woodpiles.
- Forestry Report: Generate a forestry investigation report.
- Generate Raster: Generate digital maps such as DOM, DSM, DEM, and DTM from the selected point cloud. (Full names: Digital Orthophoto Map, Digital Surface Model, Digital Elevation Model, Digital Terrain Model).

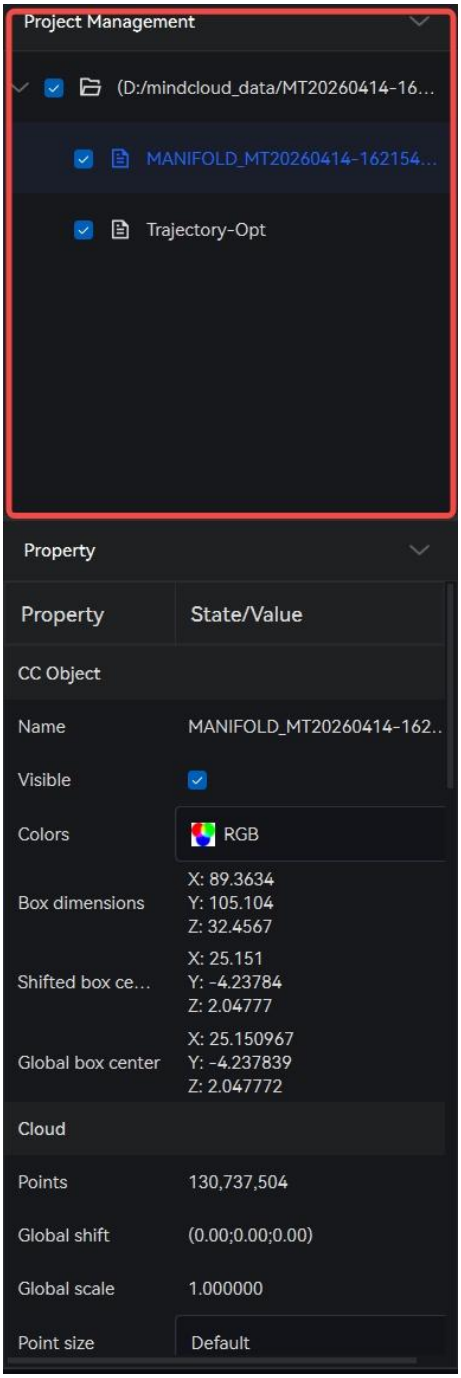
3.5 Setting bar



The bar includes the following features:

- Language: Switch the software's display language. Changes take effect after restarting the software.
- Log Path: Open the folder containing the software logs recorded by MindCloud Studio.
- Display Options: Adjust display settings such as the software interface background, colors, fonts, and units.
- Shift Settings: Set a unified global translation offset for 3D space, applying it uniformly to different point clouds and other point files for easy matching and comparison. Additionally, you can select a specific point cloud to set a non-uniform translation offset.
- Cloud License: View the software's authorization status.
- User Manual: Open the software's user manual.
- Feedback: Report software issues or bugs encountered.
- Check for Updates: View software update information.

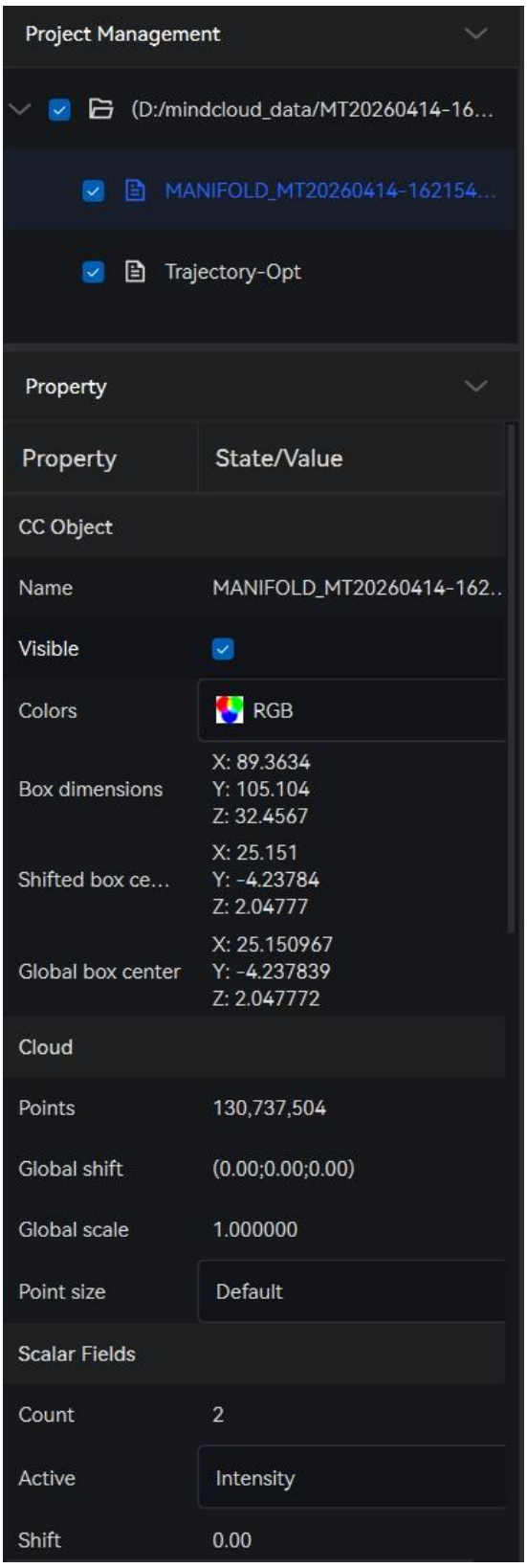
3.6 Project Management directory



The project management directory displays the currently loaded data objects. Click a cell to determine the display status of the data object:

- Check: Show in view.
- Do not check: Hide in view.

3.7 Property directory



The property directory contains the following information, using point cloud data as an example:

- Name: View the name of the selected point cloud data object.
- Visible: Click to check or uncheck to display or hide the selected point cloud object data.
- Colors: You can switch between RGB or scalar fields to display point cloud colors.
- Box size and center: View the bounding box of the point cloud object data, which serves as a geometric container holding the entire point cloud. You can view the box's size and position.
- Points: View the number of points in the point cloud.
- Global shift: The globally applied uniform translation value for the point cloud in the coordinate system.
- Global scale: The unified scaling ratio applied globally to the point cloud in the coordinate system.
- Point size: Adjust the point size.
- Scalar Fields: Switches between different point cloud attributes to determine the current rendering basis for point cloud colors, where Intensity represents reflection intensity and Label indicates the time frame.

3.8 3D View window



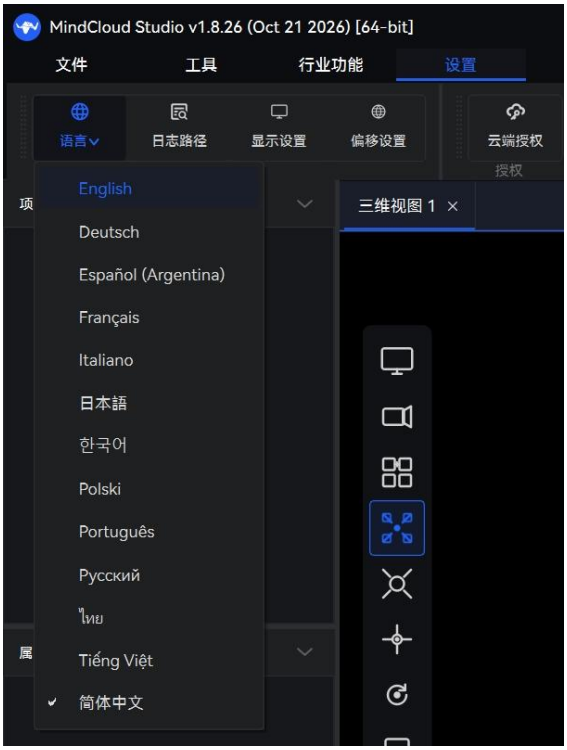
The center of the 3D view window displays all visible object data. There are shortcut buttons on the left with the following functions:

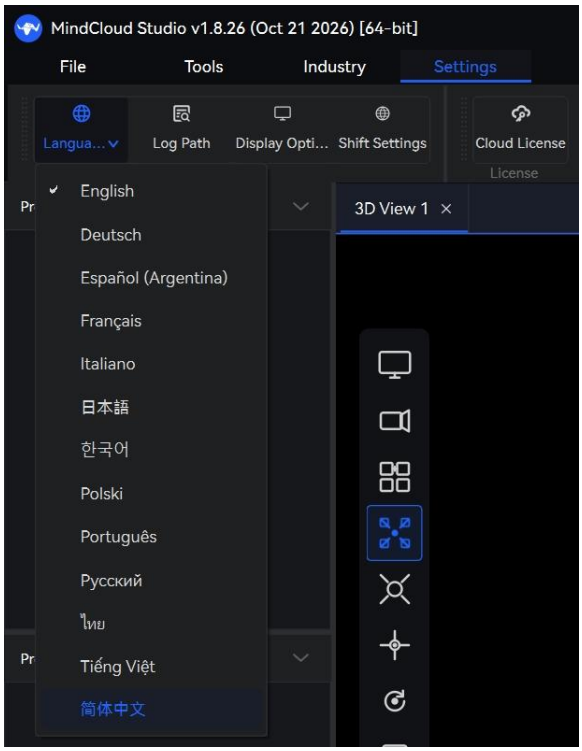
- Display Settings: Adjust software configurations such as background color, lighting conditions, and data loading strategies.
- Camera Settings: Adjust the view angle and position of the current view.
- Global Zoom: Fit all object data within the current view.
- Center View: Switch between perspective projection and orthogonal projection.
- Zoom and Center Selected Entities: Display the selected object data prominently in the view.
- Select Rotation Center: Manually pick the center point for rotating the object data.
- Auto-select Rotation Center: Automatically choose the rotation center of the object data, typically the center of the view.
- Top View: View the object data from a top-down perspective.
- Front View: View the object data from a front-facing perspective..

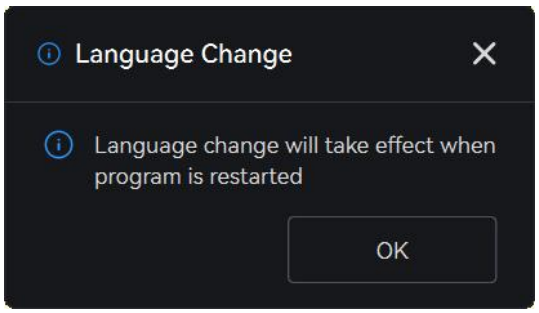
4. Basic Operations

4.1 Language Switch

(1) In Settings, click Language to switch the language, then reopen the software to change the language again.



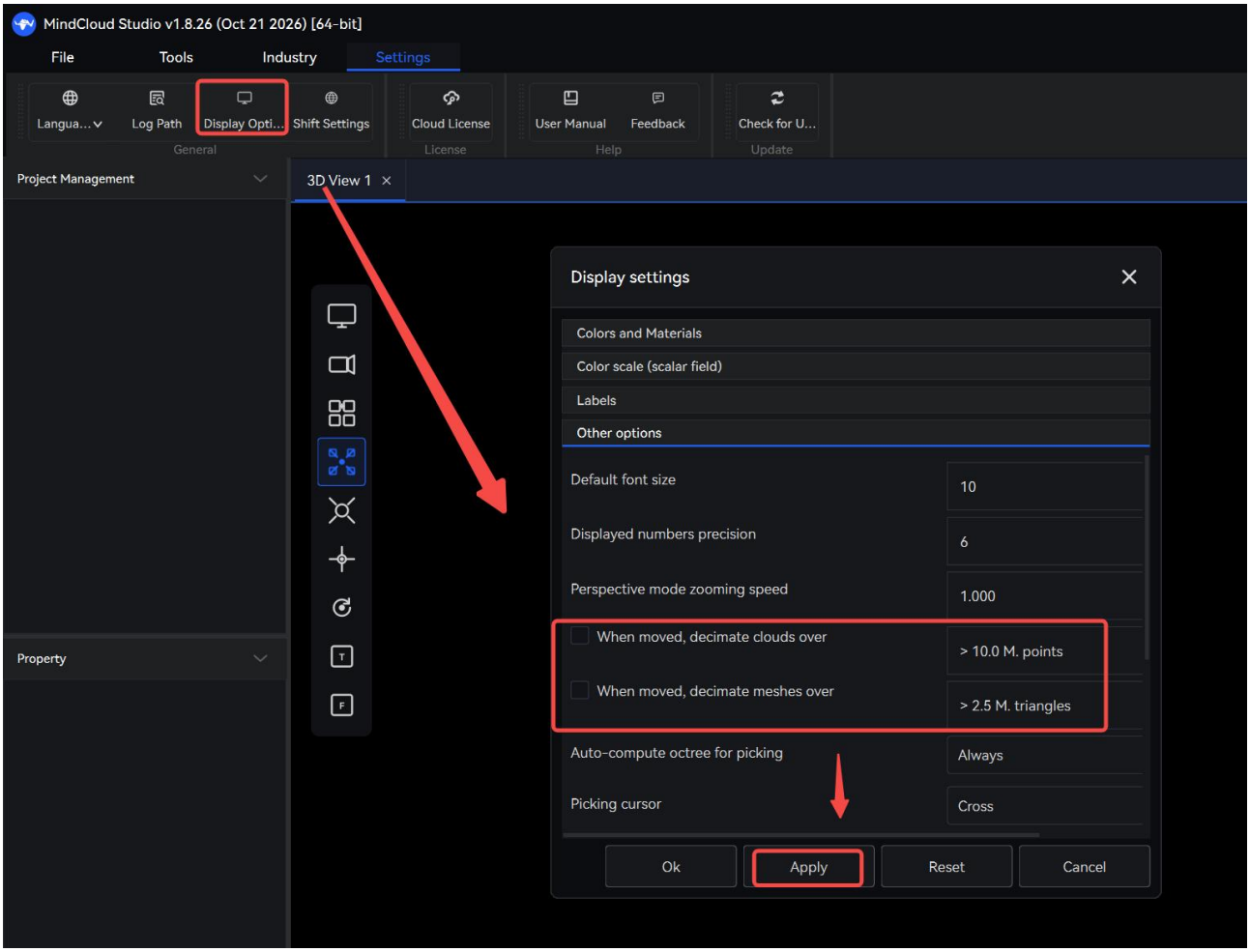




Switch language

4.2 Block Loading

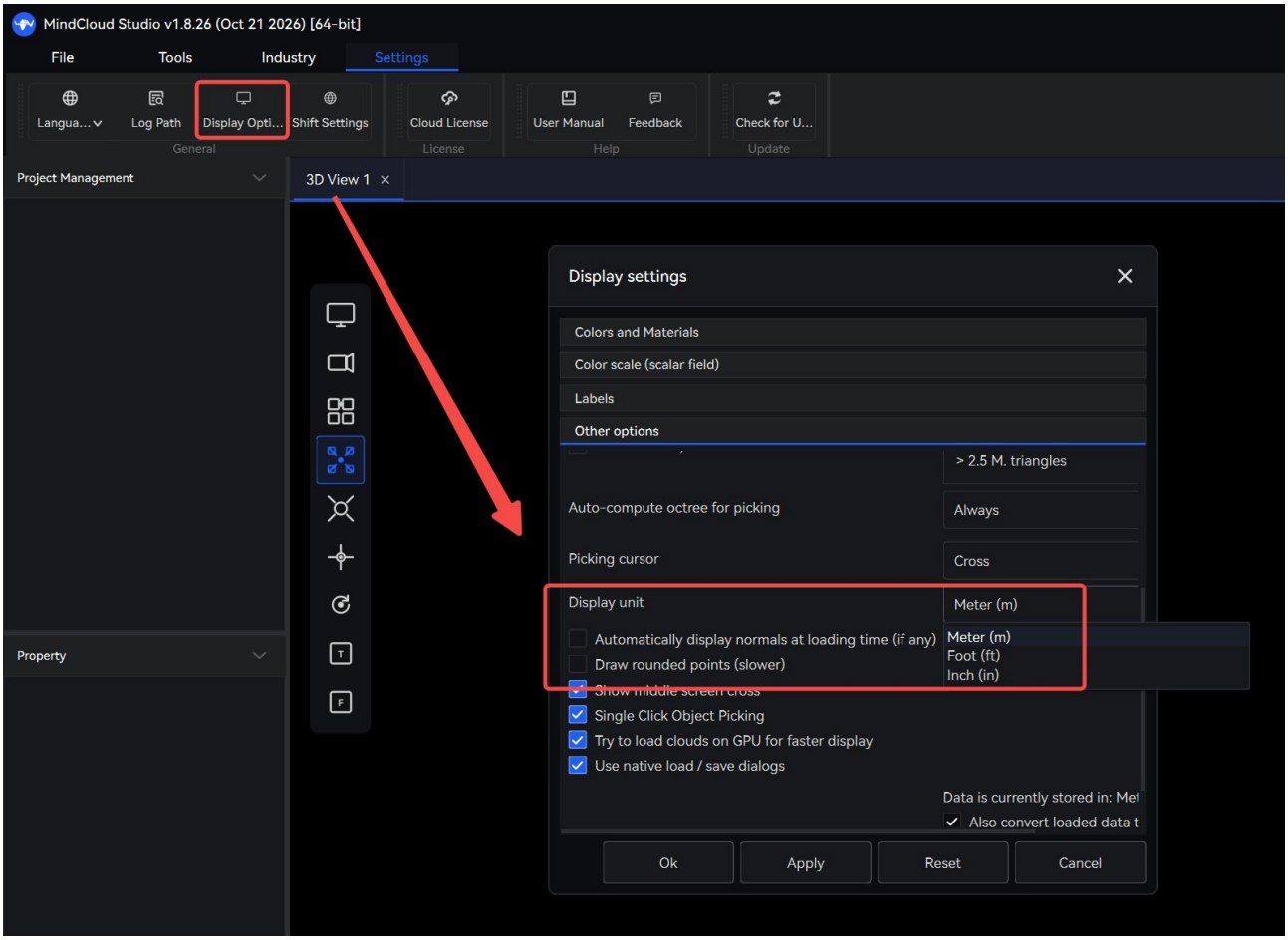
(1) In the 3D view window, click the "Display Settings" shortcut button, check the "Move Simplification" option, and save with the configured values. Unchecking this option will fully load the data.



Block Loading

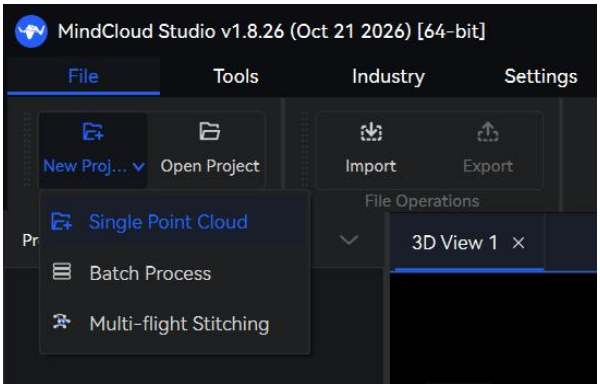
4.3 Changing Display Units

(1) By default, the numerical unit in MindCloud Studio is set to meters (m). You can change this to feet (ft) or inches (in) in the display settings/window



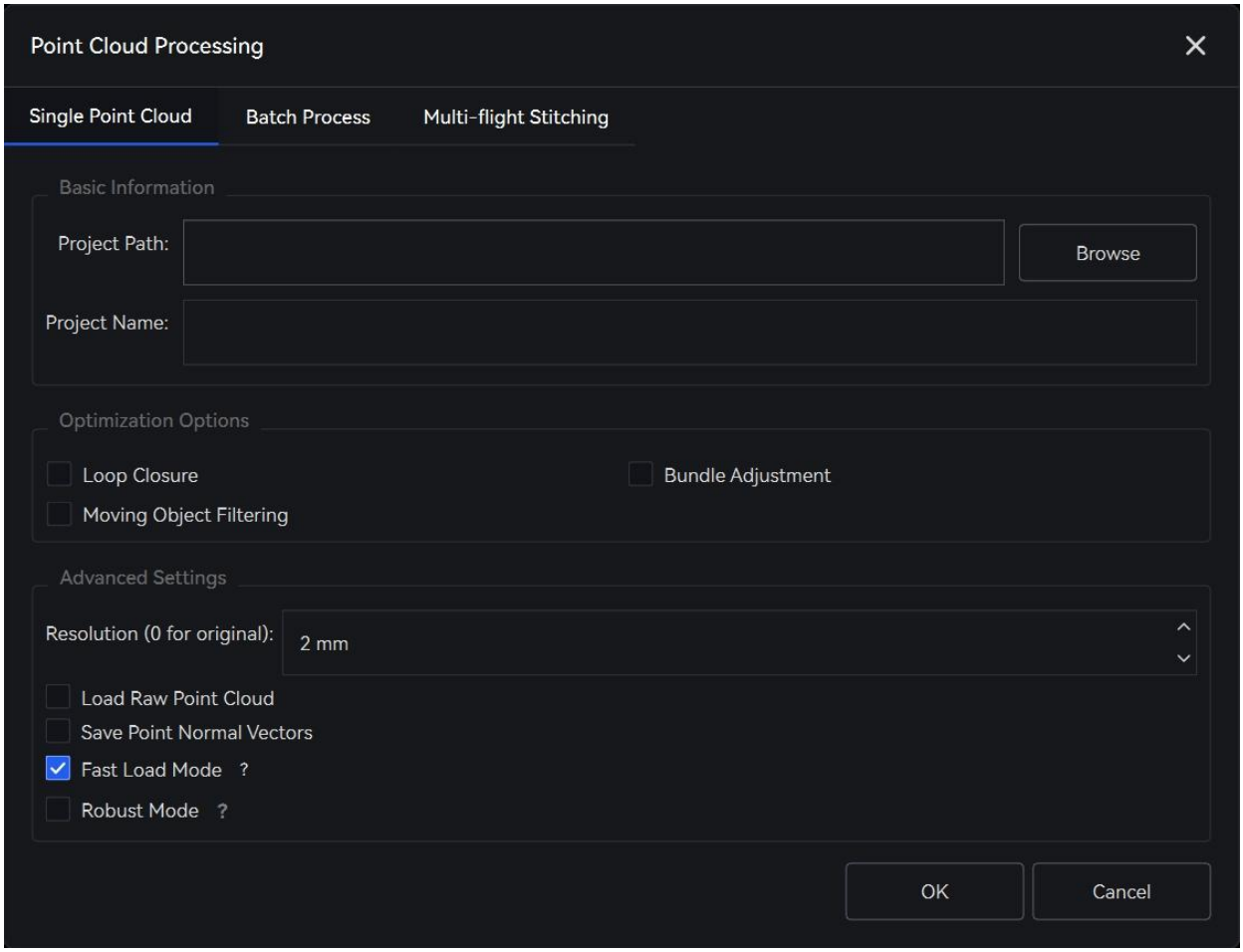
4.4 Task Creation and Point Cloud Loading

(1) Click "Single Point Cloud" under "New Project" to enter the point cloud processing configuration interface.



Click on the Single Point Cloud

(2) In the configuration interface, you can select the point cloud to load based on the path, choose standard optimization options, and configure parameters such as point cloud resolution, loading the raw point cloud, saving point cloud normal vectors, fast load mode and robust mode.



Point Cloud Processing Configuration Interface

(3) There are three standard optimization options: loop detection, adjustment optimization, and moving object filtering, each serving the following purposes:

- Loop Closure: Used to determine whether the SLAM scanner has re-scanned previously traversed scenes, thereby correcting cumulative errors. This technique is typically employed when scanning paths intersect or overlap, eliminating layering effects caused by accumulated errors in repetitive scenes and enhancing the map's integrity and consistency.
- Bundle Adjustment: Eliminates minor errors in local scenes and, through comprehensive calculation, distributes the errors uniformly across the entire scene rather than accumulating them solely at the periphery. This approach reduces noise and subtle layering effects, effectively decreasing the point cloud thickness.
- Moving Object Filtering: Reduces the point cloud of moving objects during scanning, primarily targeting noise from passing pedestrians and vehicles.

(4) Point cloud resolution refers to the distance between points, measured in millimeters, and controls the density and detail accuracy of the point cloud. A smaller value indicates a denser point cloud with richer details; the default is 2 mm, while 0 mm and 1 mm represent the original resolution.

(5) Loading the raw point cloud means that both the original and optimized point clouds are output during processing, which consumes extra computing resources.

(6) The saving of point cloud normal vectors refers to calculating and outputting the normals of each point in the point cloud relative to the surface during point cloud processing.

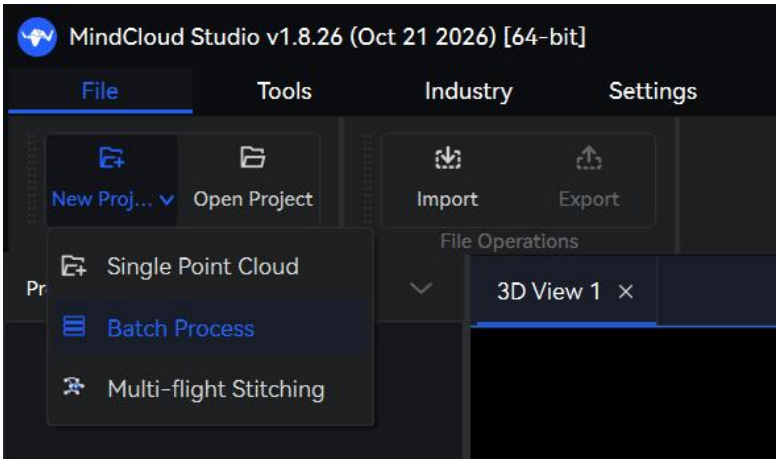
(7) Dynamic point cloud loading refers to the automatic adjustment of the number of loaded points based on available memory, which enables nearly lossless compression to reduce memory usage and processing time.

(8) The Robust Mode refers to switching to this processing mode, which significantly reduces memory usage by leveraging the hard drive, though it offers slower processing speeds and requires sufficient disk space—making it suitable for running large-scale point clouds on memory-constrained devices. The default mode is Fast Mode, which processes data using memory for maximum speed but demands substantial memory capacity, ideal for small to medium datasets. Robust Mode is only activated when manually selected.

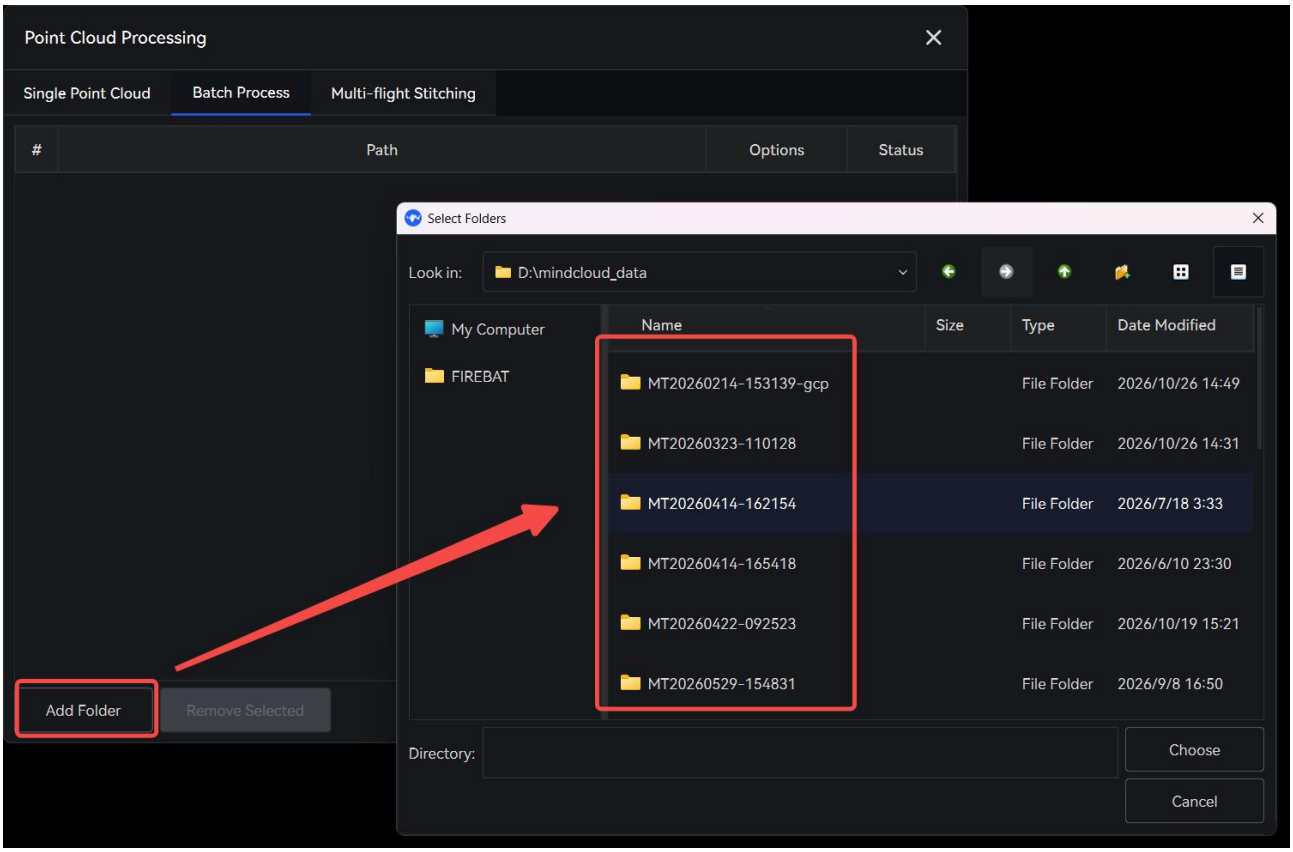
4.5 Batch Processing

You can import multiple sets of engineering data and process them sequentially.

(1) Under the File bar, select "Batch Processing" to import the project data folder to be processed.

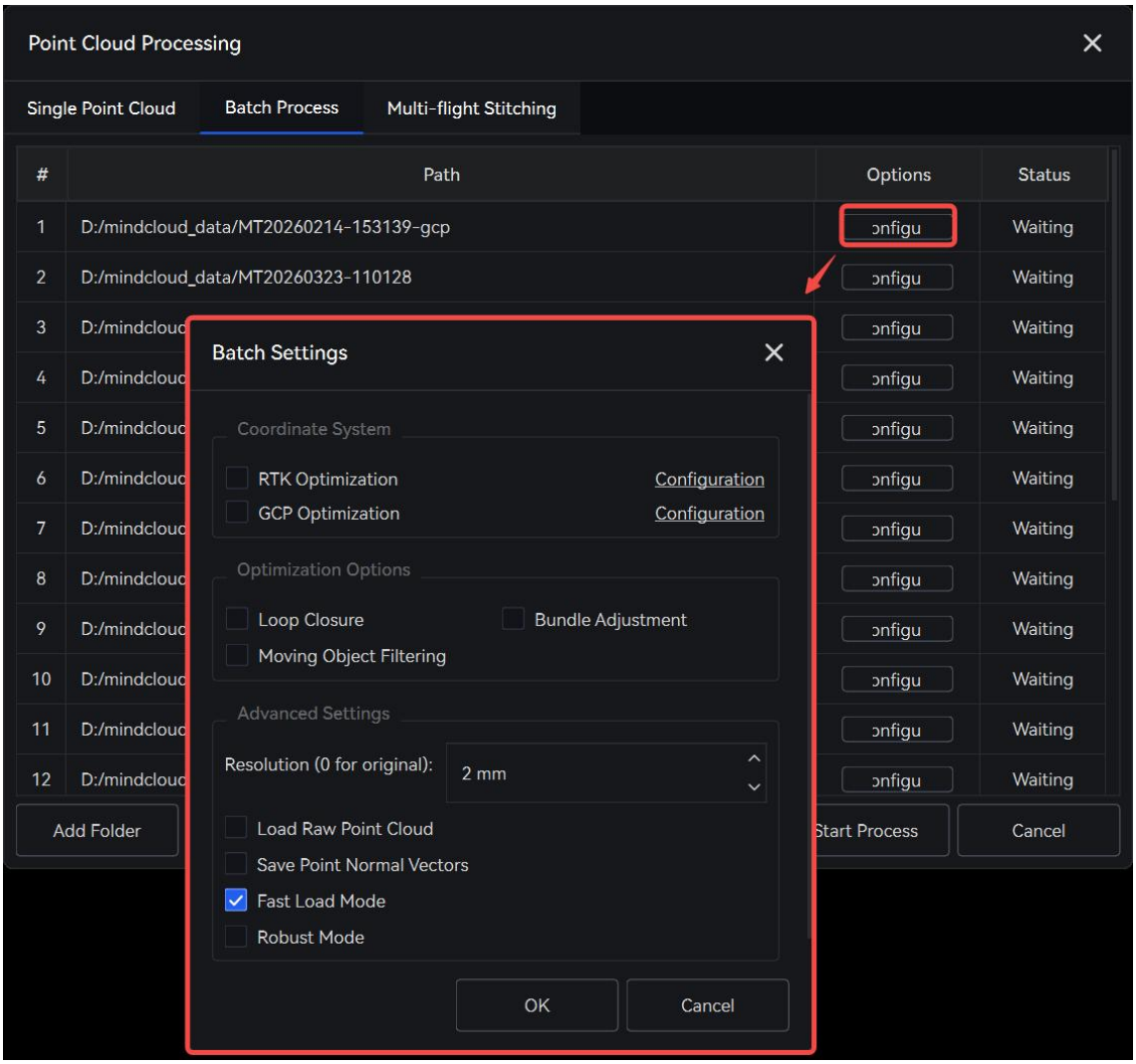


Batch Process



Batch Import

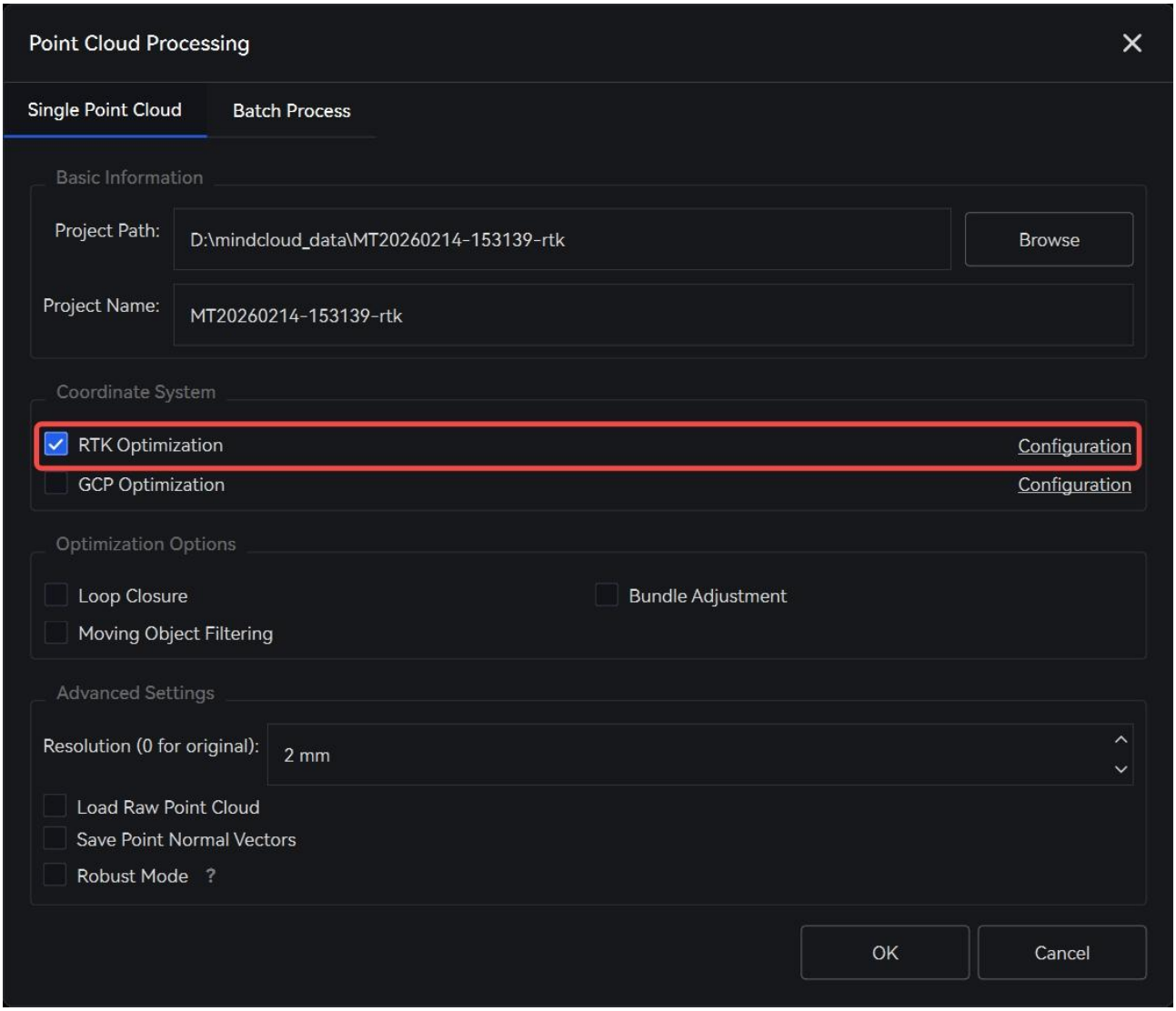
(2) Continue configuring the processing options for each set of engineering data, then start batch processing.



4.6 RTK Optimization

(1) When processing point clouds, if the engineering data contains GNSS positioning data recorded by RTK, RTK optimization is automatically displayed.

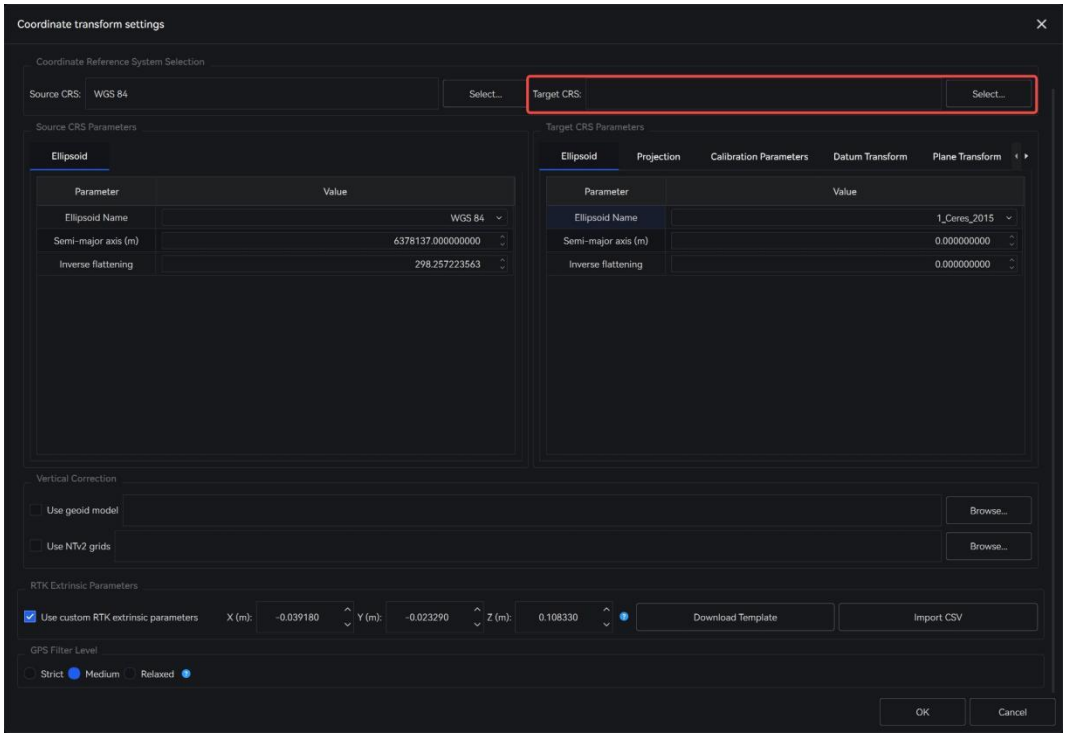
(2) In the Configuration section, you can select a coordinate transformation method. The default is "Coordinate Reference System," which converts the point cloud's relative coordinates to the target ellipsoid + projection coordinate system and may include additional correction parameters.

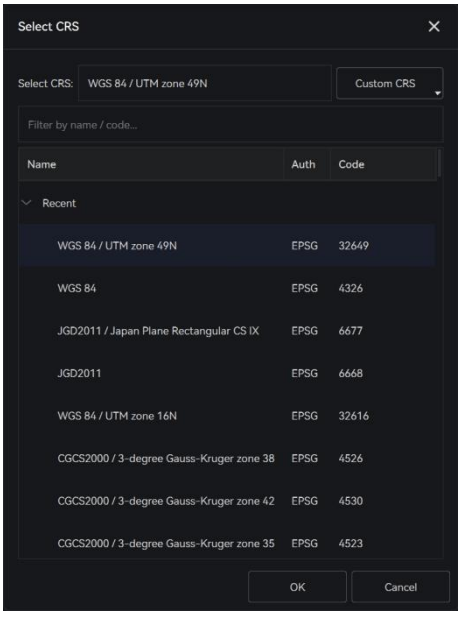


RTK optimal configuration

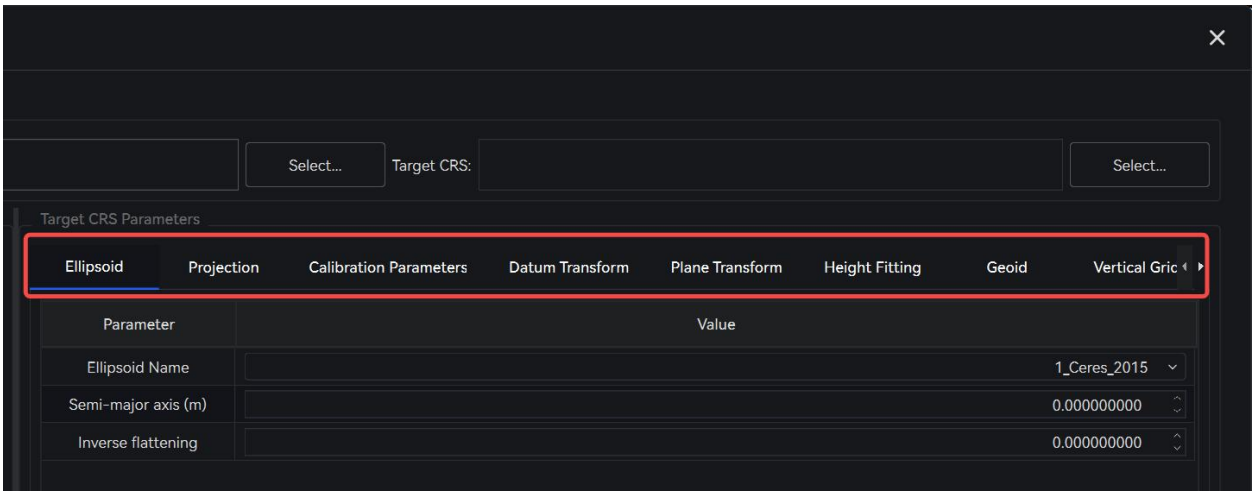
(3) In RTK optimization configuration, the source coordinate reference system automatically reads the coordinate system broadcast by the cors account used within RTK, while the target reference system is the final converted coordinate system, which requires manual configuration.

- The commonly used coordinate system in China is CGCS2000 combined with the Gauss 3-degree zone projection, where the central meridian depends on the local longitude;
- Additionally, the internationally recognized WGS84 + UTM projection transformation method is employed.

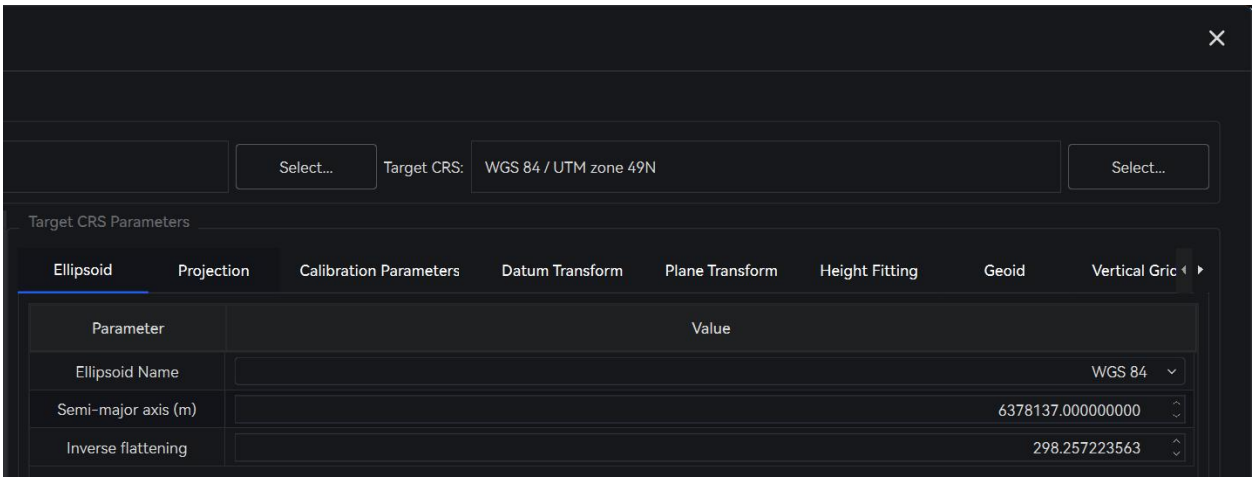




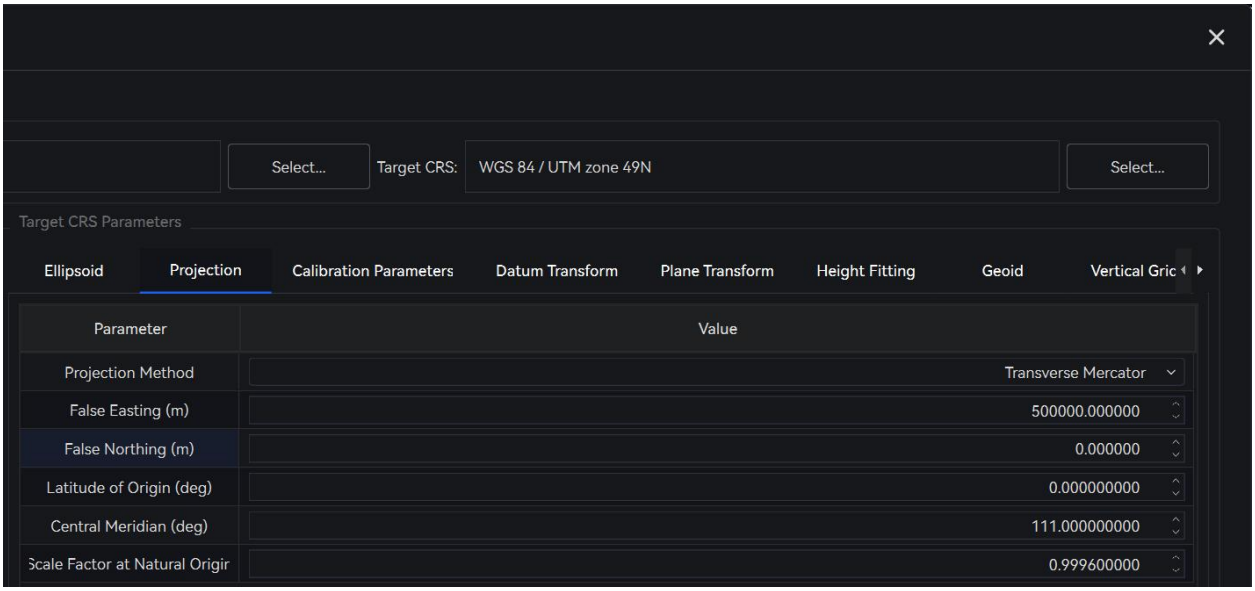
(4) Meanwhile, within the target coordinate system parameters, users can configure various system parameters — including ellipsoid parameters, projection parameters, translation correction (Calibration parameters), seven-parameter (Datum Transform), four-parameter (plane transform), and Height fitting — as well as import the geoid model and NTv2 grid.



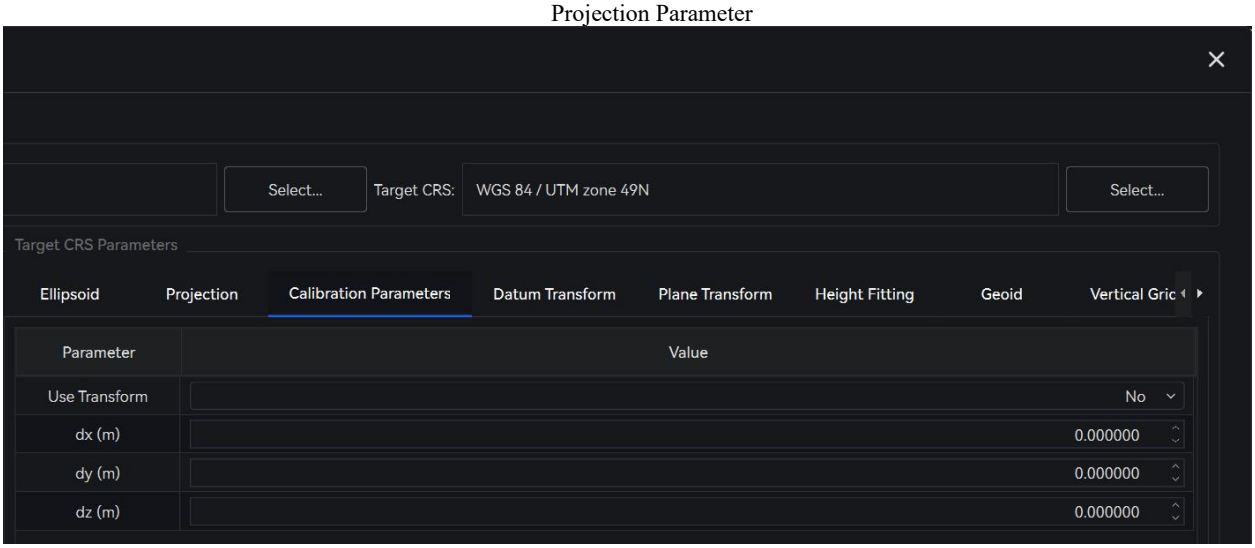
Target CRS Parameters



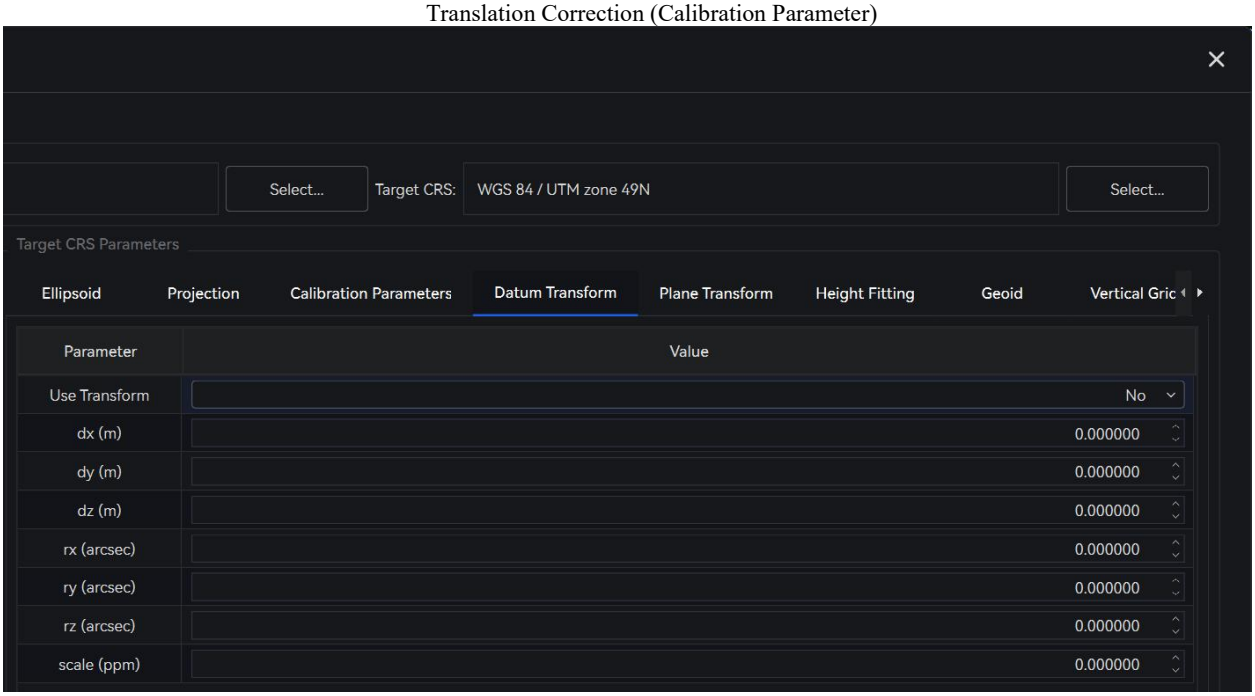
Ellipsoid Parameters



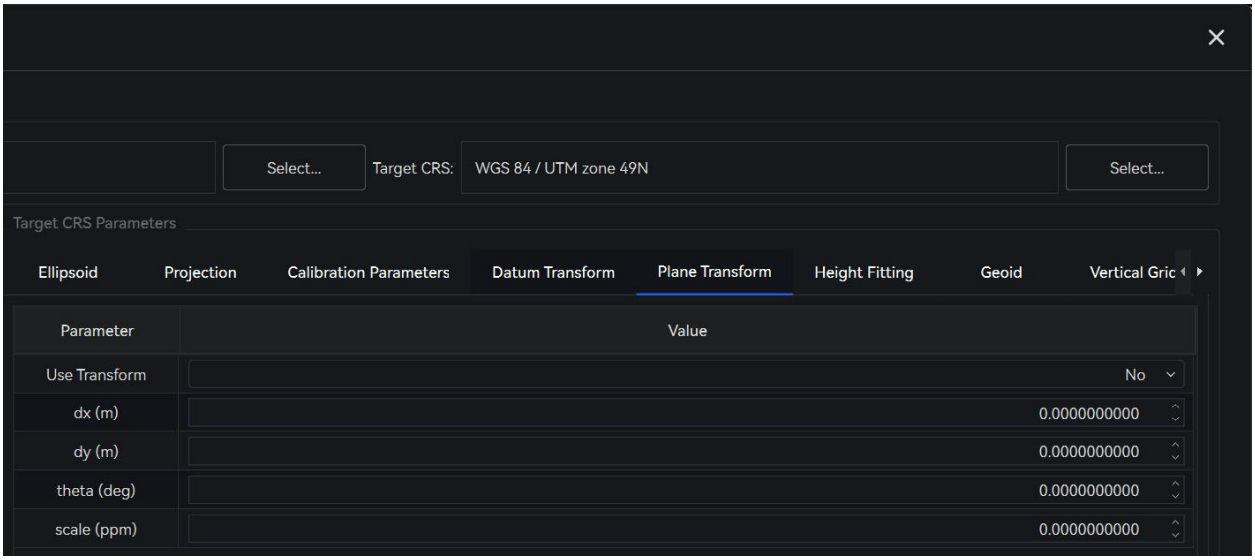
Projection Parameter



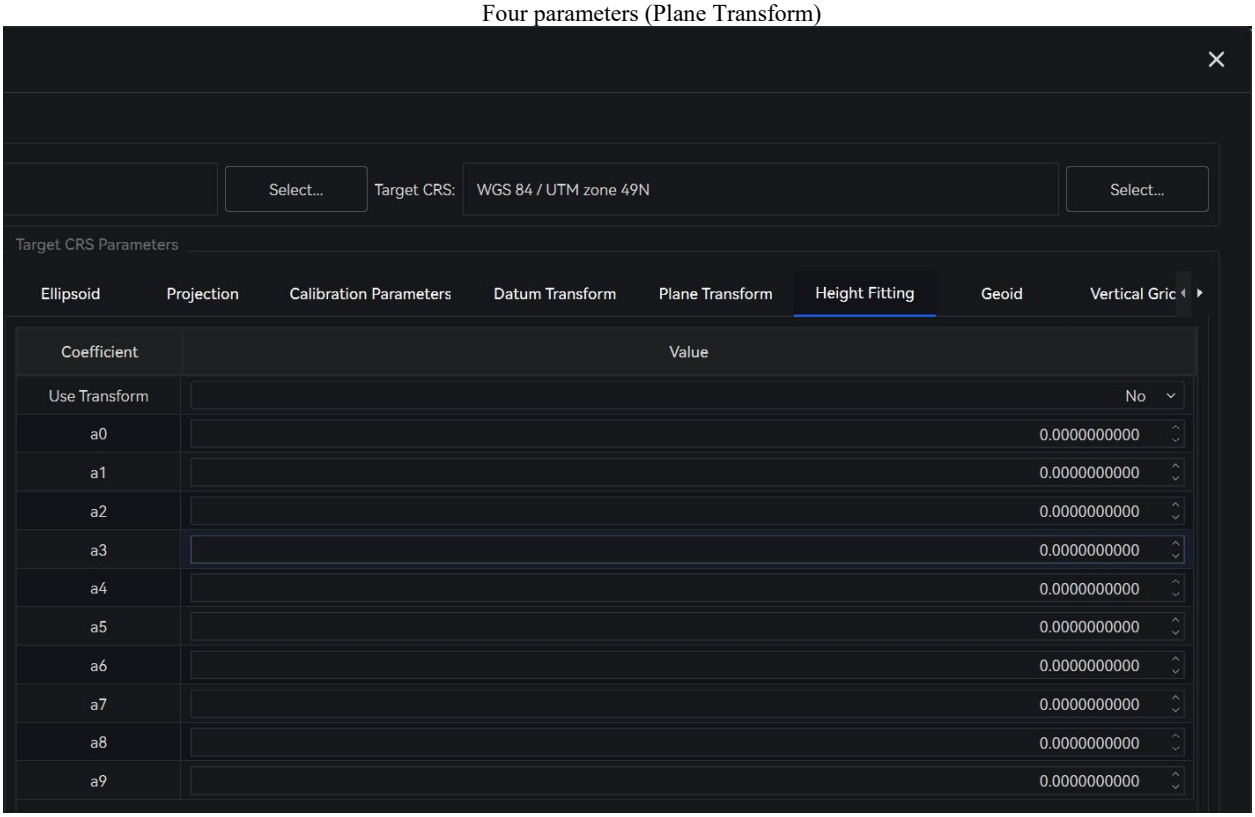
Translation Correction (Calibration Parameter)



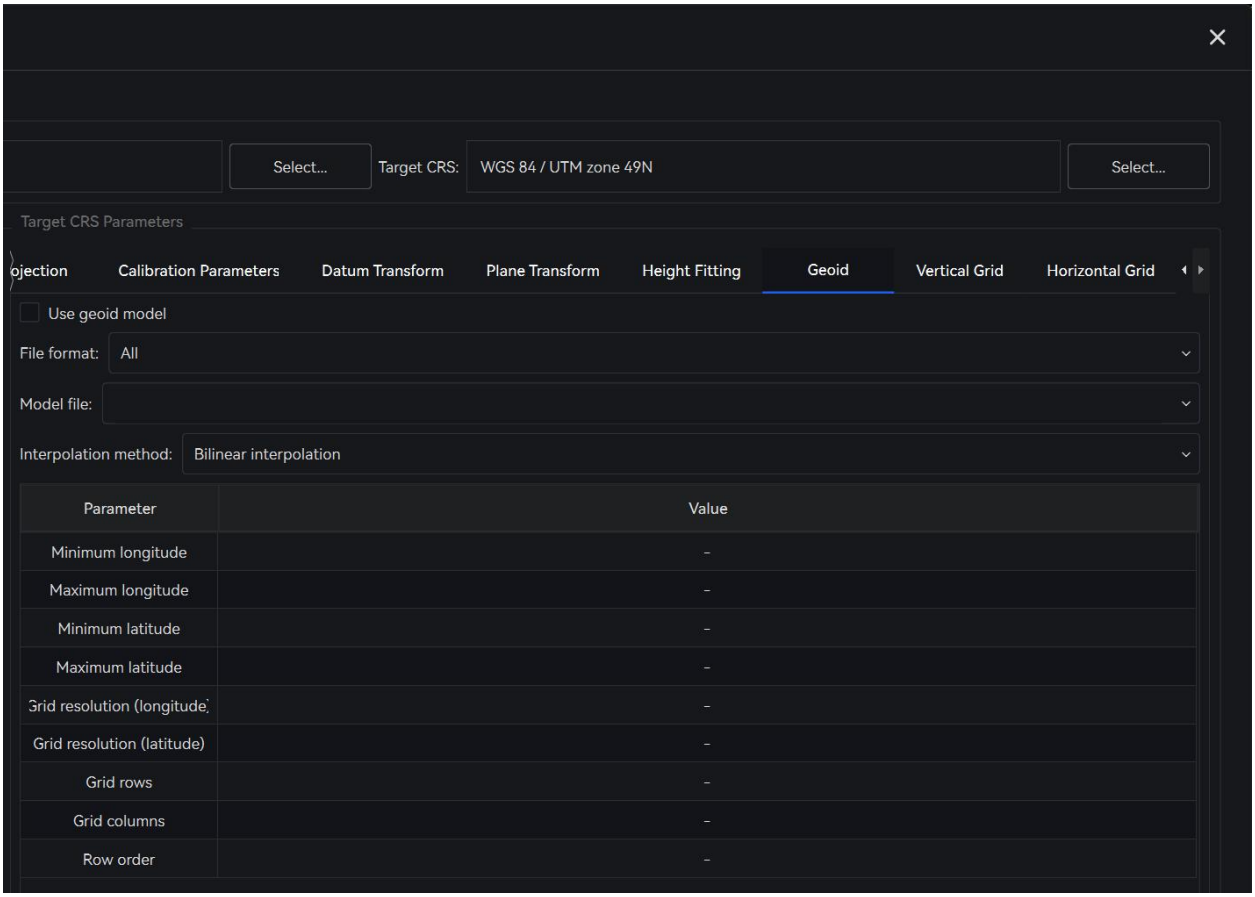
Seven parameters (Datum Transform)



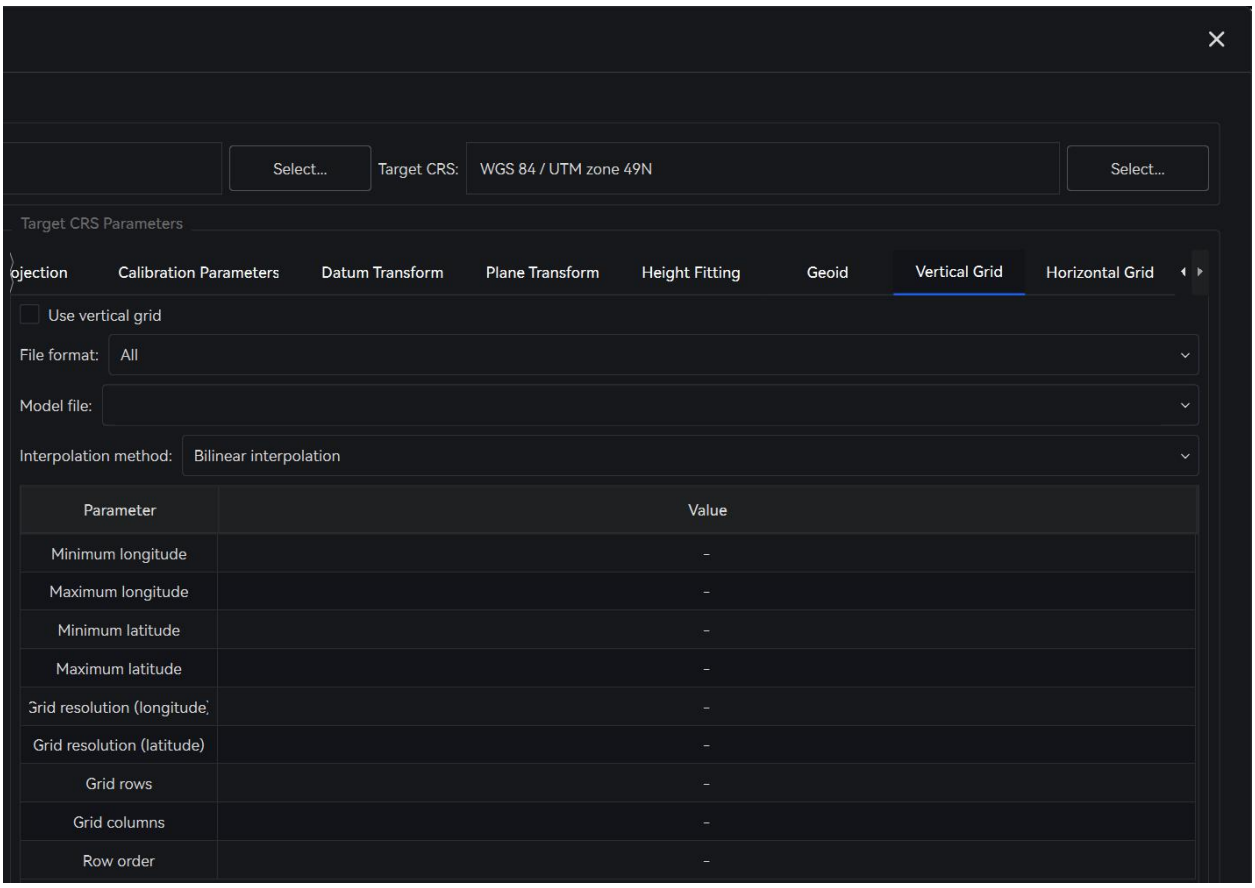
Four parameters (Plane Transform)



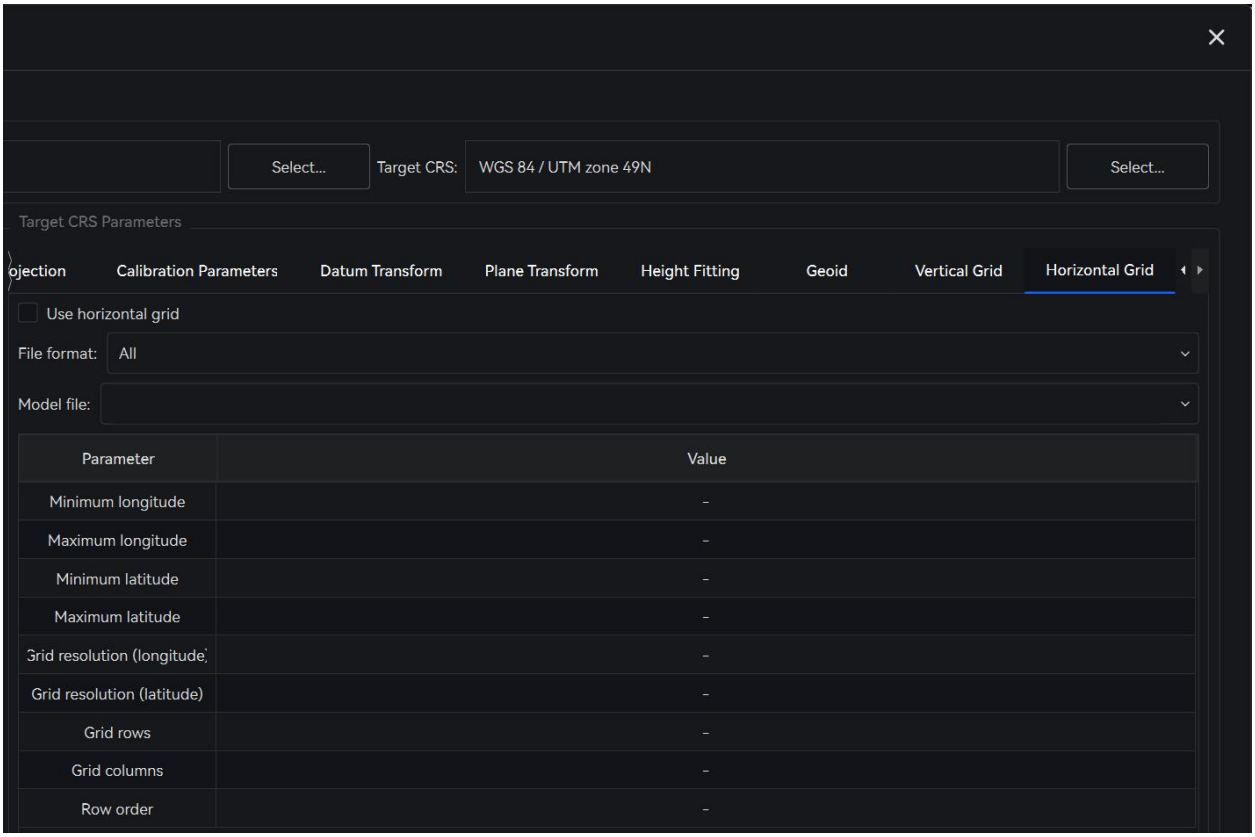
Height Fitting



Geoid

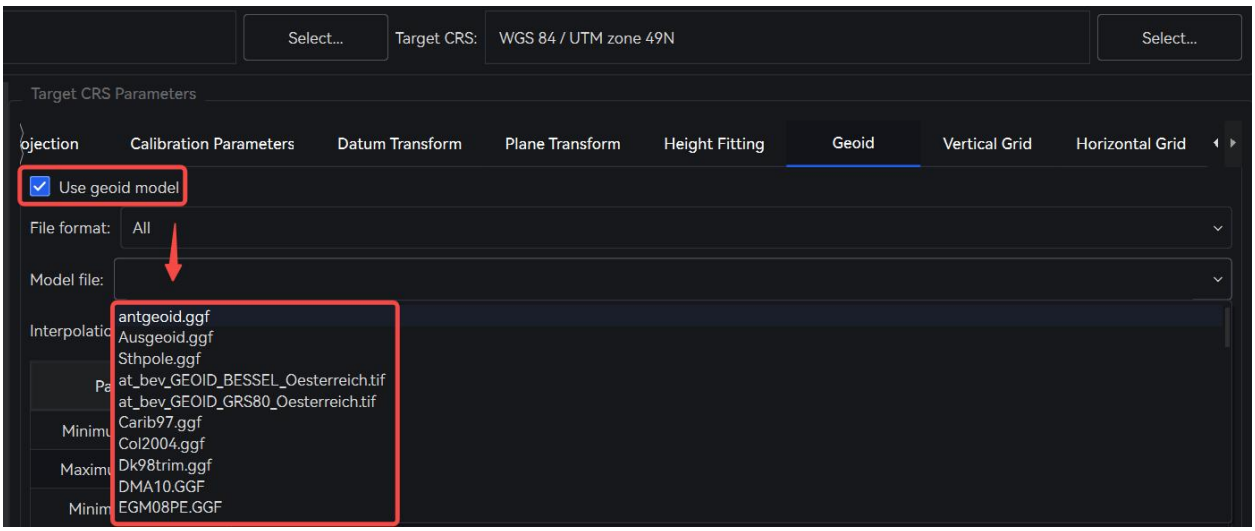


Vertical Grid

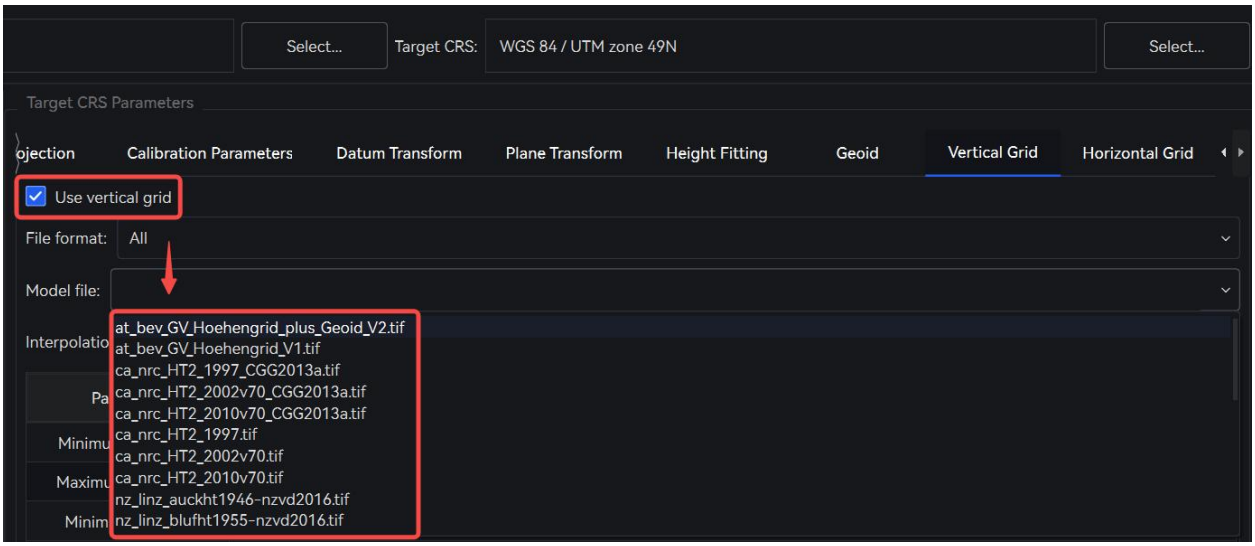


Horizontal Grid

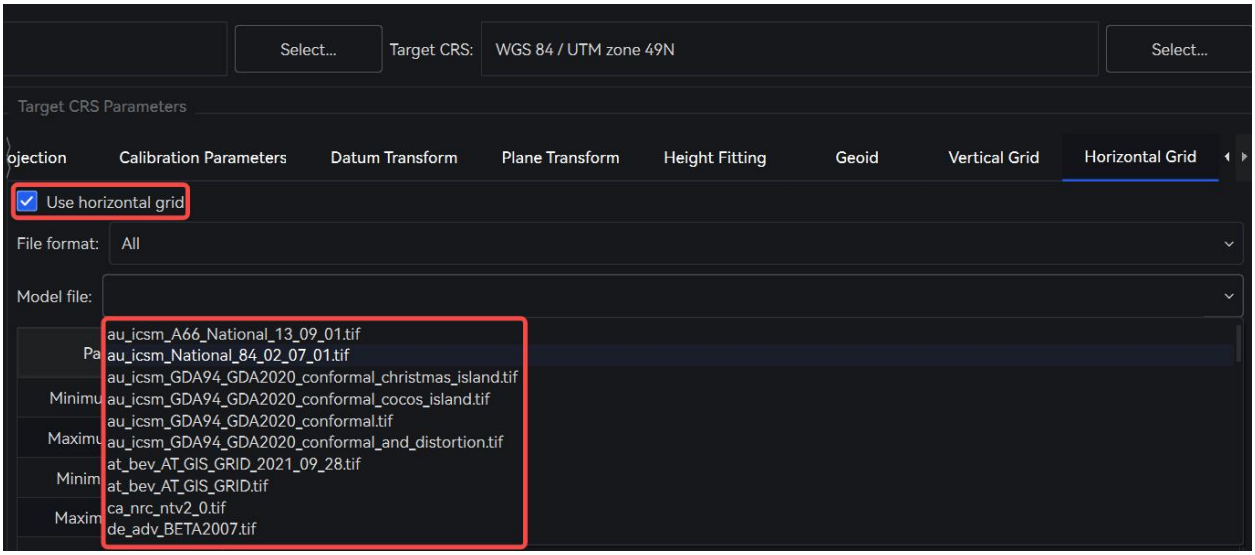
(5) The Geoid, Vertical Grid, and Horizontal Grid options come with built-in common model files. You can apply them as needed or manually import local model files.



Built-in Geoid Model

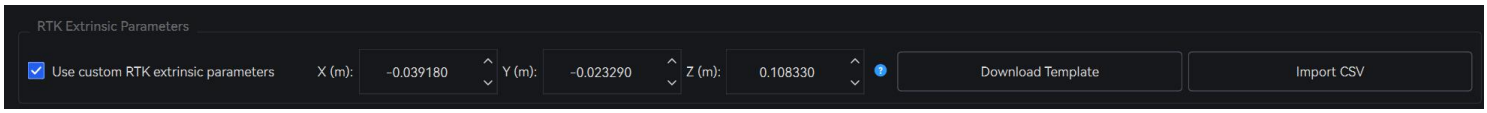


Built-in Vertical Grid



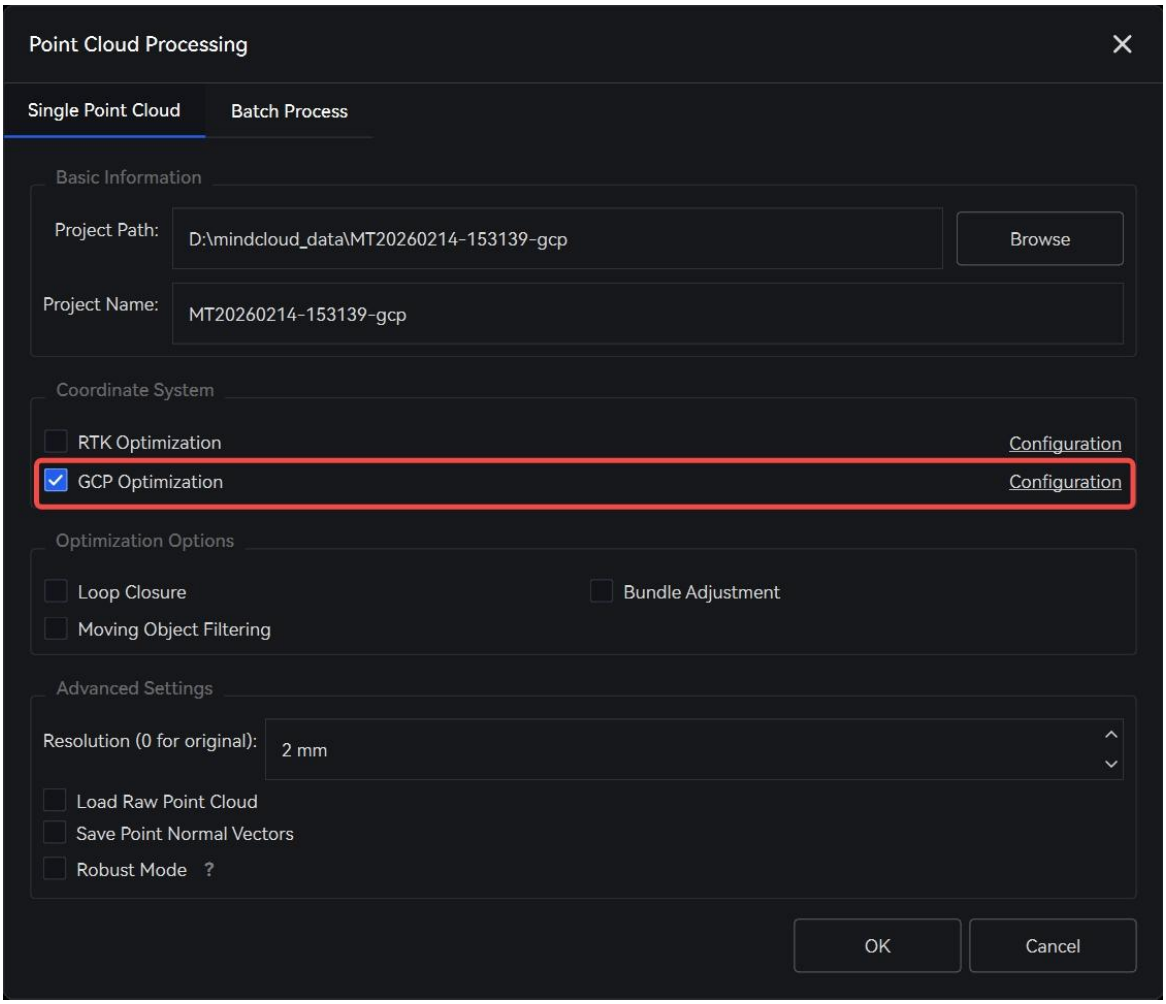
Built-in Horizontal Grid

(6) RTK optimization also allows customization of the external parameters for input RTK frames. However, when using the accompanying frames, no additional steps are required — the software automatically reads the frame's external parameters and applies the default settings directly.



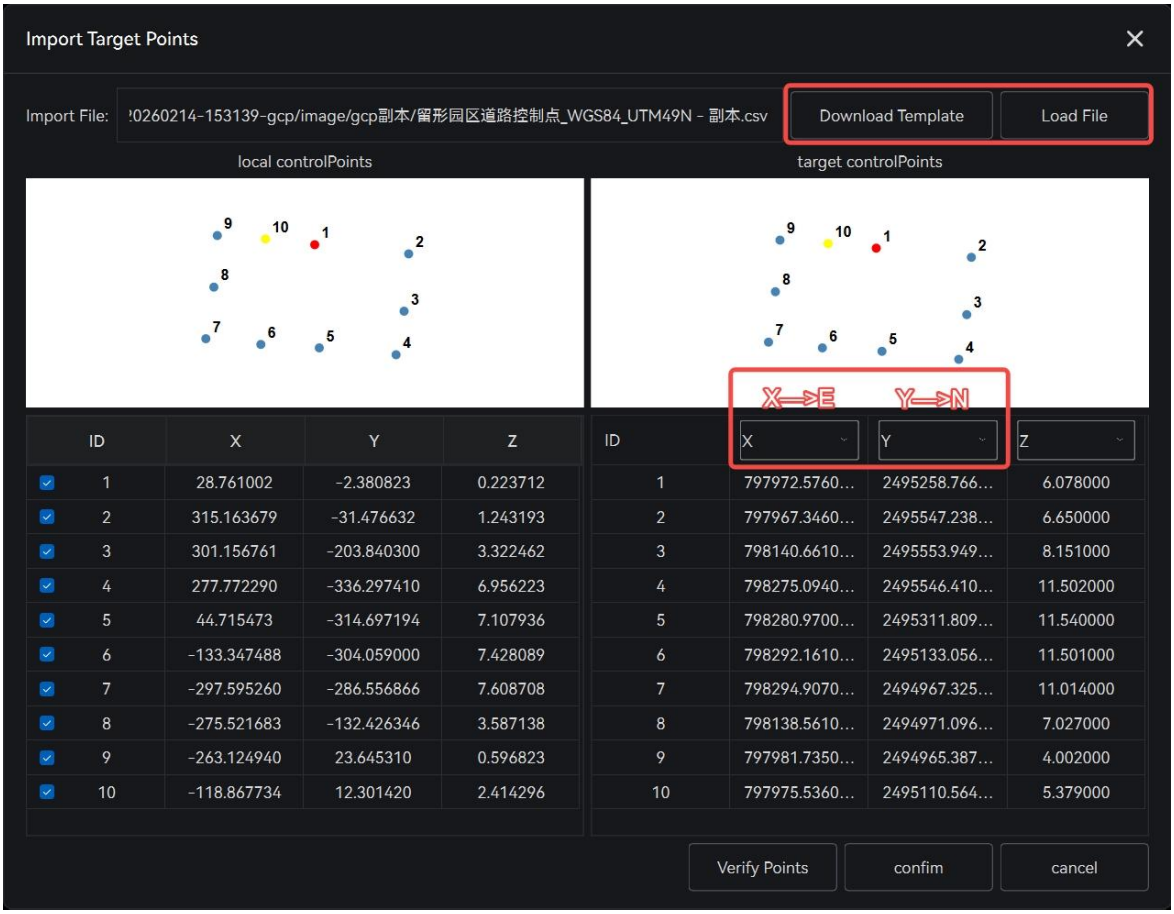
4.7 GCP Optimization

(1) When processing point clouds, if the engineering data contains control point information collected during field surveys, the system automatically displays GCP optimization—specifically, control point optimization.



Control Point Optimization

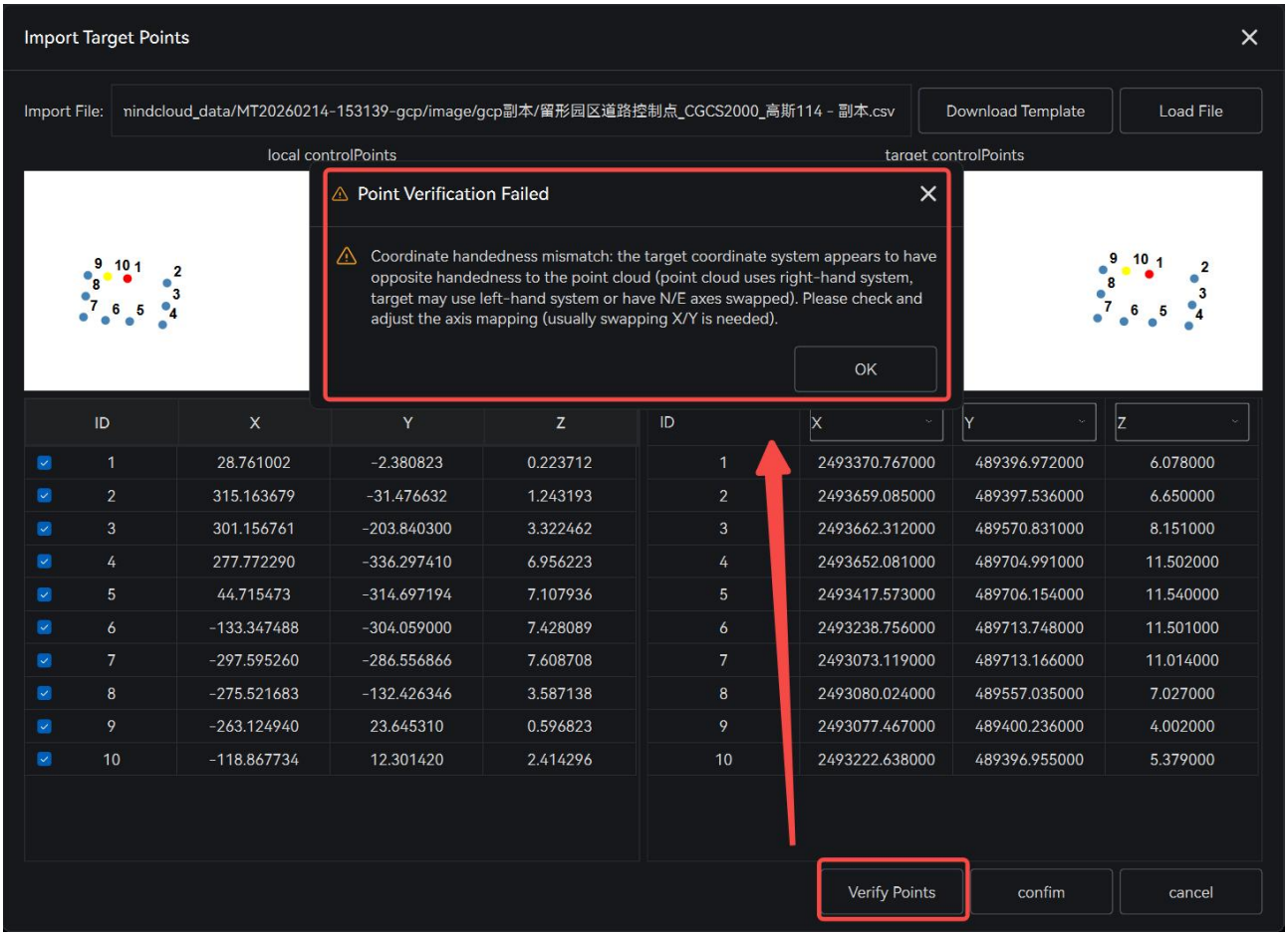
(2) Select Configuration, then import the CSV file containing the geographic coordinate data of control points. Ensure the order of control points matches that in the coordinate file, and correctly map the north and east coordinates to the Y-axis and X-axis, respectively.



Note: Typically, the north coordinate points upward to the Y-axis of the point cloud, and the east coordinate points to the right to the X-axis of the point cloud.

(3) The Control Point Verification checks whether the imported control point file matches the collected points, and provides corresponding error options, including the following:

- Quantity Mismatch between control points and collected points;
- Coordinate Value Magnitude Mismatch between control points and collected points;
- Sequence Mismatch between control points and collected points;
- Coordinate Axis Mismatch between control points and collected points (point cloud right-handed system vs. geographic left-handed system).



(4) The CSV file template containing control point coordinate data is as follows, typically comprising four columns: point number, north coordinate, east coordinate, and elevation, with no header:

	A	B	C	D	E
1	name	E(x)	N(y)	H(z)	
2	1	94322.159	2503967.8	187.312	
3					

Control Point CSV Template

4.8 Multi-flight Stitching

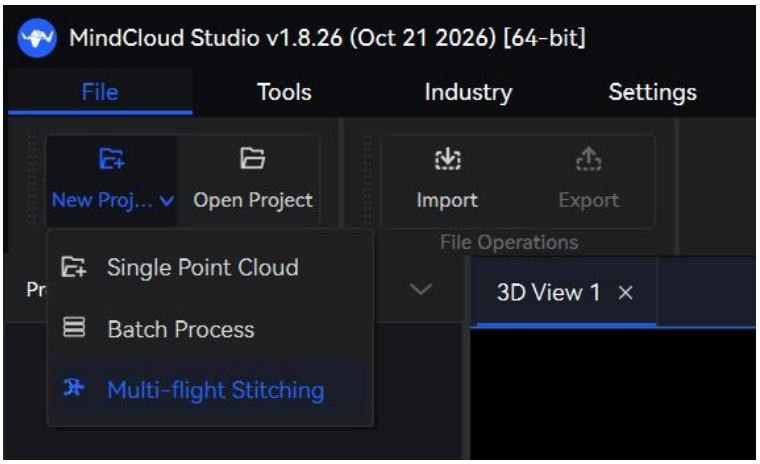
The point cloud data obtained from continuous scanning in the field is jointly solved and automatically stitched according to a single flight.

Note: Continuous scanning requires that each subsequent scan set begins at the same position and orientation as the previous set's endpoint, as shown below:

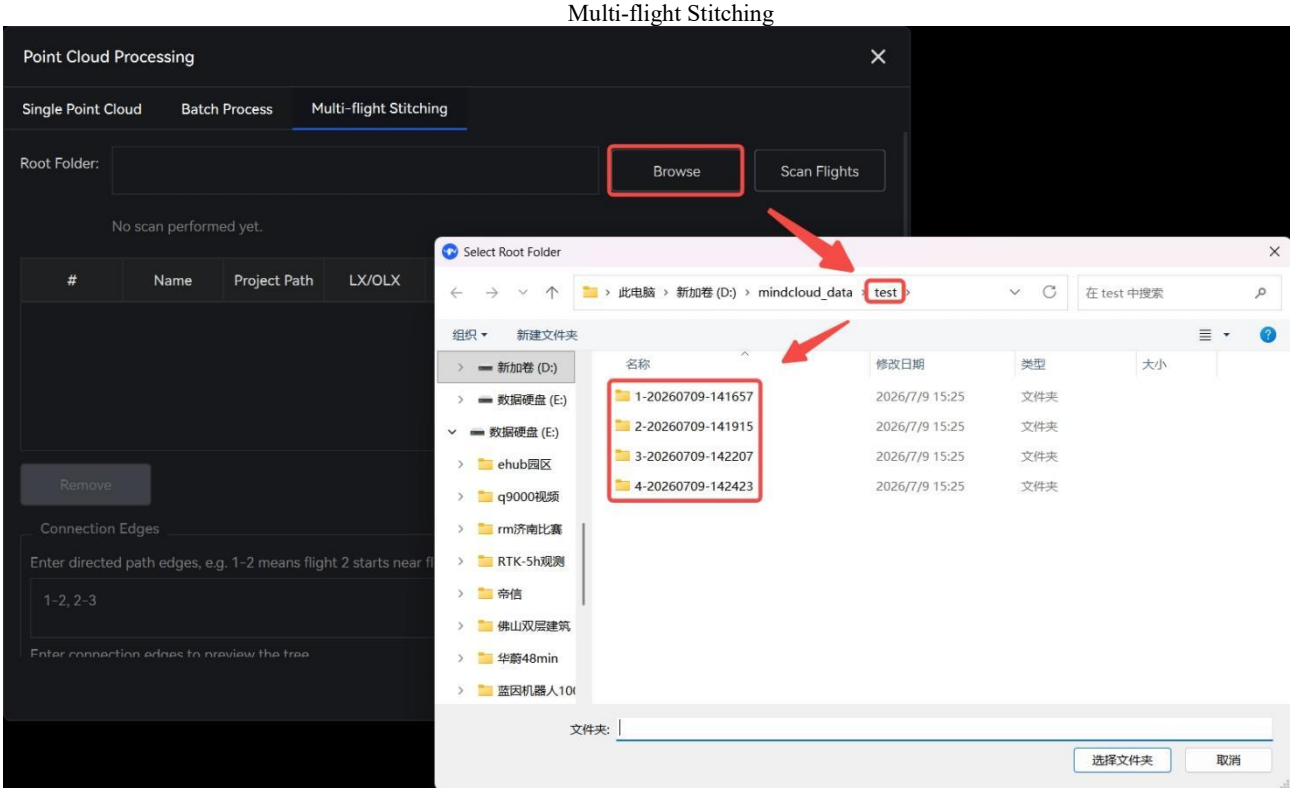


Fieldwork requirements

(1) Under the File bar, select "Multi-flight Stitching", and click "Browse" to import the project data from the specified folder;

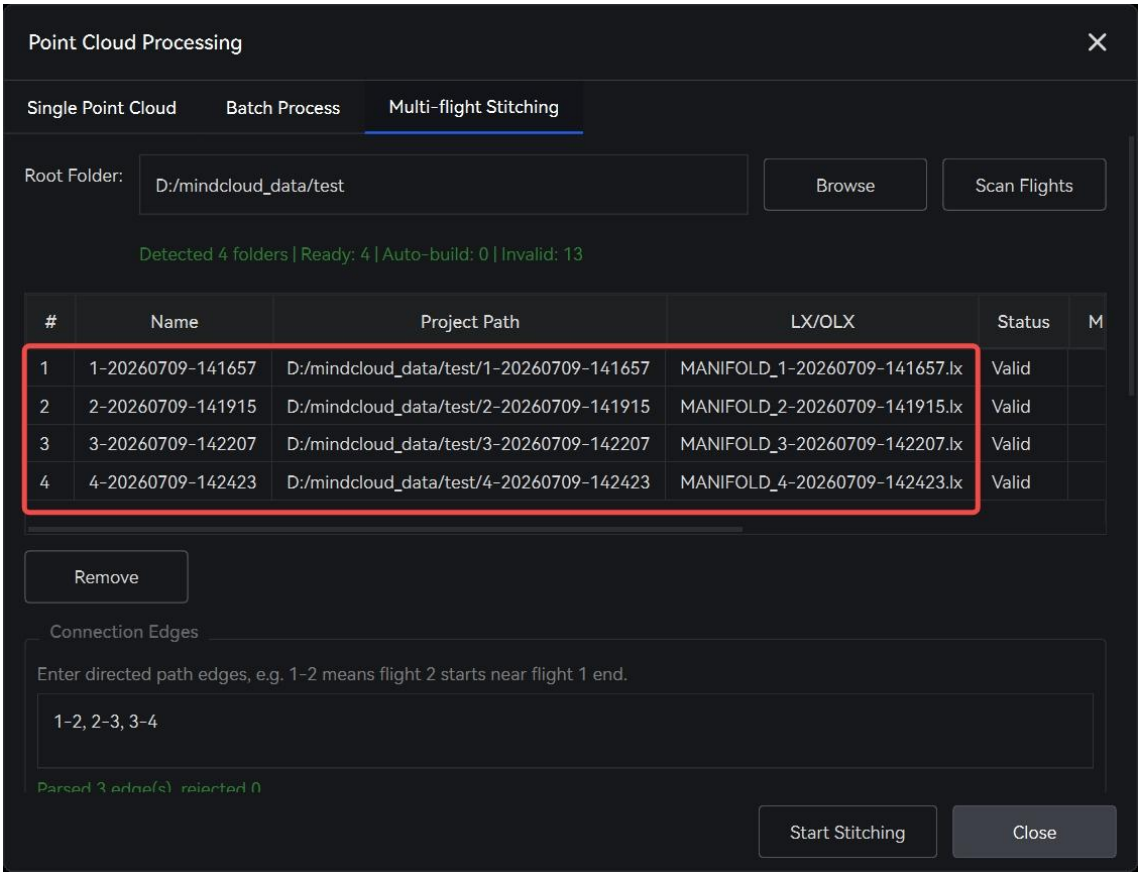


Multi-flight Stitching

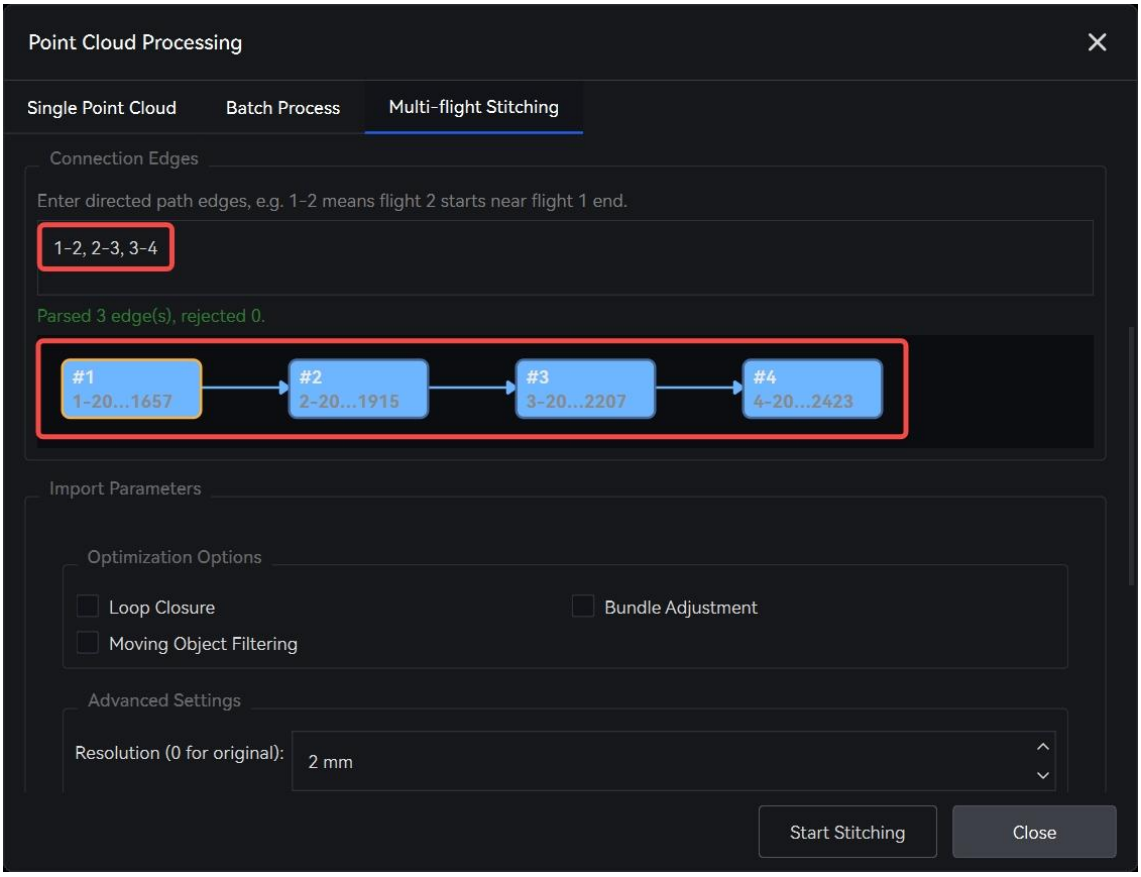


Import

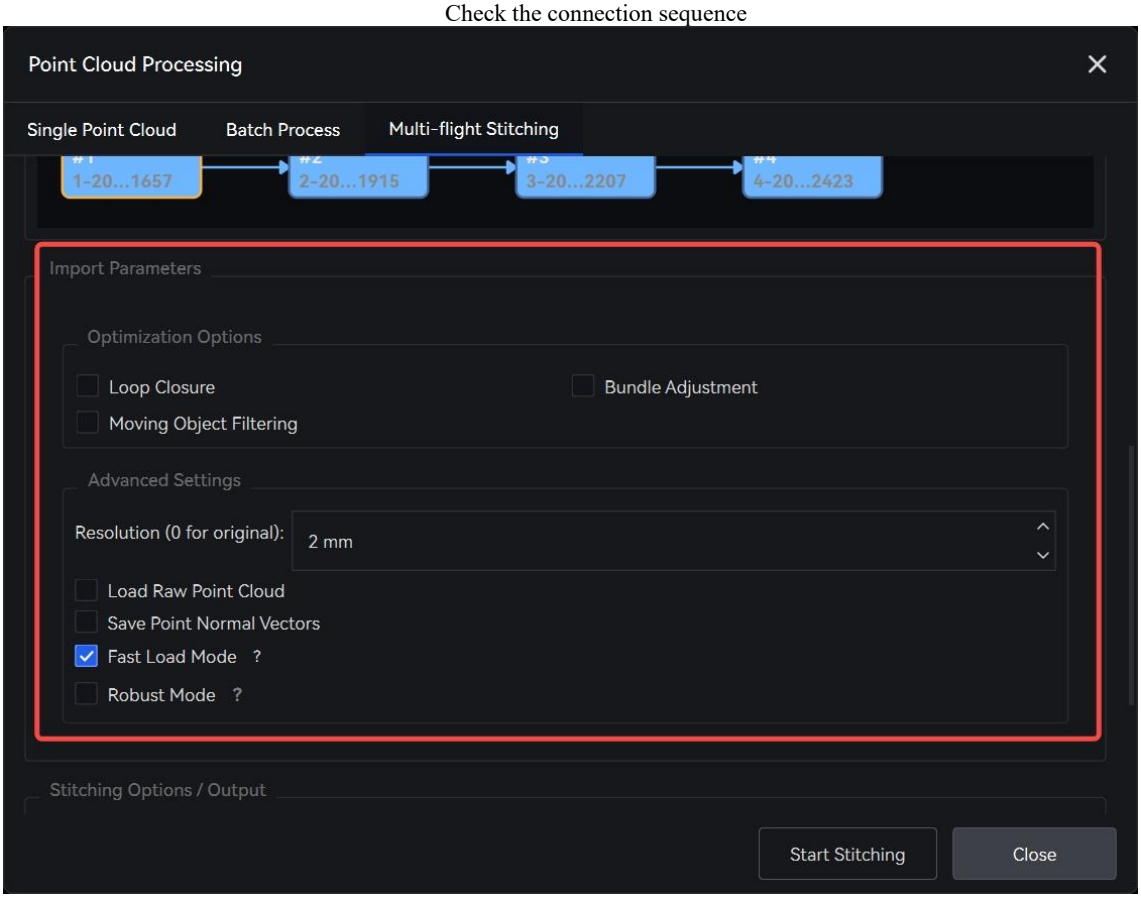
(2) After successful import, it is necessary to check whether the connection sequence automatically recognized by the software is consistent with that during field data collection, and configure optimization options;



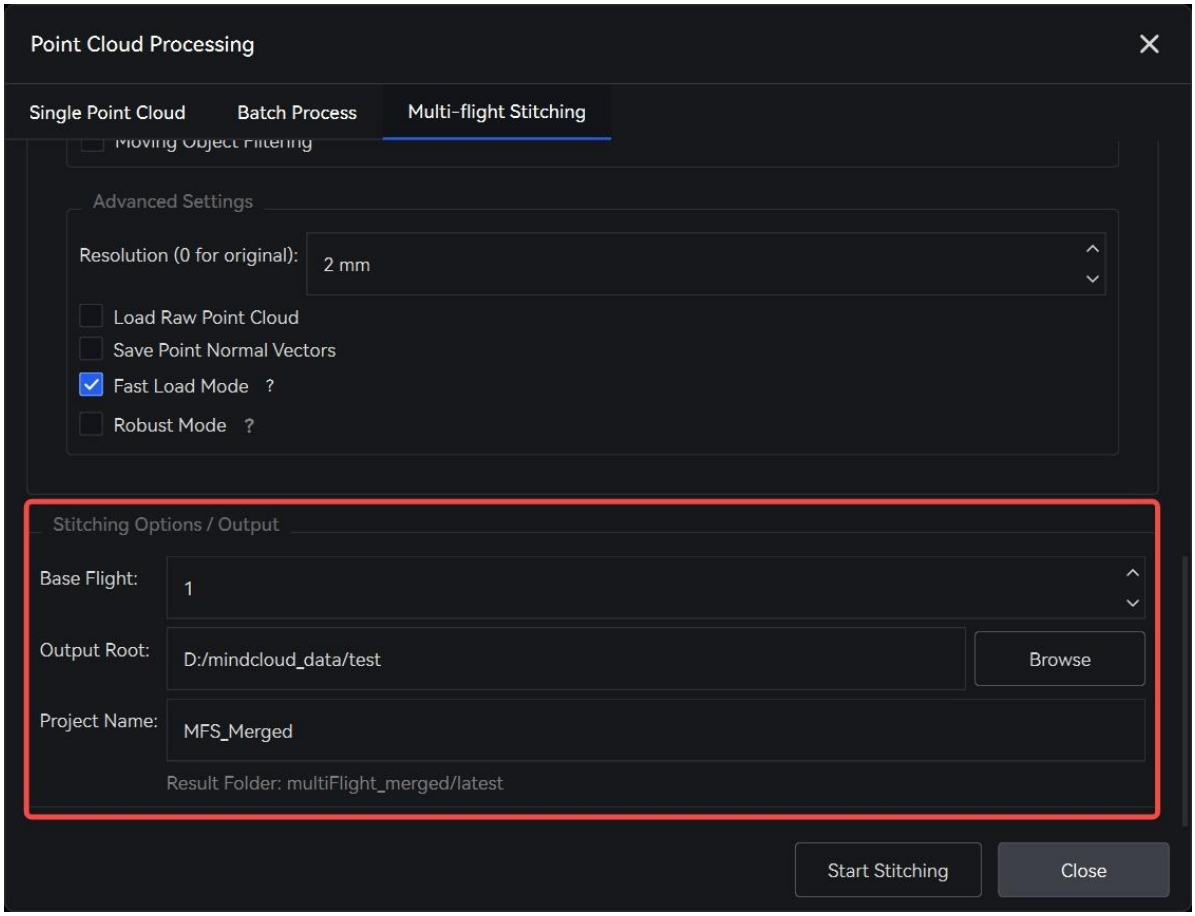
Engineering data from the same flight



Check the connection sequence

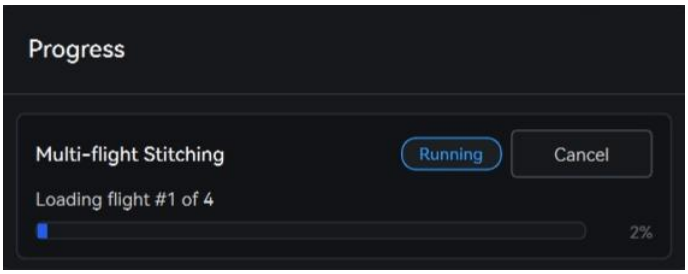


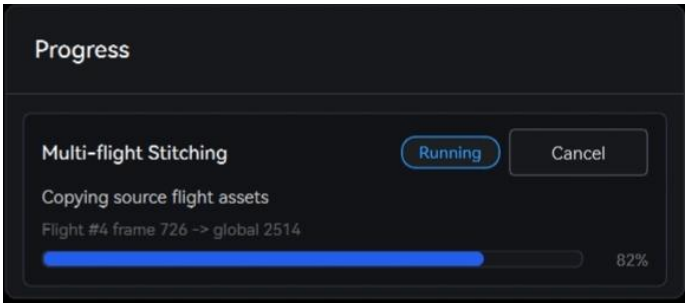
Configuration optimization options

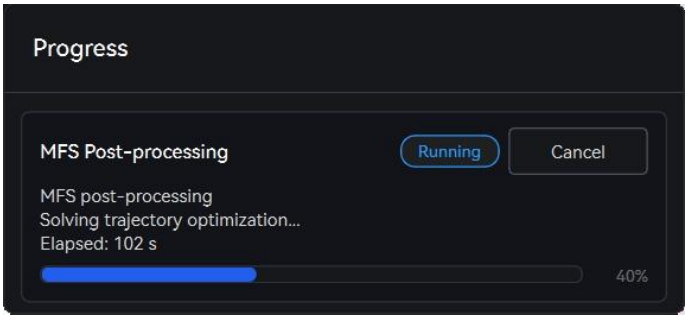

Point Cloud Processing
Single Point Cloud
Batch Process
Multi-flight Stitching
Advanced Settings
Resolution (0 for original):
2 mm
Load Raw Point Cloud
Save Point Normal Vectors
Fast Load Mode ?
Robust Mode ?
Stitching Options / Output
Base Flight:
1
Output Root:
D:/mindcloud_data/test
Browse
Project Name:
MFS_Merged
Result Folder: multiFlight_merged/latest
Start Stitching
Close

Output

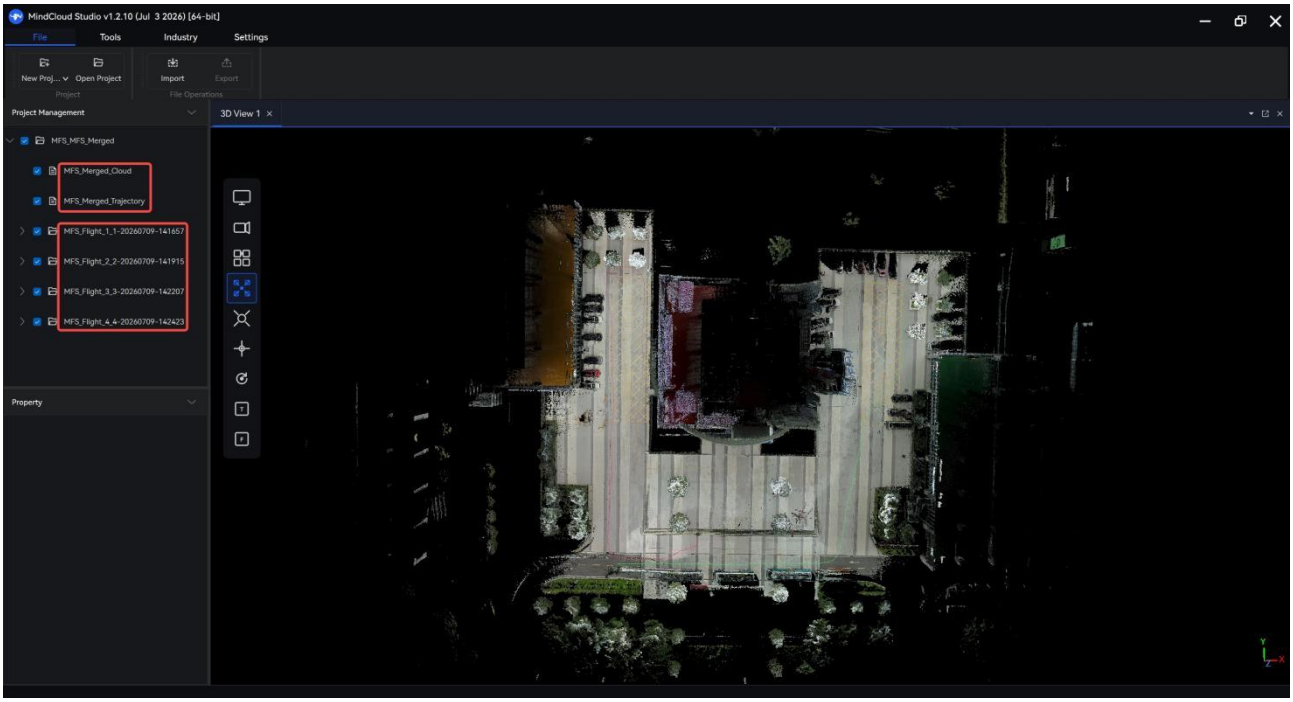
(3) Waiting for joint solution and automatic stitching;







(4) After processing, "MFS_Merged" in the directory represents the complete point cloud after automatic stitching, while "MFS_Flight" represents the independent point cloud before stitching.

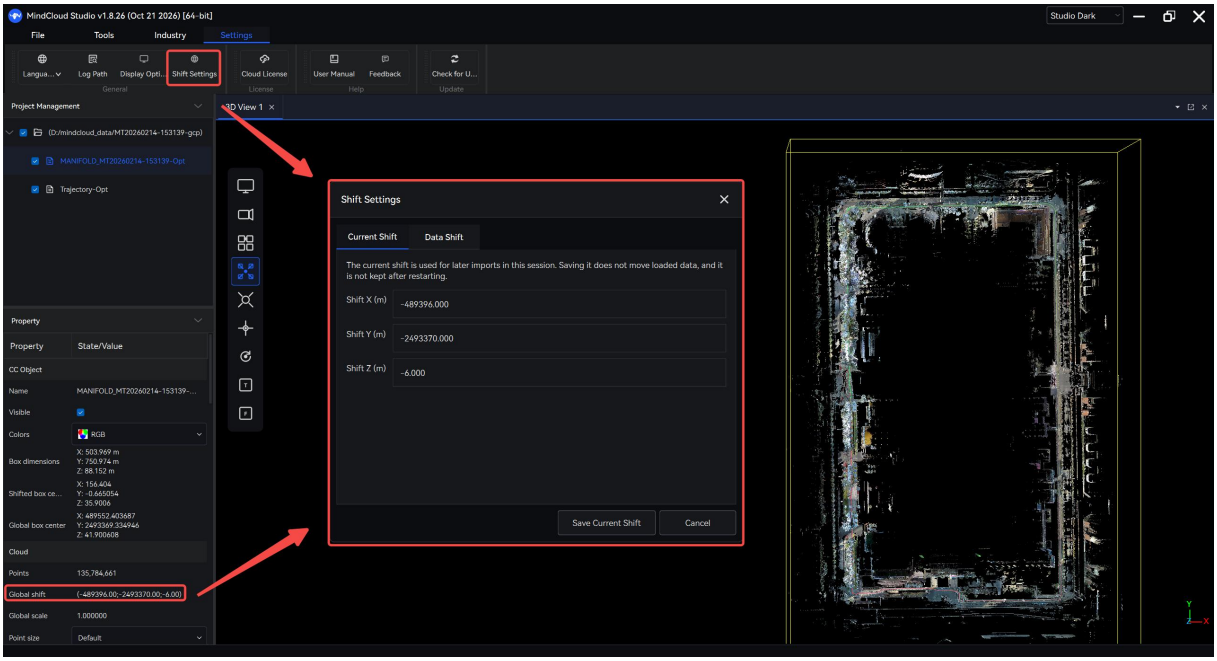


Automatically stitched complete point cloud

4.9 Global Shift Settings

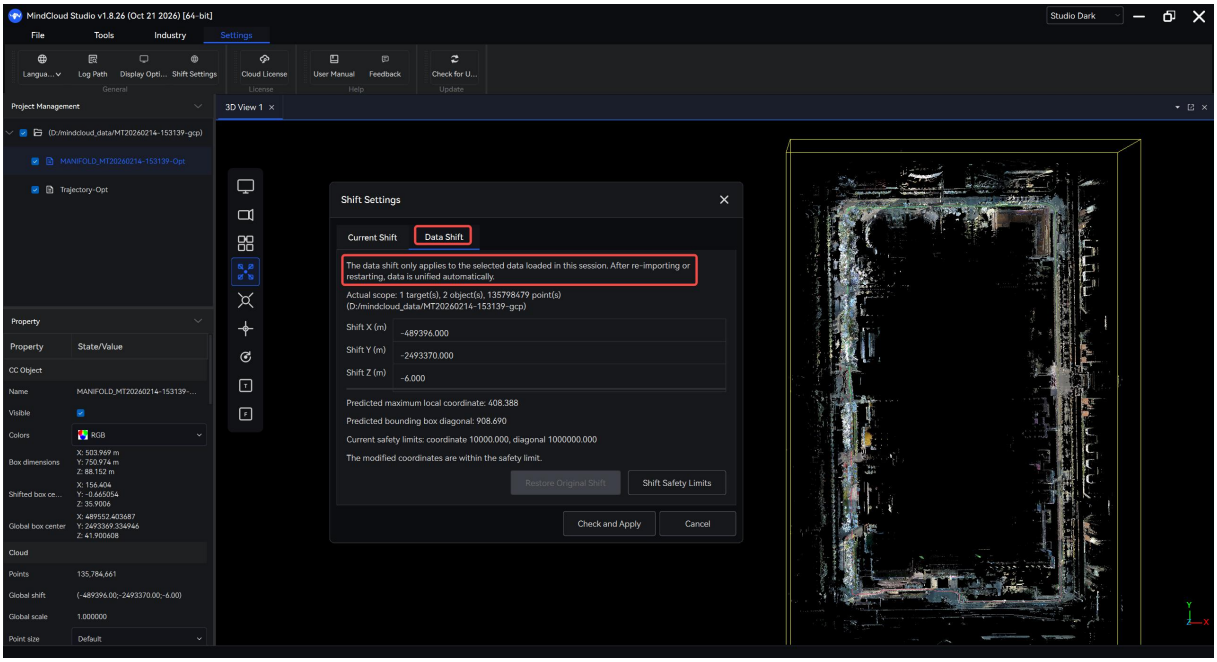
After checking RTK optimization or GCP optimization and completing the processing, the point cloud data will automatically generate a global shift based on the coordinate origin or the scan starting point, to align and match with the specified coordinate system.

(1) In the settings bar, click the Shift Settings icon to set a unified global shift for the current 3D space, facilitating the matching of point clouds with other point files;



Default Shift

(2) Alternatively, you can select a specific point cloud and set a non-uniform shift for it.

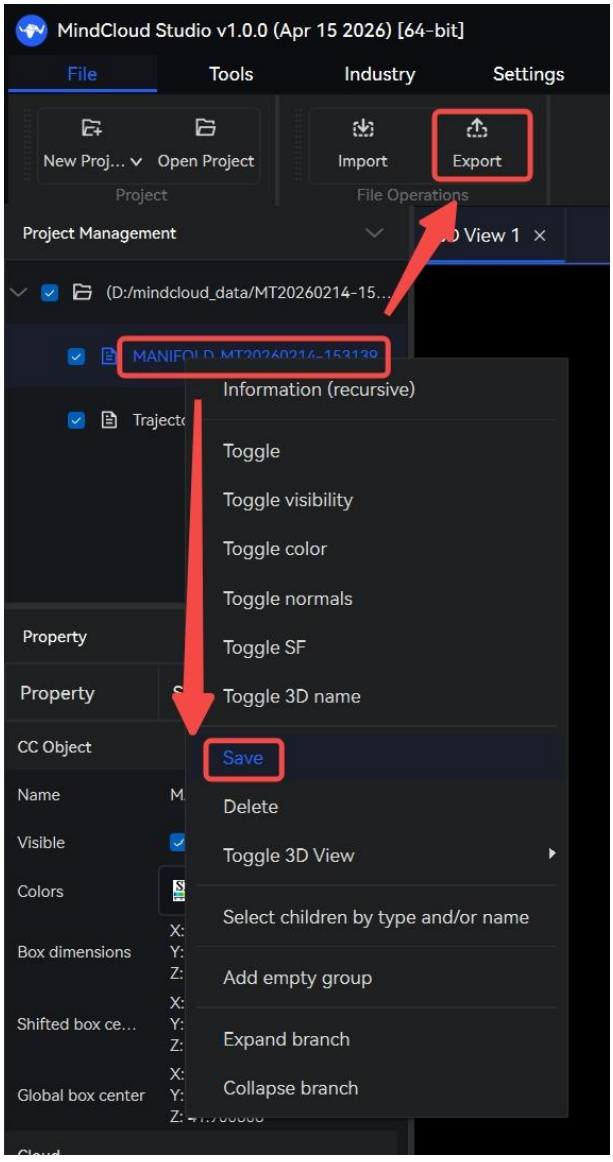


Specified Shift

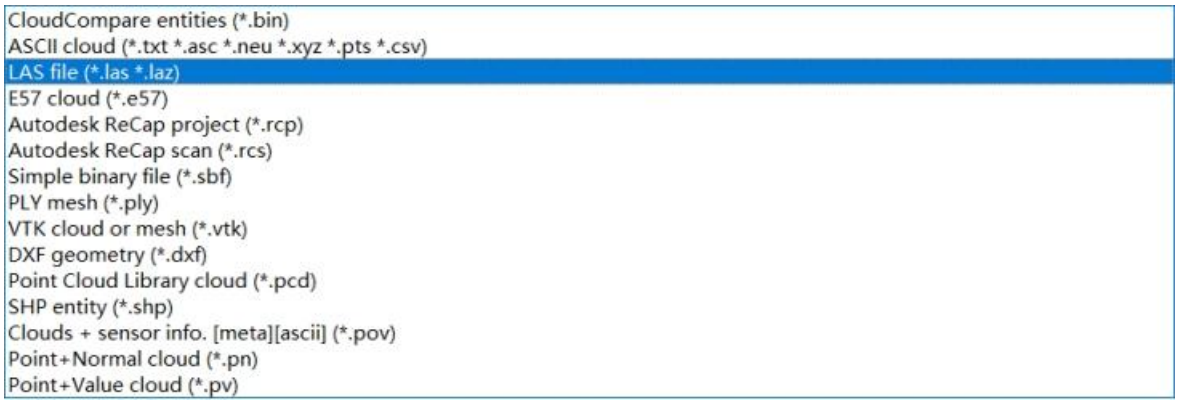
4.10 Data Export

Export point cloud data or meshes separately to other formats, and save them in multiple formats.

(1) Select the point cloud, right-click to save, or click the Export button in the file bar.



derive data



Different formats of point clouds

4.11 Zooming, Translation, and Rotation of Point Clouds

By combining various mouse button combinations, you can zoom, pan, and rotate the point cloud. The methods are as follows:

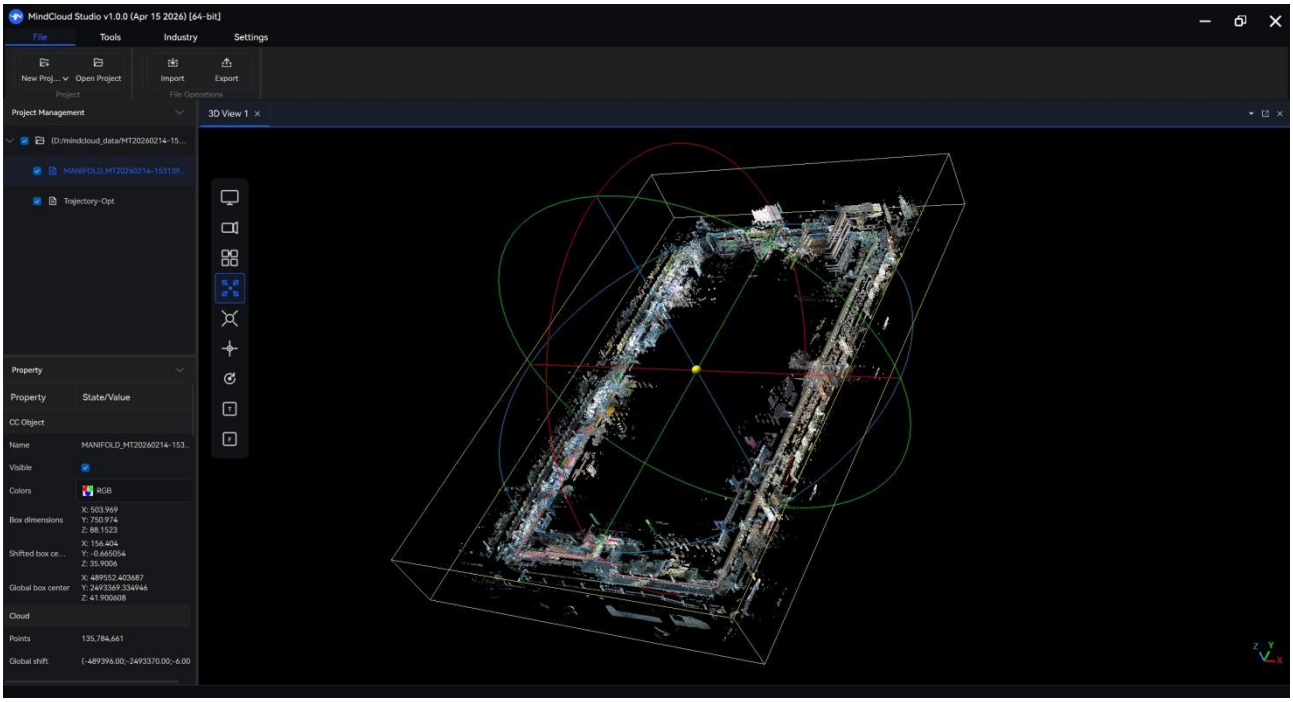
(3) Left-click and hold to rotate the control point cloud;

(4) Right-click and hold to pan the control point cloud;

(5) Roll the wheels up and down to zoom the point cloud;

(6) Long-press and drag the roller to quickly zoom the point cloud.

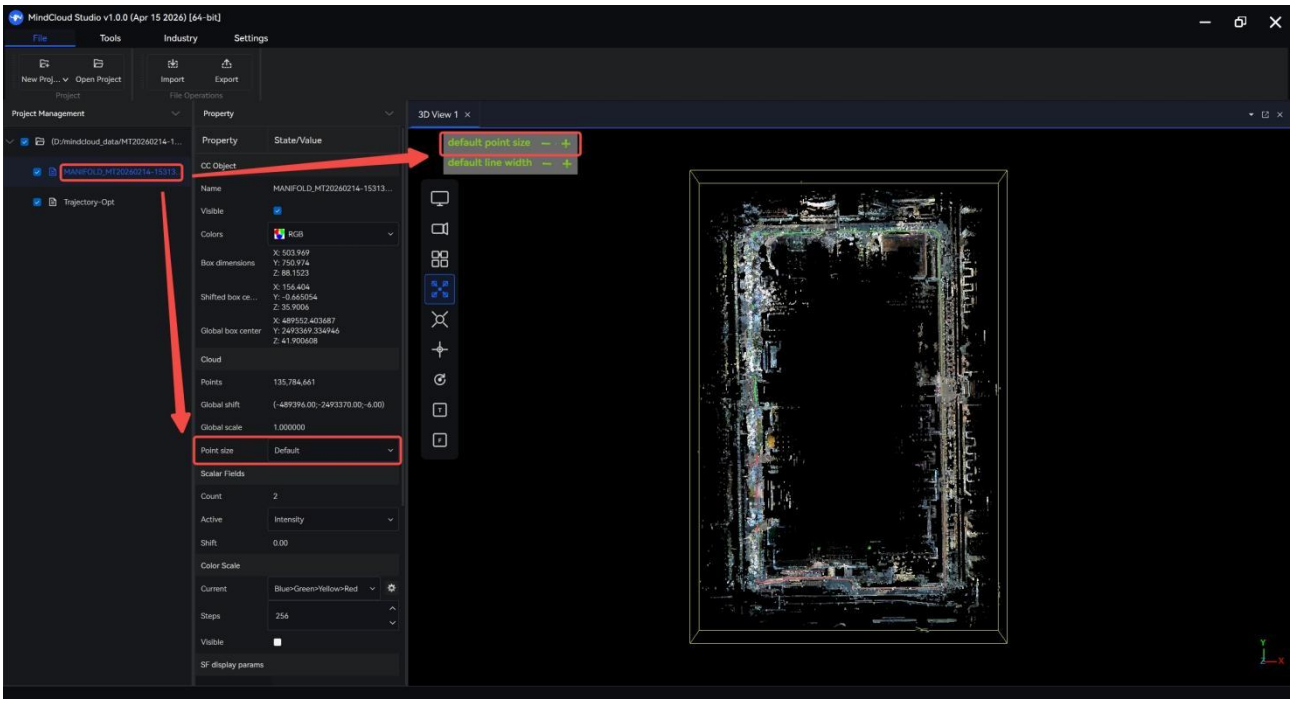
(7) Within the point cloud, double-click the left or right button or use the scroll wheel to reset the rotation center.



Zoom, Pan, Rotate

4.12 Adjustment of Particle Size

(1) After selecting the point cloud, adjust the point size value in the properties box or change the default global point size in the upper-left corner of the view.

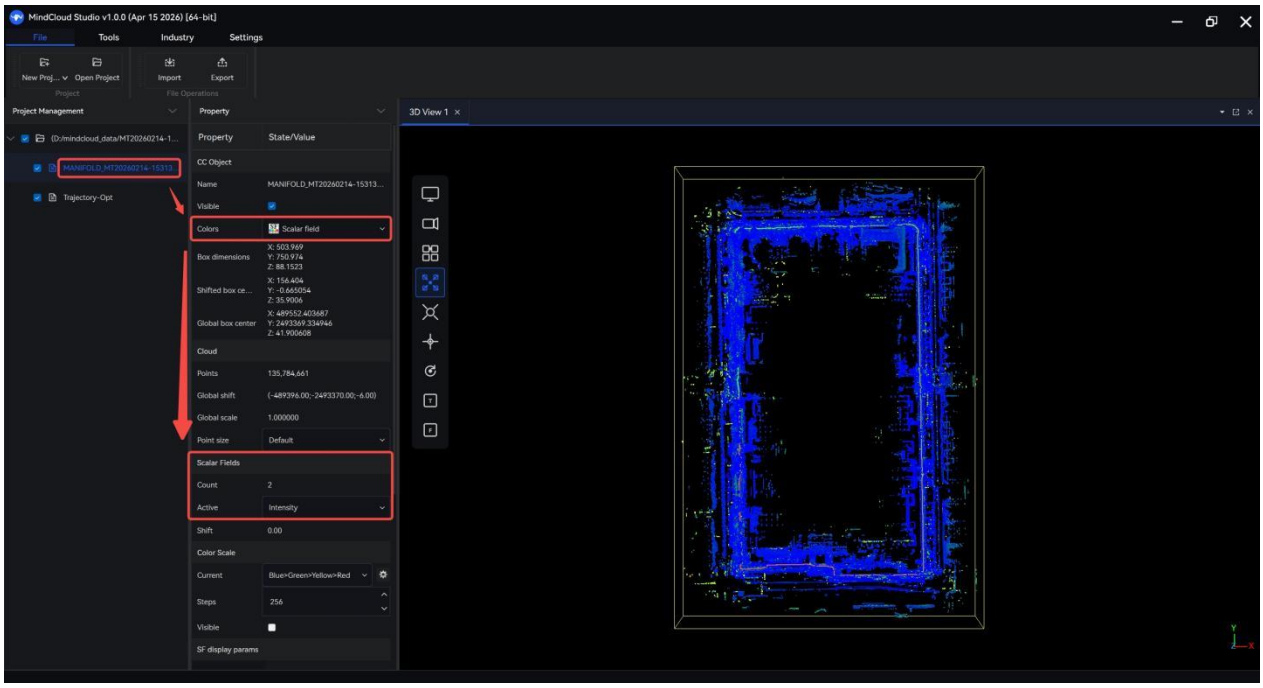


Adjust point size

4.13 Render method changed

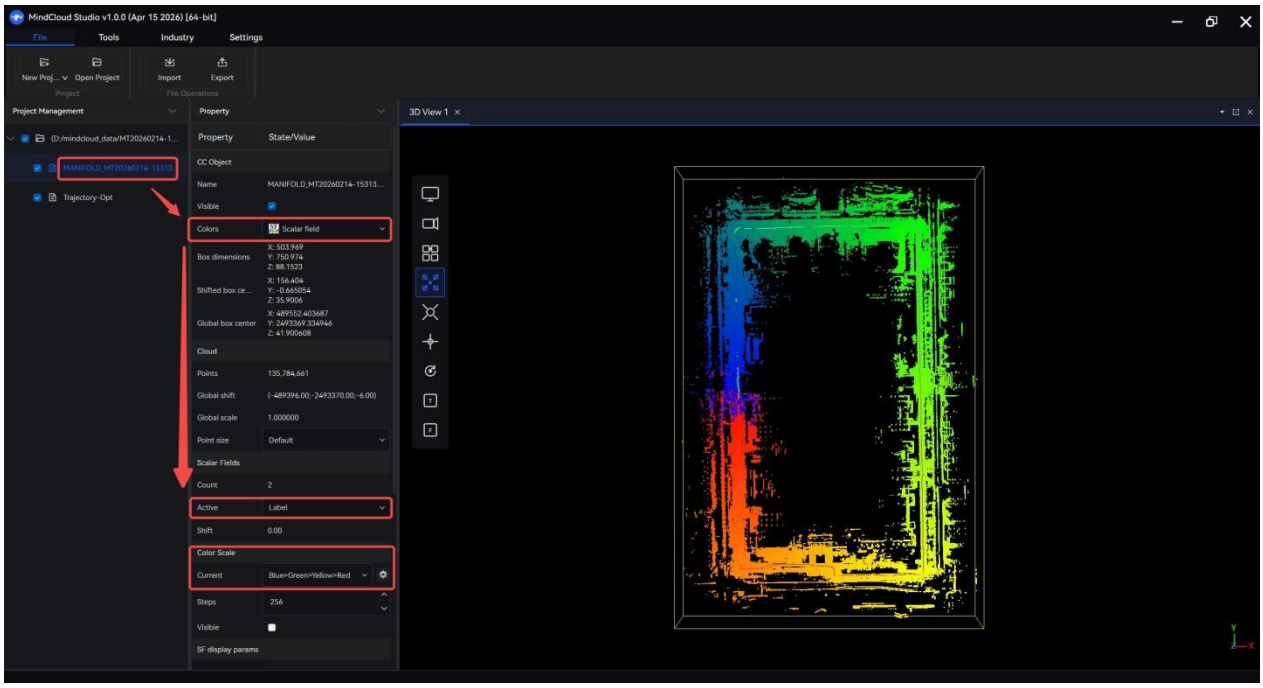
This feature allows you to freely transform point clouds into color renderings with various attributes.

(1) Select the point cloud, then click Color in the properties window to switch from "RGB" to "Scalar field," after which you can freely choose different color scales.



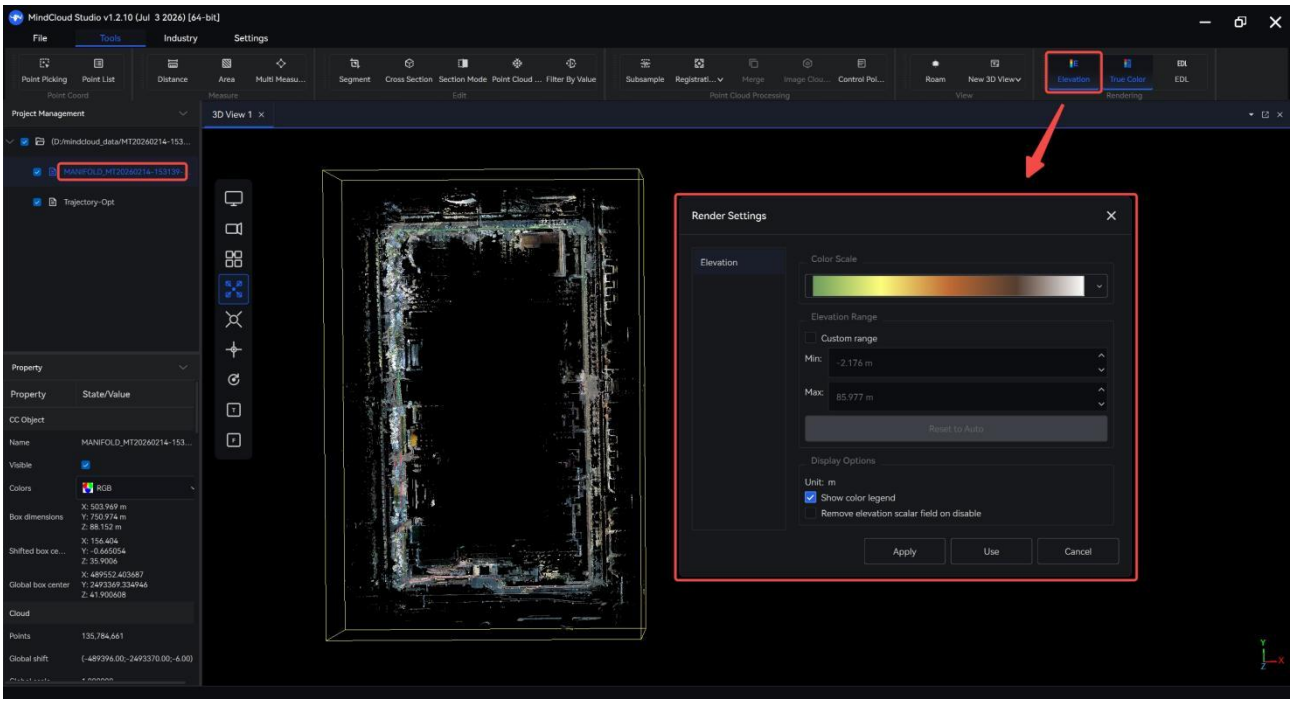
Scalar field

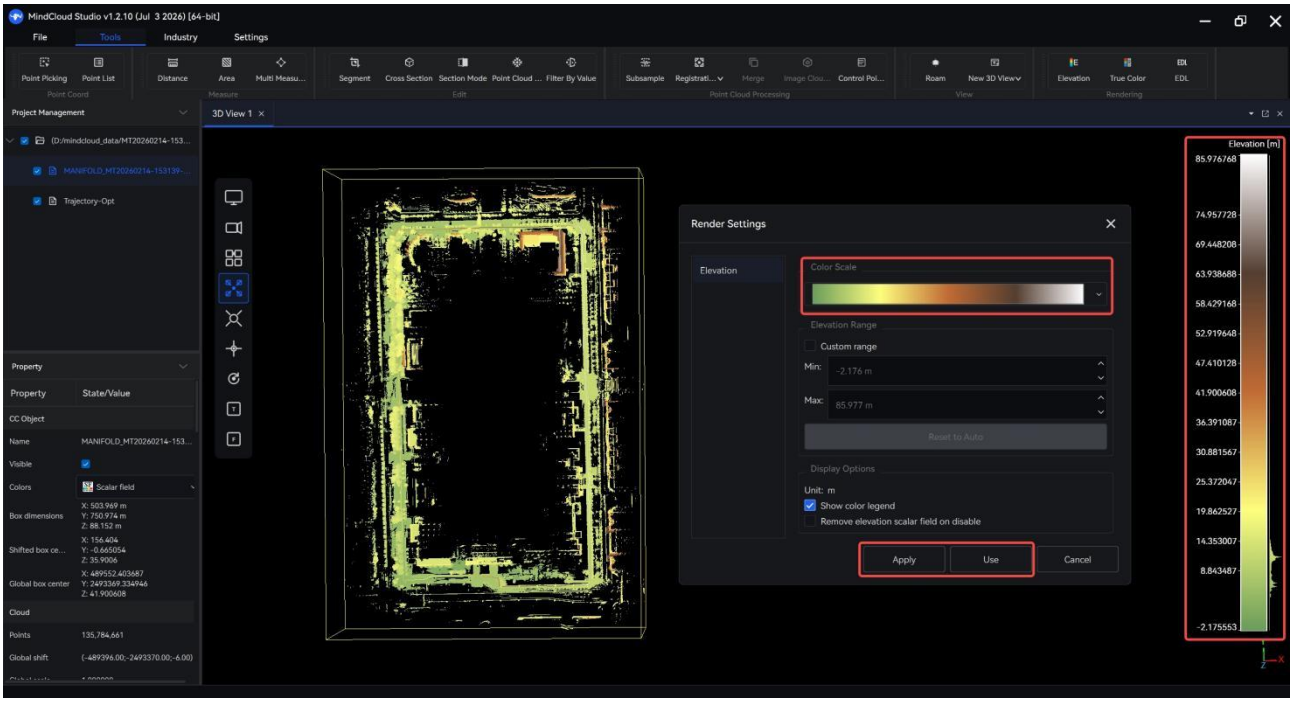
(2) Alternatively, replace "Intensity" with "Label" in the active scalar field; the software will then render the point cloud based on the scanning time.



Label

(3) Click "Elevation" in the toolbar to render the point cloud based on its height attribute.

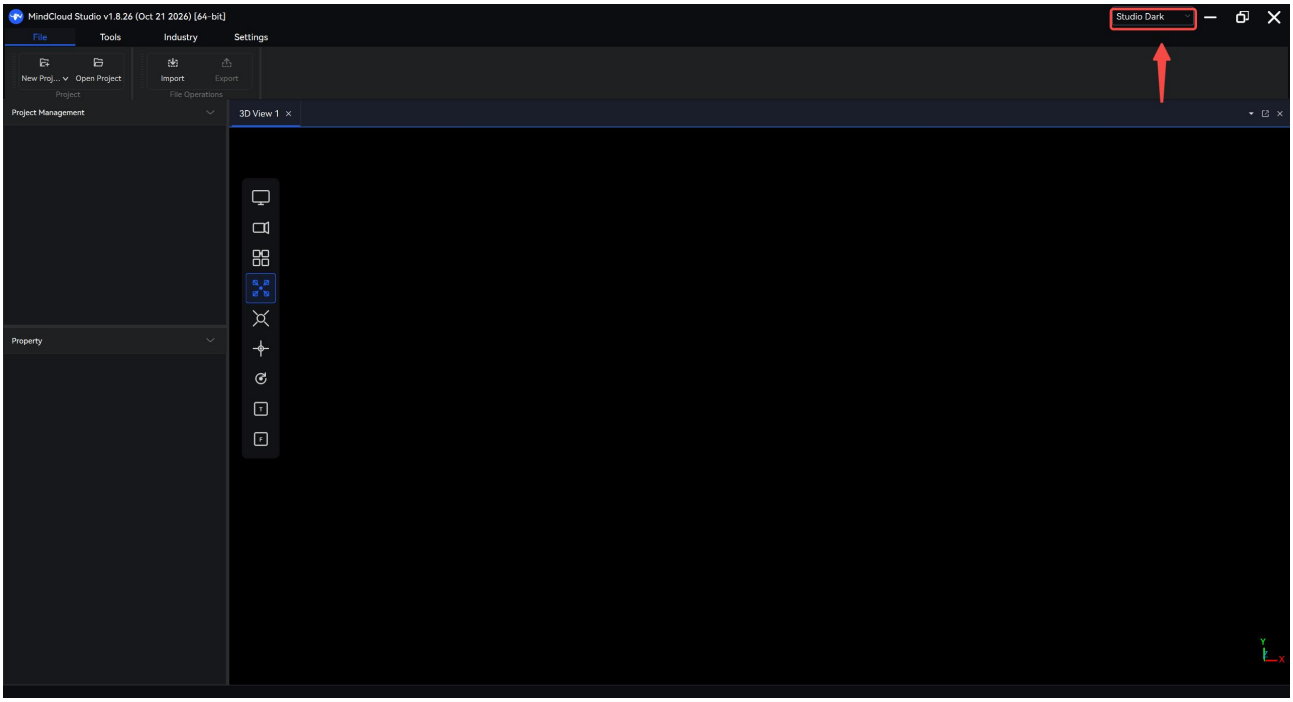




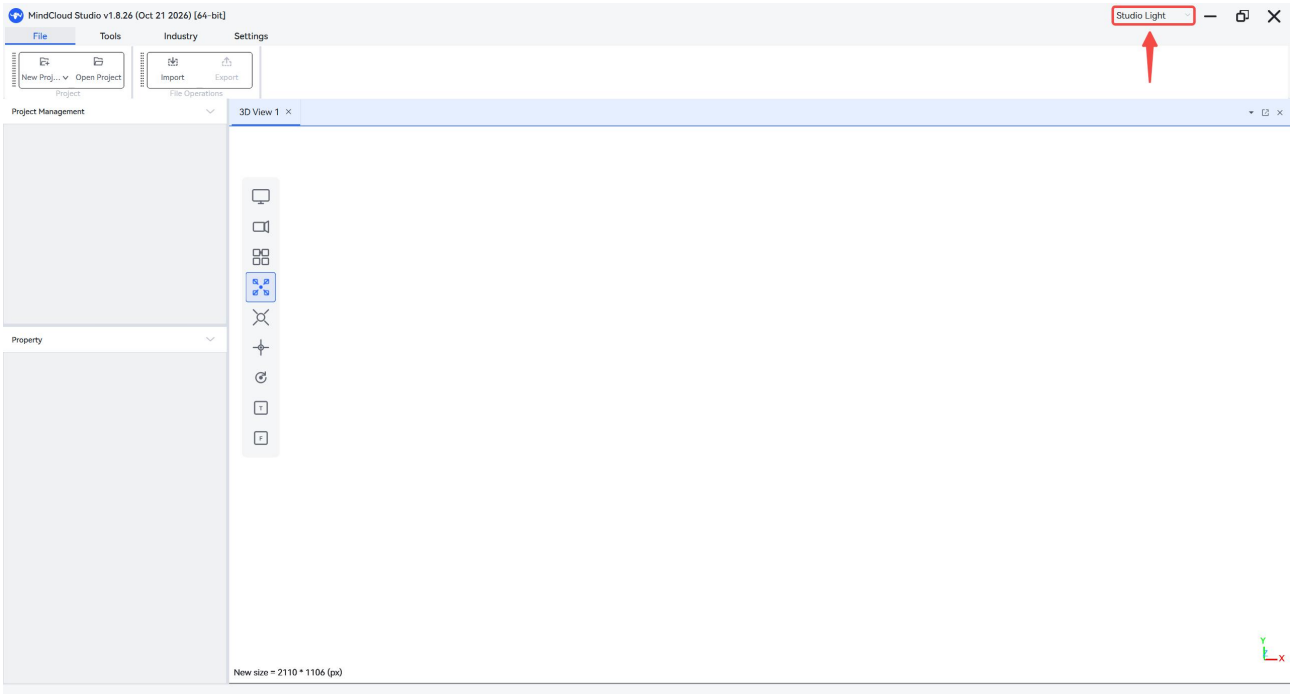
Elevation

4.14 UI Theme Switching

Allows the software's UI style to be switched between night and day modes.



Night

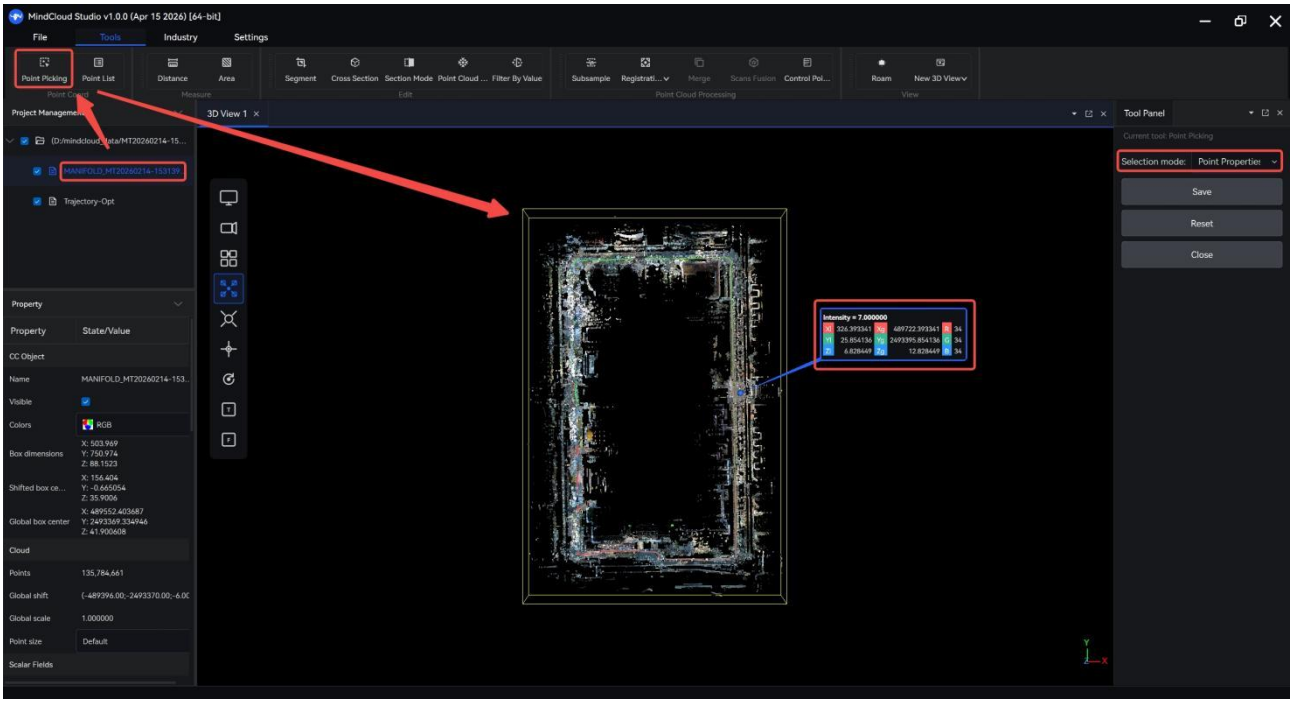


Day

5. Common Functions

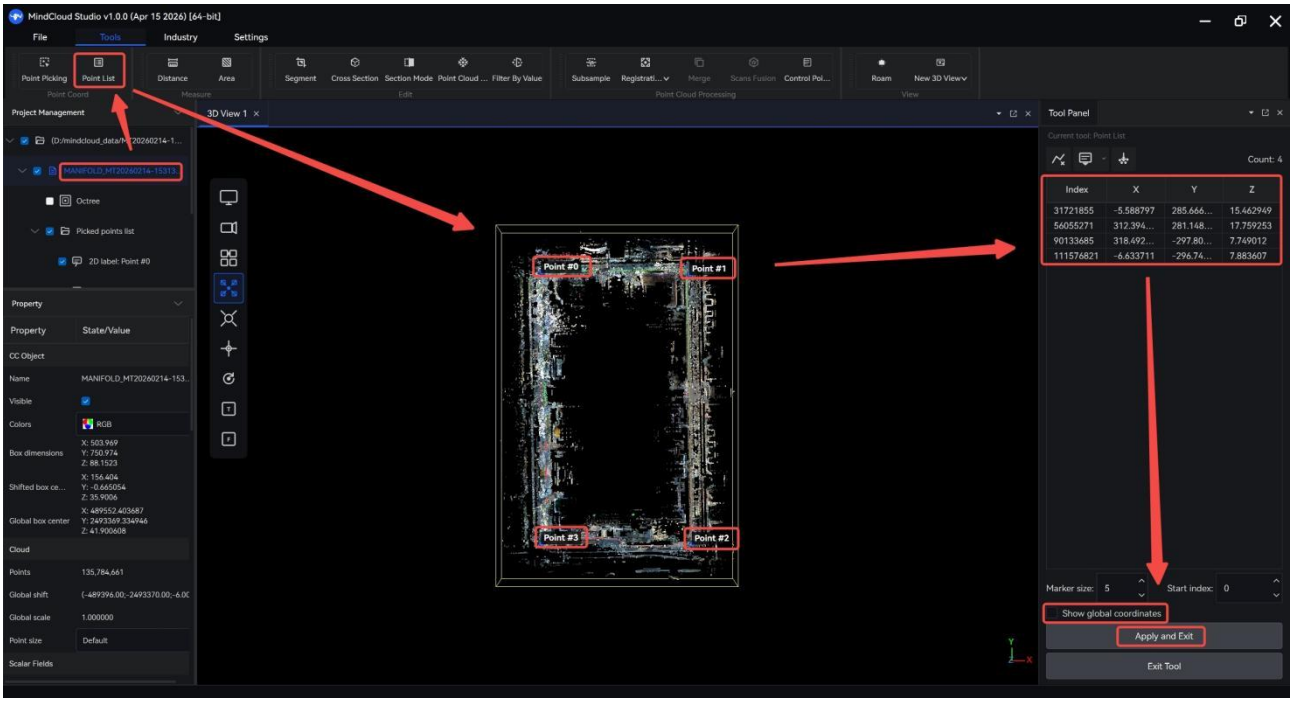
5.1 Point Selection

- Click to select points: Left-click to choose points within the point cloud to display their information.



reconnaissance

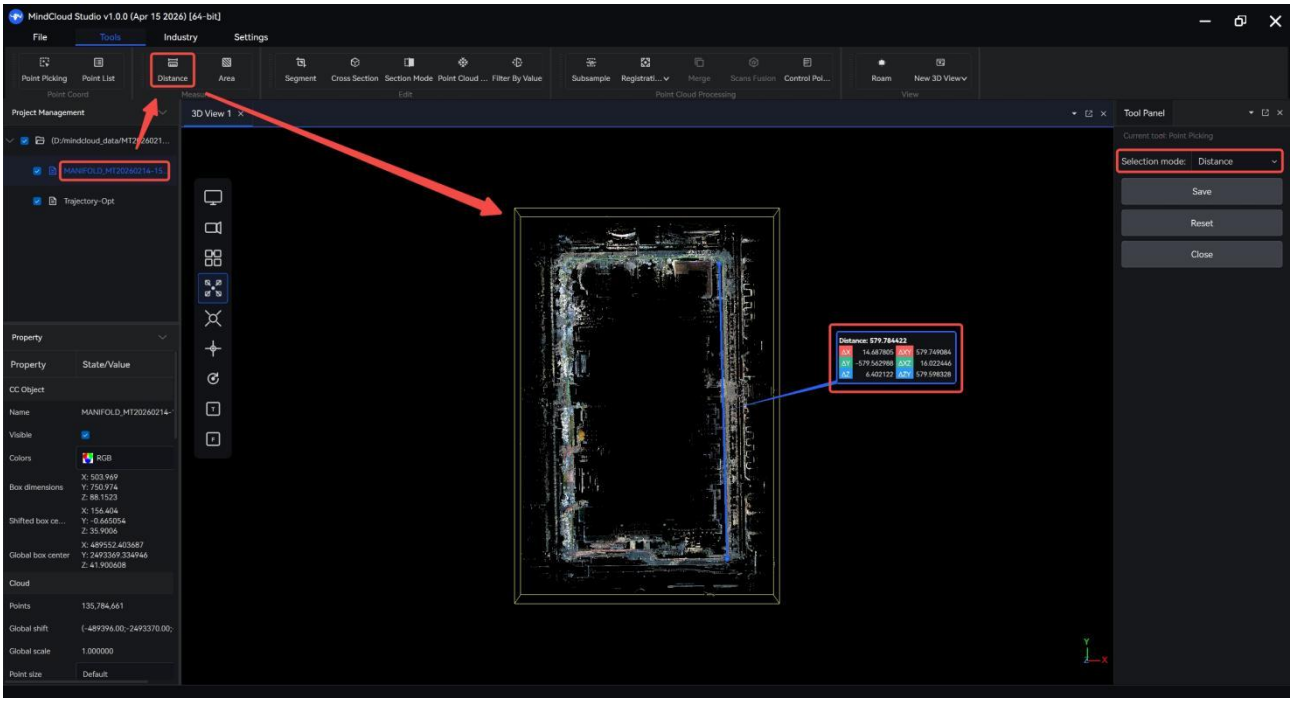
- Click the point list, right-click to select multiple points, and the information of all selected points—including global coordinates—will be saved in the table on the right. You can export the data as table files in various formats.



Point List

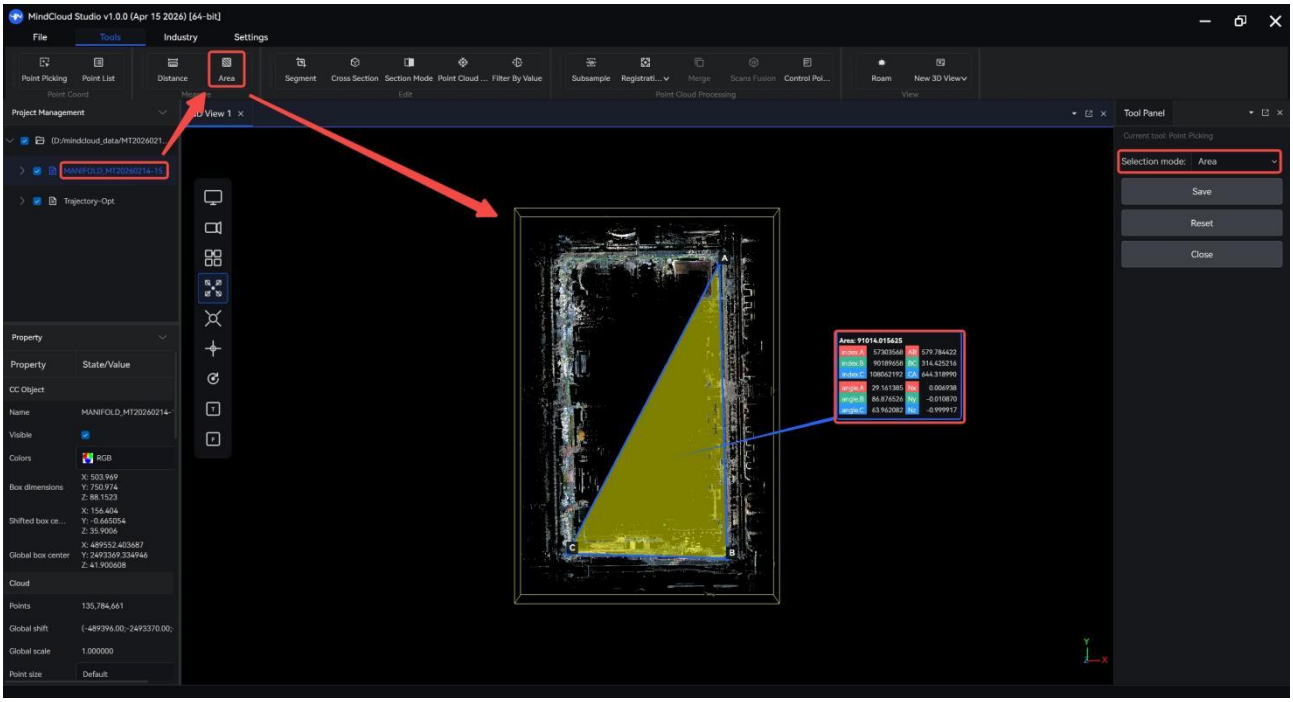
5.2 Measurement

- Click Distance measures the length between two points in a point cloud. Left-click to select points; the value appears when the two points are connected. "Distance" indicates the length, measured in meters.



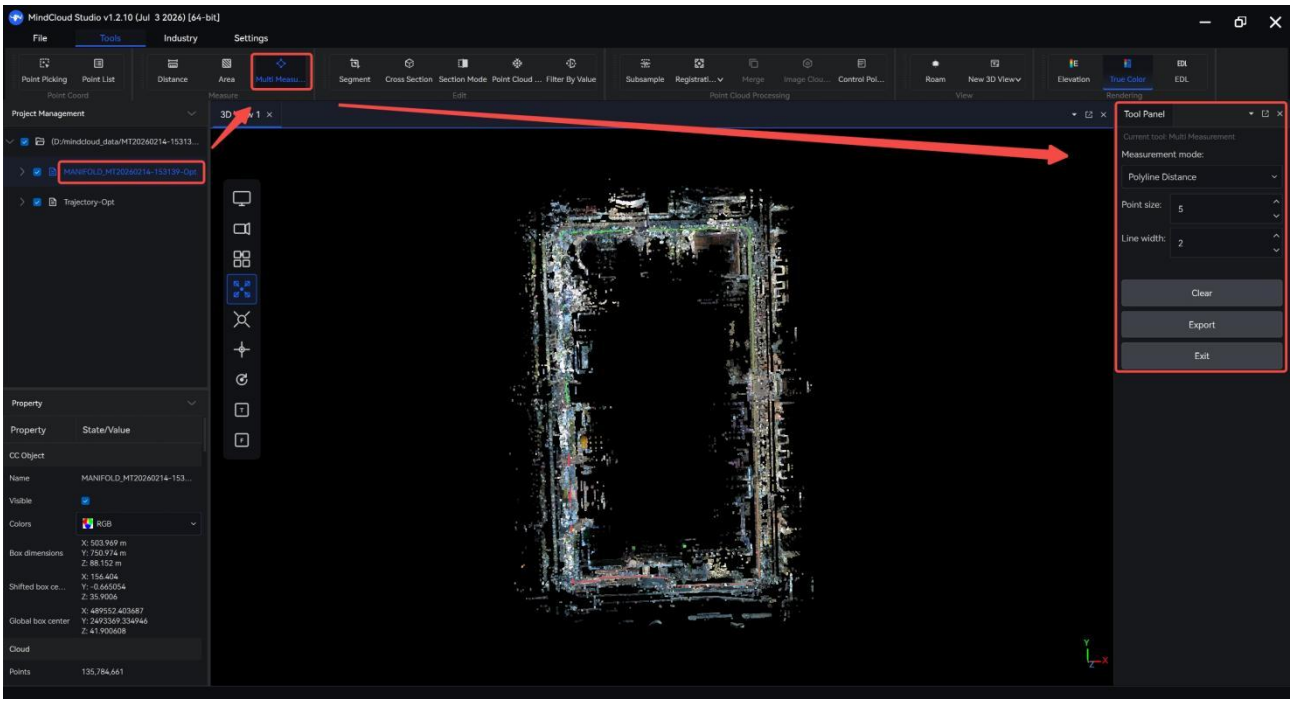
distance

- Click on the area, right-click to select points, and connect the three points to form a surface. The value will appear; "area" represents the area, measured in square meters.

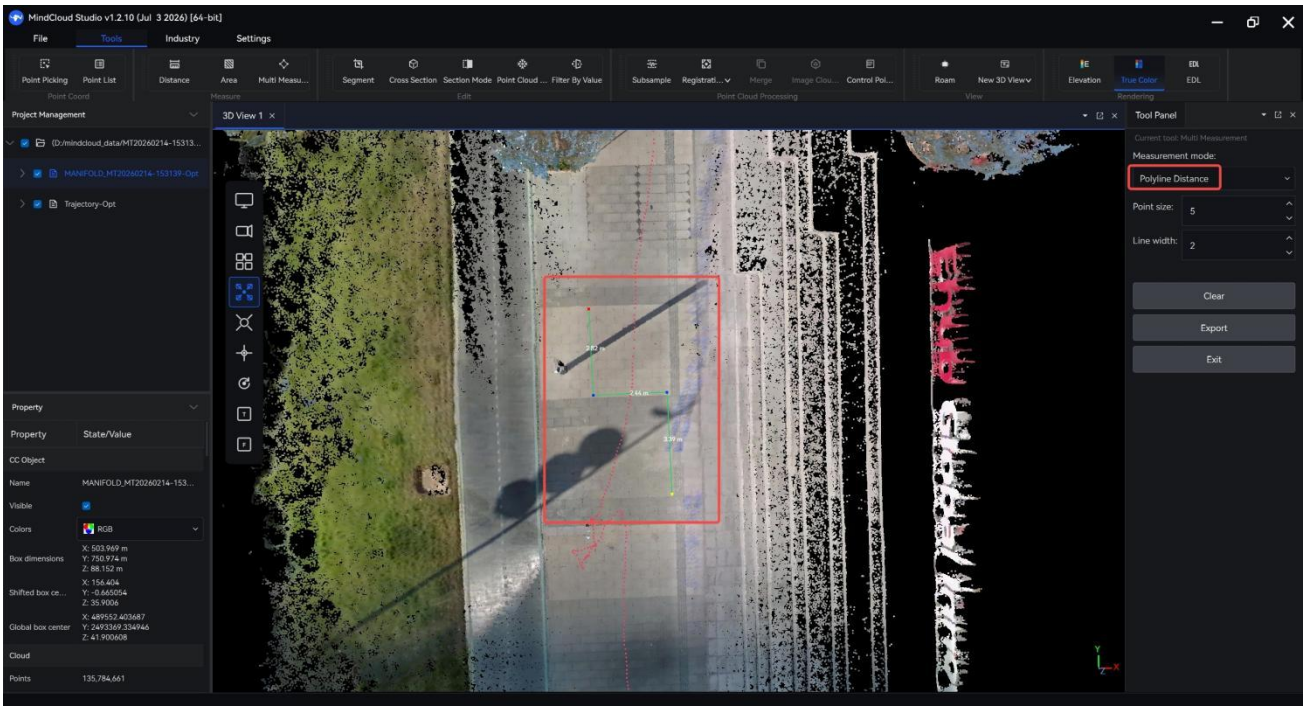


area

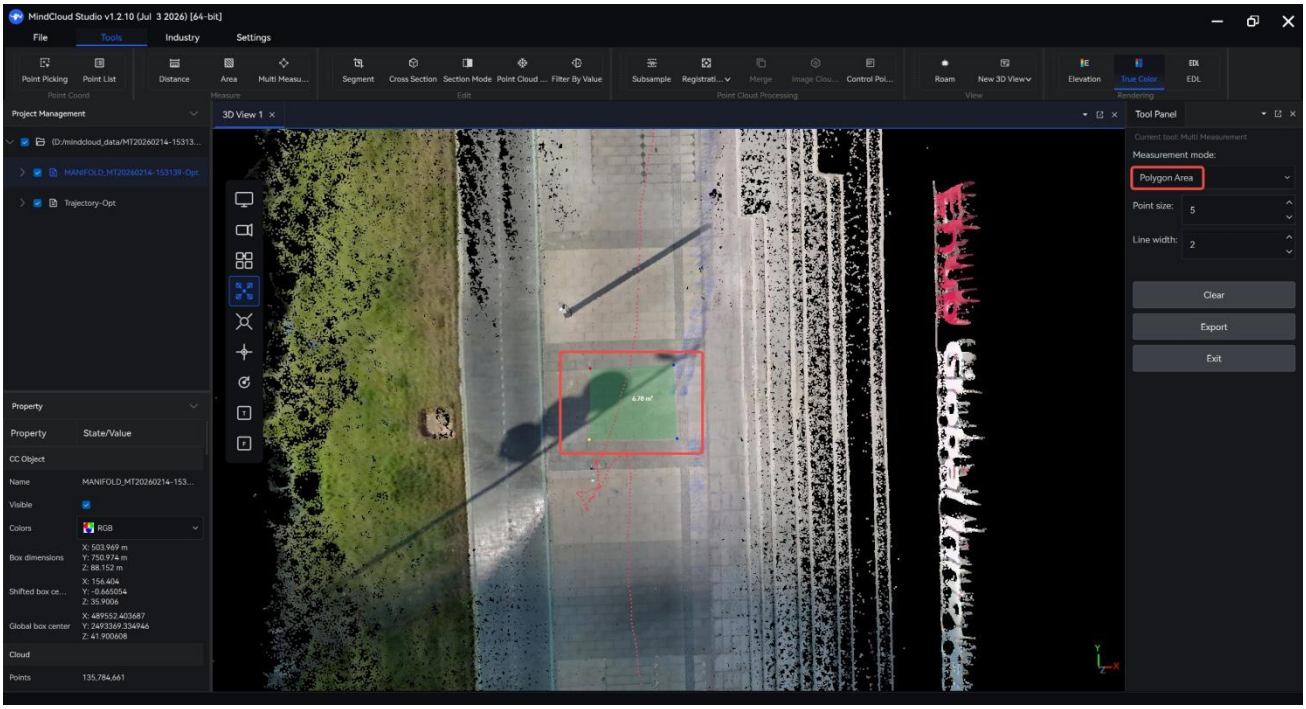
- Click on "Multi Measurement", and you can switch between measuring the distance of polylines and measuring the area of polygons in the tool panel on the right. Additionally, you can export the measurement results.



Multi Measurement



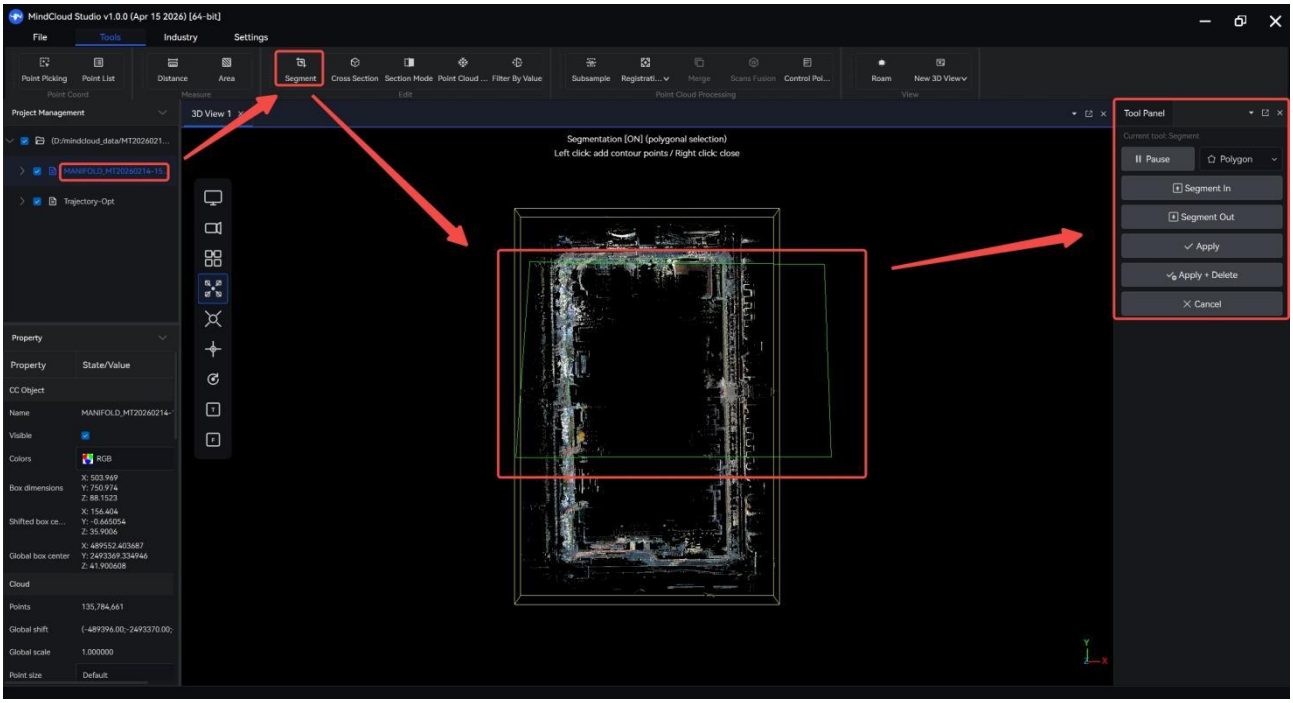
polylines


MindCloud Studio v1.2.10 (Jul 3 2026) [64-bit]
File
Tools
Industry
Settings
Point Picking
Point List
Distance
Area
Multi Measu...
Segment
Cross Section
Section Mode
Point Cloud ...
Filter By Value
Subsample
Registrati...
Merge
Control Poi...
Roam
New 3D View
Elevation
True Color
EDL
Project Management
3D View 1
Tool Panel
Measurement mode:
Polygon Area
Point size:
5
Line width:
2
Clear
Export
Exit
Property
Property
State/Value
CC Object
Name
Visible
Colors
RGB
Box dimensions
Shifted box ce...
Global box center
Cloud
Points
135,784,661

polygons

5.3 Segment

- Select the point cloud and click "Segment" on the toolbar;
- Left-click to select points and draw lines; select the target point cloud with a box; right-click to finish drawing the lines.
- You can choose either the internal or external point cloud of the selected area, then click "Apply" to complete.

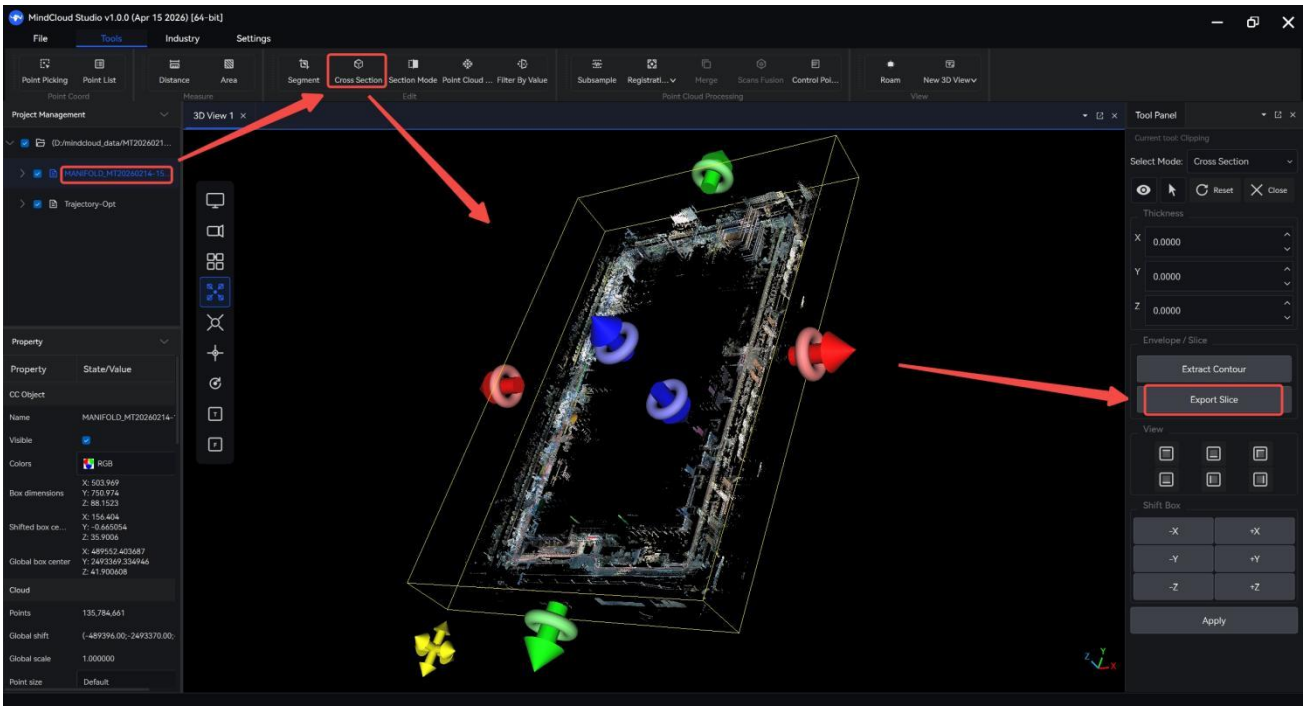


Point Cloud Cropping

- Click Pause to stop the current crop operation, release the fixed view, and allow you to move the view again. Click Pause again to continue the crop operation.

5.4 Cross Section

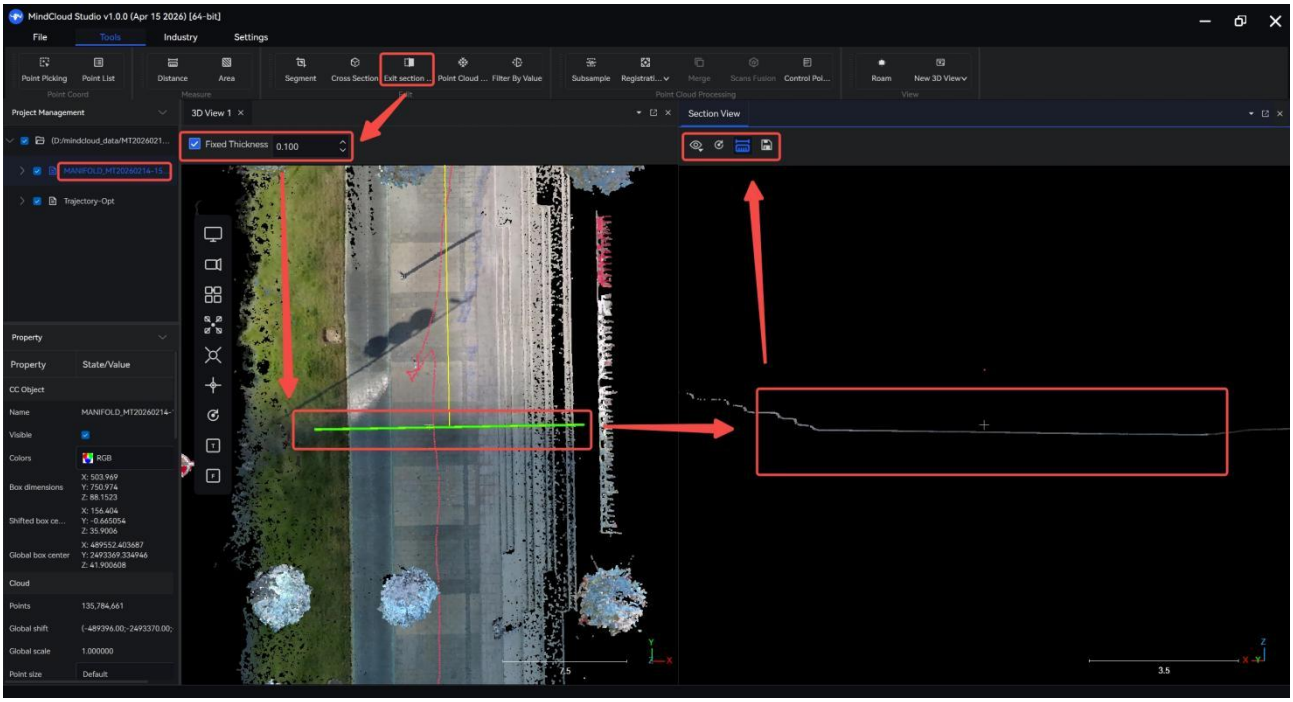
- Left-click to select the point cloud, then click "Cross Section" in the toolbar;
- Drag the arrows and circles in all six directions of the bounding box to adjust its size and angle.
- After adjusting to the appropriate angle, click the "Export Slice" button on the right toolbar.



Cross Section

5.5. Section Mode

- Left-click to select the point cloud, then click "Section Mode" on the toolbar.
- Check the option for a fixed slice width, which defaults to 0.1 m (10 cm).
- In the main view, select the point cloud scene to be sectioned; the sectioned point cloud will be displayed in the right cross-section view from a front view.



View in Section

- Meanwhile, in the section view, click the third button above to measure the length of a specific scene, such as viewing the point cloud thickness.

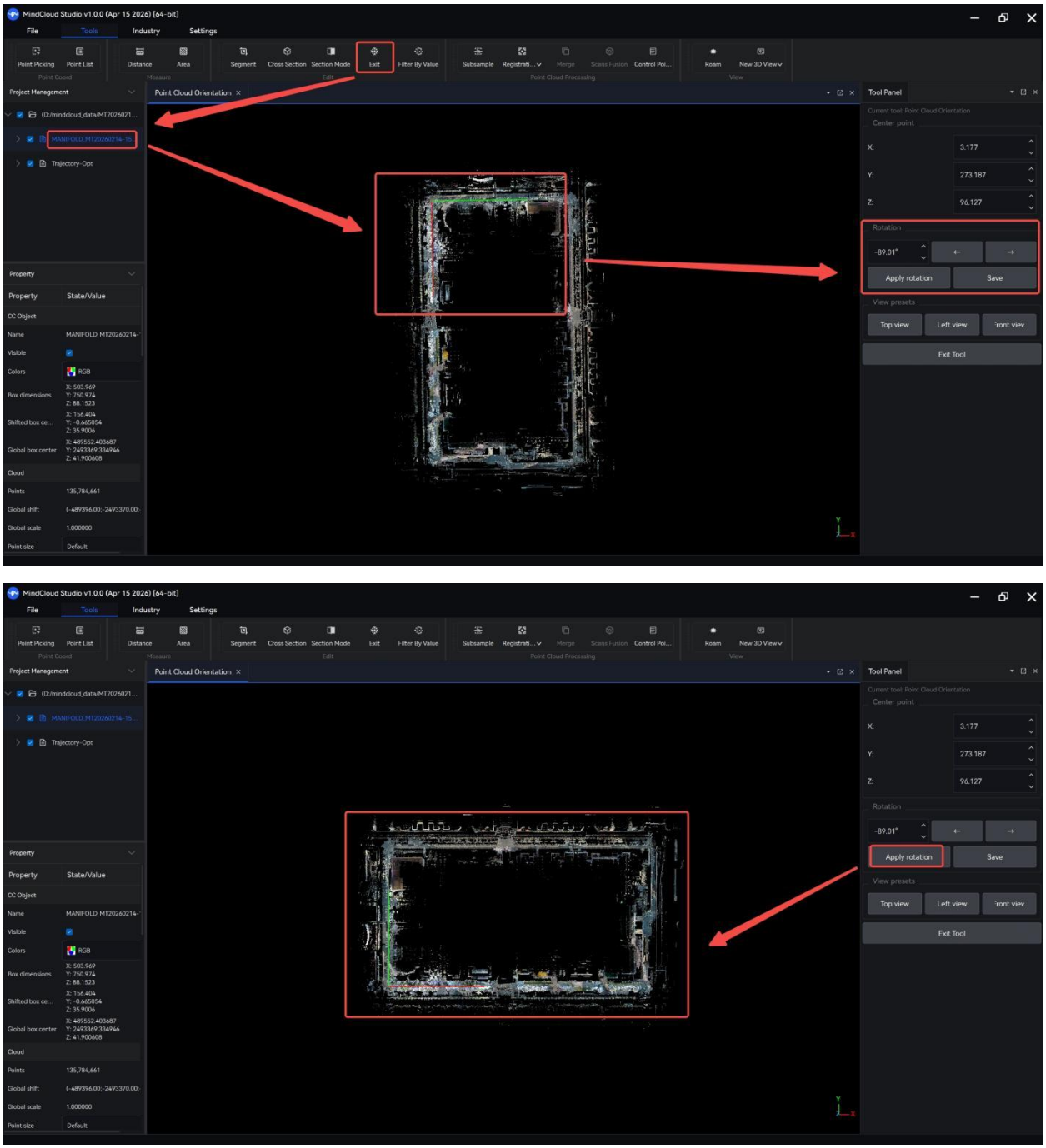


Cross-section triangle

- You can also click the fourth button to save the cut point cloud separately.

5.6 Point Cloud Orientation

- Left-click to select the point cloud, then click "Point Cloud Orientation" on the toolbar.
- You can reconfigure the X, Y, and Z axes from three perspectives: top view, front view, and left view. Adjust the point cloud orientation to reorient it.
- In the top view, you can redefine the orientation of the X and Y axes. Click Apply Rotation to adjust the point cloud direction accordingly.

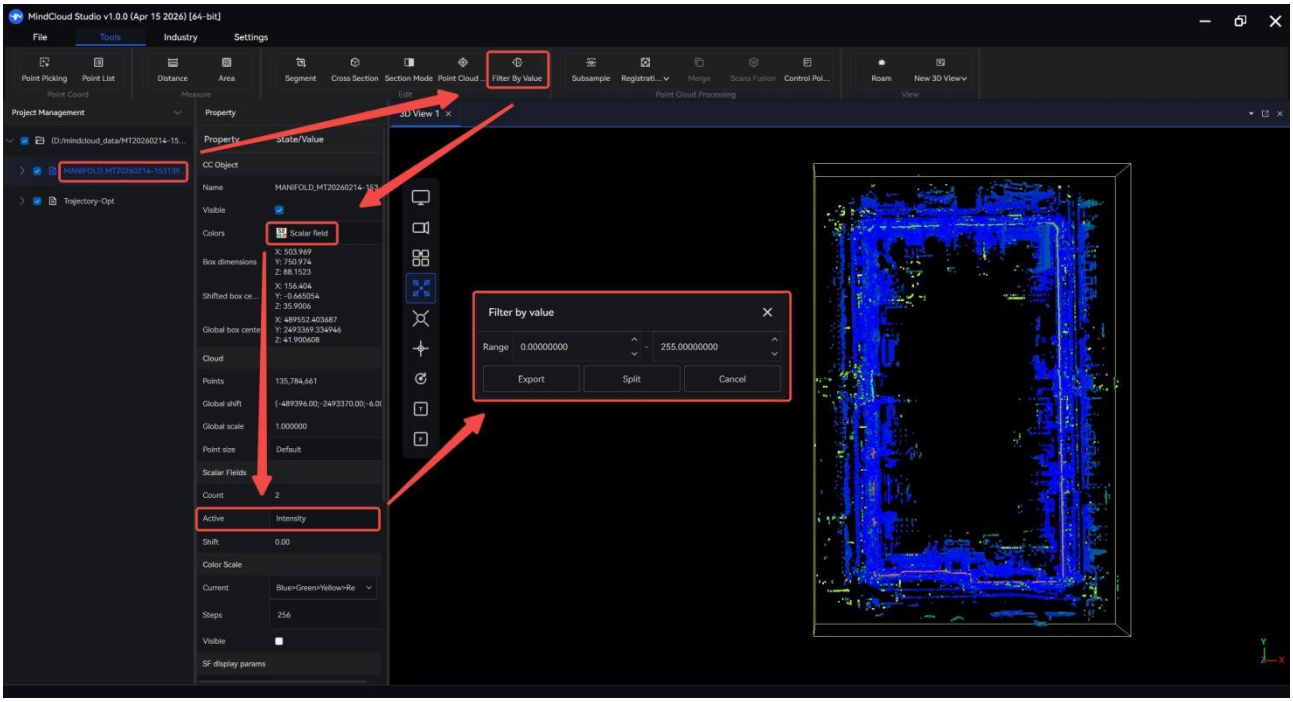


Redirect the XY axes in the top view

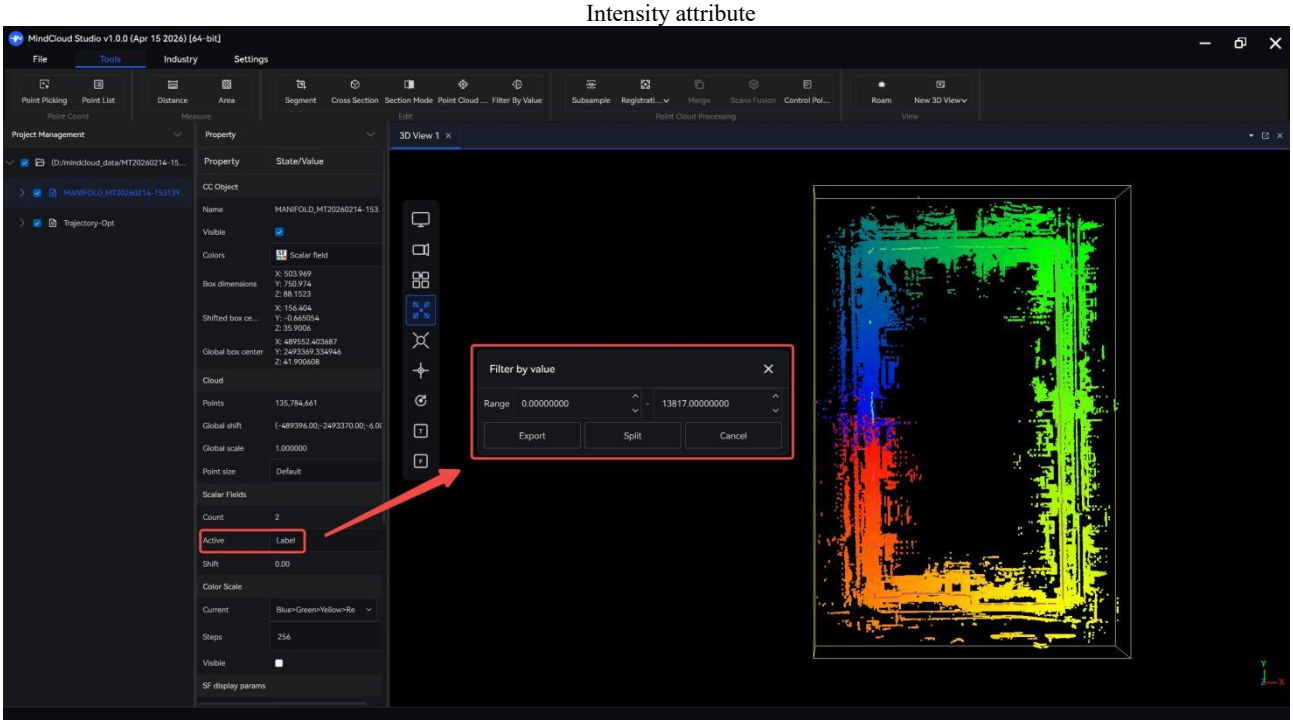
- The same operation can also modify the point cloud orientation in the front view and left/right views, then click Save.

5.7 Filter by value

- Select the point cloud and click "Filter by Value" on the toolbar to export or split the point cloud individually based on the active scalar field— "Intensity" or "Label" —attribute values.



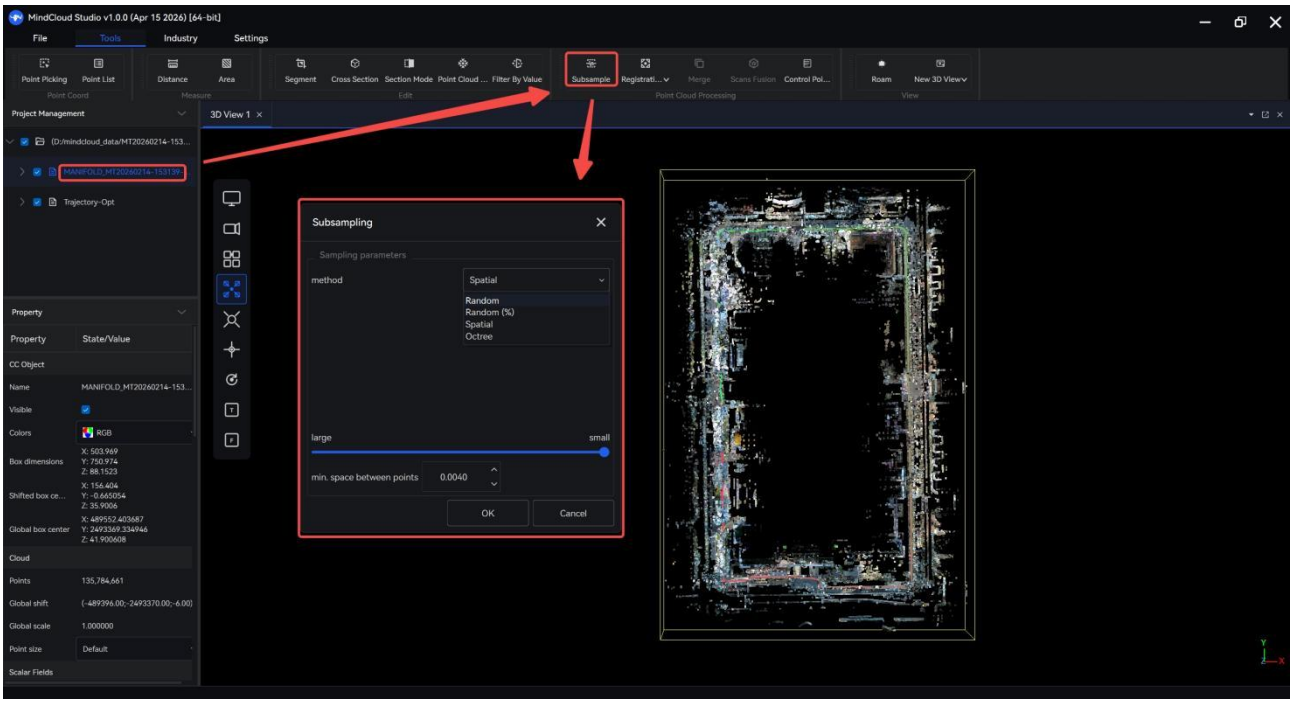
Intensity attribute



Label attribute

5.8 Sample

- Select the point cloud and click "Subsampling" in the toolbar. You can reduce the density of the point cloud using downsampling algorithms such as random percentage or point cloud spatial interval. The unit of point cloud interval is meters..



double sampling

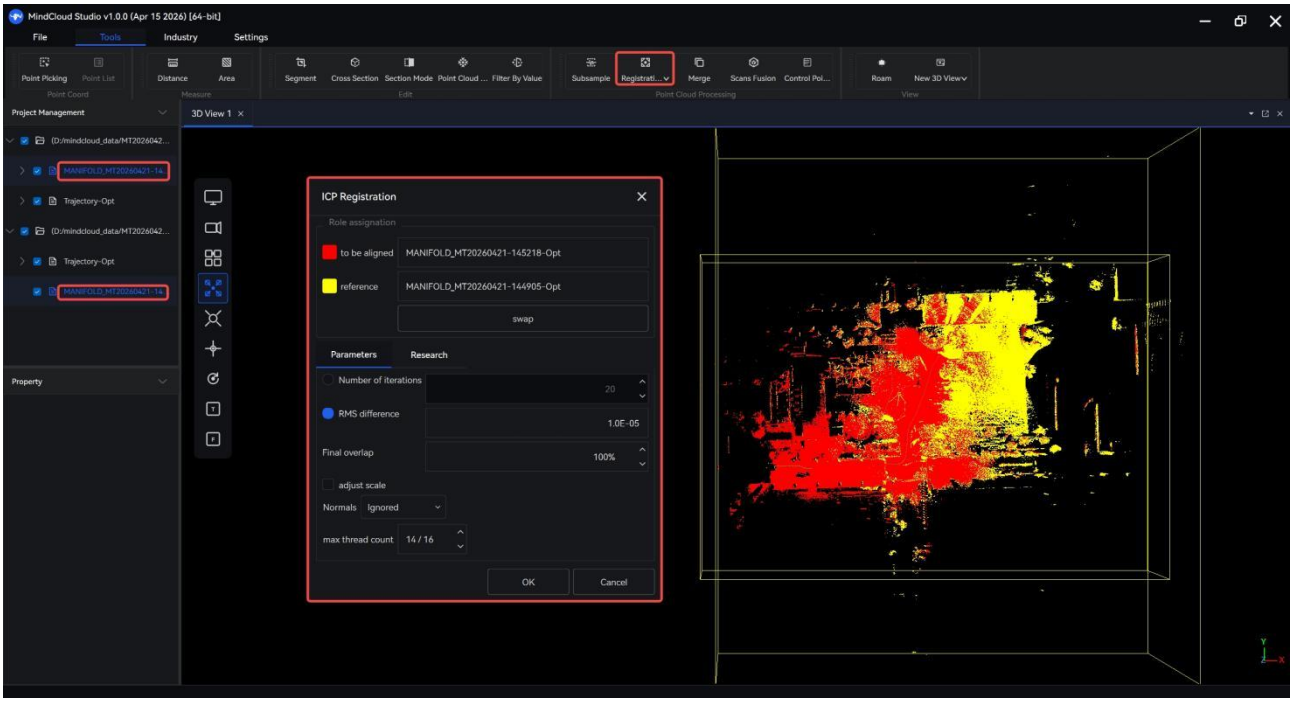
5.9 Registration

- Hold down the Ctrl key to select two point cloud datasets, then click "registration" on the toolbar. Two registration methods are available: "Align (Point-to-Point)" and "Fine Registration (ICP)".

1) Align (point-to-point): Manually select corresponding feature point pairs from two point clouds and then register the point clouds.

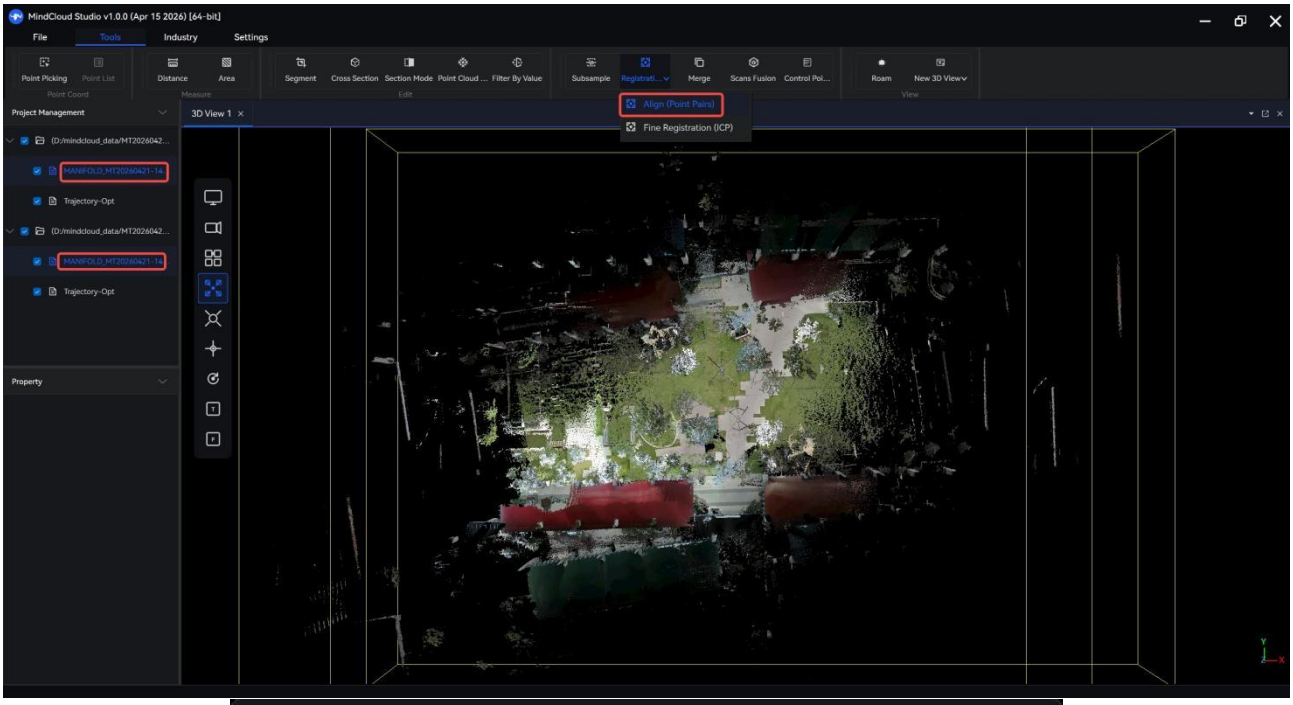
2) Integrated Cloud Registration (ICP): The ICP algorithm automatically performs global matching between two point clouds, followed by registration of the point clouds.

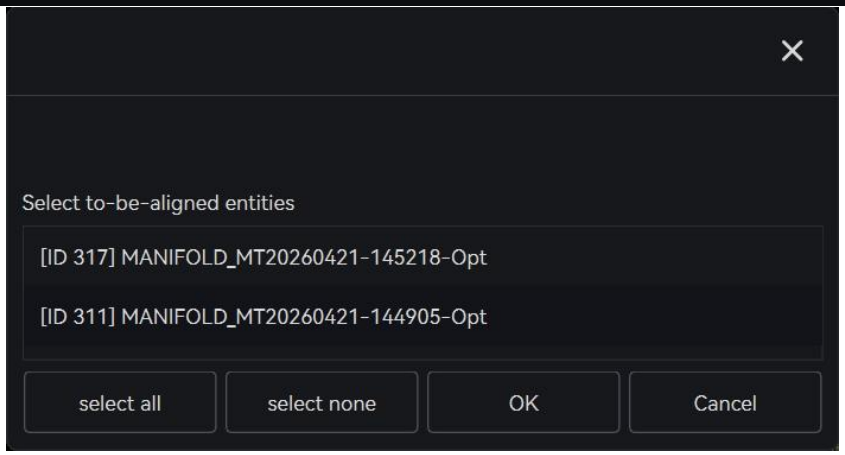
- Taking ICP as an example, click "Fine Registration (ICP)" to align the point clouds and the reference point cloud, set the overlap rate parameters, then click OK to begin the conversion.



ICP

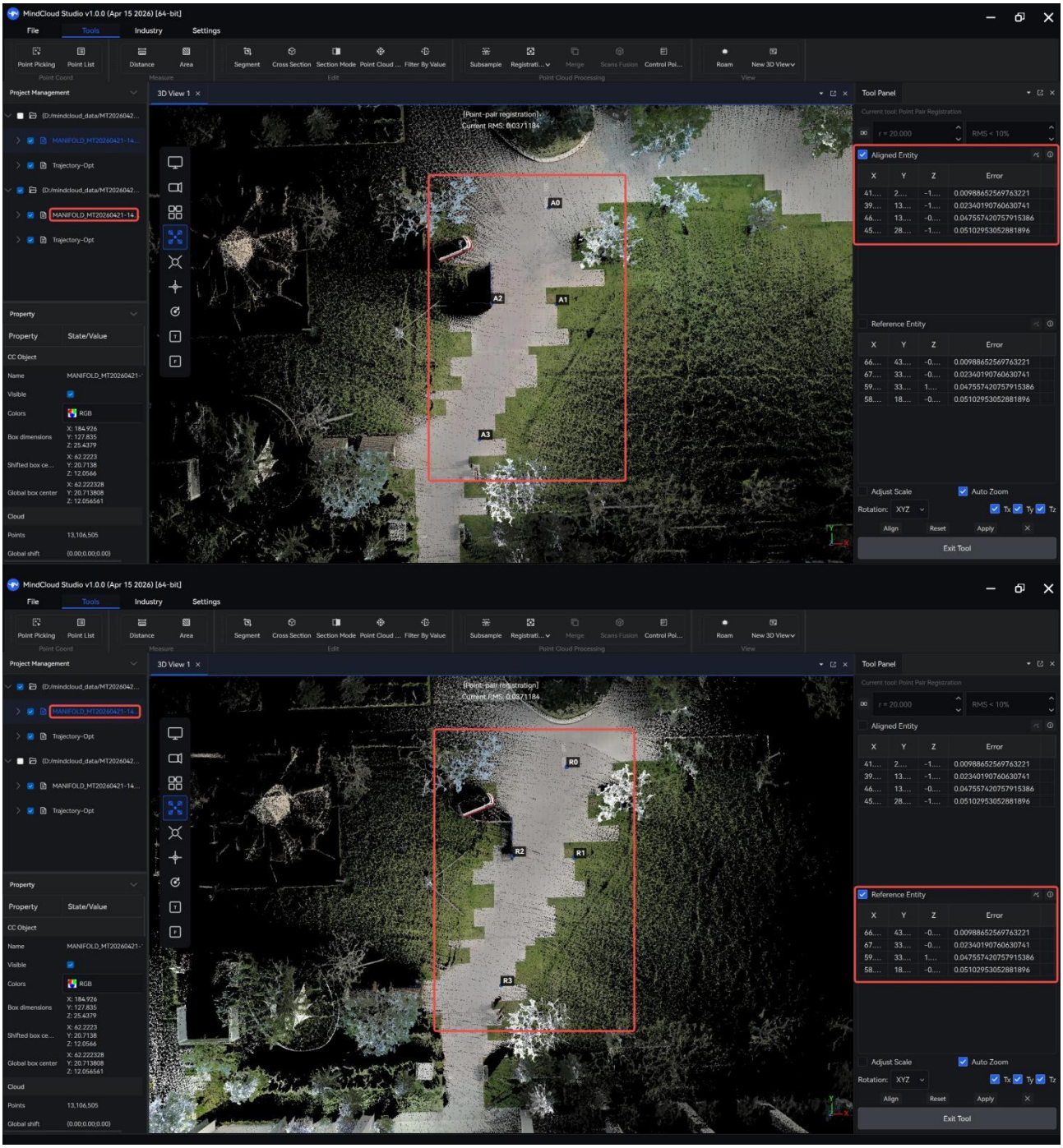
- For point-to-point selection, hold the Ctrl key to select two point clouds, then click "Align (Point-to-Point)" to align the point clouds with the reference point cloud.



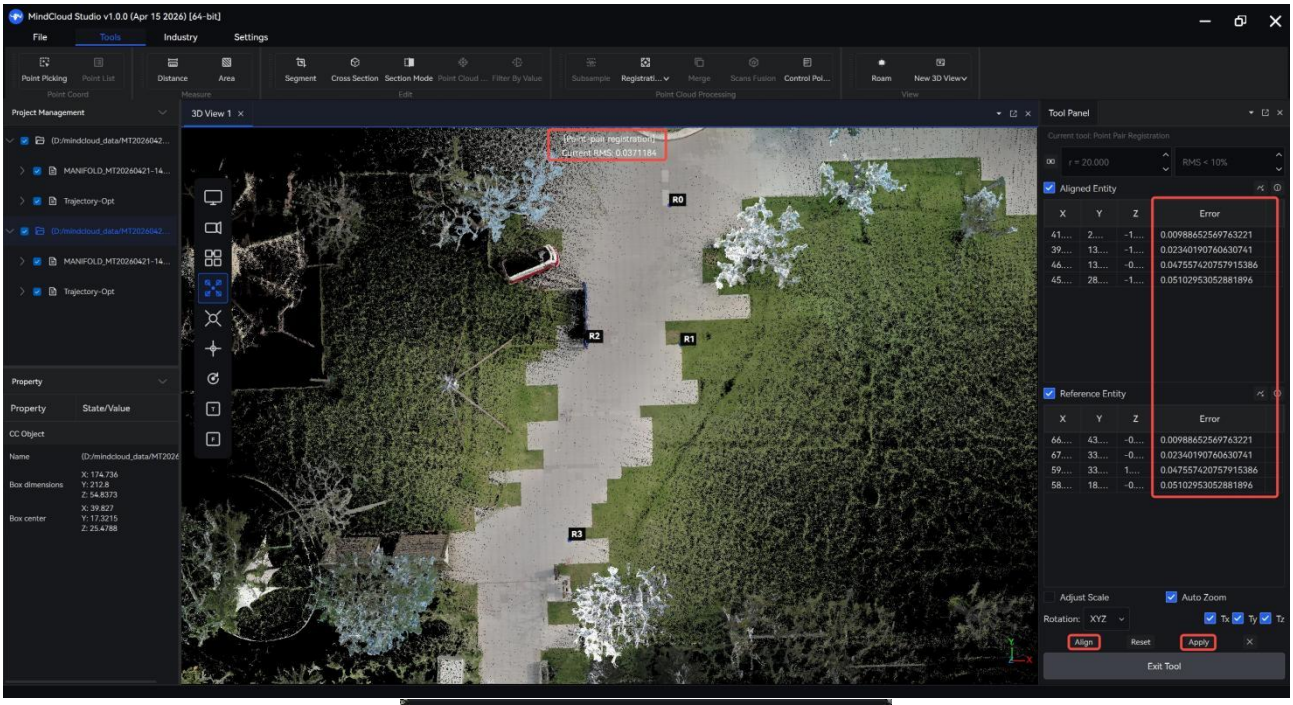


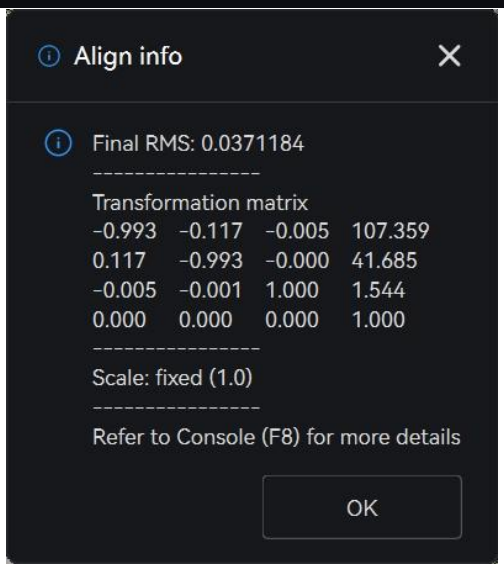
Manual registration

- To identify common feature point pairs between two point clouds, it is recommended to use objects such as cross targets or calibration plates.
- After selecting feature points, information will be displayed on the right side; the selection order of the two point clouds must remain consistent.



- Click Align to view the registration results of the two point cloud datasets, then click Apply to complete the registration.

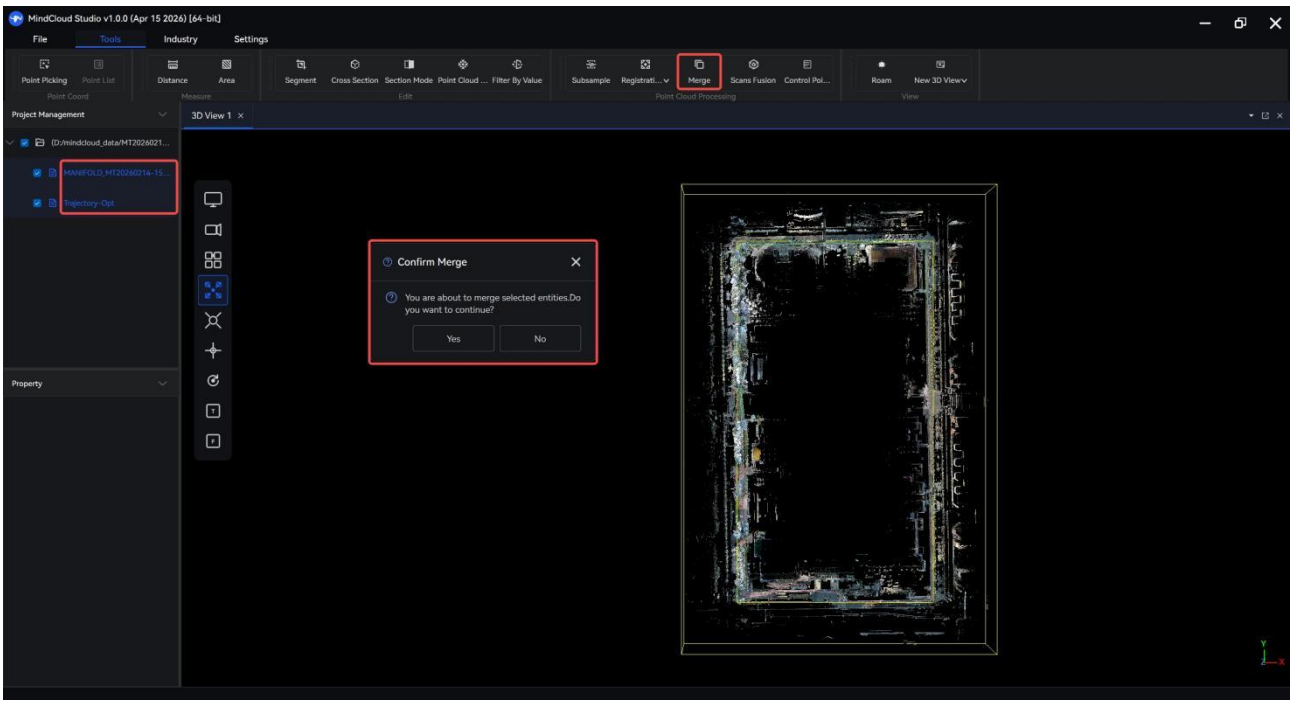




Point Cloud Registration

5.10. Merge

- Hold the Ctrl key to select multiple point cloud groups, then click "Merge" on the toolbar.



merge

5.11 Image Fusion

During field data collection, the Manifold device, utilizing additionally mounted camera accessories, can take photos independently and integrate the captured photos with the point cloud. At the same time, it also quantitatively fuses the photos taken by the built-in camera.

- Select a point cloud, click "Image Fusion" in the toolbar, and choose the type of photo to load. Photos from panoramic cameras are labeled "Panoramic Image", while photos from the built-in camera are labeled "Small Camera Image";

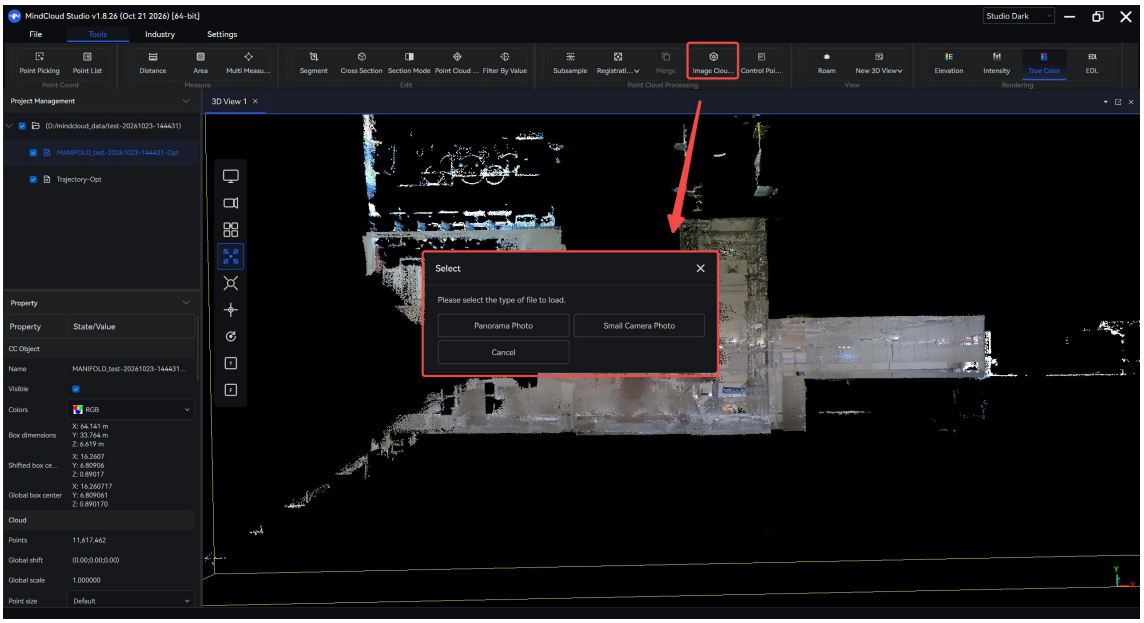
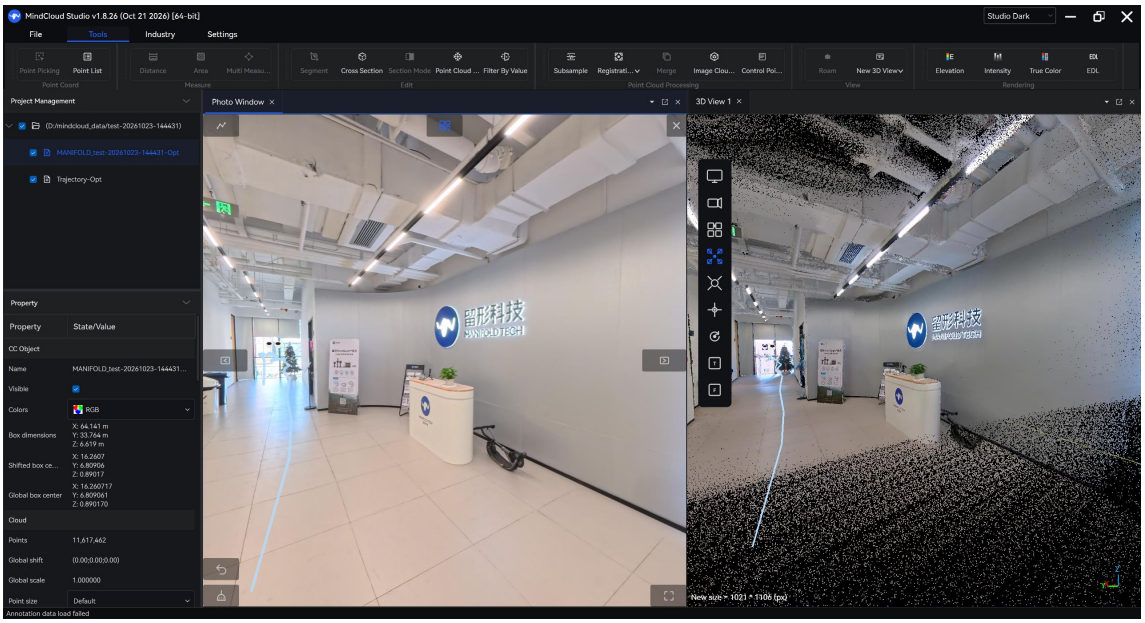


Image Fusion

- After loading the panoramic photos, click "Image-Cloud Linkage" to achieve a linked dual-view browsing effect;



Panoramic Image

- Click Image Measurement. In the photo window, you can perform multi-segment measurements and capture points in the point cloud view in real time to display the length.

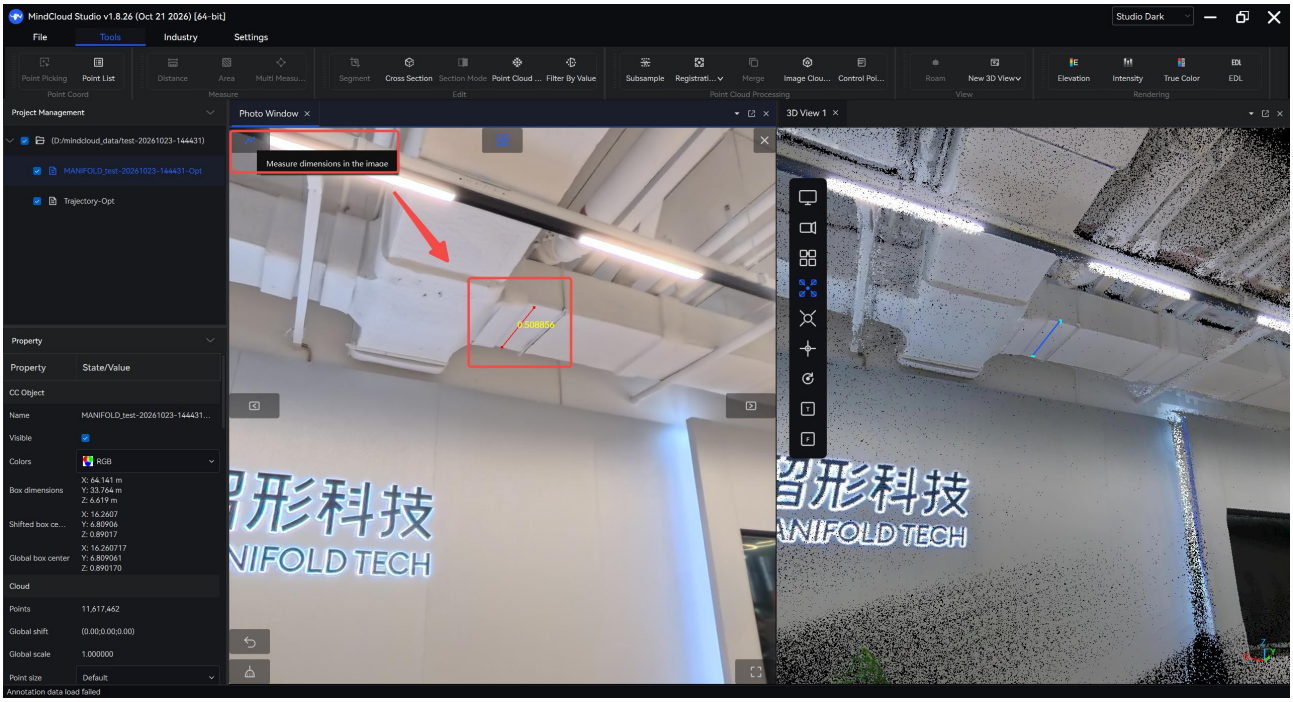
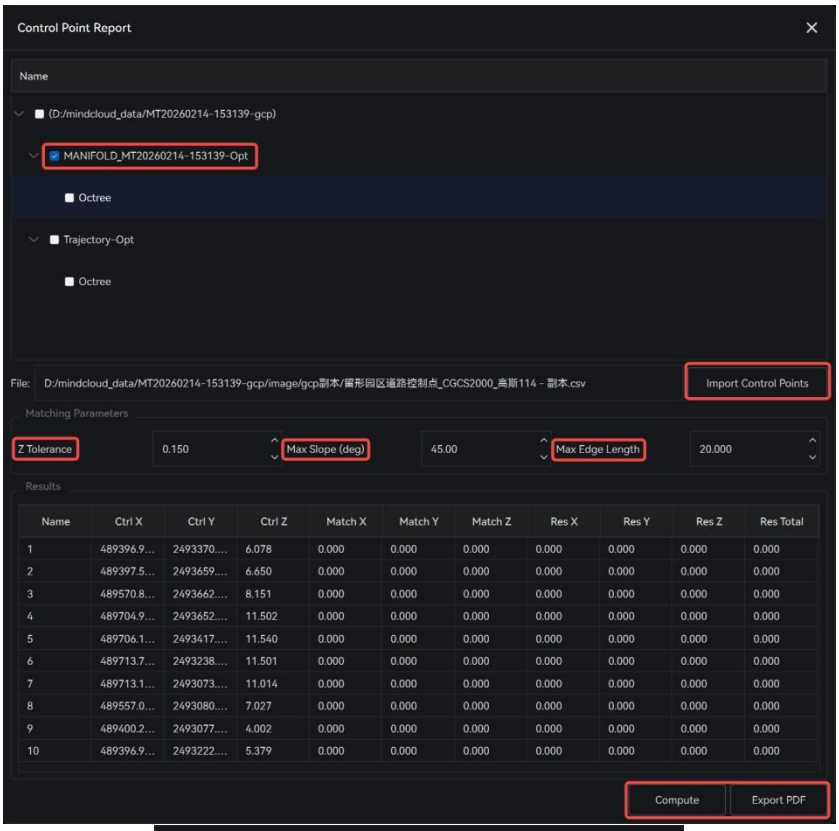
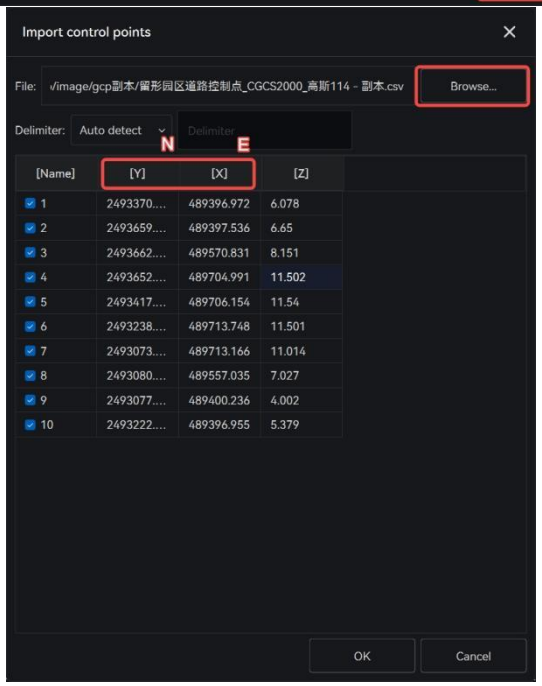


Image Measurement

5.12 Control Point Report

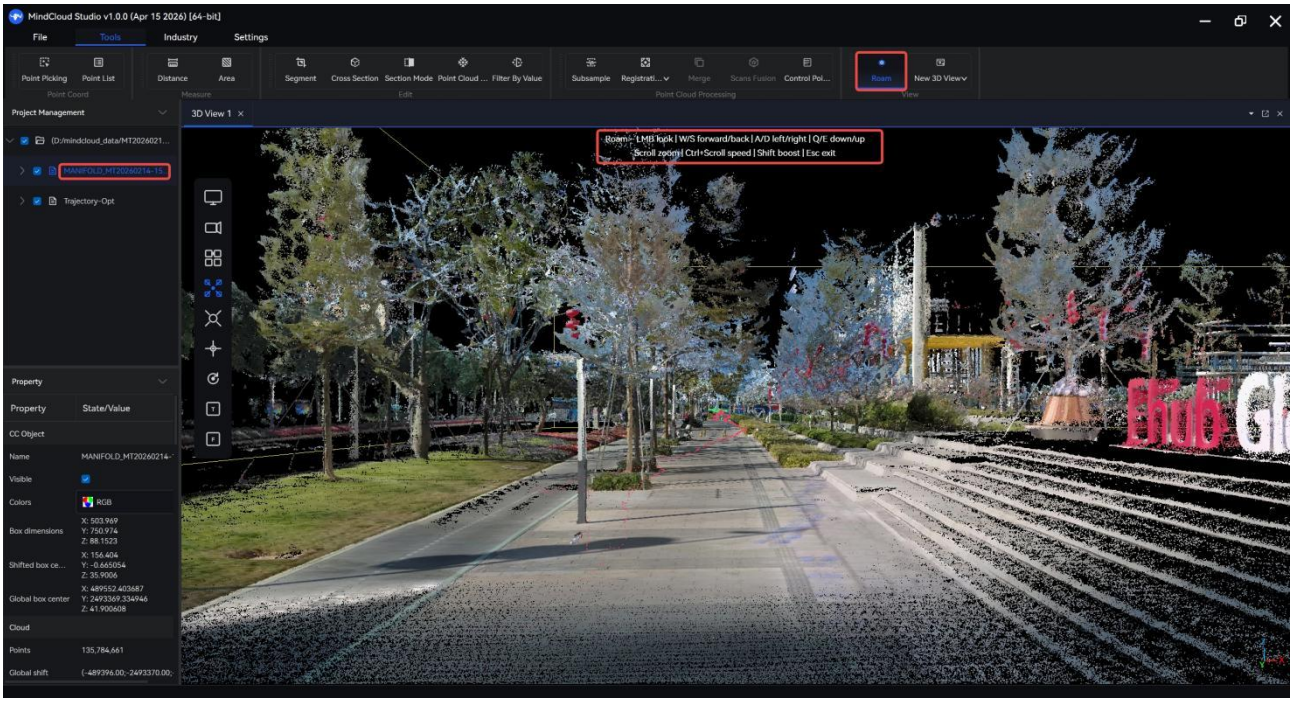
- In point cloud processing, selecting GCP optimization allows for control point accuracy verification after optimization.
- Select the point cloud, click "Control Point Report" on the toolbar, check the optimized point cloud, import the original control point file, and finally click "Calculate". You can also export the inspection results as a PDF file for easy storage.





5.13 Roam

- Select the point cloud and click "Roam" on the toolbar to switch to first-person view. Use the WASD keys to move the view, the QE key to adjust its height, and the scroll wheel to zoom the field of view.

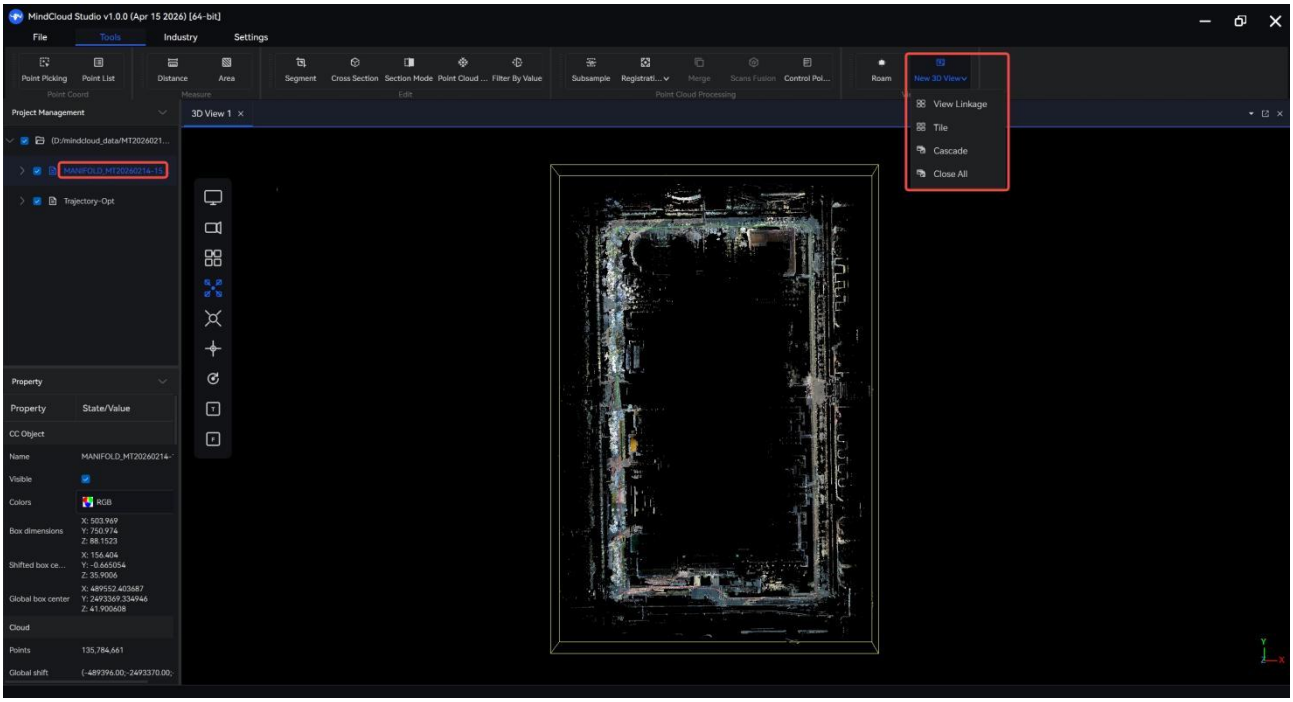


go on a pleasure trip

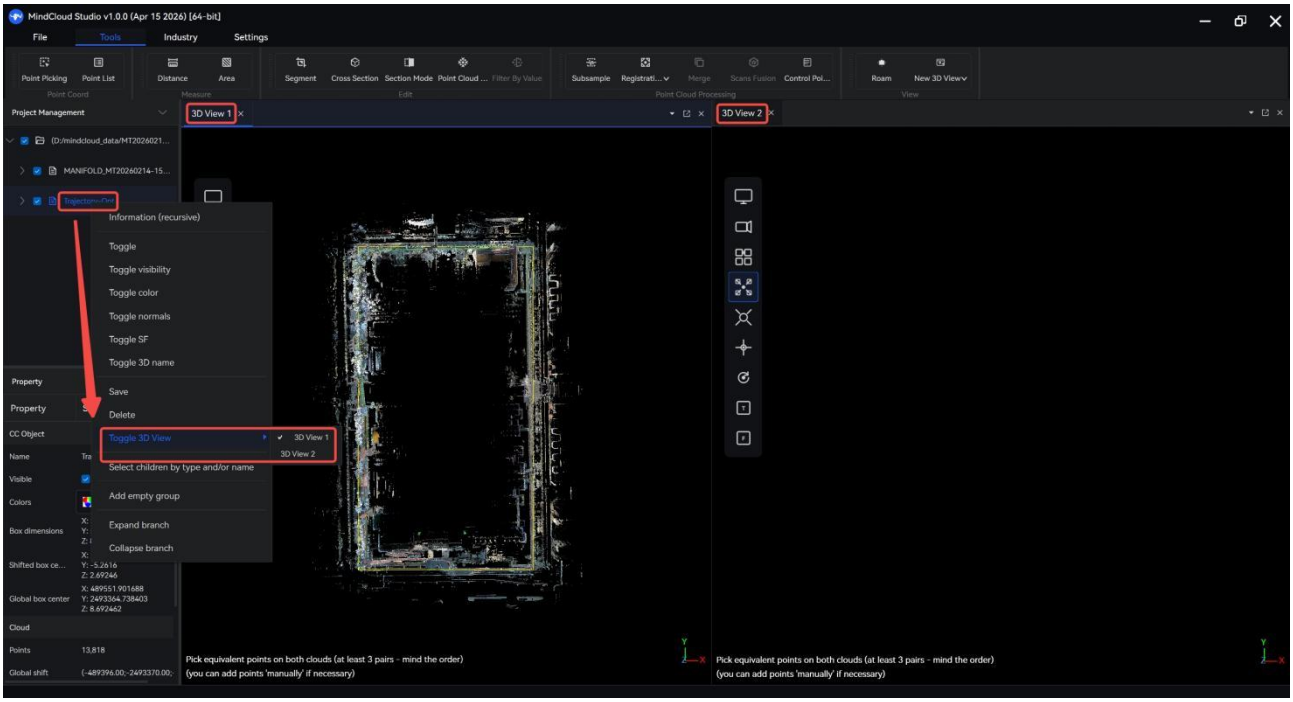
5.14 New 3D View

In the toolbar, click "New 3D View" to access the following features:

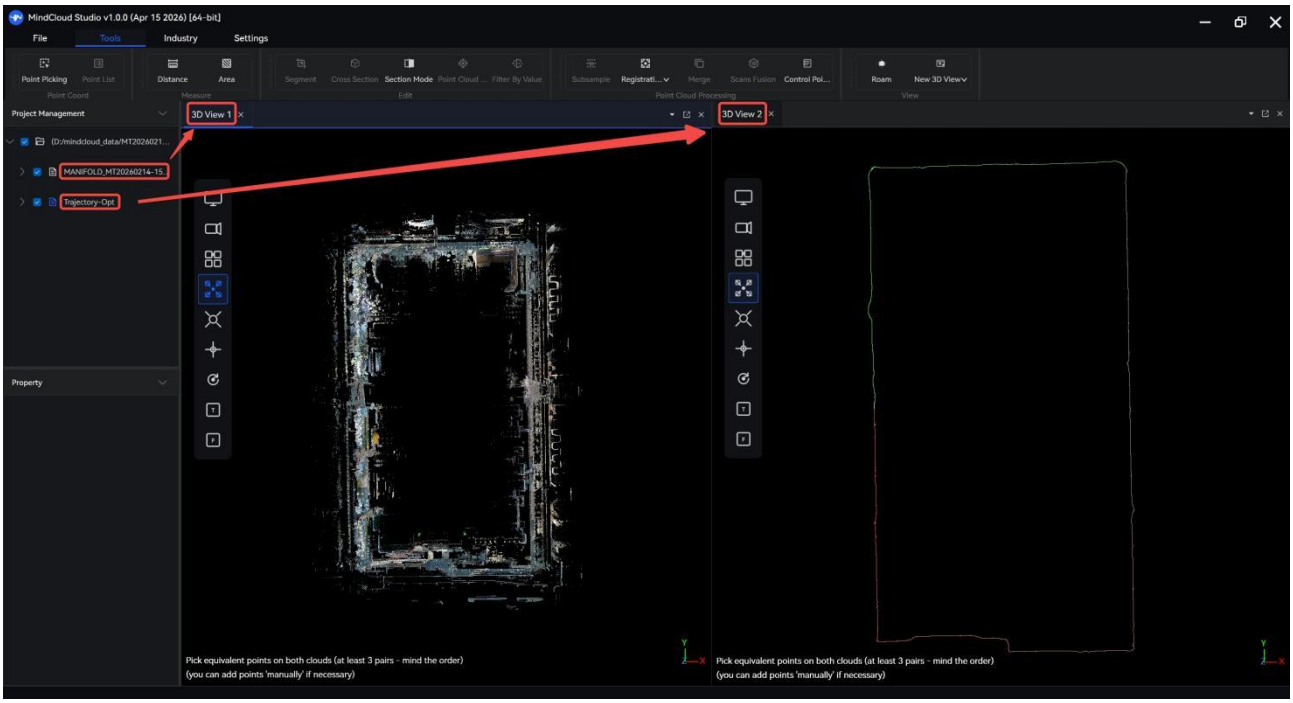
- New View
- View Linkage
- Tile
- Cascade
- Close All



Among them, the new view allows viewing different point clouds across multiple windows.



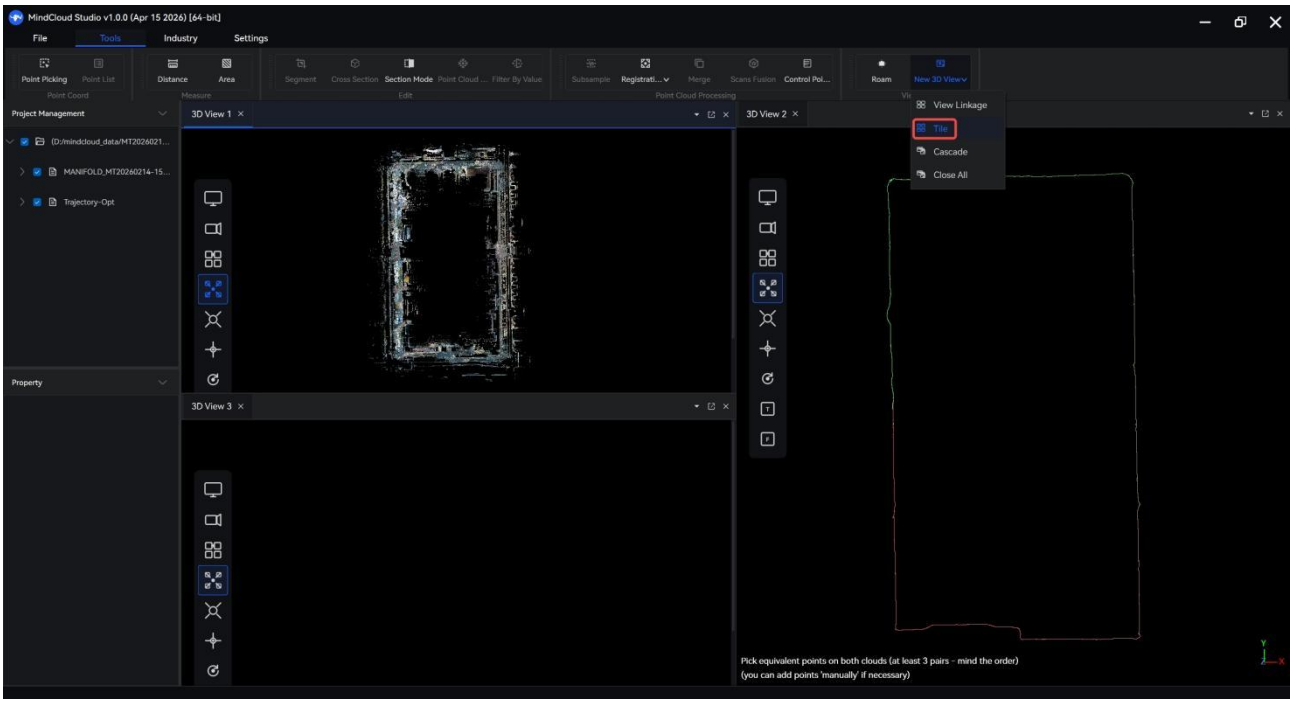
Create View and Switch Views



Multi-view point cloud display

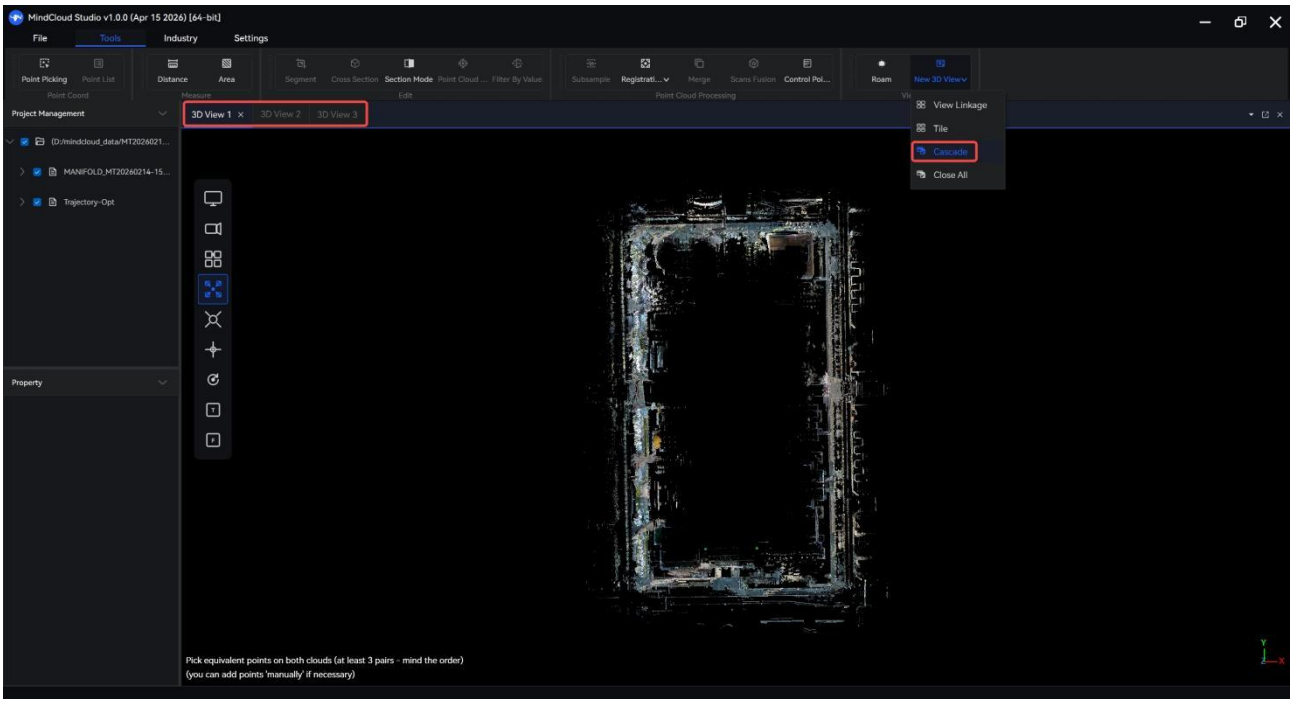
View synchronization allows all point clouds in multiple windows to move, rotate, and scale synchronously, enabling coordinated action.

The flat layout arranges all views in binary rectangles;



Tile

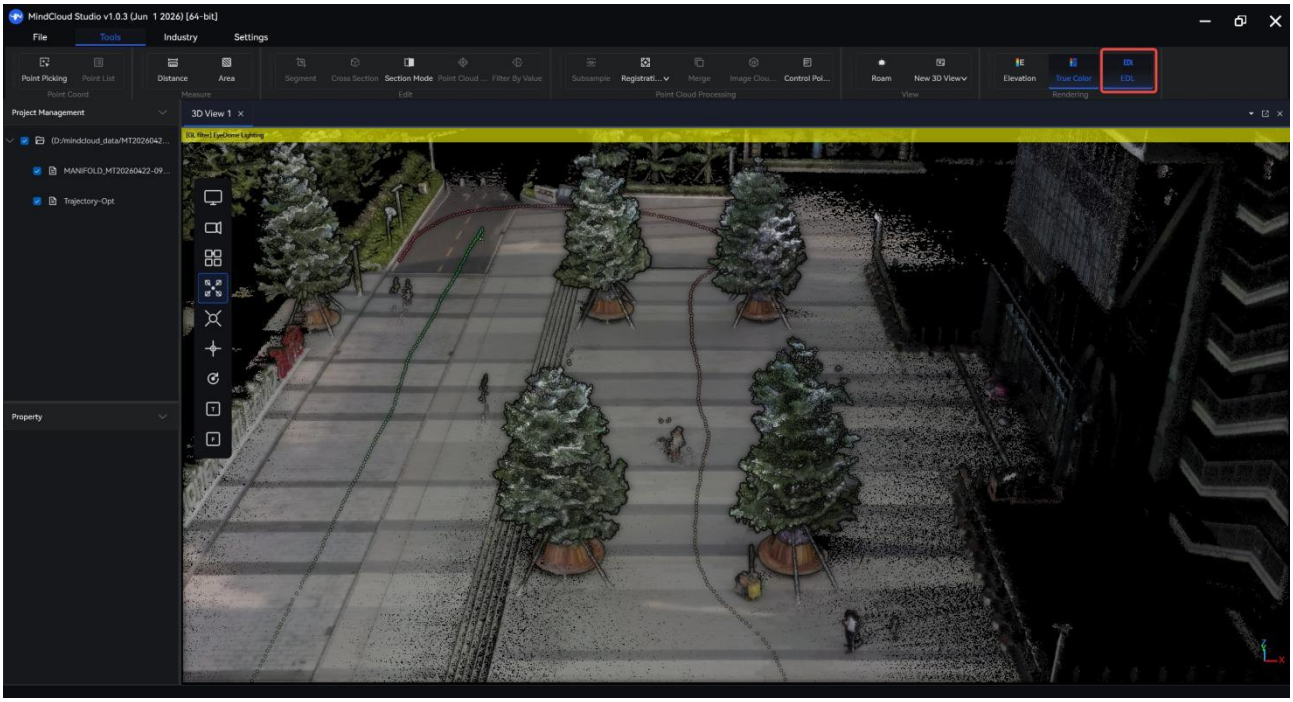
The cascade window displays all views in an indexed arrangement within a single window, showing only the current view while hiding the others.



Cascading Window

5.15 EDL

In the toolbar, clicking "EDL" can highlight the point edges of the point cloud, improve lighting, and make the overall point cloud more three-dimensional.



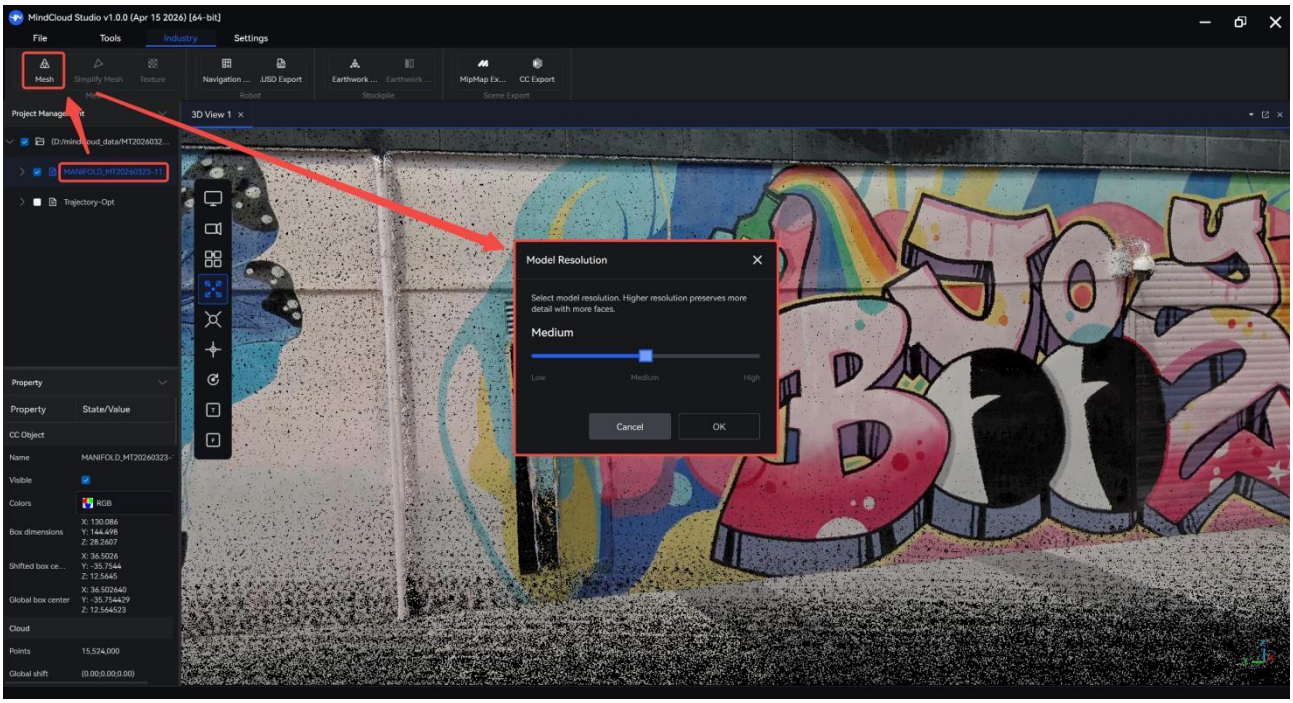
EDL

6. Industry Applications

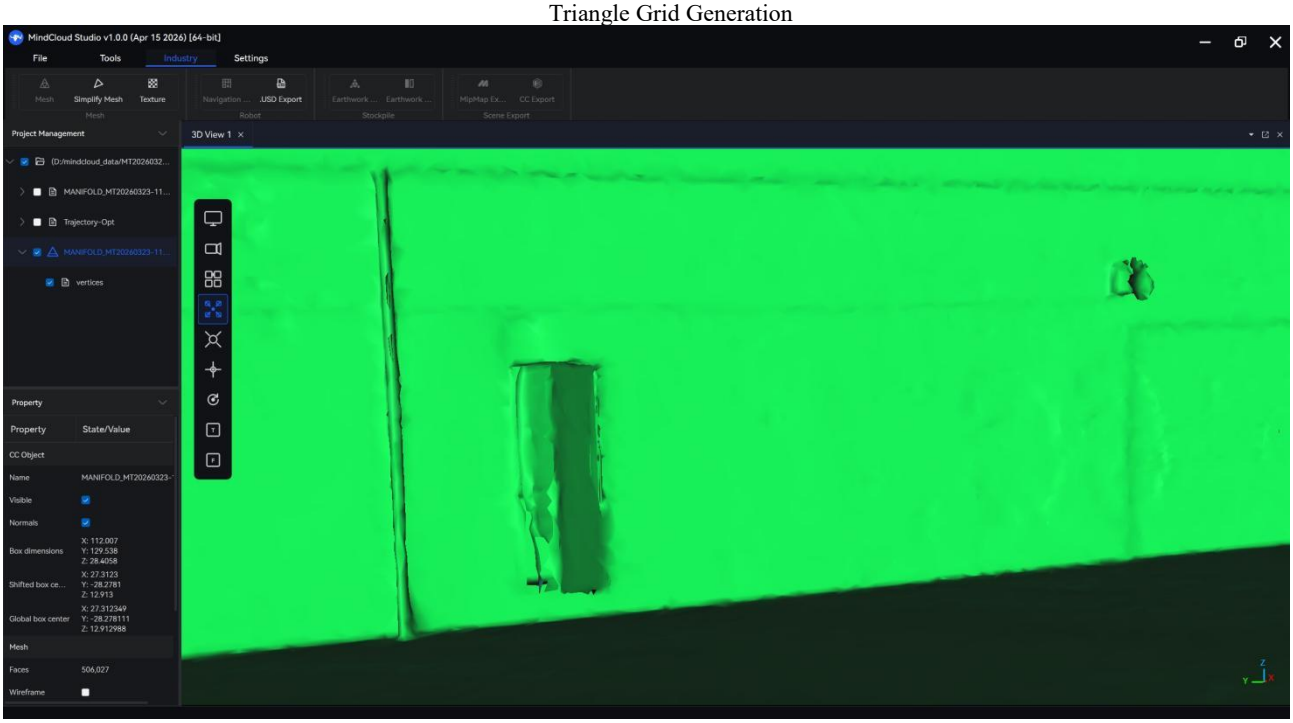
6.1. Mesh

6.1.1 Mesh

- Select the point cloud, click "Mesh" in the industry toolbar, and choose the meshing resolution (low, medium, or high; the default is medium). Click OK to generate the mesh model. The file will be automatically saved in the project directory in.ply format or can be saved in another format.



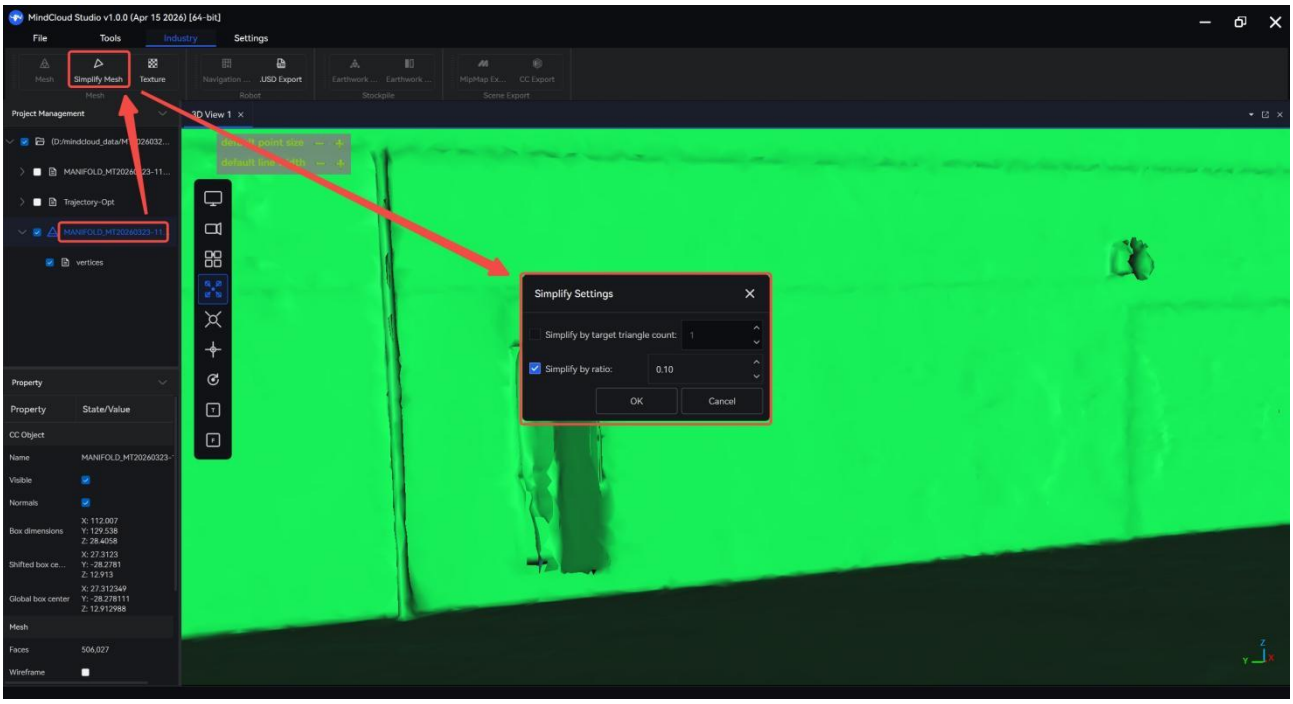
Triangle Grid Generation



Mesh

6.1.2 Simplify Mesh

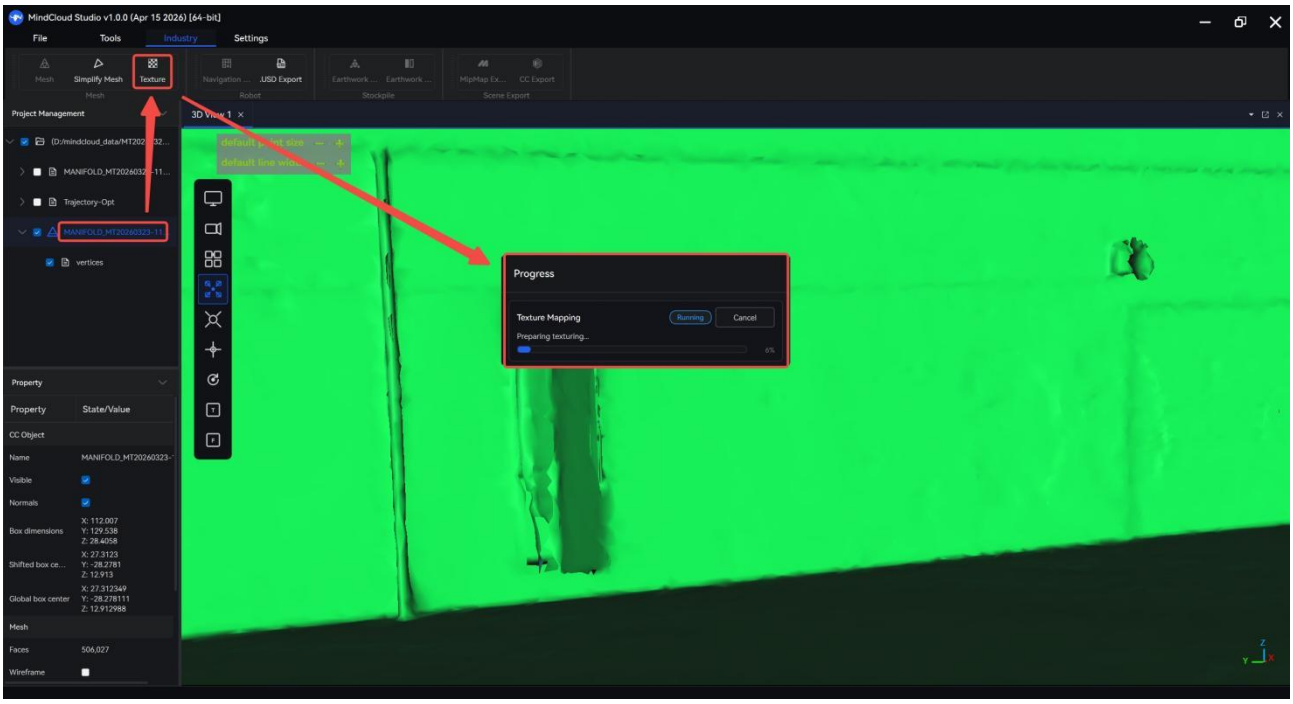
- Select the Mesh and click "Simplify Mesh" in the industry toolbar to reduce the number of mesh faces, thereby decreasing the data size. However, this will also compromise some accuracy and fit quality.



Grid Simplification

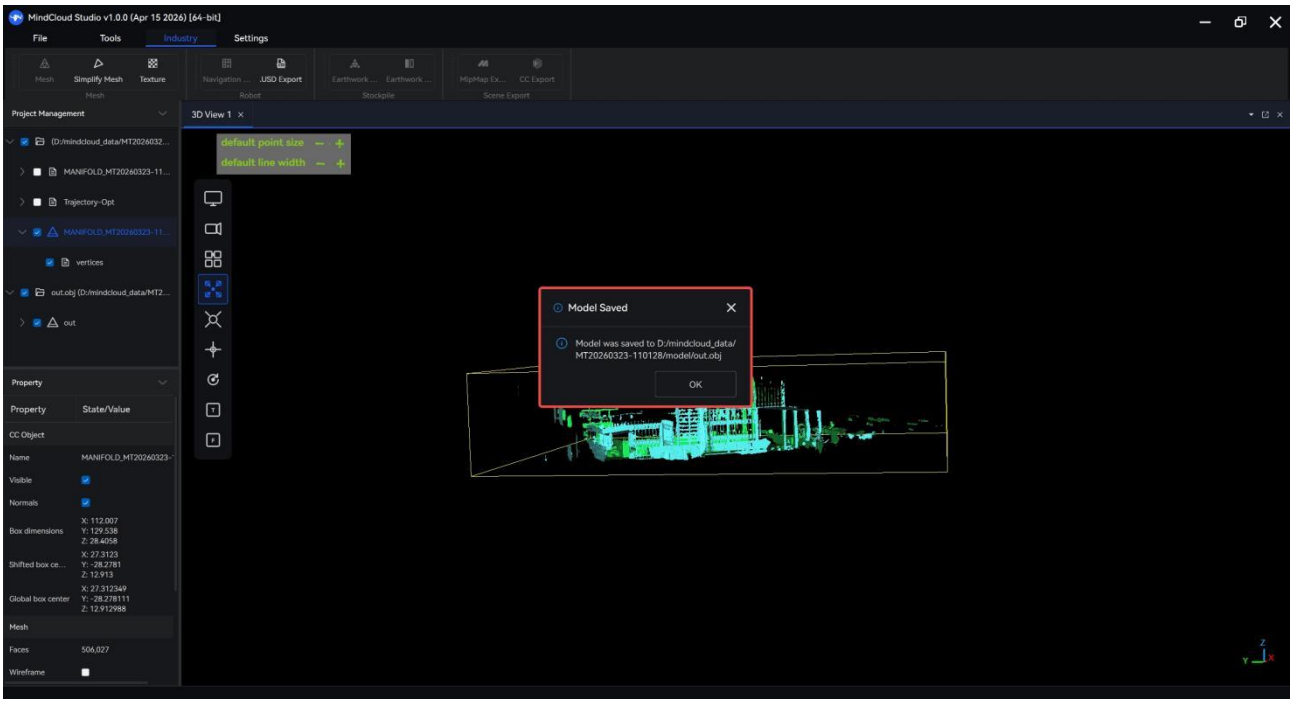
6.1.3 Texture

- Select the Mesh, then click "Texture" in the industry toolbar. The software will automatically calculate and map the photo onto the Mesh, generating a mesh model with the photo texture.

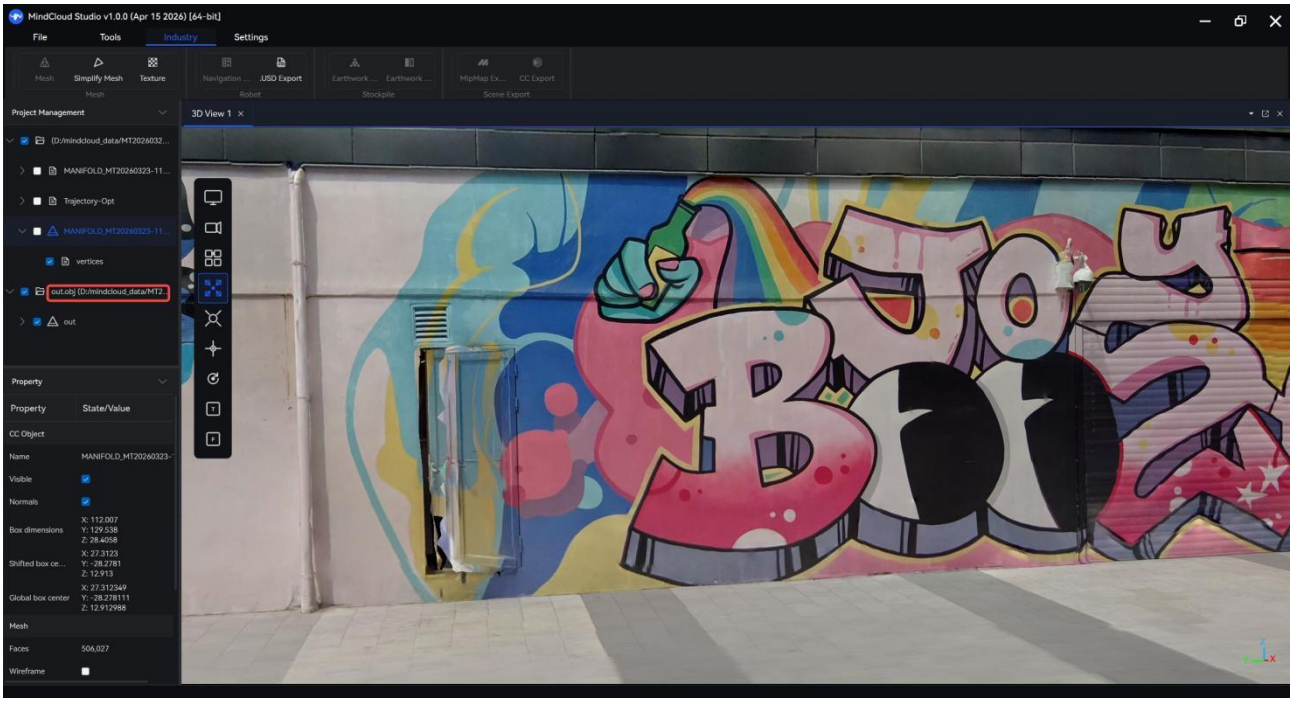


texture mapping

- After starting the process, the calculation speed depends on your computer's performance.
- After completing the texture mapping, save it in the project data directory under a folder named "model".

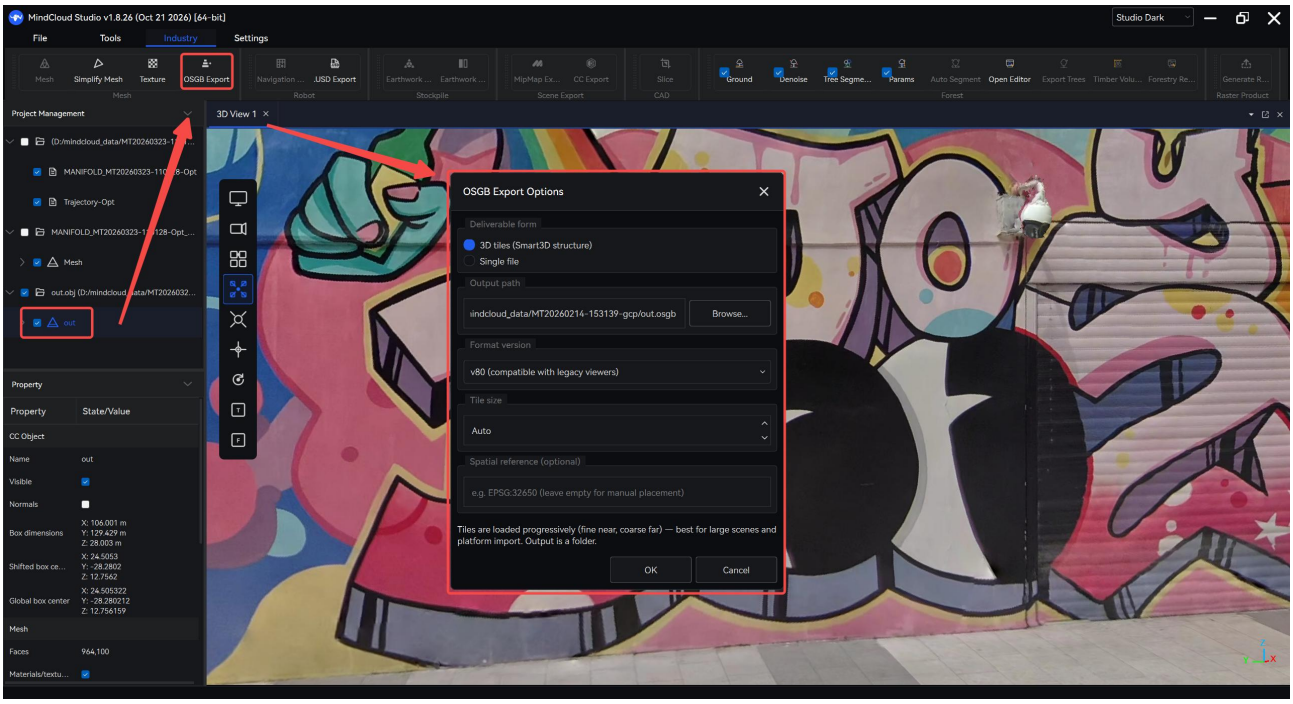


Grid Model Results Save Directory

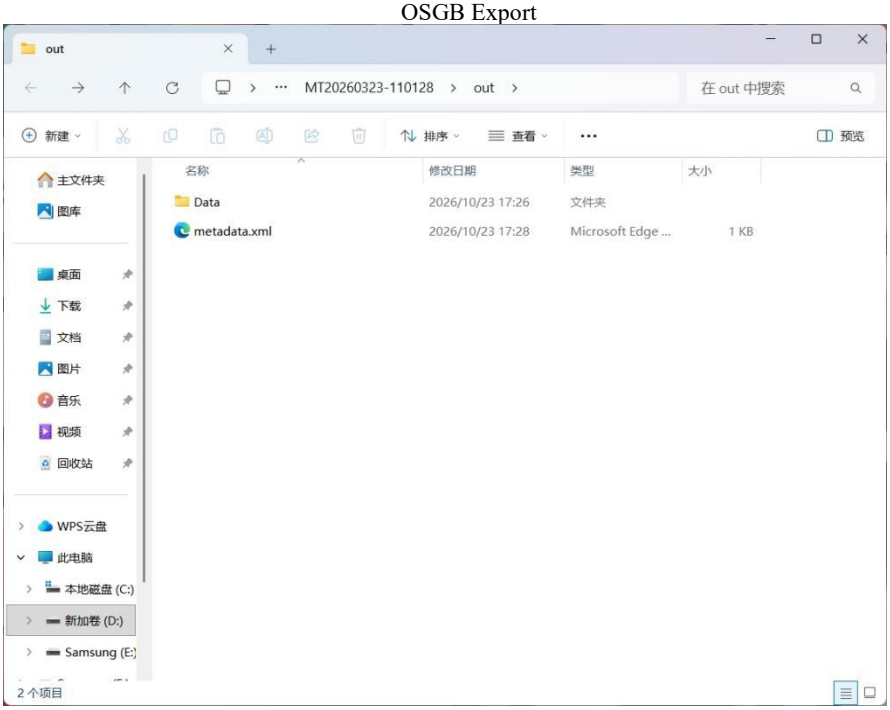

MindCloud Studio v1.0.0 (Apr 15 2026) [64-bit]
File
Tools
Industry
Settings
Mesh
Simplify Mesh
Texture
Navigation ...
.USD Export
Earthwork ...
Earthwork ...
MipMap Ex...
CC Export
Robot
Stockpile
Scene Export
Project Management
3D View 1
Trajectory-Opt
vertices
out.obj (D:/mindcloud_data/MT2...
out
Property
Property
State/Value
CC Object
Name
Visible
Normals
Box dimensions
X: 112.007
Y: 129.538
Z: 28.4058
Shifted box ce...
X: 27.3123
Y: -28.2781
Z: 12.913
Global box center
X: 27.312349
Y: -28.278111
Z: 12.912988
Mesh
Faces
506,027
Wireframe
Mesh Model

6.1.4 OSGB Export

- Select the Mesh, click "OSGB Export" in the Industry toolbar, and the software will export the Mesh as OSGB tiles.



OSGB Export

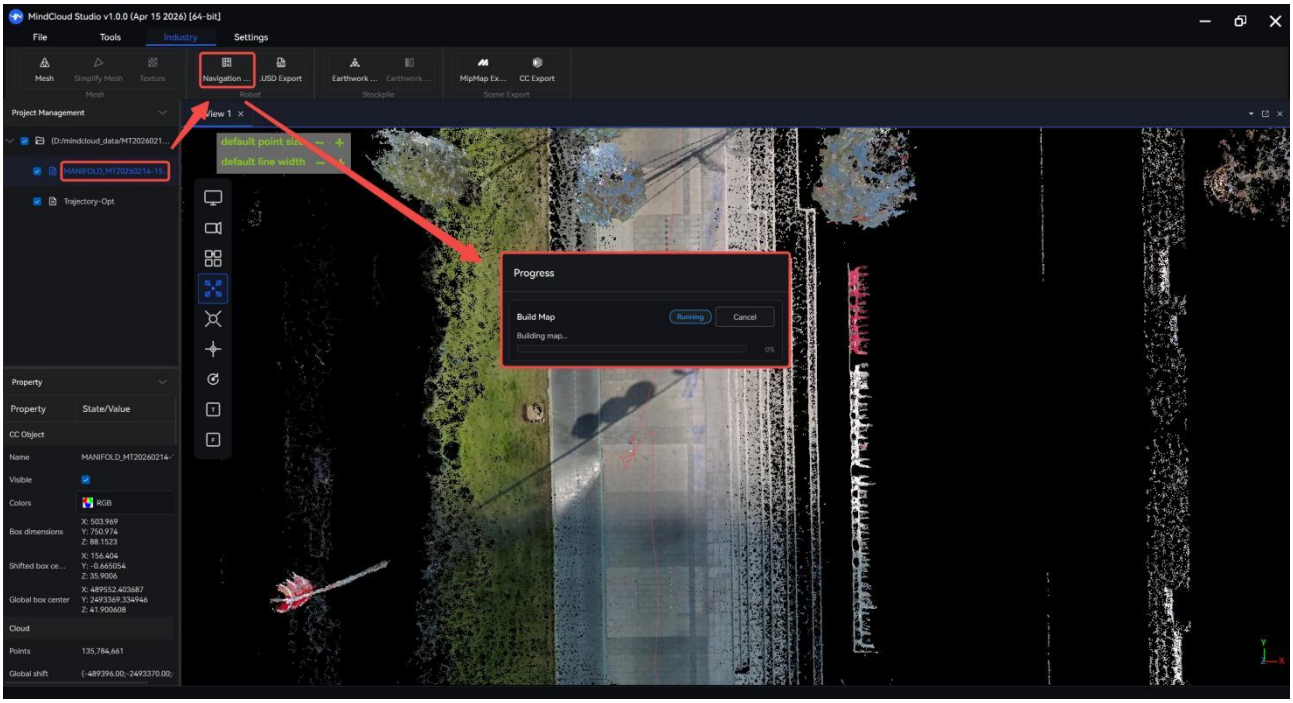


OSGB Format

6.2 Robot

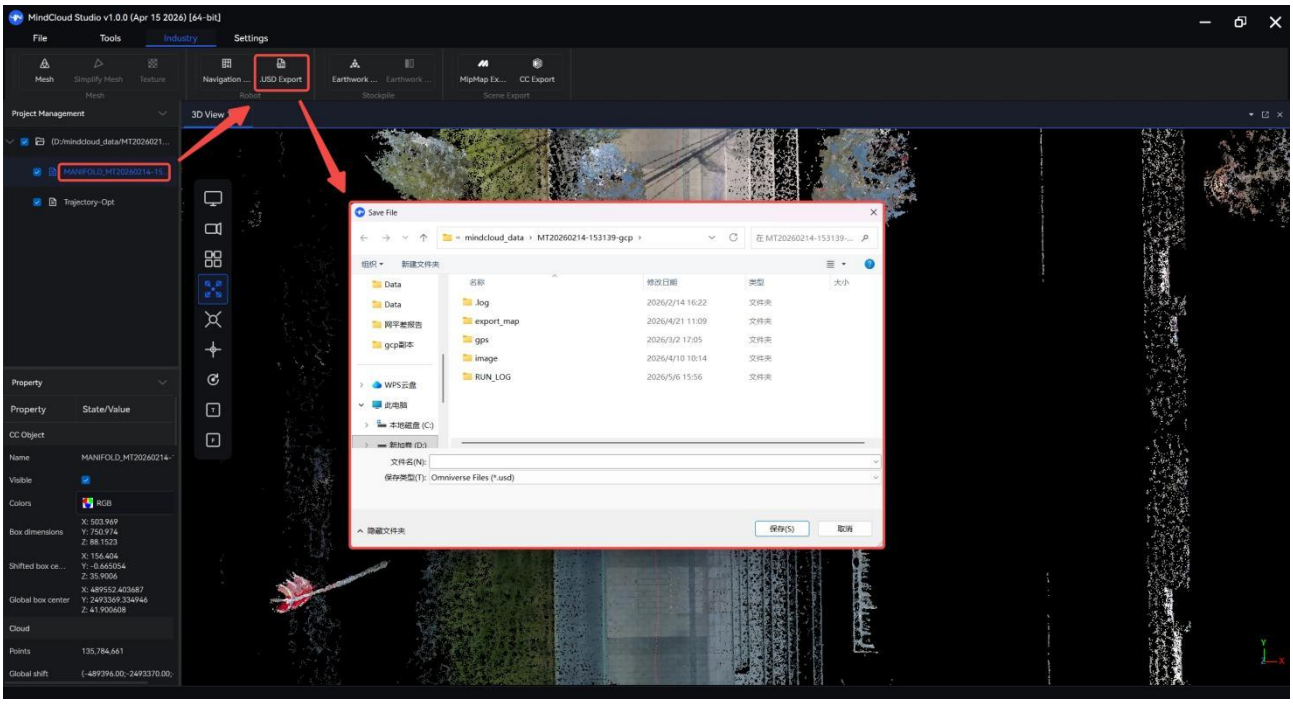
6.2.1 Navigation Map

- Select the point cloud and click "Navigation Map" under the Industry Applications section to generate another series of localization maps used by Odin, an embodied intelligent product, which facilitates navigation algorithms. For details, see: https://manifoldtechltd.github.io/wiki/odin_series/odin1/10.%20Relocalization%20Usr%20Guide.html.



6.2.2 .USD Export

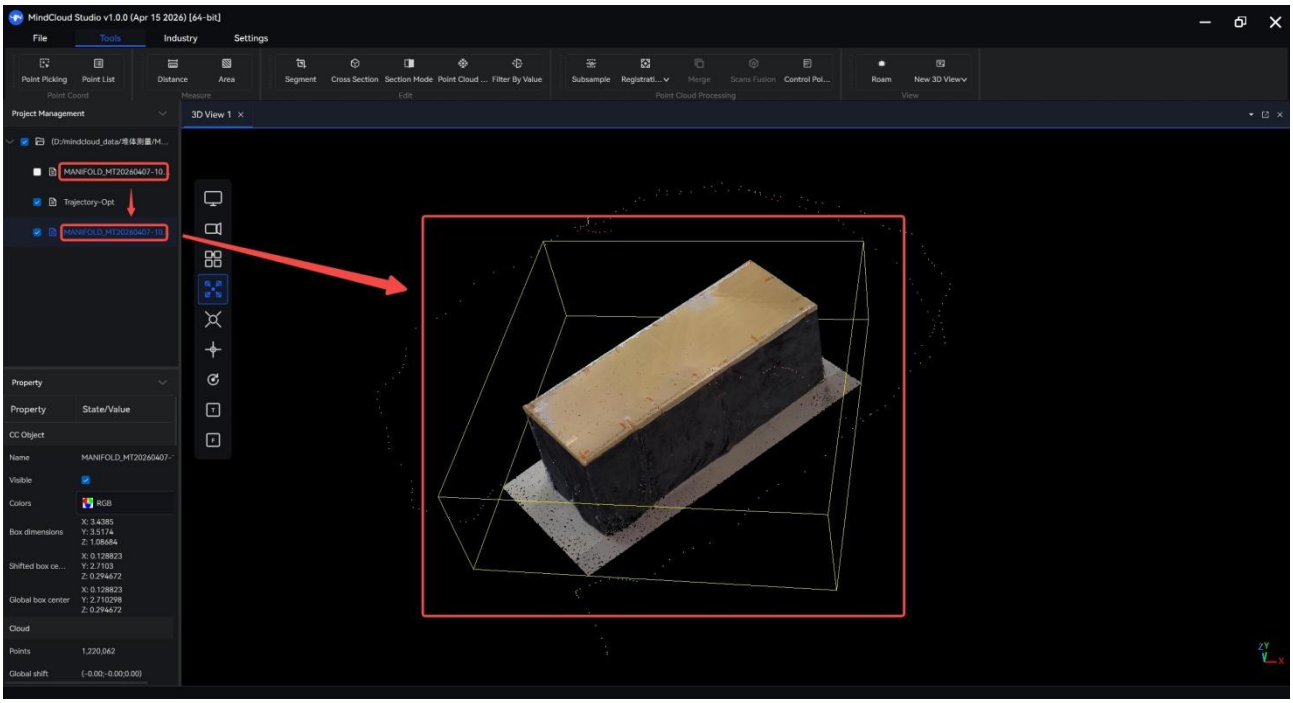
- Select the point cloud and click "USD Export" under Industry Functions to export the data in USD format, facilitating integration with the NVIDIA Omniverse simulation training platform.



6.3. Earthwork

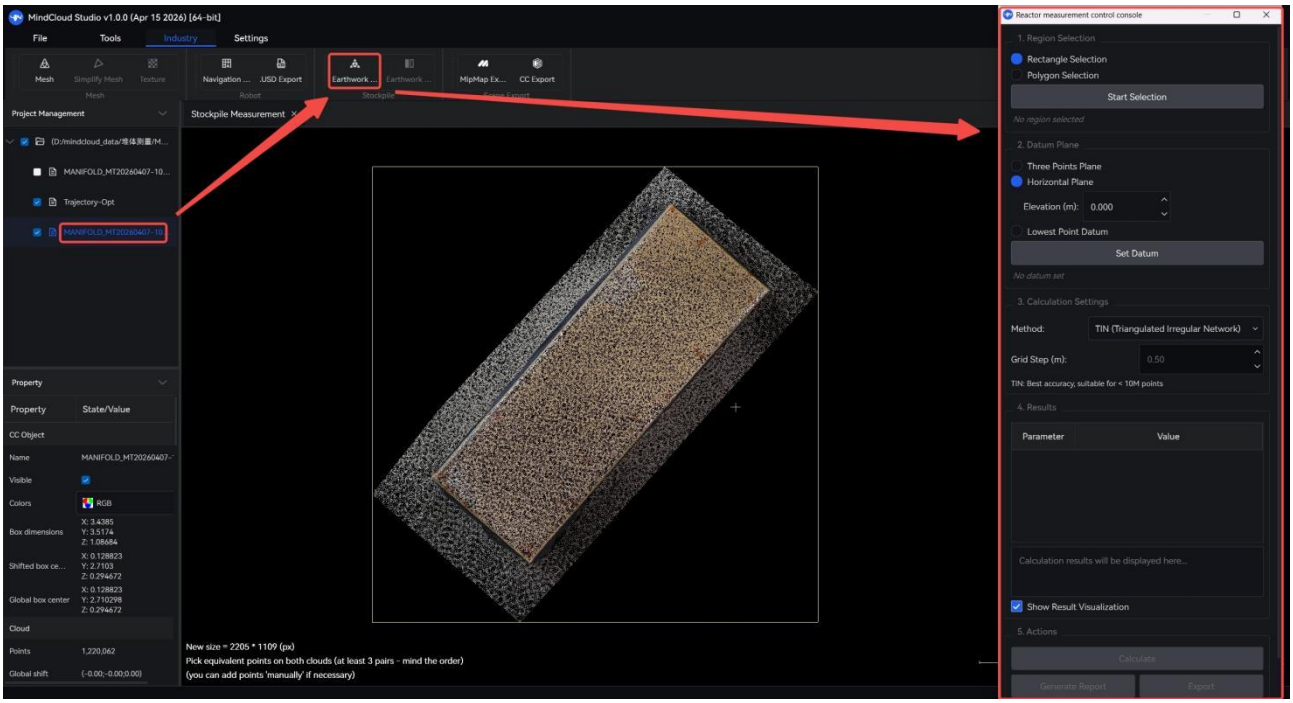
6.3.1. Earthwork Measurement

- Before using the stack for measurement, the stack must first be trimmed or the unnecessary point clouds on its edges and top removed.



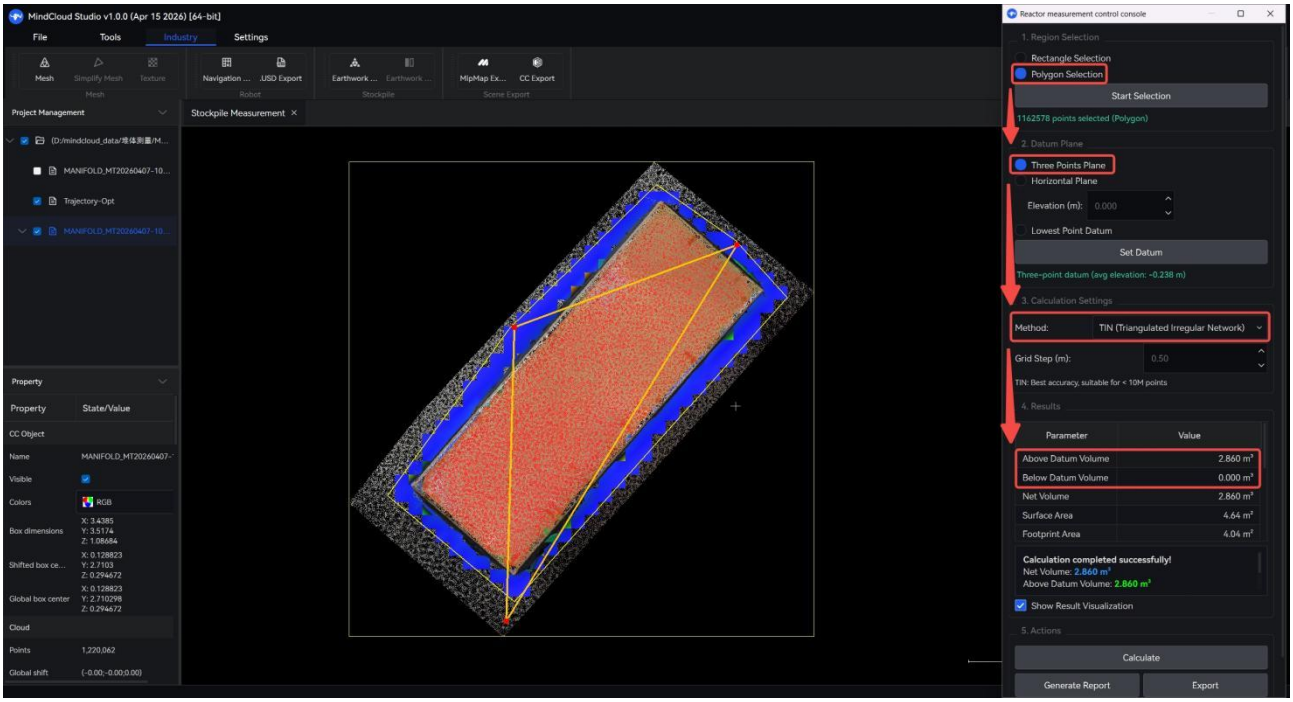
Cutting

- Next, select the cropped point cloud of the volume and click "Volume Measurement" in the Industry Applications section.



Pile mass measurement

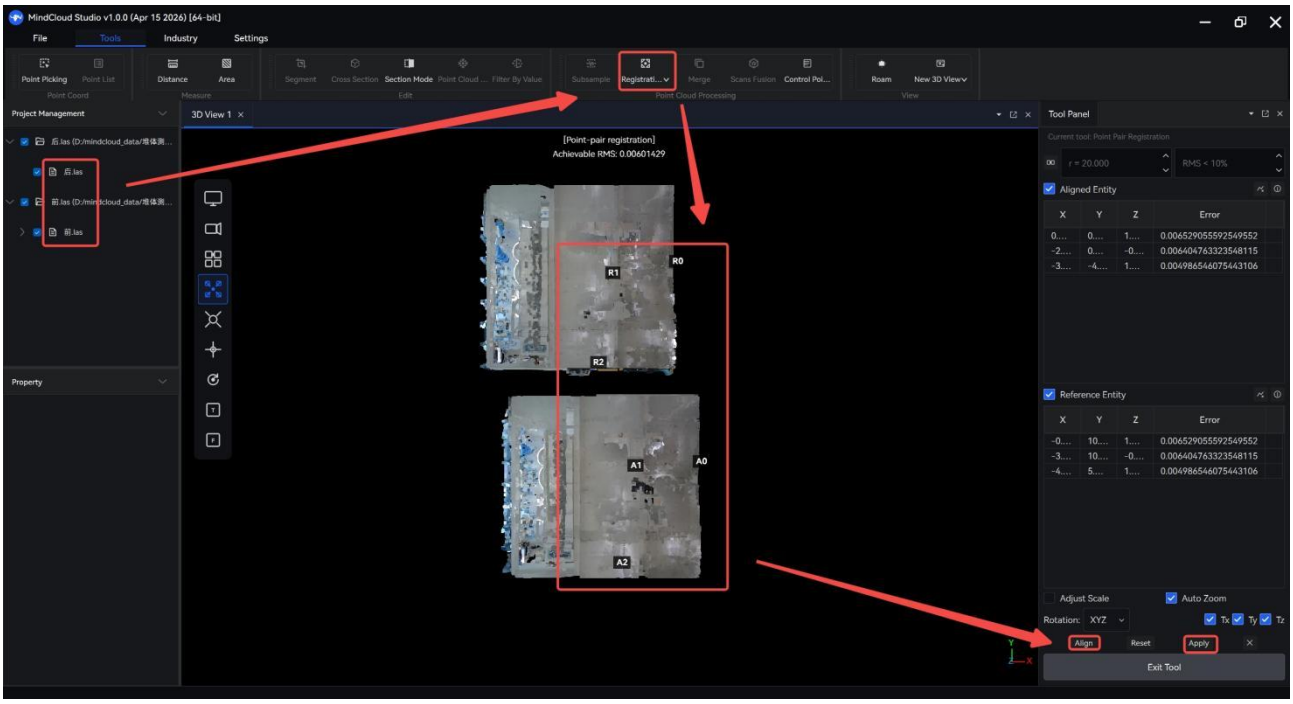
- Use the "Polygon Selection" manual box to select the occupied area of the stack;
- To set the reference plane, use the "Three-Point Plane" tool to select three points from the point cloud as the reference plane.
- Select a method for calculating the volume; the recommended option is the "Triangulated Inverse Network (TIN)". This will generate the pile information and allow you to export the report.



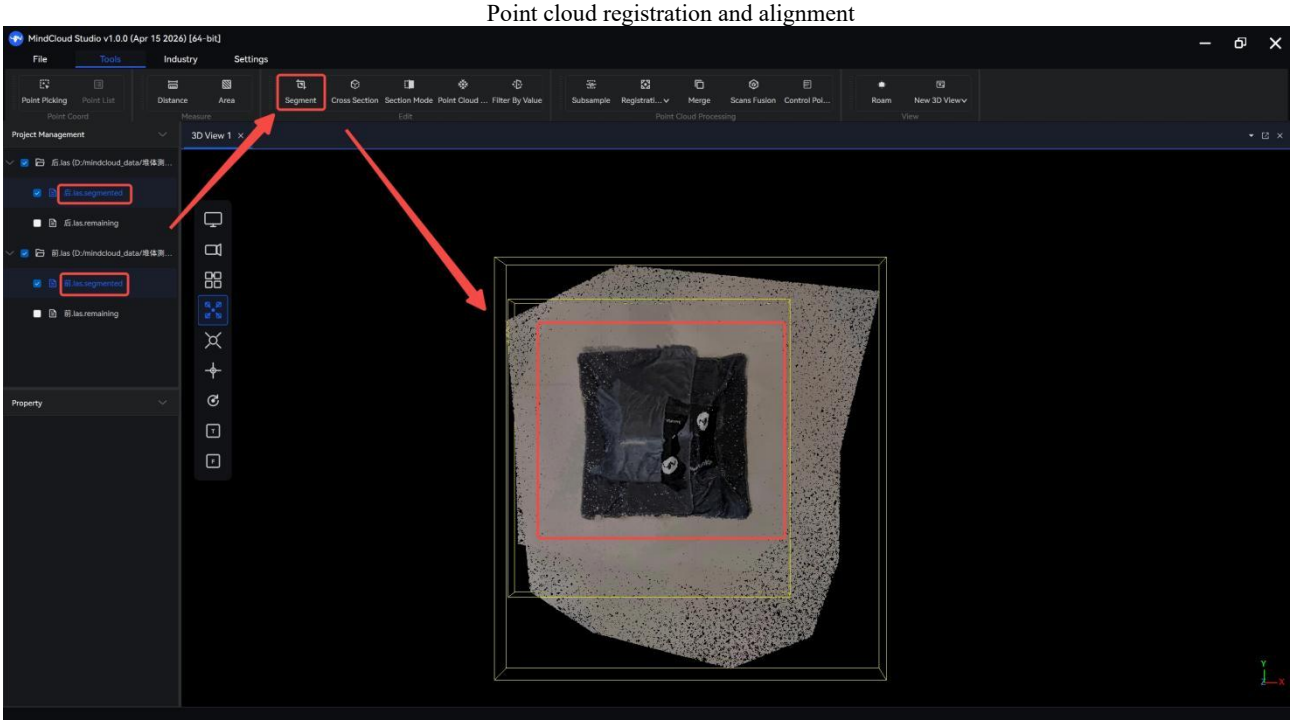
Stack Information

6.3.2 Earthwork Comparison

- Similar to pile body measurement, it is recommended to first register and align the two point cloud datasets, then crop the pile body or remove the redundant point clouds from the periphery and top.

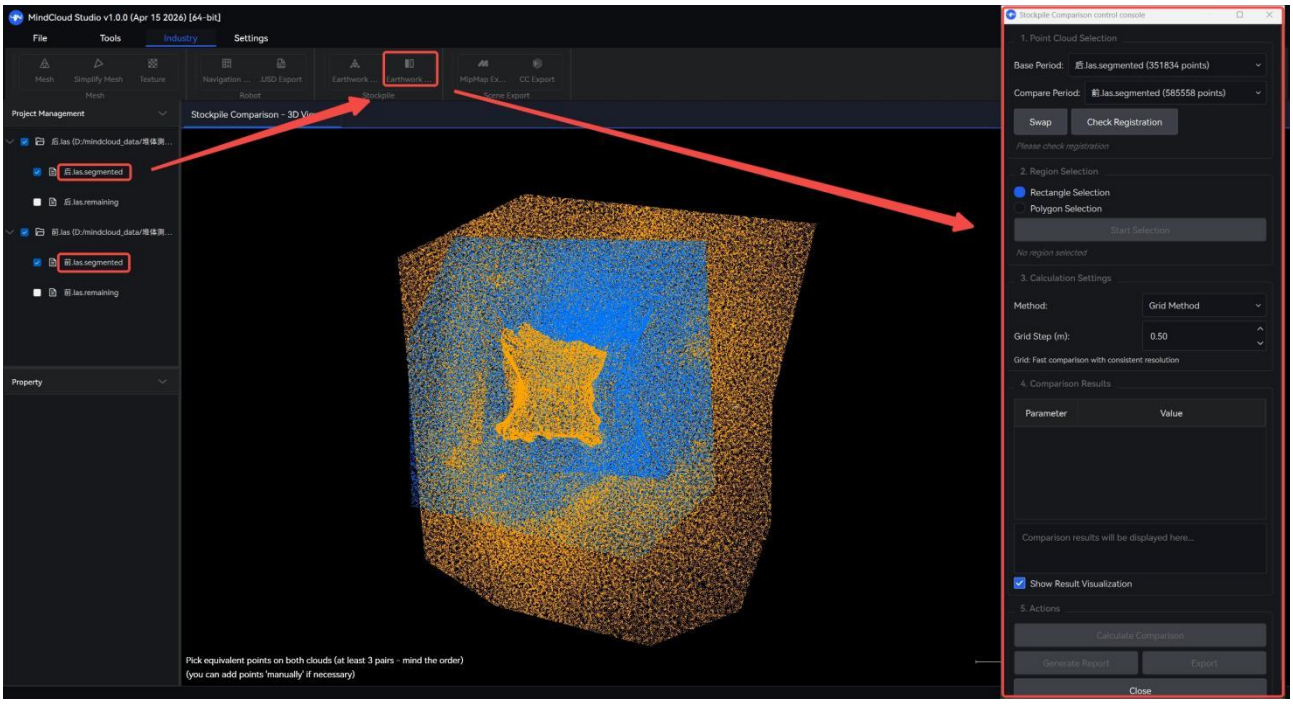


Point cloud registration and alignment

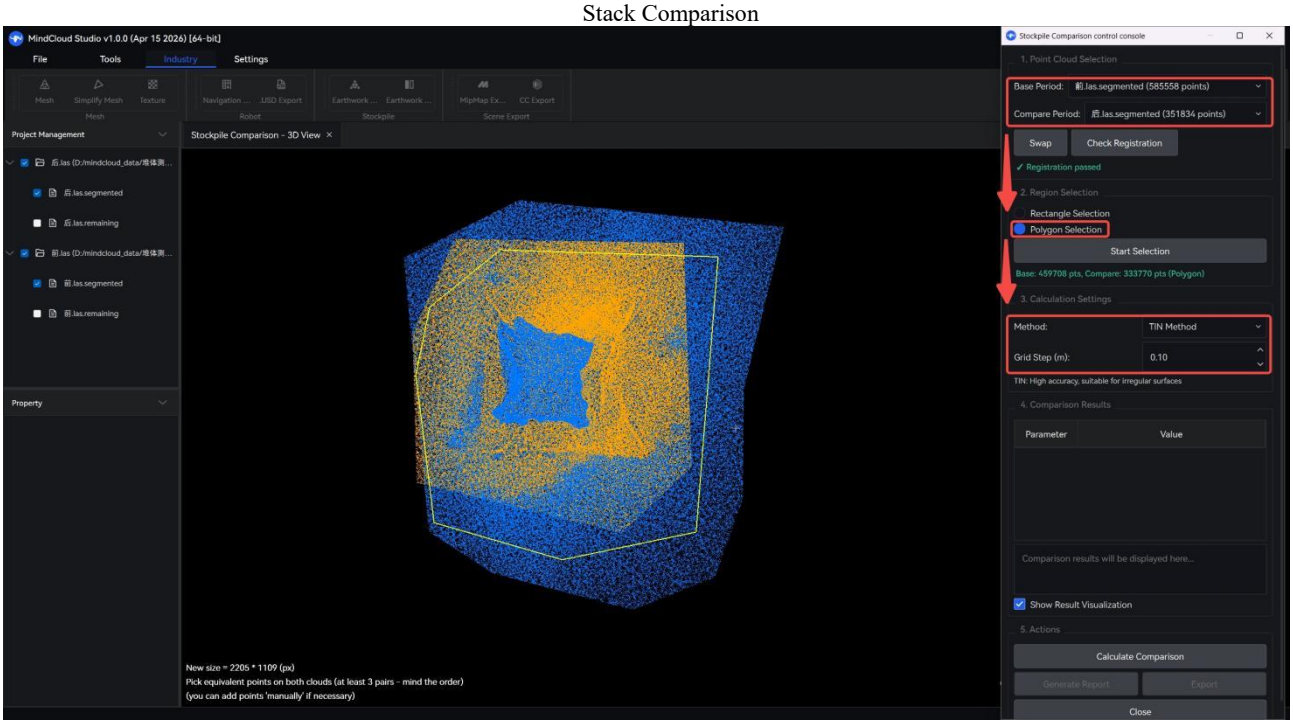


Crop stack

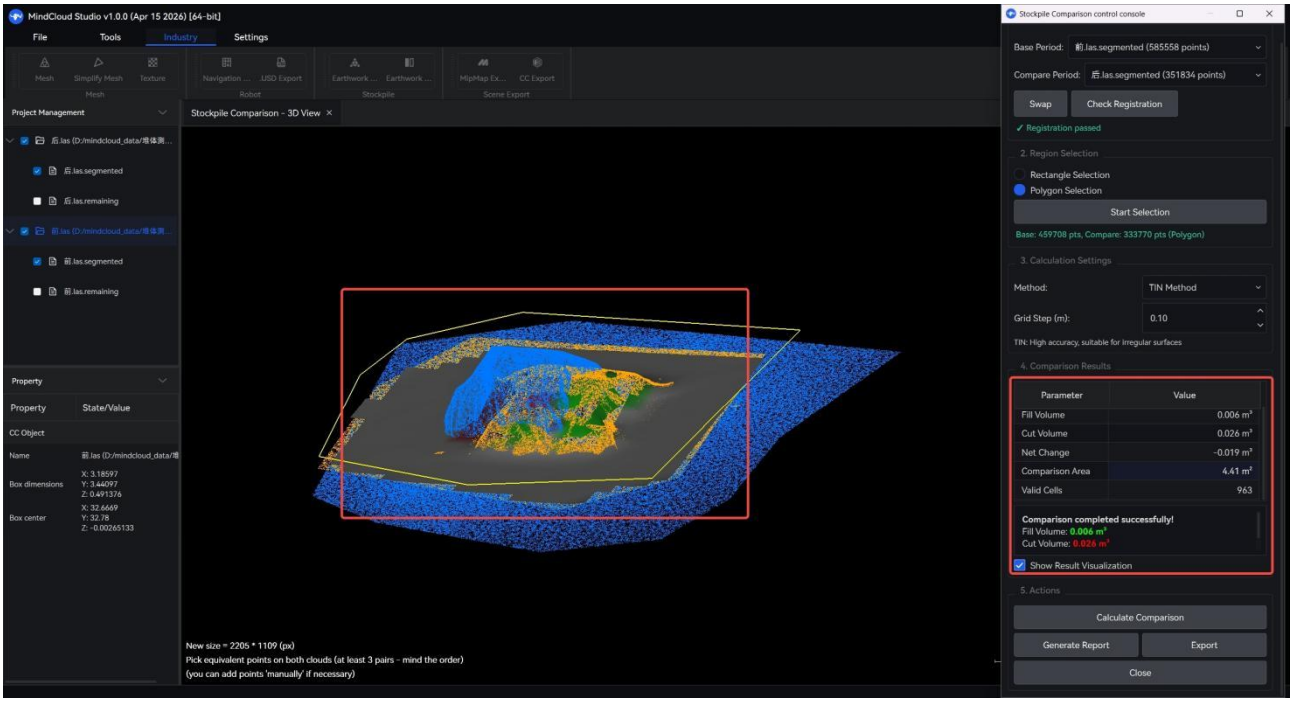
- Select two sets of embankment point clouds, click "Embankment Comparison" under the industry toolbar, specify the pre-and post-embankment configurations along with the calculation method, and finally compute the fill and cut volumes.



Stack Comparison



Select the front and rear pile bodies

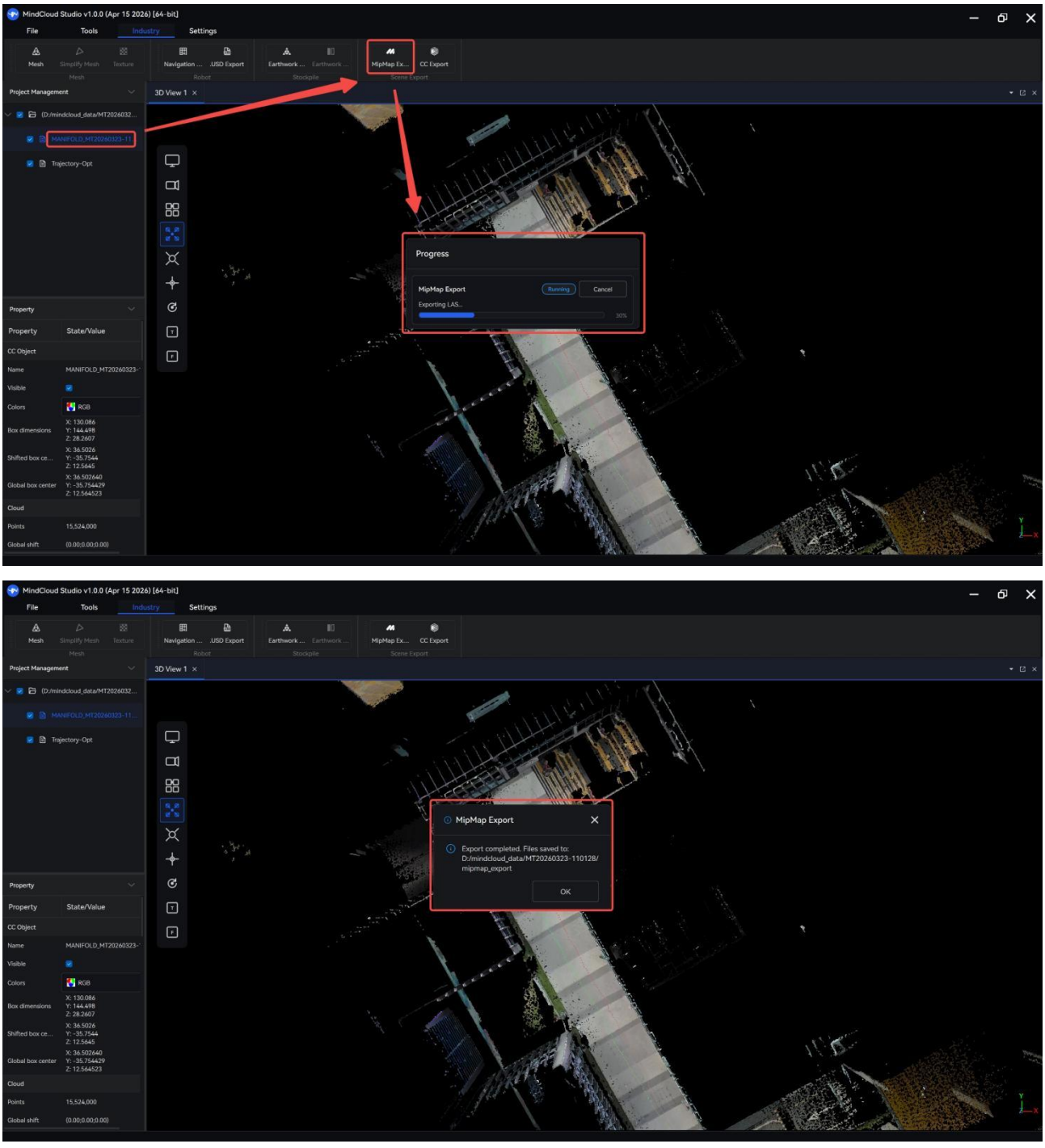


Calculation of fill and excavation work

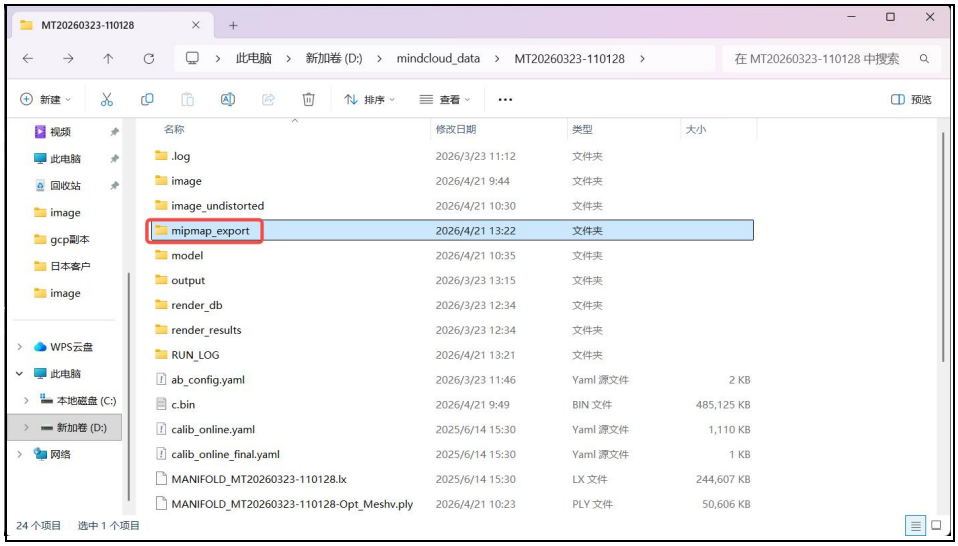
6.4 Scene Export

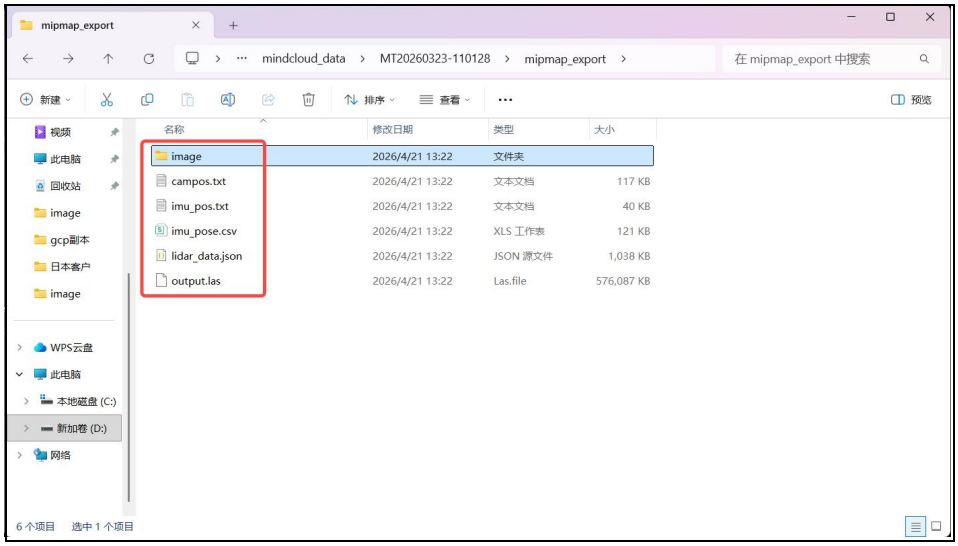
6.4.1 MipMap Export

- Select the point cloud and click "MipMap Export" in the industry toolbar. The system will automatically generate the required data structure folder for MipMap software based on the selected point cloud and its corresponding project.
- After that, use MipMap to import the corresponding converted folder for Gaussian reconstruction.



MipMap Export

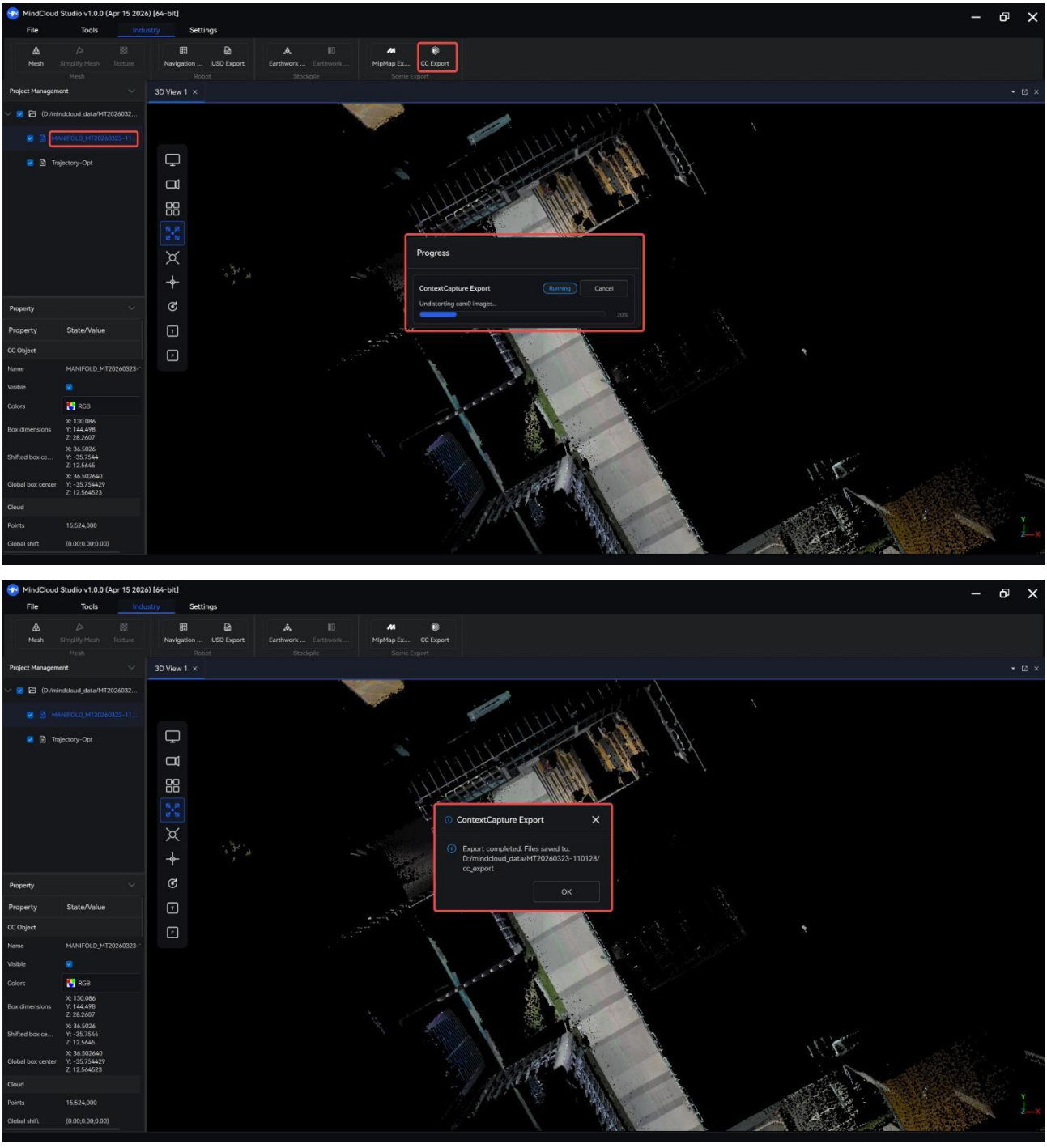




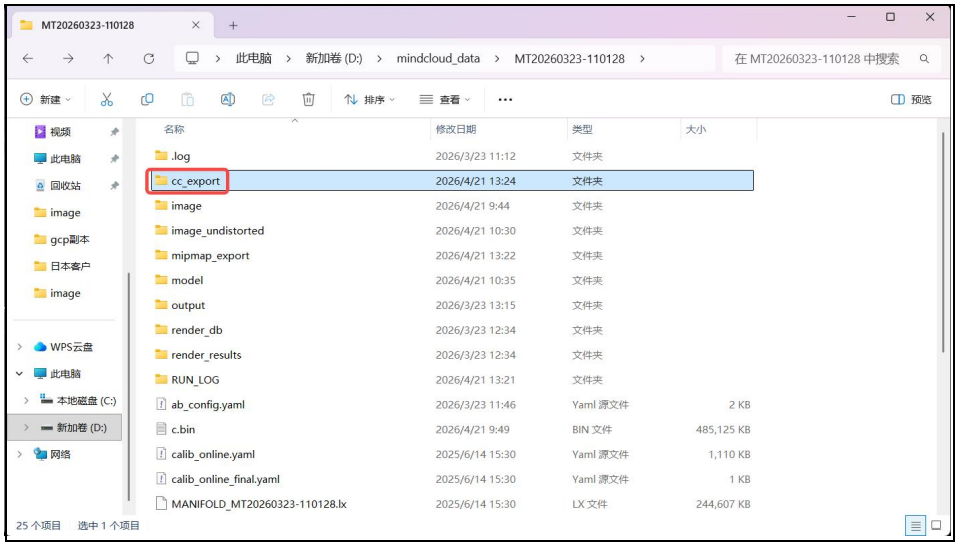
MipMap data structure folder

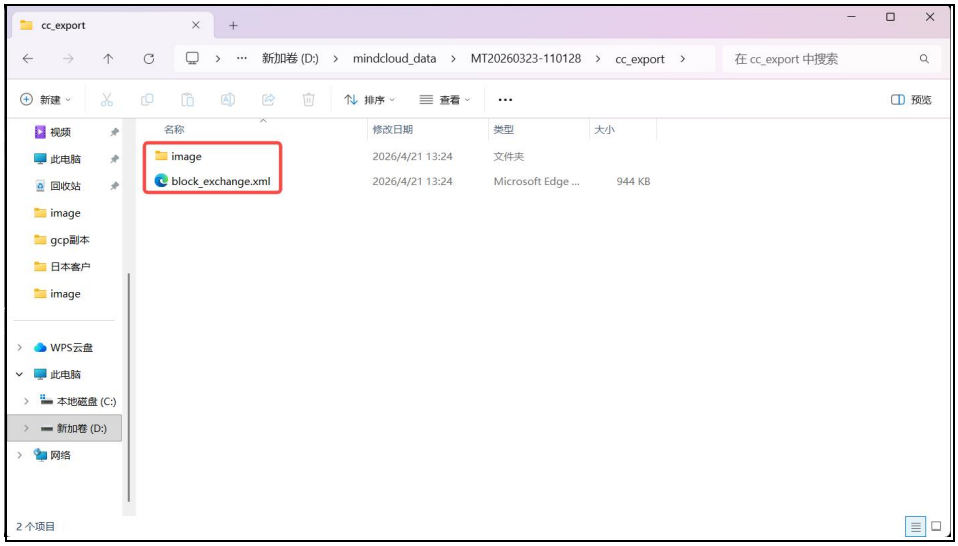
6.4.2 CC Export

- Select the point cloud and click "CC Export" in the industry toolbar. The system will automatically generate the required data structure folder for CC software (formerly Context Capture; now iTwin Capture Modeler) based on the selected point cloud and its corresponding project.
- After that, use CC to import the converted folder for 3D reconstruction.



CC leading-out



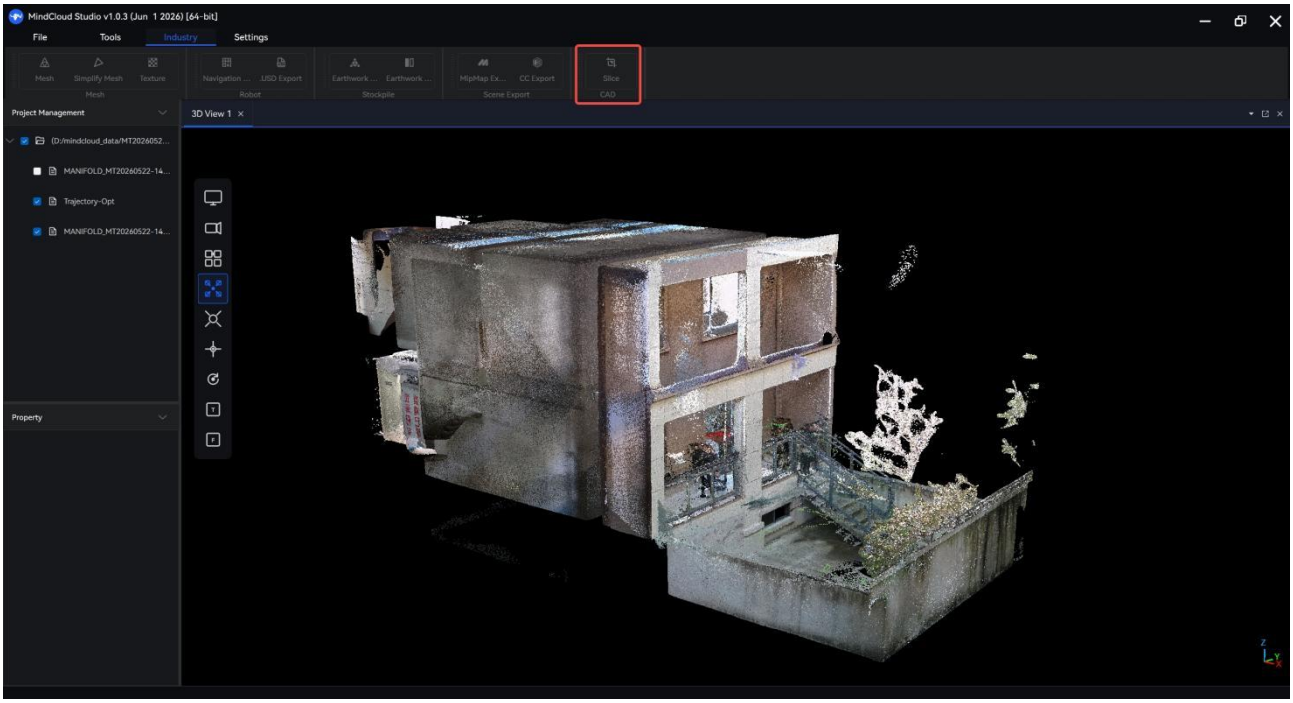


CC Data Structure Folder

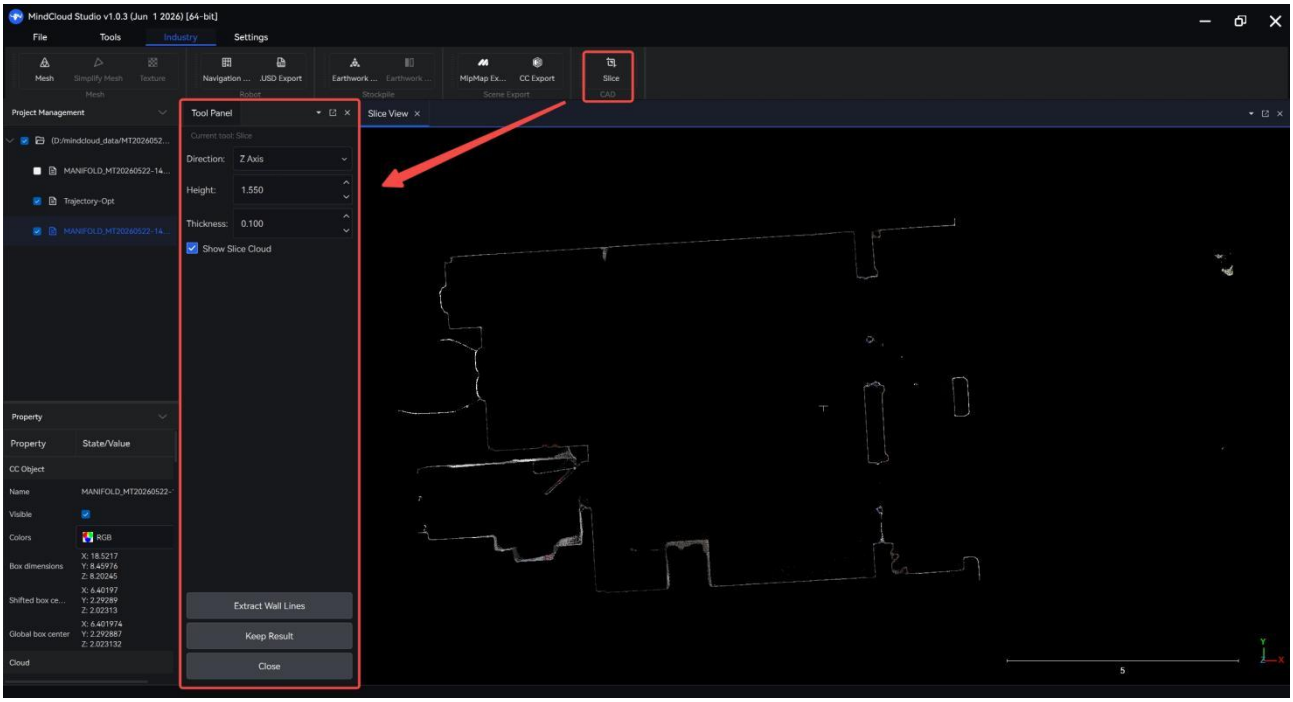
6.5 CAD

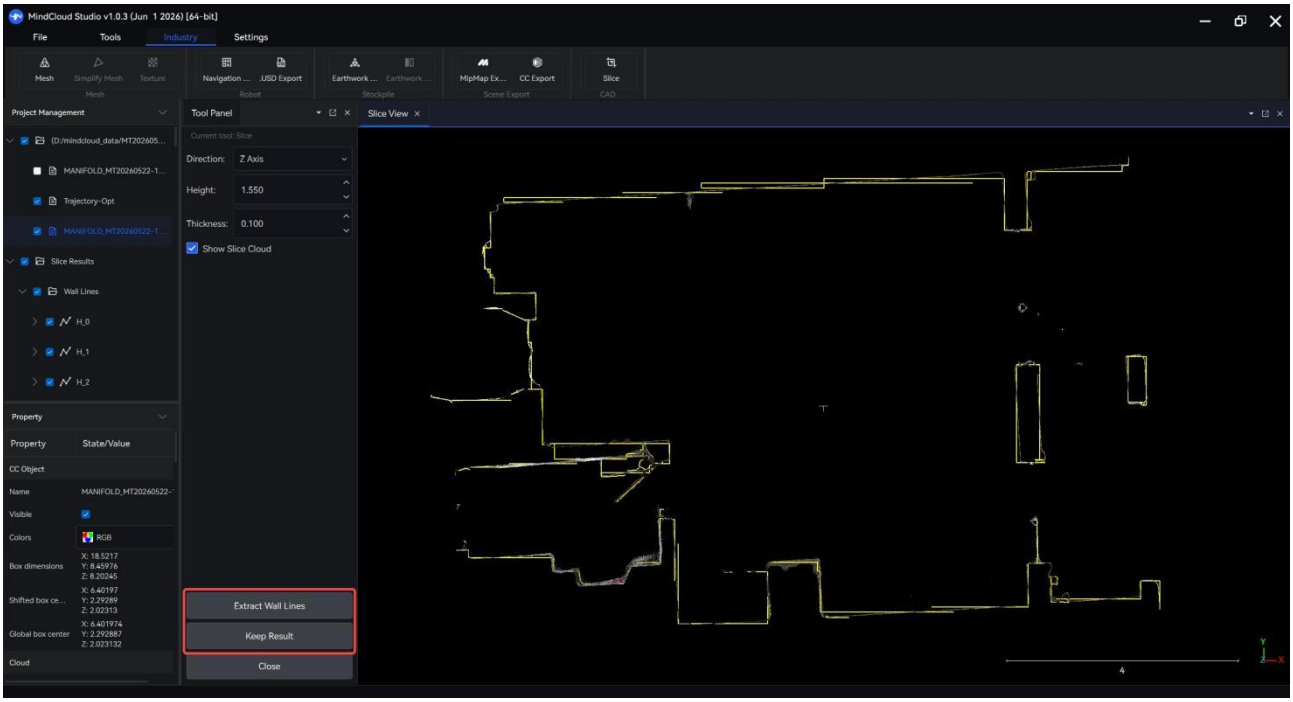
6.5.1 Slice

- Select the point cloud and click "Slice" under the industry function bar;
- Adjust the slice thickness and the height of the slice, and then click to extract the wall lines;
- After checking the polyline and confirming it is correct, click to retain the results and save the polyline in CAD drawing format.



CAD Slice




MindCloud Studio v1.0.3 (Jun 1 2026) [64-bit]
File
Tools
Industry
Settings
Mesh
Simplify Mesh
Texture
Navigation ...
.USD Export
Earthwork ...
Earthwork ...
MipMap Ex...
CC Export
Slice
Project Management
Tool Panel
Slice View
Current tool: Slice
Direction:
Z Axis
Height:
1.550
Thickness:
0.100
Show Slice Cloud
Slice Results
Wall Lines
H_0
H_1
H_2
Property
State/Value
CC Object
Name
Visible
Colors
RGB
Box dimensions
Shifted box ce...
Global box center
Cloud
Extract Wall Lines
Keep Result
Close
CAD

6.6 Forest

6.6.1 Ground Normalization

- The first stage of forestry functions: ground extraction and elevation normalization, separating ground point clouds from tree point clouds;

6.6.2 Denoise

- The second stage of forestry functions: filter out outliers and perform statistics to improve the morphological consistency of individual trees;

6.6.3 Tree Segmentation

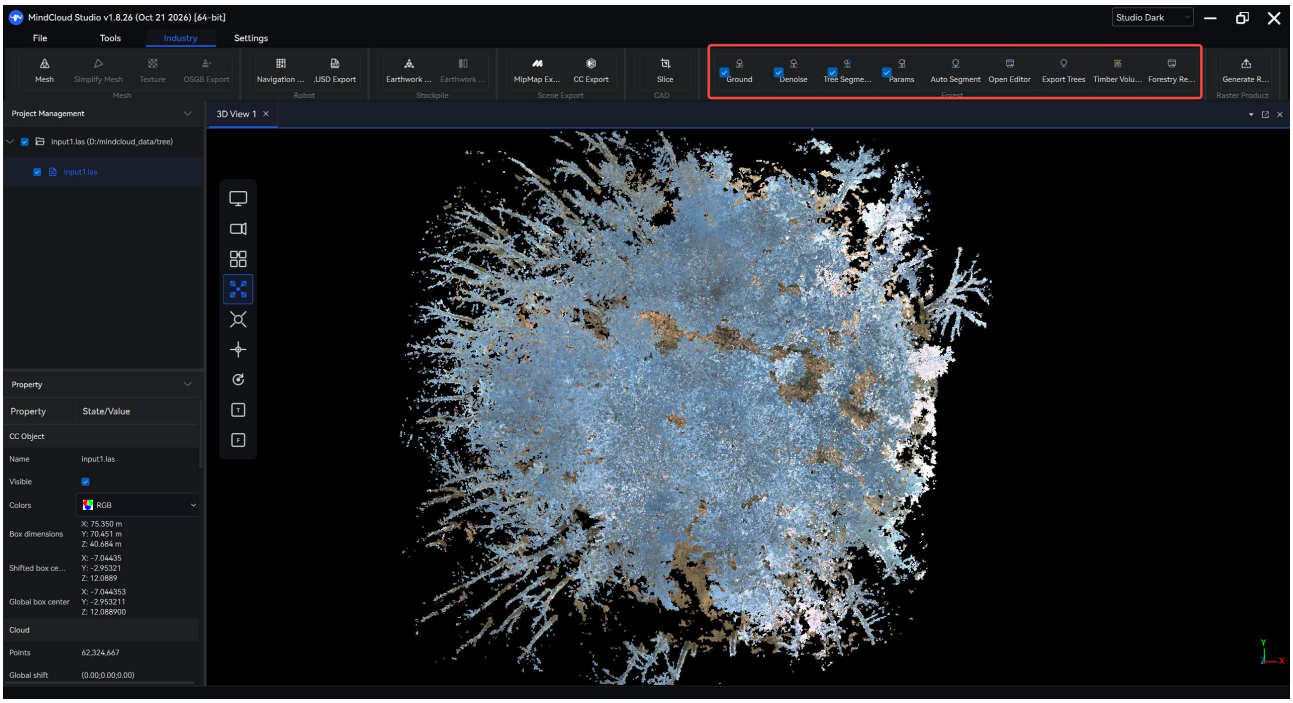
- The third stage of forestry functions: extract and segment the tree point cloud into independent individual tree point clouds;

6.6.4 Parameter Calculation

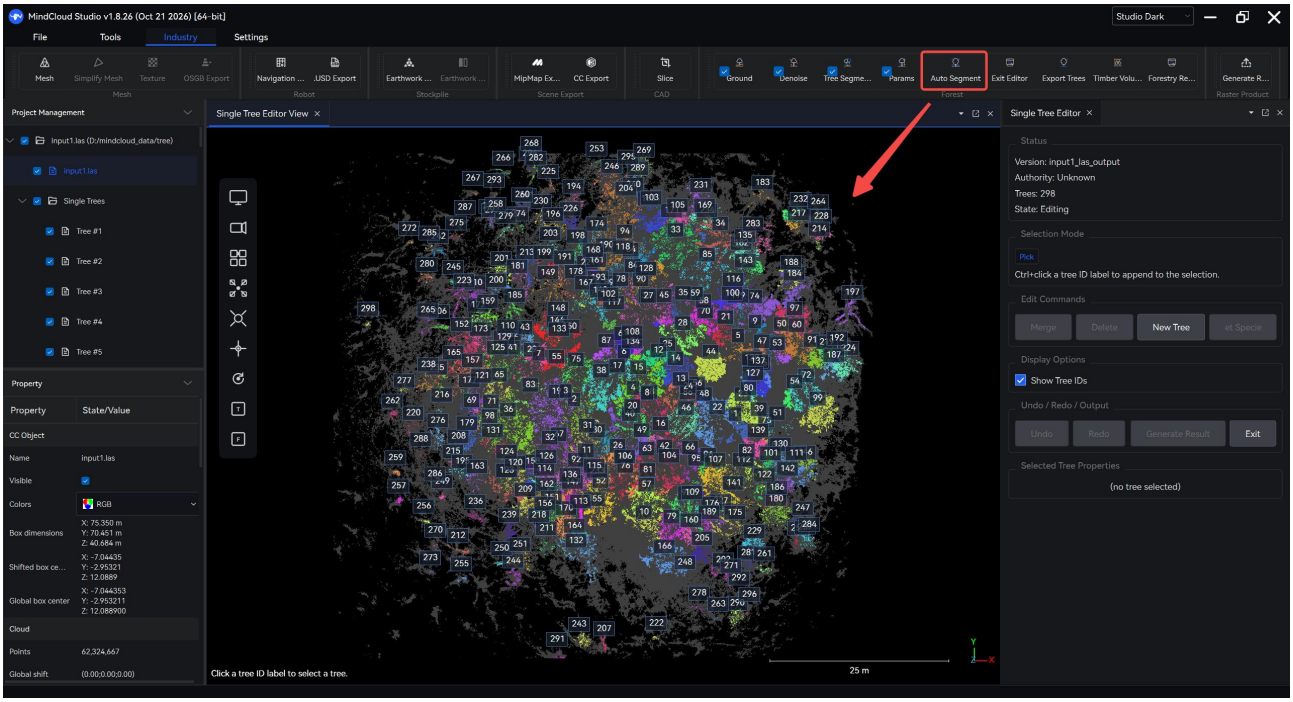
- The fourth stage of forestry functions: perform calculations for all individual trees to obtain parameters such as quantity, density, tree height, DBH (diameter at breast height), crown width, as well as further derived parameters such as volume and carbon stock;

6.6.5 Auto Segment

- Automatically process the selected forestry point cloud through the four stages (checked by default) to obtain individual tree point clouds and a result report.



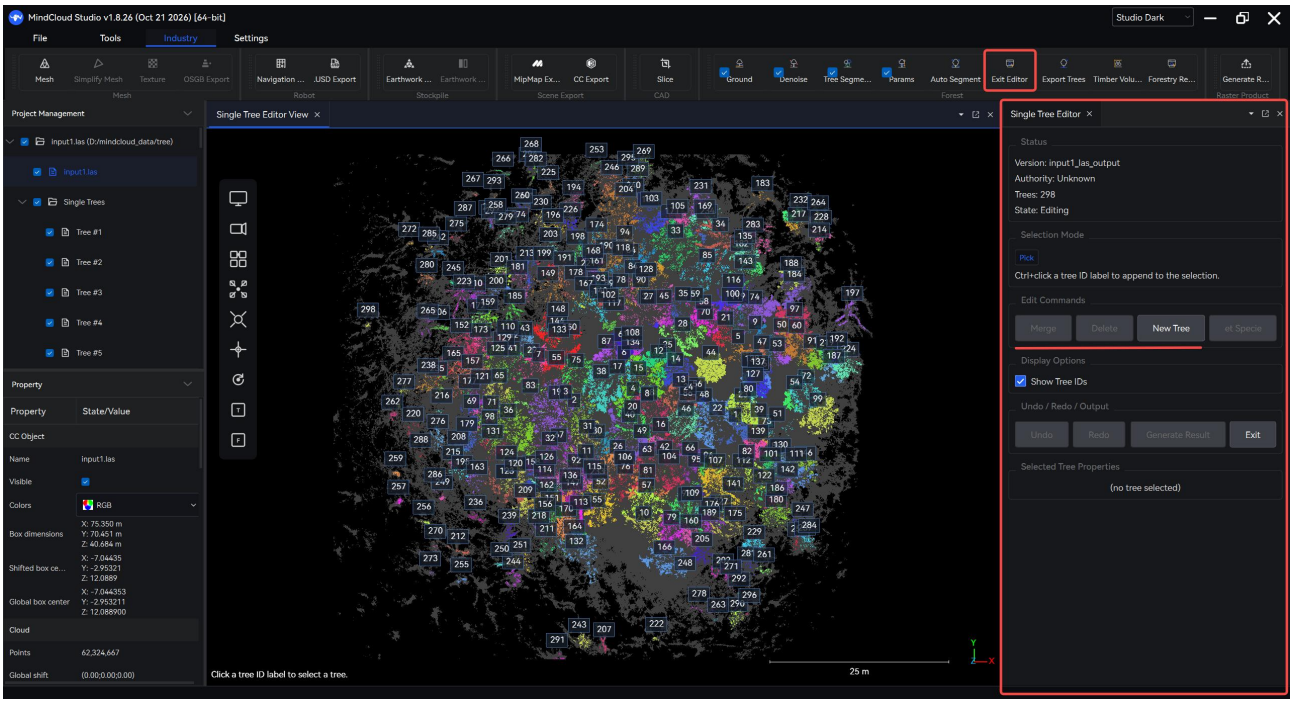
Forest Functions



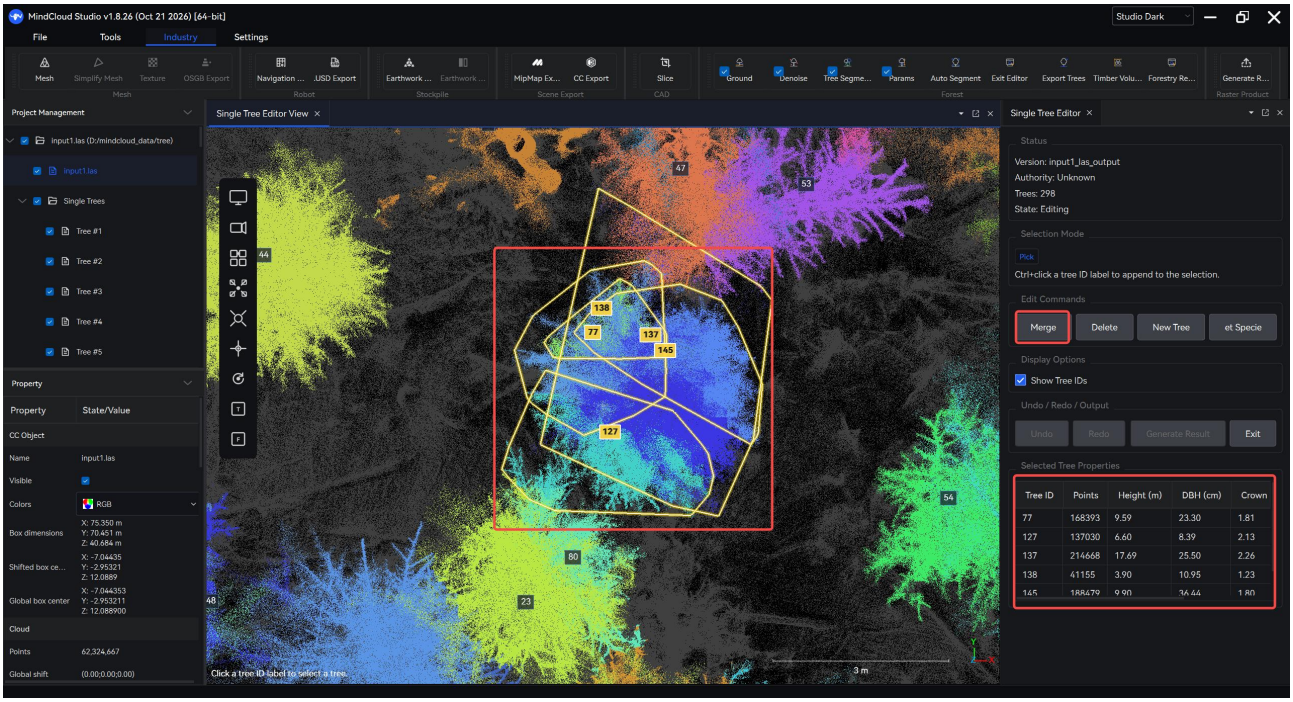
Automatically running the four-stage forestry processing

6.6.6 Open Editor

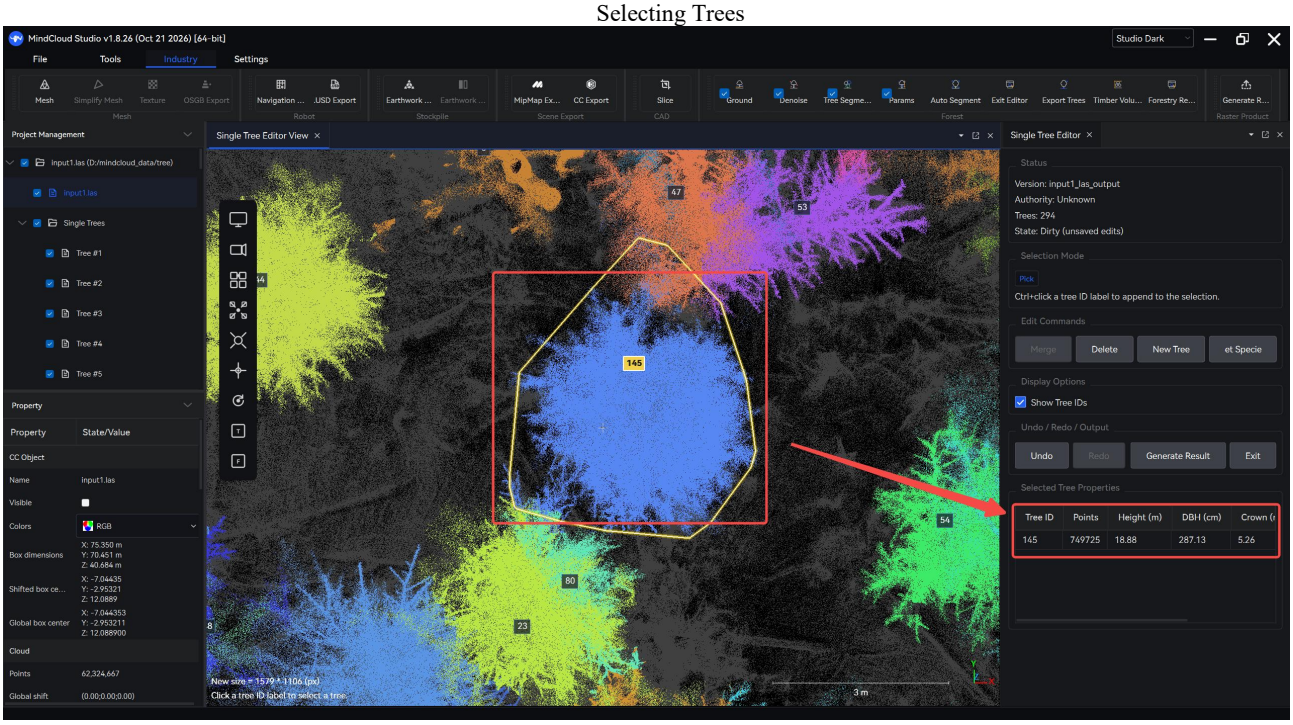
- Open the individual tree editing workbench, where you can delete, merge, or add specified individual tree point clouds;



Single Tree Editor



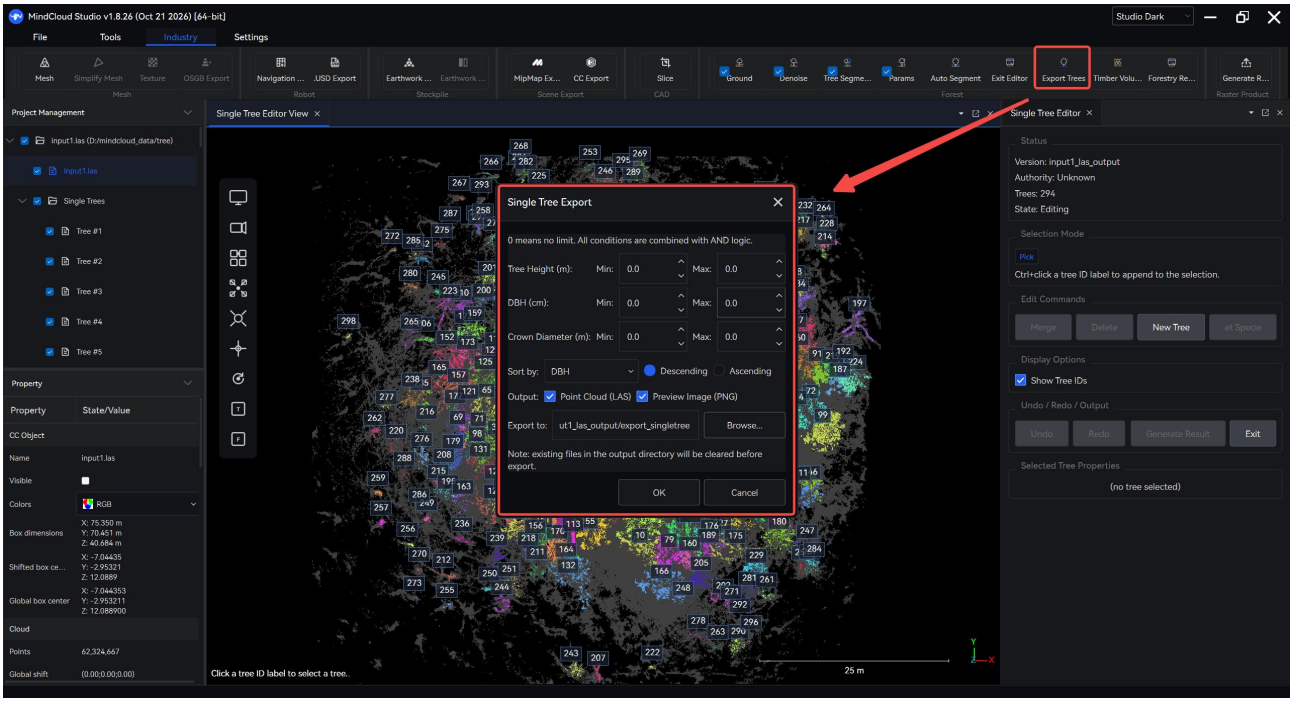
Selecting Trees



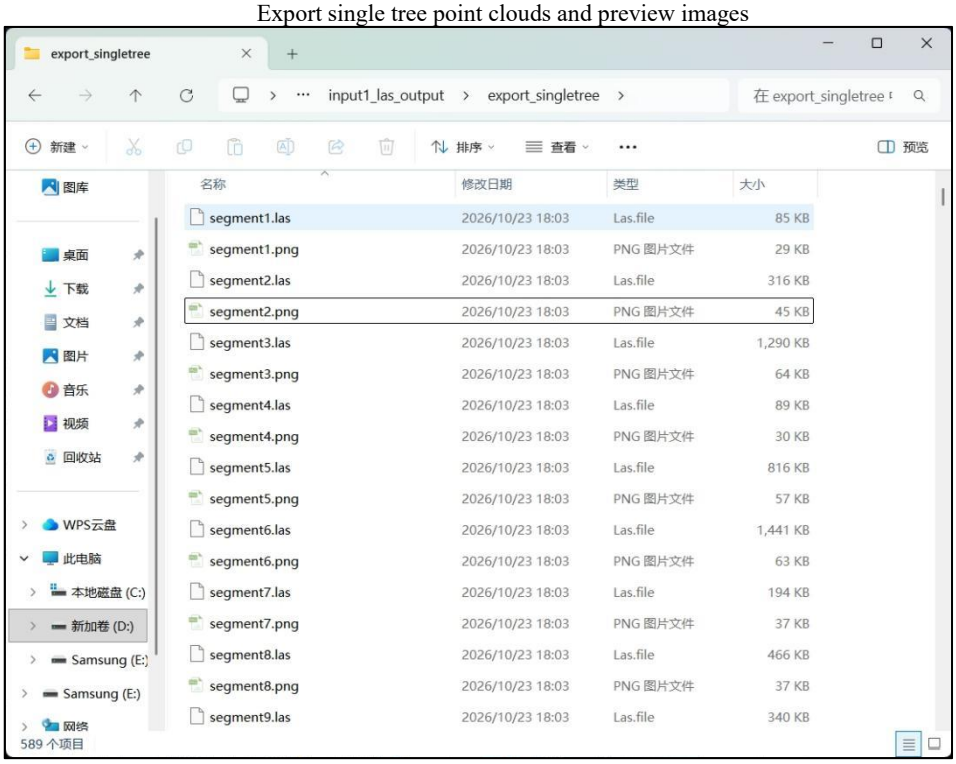
Merging Selected Trees

6.6.7 Export Trees

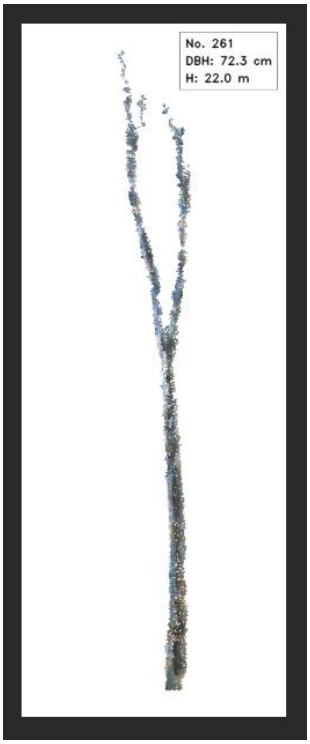
- Independently export all individual tree point clouds, accompanied by PNG preview images;



Export single tree point clouds and preview images



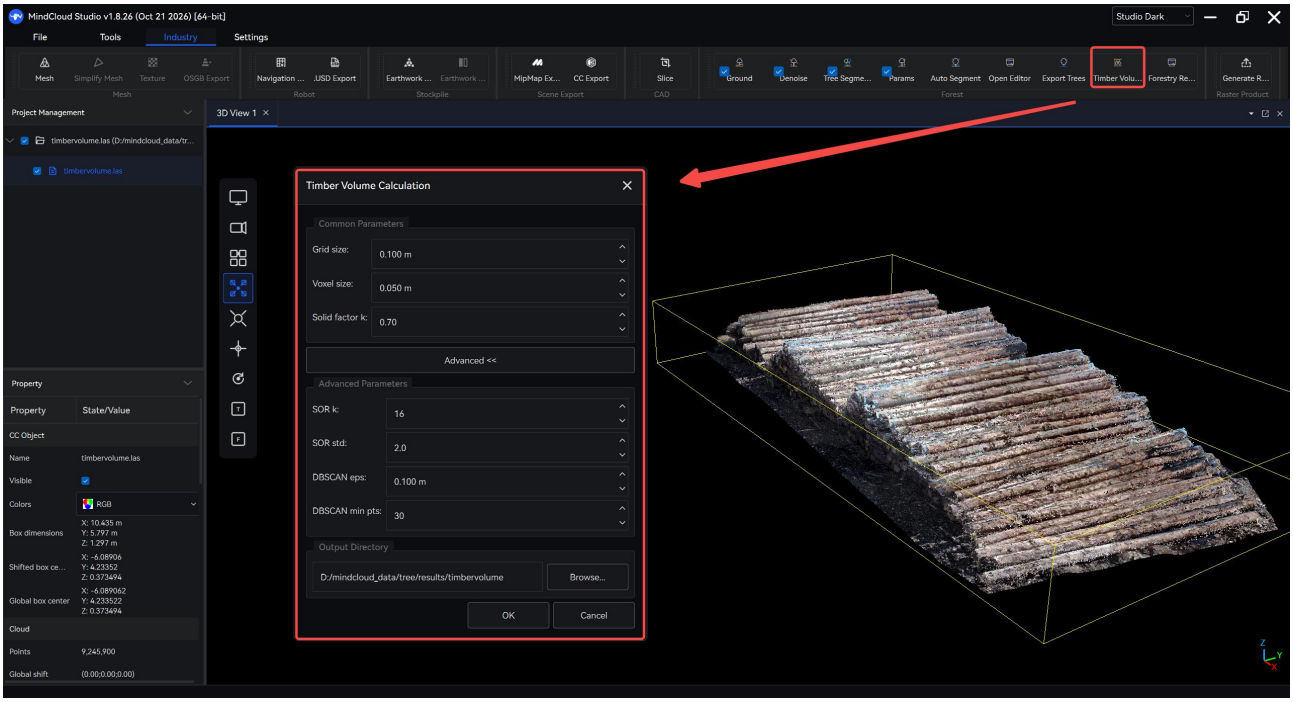
Single tree point cloud storage path



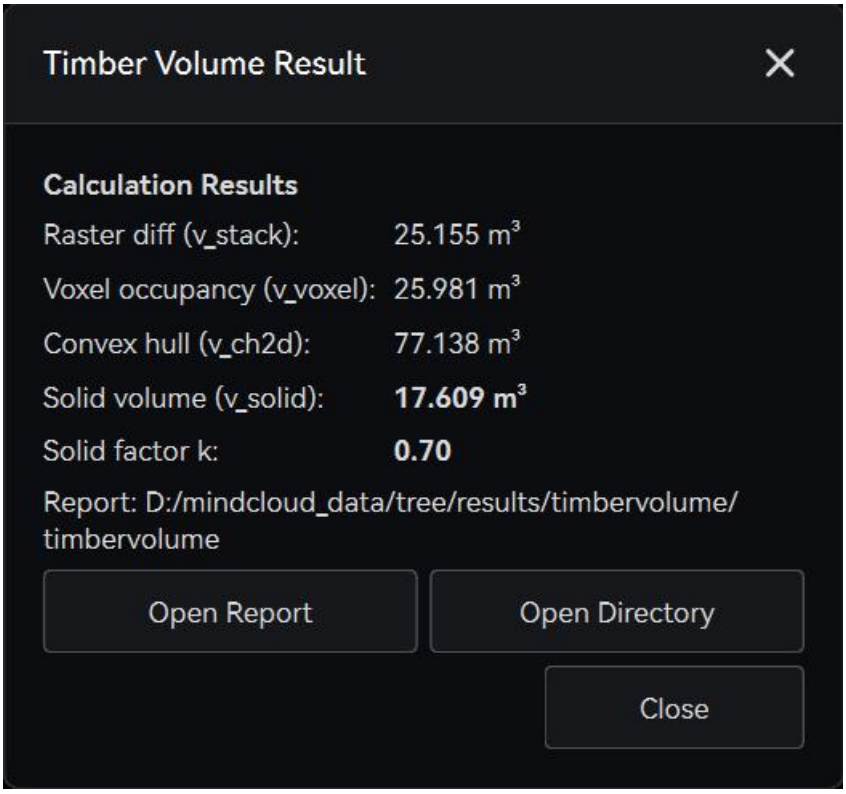
Single Tree Preview Image

6.6.8 Timber Volume Calculation

- Calculate the timber volume of stacked logs or log piles;



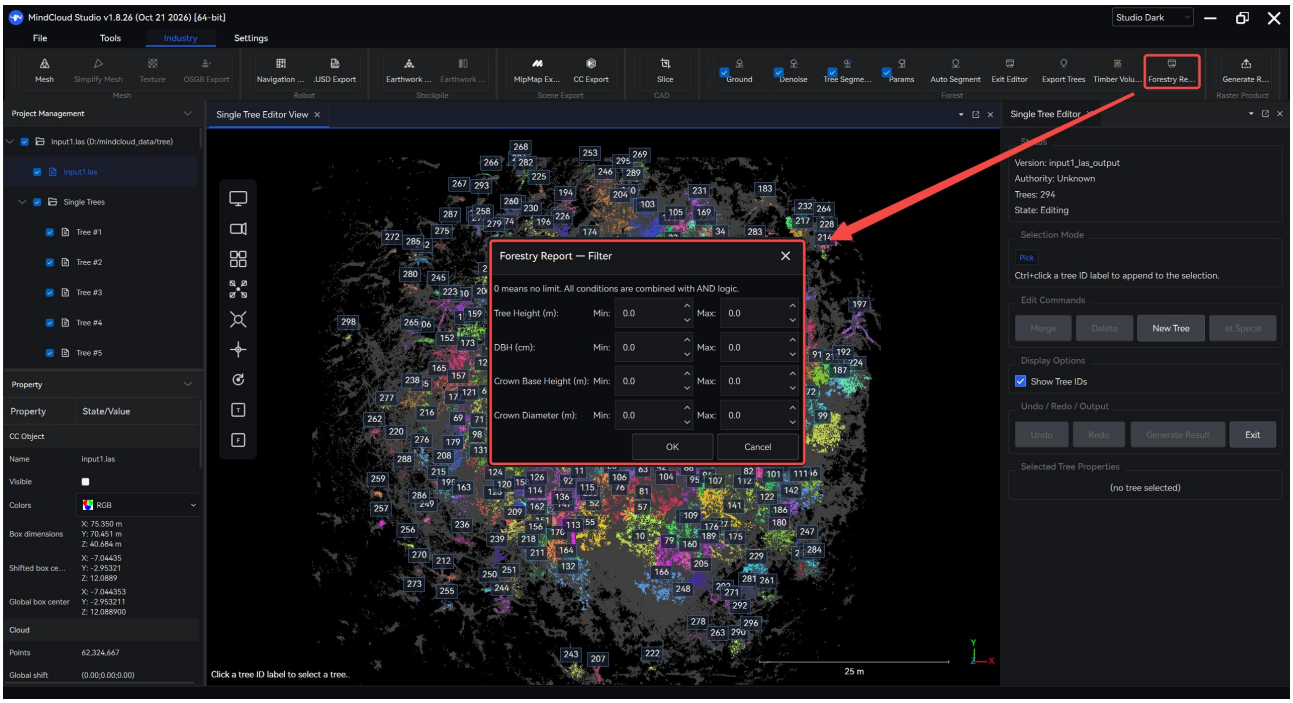
Timber Volume Calculation



Timber Volume Report

6.6.9 Forestry Report

- Generate a forestry investigation report;



Export Forestry Investigation Report



林业筛选调查报告

生成日期:-2026-10-23

一、基本信息

以下为本次扫描的基本信息概览。

项目	值
项目名称	林业筛选调查报告
坐标系	CGCS2000
扫描日期	2026-10-23
点云面积(ha)	0.47
总点数	33623608

二、整体性参数

以下为全部树木的整体统计参数。

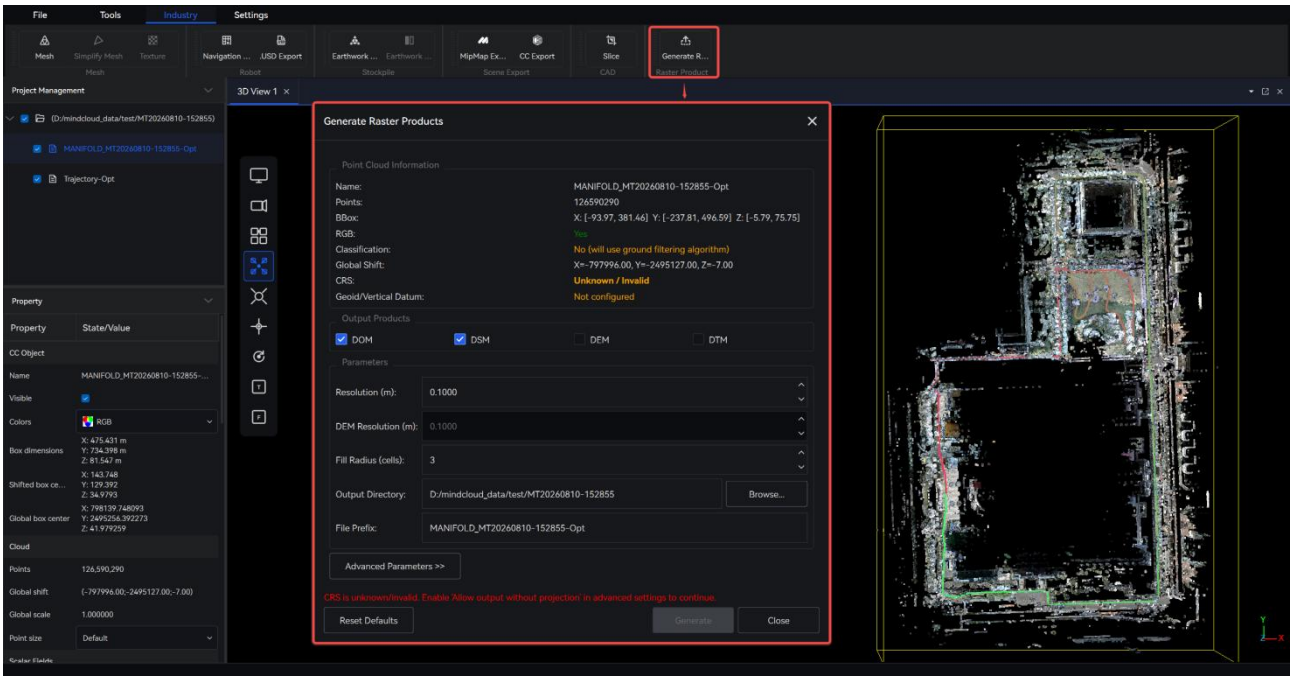
参数	值
树木总数	298
平均树高(m)	13.84
平均胸径(cm)	27.09
平均胸径周长(cm)	85.10
平均冠幅(m)	2.18

Forestry Investigation Report

6.7 Raster Product

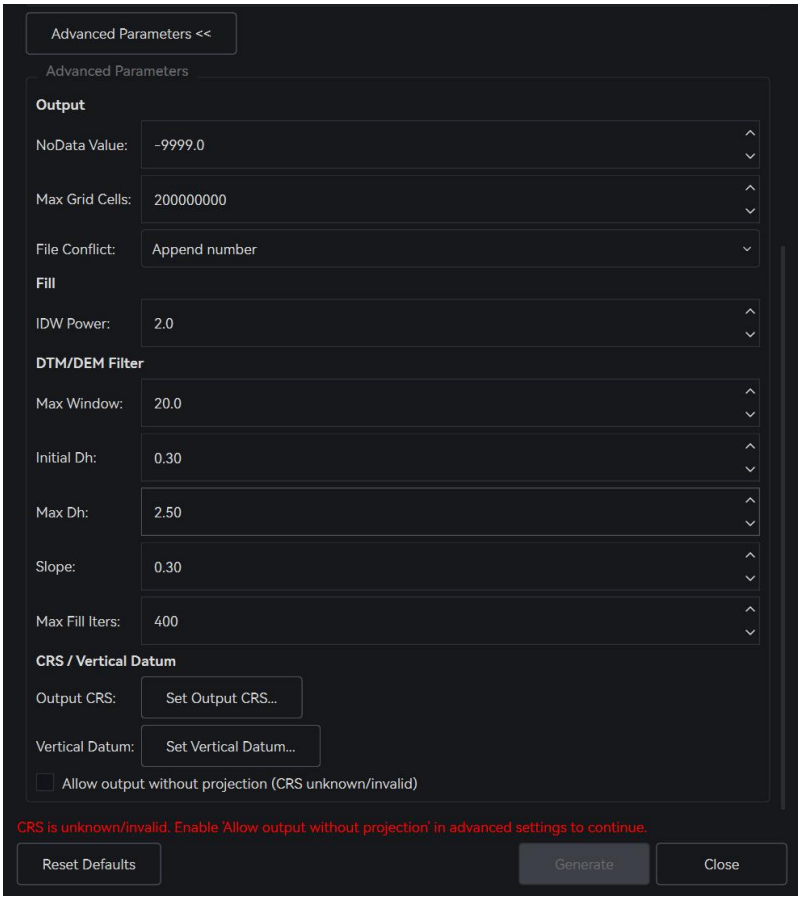
6.7.1 Generate Raster

- Select a point cloud, click "Generate Raster", configure the required parameters, and click Generate. Finally, you will obtain 4D map products, including DOM, DSM, DEM, and DTM digital maps (full names: Digital Orthophoto Map, Digital Surface Model, Digital Elevation Model, and Digital Terrain Model);



General parameters:

- Resolution (m): The pixel ground size of the DOM/DSM/DTM output grid, measured in meters; 0.1m=10cm resolution, the smaller the value, the finer the result, and the larger the file volume.
- DEM Resolution (m): The output resolution of the DEM grid.
- Fill Radius (cells): The missing point cloud causes grid holes, and this parameter sets the maximum pixel radius for filling the holes; If the cavity exceeds this size, it will not automatically fill.
- Output Directory: Path for saving results.
- File Prefix: The prefix of the output file name.



Advanced parameters:

- NoData Value: Fill value for areas without data in the grid, default -9999.0, is a common null value marker in the GIS field.
- Max Grid Cells: Limit the total pixel limit of the output grid to prevent memory overflow caused by generating large files due to low resolution.
- File Conflict: Processing method for output files with duplicate names, automatically adding sequence numbers/overwriting/skipping.
- IDW Power: inverse distance weighted interpolation power, used for hole interpolation filling; Default 2.0, the larger the value, the closer it is to the effective point, and the smaller the influence of distant points.
- Max Window: search window size for filtering analysis, unit grid; Used to identify buildings, trees, and other land features.
- Initial Dh: The initial threshold for determining the allowable elevation difference of ground points.
- Max Dh: The maximum height difference allowed within the window, exceeding which it is judged as non ground (building trees).
- Slope: The threshold for terrain slope, and points exceeding this slope are not considered ground points.
- Max Fill Iters: The number of iterations for hole filling, with larger holes being filled as the number of

iterations increases.

- Output CRS: Set the projection coordinate system of the output grid for metadata.
- Vertical Datum: metadata sets elevation benchmarks, such as geodetic height and normal height.
- Allow output without projection: Temporary switch, check when the point cloud does not have a coordinate system, the software allows outputting raster files without projection information, not recommended for use in GIS software, and the output results have no spatial reference.

7. New version features

V1.2.11 Update:

1. An urgent fix has been implemented to resolve the issue of inaccurate point cloud coordinate units following RTK optimization when the target coordinate system employs non-metric units (e.g., imperial feet or US survey feet).

V1.4.19 update:

1. Improve the stability of point cloud optimization algorithms, allowing for the generation of results with the same accuracy on different computers;
2. Optimize point cloud shading and texture quality, and fix shading penetration issues;
3. Fix the problem of texture mapping for point cloud data after RTK optimization;
4. Optimize the panoramic pose optimization link and accuracy;
5. Optimize the accuracy of the relocation map;
6. Added support for parsing engineering data scanned by Odin2s devices;
7. Fix the exception of Odin1 data external parameter usage error;
8. Fix the issue of batch processing data displaying incorrectly in the project list;
9. License adds the ability to conduct a 5-day initial trial;
10. Added the function of generating digital grid maps;
11. Improve the photo measurement function;
12. Improve the cone display of detailed cameras.

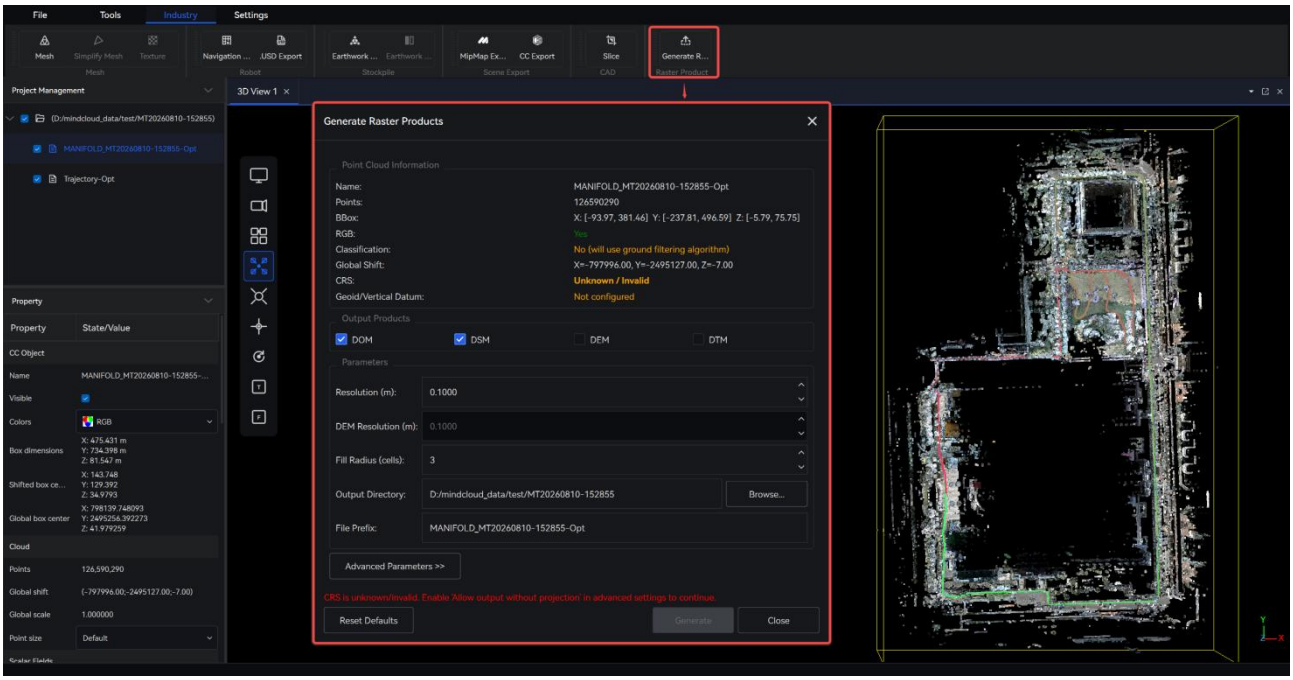
New Feature Description:

1. License adds the ability to conduct a 5-day initial trial

After the first installation of Mindcloud Studio software on the computer, you can immediately experience a 5-day trial period.

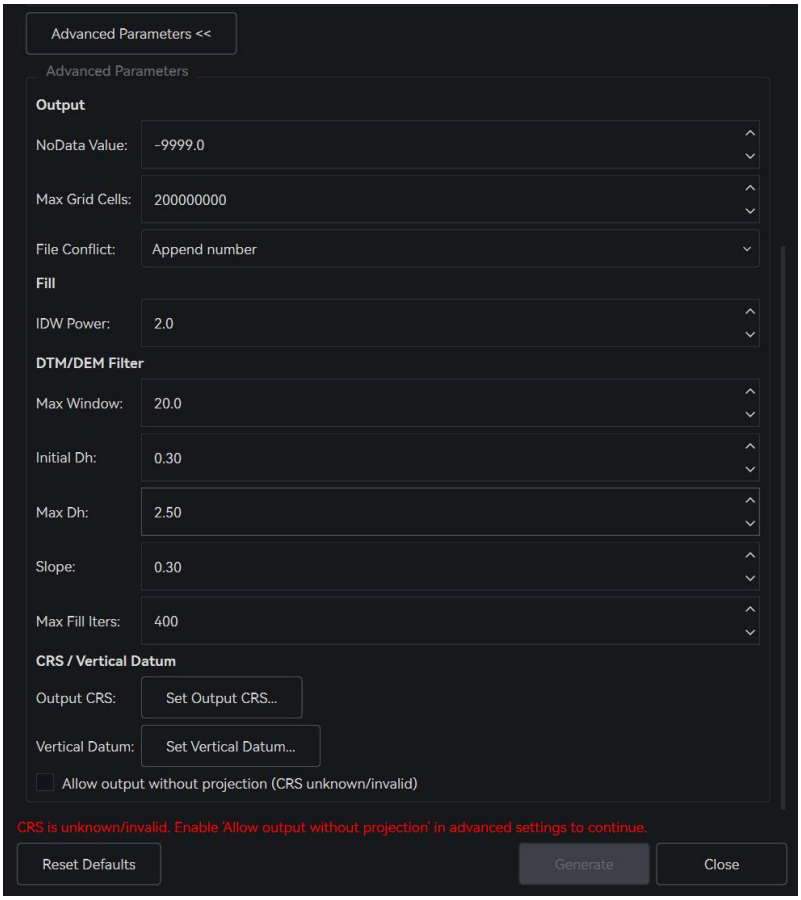
2. Added the function of generating digital grid maps

Adding grid product functionality in industry applications can generate point cloud scenes into 4D digital products, including DOM digital orthophoto maps, DSM digital terrain models, DEM digital elevation models, and DTM digital terrain models.



General parameters:

- Resolution (m): The pixel ground size of the DOM/DSM/DTM output grid, measured in meters; 0.1m=10cm resolution, the smaller the value, the finer the result, and the larger the file volume.
- DEM Resolution (m): The output resolution of the DEM grid.
- Fill Radius (cells): The missing point cloud causes grid holes, and this parameter sets the maximum pixel radius for filling the holes; If the cavity exceeds this size, it will not automatically fill.
- Output Directory: Path for saving results.
- File Prefix: The prefix of the output file name.



Advanced parameters:

- NoData Value: Fill value for areas without data in the grid, default -9999.0, is a common null value marker in the GIS field.
- Max Grid Cells: Limit the total pixel limit of the output grid to prevent memory overflow caused by generating large files due to low resolution.
- File Conflict: Processing method for output files with duplicate names, automatically adding sequence numbers/overwriting/skipping.
- IDW Power: inverse distance weighted interpolation power, used for hole interpolation filling; Default 2.0, the larger the value, the closer it is to the effective point, and the smaller the influence of distant points.
- Max Window: search window size for filtering analysis, unit grid; Used to identify buildings, trees, and other land features.
- Initial Dh: The initial threshold for determining the allowable elevation difference of ground points.
- Max Dh: The maximum height difference allowed within the window, exceeding which it is judged as non ground (building trees).
- Slope: The threshold for terrain slope, and points exceeding this slope are not considered ground points.
- Max Fill Iters: The number of iterations for hole filling, with larger holes being filled as the number of iterations increases.

- Output CRS: Set the projection coordinate system of the output grid for metadata.
- Vertical Datum: metadata sets elevation benchmarks, such as geodetic height and normal height.
- Allow output without projection: Temporary switch, check when the point cloud does not have a coordinate system, the software allows outputting raster files without projection information, not recommended for use in GIS software, and the output results have no spatial reference.

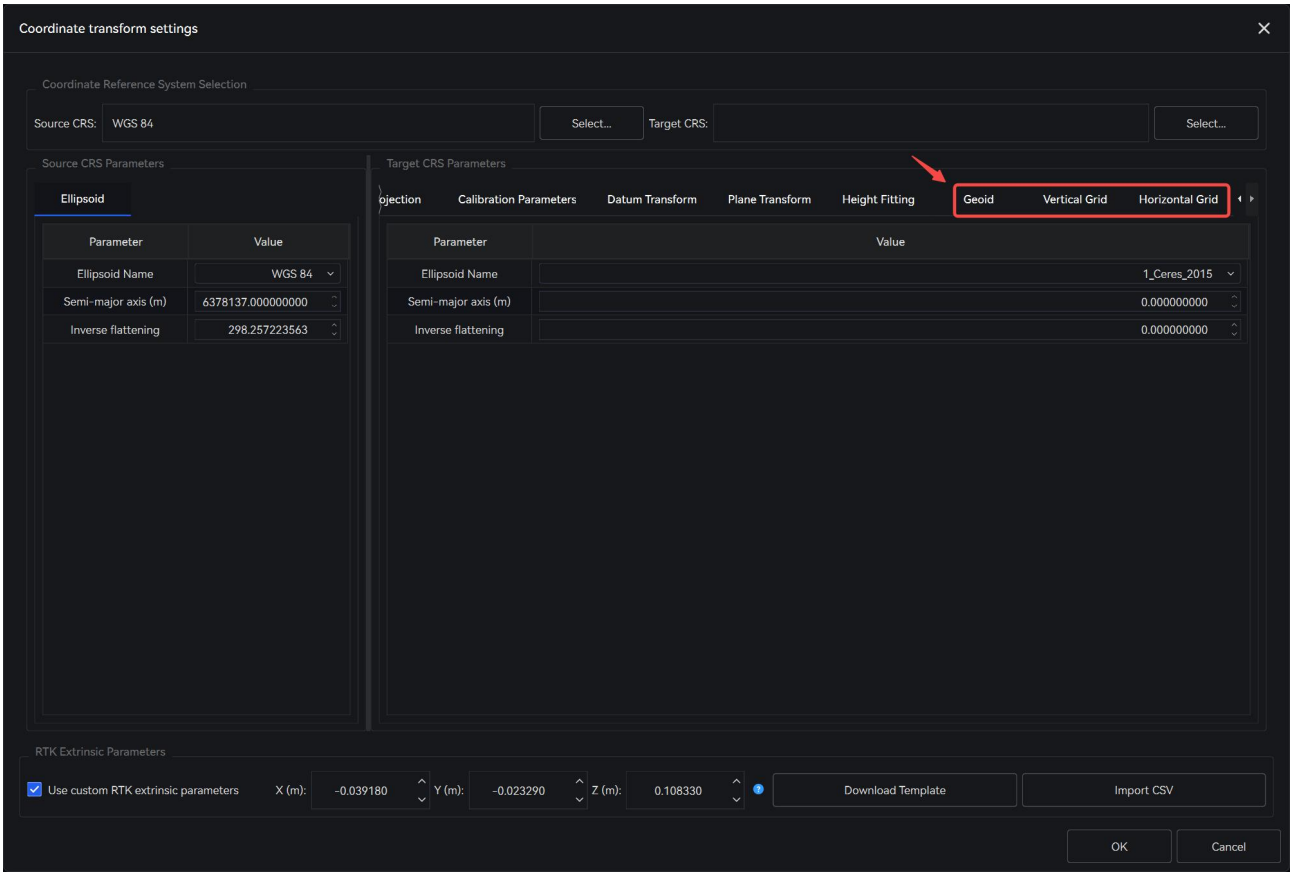
V1.6.10 update:

1. Greatly improve the point cloud optimization algorithm, ensuring accuracy while significantly reducing solution time and memory overhead;
2. Fix and enhance the loop back algorithm to reduce cross layer scene mismatches;
3. Improve RTK optimization to enhance the accuracy and stability of RTK calculations;
4. Update the configuration interface for RTK optimization, adding horizontal and vertical corrections;
5. Add a new model library that includes some geoid model files, horizontal grid correction files, and vertical grid correction files;
6. Image cloud fusion supports multi segment measurement and revocation, adds pose optimization entrance verification, and fixes several issues;
7. Optimize the accuracy and stability of the relocation map;
8. Expand support for more languages and fix language translation issues on various interfaces.

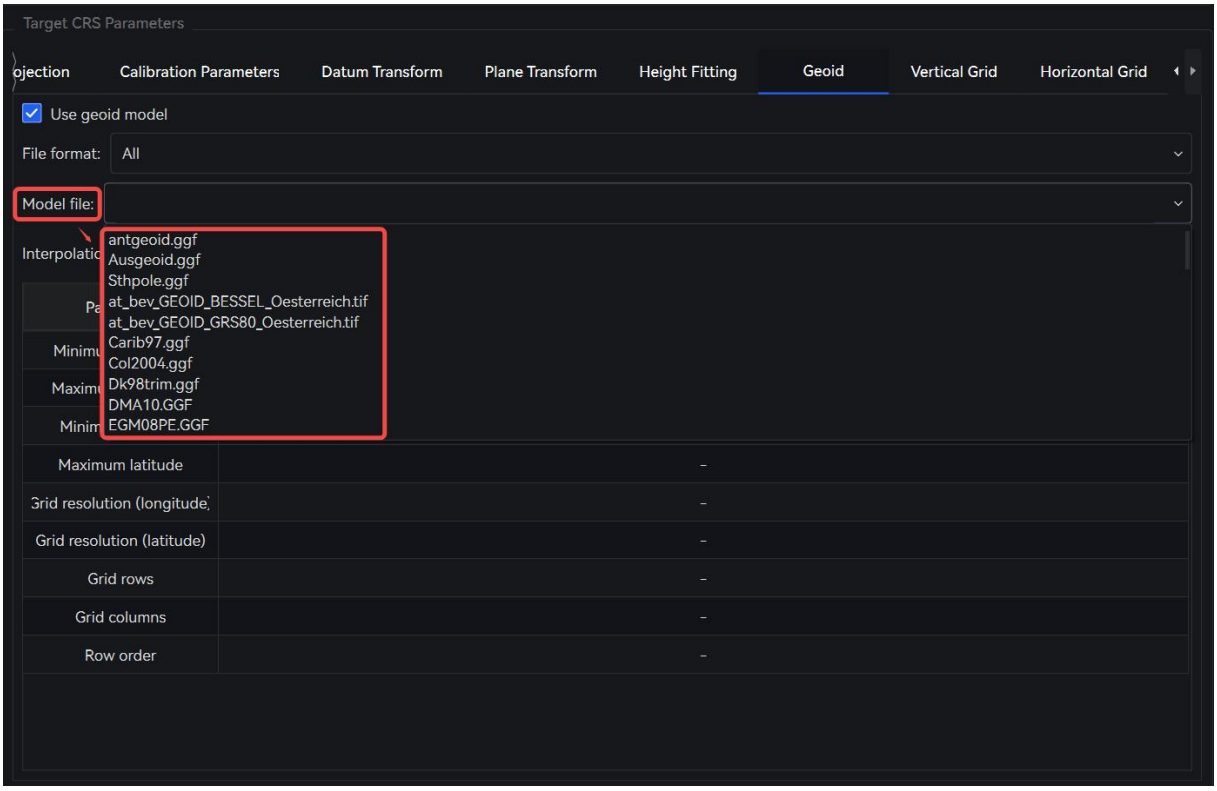
New Feature Description:

1. Update the configuration interface for RTK optimization, add horizontal and vertical corrections, and add a built-in model library

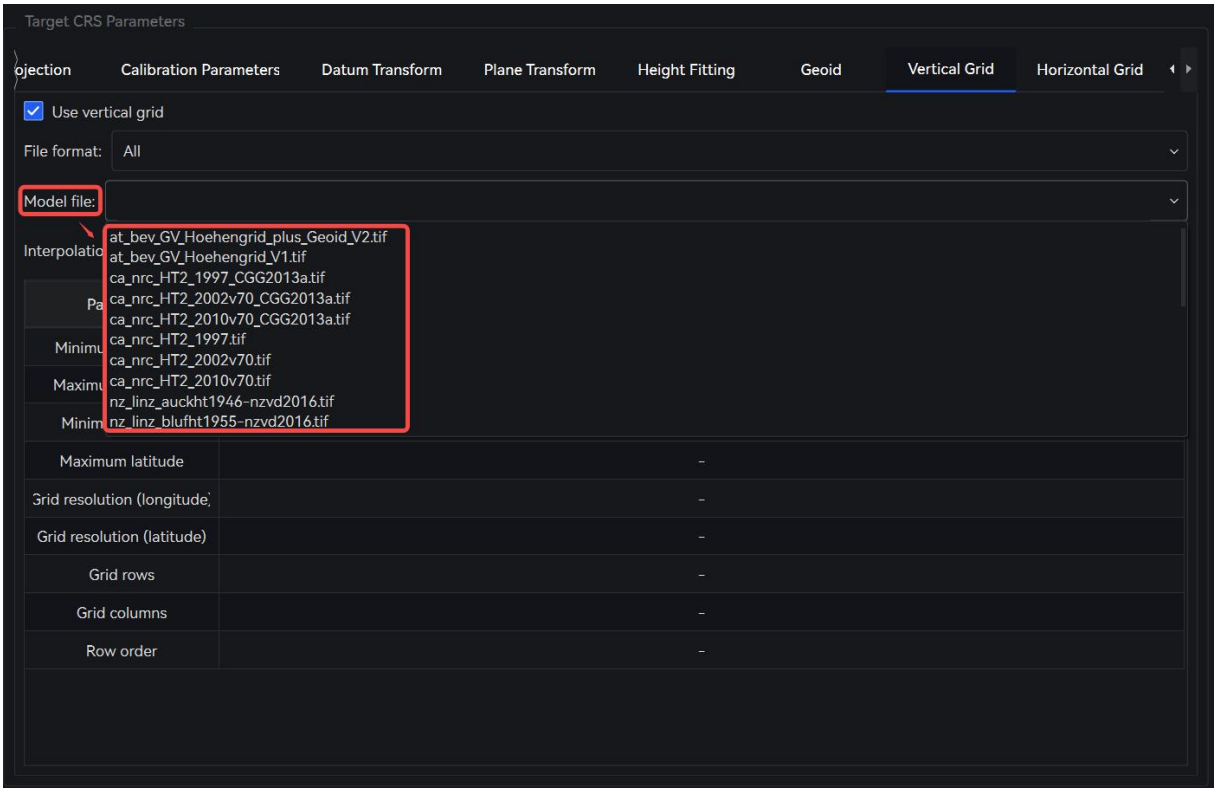
RTK optimization config now includes grid correction, with three tabs (Horizontal/Vertical/Horizontal+Vertical) replacing the original selector, and source/target panes changed to a draggable split layout.



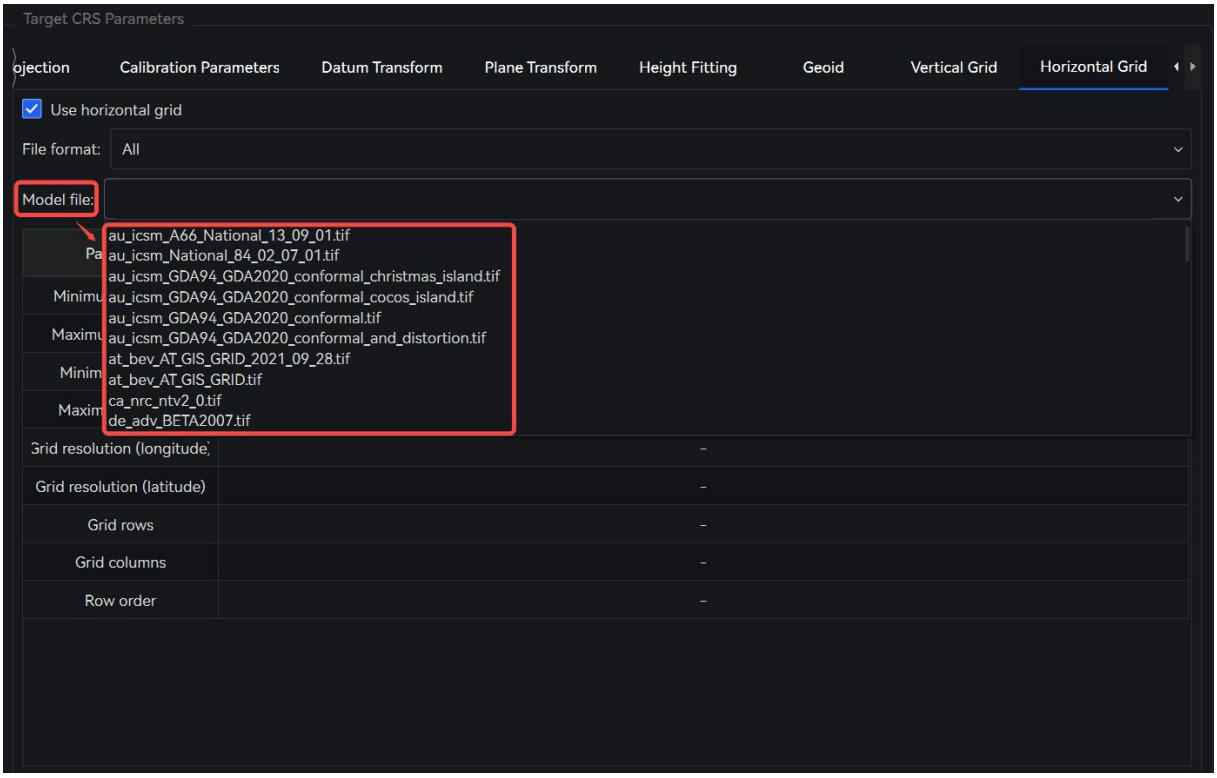
Built-in 142 grid files (approximately 480MB, including NTv2 horizontal grid, national geoid vertical grid, and global EGM model);



Geoid



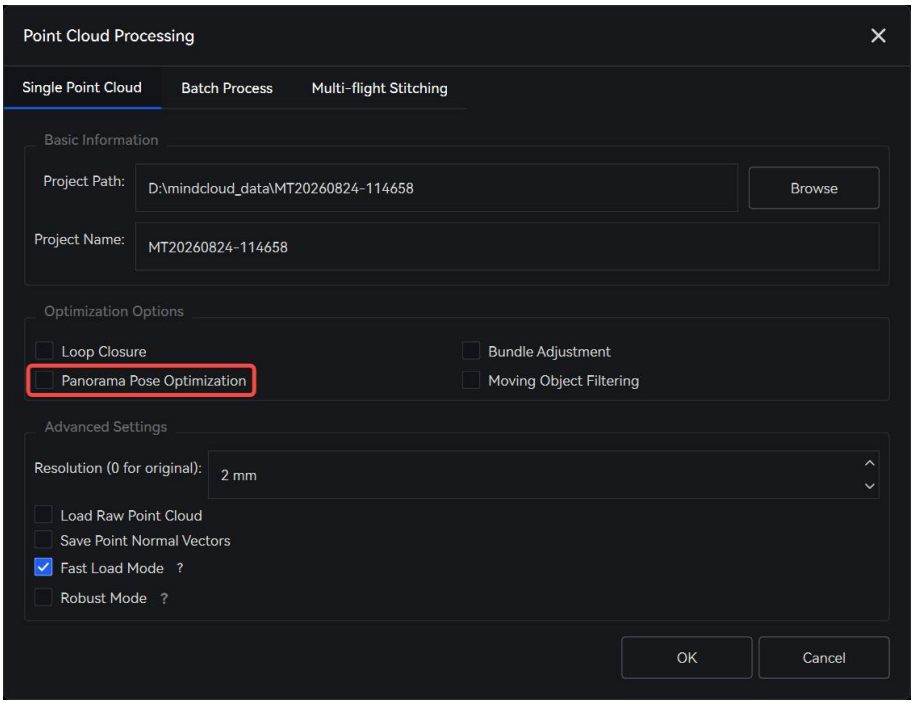
Vertical Grid



Horizontal Grid

2. Image cloud fusion now supports multi-segment measurement with undo capability, and introduces a dedicated pose optimization entry.

This feature provides a dual-view interface for displaying point clouds alongside independently captured images. Compatible devices include detail cameras, Insta360 panoramic cameras, Pocket2Pro external cameras, and others. By optimizing photo poses, it enhances the projection alignment between images and point clouds. Additionally, users can perform multi-segment measurements directly on images and export the resulting data.



Panorama Pose Optimization

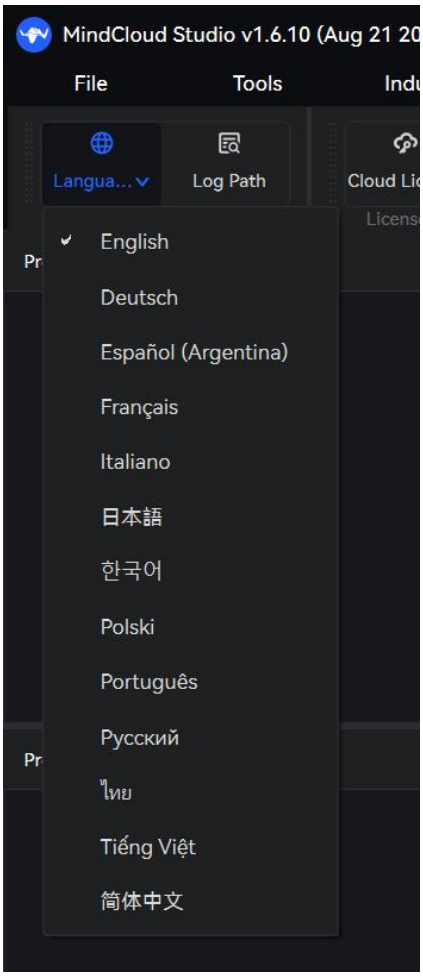


Image Cloud Fusion



Multi segment measurement

3. Expand support for more languages



V1.8.26 Updates:

1. RTK Optimization: RTK optimization is now more stable and accurate. It can complete processing smoothly even in complex scenarios with data interruptions. It reduces elevation drift and horizontal misalignment, and supports command-line batch execution.
2. Coordinate System and Shift: Supports unified shift for the working unit and engineering. When importing data across different coordinate systems or engineering projects, the coordinate shift will automatically remain consistent. The custom coordinate system database has been expanded, and unit conversion issues have been fixed.
3. Height Correction: Supports common public grid formats and comes with built-in common geoid files, ready to use out of the box.
4. Forestry Industry Application Officially Launched: A new forestry module has been added. The individual tree segmentation algorithm has been completely upgraded, generating a single point cloud for each tree. New features include timber volume calculation, individual tree export, and forestry reports. (Note: Forestry functions require separate authorization).
5. Panorama and Photos: Added panorama annotation, panorama stitching, small camera photo viewing, and measurement revocation. Supports Pocket2Pro, X6, and X5 cameras. Panorama positioning is more accurate, and the alignment between photos and point clouds is more precise.
6. Stockpile Comparison: The volume comparison accuracy is higher, and the comparison results are now displayed with diagnostic and wireframe views.
7. Mesh Reconstruction and Export: Adopts a brand-new mesh reconstruction algorithm. Added OSGB export (single file / Smart3D tiles); USD export now supports materials and textures.
8. Loop Closure Detection and Relocalization Map: Loop closure detection is more accurate, and the newly versioned relocalization map is supported.
9. Feedback: Added one-click feedback and automatic crash reporting to help us locate and solve problems faster.
10. Multilingual: Now supports 13 languages, including newly added Thai, Polish, and Italian, along with improved Vietnamese and translations for all languages.
11. UI Theme: Added day/night mode switching.