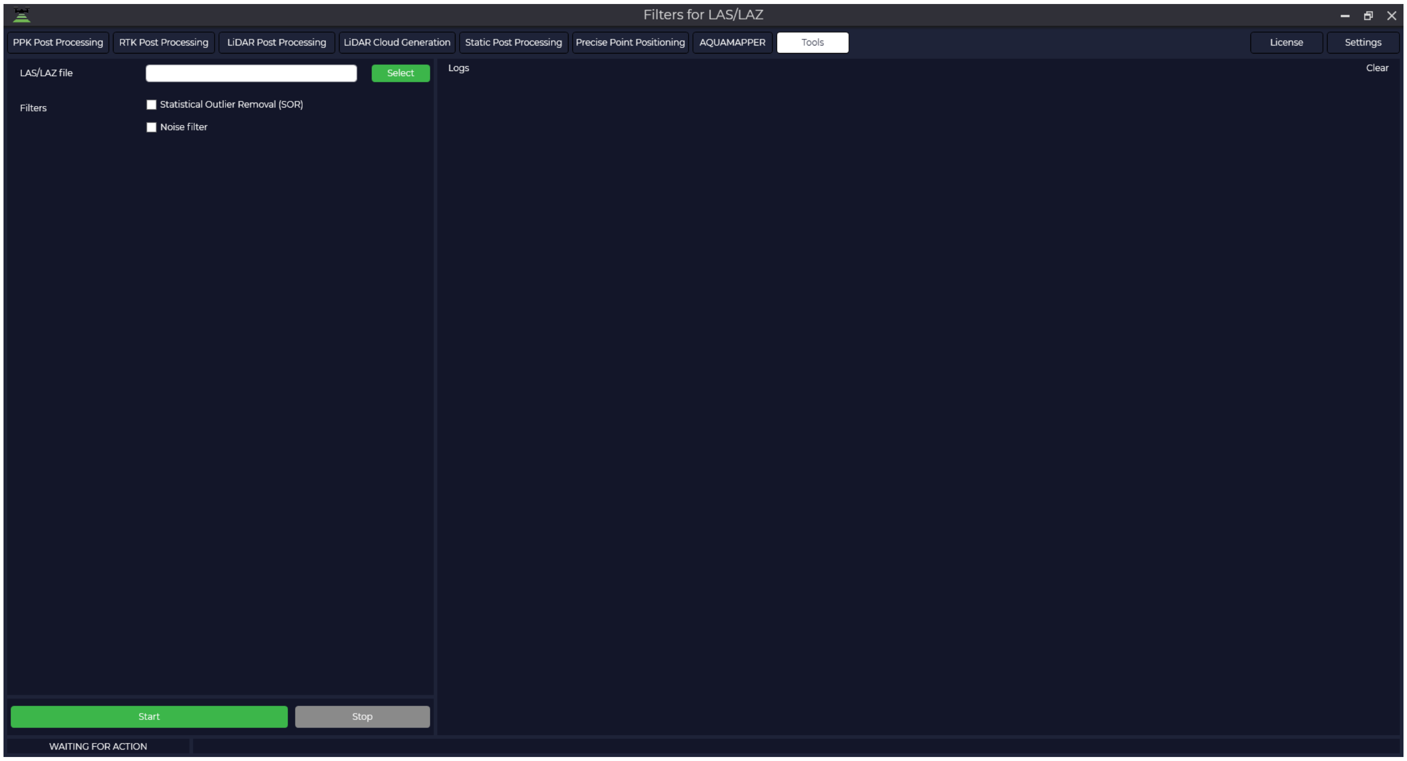
Tools

This part of the instructions will cover the various tools that help make the job easier.

- Filters LAS/LAZ
- Ground classification
- LAS/LAZ Insta 360 Coloring
- PRJ editor
- Viewing the point cloud
- Data archive GNSS
- Track trimming
- Merge track files
- Trim IMR (+GNSS)
- Trim IMR
- Coordinate converter(One coordinate)
- Coordinate Converter(Coordinates from file)
- Maps
- GNSS data converter
- RINEX merger
- Satellite filtering
- Calculating the focal length

Filters LAS/LAZ

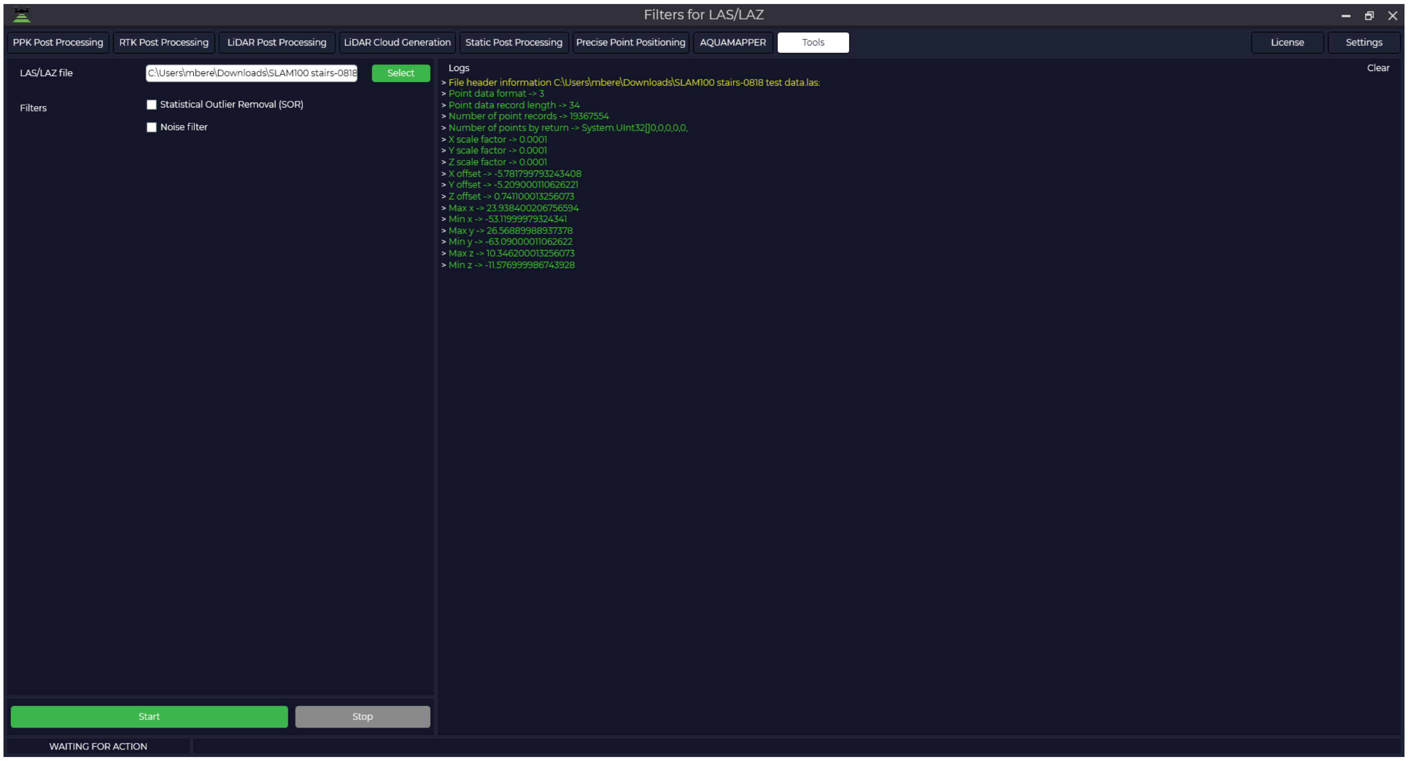
When launching the filters, we are greeted with a startup window.



Statistical Outlier Removal (SOR) is a method that first calculates the average distance between each point and its neighbors. It then removes points that are more than the average distance plus a few standard deviations. The minimum number of neighboring points is 6 and the standard deviation is 1.

Noise removal is a method that is similar to statistical outlier removal (SOR), but it considers the distance to the main surface rather than neighboring points. It locally fits a plane around each cloud point and removes a point if it is too far from that plane. This filter can be thought of as a low-point filter.

Surface reconstruction is a technique that is used to create complete surface models from heterogeneous data. Sometimes small errors in distance measurements can lead to difficulties in removing anomalies by statistical analysis. In such cases, surface reconstruction uses a resampling algorithm that attempts to reconstruct missing parts of the surface by polynomial interpolation between surrounding data points. This corrects small errors and smooths out artifacts such as "double walls" that occur when multiple scans are recorded simultaneously.

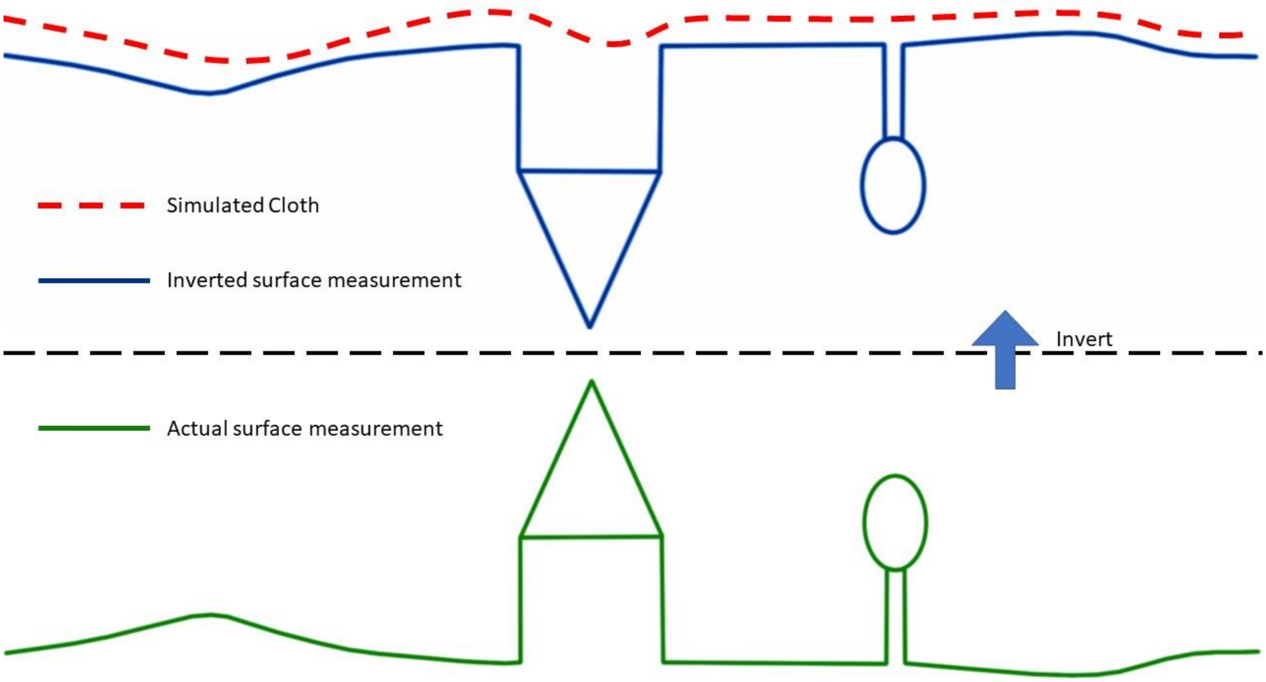


If you select a file in LAS or LAZ format, the login window will display the information contained in the file: number of points, X, Y, Z offsets, etc.

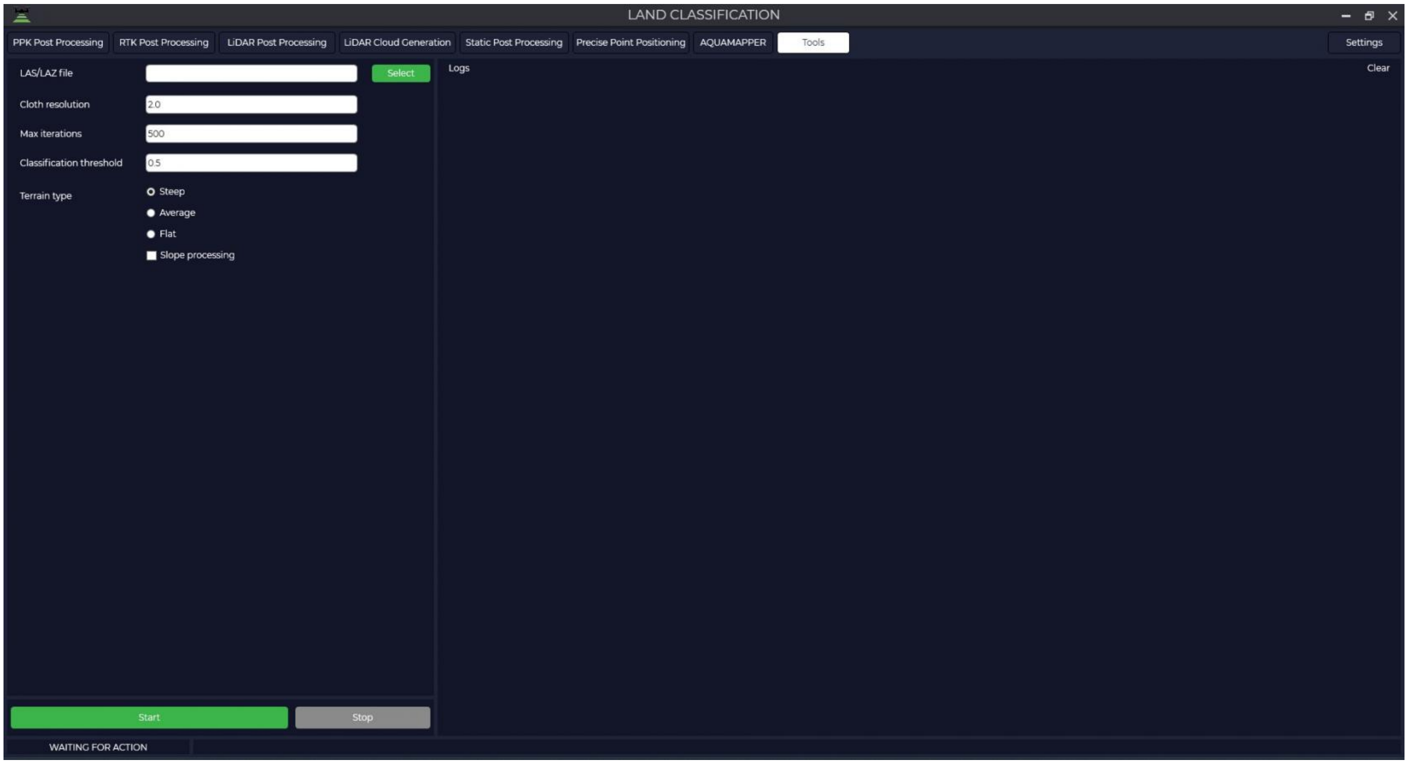
To process, check the required filters and press the "Start" button. If several filters are selected, they are applied sequentially. All results are saved to the folder with the source file.

Ground classification

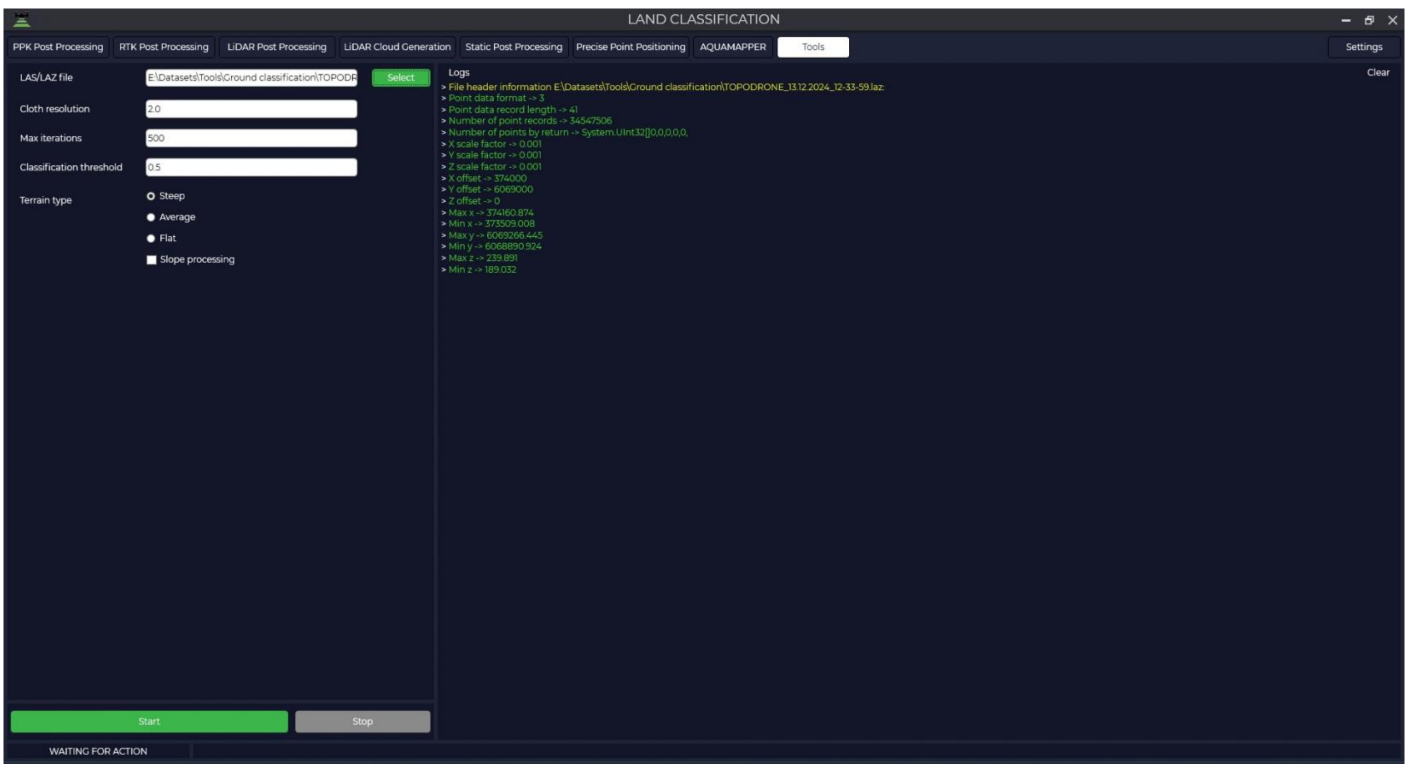
The Ground Classification tool allows you to divide the point cloud into two components: terrain related points and all other points. This method is based on a simplified physical process. Imagine a piece of cloth suspended above the terrain, which then falls down due to gravity. If the fabric is soft enough, it will stick to the surface and the final shape of the fabric will be a digital model of the terrain. However, if the point cloud is first turned upside down and the fabric is made stiff, the final shape will be a digital terrain model. A method called fabric modelling is used to model this process. Based on this method, a cloth modelling filtering (CSF) algorithm has been developed to extract ground points from the point cloud. An overview of the proposed algorithm is shown in Fig. First, the original point cloud is flipped upside down, and then a fabric is dropped on the flipped surface. By analysing the interaction between the fabric nodes and the corresponding points, the final shape of the fabric can be determined and used to classify the original points into terrain points and all other points.



When launching the tool, we are greeted with a startup window.



In the window that opens, click the "Select" button and select the file in the *.las or *.laz format for which you are going to make a classification. The Logs window displays information about the uploaded file.



After that, set parameters that match the characteristics of your point cloud:

The grid step is the size of the grid cell, expressed in point cloud units, that is applied to cover the terrain. Increasing the grid resolution will result in a more detailed surface model, but will increase the computational load.

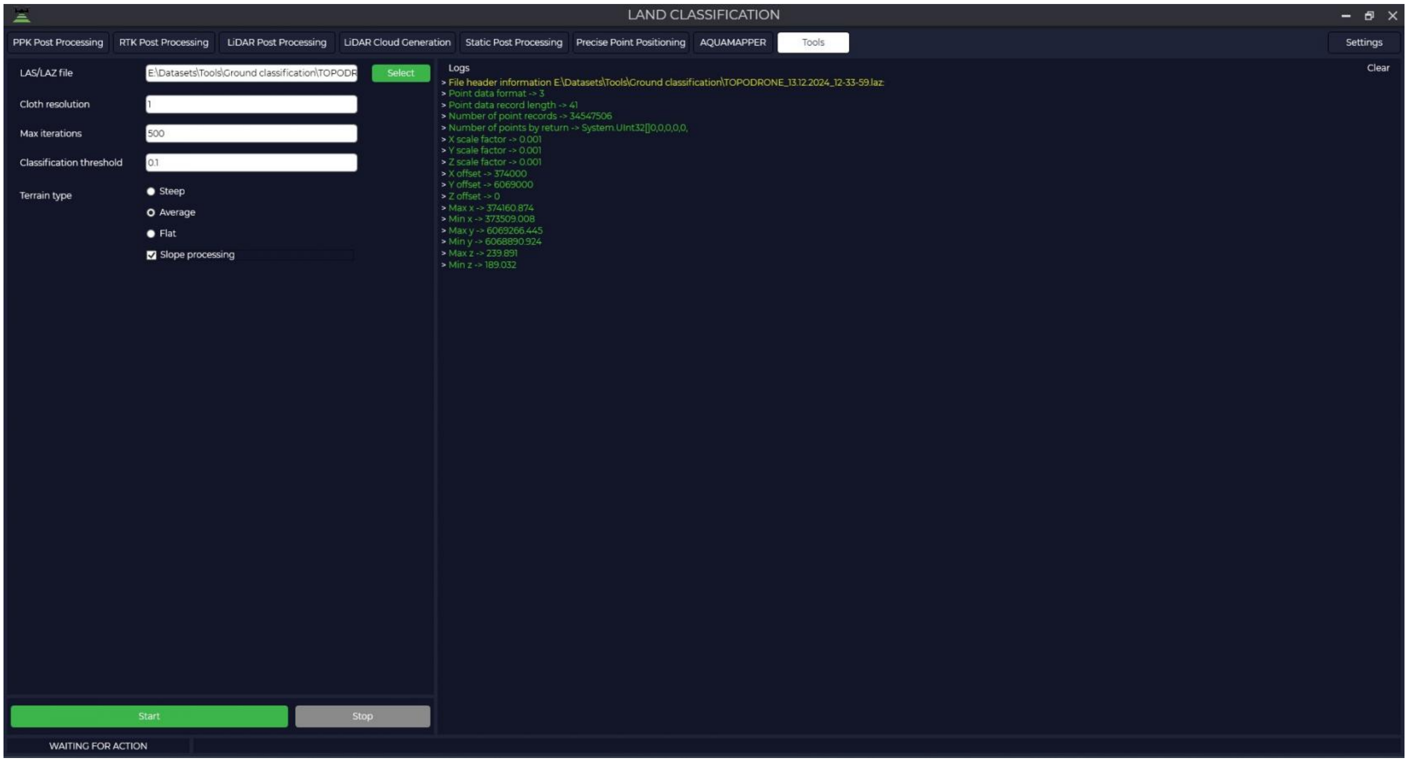
Number of iterations - the maximum allowable number of iterations performed during surface modelling. For most scenes it is recommended to set this value at 500 iterations, which is sufficient to achieve acceptable accuracy.

Classification tolerance - a parameter used to separate point clouds into ground related points and other points based on distances to the modelled terrain surface. The units of the tolerance must match the units of your point cloud. The recommended value for this parameter is 0.5, which is appropriate for most processing scenarios.

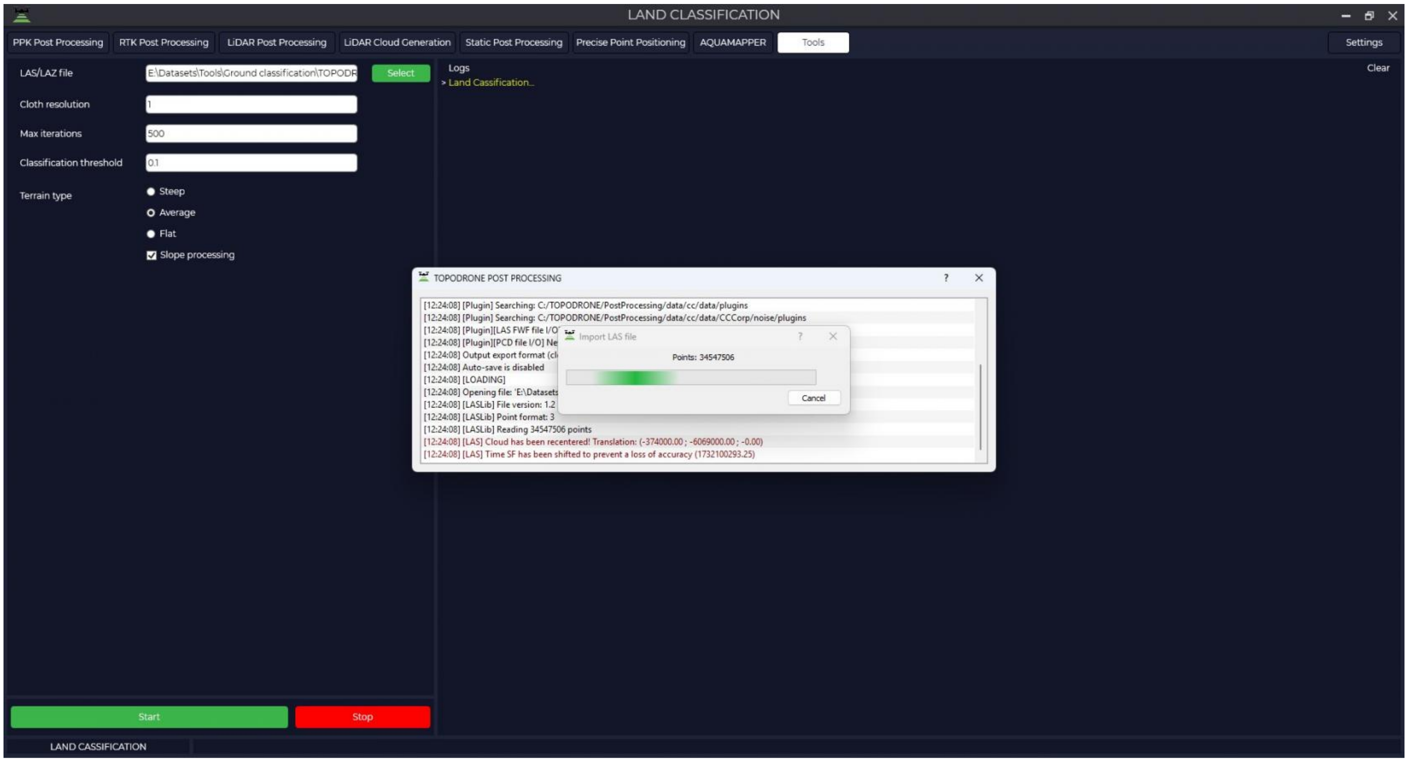
Terrain Type - with this parameter you can set the type of point cloud scene.

> For steep slopes, this algorithm can produce relatively large errors because the modelled fabric is above the steep slopes and does not agree well with ground-based measurements due to internal constraints between particles.

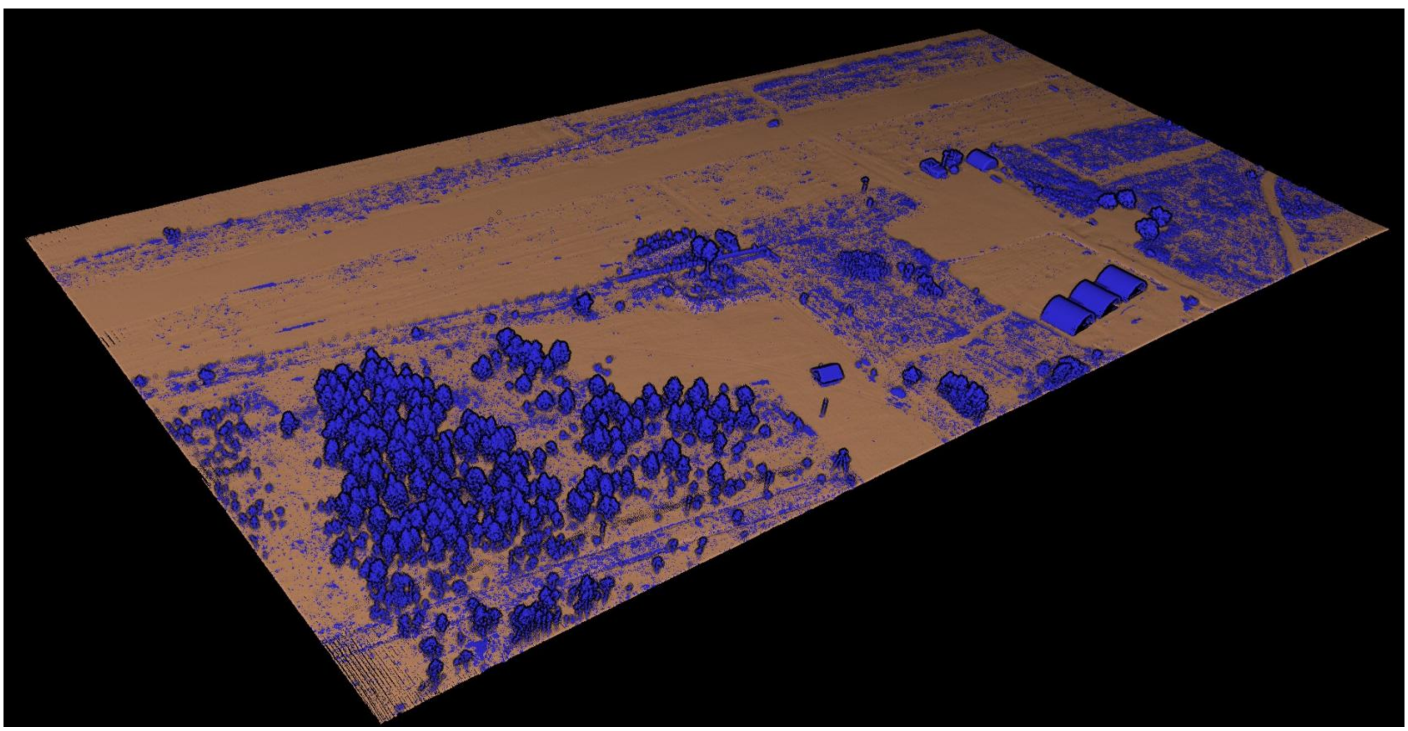
Slope handling — the problem described above can be solved by selecting this option. If your scenes don't have steep slopes, just ignore it.



Press the ‘Start’ button and wait for the operation to complete.



The final result is the files: the ground point cloud and the rest of the points.



LAS/LAZ Insta 360 Coloring

This module is designed for automatically assigning color characteristics to a Mobile Laser Scanning (MLS) point cloud, coloring it with natural colors using data obtained from TOPODRONE scanning systems.

Operating Principle and Data Requirements:

To obtain a point cloud with reliable RGB information, the following processing sequence must be executed:

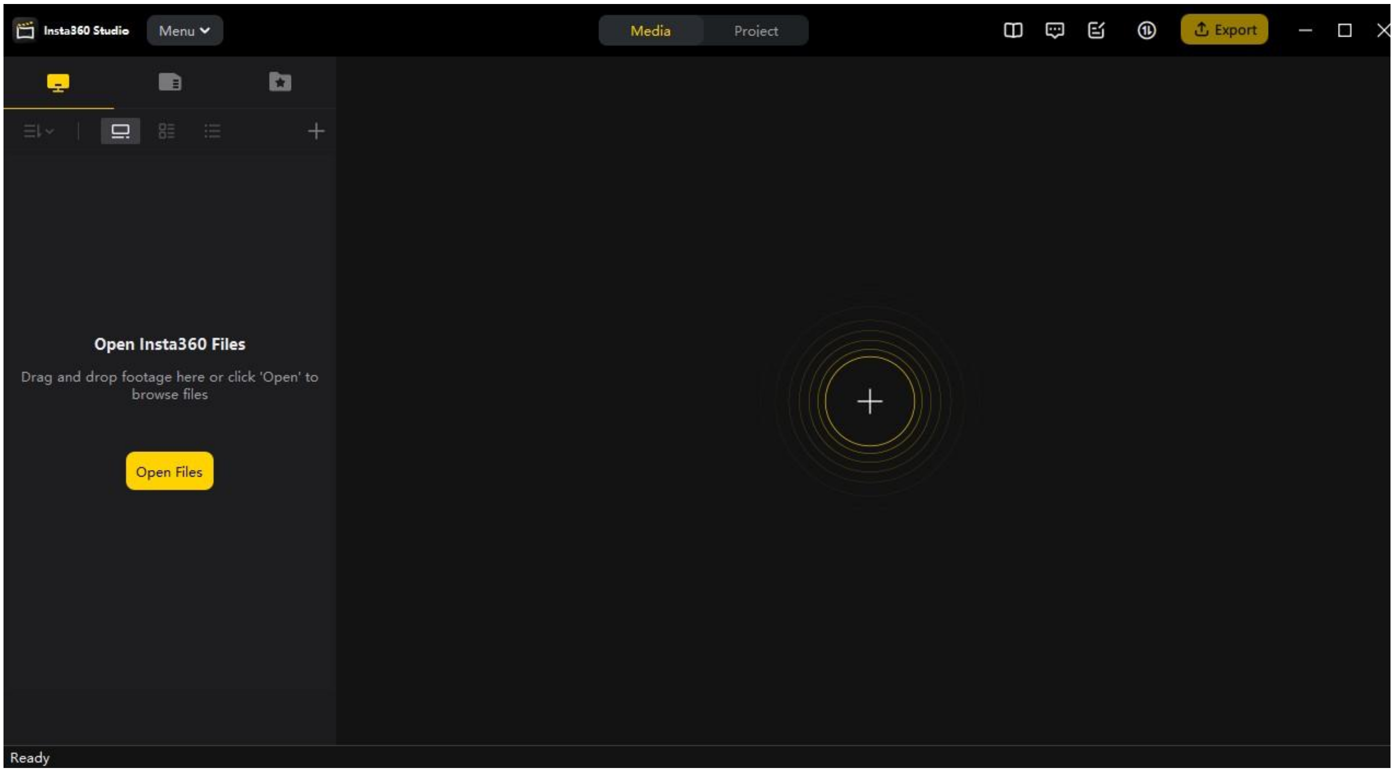
1. **Primary Data Processing:** Perform standard processing of raw data in the **LiDAR Post Processing** module to obtain the laser scanner's trajectory.
2. **Point Cloud Generation:** Generate the final point cloud in LAS/LAZ format using the **LiDAR Cloud Generation** module.
3. **Point Cloud Coloring:** At the final stage, using the **"LAS/LAZ Insta 360 Coloring"** tool, RGB values are assigned to the points in the cloud. The algorithm matches each laser reflection point with the corresponding pixel from the panoramic images taken by the Insta 360 camera, based on the precise trajectory and data about the camera's position relative to the laser scanner. This ensures realistic coloring in natural colors.

The point cloud coloring process involves several stages.

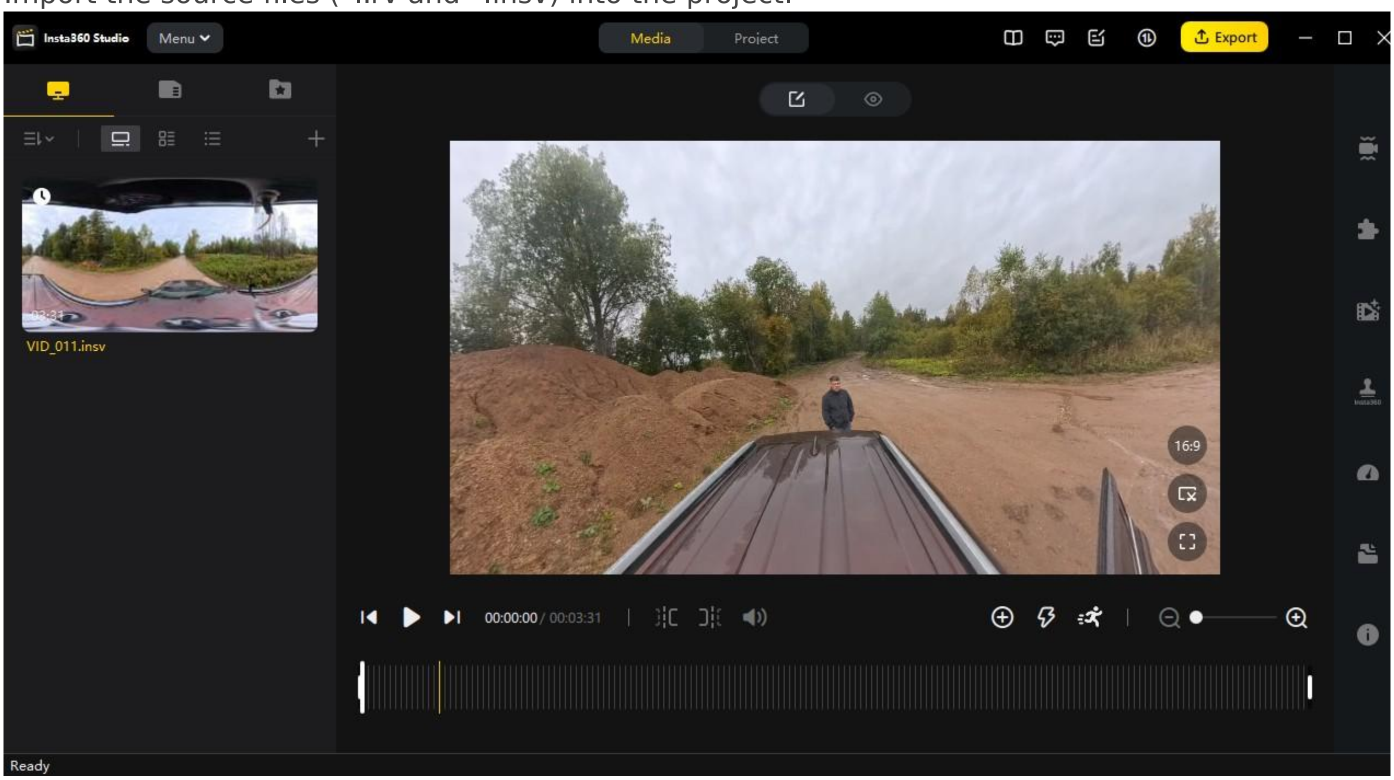
Data Preparation

During recording, the Insta 360 camera saves data in its proprietary formats (*.lrv and *.insv). These formats are optimized for working with panoramic video in the manufacturer's software. For further processing, specifically for point cloud coloring, the video stream must be converted to the standard *.mp4 format. To do this, you need to install the Insta360 Studio program.

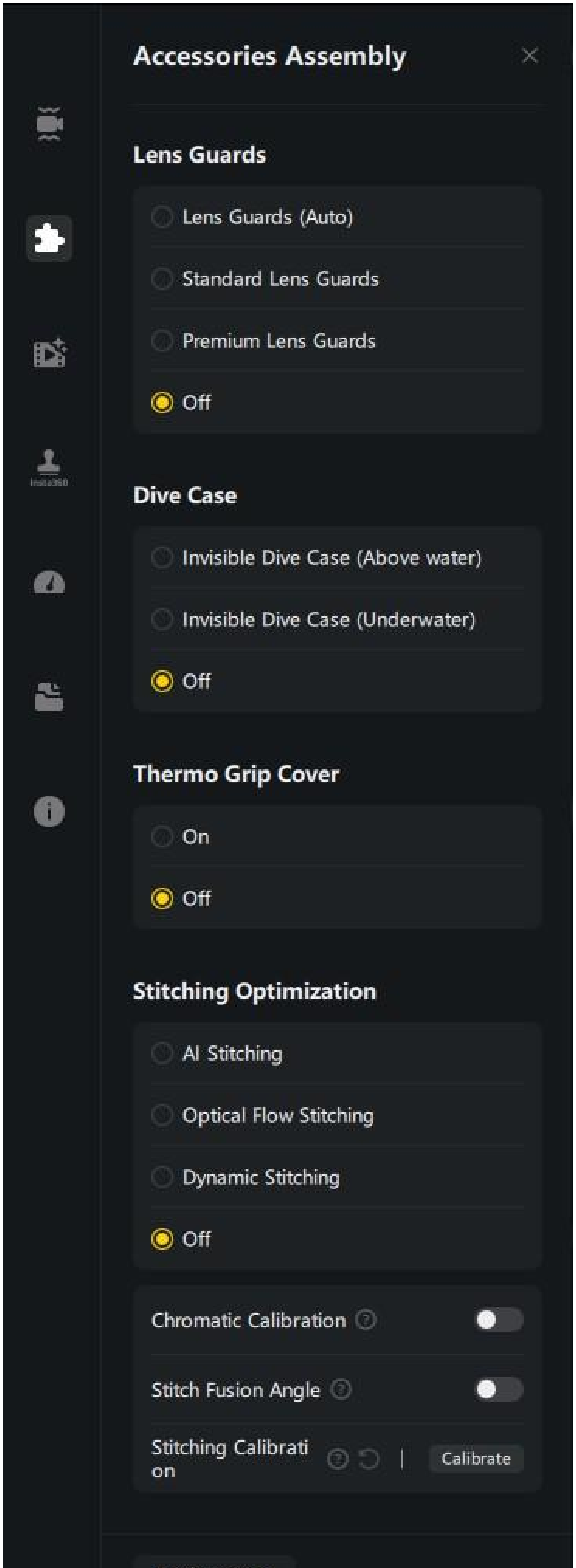
1. Launch the Insta360 Studio program.



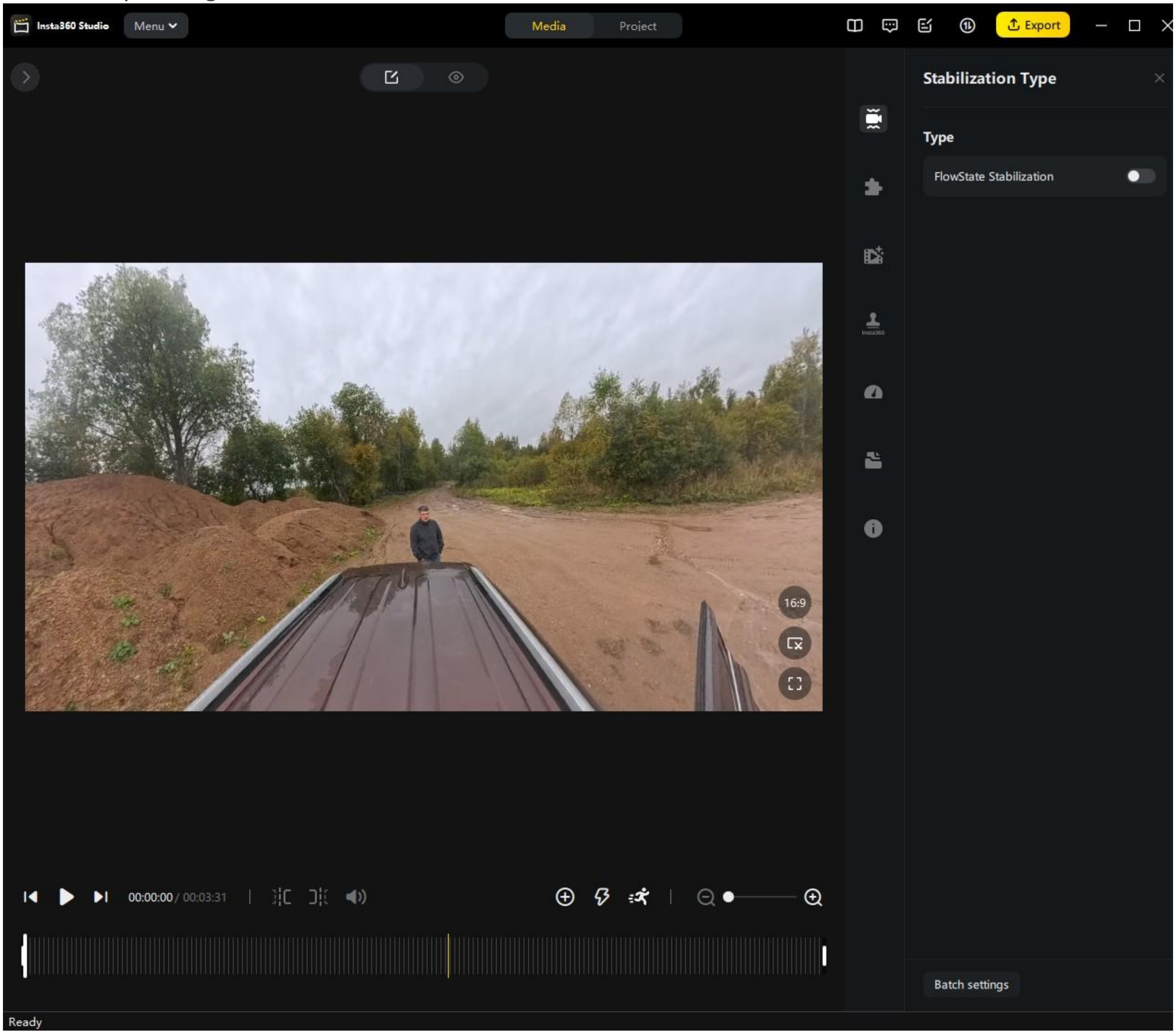
2. Import the source files (*.lrv and *.insv) into the project.



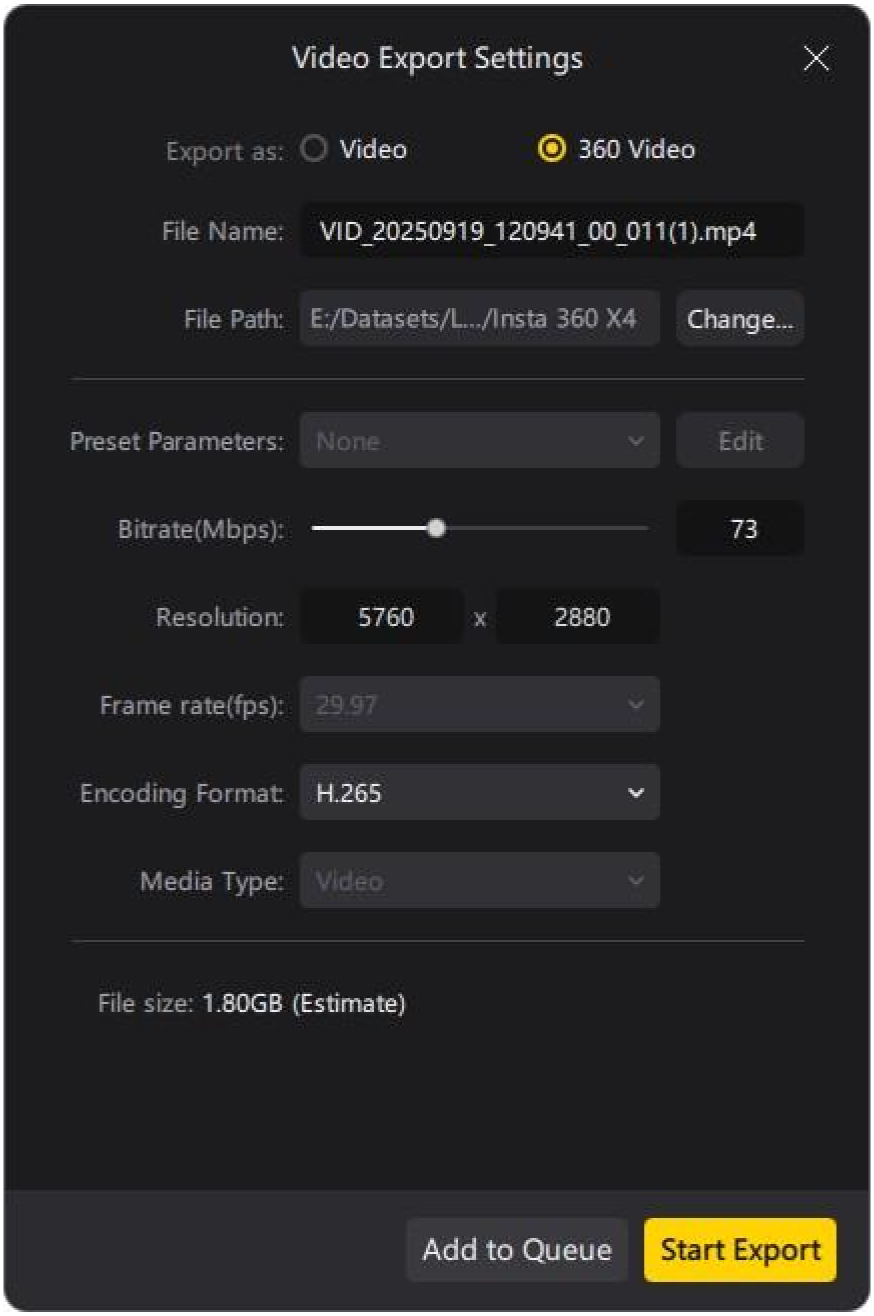
3. Navigate to the "Accessory Layout" tab and set the parameters according to the screenshot below.


Accessories Assembly
Lens Guards
Lens Guards (Auto)
Standard Lens Guards
Premium Lens Guards
Off
Dive Case
Invisible Dive Case (Above water)
Invisible Dive Case (Underwater)
Off
Thermo Grip Cover
On
Off
Stitching Optimization
AI Stitching
Optical Flow Stitching
Dynamic Stitching
Off
Chromatic Calibration
Stitch Fusion Angle
Stitching Calibrati
on
Calibrate

4. In the "Stabilization Type" tab, deactivate the "FlowState Stabilization" option by unchecking the corresponding box.

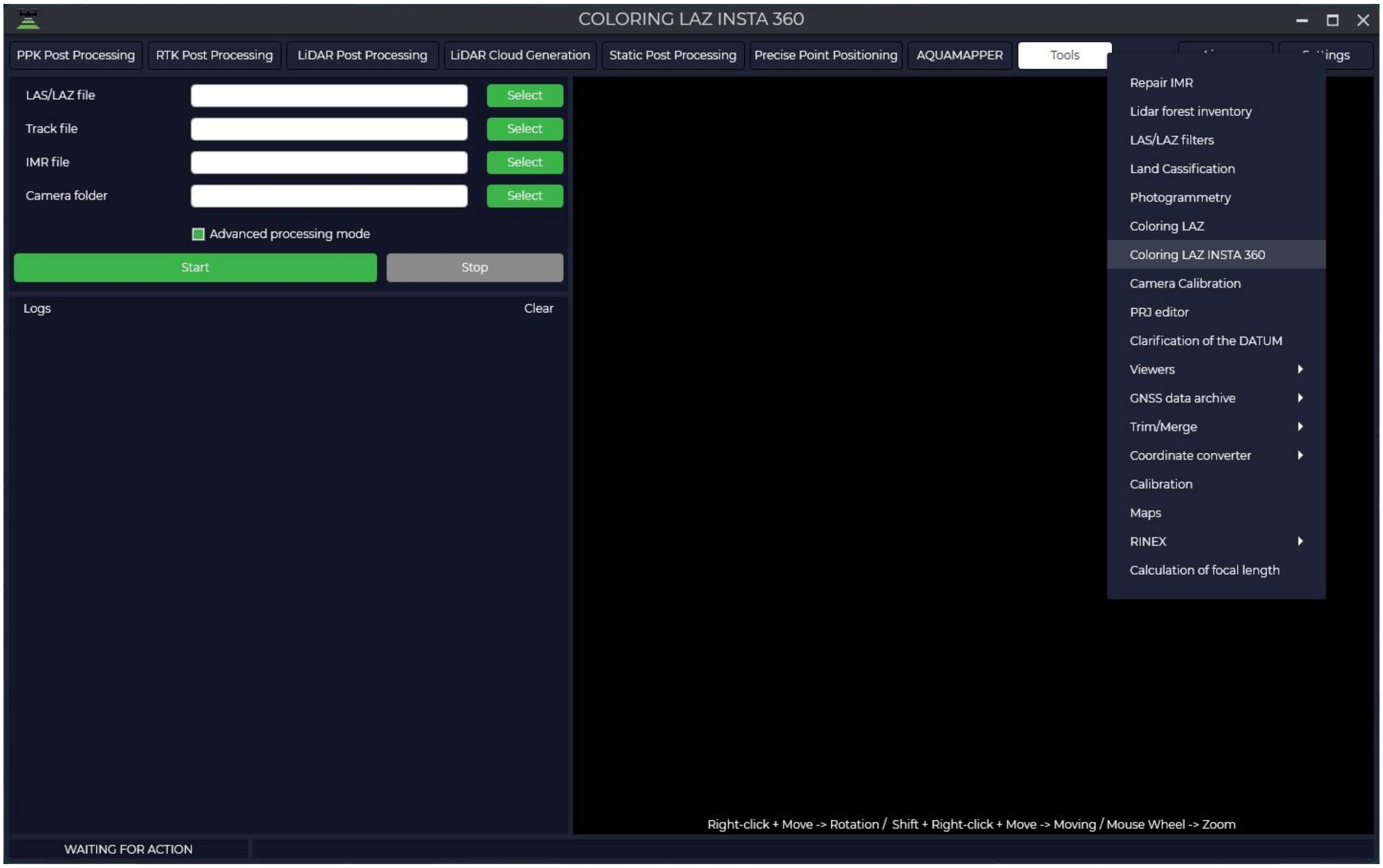


5. Initiate the export of the video file using the settings specified below into the folder containing the source *.lrv and *.insv files.

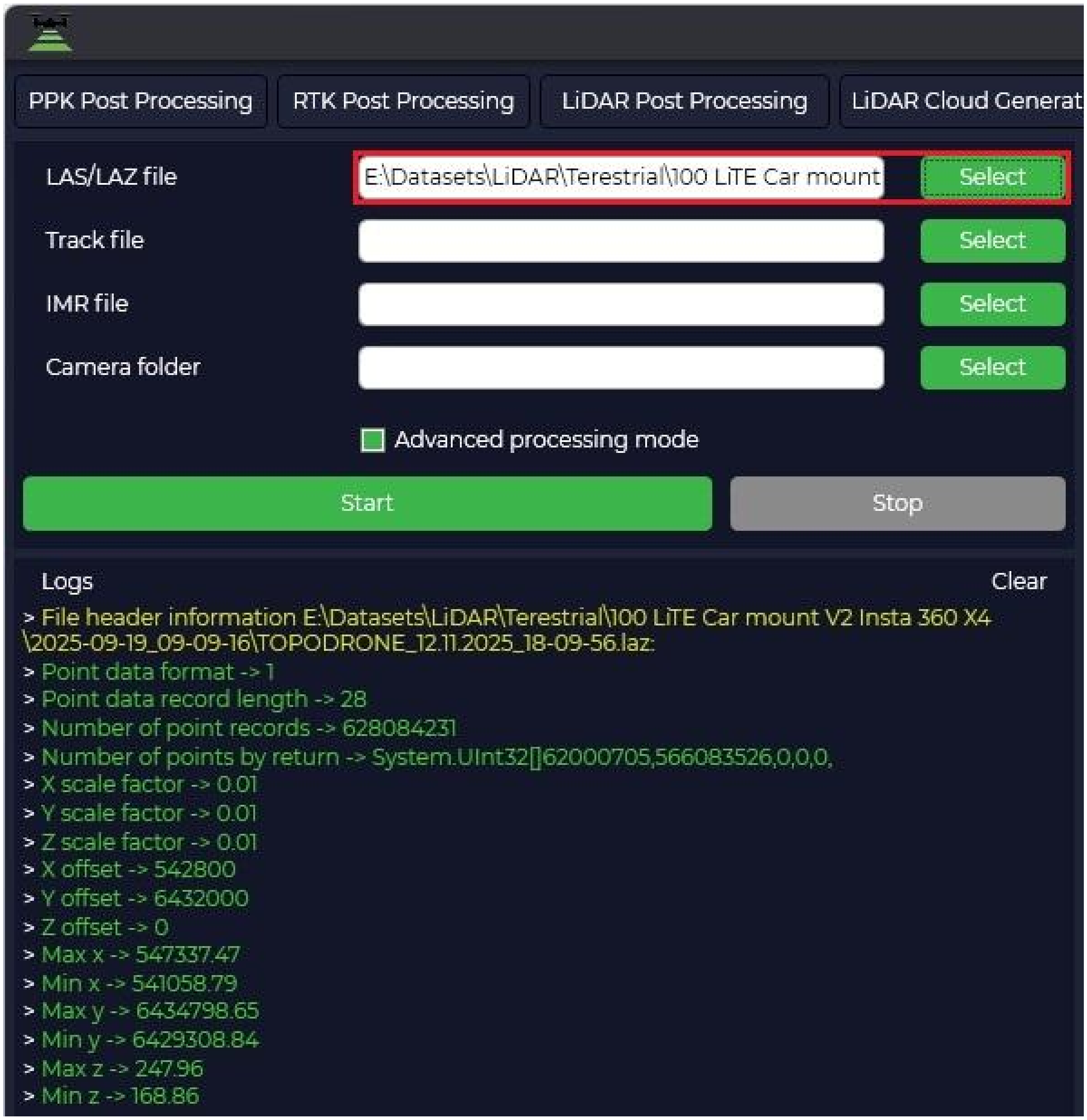


Point Cloud Coloring Process

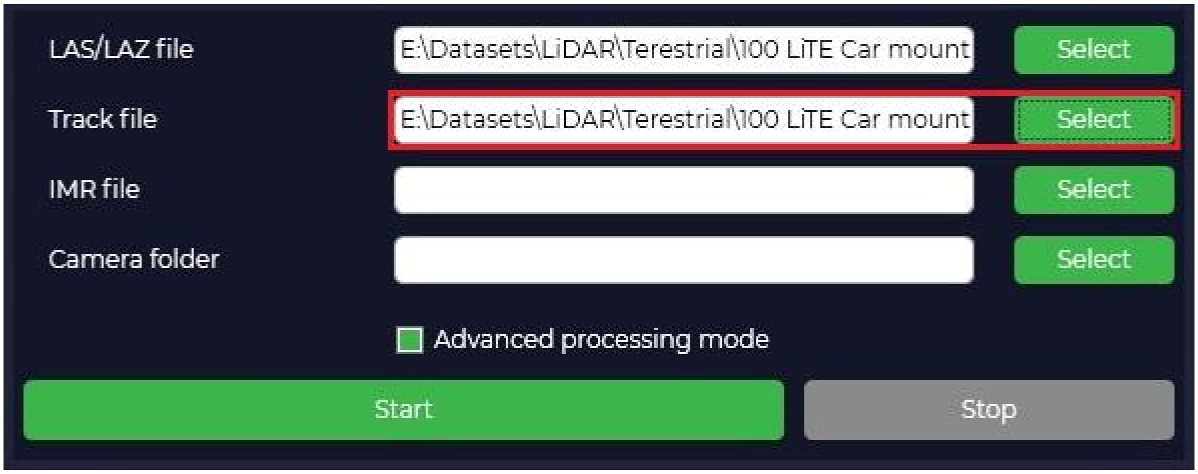
Navigate to the **"Tools"** menu and select the **"LAS/LAZ Insta 360 Coloring"** module.



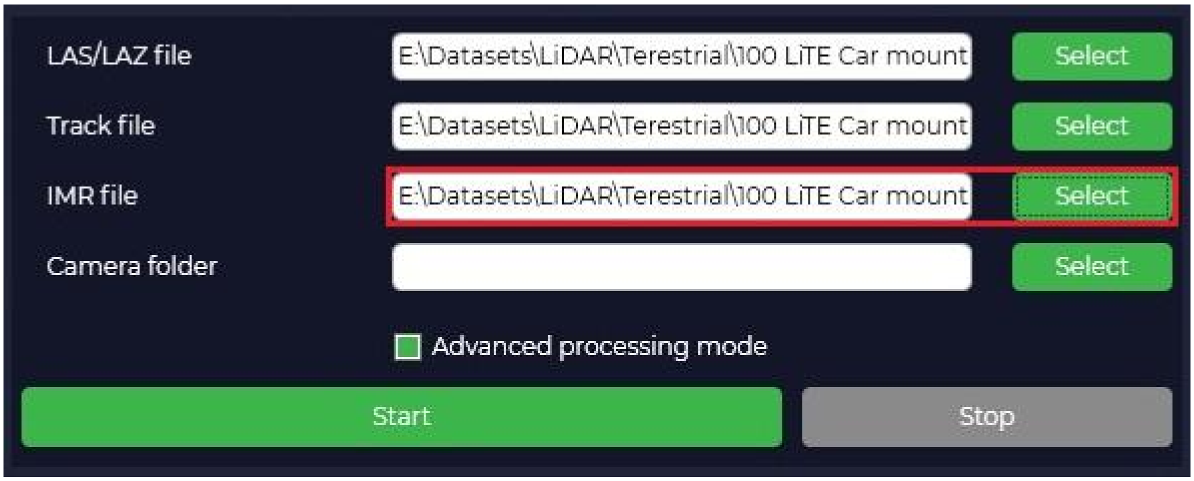
Specify the point cloud file in LAS/LAZ format, generated in the previous processing step in the **"LiDAR Cloud Generation"** module. This is an uncolored point cloud that contains spatial coordinates (X, Y, Z) and other laser information but lacks color attributes.



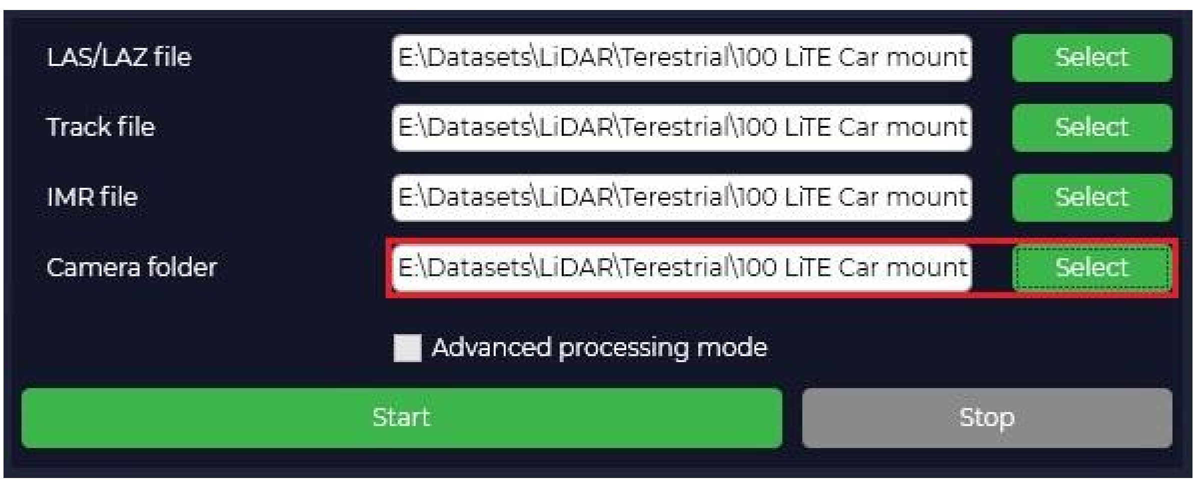
Select the trajectory file in the appropriate projection, obtained along with the point cloud from the **"LiDAR Cloud Generation"** module. The trajectory file contains precise coordinates and orientation of the scanning system at each moment in time. This data is critical for the temporal and spatial synchronization of frames with the cloud points.



Load the Inertial Measurement Unit (IMU) data file.



Specify the folder containing all the necessary video materials in *.lrv, *.insv, and *.mp4 formats.



Click the **"Start"** button to initiate the coloring algorithm.
The processing progress is displayed in the **"Log"** text window. This window outputs information

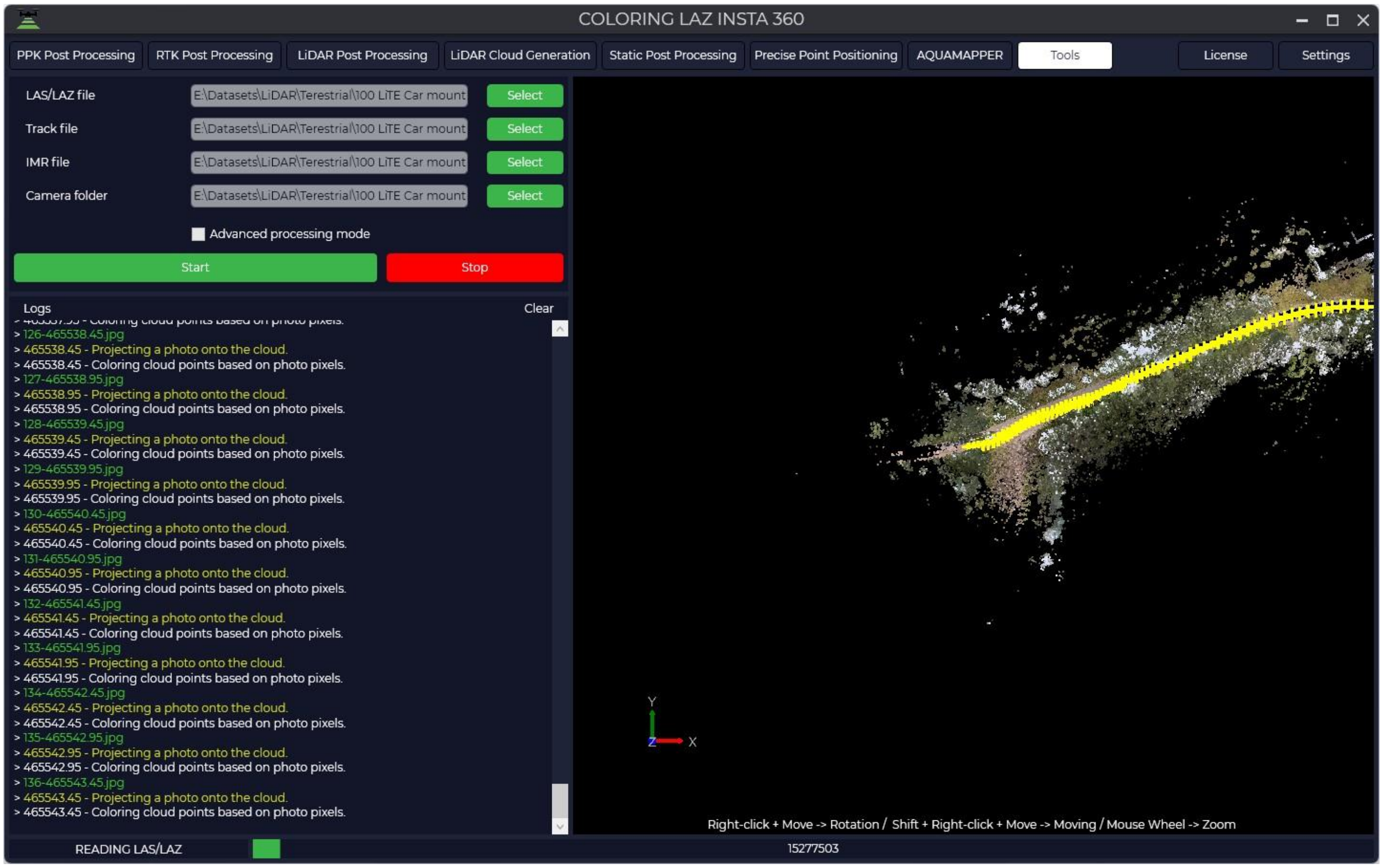
messages, warnings, and errors.

Logs

```
> Parsing IMU...
> Loaded 634587 IMU epochs
> IMU time interval: 468147.385 seconds
> IMU interpolation up to 200 Hz
> Changing IMU axes...
> Finding Gyro Bias IMU...
> Gyro Bias Roll IMU = -0.0292
> Gyro Bias Pitch IMU = -0.0148
> Gyro Bias Yaw IMU = 0.0168
> Applying the calculated bias to the IMU gyroscope...
> Parsing the camera metadata file...
> Found .insv files: 1
>   VID_20250919_120941_00_011.insv
> File processed successfully: VID_20250919_120941_00_011.insv.csv
> Data parsing...
> INSTA interpolation up to 200 Hz
> Removed intermediate file: VID_20250919_120941_00_011.insv.csv
> Loaded 633475 epochs of Insta360 IMU data
> Insta360 Time Interval: 3167.372534 seconds
> Changing INSTA axes...
> Finding Gyro Bias INSTA ...
> Gyro Bias Roll INSTA = 0.0203
> Gyro Bias Pitch INSTA = 0.1956
> Gyro Bias Yaw INSTA = 0.0312
> Applying the calculated bias to the INSTA gyroscope...
> MadgwickAHRS for IMU...
> MadgwickAHRS for INSTA...
> Analysis of time shift between lidar and camera...
> Best shift: 465002.700, matches: 21, average error: 125.650
> Average Error: 125.65
> Automatically calculated time shift: 465002.70 seconds
> User adjusted time offset: 465001.741 seconds
```


```
> E:\Datasets\LiDAR\Terestrial\100 LiTE Car mount V2 Insta 360 X4\2025-09-19_09-09-16\Insta 360 X4\Photo folder successfully cleared
> Extracting all frames in the range 470.96s - 1788.68s with time step 0.50s...
> *.mp4 files found: 1
> Getting video duration...
> Video frames: 6328, Real duration: 3164.00 seconds
> Processing file 1/1: VID_20250919_120941_00_011.mp4
> Waiting for operation to complete...
> Created files for VID_20250919_120941_00_011.mp4: 2636
> Renaming 2636 files with real time...
> Processing 2636 files with time step 0.50s...
> Renaming completed. Files processed: 2636
> Files successfully renamed with real time
> Temporary files have been deleted
> The photo series has been successfully created
> Searching for suitable photos...
> Done! 2630 matching images found.
> Reading LAS/LAZ file
```

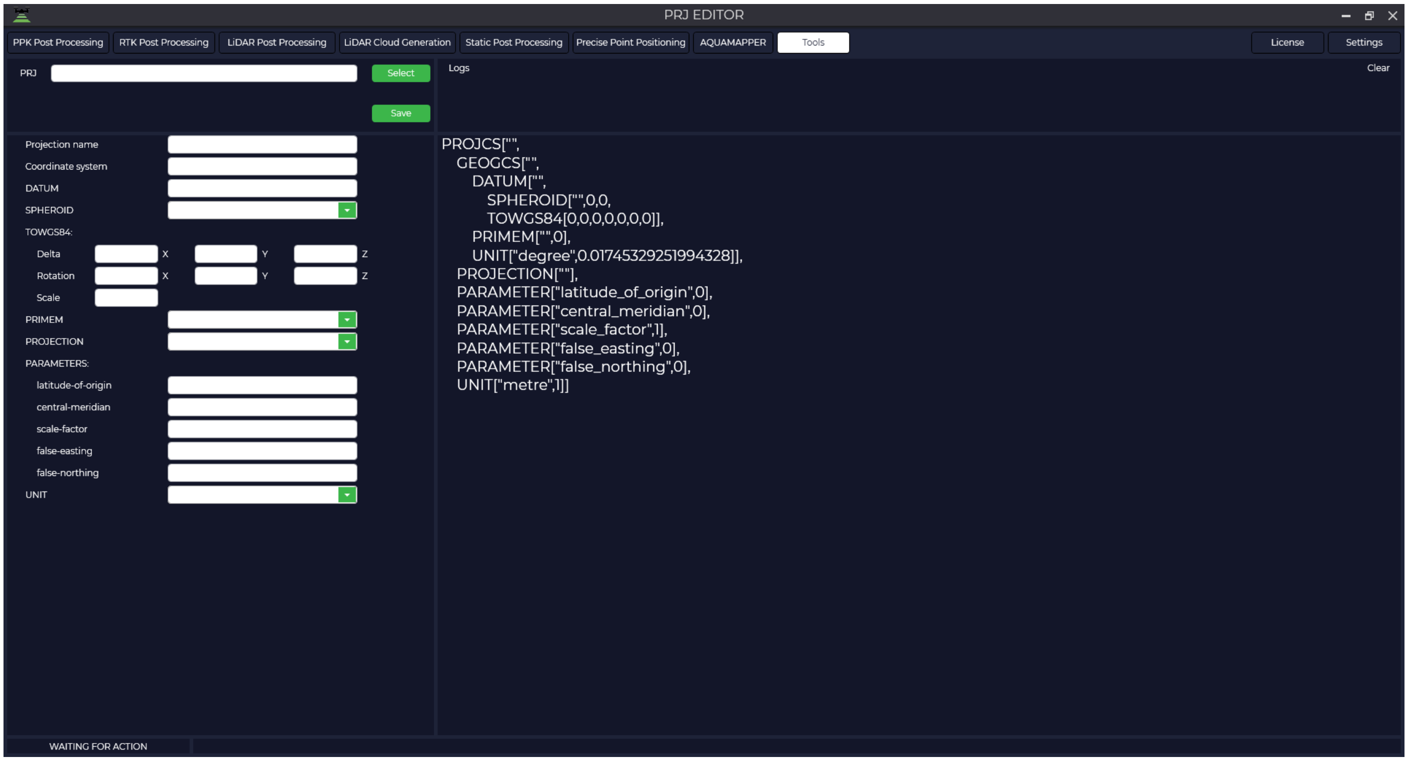
The **"Viewer"** window displays the process of assigning colors to the point cloud points in real-time, allowing for visual control over the processing accuracy.



Upon successful completion of the process, the module will automatically create a new file of the colored point cloud. The file is saved in the same directory as the source cloud. The prefix `_RGB` is added to the source filename for identification. A folder named "Photo" will be created in the directory containing the video files; this folder will contain panoramic images georeferenced to the WGS-84 coordinate system.

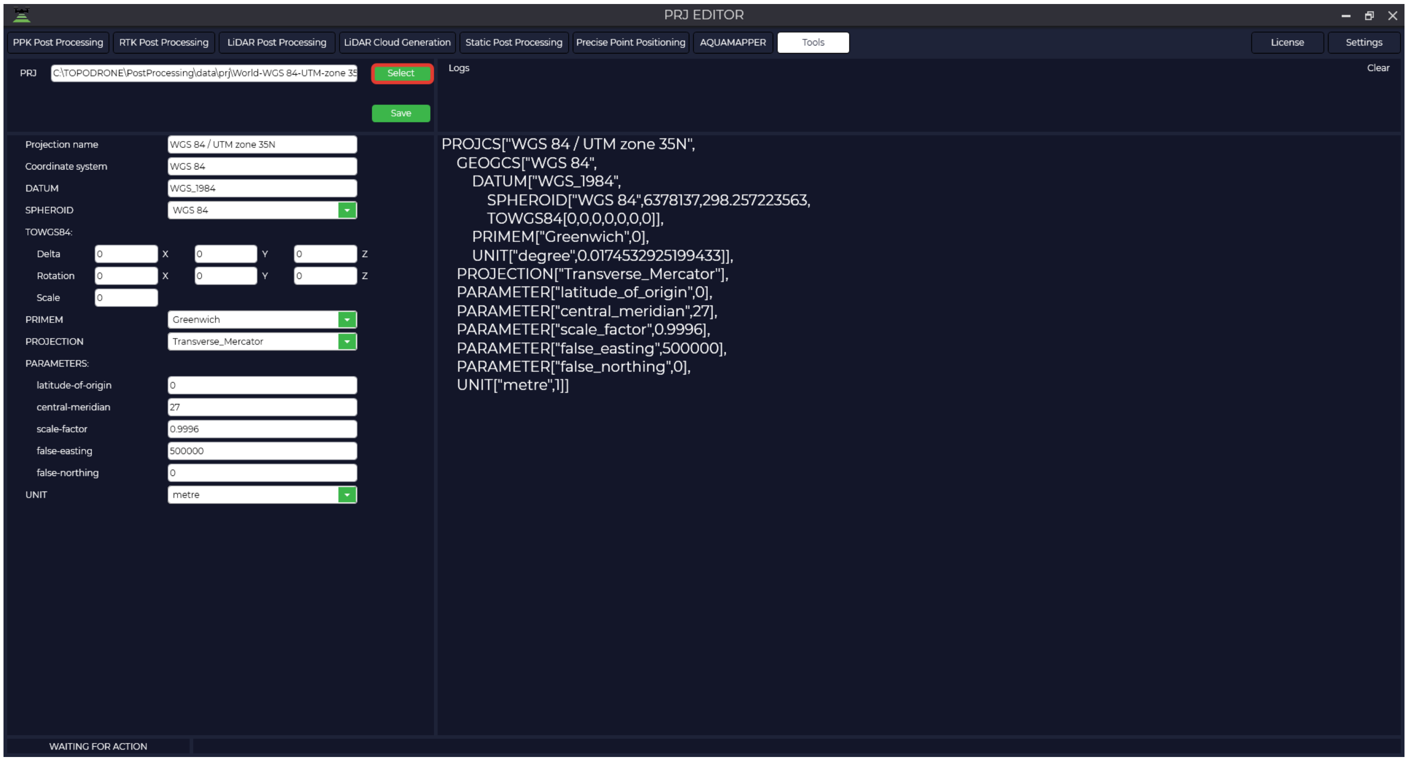
PRJ editor

PRJ Editor is a tool that allows you to edit the coordinate system knowing the transition parameters. In order to use it you need to select "PRJ Editor" in the Tools panel.



> Currently, a small amount of photogrammetry and laser scanning software supports affine transformations, so this tool does not support affine transformations in the same way.

In the window that opens, click the "Select" button and select the *.prj file you want to edit.

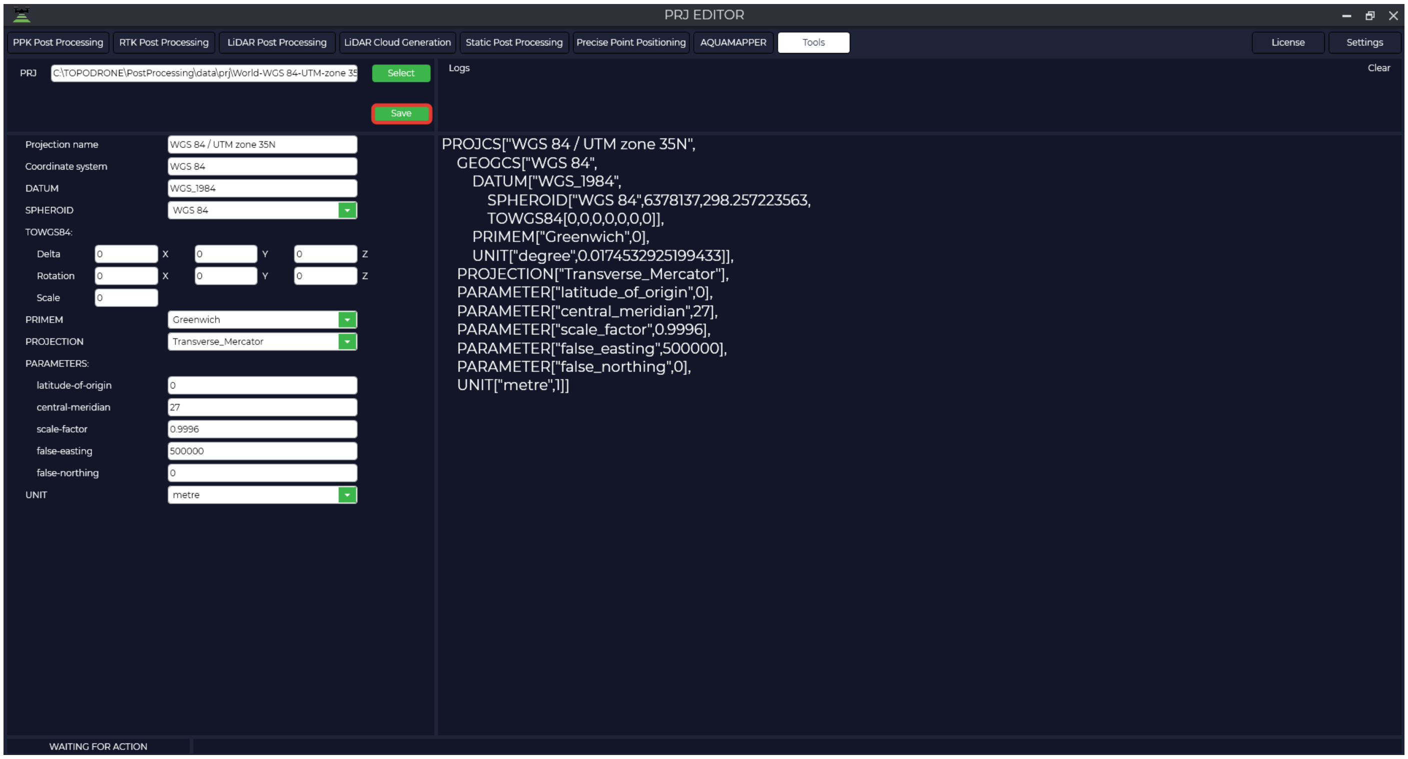


The table provides a description of the parameters

Projection name	WGS 84 / UTM zone 35N	Projection name
Coordinate system	WGS_1984	Name of coordinate system
DATUM	WGS_1984	Datum name
SPHEROID	WGS 84",6378137,298.257223563	Name of ellipsoid
TOWGS84		7 parameters of transition to WGS84
Delta	0,0,0	Displacement of the intermediate geocentric coordinate along the X, Y, Z axes. It is specified in meters, and the translation direction is indicated by the value sign.
Rotation	0,0,0	The amount of rotation about the X, Y, Z axes that applies to intermediate geocentric coordinates. It is specified in angular seconds, and the direction of translation is indicated by the sign of the value.

Scale	0	A scaling factor that applies to intermediate geocentric coordinates. The value is given in parts per million and is the difference between the actual scaling factor and one. For example, a scale parameter value of -2.5 gives an actual scale factor of 0.9999985. That is, the actual scale factor used is obtained by multiplying the parameter value by 1.0x10-06 and adding the result (algebraically) to 1.0.
PRIMEM	"Greenwich",0	Zero meridian, indicating the offset between the zero meridian of the declared coordinate system and the Greenwich coordinate system.
UNIT	"degree",0.01745329251994328	The unit of measure of SC (degrees).
PROJECTION	Transverse_Mercator	Projection type
PARAMETERS		
Latitude of origin	0	Initial latitude
Central meridian	27	Central meridian
Scale factory	0.9996	Scale factor
False easting	500000	Shift east
False northing	0	Shift north
UNIT	metre	Projection unit

Make all necessary changes to the parameters, click the "Save" button, specify the path to save and the file name.

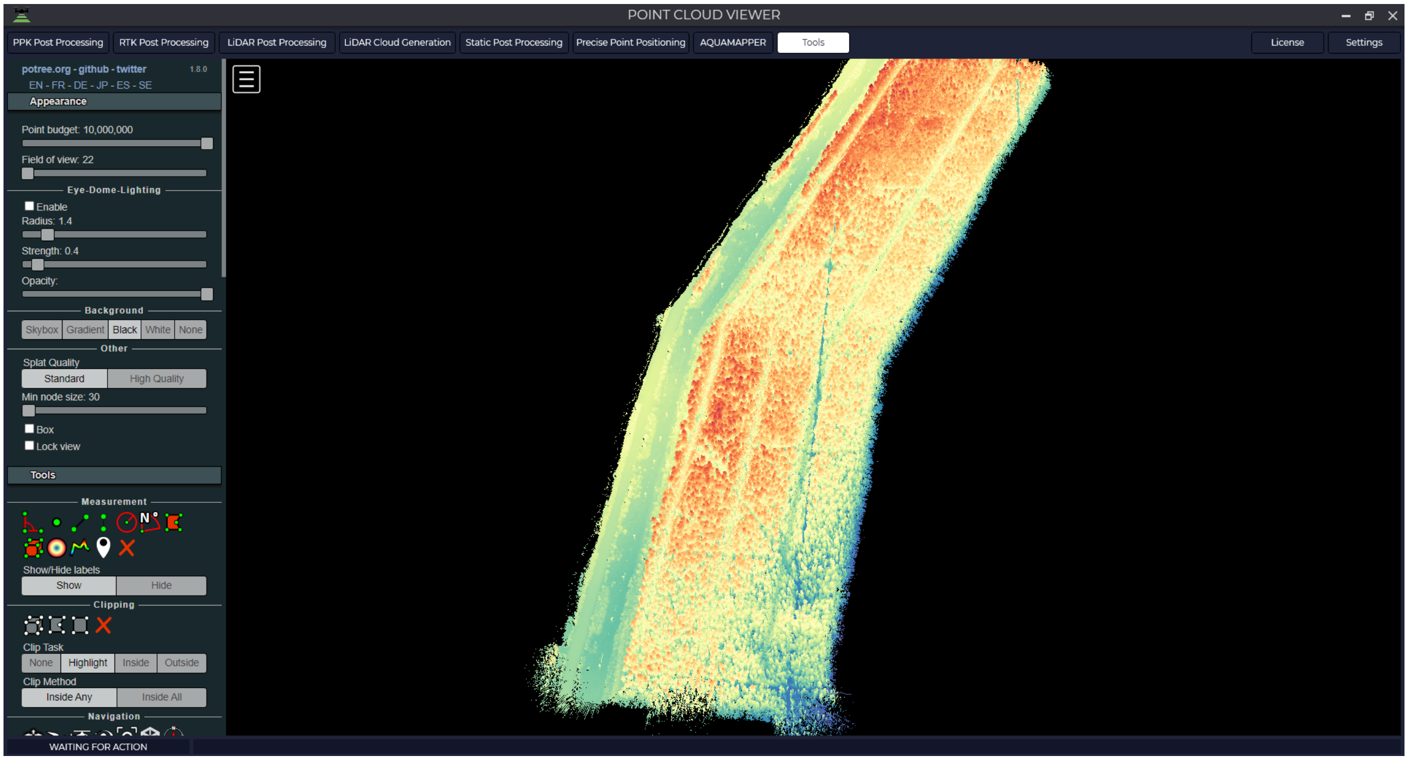


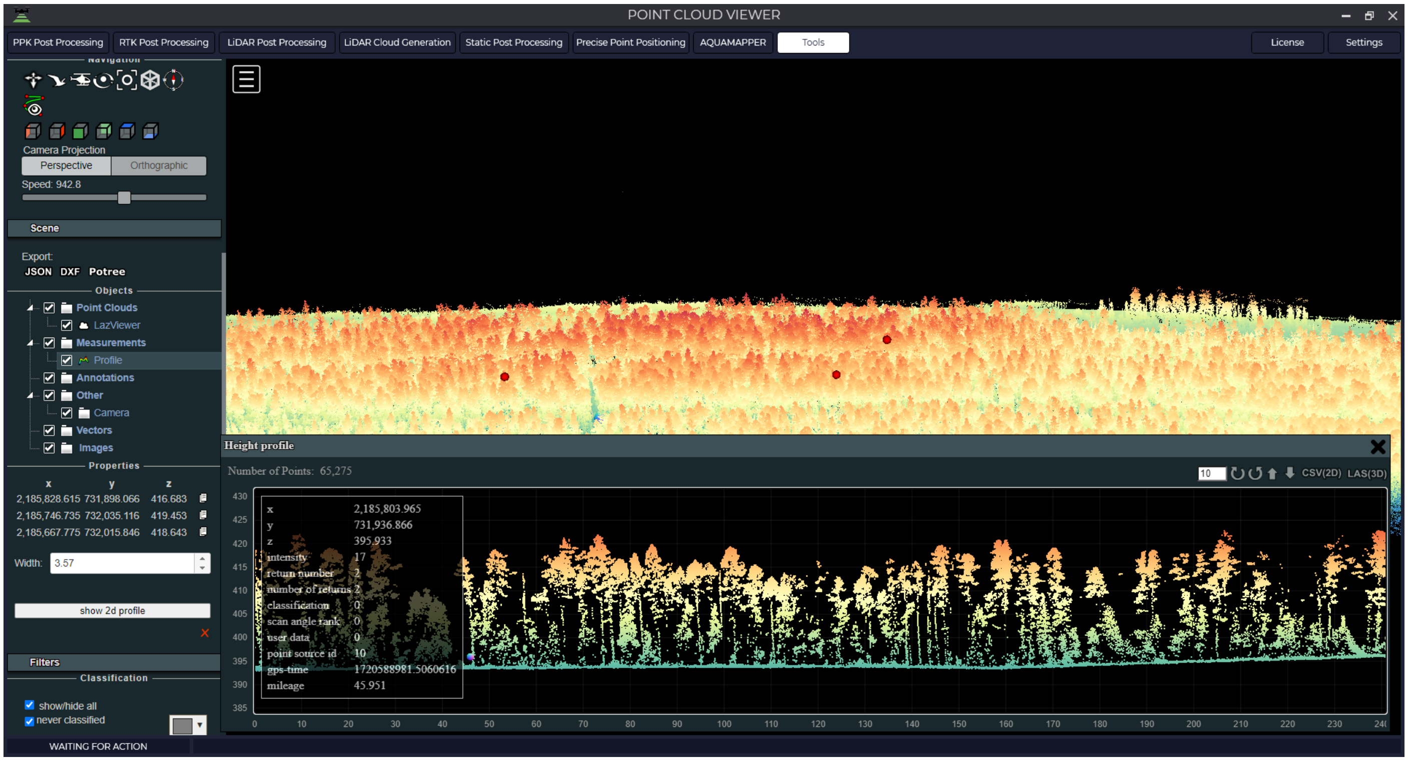
The resulting file is shown below.

```
PROJCS["WGS 84 / UTM zone 35N",
    GEOGCS["WGS 84",
        DATUM["WGS_1984",
            SPHEROID["WGS 84",6378137,298.257223563,
            TOWGS84[0,0,0,0,0,0,0]],
        PRIMEM["Greenwich",0,
        UNIT["degree",0.0174532925199433,
    PROJECTION["Transverse_Mercator"],
    PARAMETER["latitude_of_origin",0],
    PARAMETER["central_meridian",27],
    PARAMETER["scale_factor",0.9996],
    PARAMETER["false_easting",500000],
    PARAMETER["false_northing",0],
    UNIT["metre",1]]
```

Viewing the point cloud

This tool is intended for viewing and analyzing the point cloud obtained during processing in TOPODRONE Post Processing software. To start the module, go to the Tools tab, then Viewers and click on the New button. If you need to open a point cloud that has just been closed, select Previous. In the opened tab select the point cloud in *.las or *.laz format. After loading, the point cloud will be displayed in the main window.

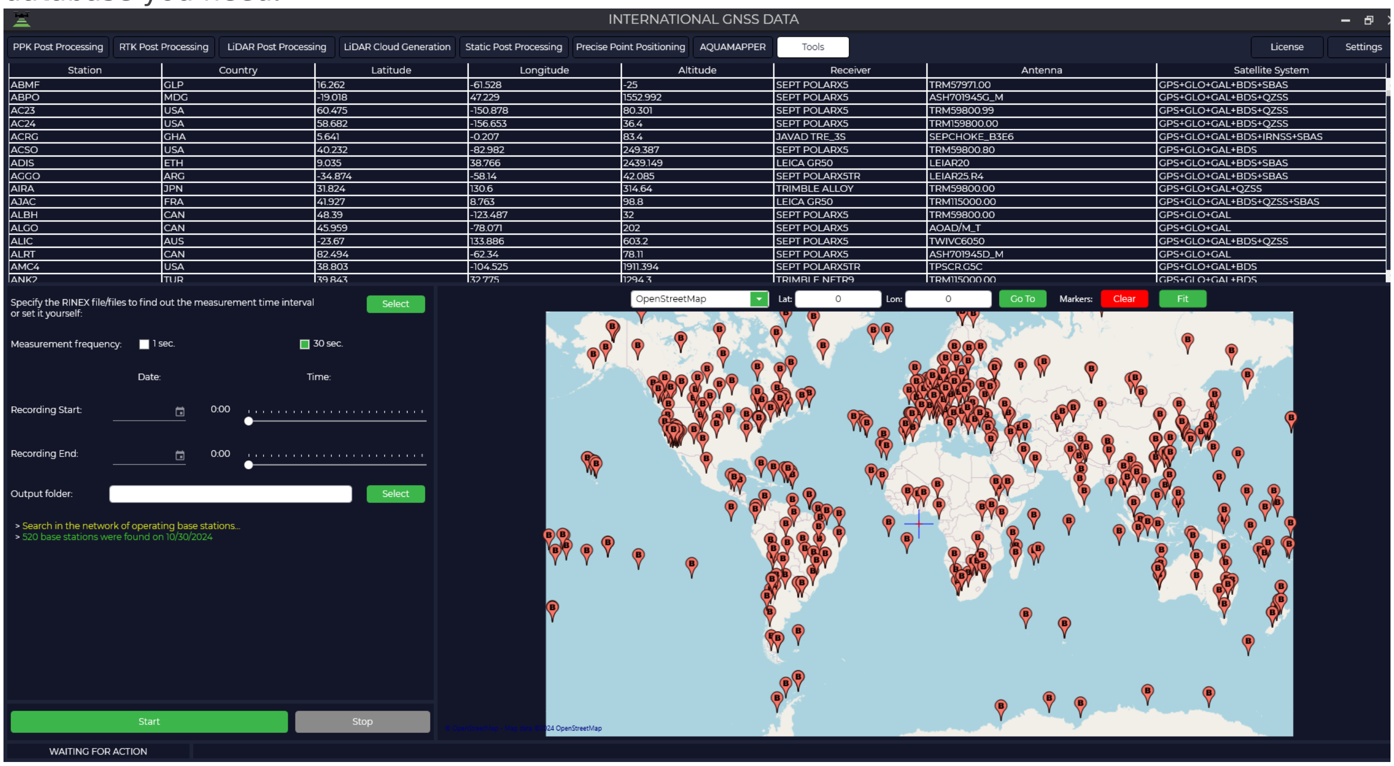



POINT CLOUD VIEWER
PPK Post Processing
RTK Post Processing
LiDAR Post Processing
LiDAR Cloud Generation
Static Post Processing
Precise Point Positioning
AQUAMAPPER
Tools
License
Settings
Camera Projection
Perspective
Orthographic
Speed: 942.8
Scene
Export:
JSON DXF Potree
Objects
Point Clouds
LazViewer
Measurements
Profile
Annotations
Other
Camera
Vectors
Images
Properties
2,185,828.615 731,898.066 416.683
2,185,746.735 732,035.116 419.453
2,185,667.775 732,015.846 418.643
Width: 3.57
show 2d profile
Filters
Classification
show/hide all
never classified
WAITING FOR ACTION
Height profile
Number of Points: 65,275
CSV(2D) LAS(3D)
x 2,185,803.965
y 731,936.866
z 395.933
intensity 17
return number 2
number of returns 2
classification 0
scan angle rank 0
user data 0
point source id 10
gps-time 1720588981.5060616
mileage 45.951

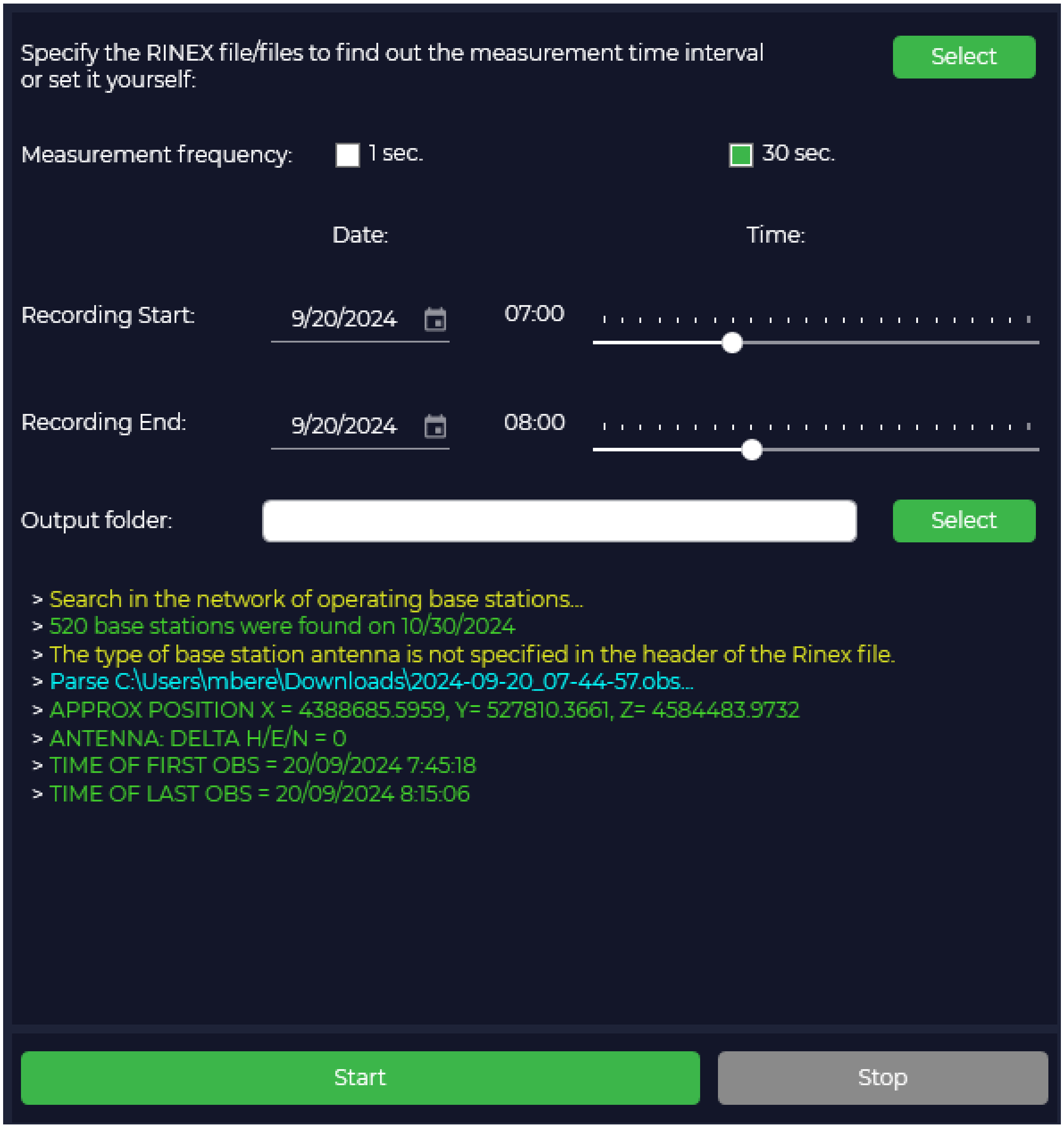
Data archive GNSS

This module is a large database with publicly available base stations for downloading observation files.

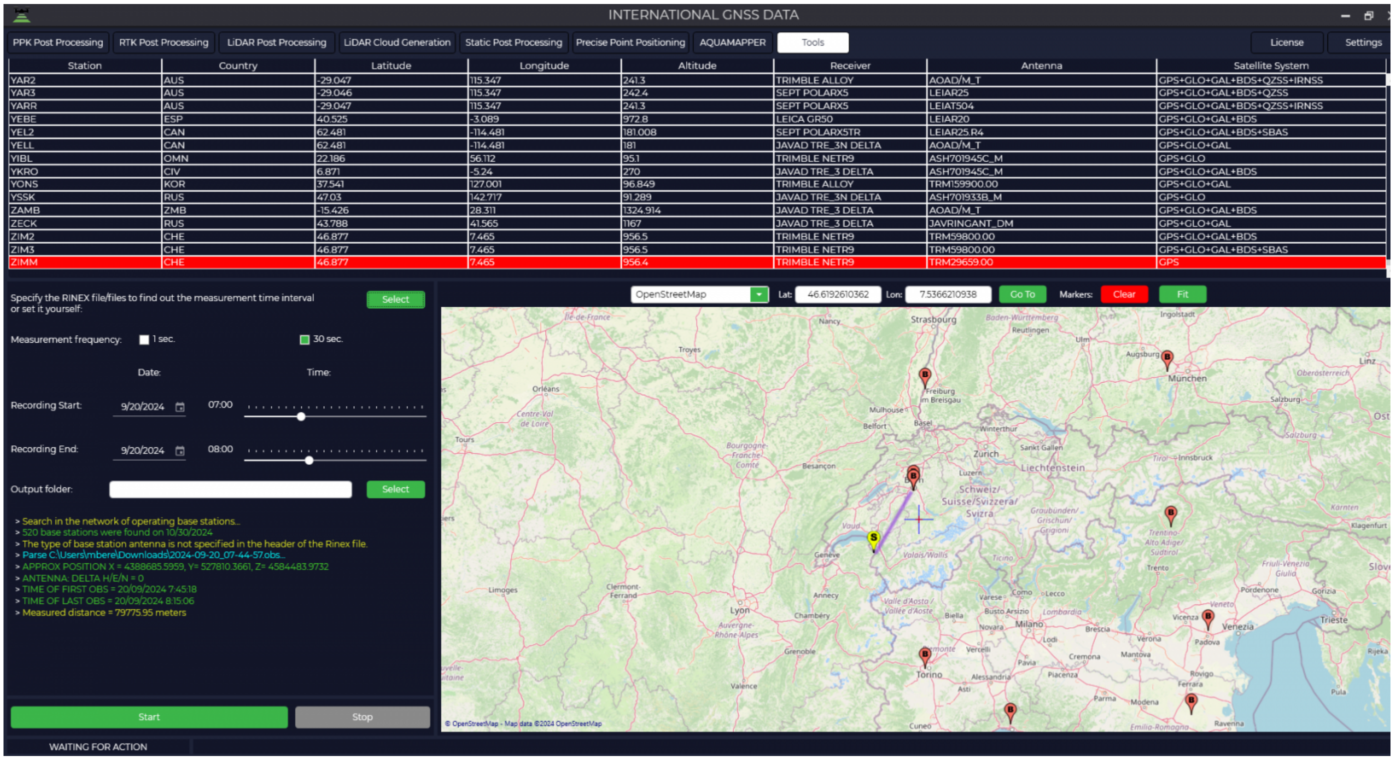
1. To start the module, go to the "Tools" tab, then "GNSS Data Archives" and select the database you need.



2. Then download the data from your receiver to have the program select the date and time of the base stations or enter this data manually. Specify the folder where you want to save the result.

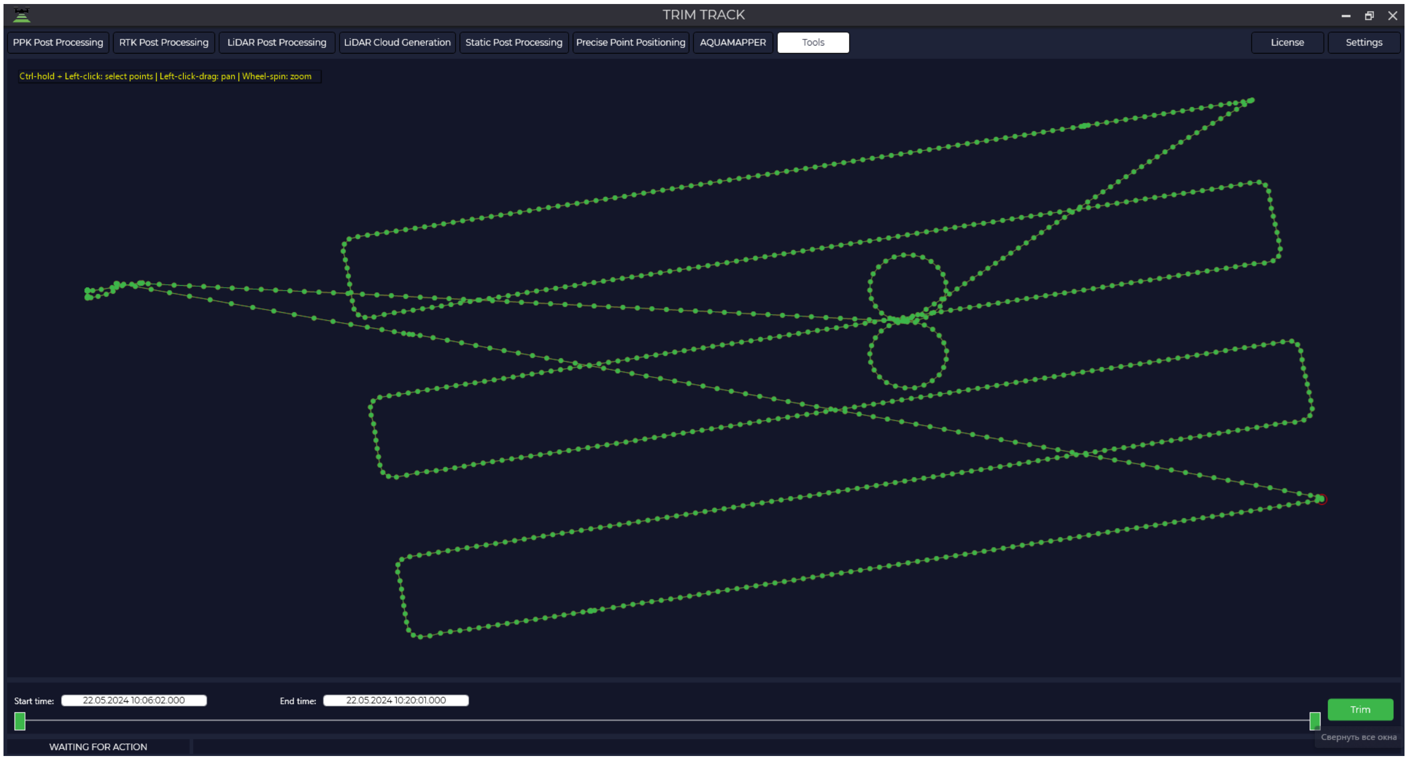


3. In the table or on the map, select the base station from which you want to download data and press the "Start" button, the data download will start in the folder you specified.

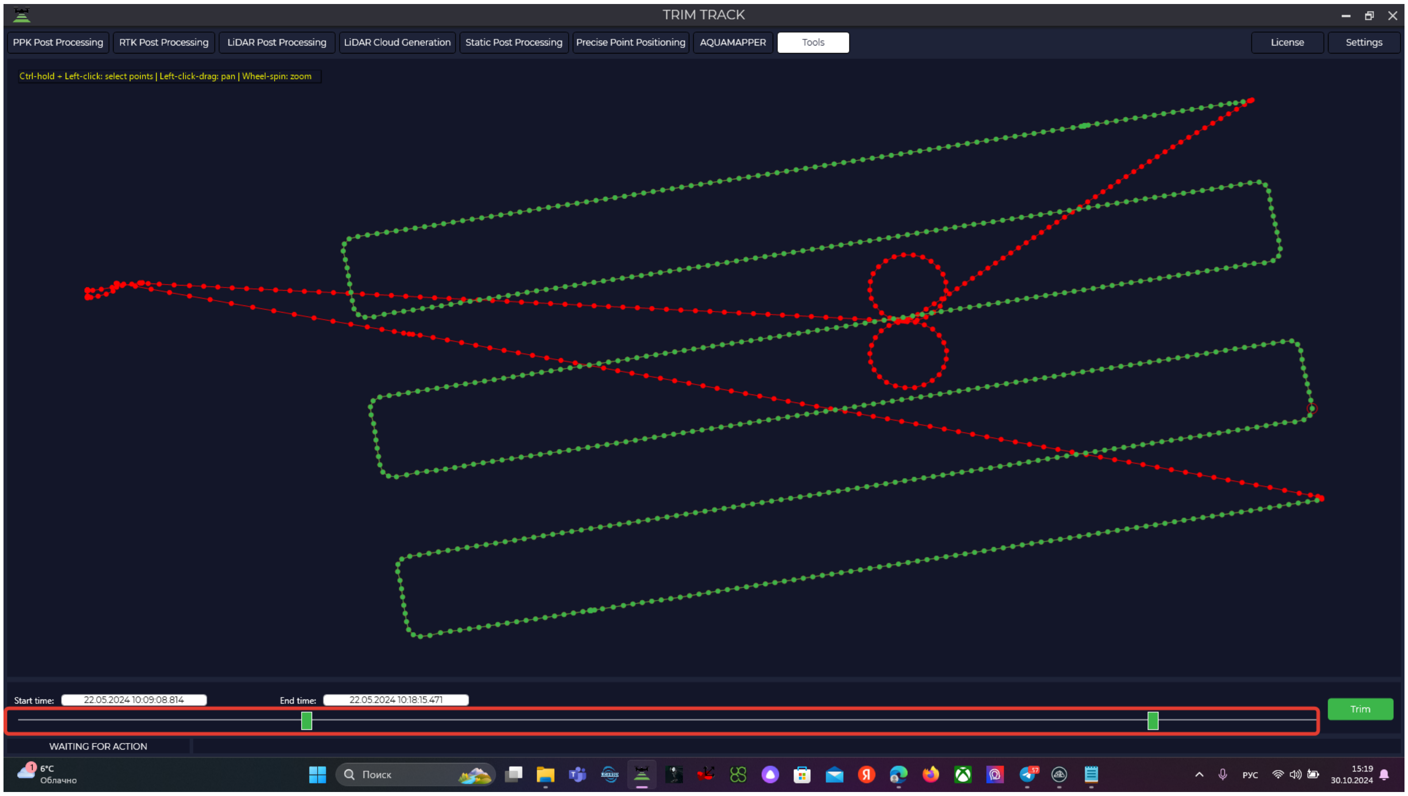

INTERNATIONAL GNSS DATA
PPK Post Processing
RTK Post Processing
LiDAR Post Processing
LiDAR Cloud Generation
Static Post Processing
Precise Point Positioning
AQUAMAPPER
Tools
License
Settings
Station | Country | Latitude | Longitude | Altitude | Receiver | Antenna | Satellite System
YAR2 | AUS | -29.047 | 115.347 | 241.3 | TRIMBLE ALLOY | AOAD/M_T | GPS+GLO+GAL+BDS+QZSS+IRNSS
YAR3 | AUS | -29.046 | 115.347 | 242.4 | SEPT POLARX5 | LEIAR25 | GPS+GLO+GAL+BDS+QZSS
YARR | AUS | -29.047 | 115.347 | 241.3 | SEPT POLARX5 | LEIAT504 | GPS+GLO+GAL+BDS+QZSS+IRNSS
YEBE | ESP | 40.525 | -3.089 | 972.8 | LEICA GR50 | LEIAR20 | GPS+GLO+GAL+BDS
YEL2 | CAN | 62.481 | -114.481 | 181.008 | SEPT POLARX5TR | LEIAR25.R4 | GPS+GLO+GAL+BDS+SBAS
YELL | CAN | 62.481 | -114.481 | 181 | JAVAD TRE_3N DELTA | AOAD/M_T | GPS+GLO+GAL
YIBL | OMN | 22.186 | 56.112 | 95.1 | TRIMBLE NETR9 | ASH701945C_M | GPS+GLO
YKRO | CIV | 6.871 | -5.24 | 270 | JAVAD TRE_3 DELTA | ASH701945C_M | GPS+GLO+GAL+BDS
YONS | KOR | 37.541 | 127.001 | 96.849 | TRIMBLE ALLOY | TRM159900.00 | GPS+GLO+GAL
YSSK | RUS | 47.03 | 142.717 | 91.289 | JAVAD TRE_3N DELTA | ASH701933B_M | GPS+GLO
ZAMB | ZMB | -15.426 | 28.311 | 1324.914 | JAVAD TRE_3 DELTA | AOAD/M_T | GPS+GLO+GAL+BDS
ZECK | RUS | 43.788 | 41.565 | 1167 | JAVAD TRE_3 DELTA | JAVRINGANT_DM | GPS+GLO+GAL
ZIM2 | CHE | 46.877 | 7.465 | 956.5 | TRIMBLE NETR9 | TRM59800.00 | GPS+GLO+GAL+BDS
ZIM3 | CHE | 46.877 | 7.465 | 956.5 | TRIMBLE NETR9 | TRM59800.00 | GPS+GLO+GAL+BDS+SBAS
ZIMM | CHE | 46.877 | 7.465 | 956.4 | TRIMBLE NETR9 | TRM29659.00 | GPS
Specify the RINEX file/files to find out the measurement time interval or set it yourself:
Select
Measurement frequency:
1 sec.
30 sec.
Date:
Time:
Recording Start:
9/20/2024
07:00
Recording End:
9/20/2024
08:00
Output folder:
Select
> Search in the network of operating base stations...
> 520 base stations were found on 10/30/2024
> The type of base station antenna is not specified in the header of the Rinex file.
> Parse C:\Users\mbere\Downloads\2024-09-20_07-44-57.obs...
> APPROX POSITION X = 4388685.5959, Y= 527810.3661, Z= 4584483.9732
> ANTENNA: DELTA H/E/N = 0
> TIME OF FIRST OBS = 20/09/2024 7:45:18
> TIME OF LAST OBS = 20/09/2024 8:15:06
> Measured distance = 79775.95 meters
Start
Stop
WAITING FOR ACTION
OpenStreetMap
Lat:
46.6192610362
Lon:
7.5366210938
Go To
Markers:
Clear
Fit
Strasbourg
Zürich
Milano
Torino
Lyon
Venezia
München
© OpenStreetMap - Map data ©2024 OpenStreetMap

Track trimming

This tool is designed to trim a trajectory file in *.pos and *.poses format.
To start the tool, select Track Trim in the Tools, Trim/Stitch tab. Then select the track you want to trim.



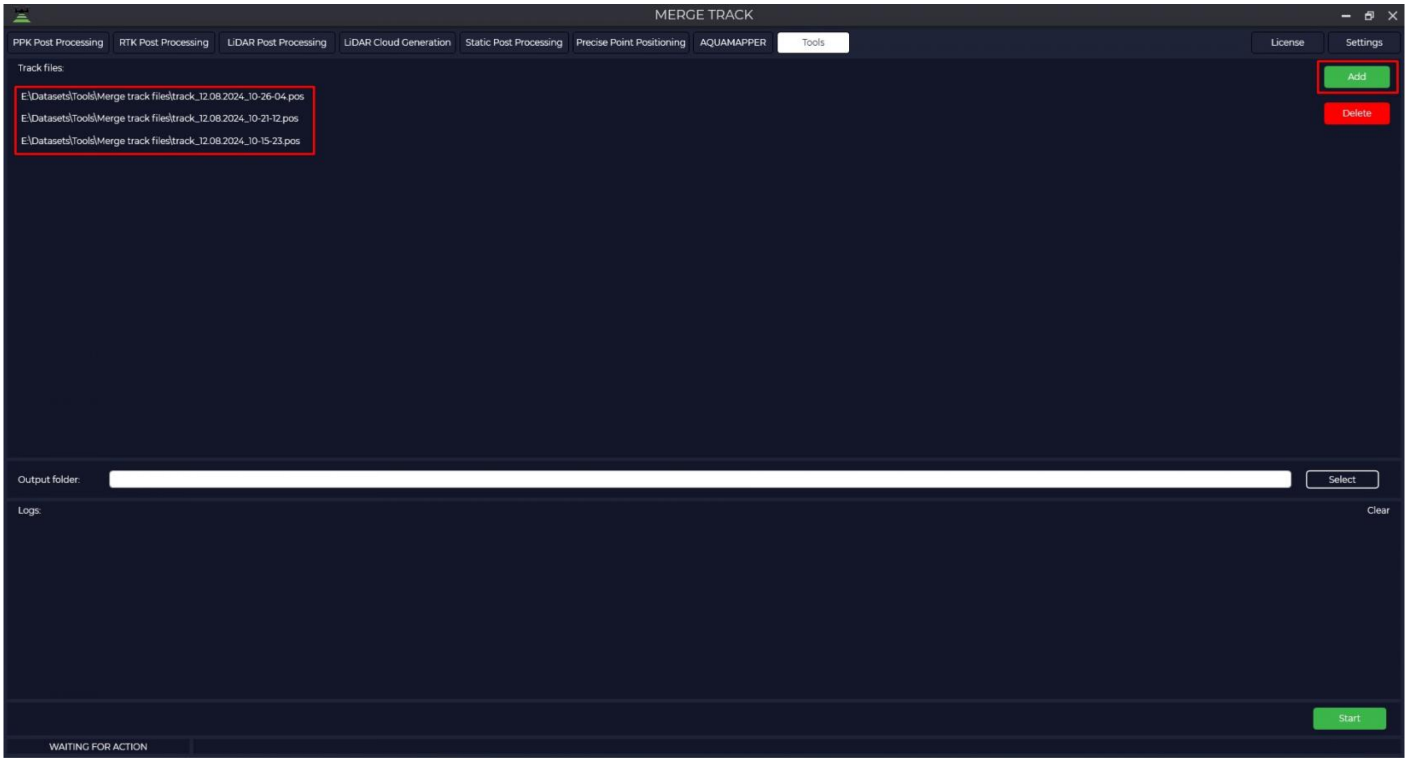
There are two sliders at the bottom, by moving them you specify the interval of the trajectory, which will remain and which will be cut. You will see a visual representation of the two colors on the trajectory. Green indicates the area that will be saved after trimming, and red indicates the area that will be trimmed.



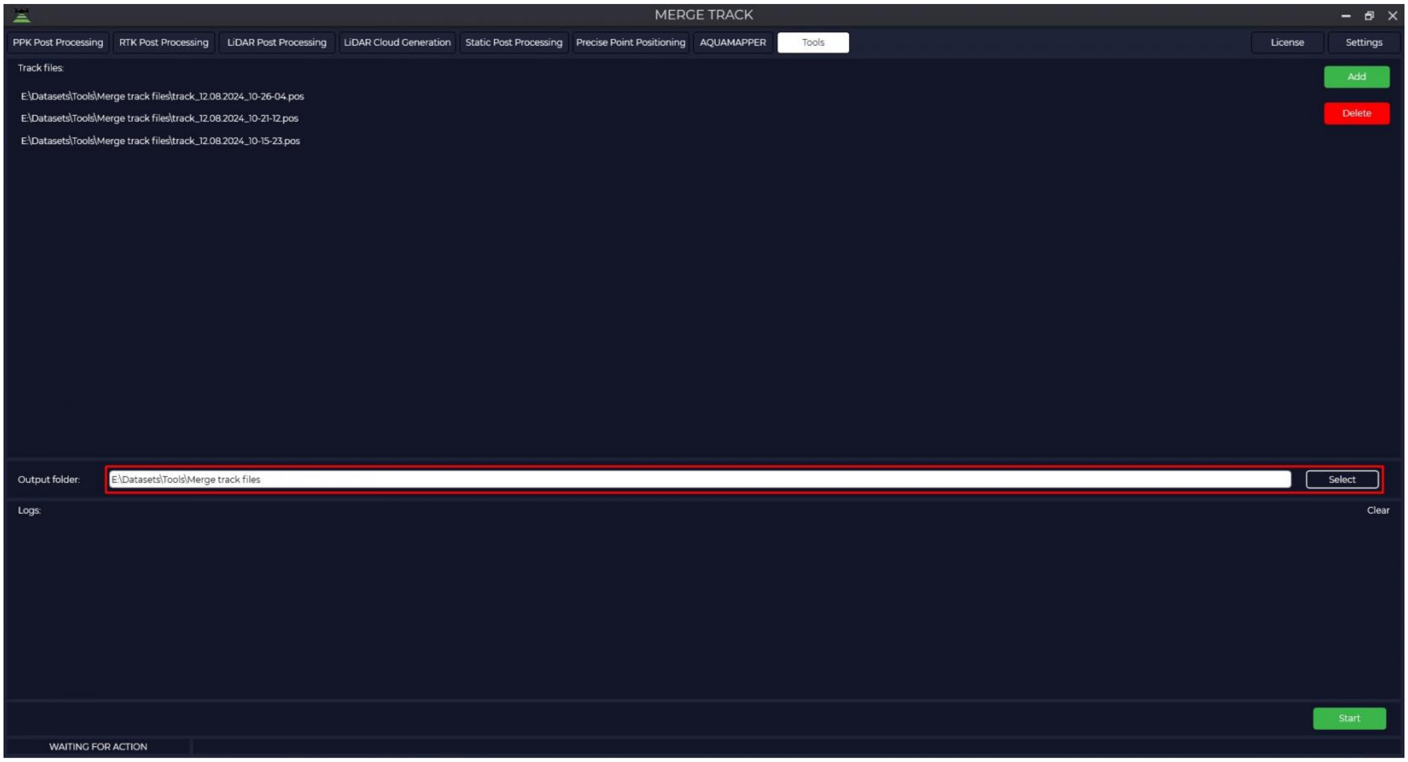
After selecting an area, cut the part you don't want by clicking on "Trim". The trajectory will be saved to a file in the original format.

Merge track files

The module is designed for trajectory stitching followed by point cloud generation in the LiDAR Cloud Generation module.
To start the tool, select Track File Stitching in the Tools, Trim/Stitch tab. Then through the "Add" button select the trajectories to be merged.



Select the Output folder where to save the merged trajectory and click "Start" to start the process. At the end of the process the program will display a message that everything is ready.


MERGE TRACK
PPK Post Processing
RTK Post Processing
LiDAR Post Processing
LiDAR Cloud Generation
Static Post Processing
Precise Point Positioning
AQUAMAPPER
Tools
License
Settings
Track files:
Add
Delete
E:\Datasets\Tools\Merge track files\track_12.08.2024_10-26-04.pos
E:\Datasets\Tools\Merge track files\track_12.08.2024_10-21-12.pos
E:\Datasets\Tools\Merge track files\track_12.08.2024_10-15-23.pos
Output folder:
E:\Datasets\Tools\Merge track files
Select
Logs:
Clear
Start
WAITING FOR ACTION

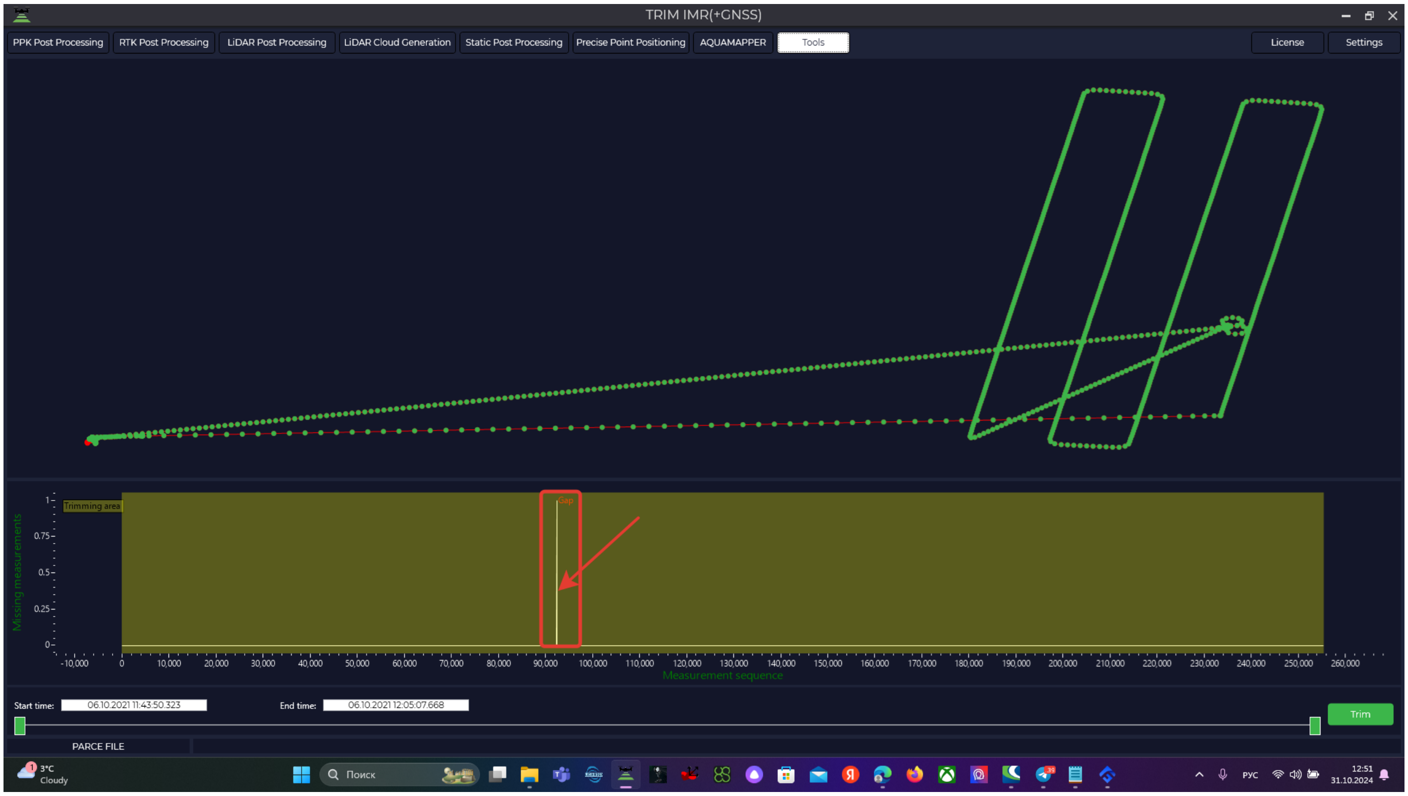
Trim IMR (+GNSS)

You can use the IMR(+GNSS) Trim IMR(+GNSS) tool to eliminate jumps in inertial navigation system (IMU) data when working in conjunction with satellite navigation data.

> This tool is useful if after starting trajectory processing the dataset contains an error message - IMU file contains gaps in measurement points! Use the "Trim IMR(+GNSS)" tool to remove the missing sampling time interval.

To start the tool, select IMR(+GNSS) Trim in the Tools, Trim/Stitch tab. Then select the file in *.imr format to be trimmed and the GNSS receiver file.

The program will pre-process the GNSS and if there were any gaps in the IMU data, you will see this on the screen as vertical lines and the designation (Gap).



For further correct processing, it is required to exclude outliers from the data.
From the selected file we will need to exclude two skips from processing, therefore the IMU file should be divided into three segments and further processed in three parts. Only one segment is trimmed, so in this case we will need to repeat this procedure three times.

After selecting the desired segment using the sliders at the bottom of the screen, click "Crop". The IMU file will be saved to the folder in its original format at the interval you specified and will be saved to the original folder.

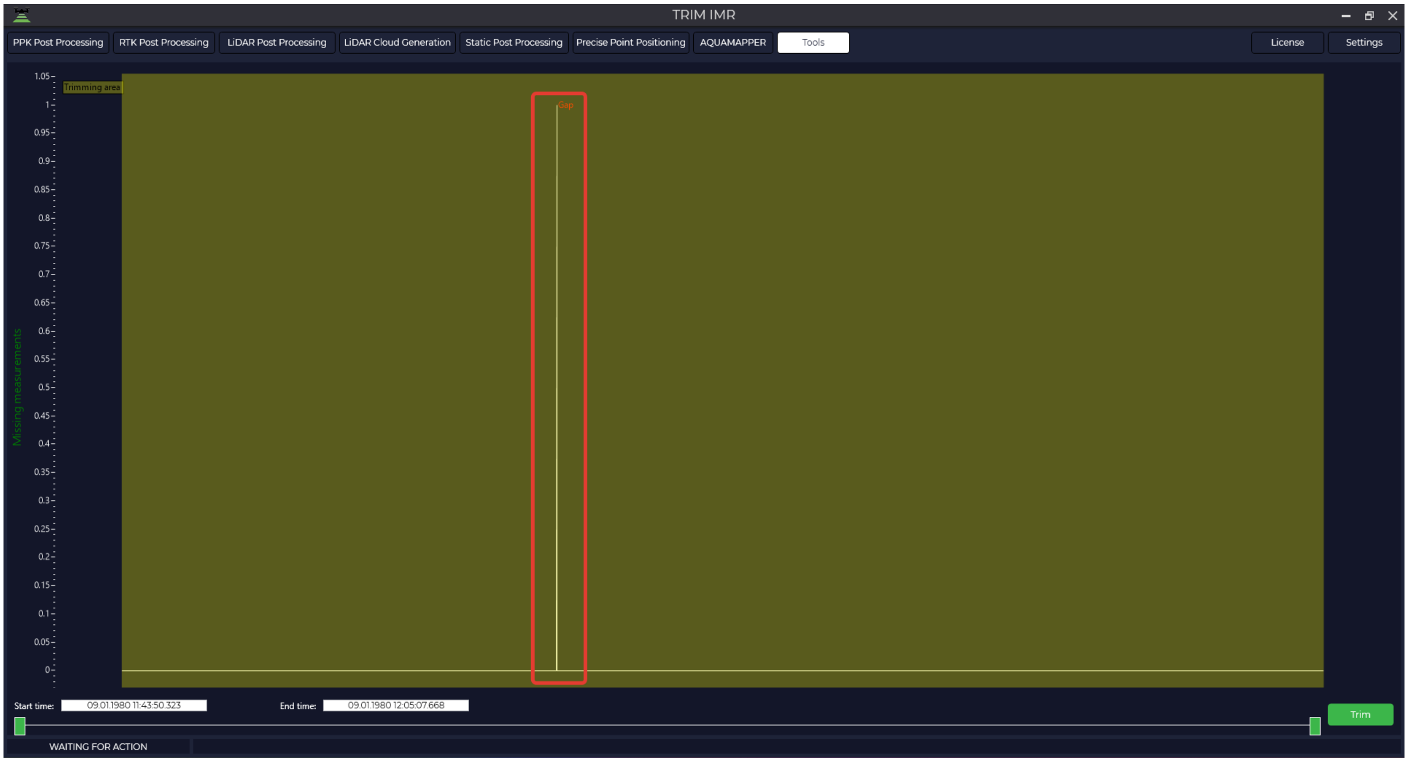
Trim IMR

To eliminate jumps in inertial navigation unit (IMU) data when performing work without satellite navigation data, you can use the IMR Trim tool.

> This tool is useful if the dataset contains an error message - IMU file contains gaps in measurement points! Use the IMR Trim tool to remove the missing sample time interval.

To start the tool, select IMR Trim in the Tools, Trim/Stitch tab. Then select the file in *.imr format to be trimmed.

The program will perform pre-processing and if there were any gaps in the IMU data, you will see this on the screen in the form of vertical lines and the designation (Gap).



For further correct processing it is necessary to exclude omissions from the data, therefore the IMU file should be divided into two segments and further processed in two parts. Only one segment is trimmed, so in this case we need to repeat this procedure twice.

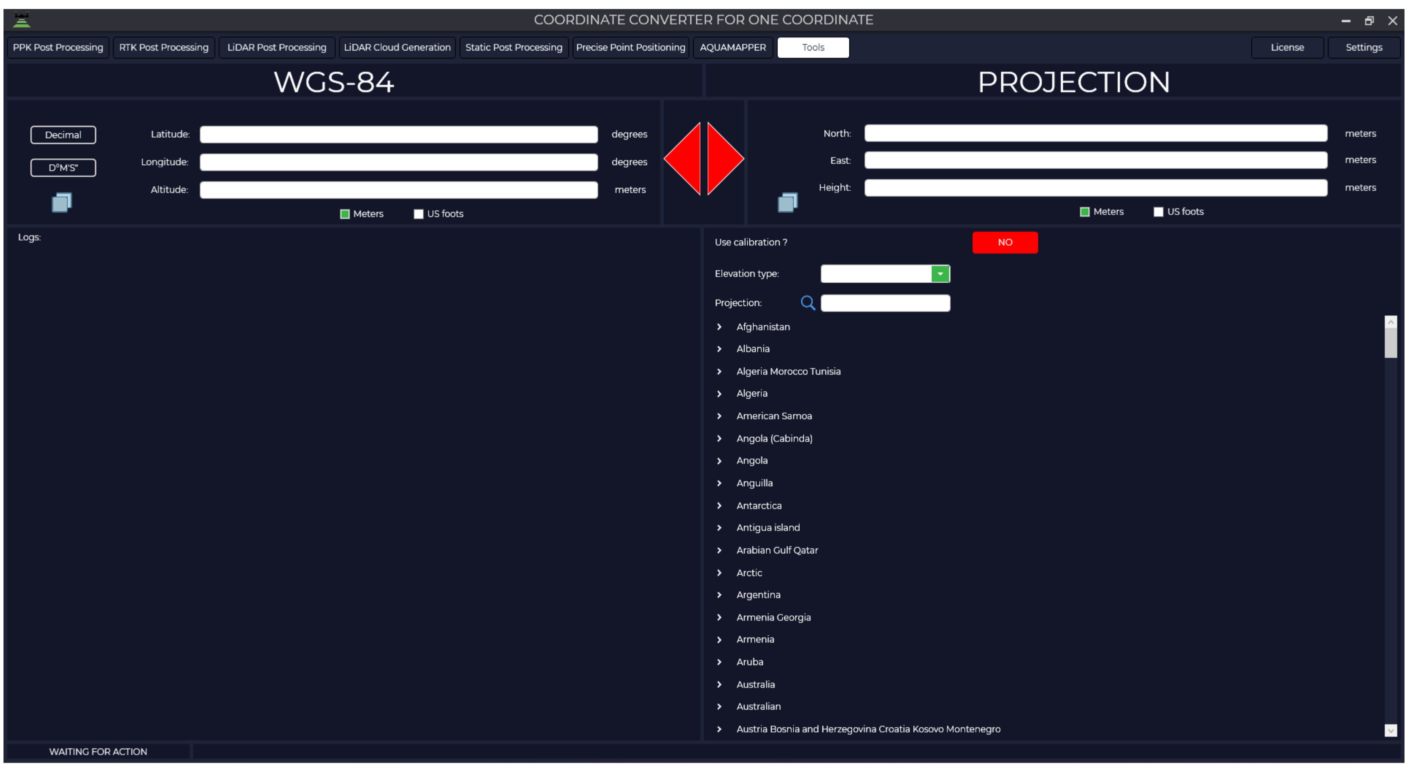
After selecting the desired segment using the sliders at the bottom of the screen, click "Crop". The IMU file will be saved to the folder in its original format at the interval you specified and will be saved to the original folder.

Coordinate converter(One coordinate)

This tool allows to convert data from WGS-84 coordinate system to another one using *.prj file of coordinate system, which is loaded into the program database or using calibration file, which was made before in TOPODRONE Post Processing program. For more details see Calibration.

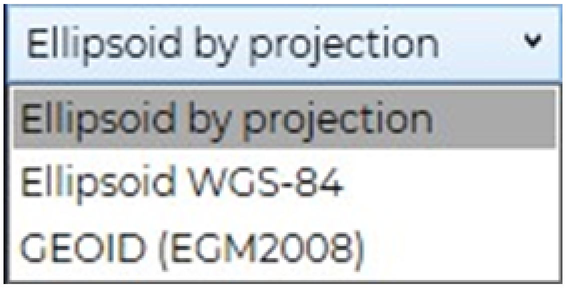
> For example, this tool can help you to convert a base station coordinate from local coordinate system to WGS-84 when processing an area in the LiDAR Post Processing module.

In order to convert one point from WGS-84 coordinate system to any other, you should choose Coordinate Converter in the Tools tab, then One coordinate.



Select the coordinate format (decimal or degrees, minutes, seconds)

Next, select the desired height type.



Select the required coordinate system. The required *.prj file can be quickly found using the search bar. The coordinates of the source point must be within the area covered by the *.prj file.

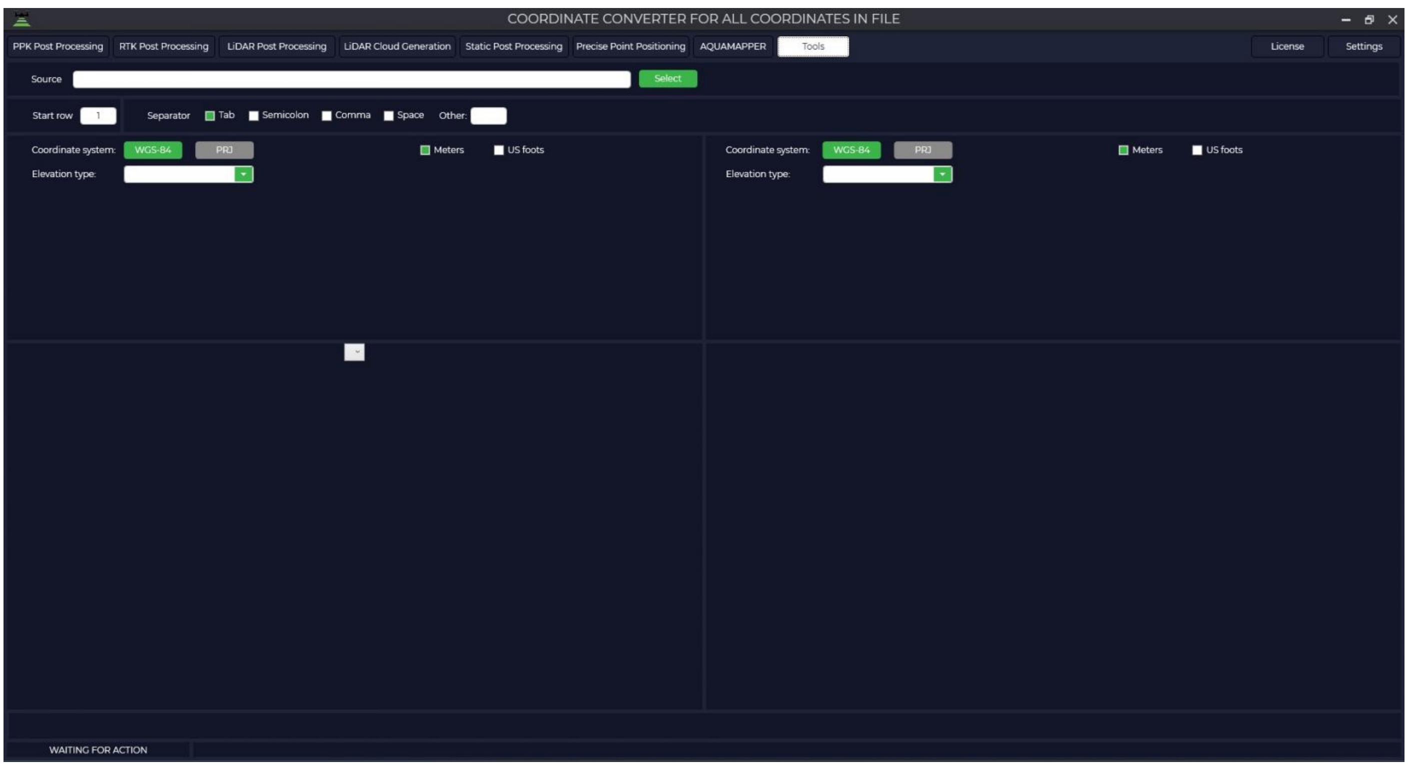
If you have calibrated in the TOPODRONE Post Processing program, press the "NO" button and select your calibration file.

After that, click on the right arrow, which will change its color to green when you hover your mouse cursor over it. Click on the arrow with the left mouse button.

After that, the converted coordinate values of the source point in meters will appear in the right part.

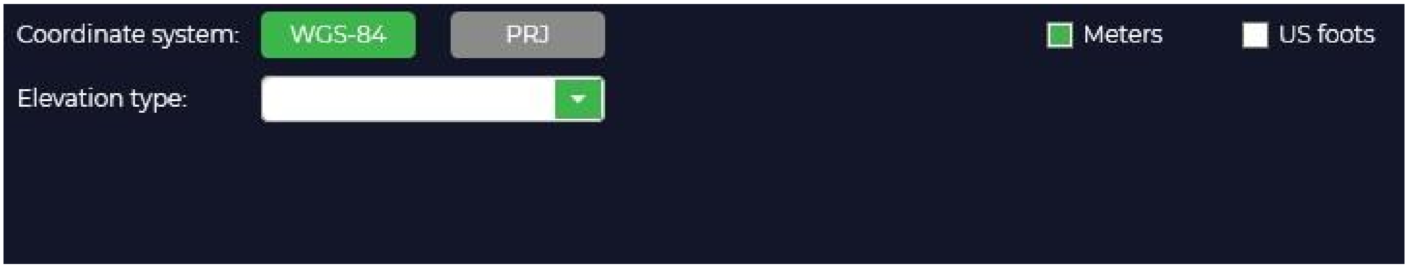
Coordinate Converter(Coordinates from file)

The tool allows you to convert coordinates from one coordinate system to another using the *.prj coordinate system file loaded into the program database or the calibration file created earlier in the TOPODRONE Post Processing program. More details about this process can be found in the "Calibration" section. To convert a coordinate catalog from one coordinate system to another, go to the "Tools" menu and select "Coordinate Converter", then "Coordinates from file".



In the Source section, specify the coordinate catalog file you want to convert, the import start line, and the coordinate separator type.

Select the coordinate system and elevation type of the original coordinate catalog.

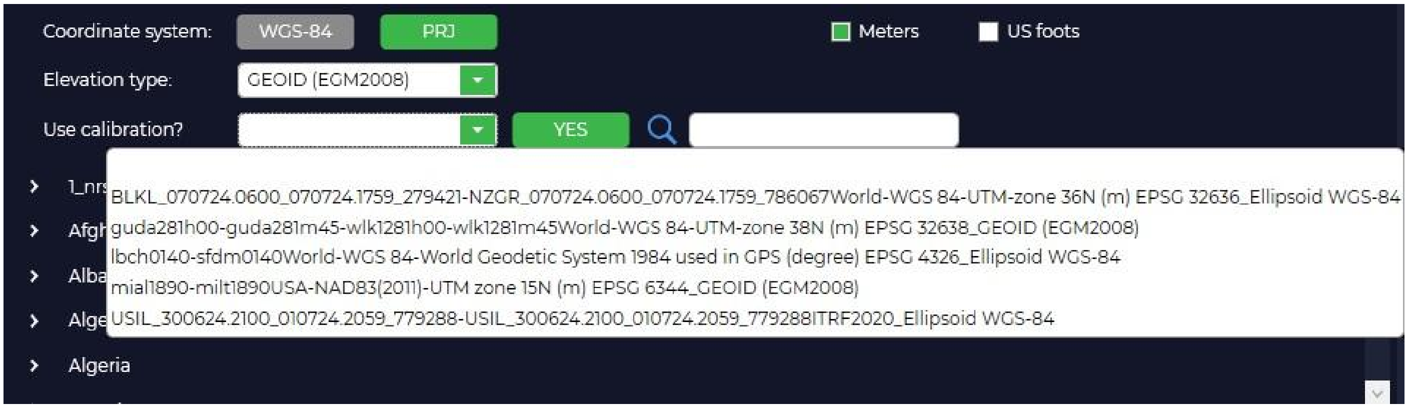


Determine whether the columns match the values.

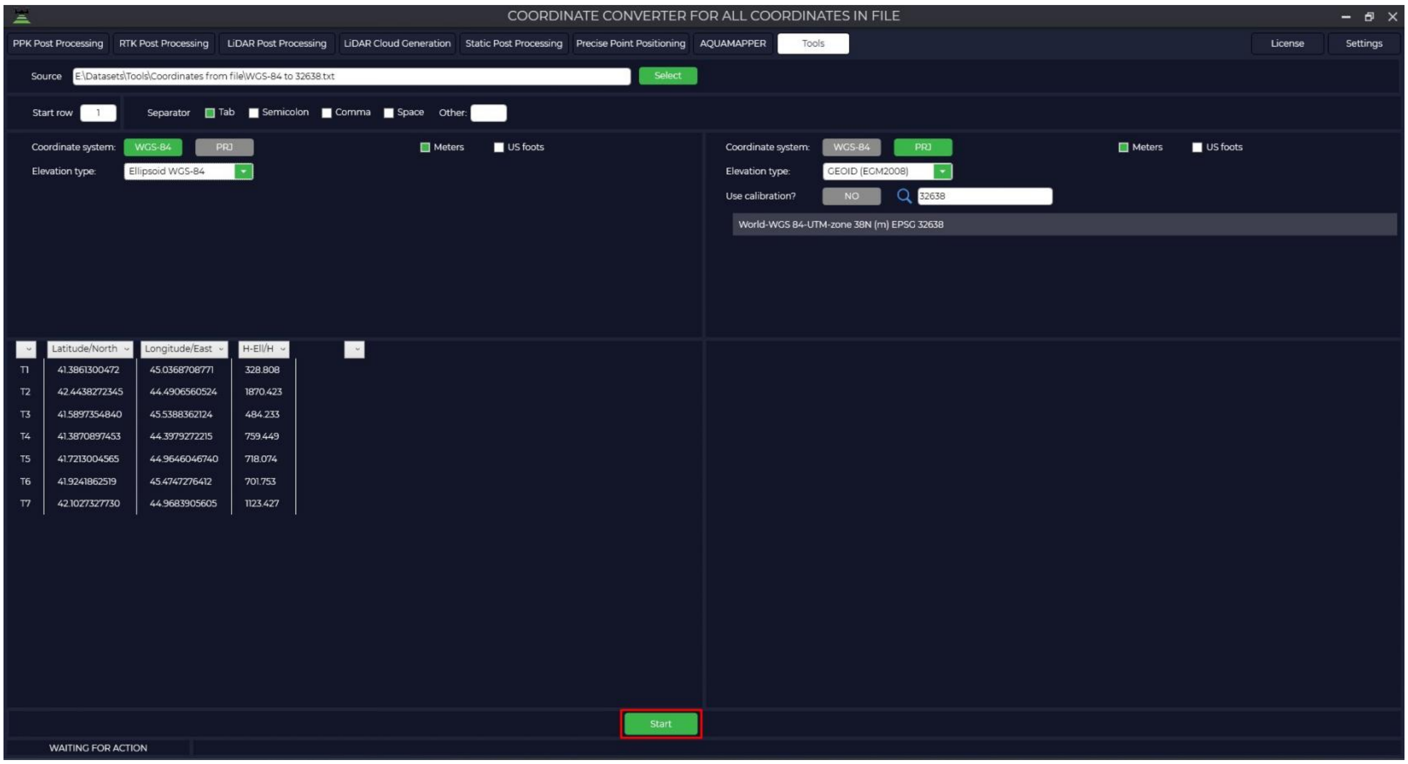
	Latitude/North	Longitude/East	H-Ell/H	
T1	41.3861300472	45.0368708771	328.808	
T2	42.4438272345	44.4906560524	1870.423	
T3	41.5897354840	45.5388362124	484.233	
T4	41.3870897453	44.3979272215	759.449	
T5	41.7213004565	44.9646046740	718.074	
T6	41.9241862519	45.4747276412	701.753	
T7	42.1027327730	44.9683905605	1123.427	

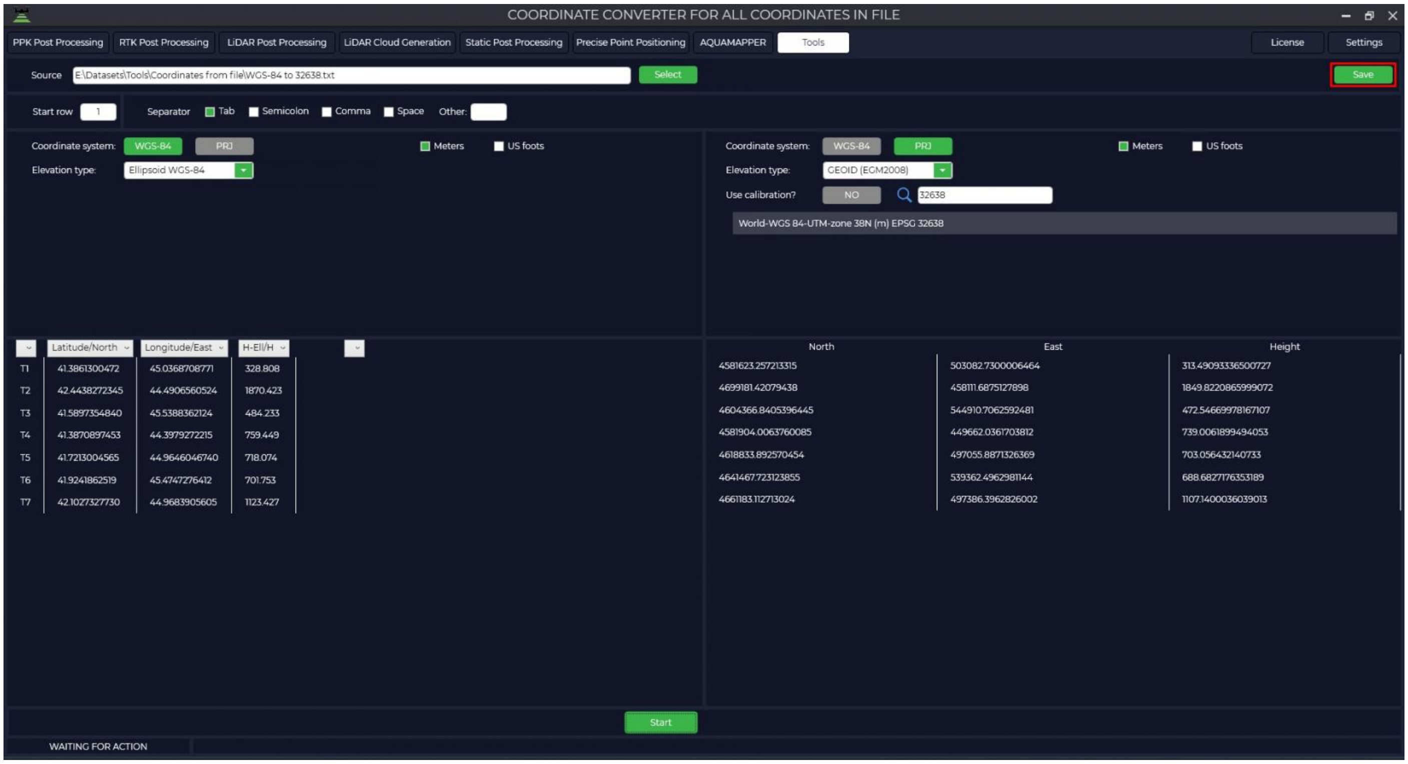
Specify the coordinate system and elevation type of the target coordinate catalog.

If you have calibrated in the TOPODRONE Post Processing program, press the "PRJ" button, then press "NO" and select your calibration file.



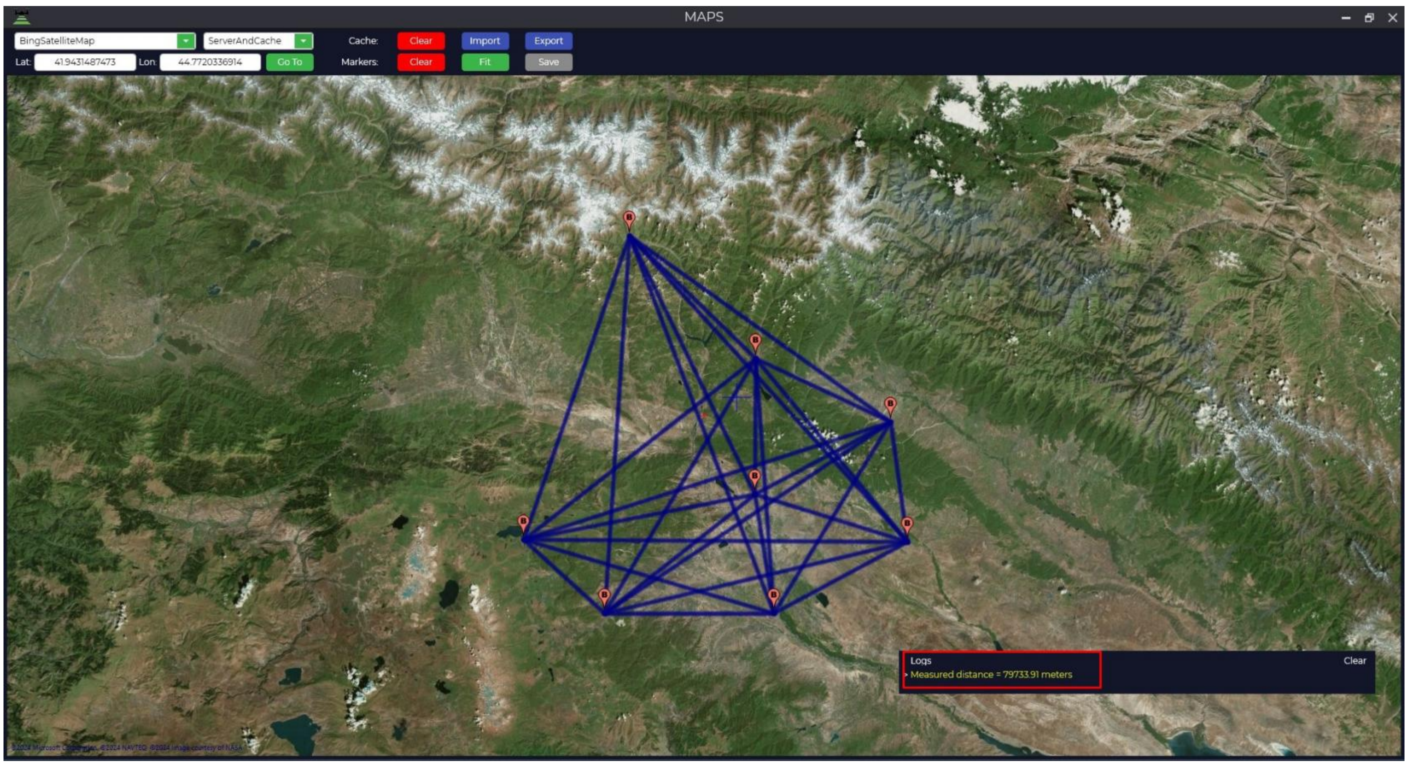
After pressing the "Start" button, the right window will display the coordinate catalog in the selected coordinate system. If necessary, click the "Save" button and save the new file.




COORDINATE CONVERTER FOR ALL COORDINATES IN FILE
PPK Post Processing
RTK Post Processing
LiDAR Post Processing
LiDAR Cloud Generation
Static Post Processing
Precise Point Positioning
AQUAMAPPER
Tools
License
Settings
Source
E:\Datasets\Tools\Coordinates from file\WGS-84 to 32638.txt
Select
Save
Start row
1
Separator
Tab
Semicolon
Comma
Space
Other:
Coordinate system:
WGS-84
PRJ
Meters
US foots
Elevation type:
Ellipsoid WGS-84
Coordinate system:
WGS-84
PRJ
Meters
US foots
Elevation type:
GEOID (EGM2008)
Use calibration?
NO
32638
World-WGS 84-UTM-zone 38N (m) EPSG 32638
Latitude/North
Longitude/East
H-Ell/H
T1 41.3861300472 45.0368708771 328.808
T2 42.4438272345 44.4906560524 1870.423
T3 41.5897354840 45.5388362124 484.233
T4 41.3870897453 44.3979272215 759.449
T5 41.7213004565 44.9646046740 718.074
T6 41.9241862519 45.4747276412 701.753
T7 42.1027327730 44.9683905605 1123.427
North
East
Height
4581623.257213315 503082.7300006464 313.49093336500727
4699181.42079438 458111.6875127898 1849.8220865999072
4604366.8405396445 544910.7062592481 472.54669978167107
4581904.0063760085 449662.0361703812 739.0061899494053
4618833.892570454 497055.8871326369 703.056432140733
4641467.723123855 539362.4962981144 688.6827176353189
4661183.112713024 497386.3962826002 1107.1400036039013
Start
WAITING FOR ACTION

Maps

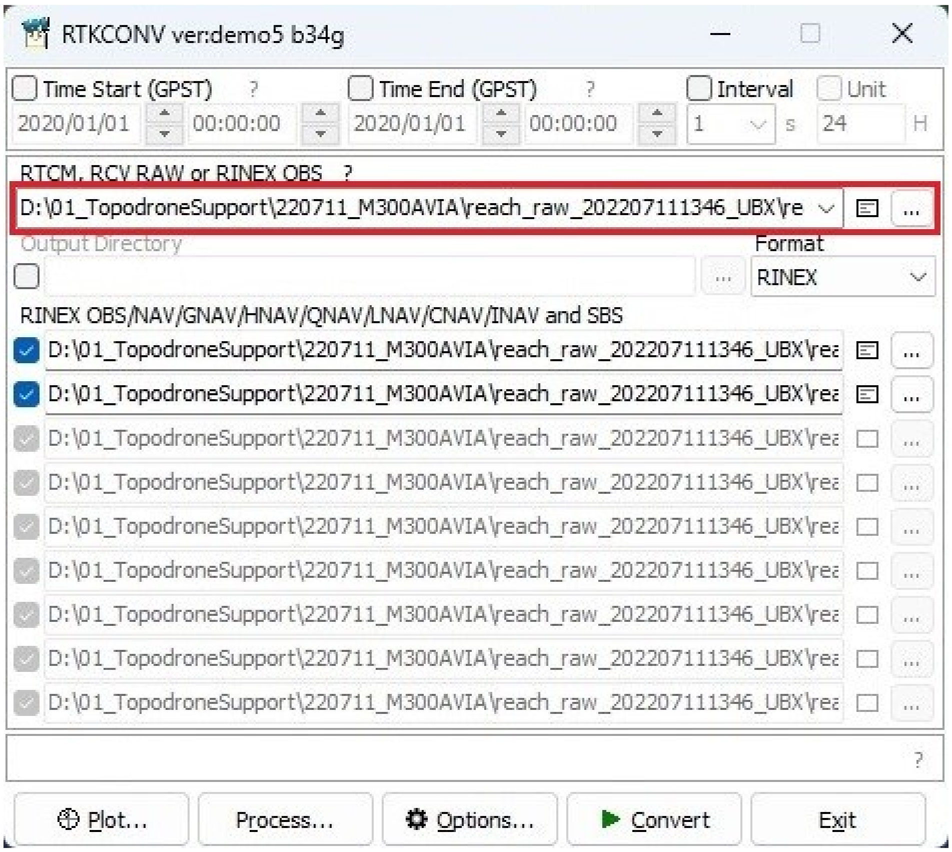
The "Maps" module is designed to display loaded static observations and vectors at all stages of data processing. To launch the module, go to the "Tools" tab and click the "Maps" button. Important: for correct display of observation points, the map window should be opened when loading files. If this condition has not been met, you should re-download the data. An additional function of the module is to measure the distance between two points on the map. To do this, press the "Ctrl" key and select two points in the map area with the left mouse button. The value of the measured distance will be displayed in the log window.



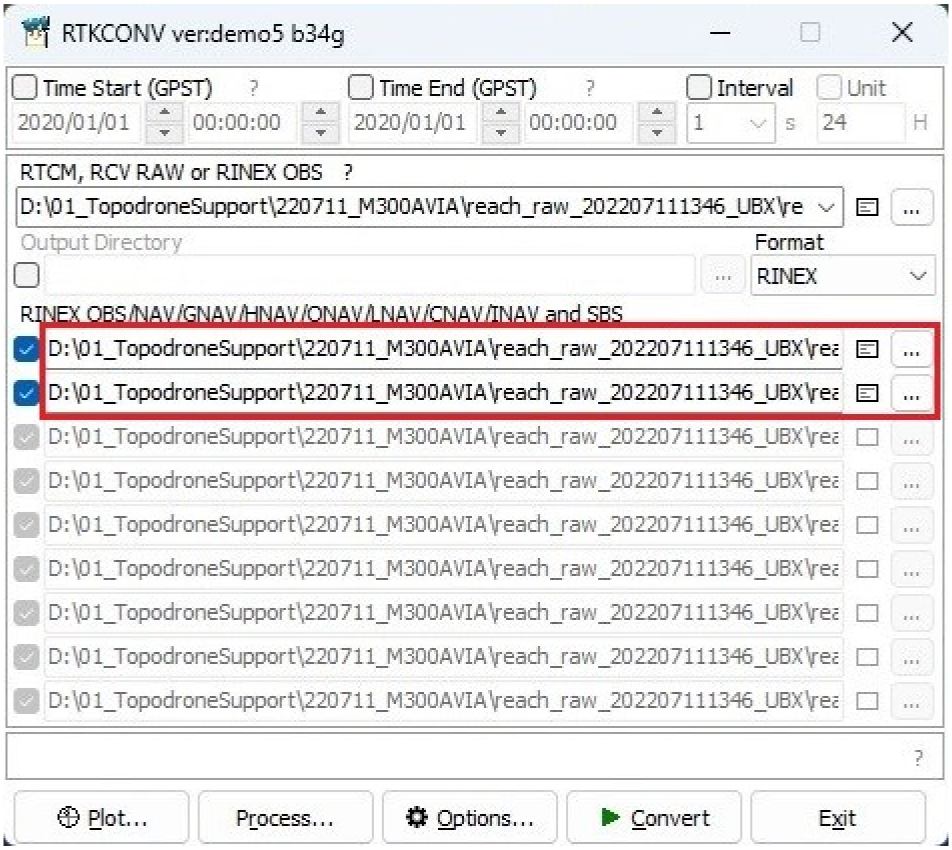
GNSS data converter

The module is based on the open source software RTKLIB, this module is designed to convert raw observation files from Global Navigation Satellite System (GNSS) receivers into RINEX format. The module supports data formats from the following GNSS chip manufacturers: U-blox, ComNav, NovAtel, Hemisphere, Javad, Trimble, as well as the common *.YYO format, where YY is the year of observations.

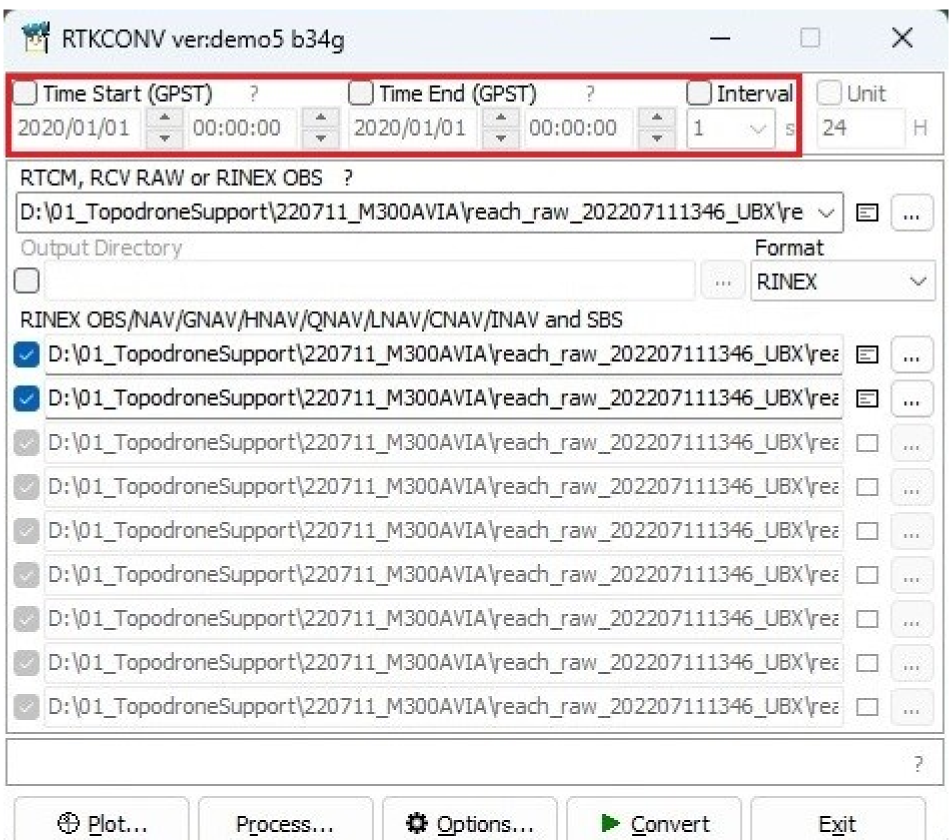
To convert data to *.obs format, perform the following actions: Go to the "Tools" tab and select "GNSS Data Converter" in the RINEX section. Specify the file to be converted to *.obs format.



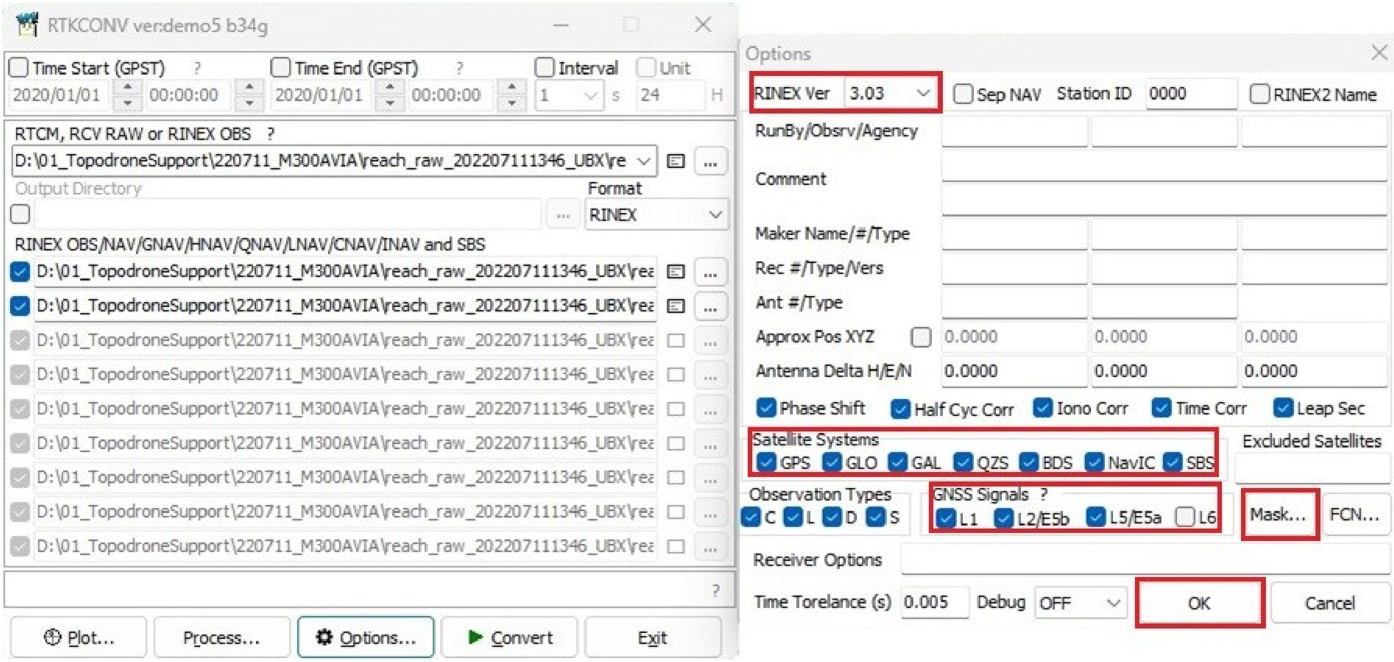
The lower part of the window displays the files to be exported.



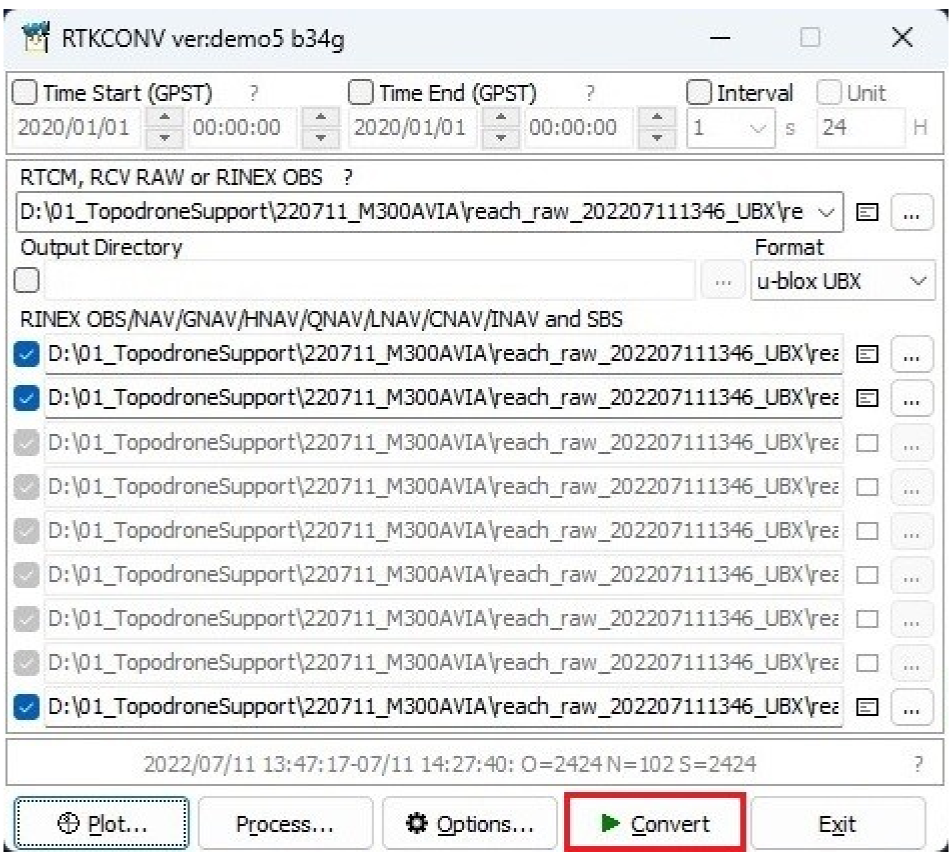
If necessary, time-limit the file by specifying the date and range of operation, and change the frequency of the final file write.



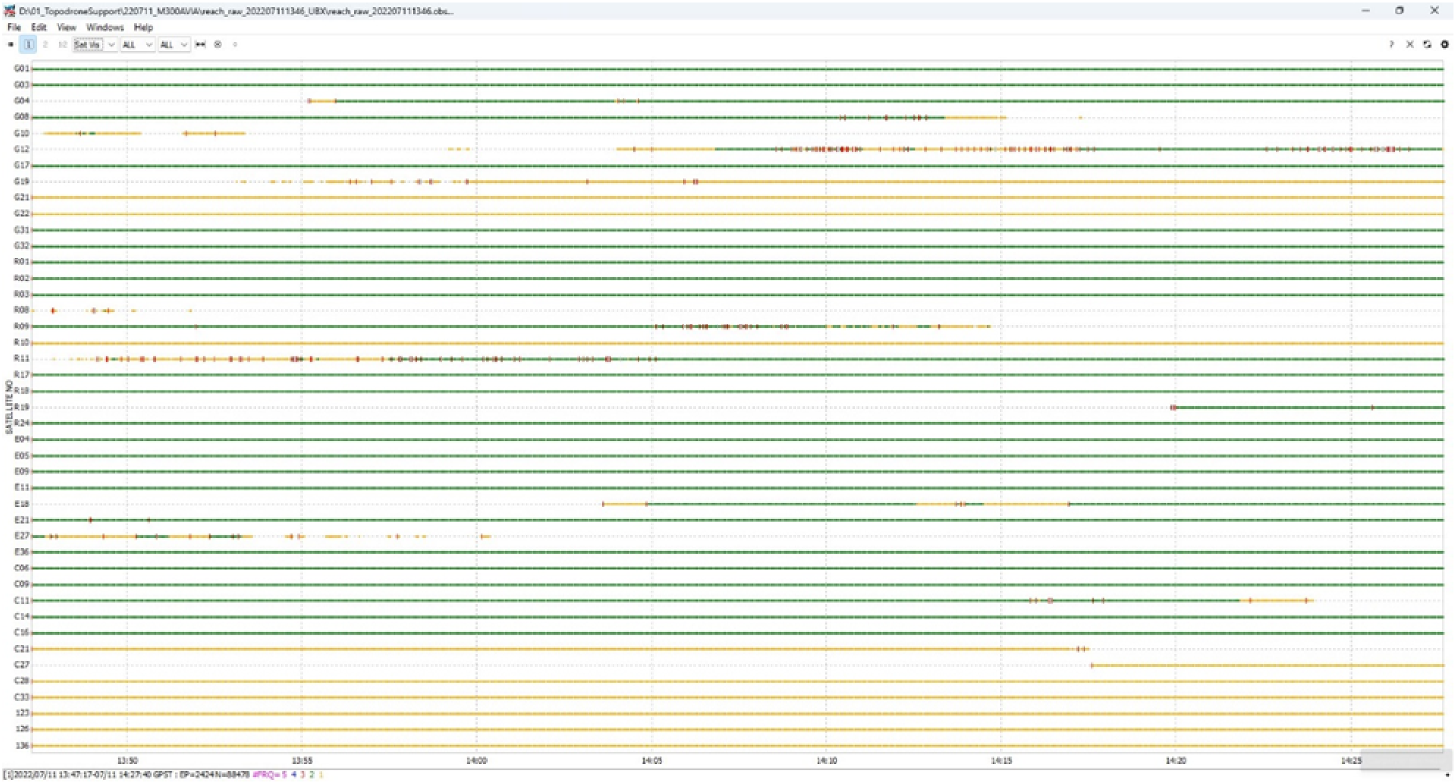
Click on the "Options..." button and select the RINEX version, satellite constellations, operating frequency or specific satellites. Then click on the "OK" button.

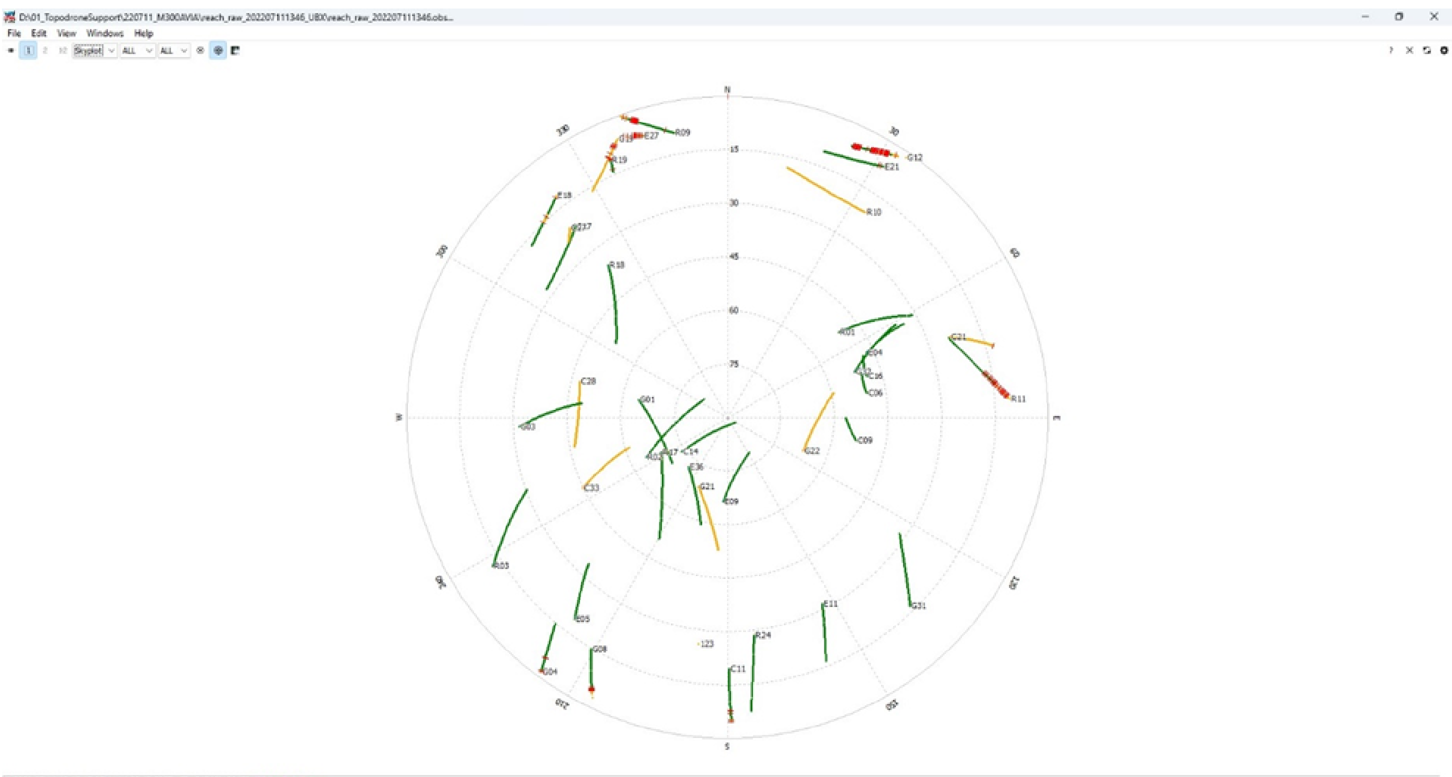


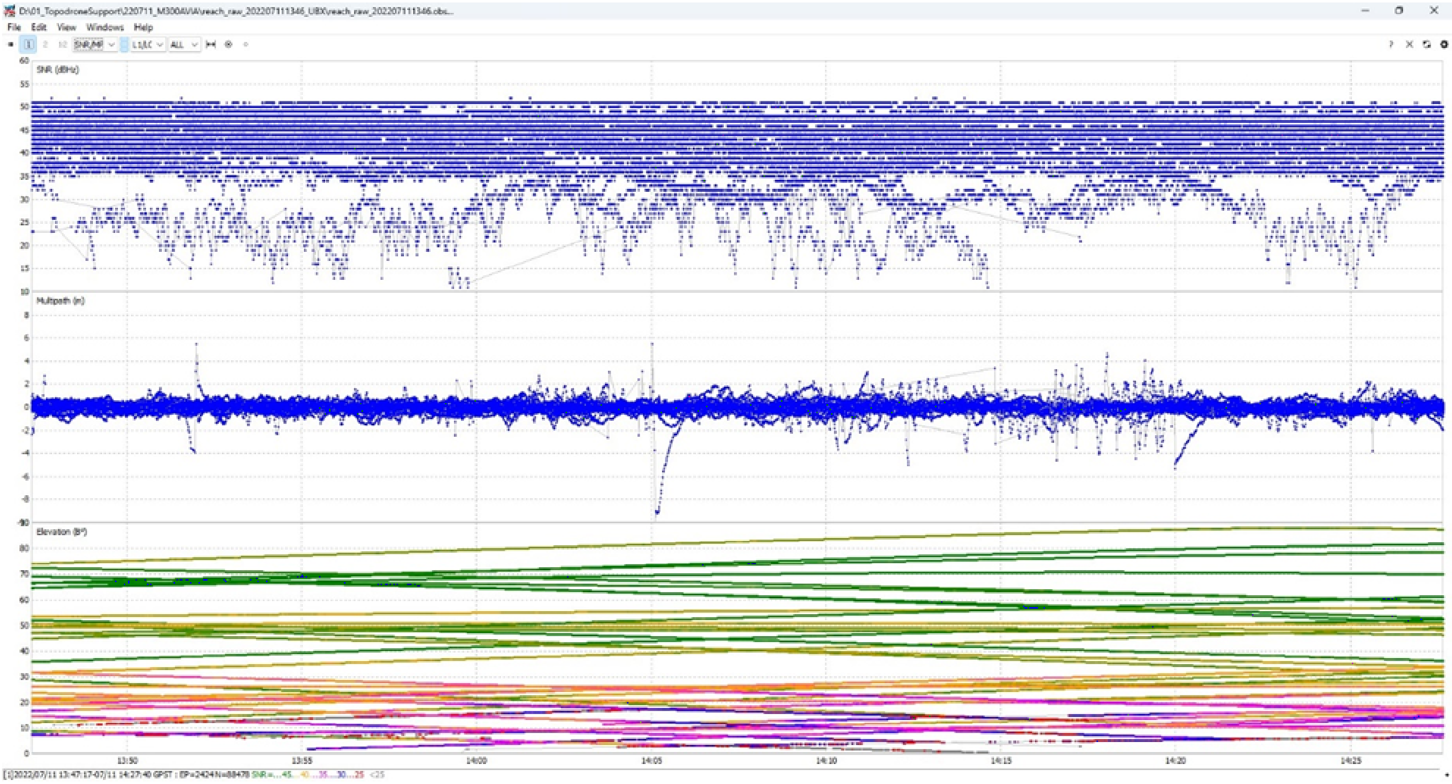
Click on the "Convert" button to have the program convert your file to RINEX format with your parameters.



After converting the file, click on the "Plot..." button to evaluate the quality of your data. For more information about data quality analysis, see [Appendix B.](#)





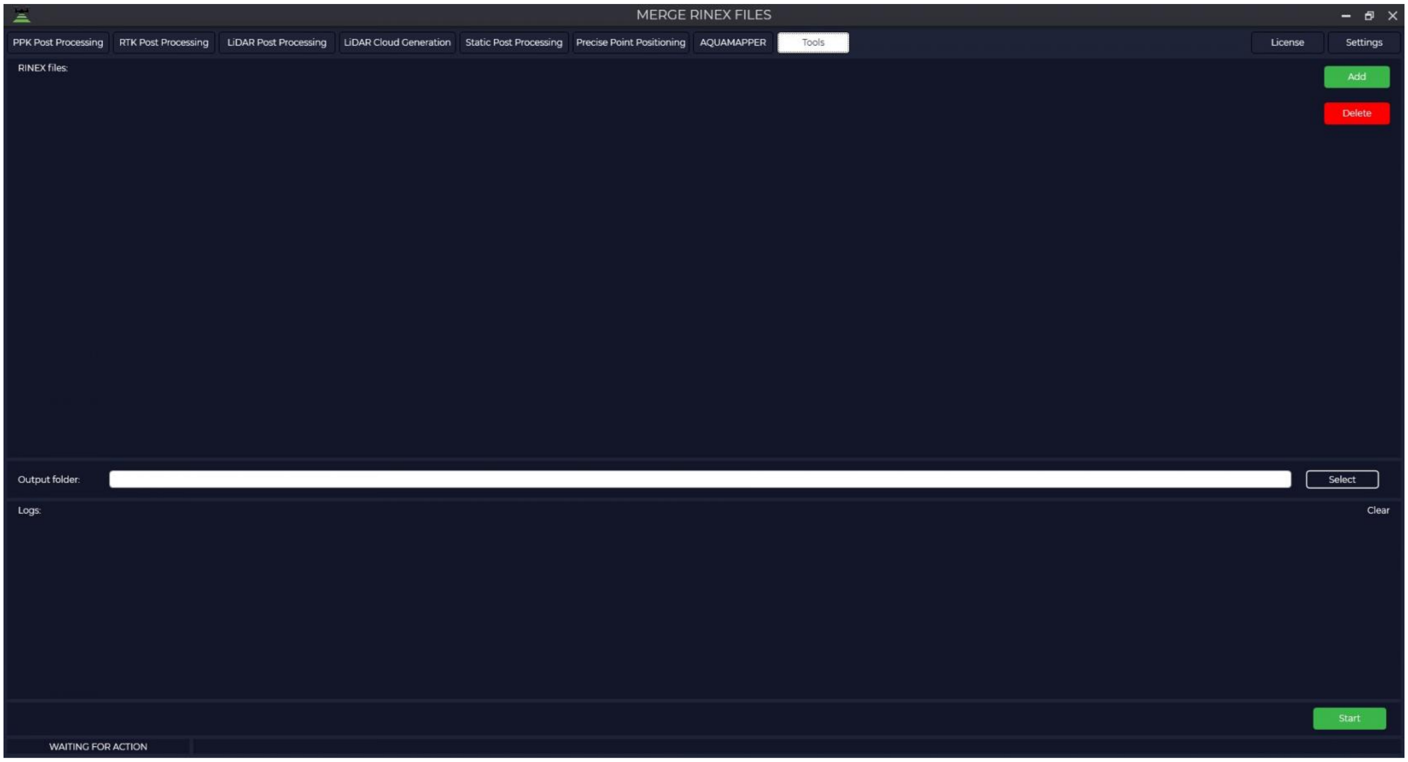


D:\01_TopodroneSupport\220711_M300AVIA\reach_raw_202207111346_UBX\reach_raw_202207111346.obs...
File Edit View Windows Help
SNR/MP
L1/LC
ALL
SNR (dBHz)
Multipath (m)
Elevation (El°)
13:50
13:55
14:00
14:05
14:10
14:15
14:20
14:25
[1]2022/07/11 13:47:17-07/11 14:27:40 GPST : EP=2424 N=88478 SNR=...45...40...35...30...25 <25

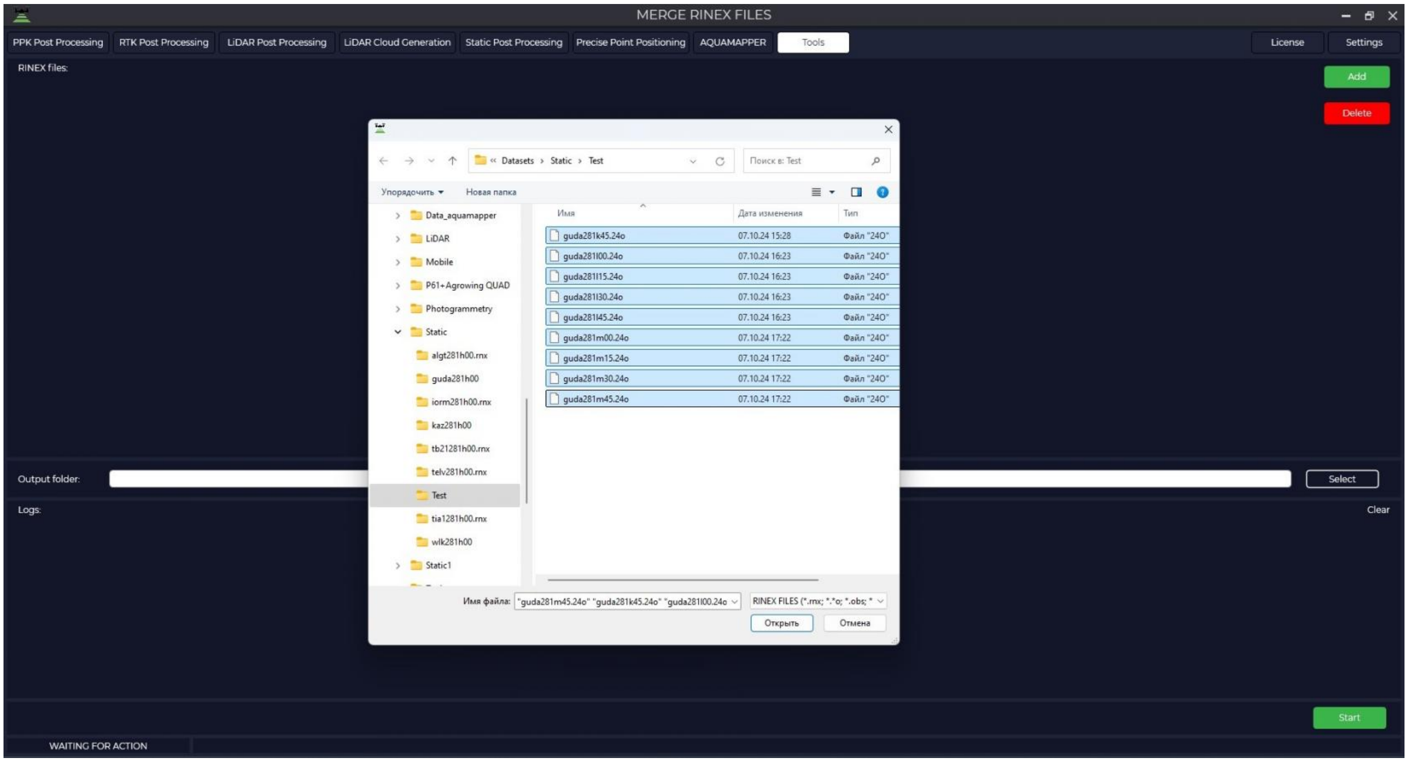
RINEX merger

This function is designed to merge measurement files received from different receivers of the global navigation satellite system into one file. It is especially useful when the reference base station provider divides files into time slots when downloading data.

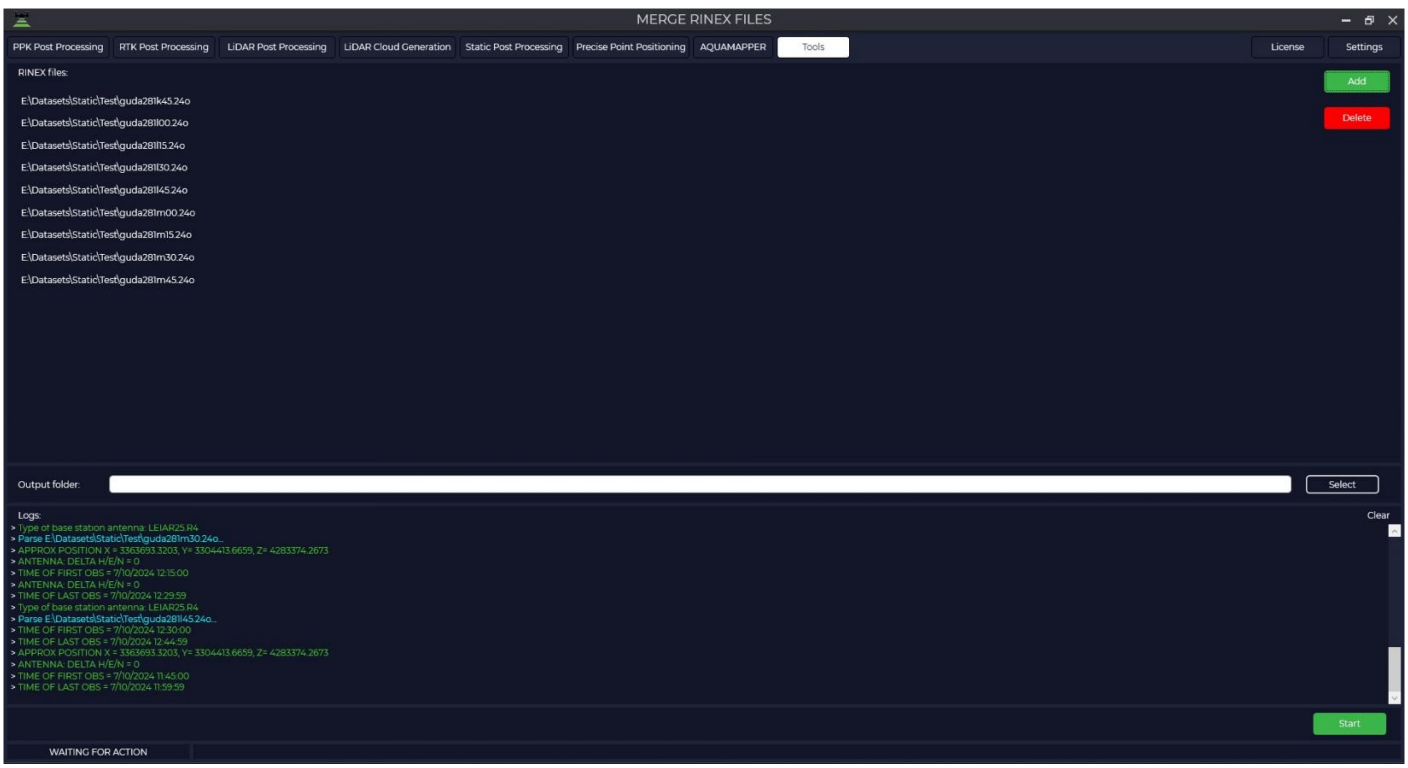
Follow the steps below to merge the files: Go to the Tools tab and select Merge under RINEX.



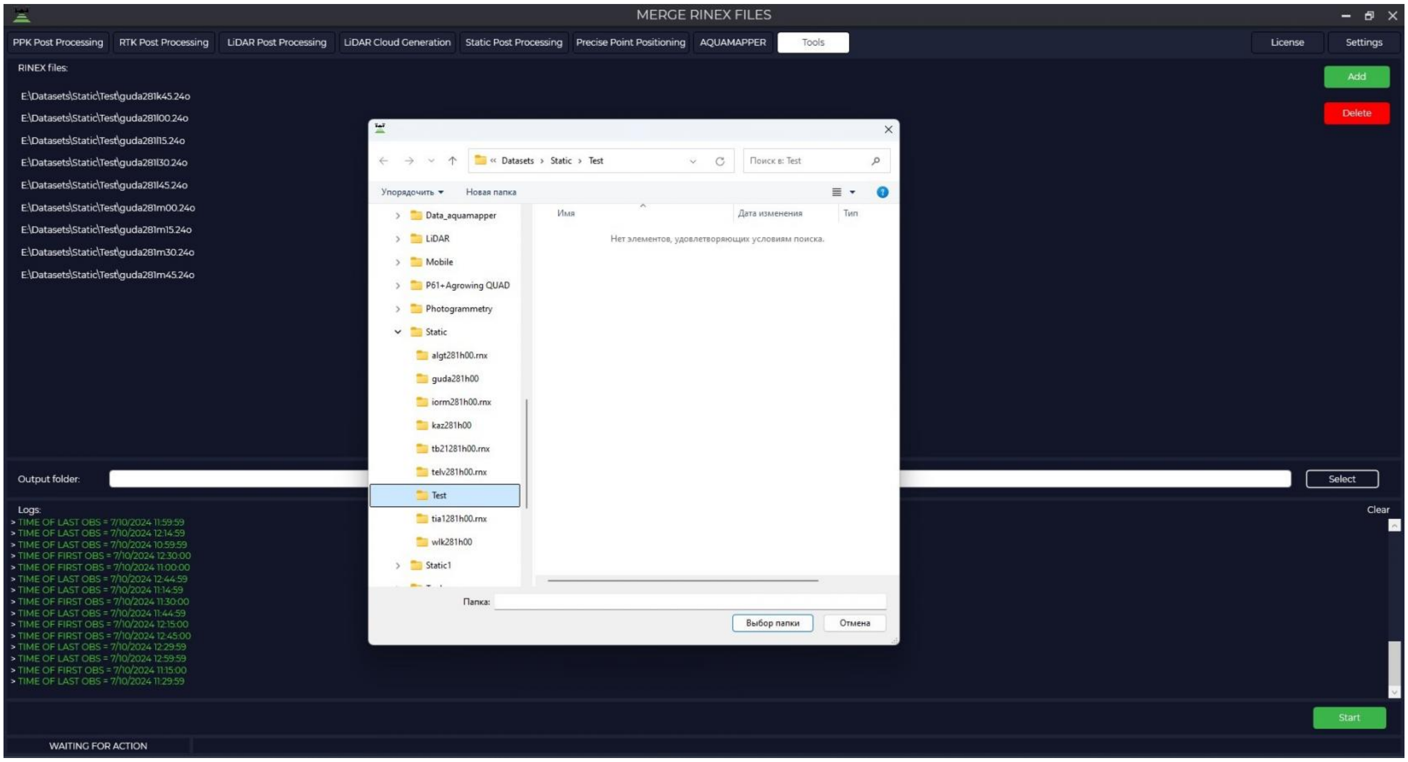
Click the "Add" button to add measurement files and select the required files in *.rnx, *.**o and *.obs formats.



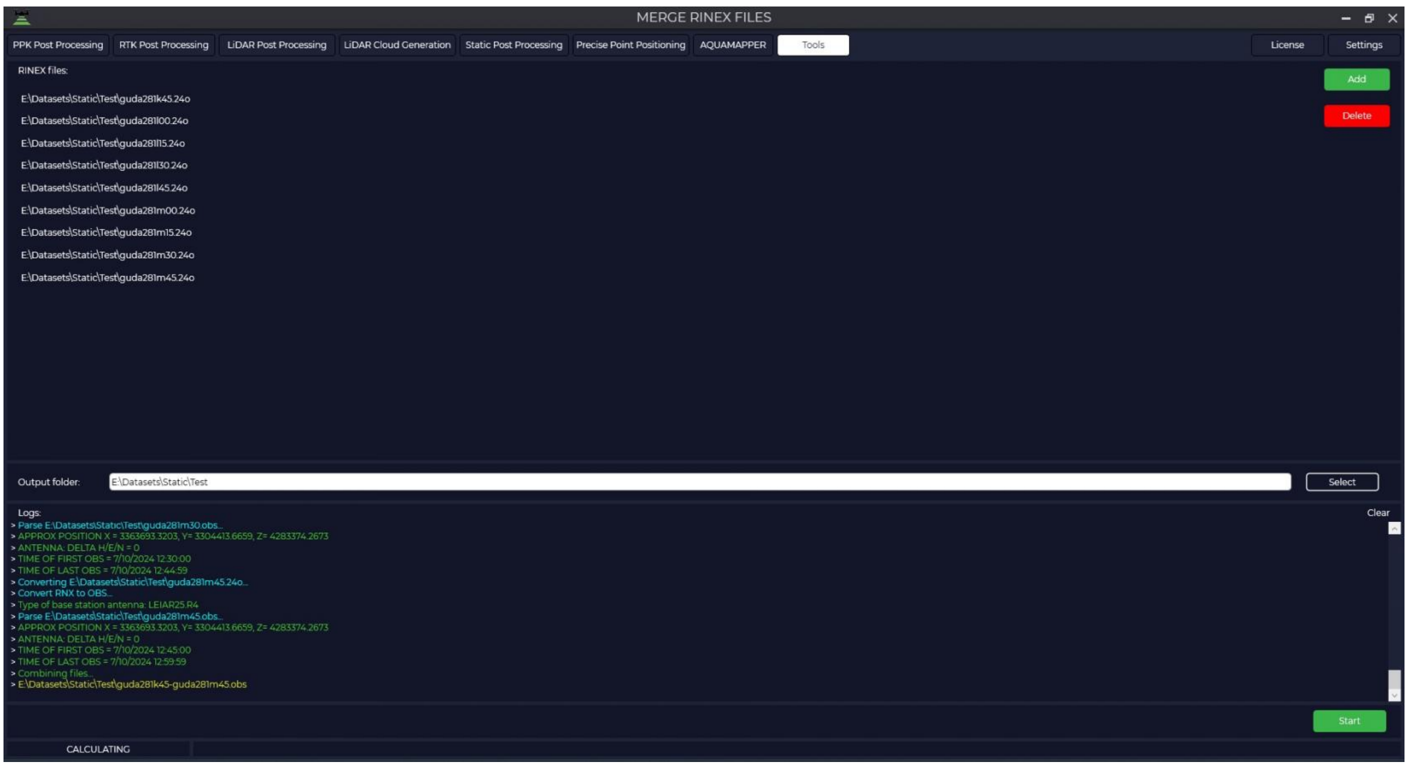
The "RINEX files" window will display the downloaded files, and the "Logs" window will display information about the recording time, antenna type, and receiver coordinates that the program reads from your files.



Specify the path to the folder where you want to save the merged file.



Click on the "Start" button to have the program merge all files and save to the previously specified folder.

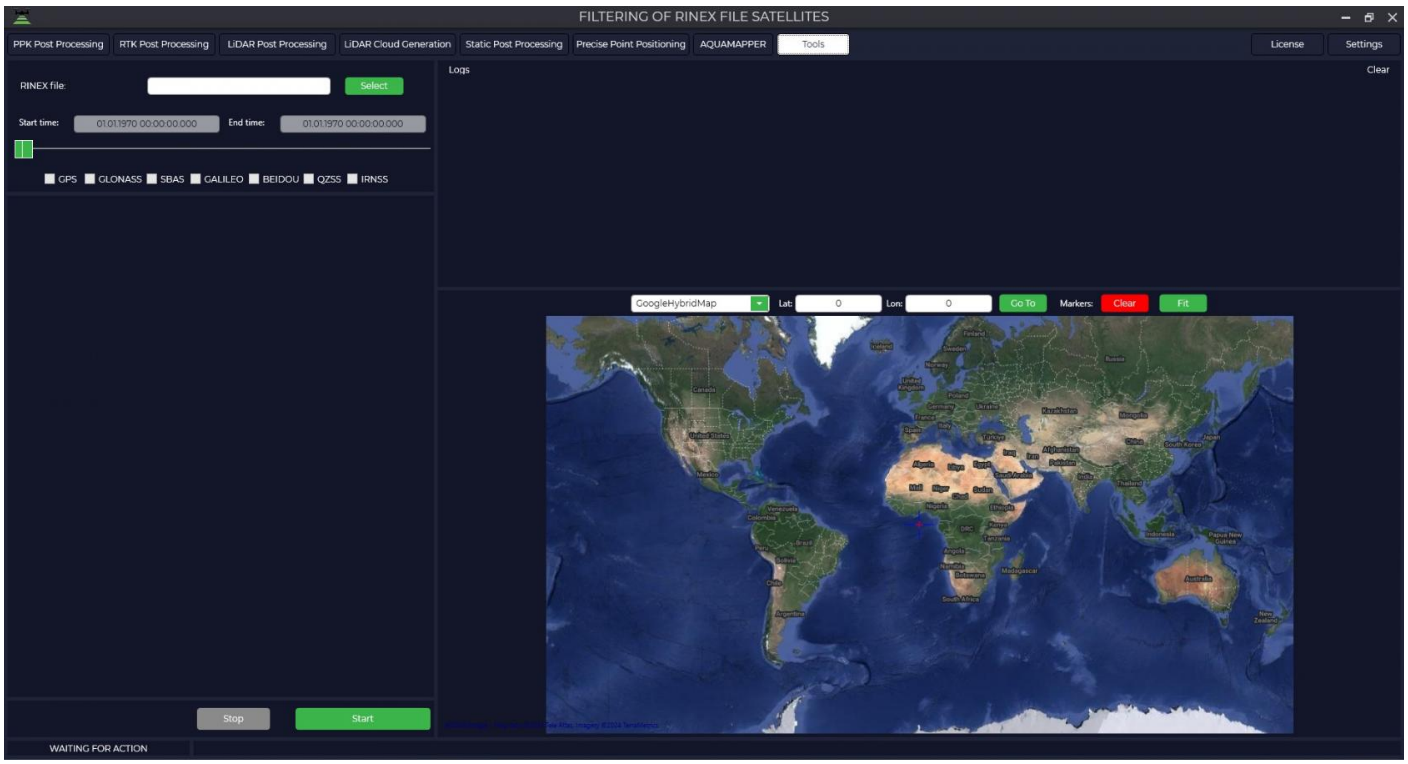


After the file merge operation is successfully completed, you can use the resulting file for further data processing.

Satellite filtering

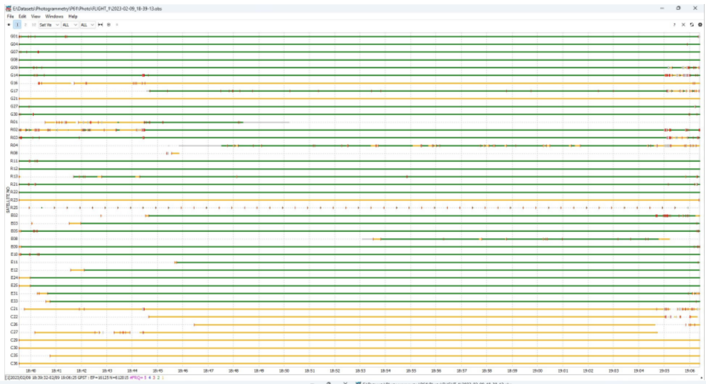
This module allows you to exclude certain satellite constellations or specific satellites from the observation file, which may be necessary to improve data quality.

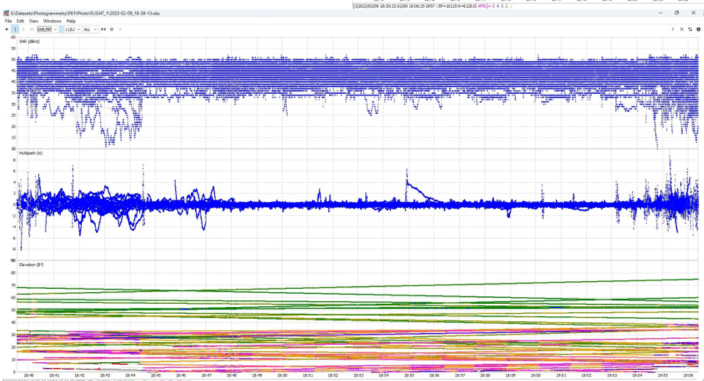
Follow the steps below to filter satellites: Go to the "Tools" tab and select "Rinex", then "Satellite Filtering".

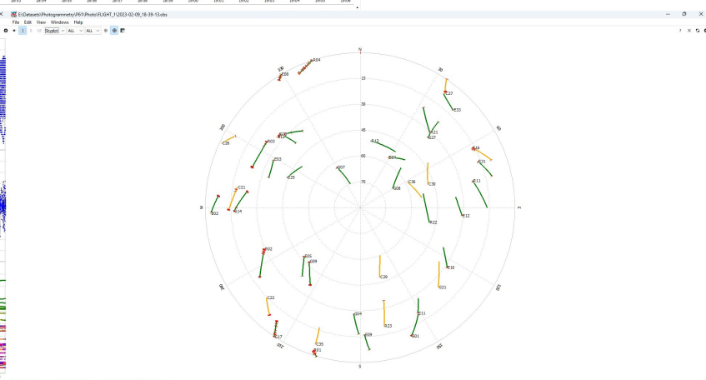


In the upper left part of the RINEX file window click the "Select" button and specify the raw observations file in *.obs format.

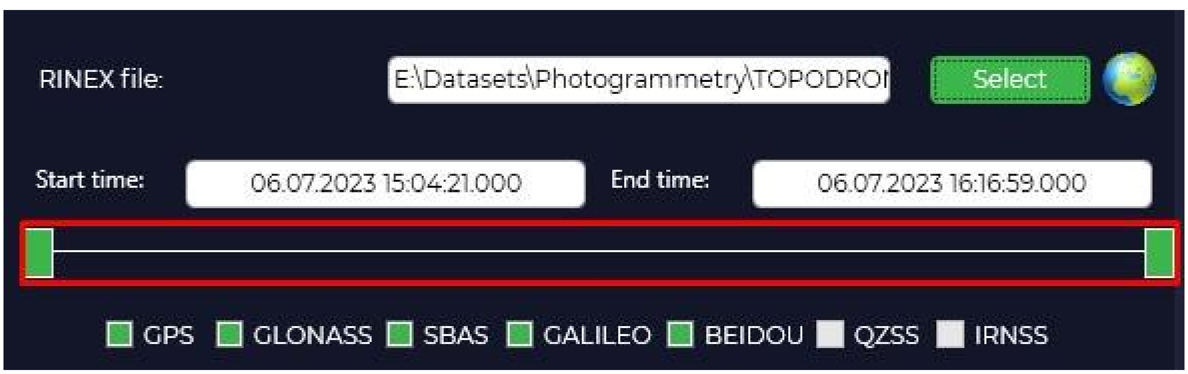
Click on the icon to view the signal quality  to open the "Plot" window, which allows you to understand which satellites may be interfering with data processing. For more information about data quality analysis, see [Appendix B.](#)





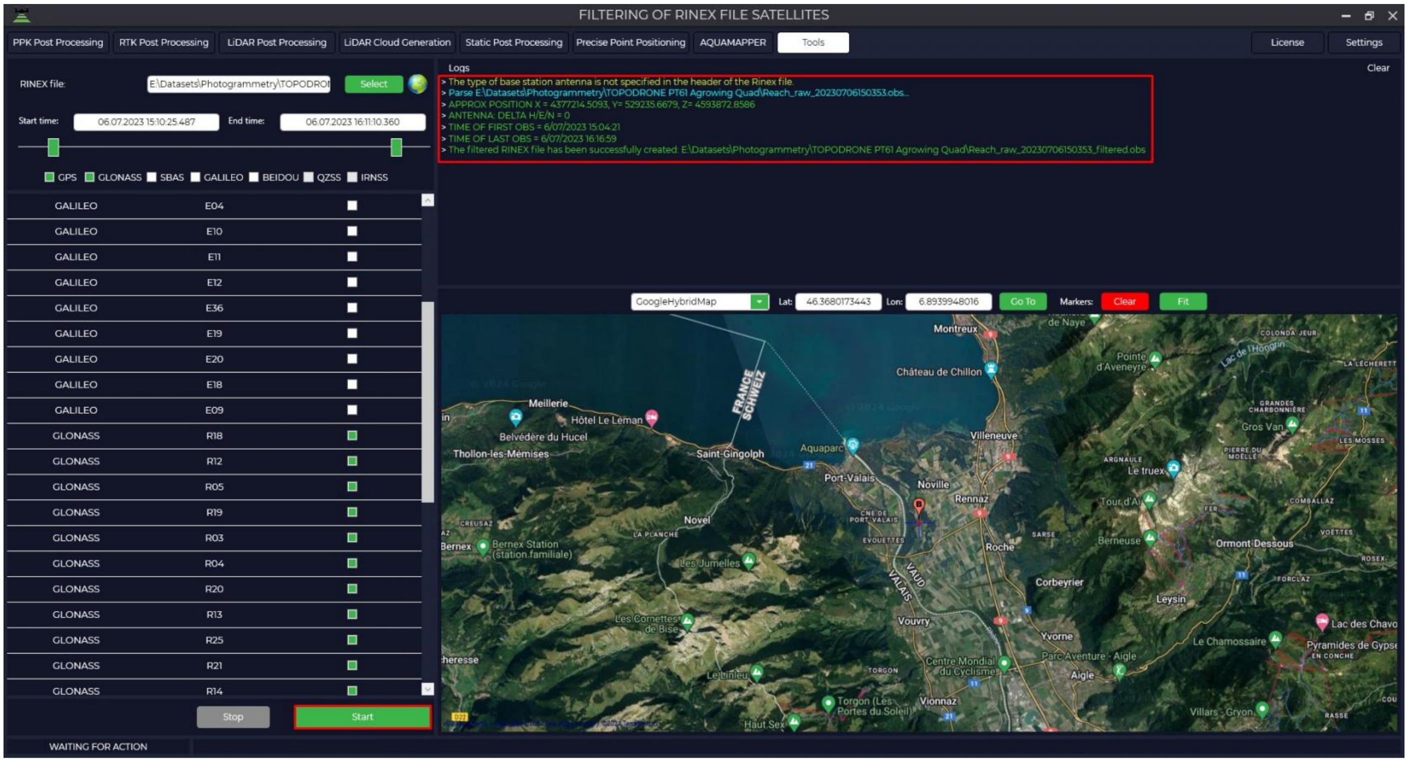


Move the sliders left and right if necessary to change the start and end time of the file.



Uncheck the required checkboxes if you want to exclude certain satellite constellations (GPS, GLONASS, GALILEO and BEIDOU) or specific satellites.

Press the "Start" button. The program will save the new file, excluding the selected satellites from it.



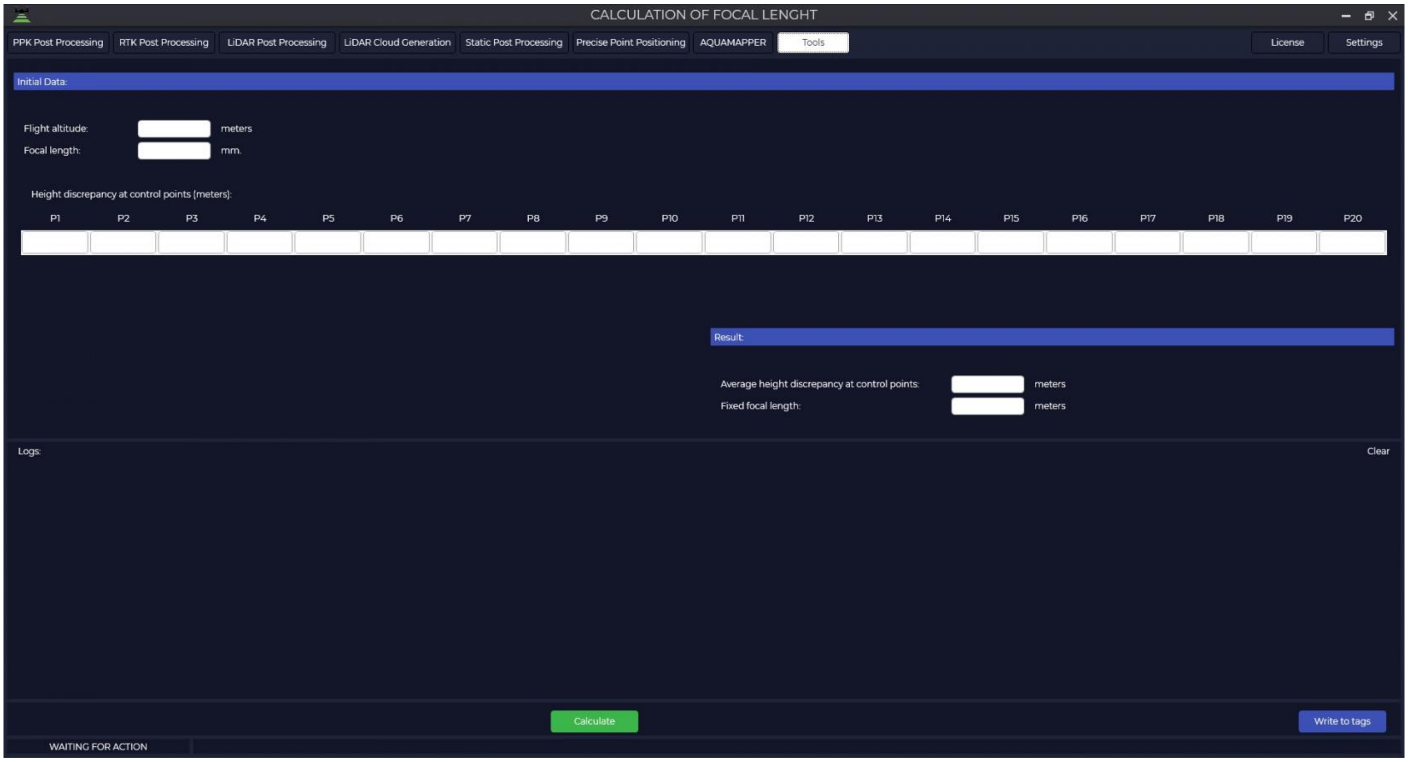
Once the satellite filtering operation has been successfully completed, you can use the resulting file for further data processing.

Calculating the focal length

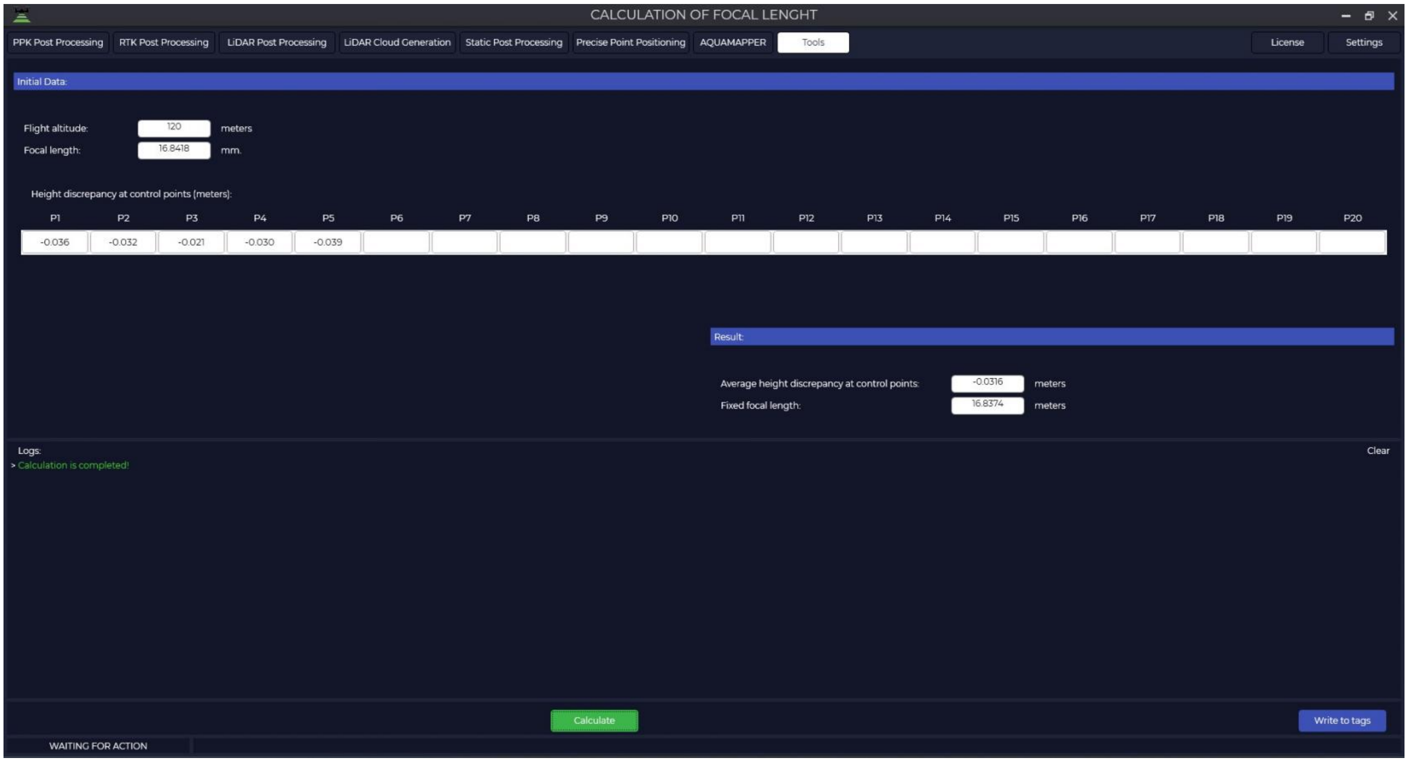
This tool is not directly related to GNSS data processing, but it helps to calculate the focal length of the camera, which is necessary for data processing in photogrammetric programs.
Instructions for calculating the focal length:

1. Click the Tools tab and select Focal Length Calculation.

2. In the opened window specify the following parameters: flight altitude of your aircraft, previously obtained focal distance in millimeters (from the result of aerotriangulation in photogrammetric software) and error values by height of your control points.

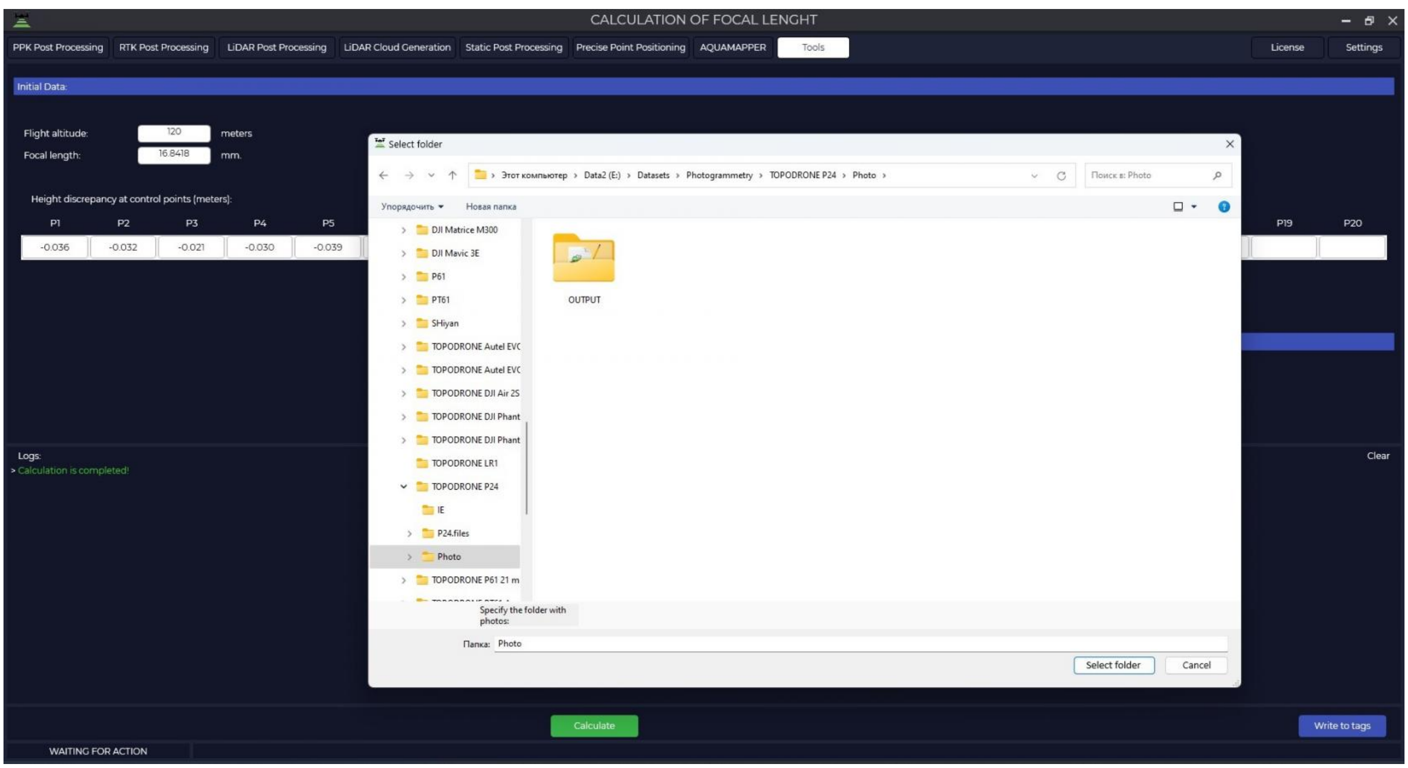


3. Click the "Calculate" button. The program will calculate average height error and focal length, which can be used in photogrammetric programs.



4. If necessary, the new focal length can be written to the EXIF tags of your photos by clicking the "Write to Tags" button. This will help in further photogrammetric data processing.

5. Specify the folder with the photos.



6. The program will write the new focal length to all photos in the specified folder.

The program replaces the focal length in the o