SOFTWARE INSTALLATION

For access to the latest available RIEGL software, please create a Members Area account on the RIEGL website at http://www.riegl.com.

It takes a minimum of 24 hours to be granted access to the download area. Be sure to provide as much information as possible, including your segment (Airborne, Terrestrial, or Mobile) so that access is not denied.

You will receive an email notification when your account has been granted access to the download area.

List of required software for Processing

- RiPROCESS – installed by RiKinematic LiDAR Software Setup
- RiUNITE
    i. RiMTA
    ii. RiWorld

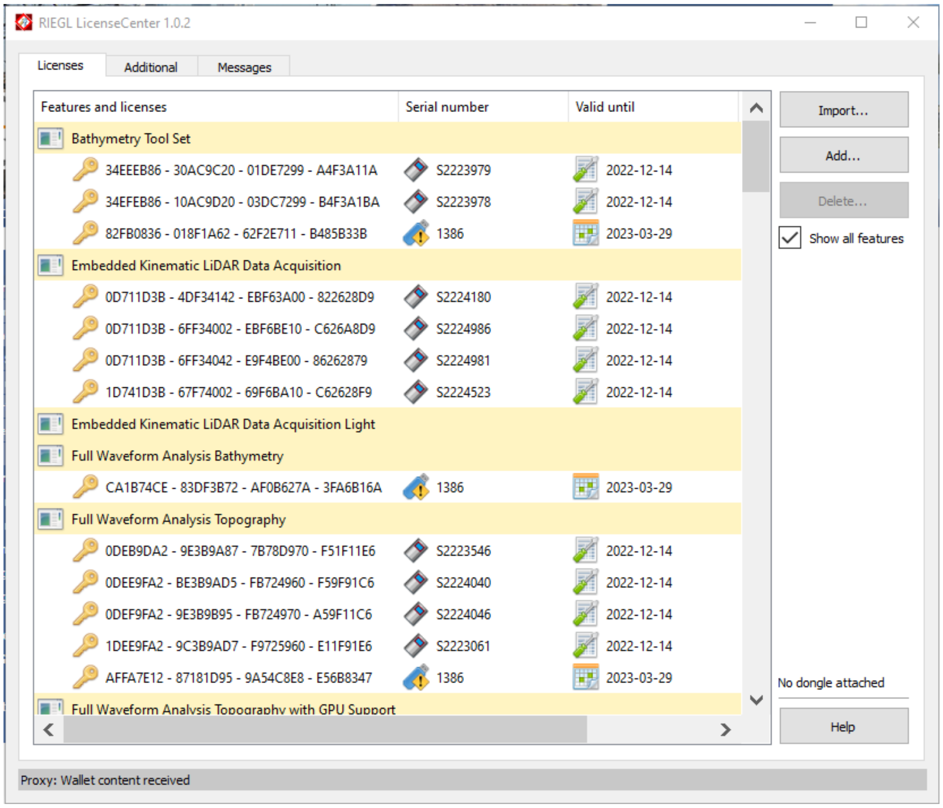
Once all the above software is installed, take the following steps to finish setting up the software on your computer. These steps are explained in further detail on subsequent pages.

✓ Run **License Center** and use “import Key” to pull in licenses for all software This will input both the SNL licenses and the dongle licenses for temporary dongle useage

✓ **RiServer Setup** - linking Riunite and setup number of tasks to run in parallel Recommended 3 for most laptops 6 if high end desktop or server

License Center

1. Install all of your *RIEGL* software
2. Open License Center
    a. Windows key “license center”
3. Import Dongle License and SNL license files



a. Click: Import… button on the right hand side

b. Select the *.lic file

c. Click: “Open”

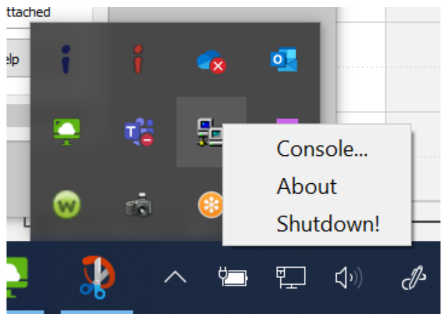
d. All license keys located in the *.lic file will import to the corresponding software

e. Save all changes and close

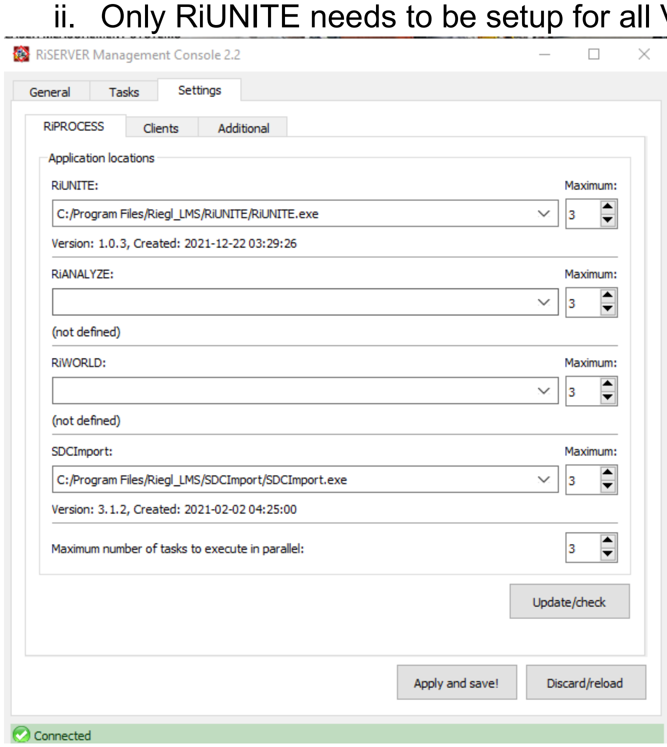
RiSERVER Setup

1. After initial installation, open RiSERVER 
   a. Right click on the RiSERVER icon located on the right side of the Windows taskbar

   b. Select "Console" to configure settings



   c. Goto Settings and define maximum number of tasks
      i. Recommend 3 for a laptop configuration
      ii. Only RiUNITE needs to be setup for all VQ or VUX sensors.

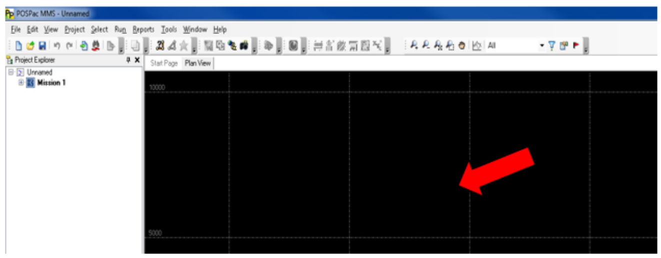


   d. Click: "Apply and save" - RiSERVER is now setup

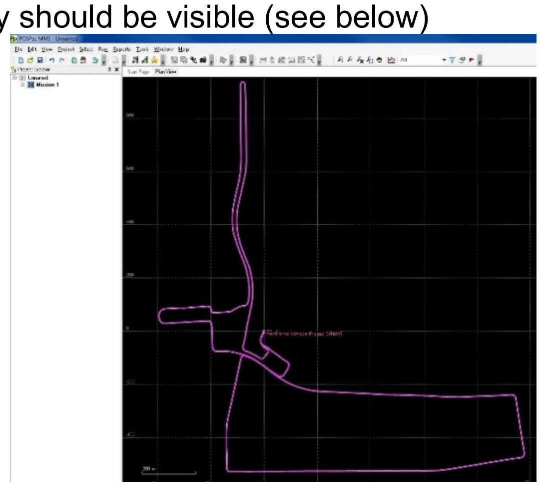
TRAJECTORY PROCESSING

POSPac MMS Tutorial for Mobile Processing

1. Open POSPac MMS
    a. Create New Document
        i. Click: The “New Project” icon
    b. Drag & Drop the appropriate file into program user interface (see below)
        i. Find the file: “02_INS-GPS_RAW” > “02_FULL” > “datetimestamp.raw”
        ii. File location should be identical for each individual project



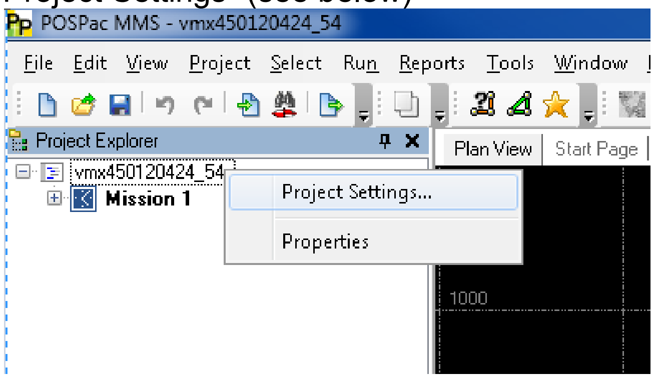
    c. Click: “Ok” twice
    d. Vehicle trajectory should be visible (see below)



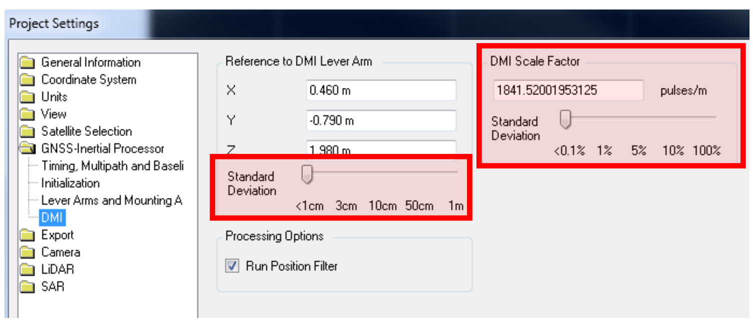
2. Save File
    a. Save the newly processed file
        i. Click: File than “Save Project As”
        ii. Save the processed file in the “05_INS-GPS_PROC/02_Project) folder (The original file remains unchanged)
    b. Save frequently after each of the following steps to prevent loss of work

Project Settings

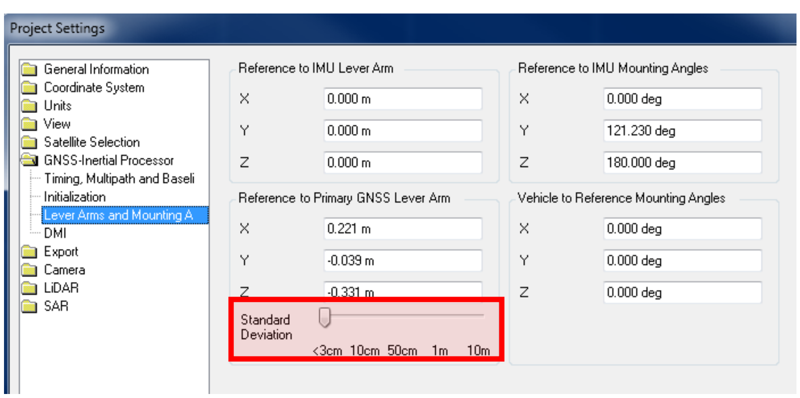
3. Opening Settings
    a. Right Click: "Project_Name" in Project Explorer
    b. Then select "Project Settings" (see below)



4. DMI Settings (only if applicable)
    a. Click: "GNSS-Inertial Processor" to open up sub-menus
    b. Select: "DMI"
        i. Move both sliders all the way left to "3-10cm" and "1%"
        ii. Input the calculated DMI Scale Factor into the specified text box (see below)

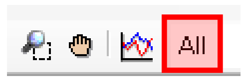


    c. Select: "Lever Arms and Mounting Arm" (directly below "Initialization")
        i. Move the one slider all the way left to "<3cm" (see below)
        ii. This fixes the lever arm

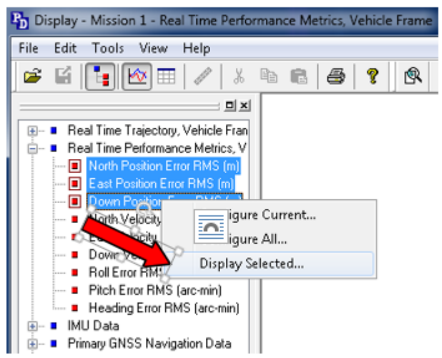


Check Error between IMU and GNSS

5. Display & Analyze Error Graphs
    a. Display Graphs: Click “Graph” icon (directly right of the “Hand” icon)

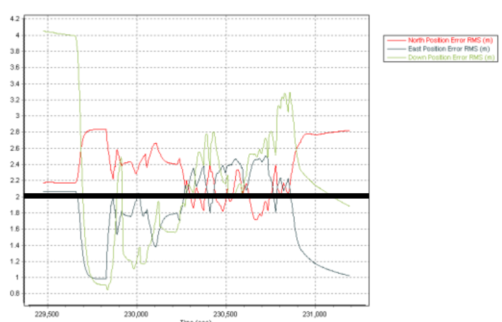


    b. Open the “Real Time Performance Metrics, Vehicle Frame” navigation tree
    c. Highlight all three “North/East/Down Position Error RMS”
        i. To do so: Hold “Shift” and click on all three



    d. Right click on one of the three selected and click “Display Selected...”
        i. This shows all data on one graph for an easy analysis

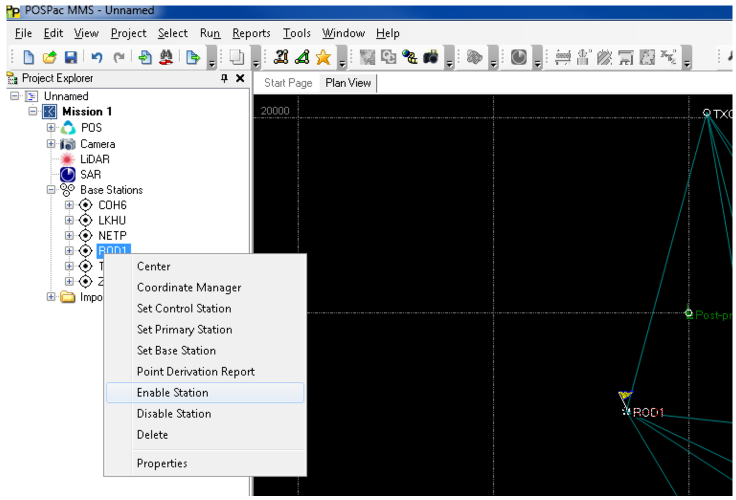
6. Deciphering the Graph
    a. This graph helps determine whether the data needs to be adjusted. The graph displays the error fluctuation between the IMU based motion model and the GNSS in meters vs. time (seconds).
        i. The “average” was marked below with a black line. In this case the average is approximately 2 meters
        ii. The average needs to be approximately .02 meters for the most accurate trajectory. Therefore, with this data, a correction is needed

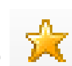


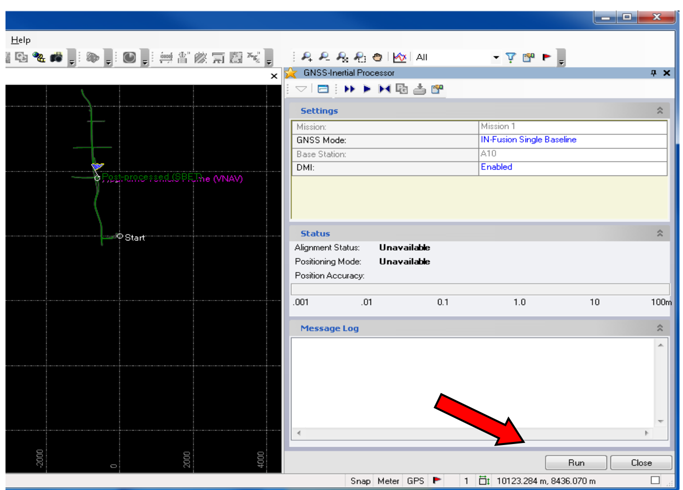
Correcting Errors

This is done by adjusting the mobile trajectory to reference stations.

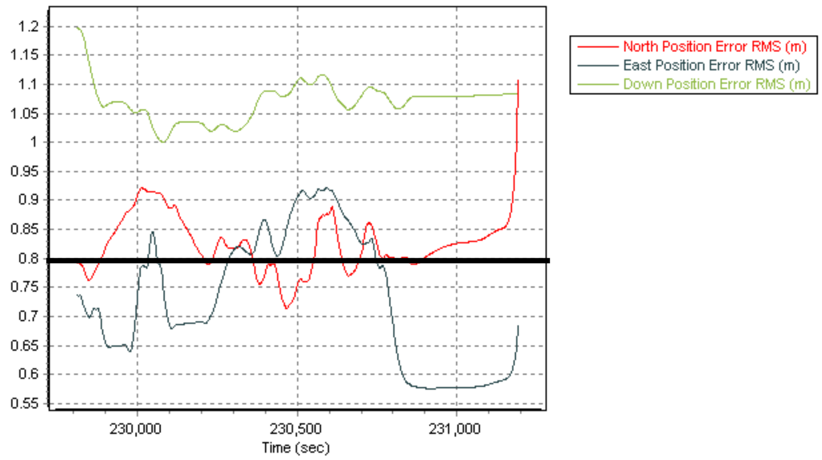
7. Preferred Option 1: Adjusting to a Single Base Station
    a. Open "Mission 1" and then "Base Stations" in the Project Explorer.
    b. Right Click: the station name i.e. "ROD1" and select "Set Base Station"



a. Next, Click: "GNSS-Inertial Processor" icon (Star) 
    i. Right Pane Window opens, click "run" and let it process



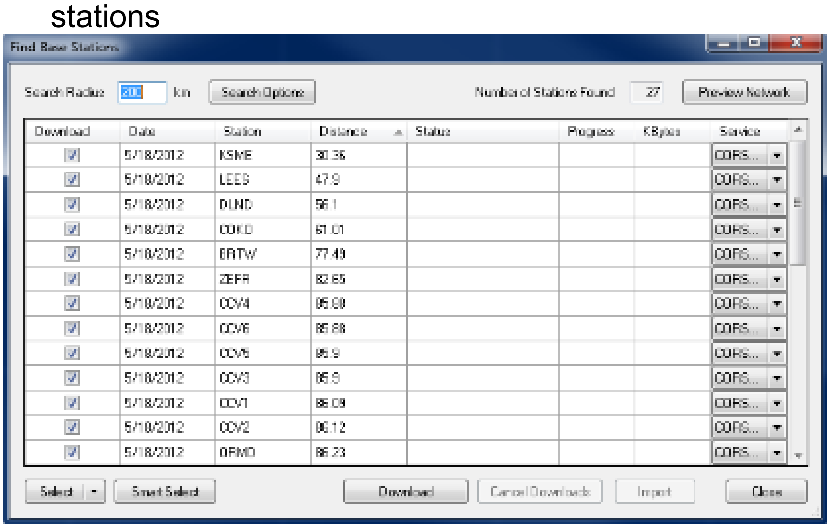
b. The correction is complete. Repeat steps 5-6 to determine the accuracy of the data.
    i. Make sure to select the "Smoothed Performance Metrics" instead of the "Real Time Performance Metrics, Vehicle Frame", the "Smoothed Performance Metrics" are representing the post-processed data
    ii. The error should be much smaller and resemble the graph below



Option 2: Adjusting to Multiple Base Stations

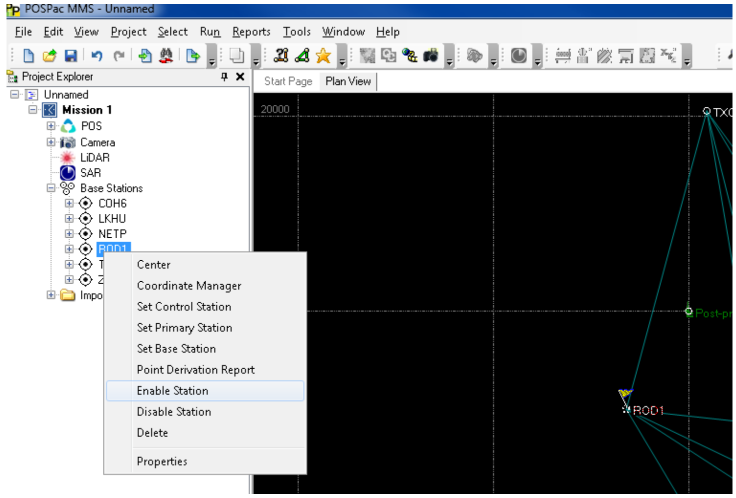
a. The exact same as “Option 1” except skip Step 8A-8B
    i. This uses all Base Stations instead of one

2. Locating Reference Stations (CORS Stations)
    a. Click on the “SmartBase Quality Check” icon.
        iii. Select “Yes” on the first pop-up window
    c. Click: “Smart Select”
        i. This option automatically selects and downloads the closest reference stations



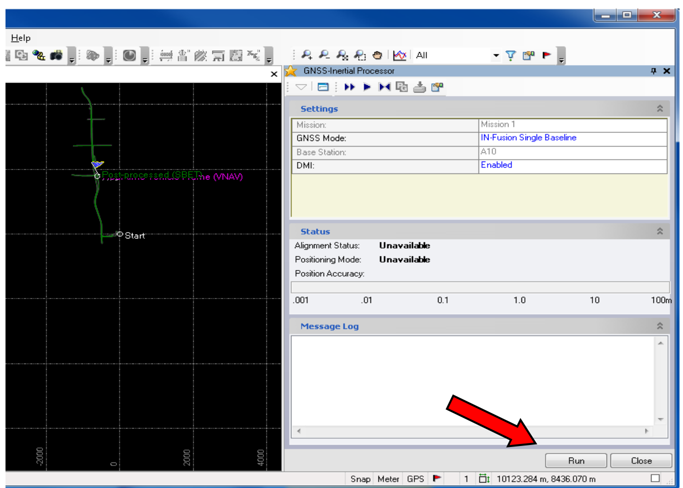
    d. Click: “Ok”
        i. Together the trajectory and reference stations are mapped
        ii. The background was removed for ease of viewing

3. Preferred Option 1: Adjusting to a Single Base Station
    a. Open “Mission 1” and then “Base Stations” in the Project Explorer.
    b. Right Click: the station name i.e. “ROD1” and select “Set Base Station”



e. Next, Click: "GNSS-Inertial Processor" icon (Star) 

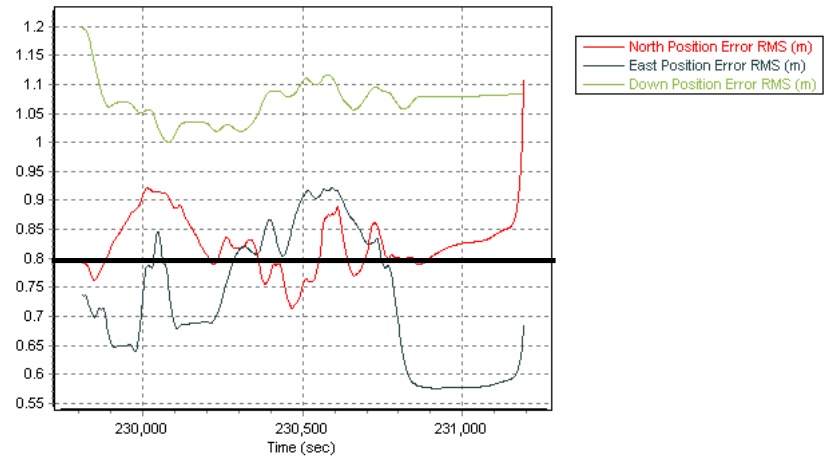
i. Right Pane Window opens, click "run" and let it process



f. The correction is complete. Repeat steps 5-6 to determine the accuracy of the data.

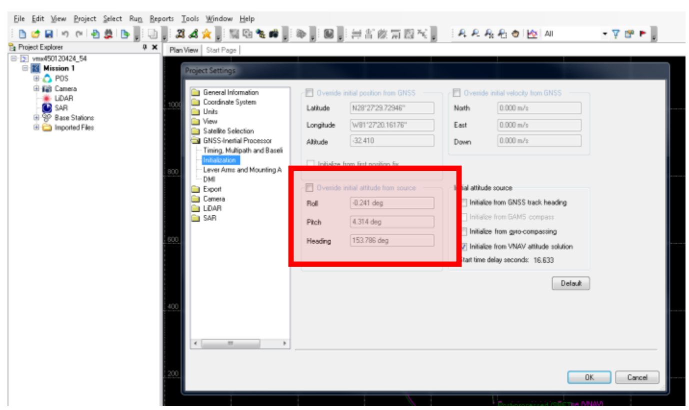
i. Make sure to select the "Smoothed Performance Metrics" instead of the "Real Time Performance Metrics, Vehicle Frame", the "Smoothed Performance Metrics" are representing the post-processed data

ii. The error should be much smaller and resemble the graph below

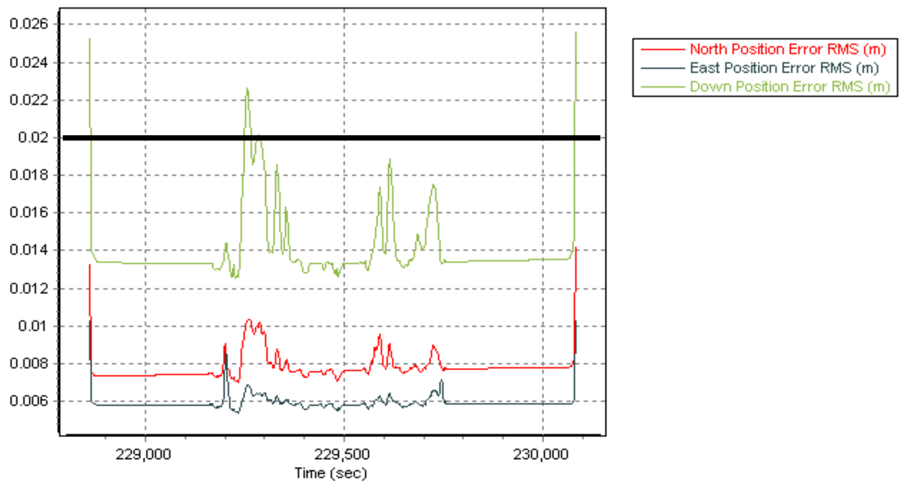


Optimizing

4. Optimizing Project Settings
   a. Repeat Step 3A-3B
   b. Click: “GNSS-Inertial Processor” to open up sub-menus
   c. Select: “Initialization”
      i. Change the selected box from “Initialize from gyro-compassing” to “Initialize from VNAV attitude solution” (see below)
      ii. This can be done if unsatisfied with results from gyro-compassing



d. Repeat Steps 8D-8E
   i. The graph will show how accurate the newly processed data is.
   ii. The graph should resemble the one below.
   iii. Notice the average error is approximately .01 meters!!
   iv. Focus on a threshold below 0.02 meters for all parameters

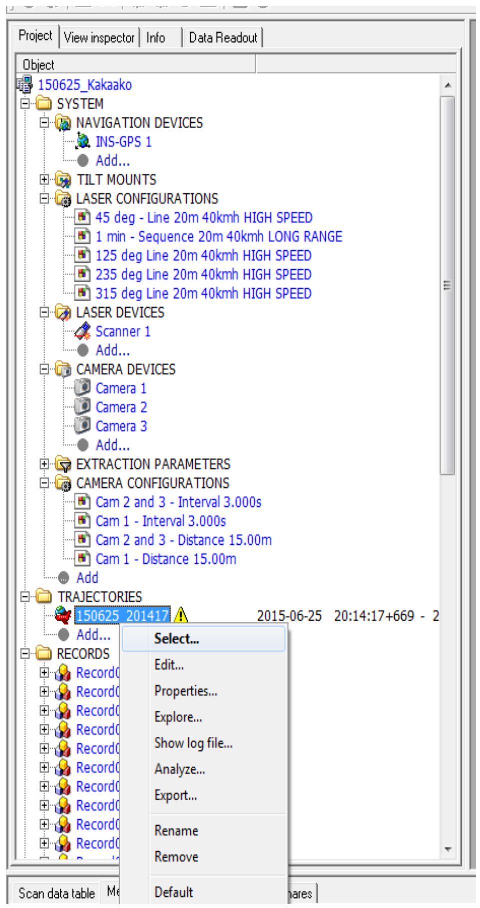


LIDAR PROCESSING

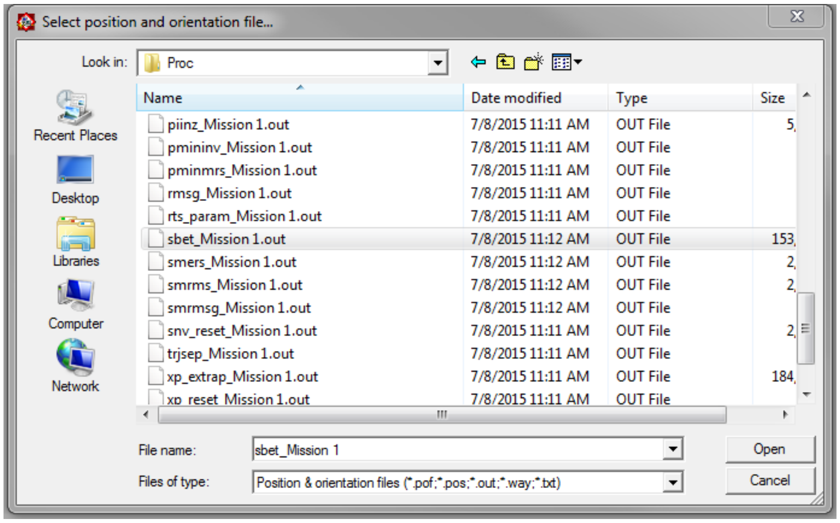
After the trajectory has been processed, we can bring it into RiPROCESS and utilize it with the LIDAR point cloud.

1. Open RiPROCESS

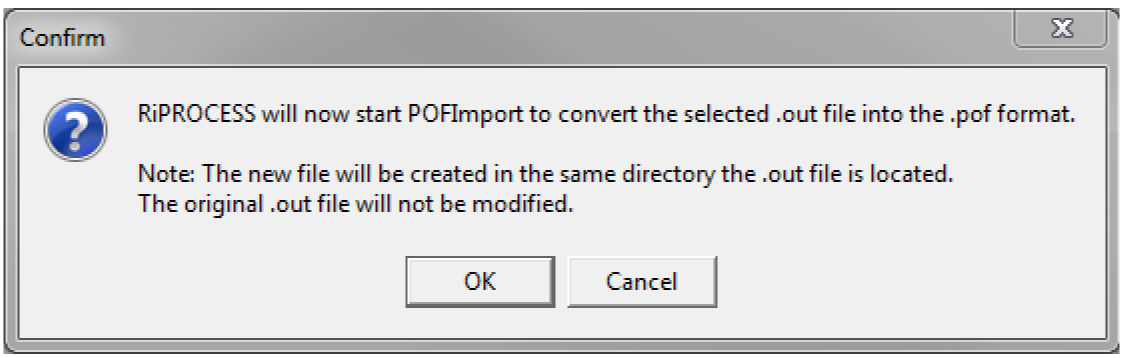
2. Scroll down the Project Tree and right click on the trajectory, then left click select.



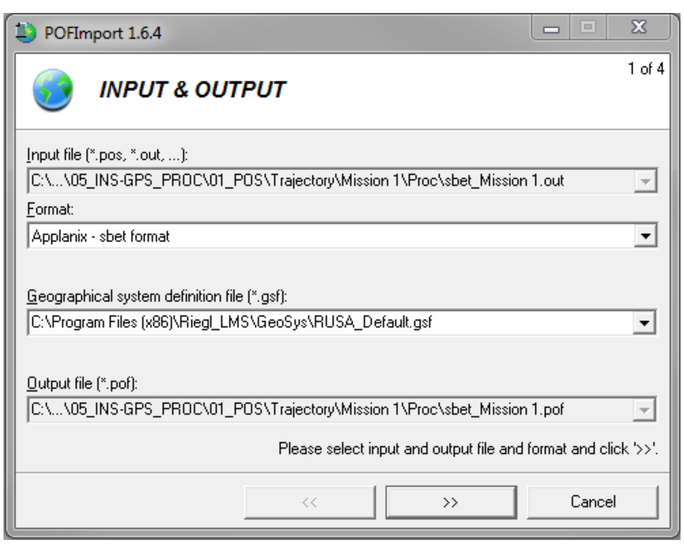
3. Find your recently processed trajectory .out file, usually named sbet_Mission1.out by default.

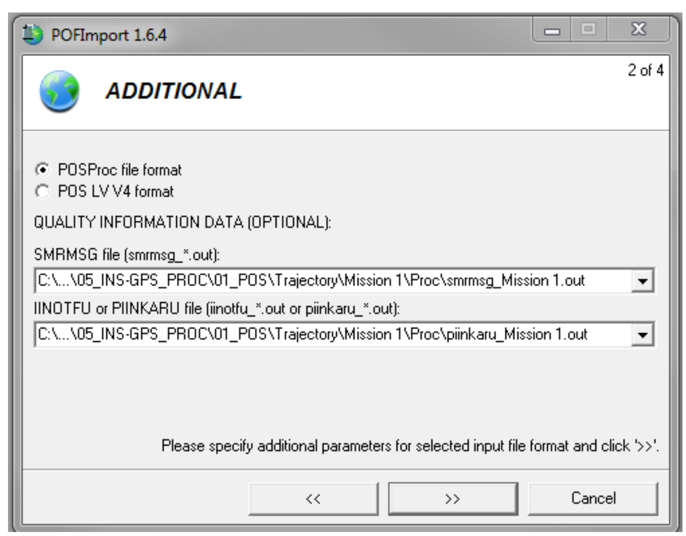


4. When you double click on the desired file, a message prompt will appear describing the conversion process from .out files to .pof, which is utilized during processing.

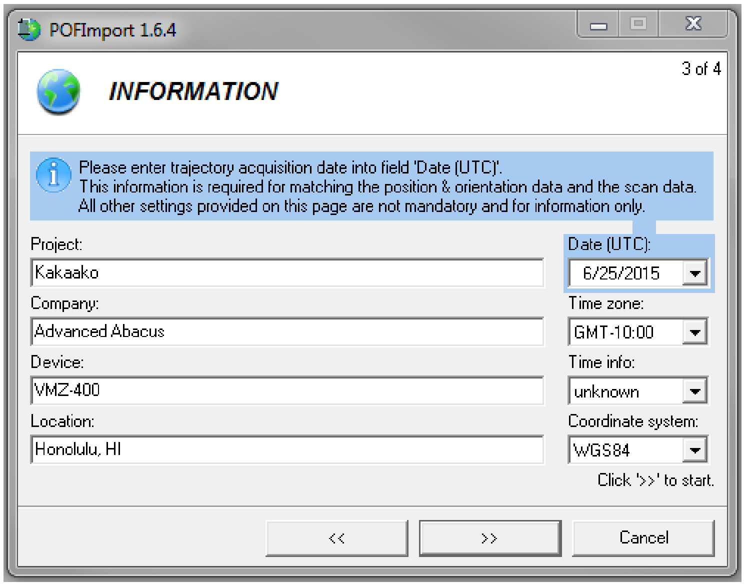


5. Click “OK” and then “>>” a few times, ensuring the SMRMSG and PINKARU files are properly in place. These fields will be filled out automatically if the files are in the same folder as the sbet_Mission1.out file. If everything appears to be in order, click next.

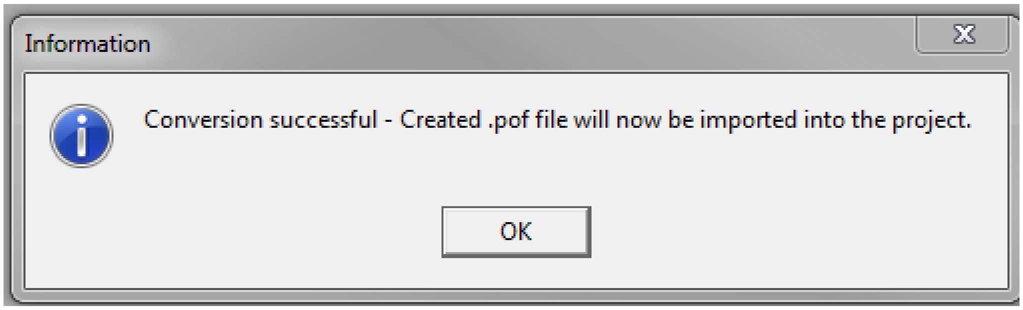




6. When you come to the Information window, fill in the requested details. While its not required, this feature will help you organize future projects. The most important thing to do is fill in the correct date. This date will be related to the trajectory and time stamp info, if it is incorrect, the data will not process properly.

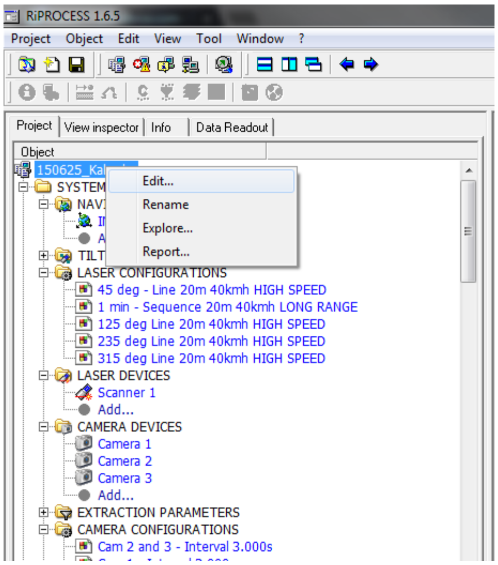


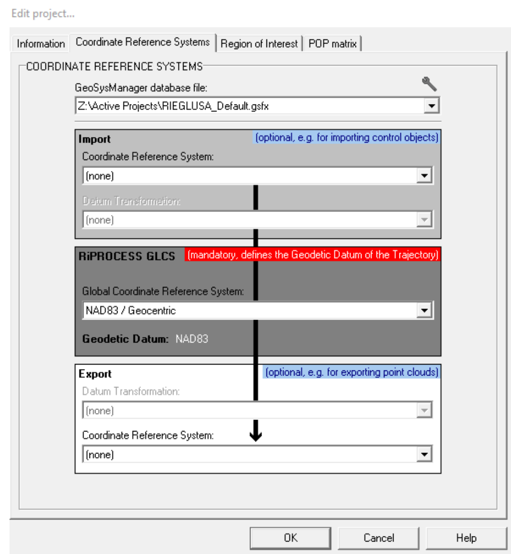
7. The final step is simply to click “OK” and allow the trajectory to be renamed to sbet_Mission1 by default. This name can be changed during the trajectory processing if desired.



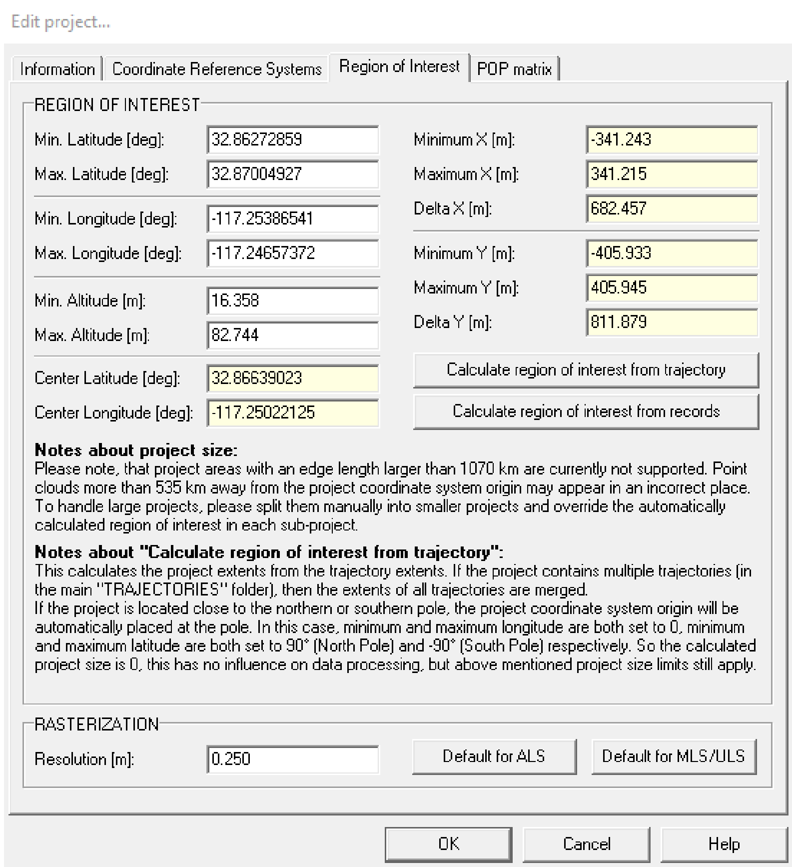
8. To ensure the Trajectory was properly added to the records, Rightclick the trajectory and select “apply to all”

9. Now that the trajectoy is imported, go to the Project name on top of the project tree and right click, then select “Edit”. Here you will be able to designate the proper coordinate system, state plane projection, and Geoid model.

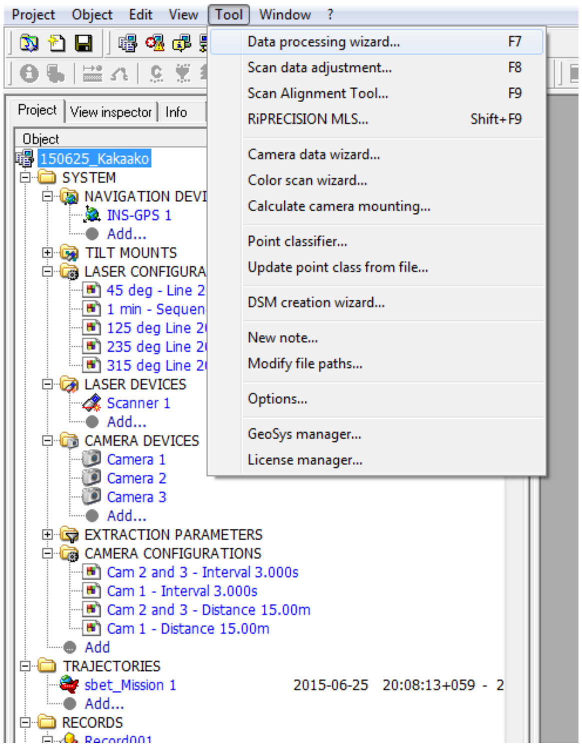


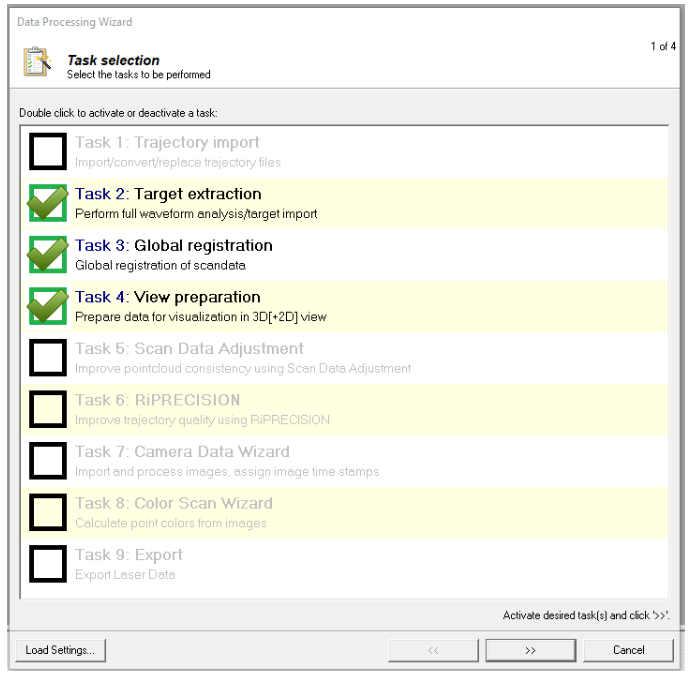


10. Once the coordinate system is selected, go the next tab to select the region of interest. First, click the “Default to MLS” button at the bottom of the window. This will insert the required parameters for mobile scanning. After you have defaulted the Rasterization resolution to MLS default, click the “Calculate region of interest from trajectory” button. Once you do this, you should see the values change slightly. Once this is complete, click “OK”.

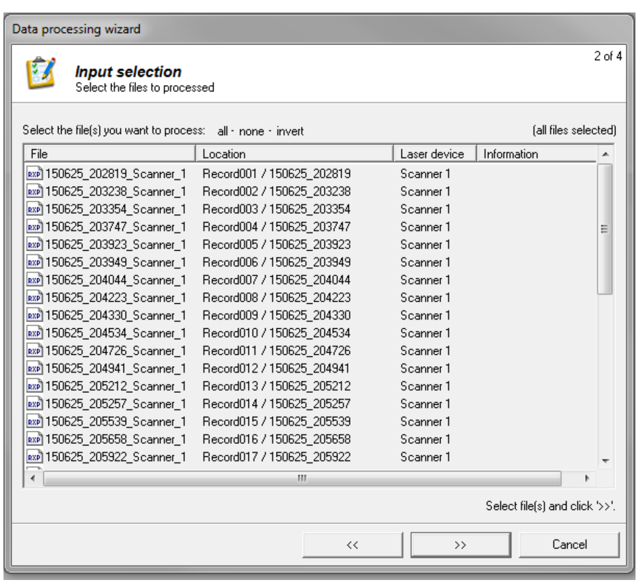

Edit project...
Information
Coordinate Reference Systems
Region of Interest
POP matrix
REGION OF INTEREST
Min. Latitude [deg]: 32.86272859
Max. Latitude [deg]: 32.87004927
Min. Longitude [deg]: -117.25386541
Max. Longitude [deg]: -117.24657372
Min. Altitude [m]: 16.358
Max. Altitude [m]: 82.744
Center Latitude [deg]: 32.86639023
Center Longitude [deg]: -117.25022125
Minimum X [m]: -341.243
Maximum X [m]: 341.215
Delta X [m]: 682.457
Minimum Y [m]: -405.933
Maximum Y [m]: 405.945
Delta Y [m]: 811.879
Calculate region of interest from trajectory
Calculate region of interest from records
Notes about project size:
Please note, that project areas with an edge length larger than 1070 km are currently not supported. Point clouds more than 535 km away from the project coordinate system origin may appear in an incorrect place. To handle large projects, please split them manually into smaller projects and override the automatically calculated region of interest in each sub-project.
Notes about "Calculate region of interest from trajectory":
This calculates the project extents from the trajectory extents. If the project contains multiple trajectories (in the main "TRAJECTORIES" folder), then the extents of all trajectories are merged.
If the project is located close to the northern or southern pole, the project coordinate system origin will be automatically placed at the pole. In this case, minimum and maximum longitude are both set to 0, minimum and maximum latitude are both set to 90° (North Pole) and -90° (South Pole) respectively. So the calculated project size is 0, this has no influence on data processing, but above mentioned project size limits still apply.
RASTERIZATION
Resolution [m]: 0.250
Default for ALS
Default for MLS/ULS
OK
Cancel
Help

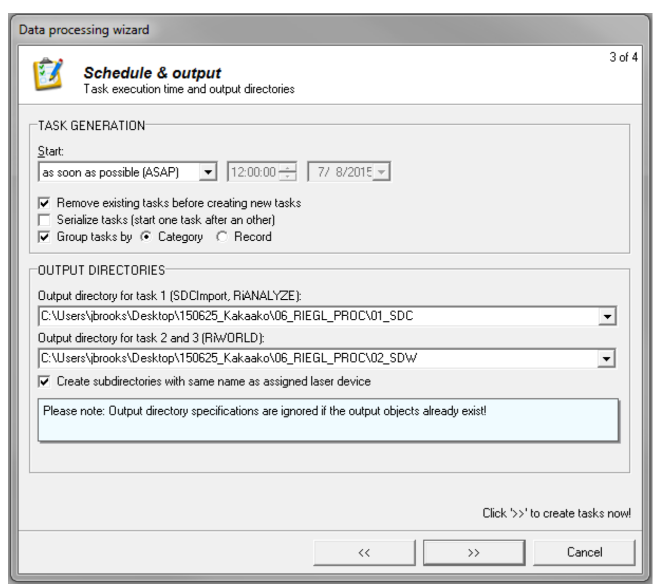
11. Now you are ready to process! Go to Tool and click on the “Data Processing Wizard”. From here you will check the boxes to process the first three tasks, since this is your initial processing. Once the RXP files are extracted in Step 2 , you may skip this task in future iterations, only needing to process steps 3 and 4.





12. Click the next (“>>”) arrows a few times until you reach the Schedule and Output window. You do not need to change anything here, and if you are ready you may click on through. However, be aware of the settings in this window in case you need to change output directiories at a future time. Or you may check the box to “Remove exsisting tasks before creating new tasks” to clean up some space in your project window.

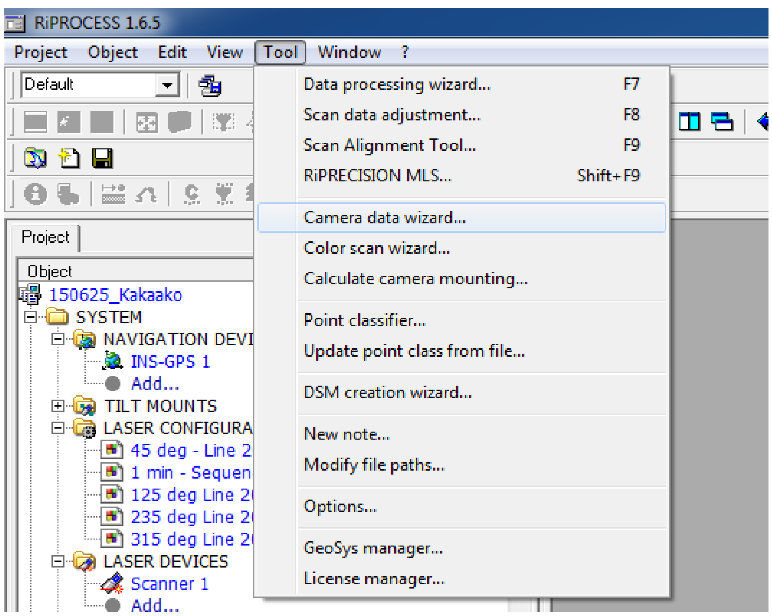




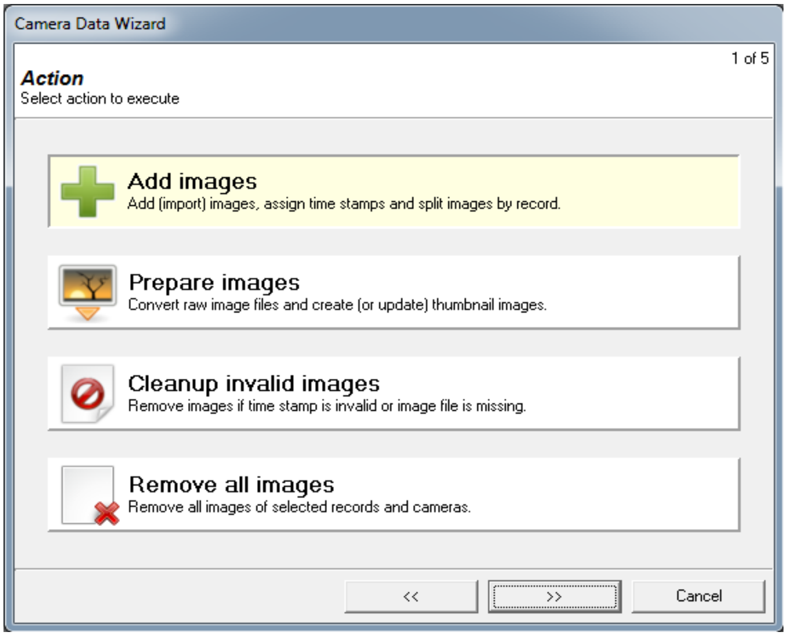
IMPORTING IMAGES

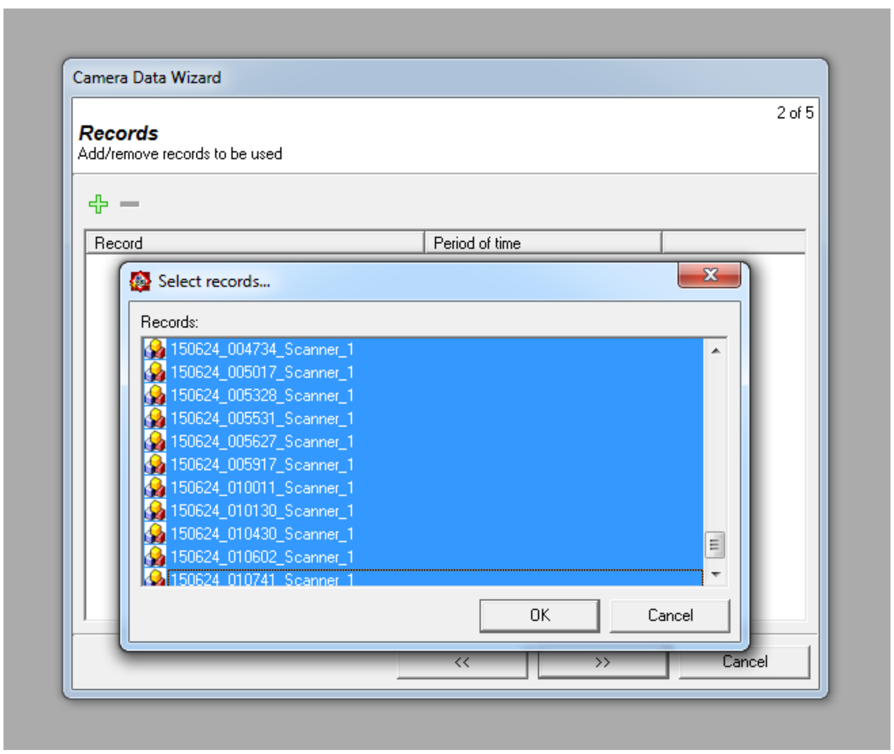
Once the data has been processed, you can now bring in the images and colorize the point cloud to true color, creating a photorealistic 3D model of your project area. **This should be used only for: Nikon, Ladybug 5 and 5+ or other 3rd party camera integrations.** This workflow isn't necessary for RIEGL CS6 or CS32 cameras as our software can read in the file formats natively but will require them to be exported into a readable format (.jpg) when completed with the alignment, image processing and colorization process.

1. Go to Tool, and click on the "Camera Data Wizard".

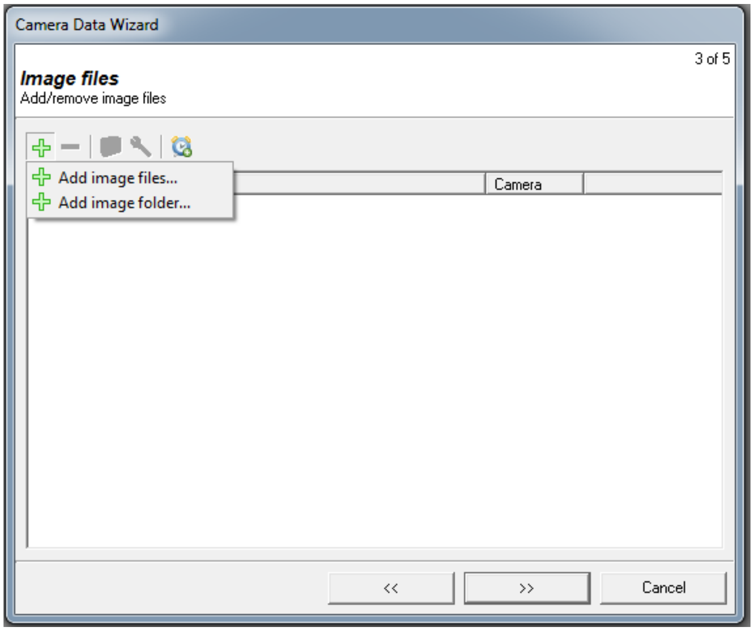


2. Click “Add Images” in the Action window.



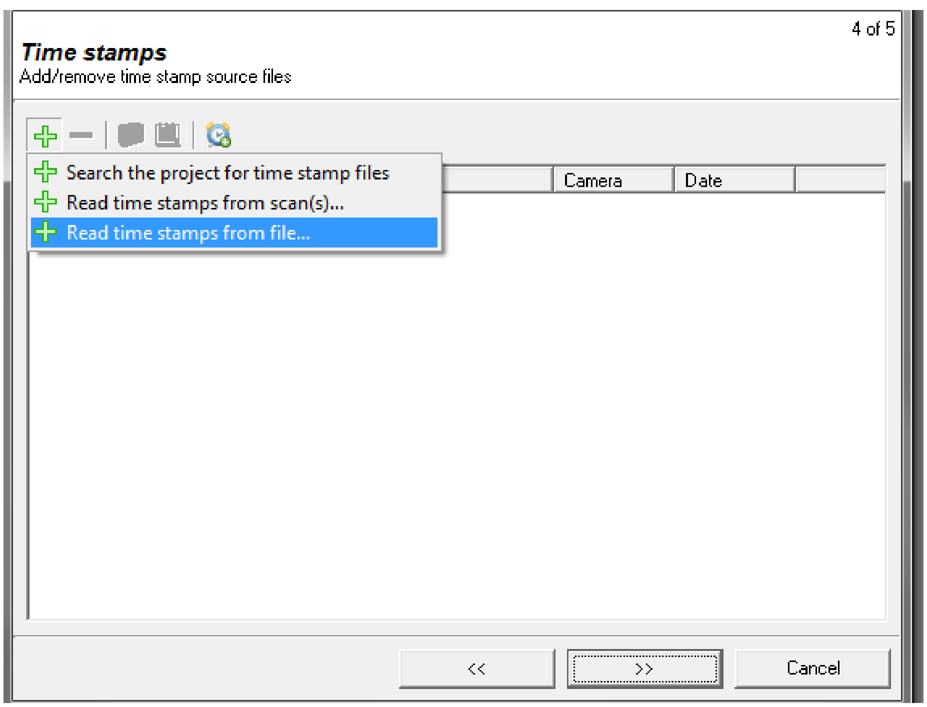


3. Click “>>” and then proceed to select all records associated with the images. You may just Ctrl + A to select all and save time. If images are not taken for a certain record, they will not interrupt the process. Click “OK” and “>>”.

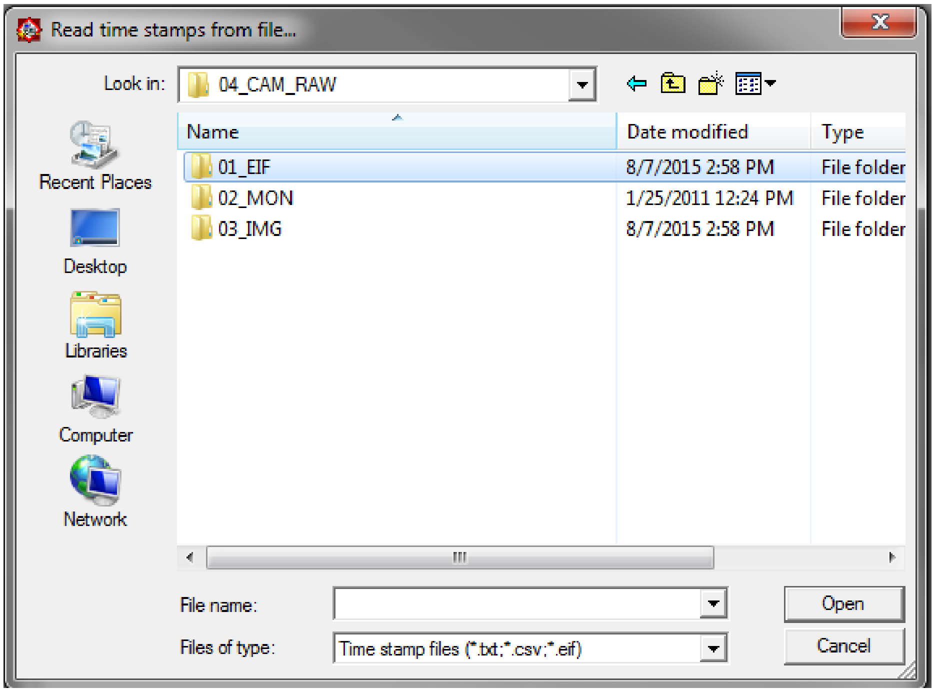


4. Add images either from individual files, or an entire folder. You may use the Shift key or Ctrl + A to select multiple files at once. Do this multiple times with various files/folders to get all of your images imported on the first run.

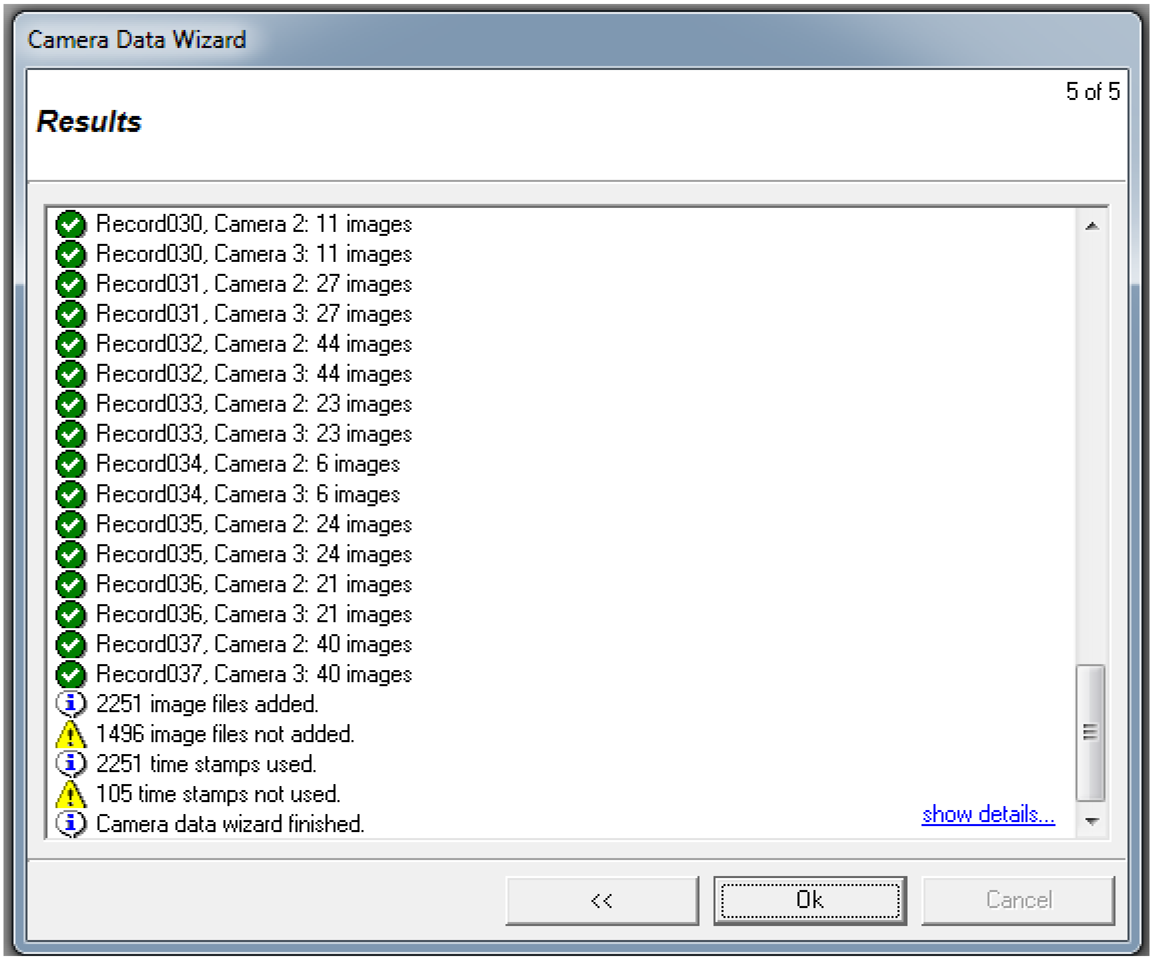
5. Now you must add the time stamps associated with each image. You can do this three different ways, but the most reliable is to "Read Timestamps from File" then select the .EIF files in the 04_CAM_RAW Folder.



6. Select all the available .EIF files, and be sure to enter the proper date of collection when the prompt appears. If you have multiple cameras capturing images during acquisition, be sure that you grab the timestamp files for each individual camera.



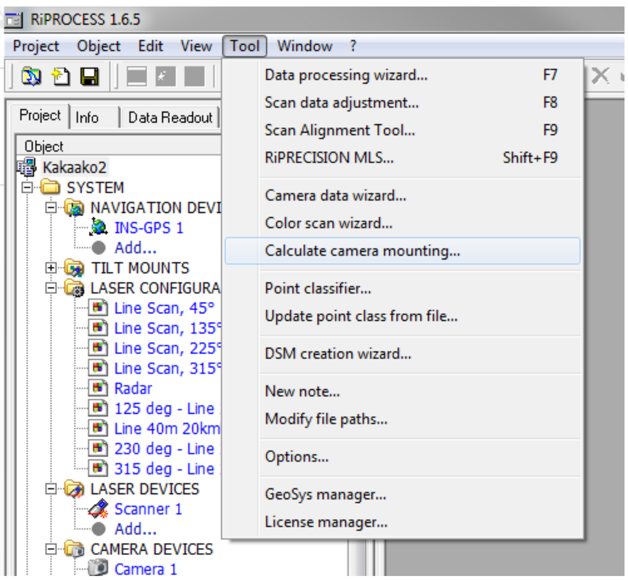
7. After the process is complete, check that you have a sufficient number of image files added. If an excessive number of images are skipped, check the “Time Stamp” settings for each camera. You can click “show details…” if you would like to see what images paired with the associated time stamps or see why they were skipped. Click “OK” when finished.


Camera Data Wizard
5 of 5
Results
Record030, Camera 2: 11 images
Record030, Camera 3: 11 images
Record031, Camera 2: 27 images
Record031, Camera 3: 27 images
Record032, Camera 2: 44 images
Record032, Camera 3: 44 images
Record033, Camera 2: 23 images
Record033, Camera 3: 23 images
Record034, Camera 2: 6 images
Record034, Camera 3: 6 images
Record035, Camera 2: 24 images
Record035, Camera 3: 24 images
Record036, Camera 2: 21 images
Record036, Camera 3: 21 images
Record037, Camera 2: 40 images
Record037, Camera 3: 40 images
2251 image files added.
1496 image files not added.
2251 time stamps used.
105 time stamps not used.
Camera data wizard finished.
show details...
<<
Ok
Cancel

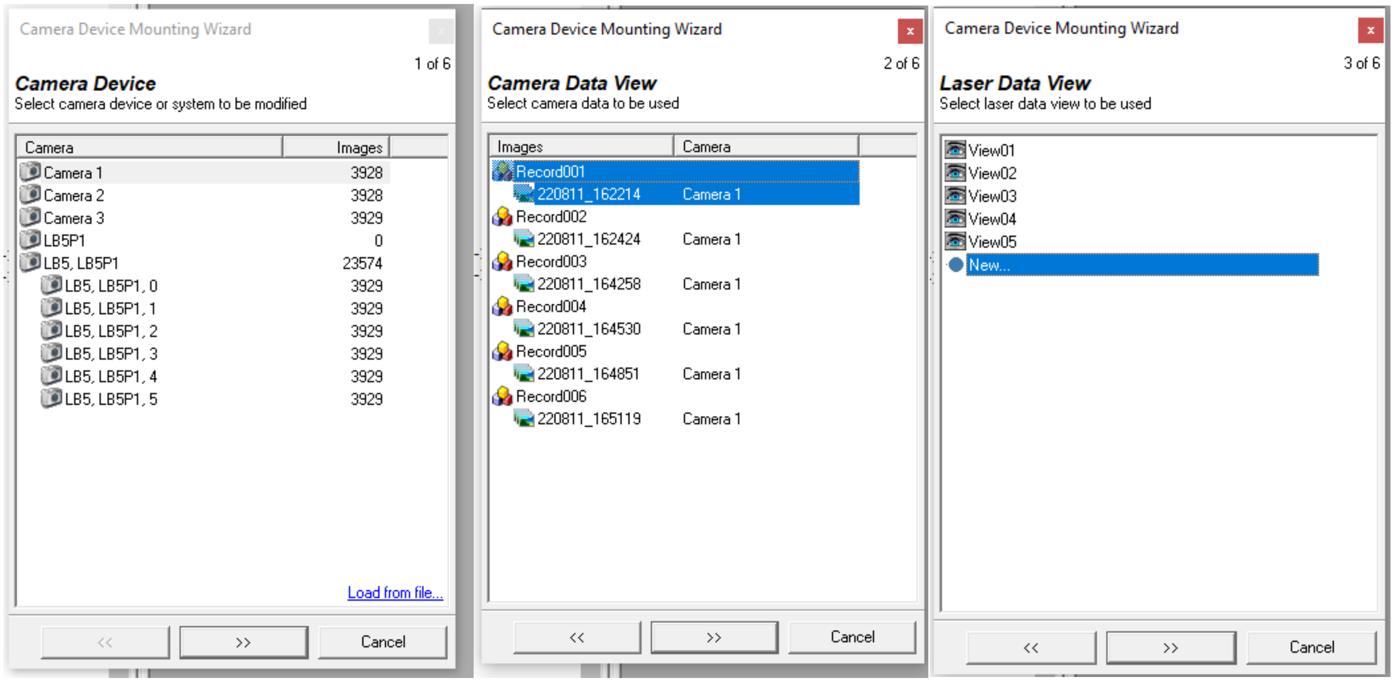
CALCULATE CAMERA MOUNTING

Once the images are successfully imported, now it is time to calculate the. This will ensure proper orientation of the images in relation to the point cloud, which will create an accurately colorized point cloud.

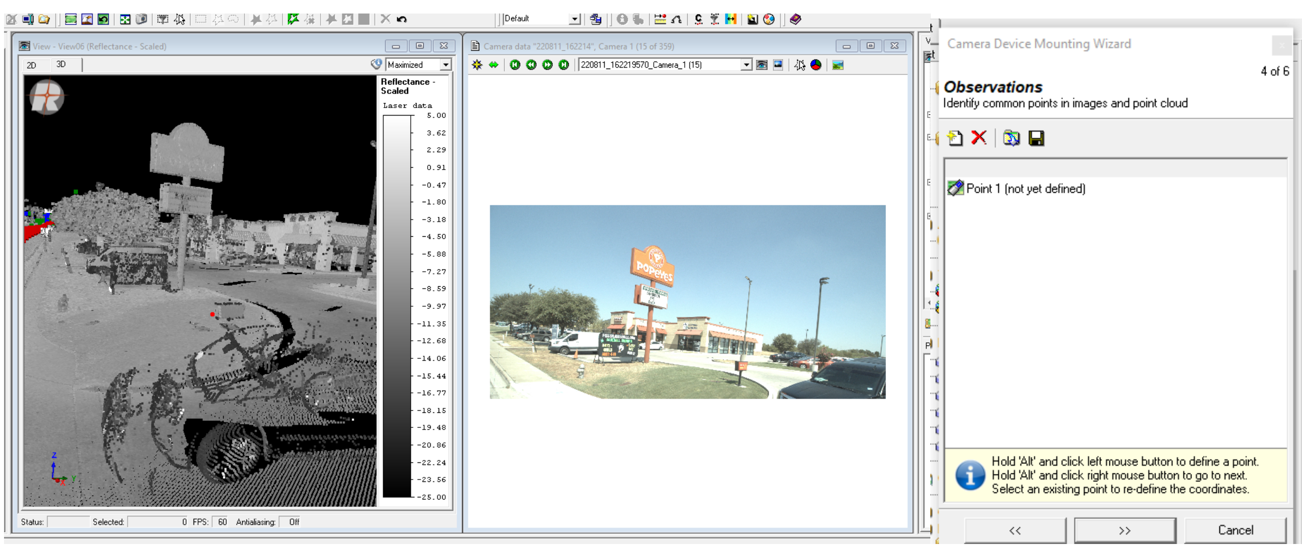
1. Open Tool then click “Calculate camera mounting…”



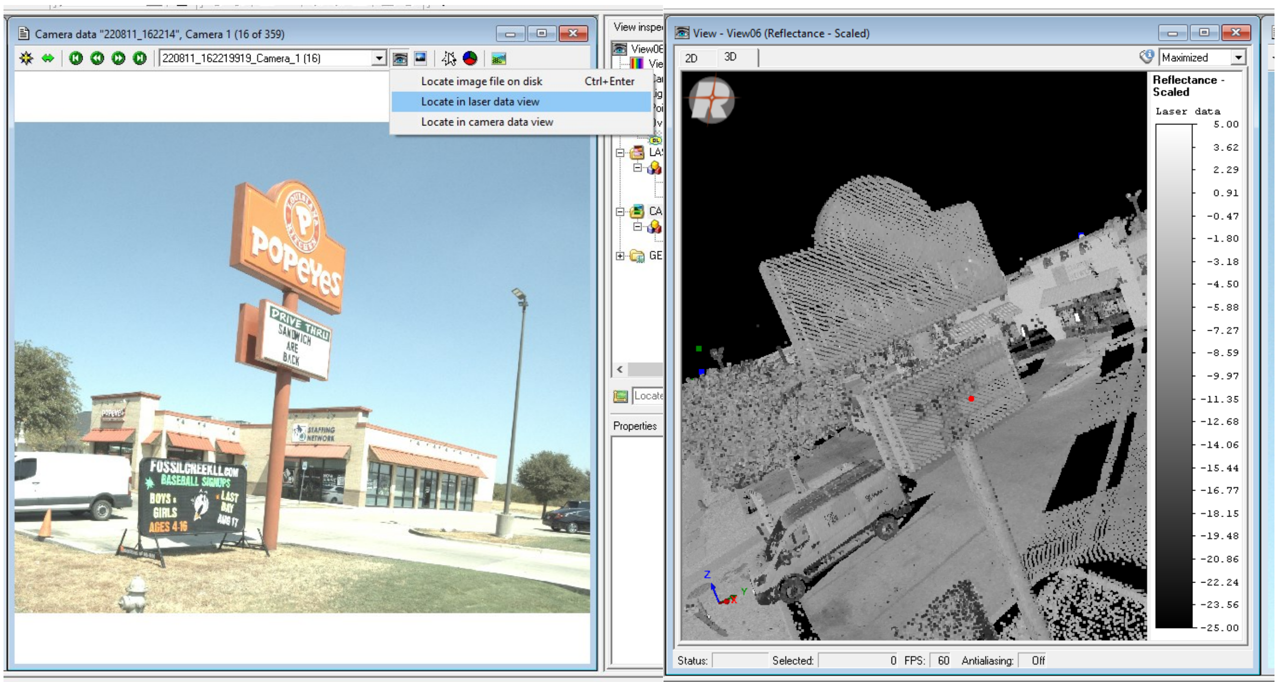
2. Once the new menu opens you will want to select the Camera you want to calculate the mounting for. You will also want to choose the record, and view you want to use for the calibration.



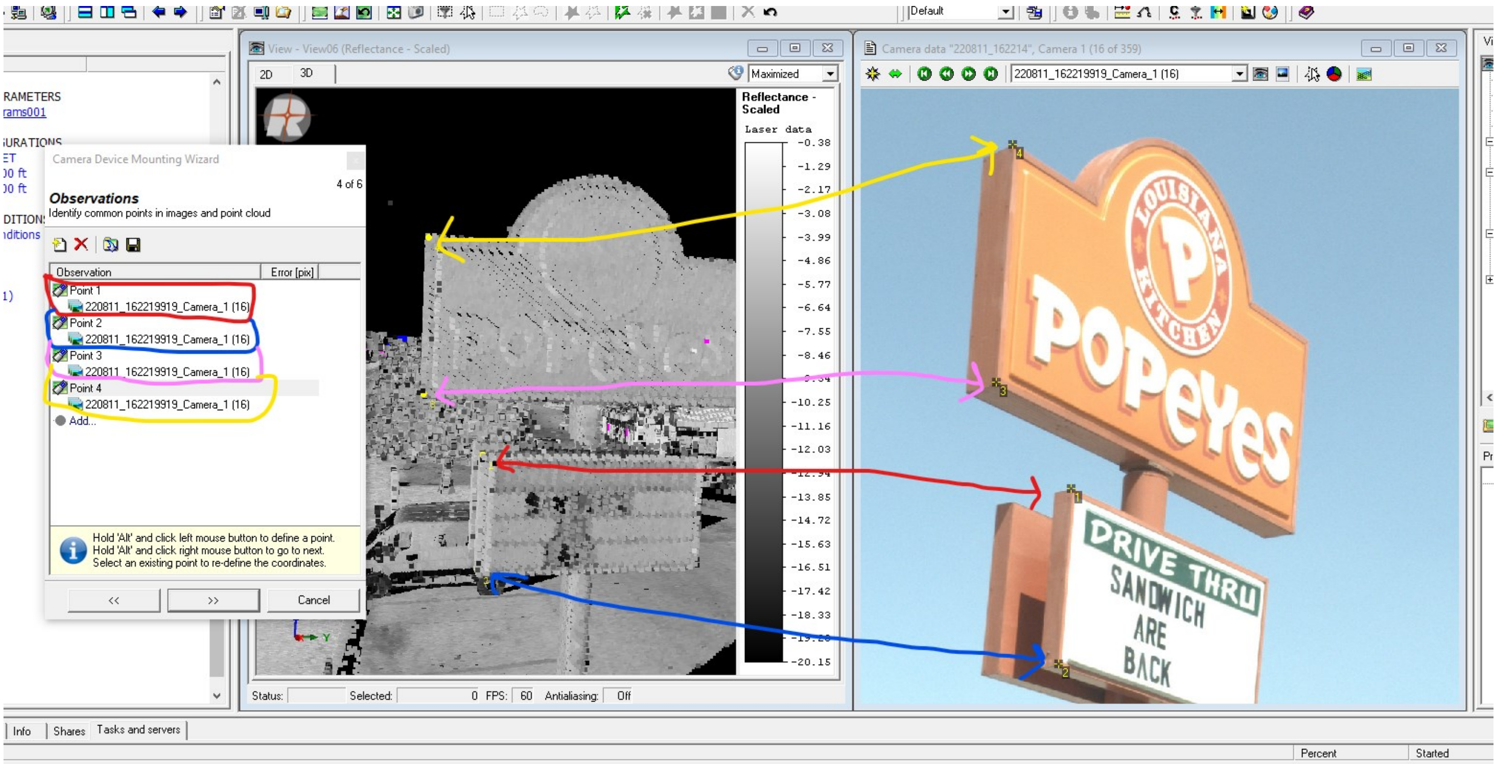
3. You will now see two new views populated. One will be the camera images, and the other will be the laser data. You should also see a new observation menu pop up as well.



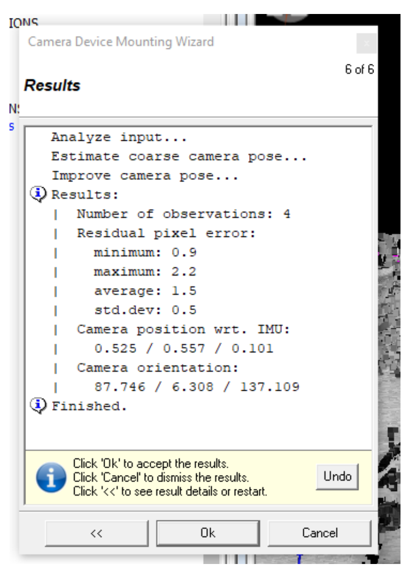
4. Next you will need to find a good reference point in both the imagery, that can be used as a good reference position for points. Once you have located that object you can use the locate tool to automatically find that object in the laser view.



5 Now you will pick a matching point in each window that are in the same position using ALT+Left Click. Riporcess will require at least three points per camera. As you can see in the example below, we choose four points on a sign.

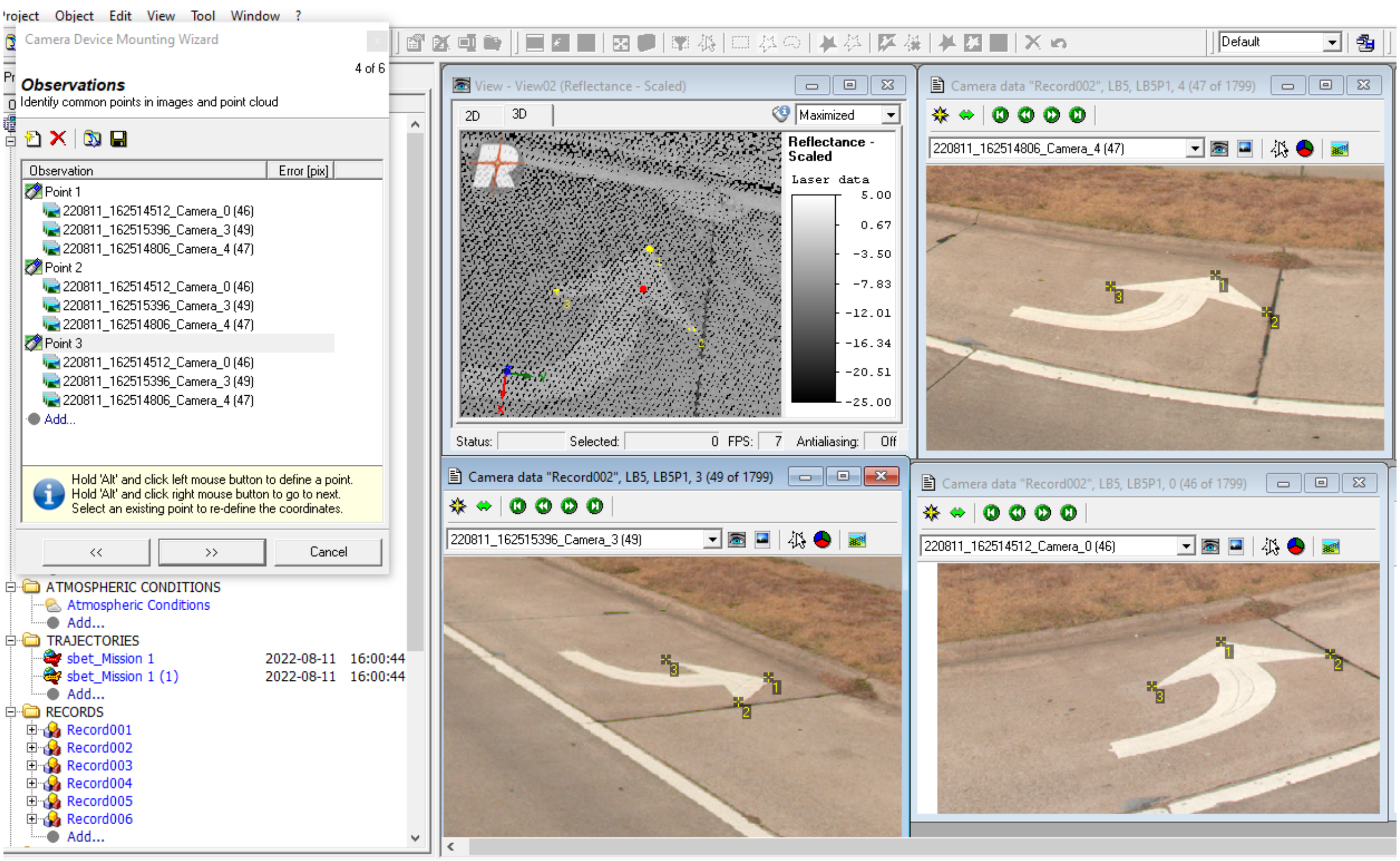


6. Once that is complete you will see a results window populate. Here you can see the pixel error rate of the points you choose. If you were to hit back on this window you will be able to see the pixel error rate for each point you picked.



7. You will now need to go back and complete this process for each camera.

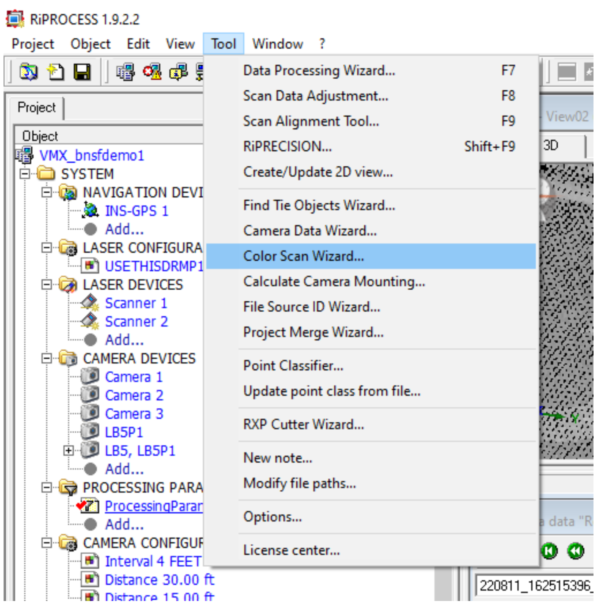
8. It is important to note that if you are using a Ladybug camera you will need to go through and find matching points for all the camera. In the example below we have used a turn arrow on the road that is visible in 3/5 cameras.



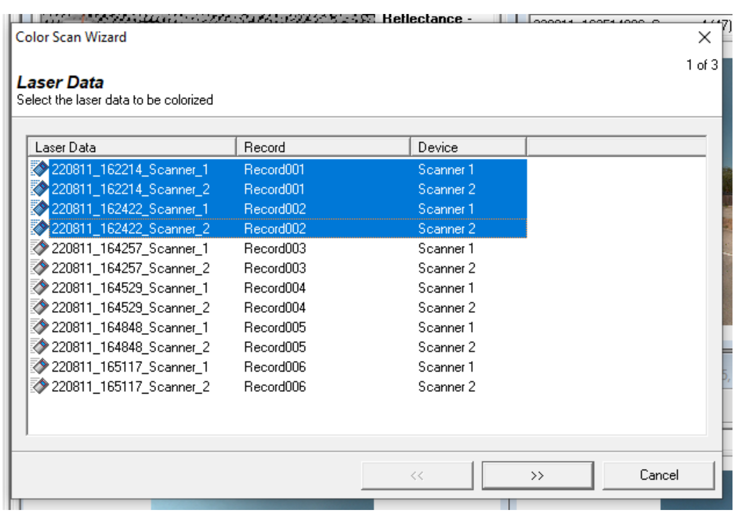
COLOR SCAN WIZARD

Once the camera mounting angles have been calculated you can use the images acquired by the digital cameras to determine a color value for each scanned 3D point.

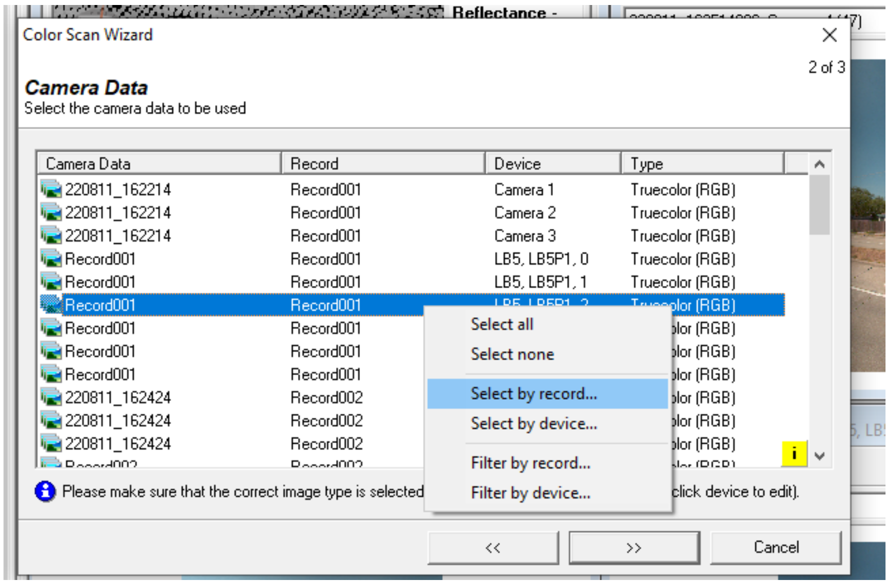
1. Navigate to Tool -> Color Scan Wizard



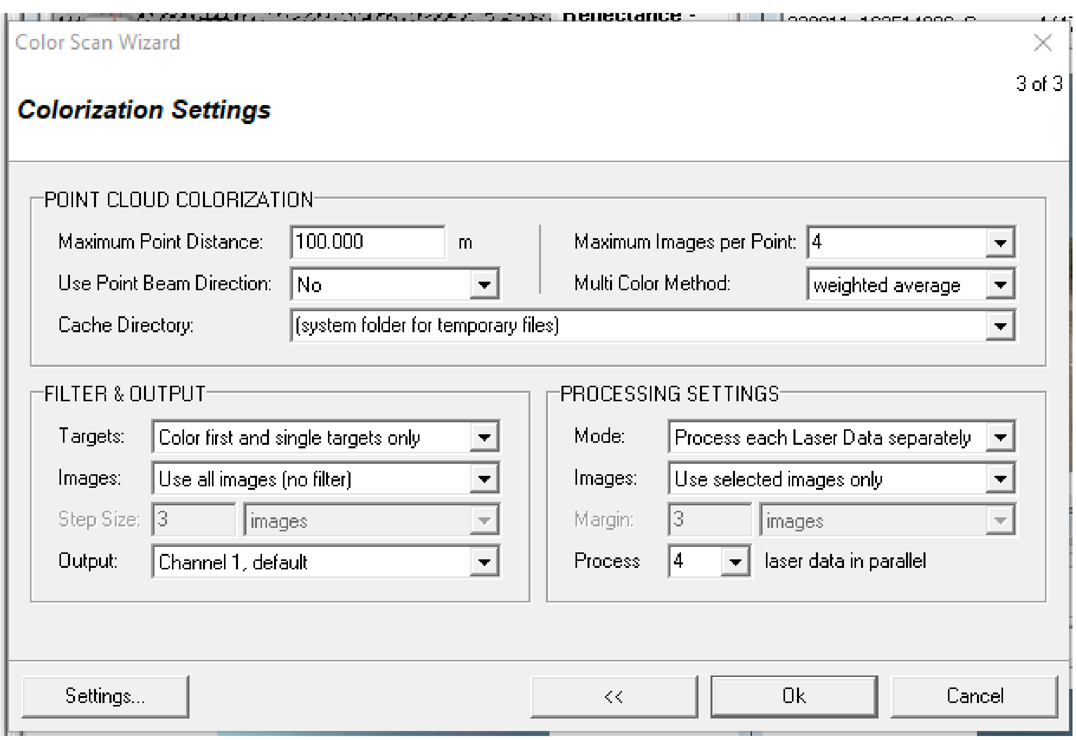
2. Select the records that you want to colorize



3. Next you will see that RiPROCESS has auto selected the camera data that corresponds to the records that you selected in the pervious window. You can also left click, and select the images you wish to be pulled in from each record.

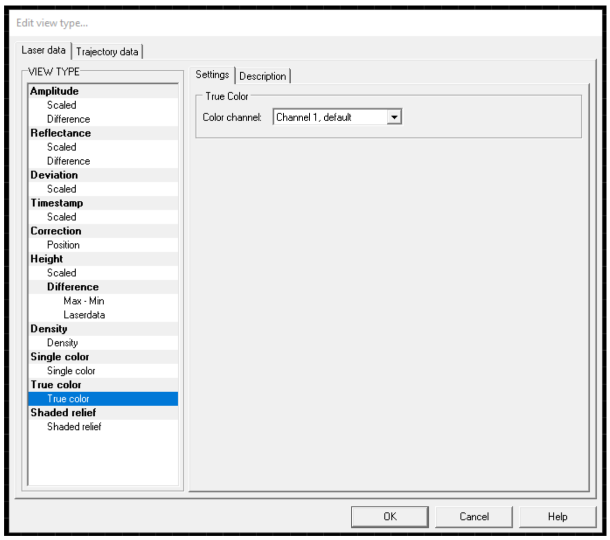


4. Then you will fill in the desired colorization settings. These parameters may need to be changed depending on the results you desire.

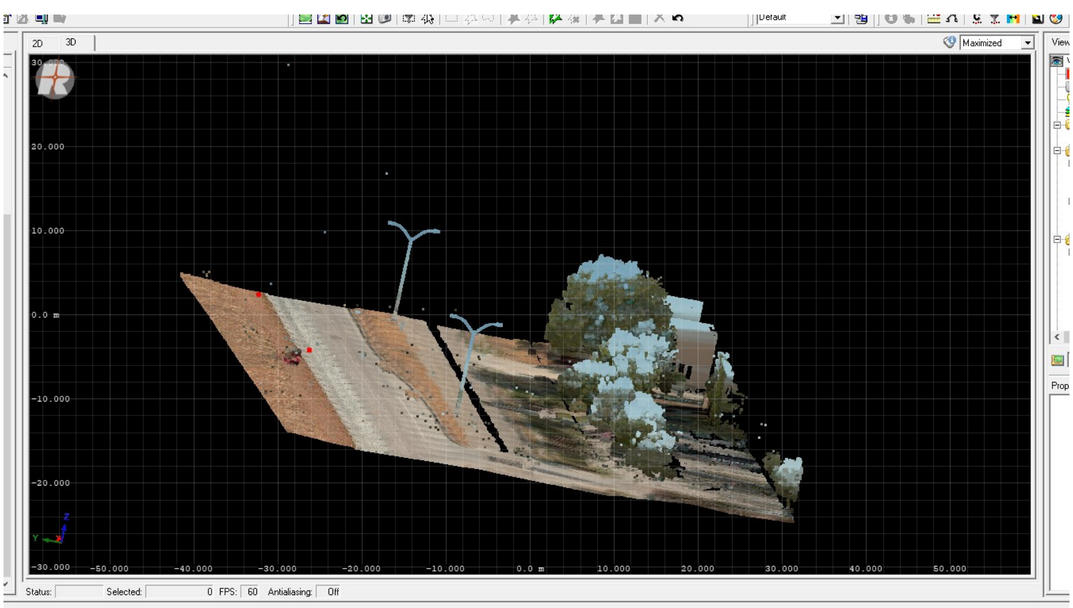


5. Once that is complete you will see a new task created under the Task, and servers tab

6. Once that process is complete, go ahead and create a new view, and set the view type to “True Color”



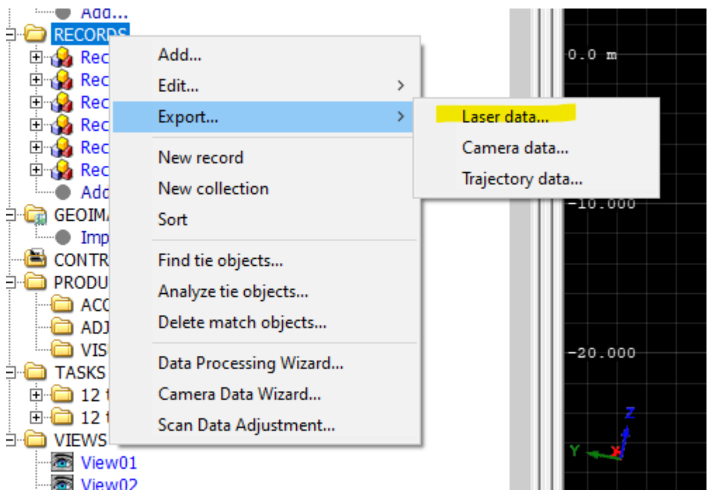
7. once the viewer is open, you will need to switch the viewer to 3D, for true color to be visible.



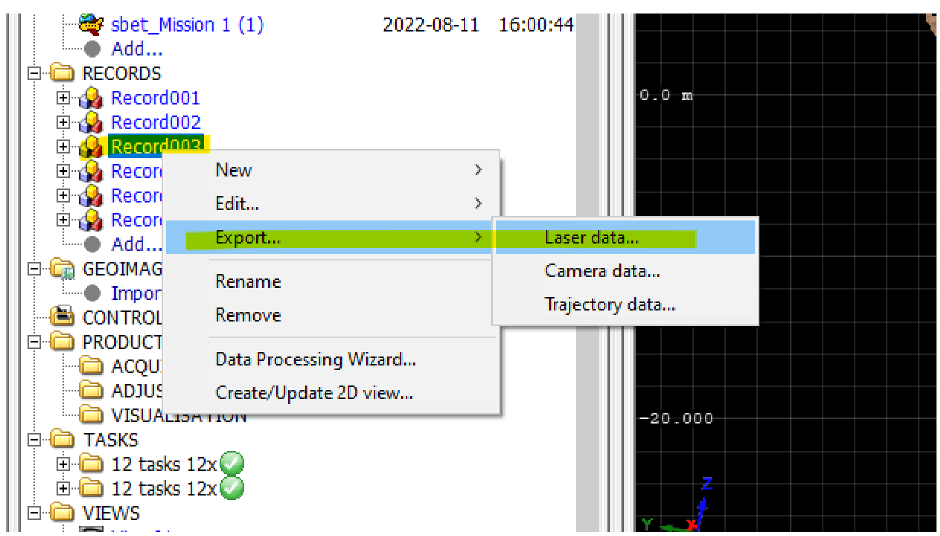
3D DATA EXPORT

There are several ways to start an export of 3D Data.

1. From the project manager; right click the records and choose “Export > Laser data” and select the data you wish to export.

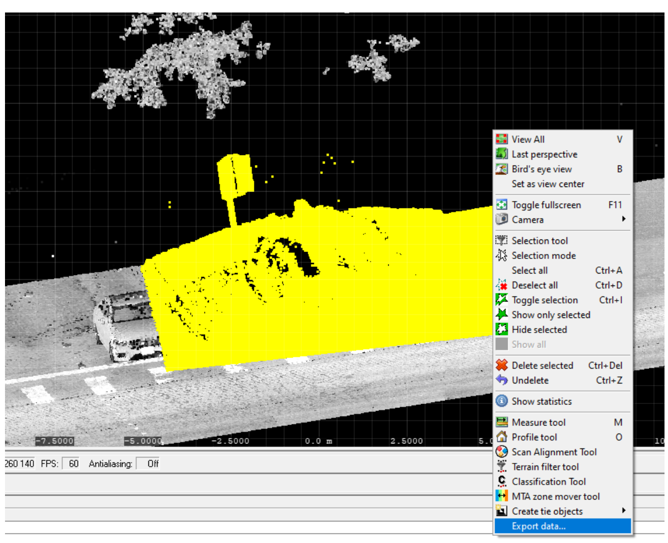


2. From the project manager, you can select individual records, and export them

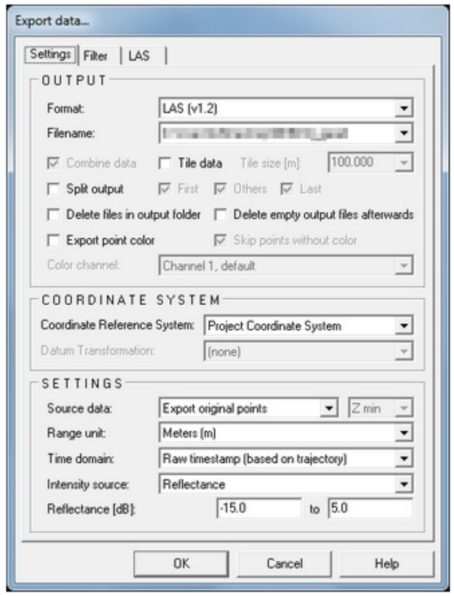


3. Inside of a 2D view: hold “E” and make a rectangular selection with the mouse inside the view.

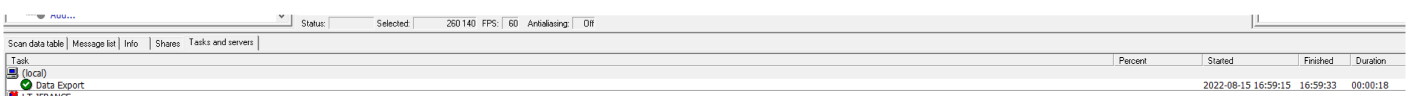
4. Inside the 3D viewer you can use the selection tool, and right click the view and select “Export Data”



5. Next you will want to choose the options that best fits your projects parameters and click Ok.



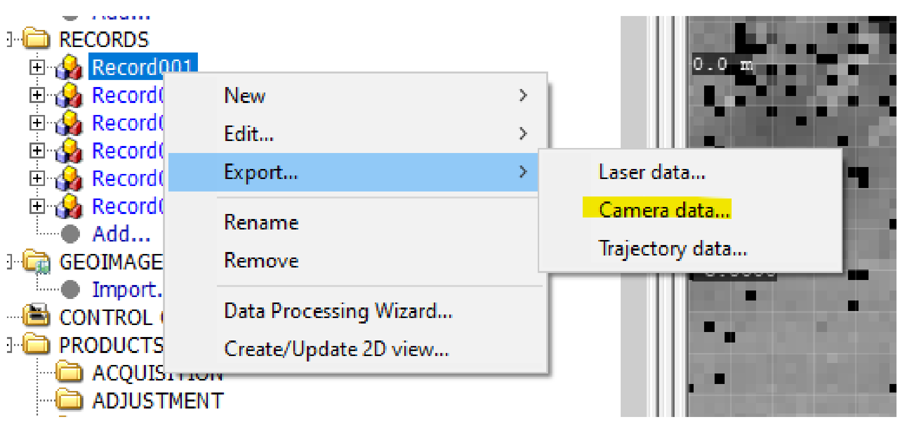
6. You will now see a progress bar in "Task and Servers" menu. Once that bar is complete, you will find your exported data in the export folder location you choose.



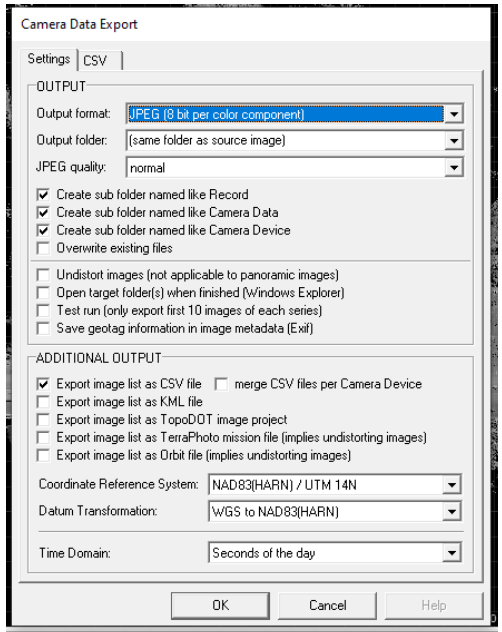
CAMERA DATA EXPORT

Camera data can be exported in JPED or TIFF format. Optionally, also index files containing time stamps, positions and orientation for each image can be created.

1. Select the camera data you want to export, right click and select "Export" As an alternative, you can also select one or more records by right clicking on the record and choosing "EXPORT" > Camera data



2. On the page "Settings" you can define the image output format (format details see below) and the output folder.



3. It is recommended to activate all options "Create sub folder named like ..." to avoid images getting overwritten because of identical names.

4. As an additional output RIPROCESS can create index files. They include additional information for each image such as: Time stamp, position, and orientation of camera. Currently RiPORCESS supports CSV, KML, TopoDOT, TerraPhoto, and Orbit index file formats.