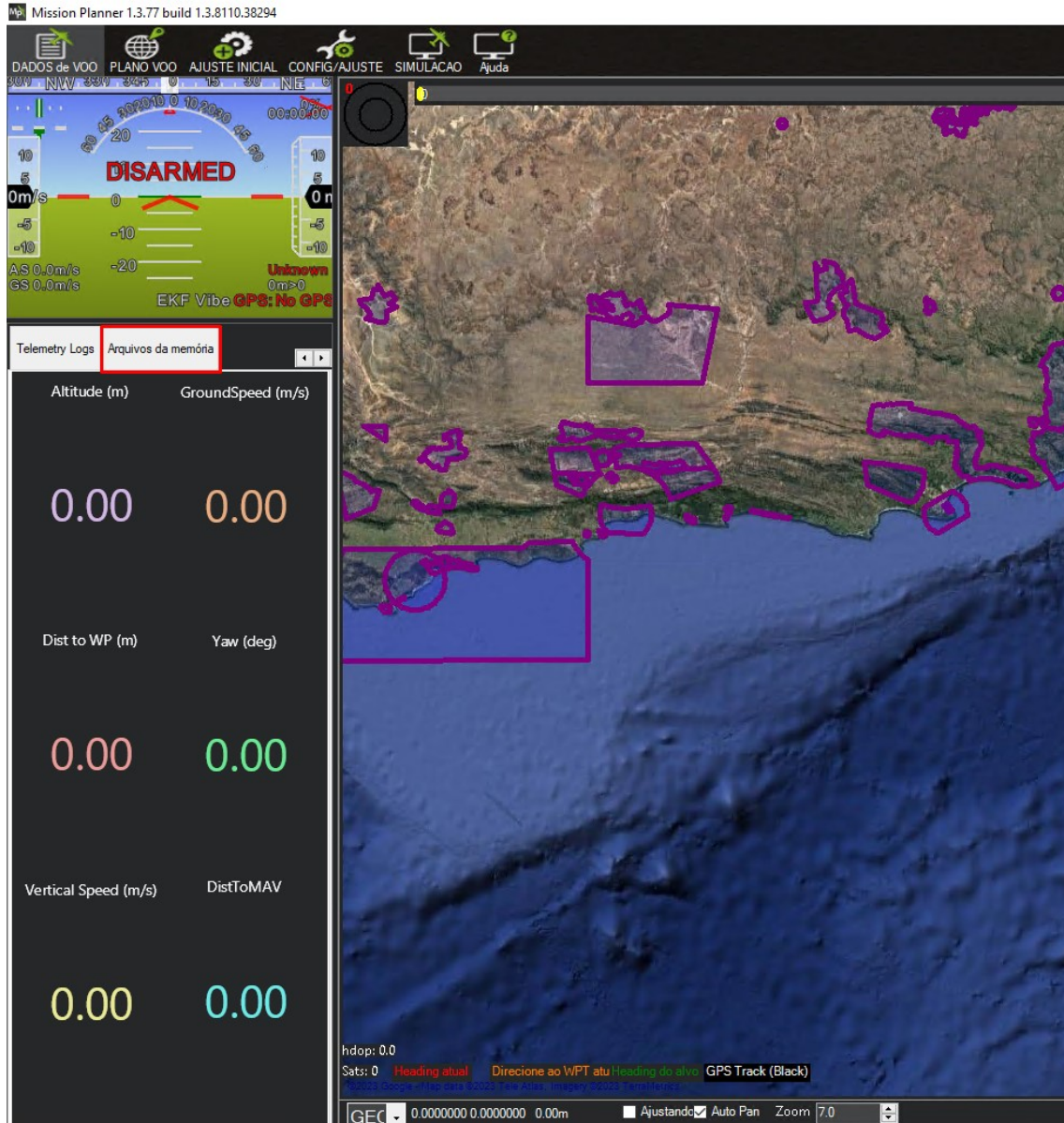


# Processing Agrowing's Multispectral Imagery with Pix4D Fields

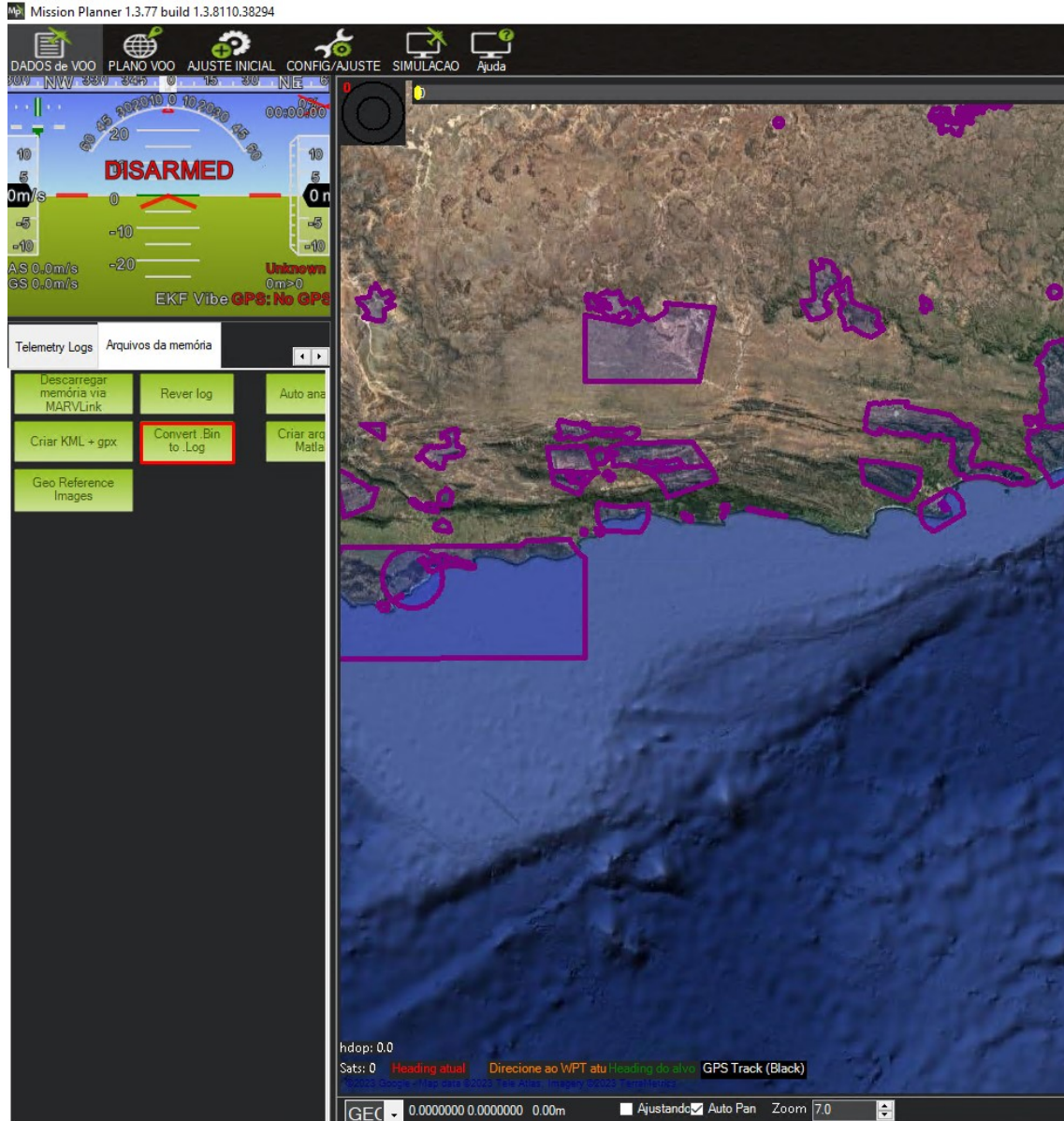
March 2023

The first step of the processing is the conversion of the flight LOG.

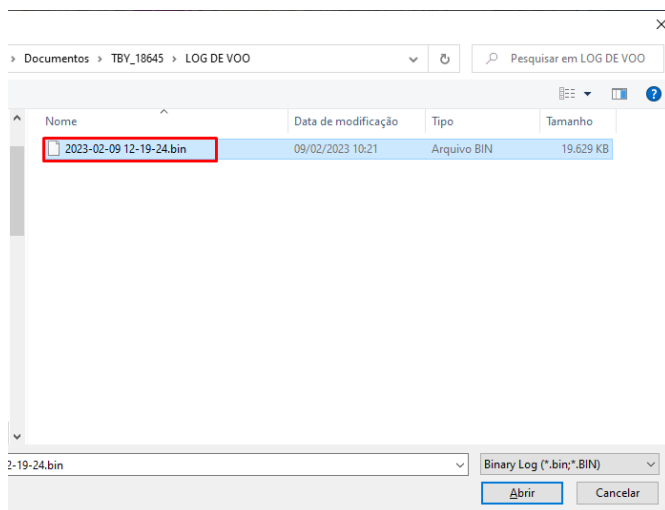
The MISSION PLANNER is used for this task.



Look for "memory files" in the Mission Planner and use the option "Convert Bin To "Log".



Locate the LOG in "BIN" and select it



In the same folder of the "BIN" file the LOG file will appear as a TXT document. The TXT file will be used for Geotagging the acquired imagery (photos) by the "Agrowing Basic" application.

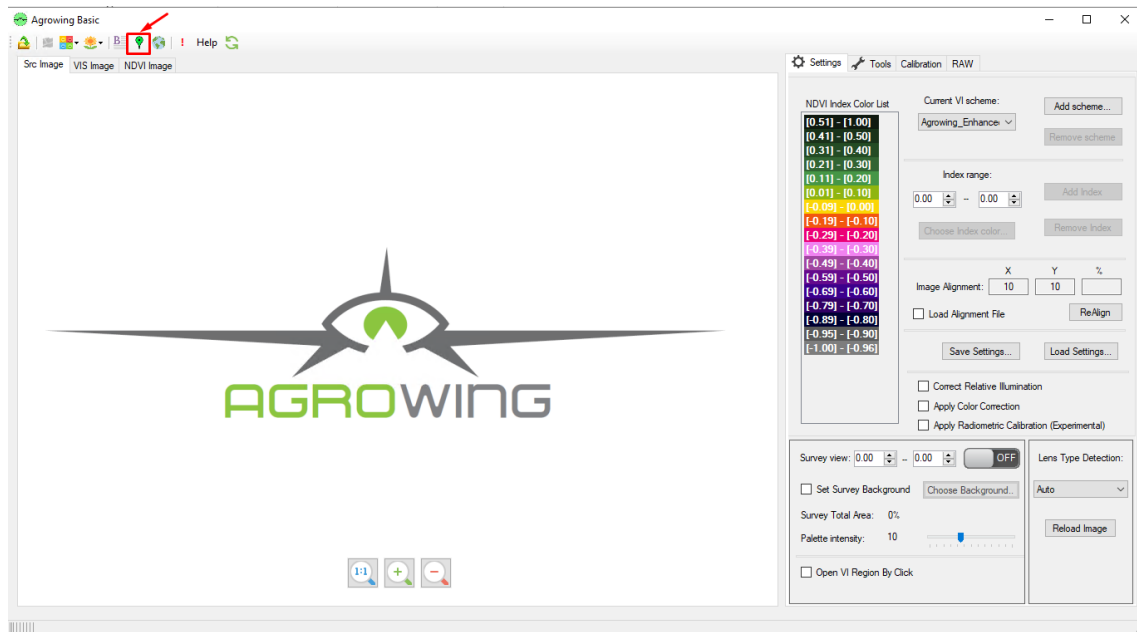
cumentos > TBY\_18645 > LOG DE VOO

| Nome                    | Data de modificação | Tipo               | Tamanho   |
|-------------------------|---------------------|--------------------|-----------|
| 2023-02-09 12-19-24.bin | 09/02/2023 10:21    | Arquivo BIN        | 19.629 KB |
| 2023-02-09 12-19-24.log | 15/03/2023 09:58    | Documento de Te... | 44.002 KB |

After the conversion of the LOG file to a TXT one by the Mission Planner, launch Agrowing's Basic application.

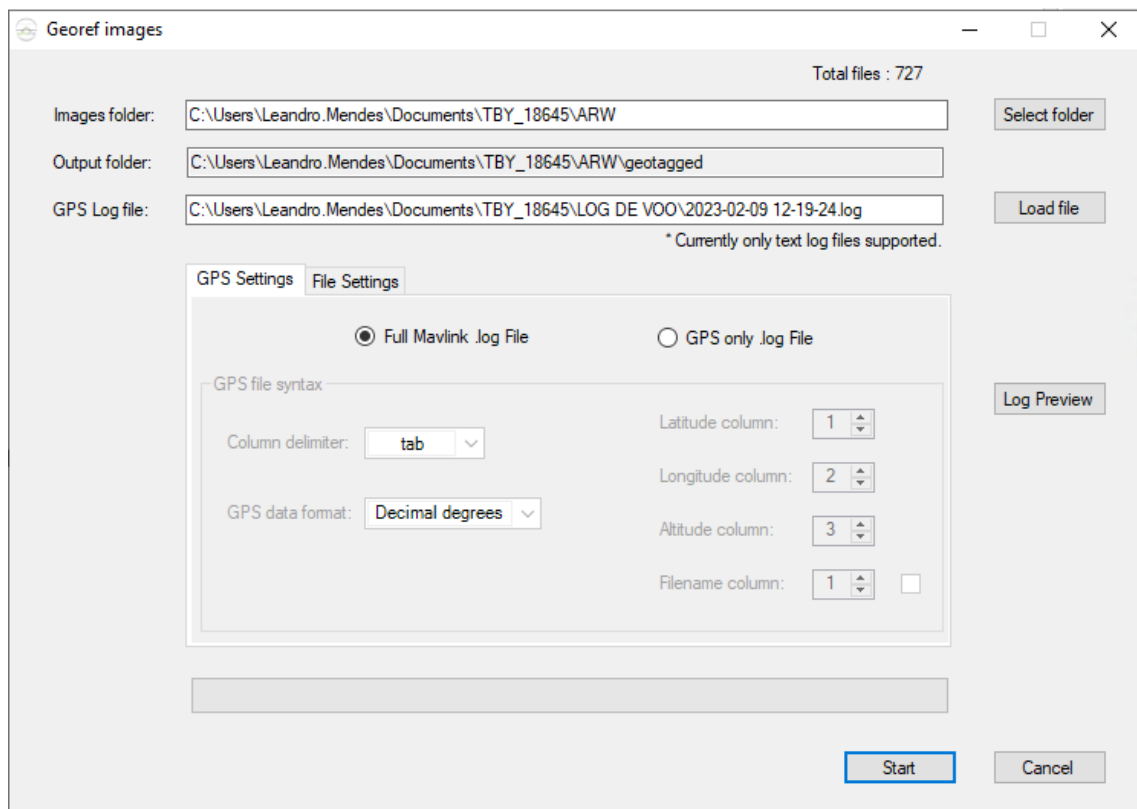
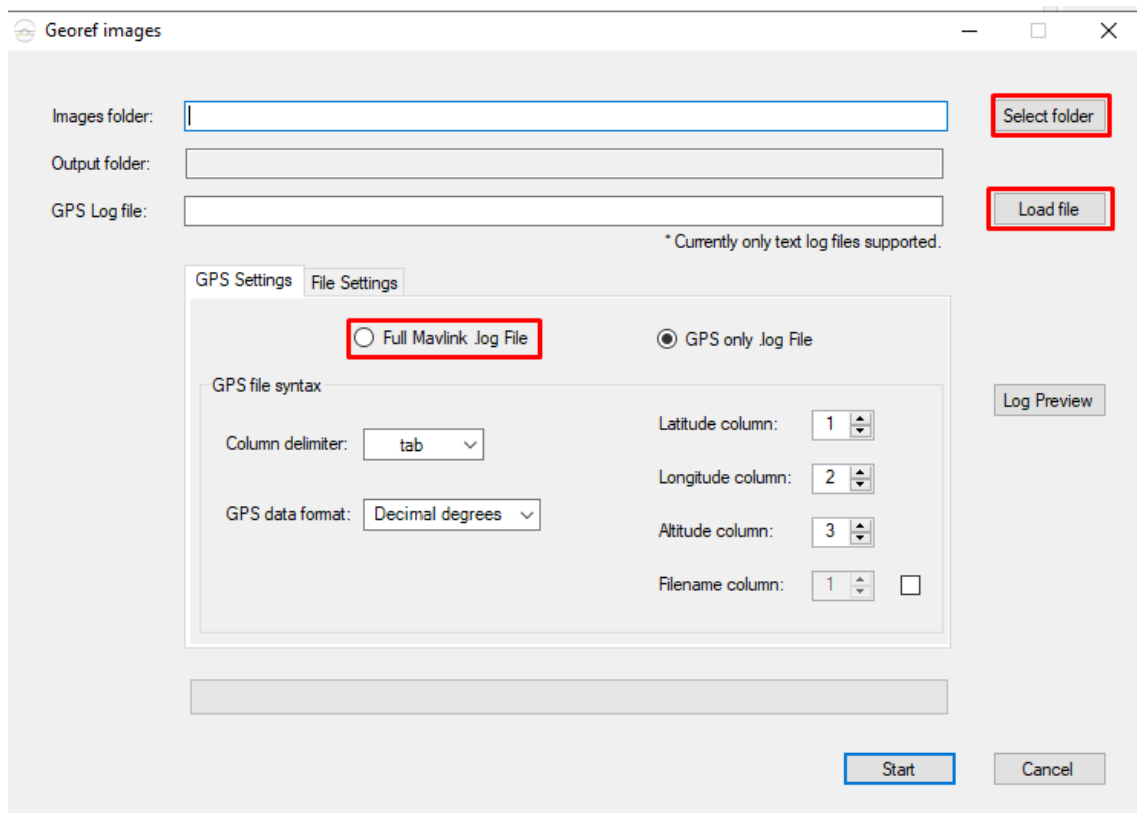


In Agrowing Basic go to "GeoRef Images"

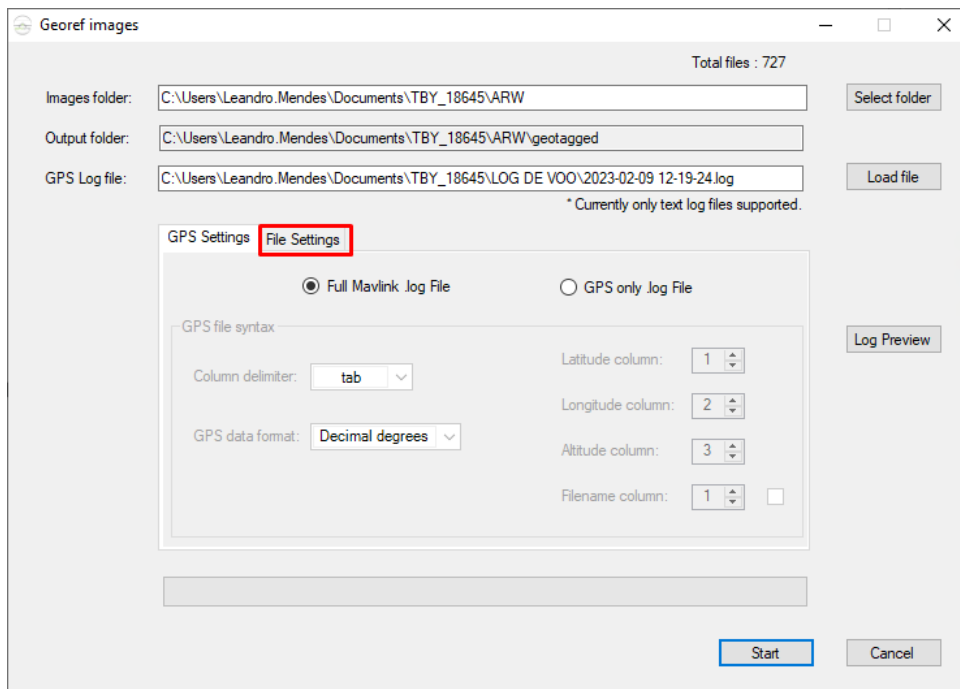


Select the folder where the images to be Georeferenced are located and then the Log TXT file location.

After selecting the two folders, enable the option "Full Mavlink .log File"

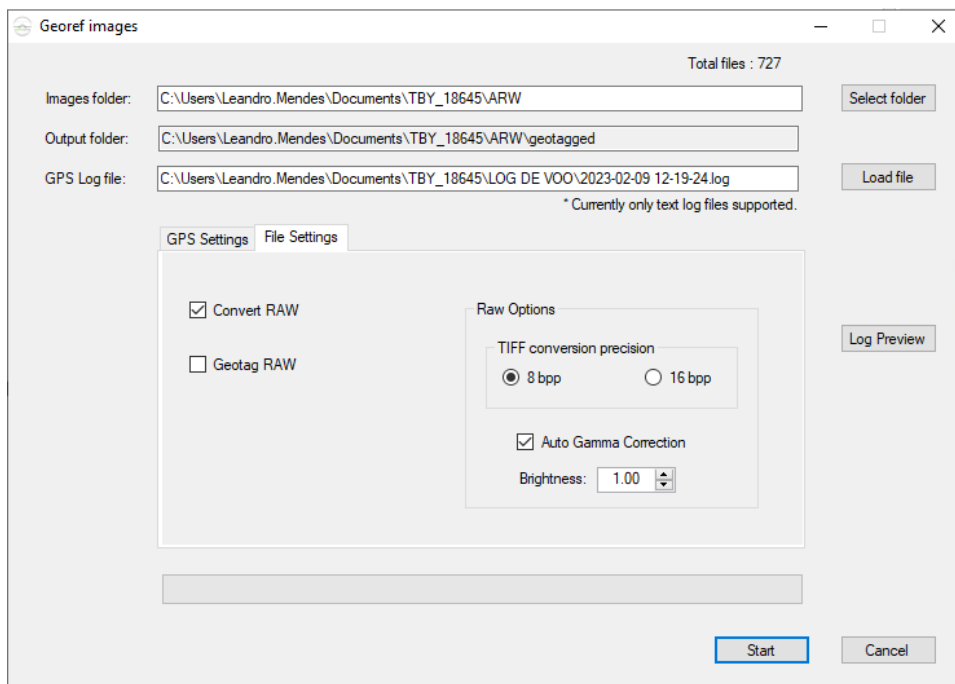


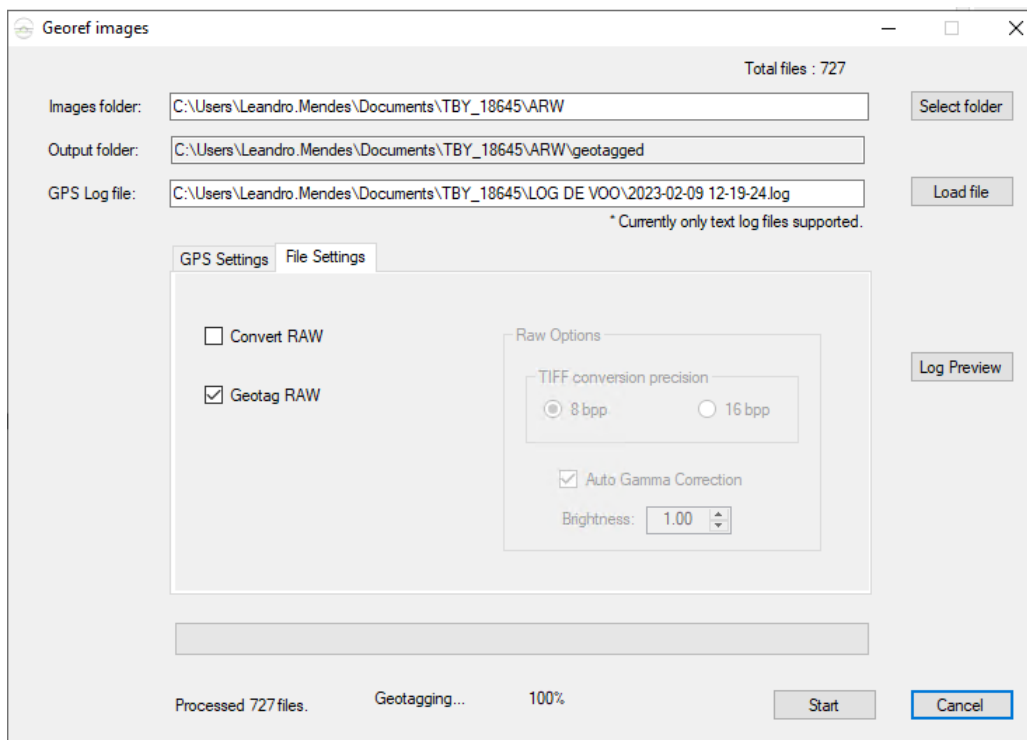
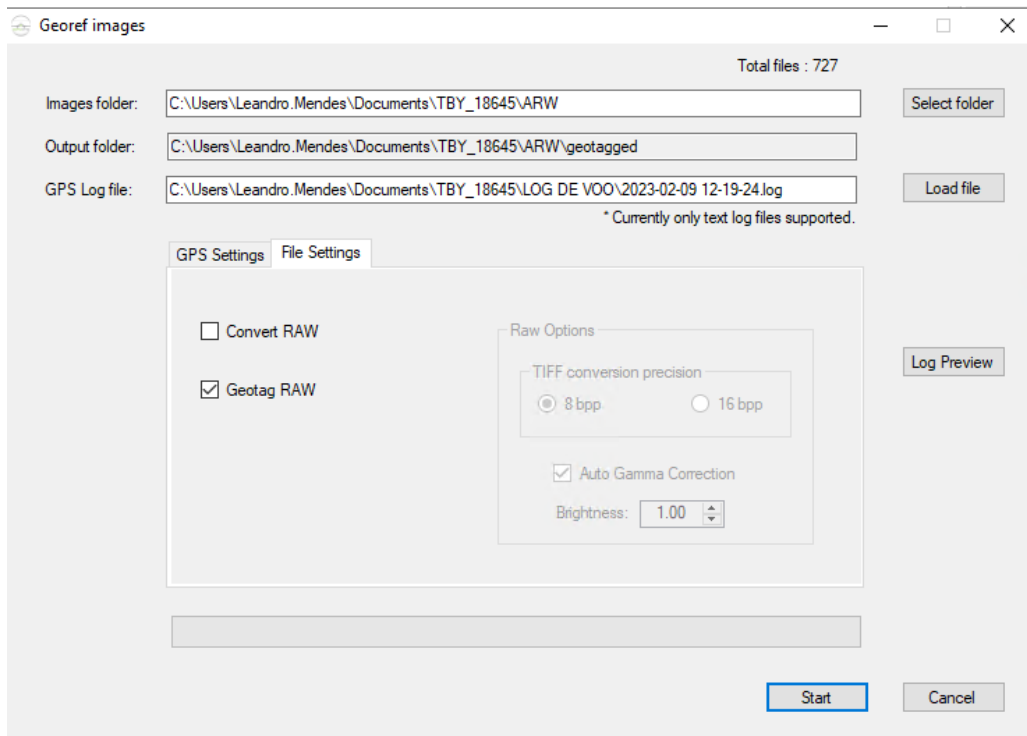
## Select the Tab "File Settings"



In the "File Settings" tab clear the option that is marked "Convert RAW" and enable the "Geotag RAW" option.

Click "Start" to start geotagging the images.

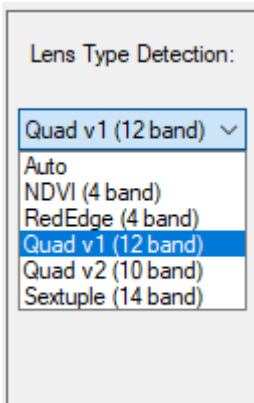
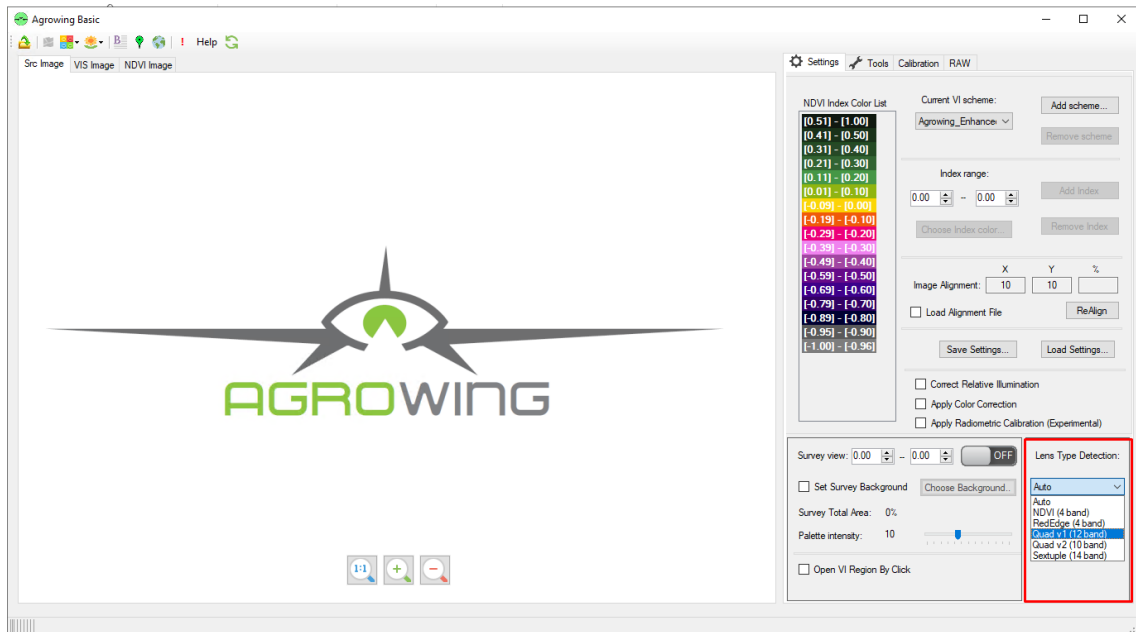




Once finished close this window.

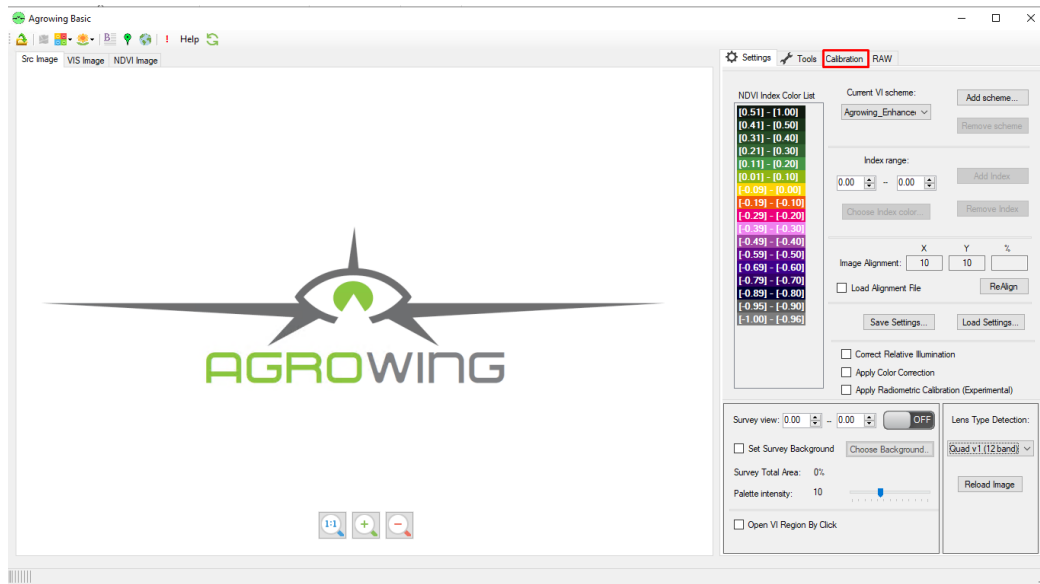
In the folder where the original images are located a new folder was created named ". ARW\_geotagged". The images in this folder are georeferenced.

To start the imagery processing, the type should be selected first. Click on "Lens Type Detection".

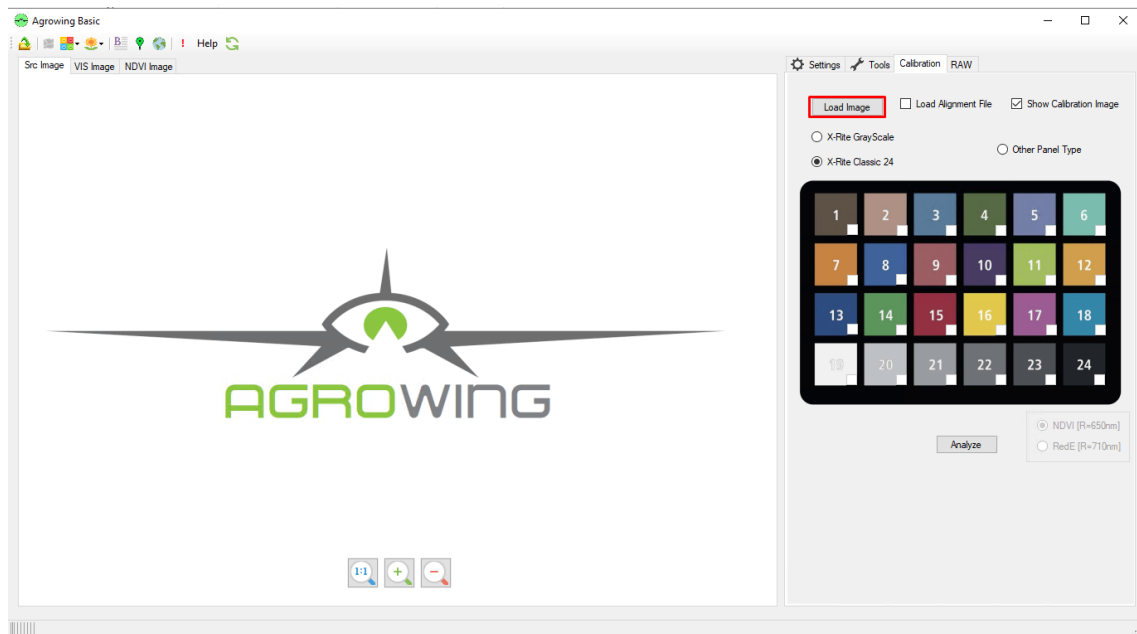




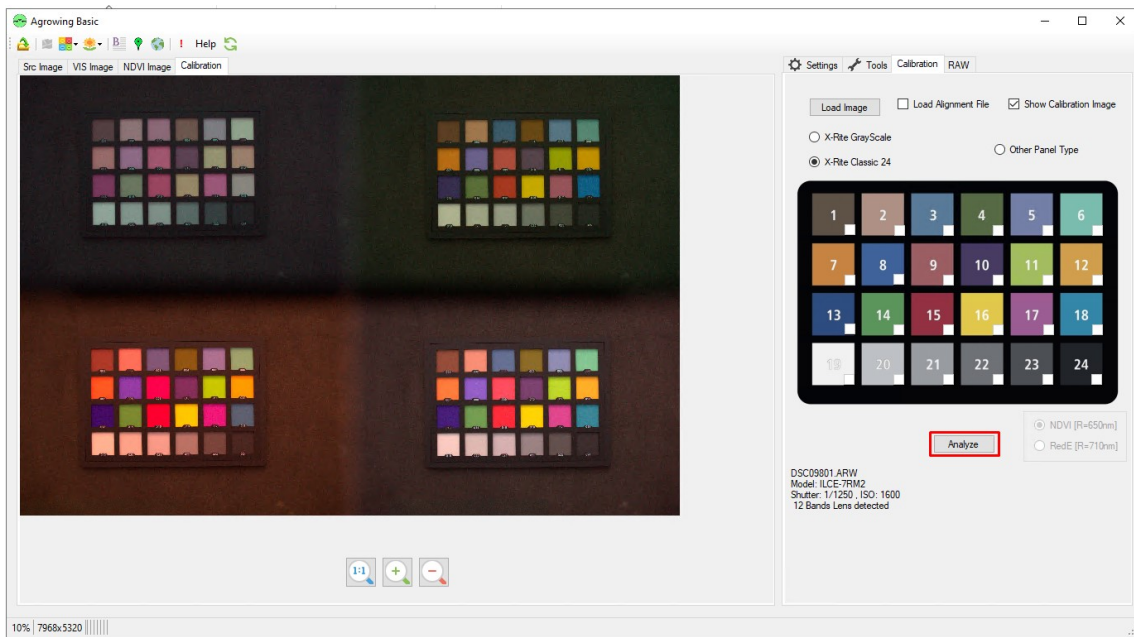
Next, load the image of the calibrating-board in the option "Calibration".



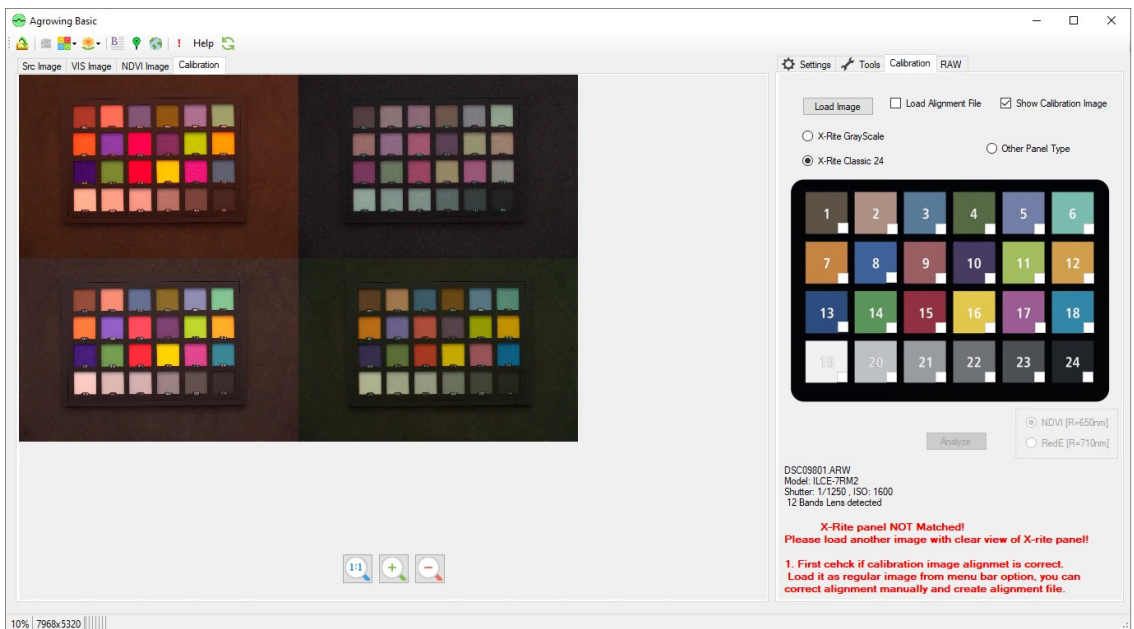
Load the board's image by clicking on "Load Image".

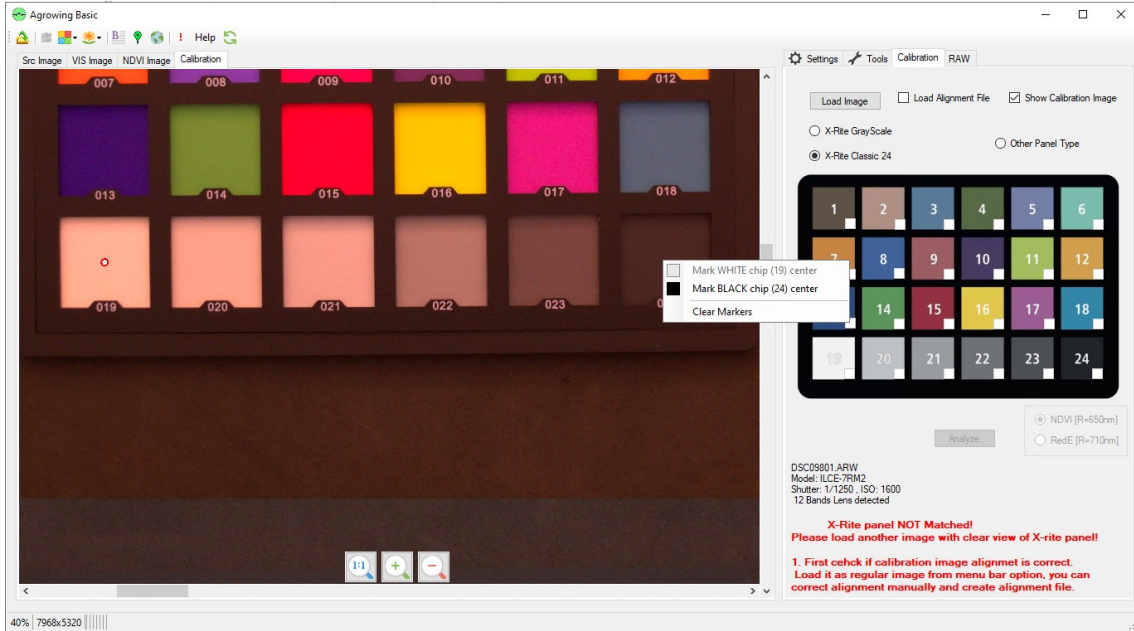
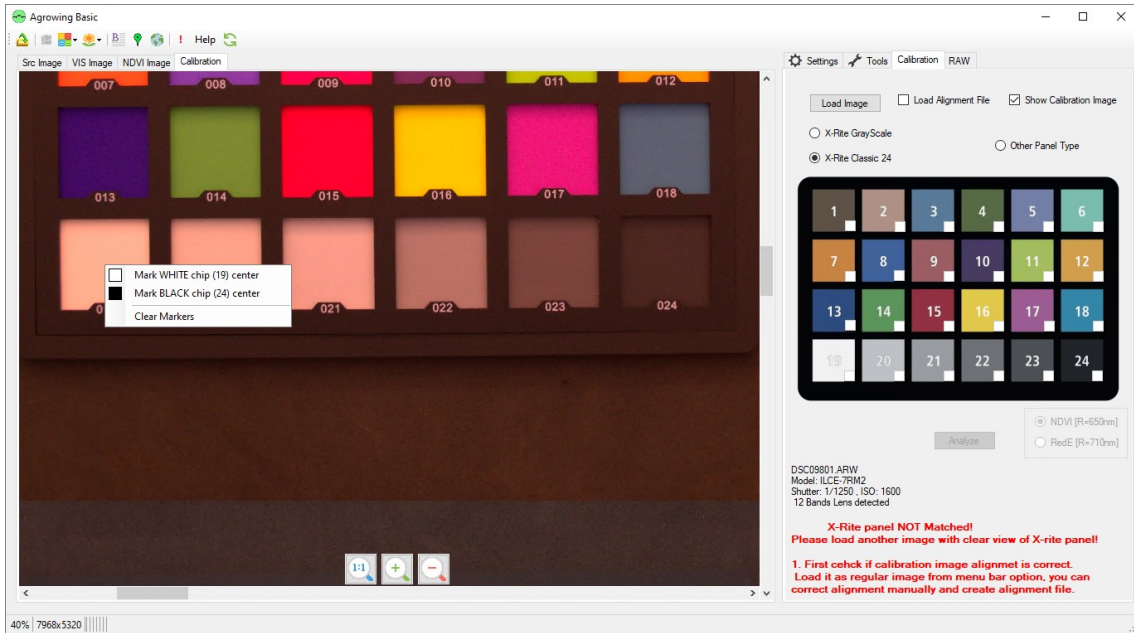


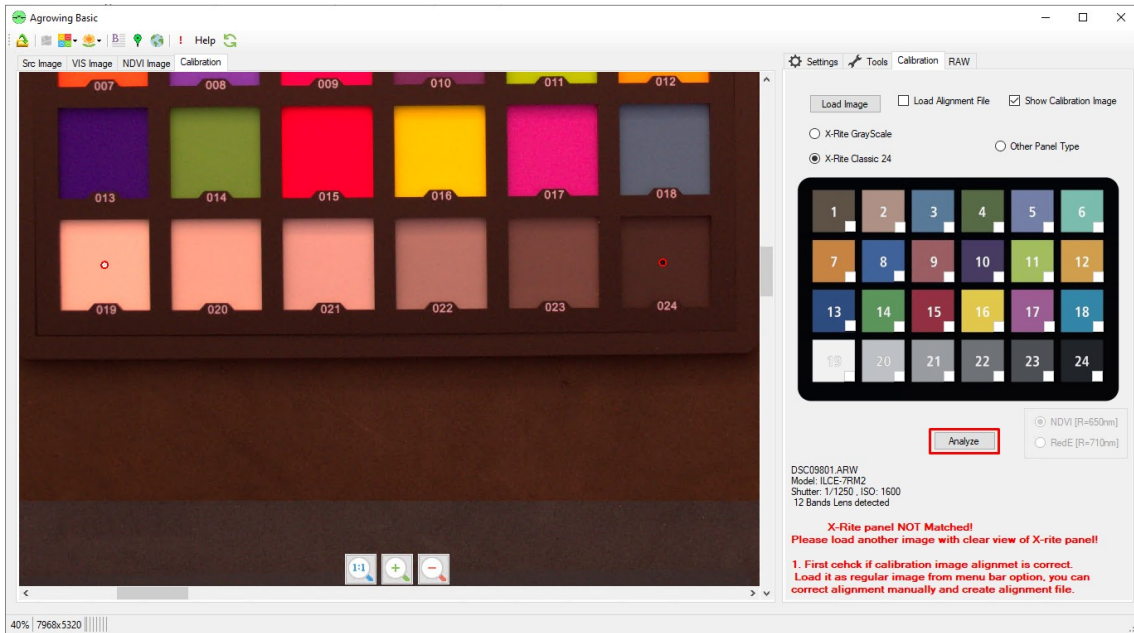
After the board's image was loaded, click on "Analyze".



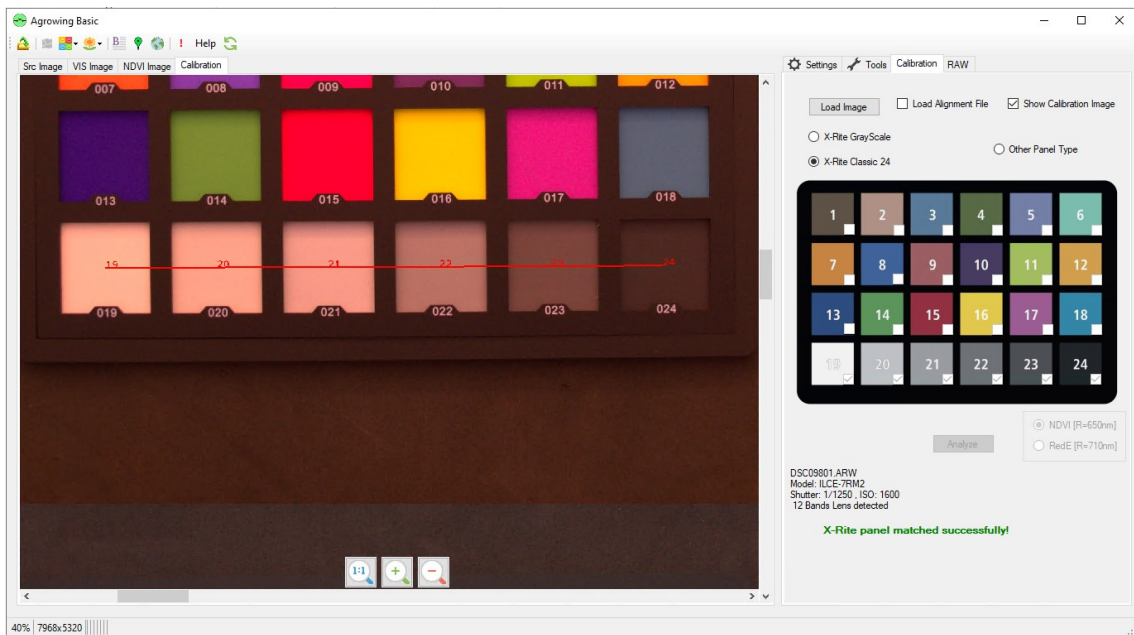
An error may occur at the end of the calibration analysis. If the error message "X-Rite Panel Not Matched" appears, click on the center of the white square (19) and in the center of the black square (24) and mark with the corresponding options, as shown in the images of the next page.





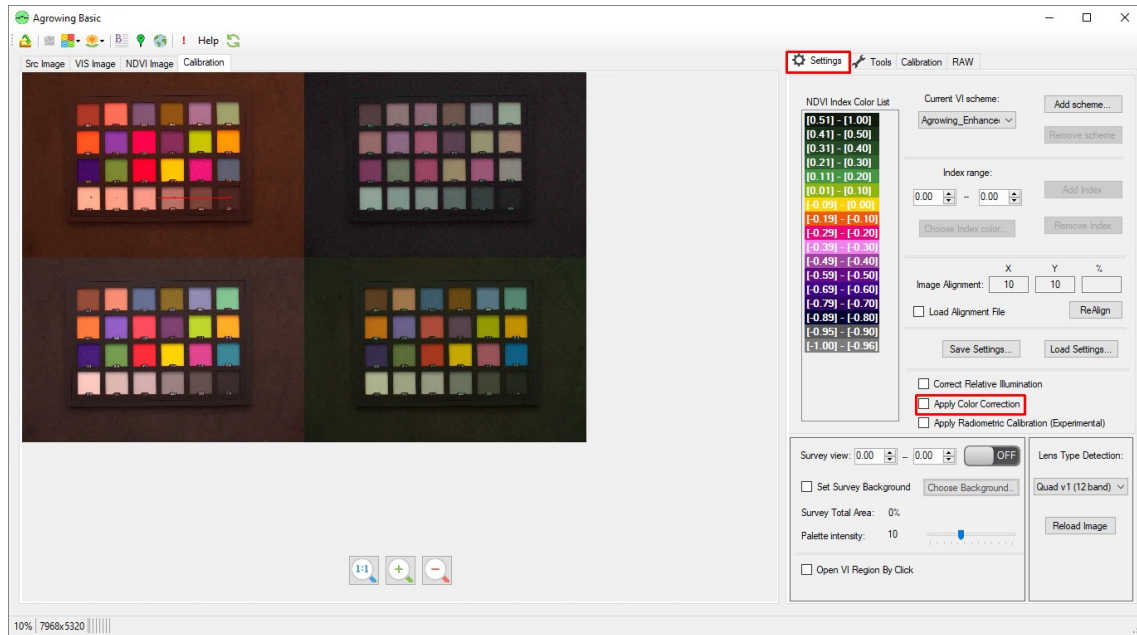


Click again on "Analyze".

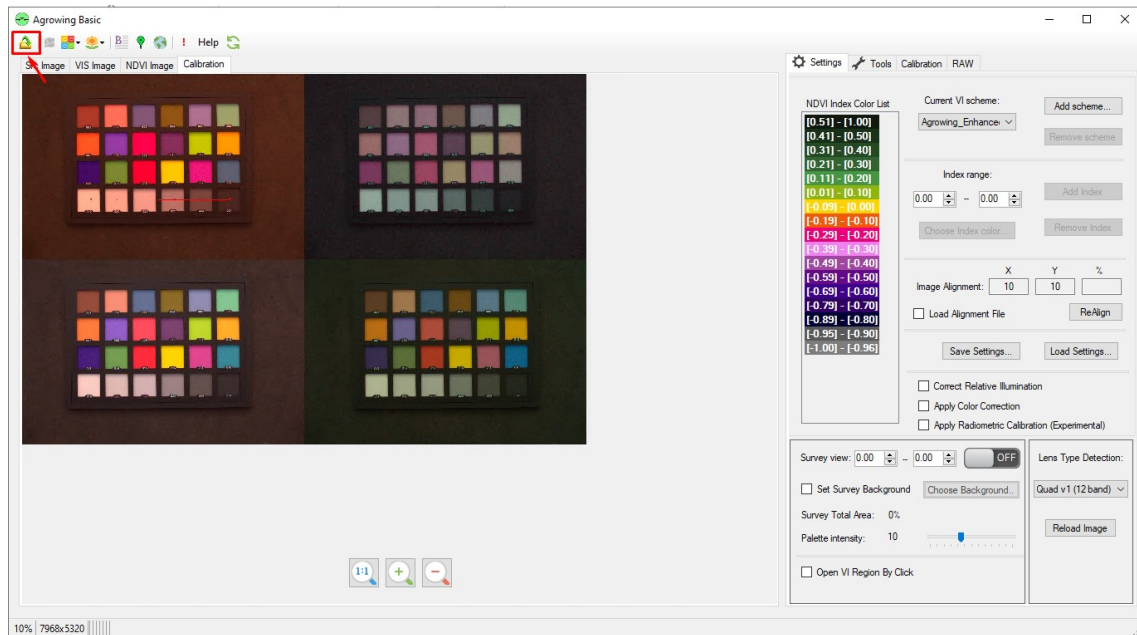


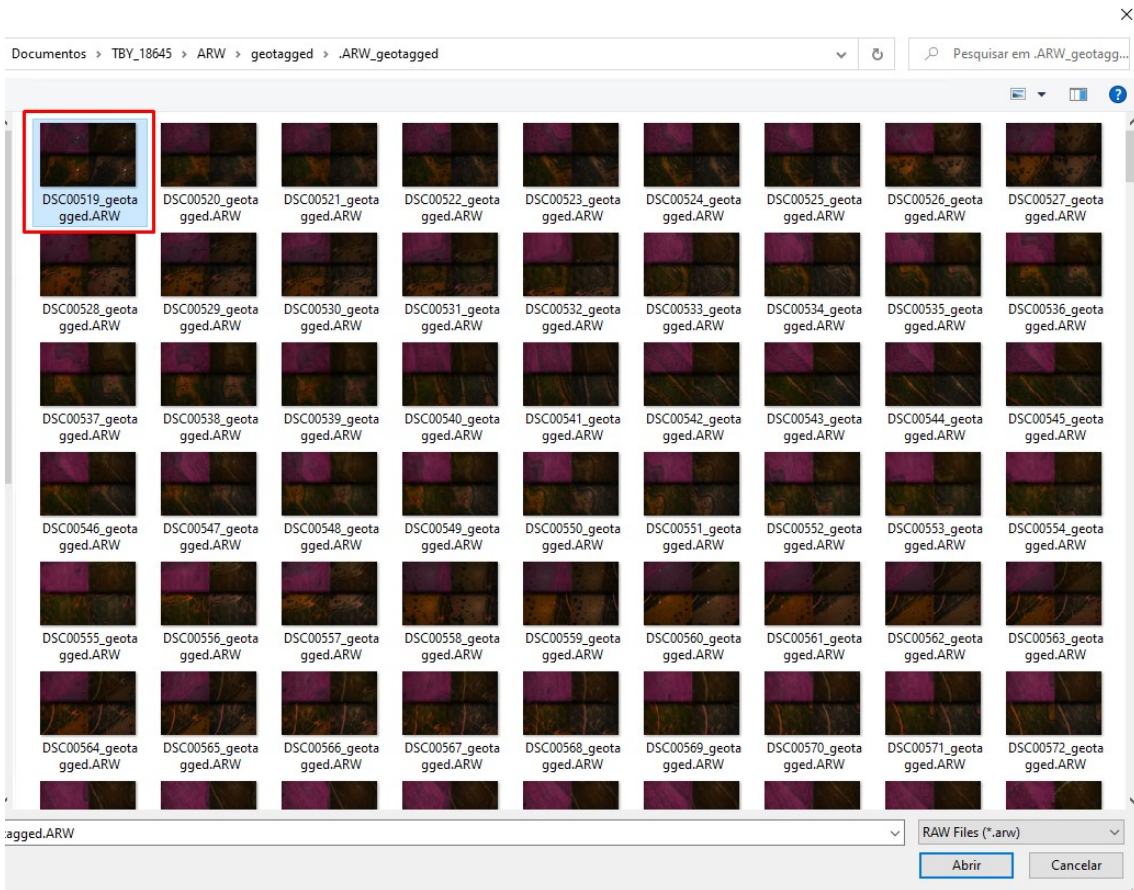
The message "X-Rite Panel Matched Successfully!" verifies that the calibration has been performed successfully.

Return to the "Settings" tab and enable the "Apply Color Correction" option.

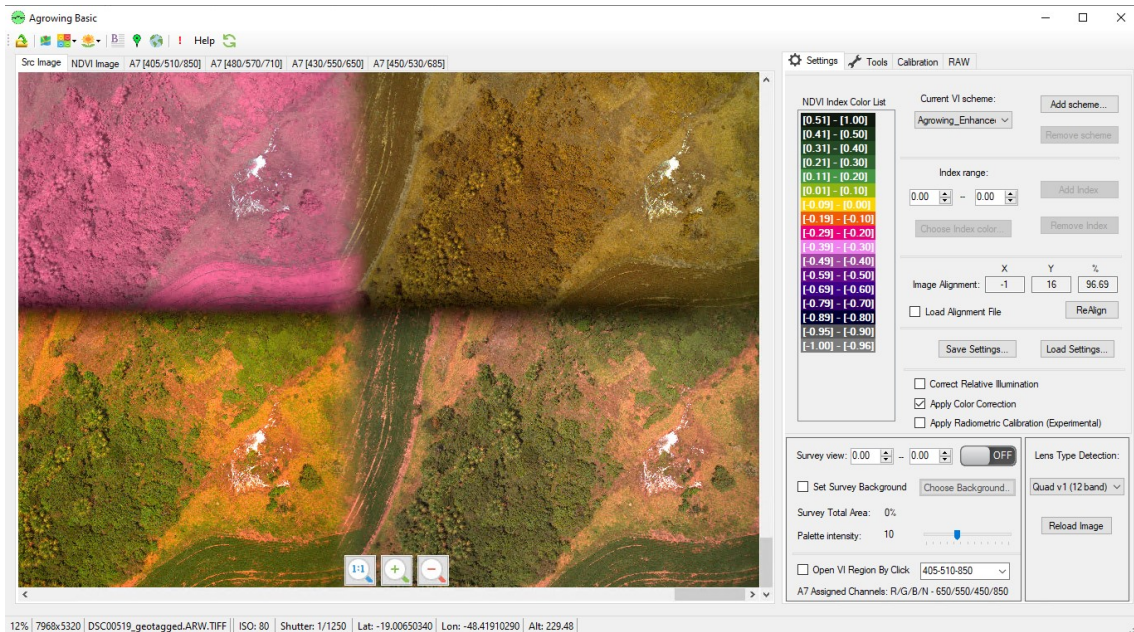


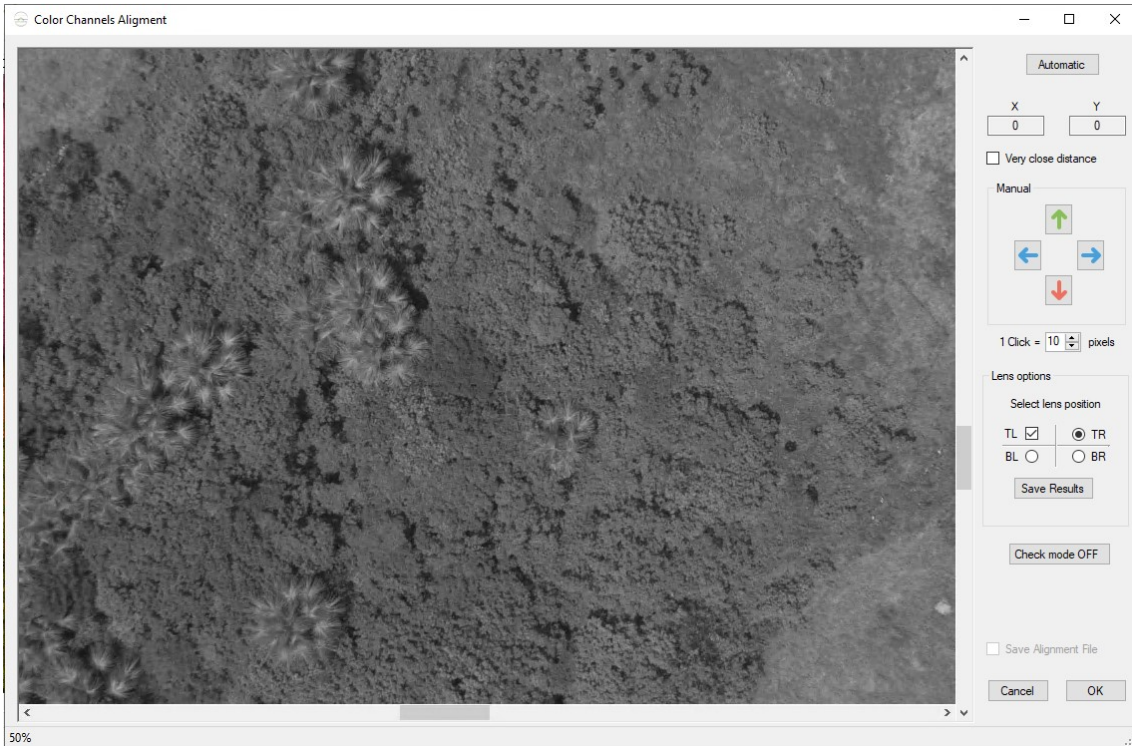
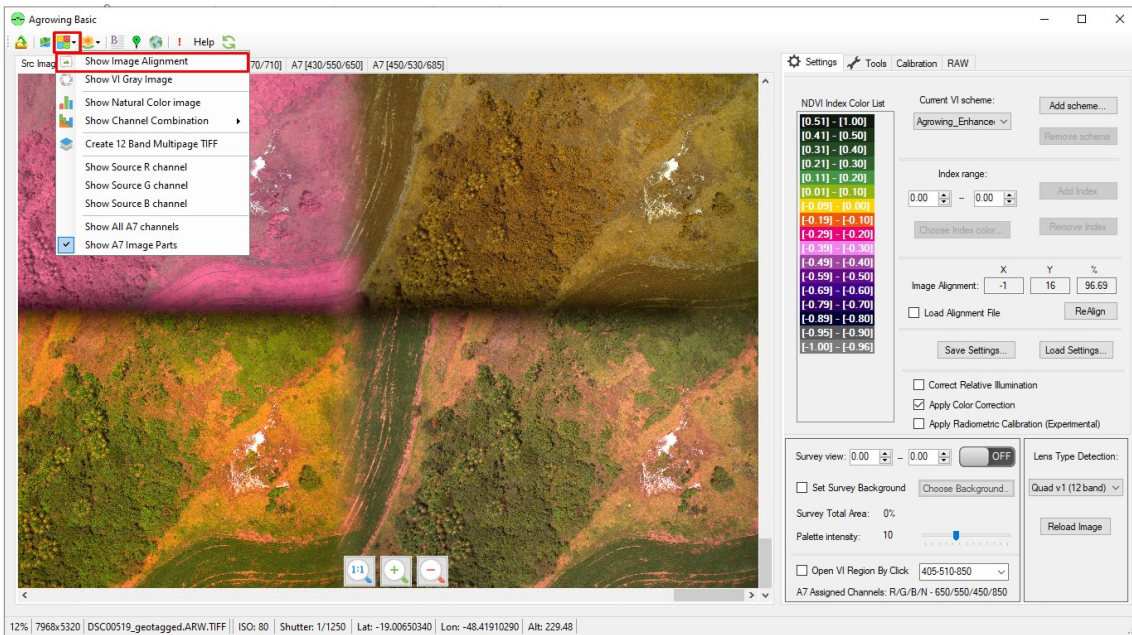
Upload the first image of the folder that has been Georeferenced in "ARW geotagged".





After the image loaded perform the bands alignment by clicking on the option "Show RGB Channels" and then "Show Image Alignment" as seen on the next page.

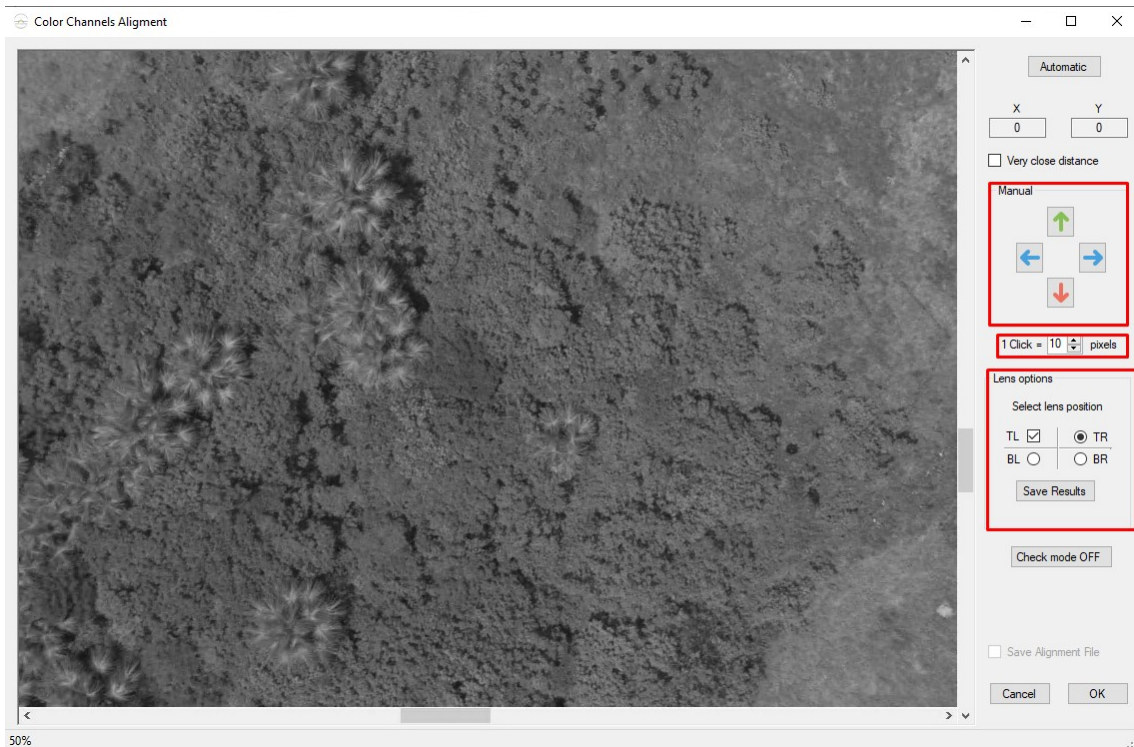




Check the alignment by identifying a distinctive point in the image and use the arrows to move the quadrants' images for optimal overlapping.

Set the number of pixels for with each Click. (Final alignment should be done using 1 Pixel).

In "Lens Options" check and align each of the options "TR" – "BR" – "BL". With every single check and alignment the alignment must be saved by clicking on "Save Results"

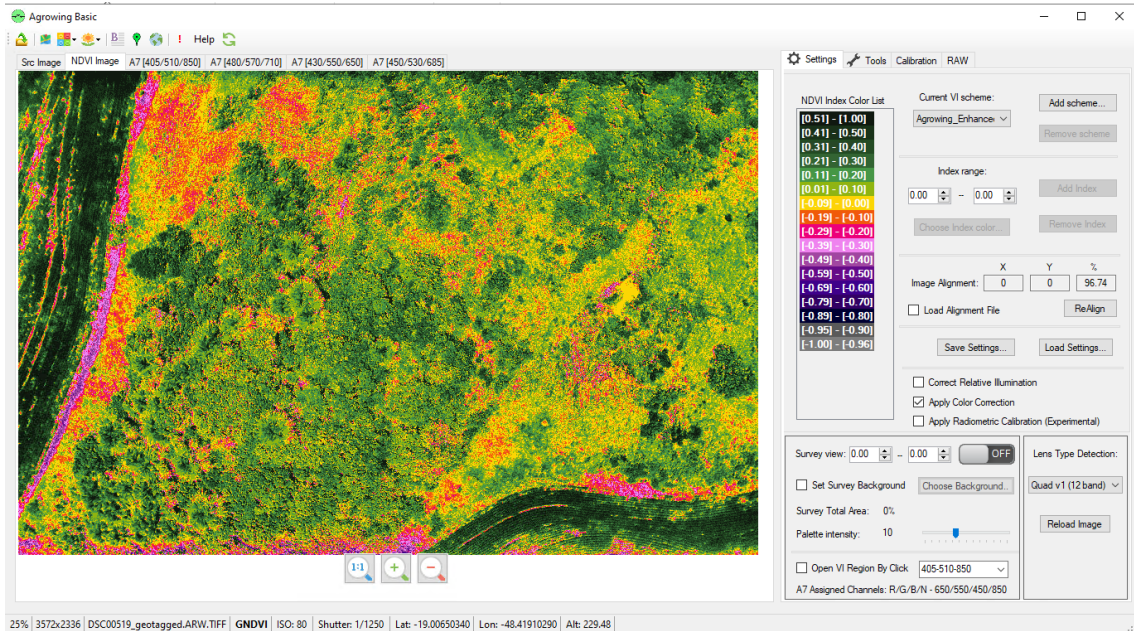
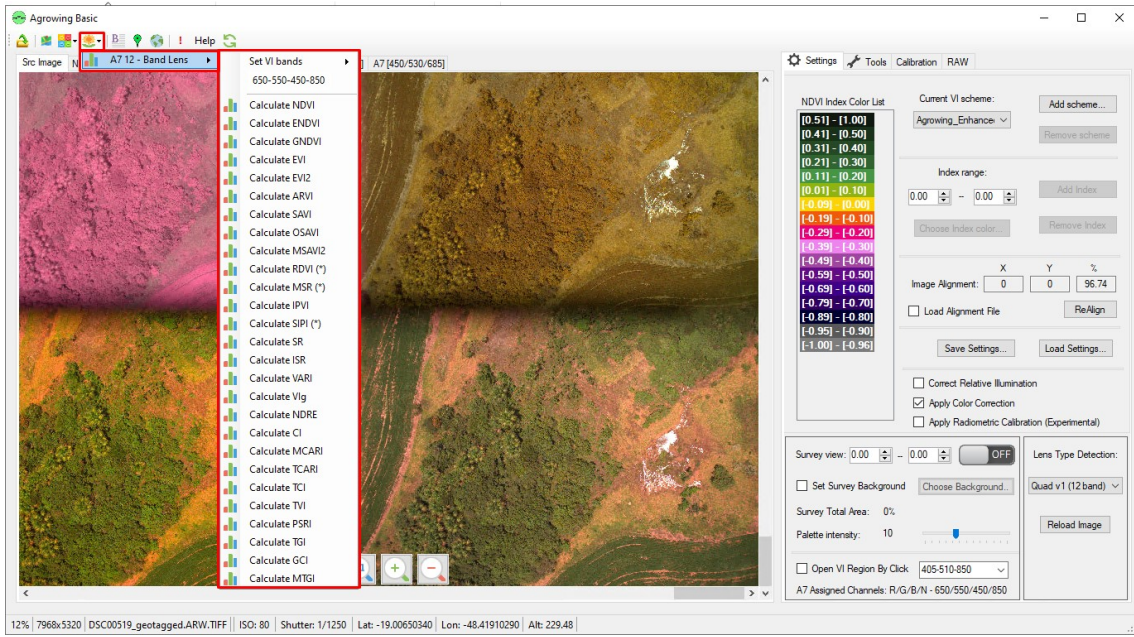


Once all the 4 quadrants were aligned, click on "Save Alignment File" and then click on OK.

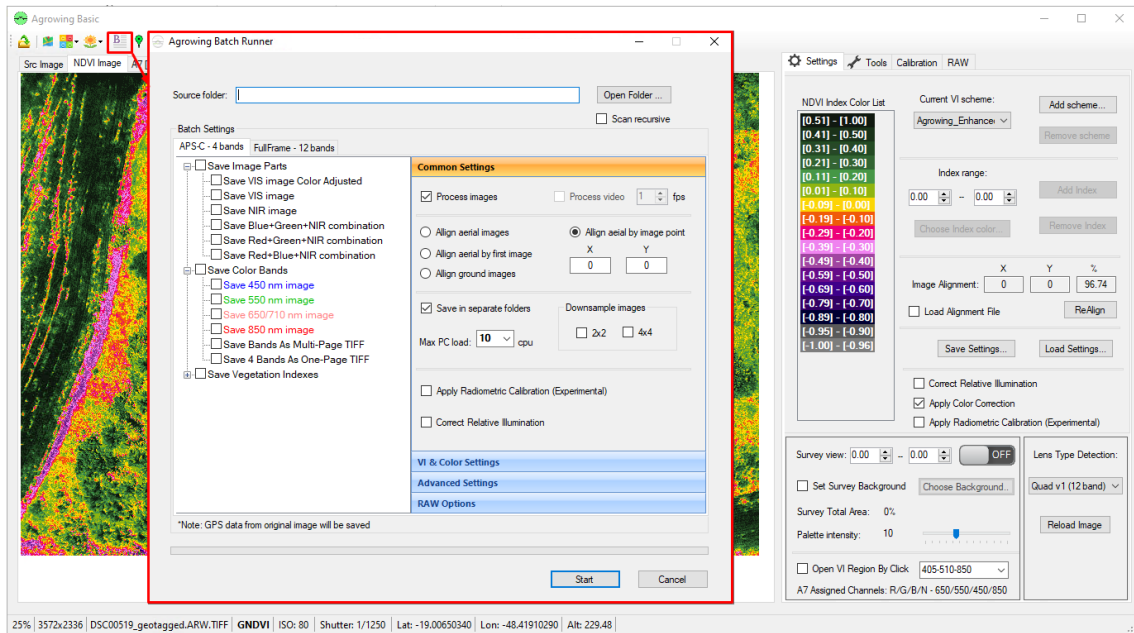


Select and apply an index of your choice from the supported vegetation indices. Click on "Calculate Vegetation Index", then on "Band Lens", and select some index for the boards activation.

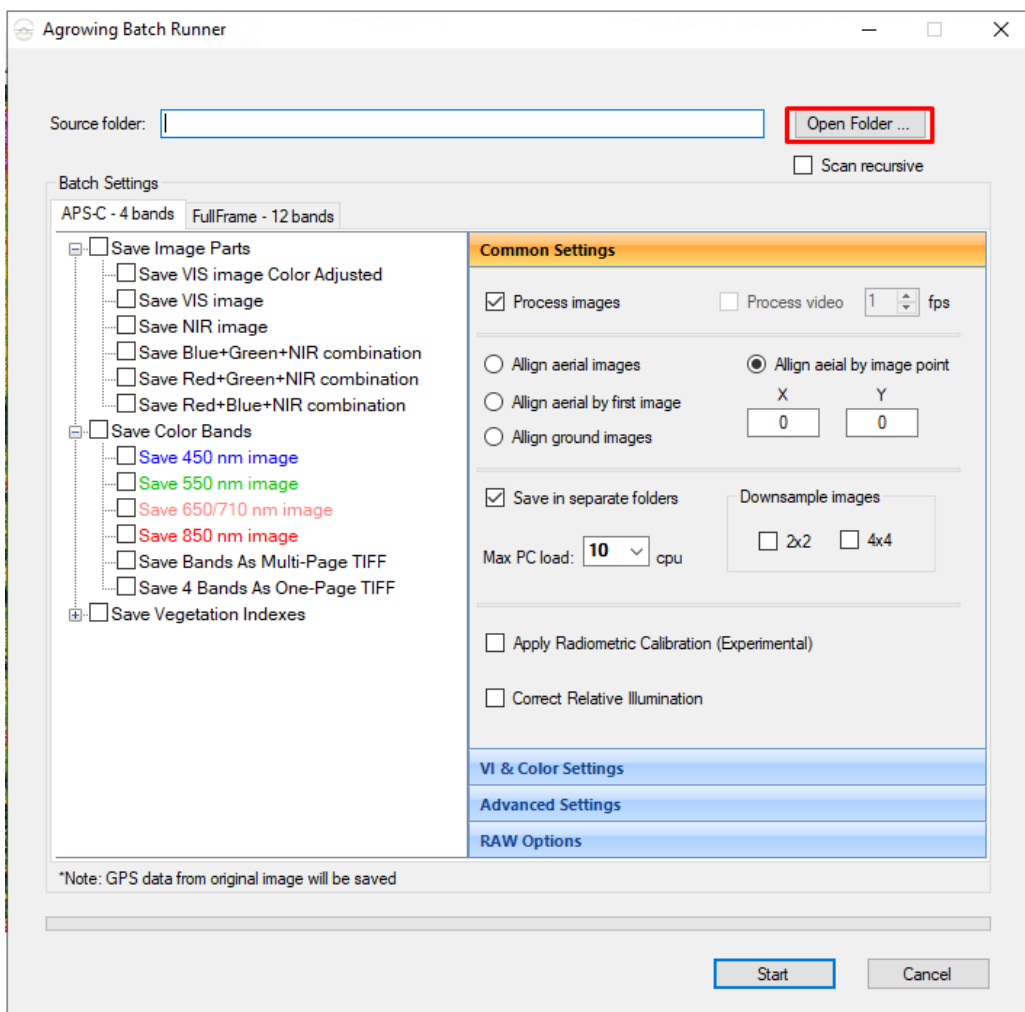


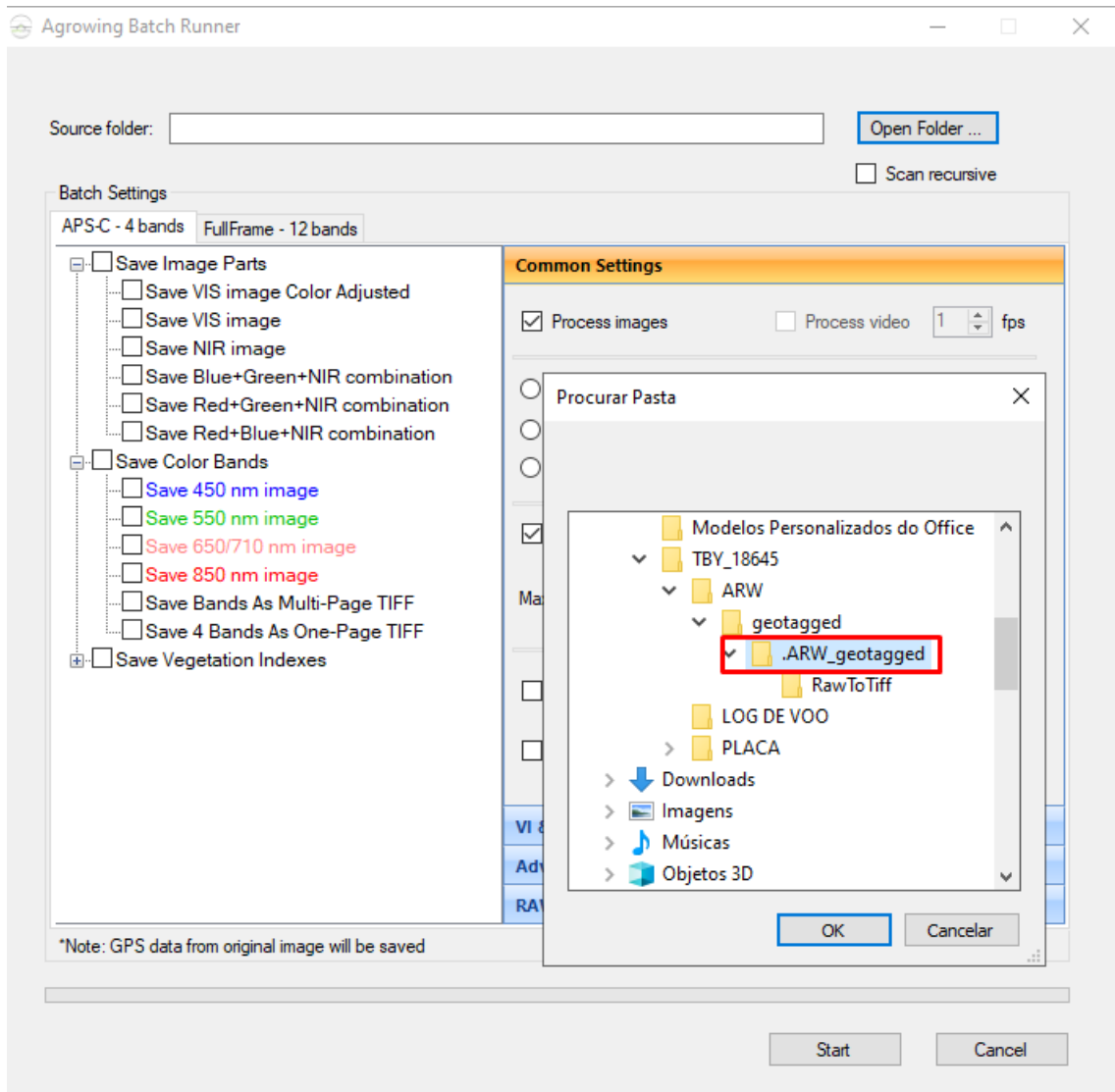


To process all the mission's images, use the "Batch Runner". After opening the window configure the options in the following order.

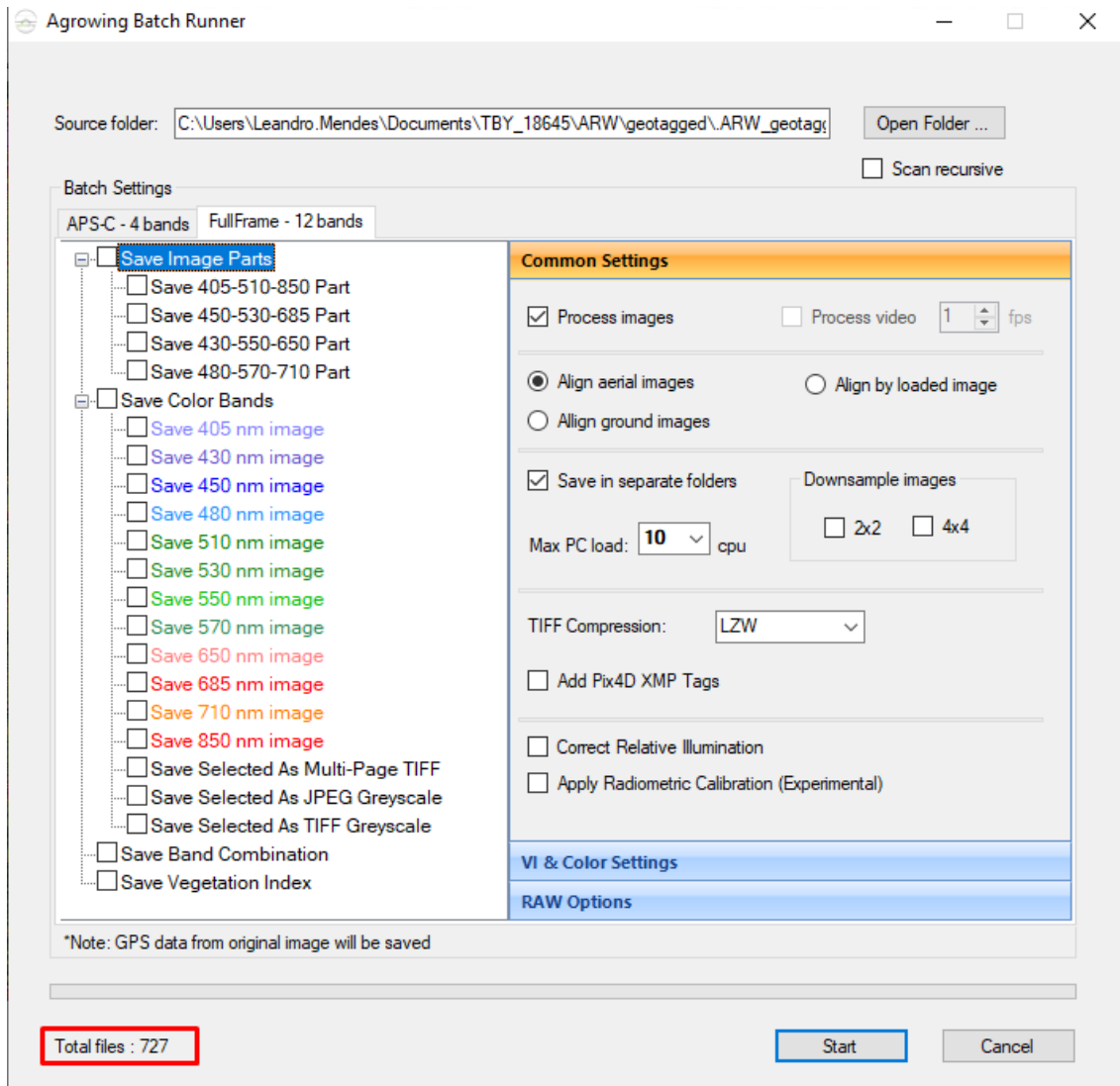


First, locate and select the folder where the Geotagged images are located.



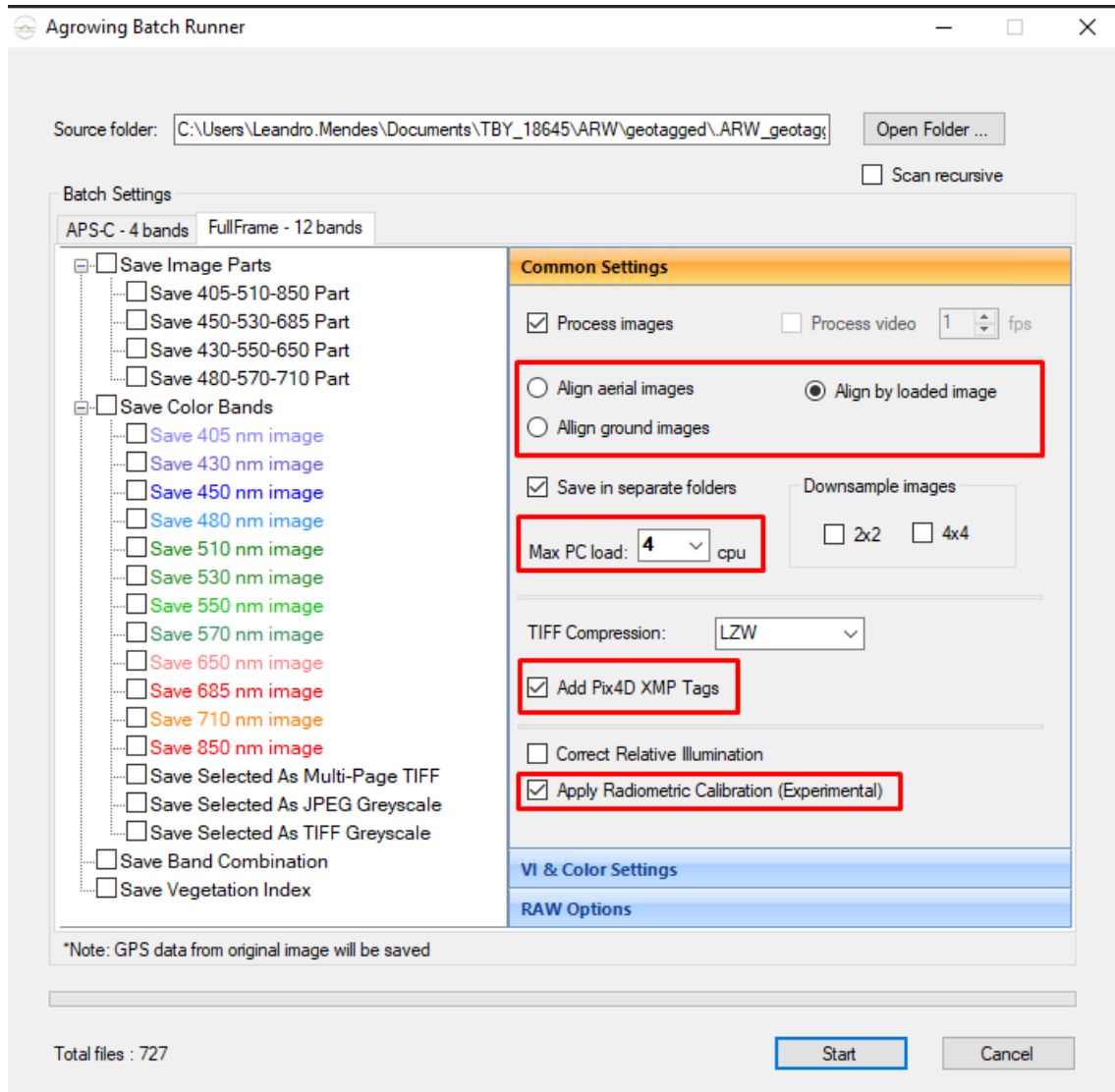


Verify (lower left corner) that the images were uploaded and the total uploaded number of the images matches the mission's number of images.

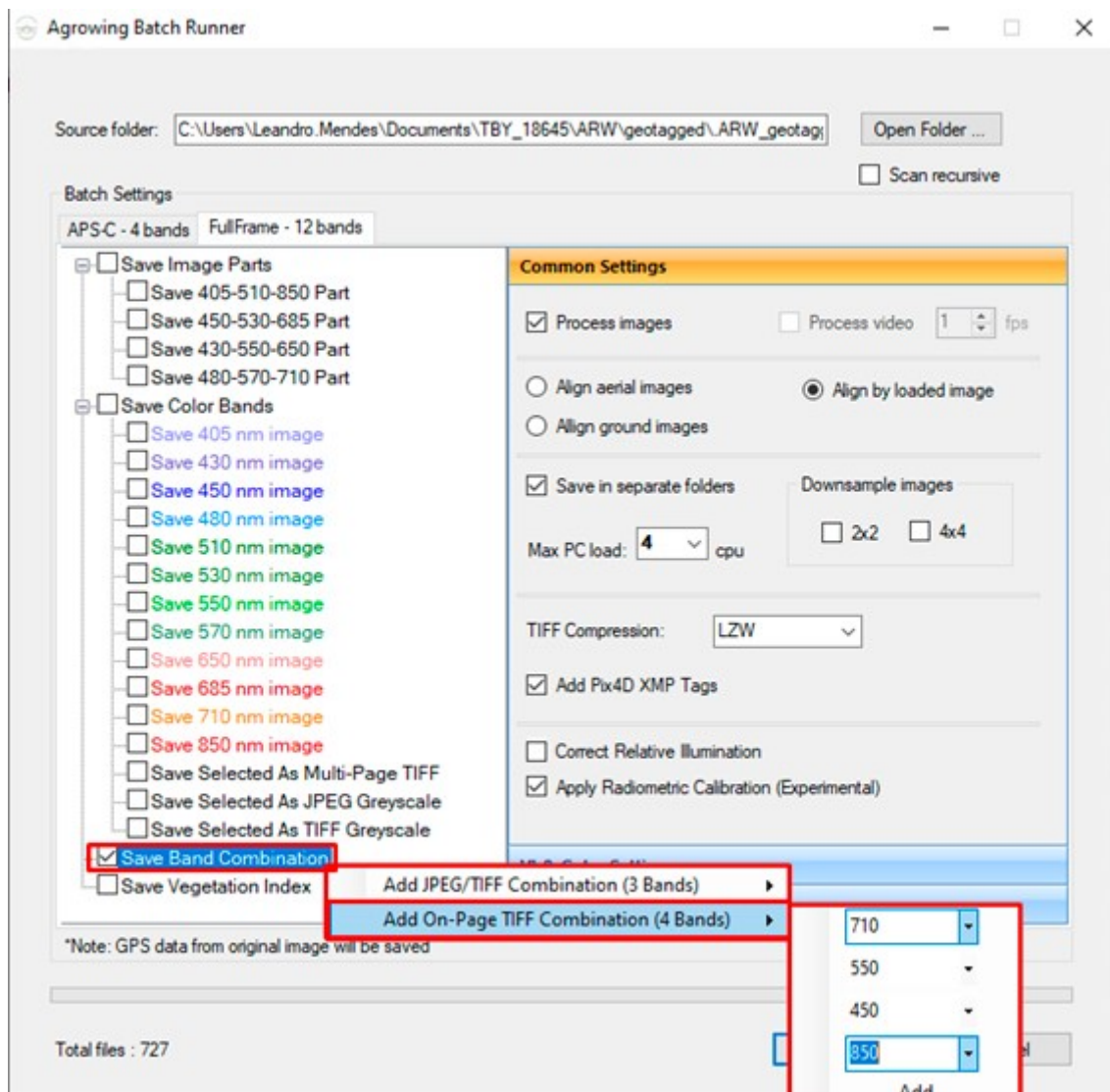


In the "Common Settings" tab we change some of the options as follows:

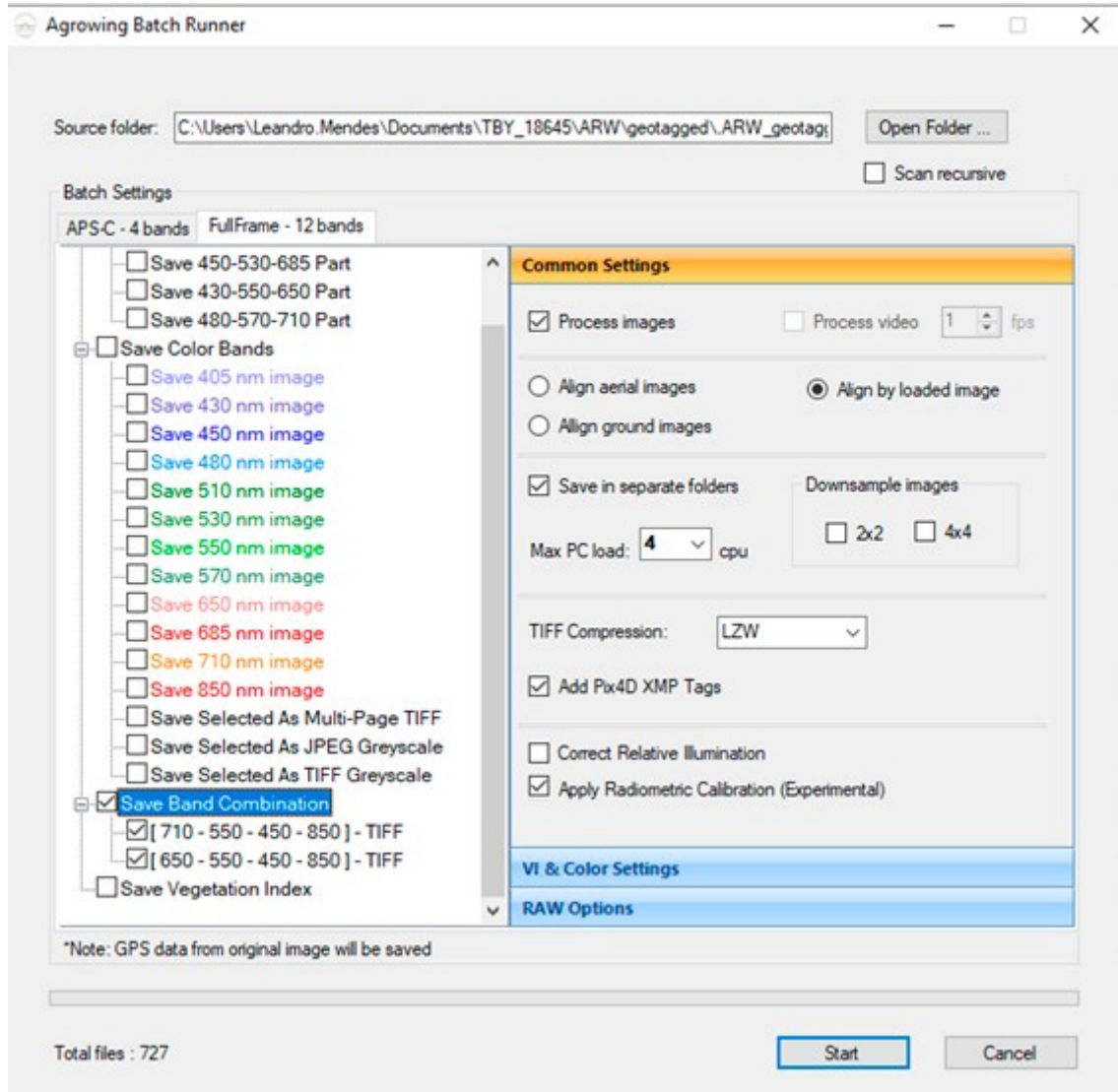
- Enable the "Align by loaded image" option.
- In "Max PC load" set the number of cores to be used for the processing.
- Enable the option "Add Pix4d XMP Tags".
- Enable the "Apply Radiometric Calibration" option.



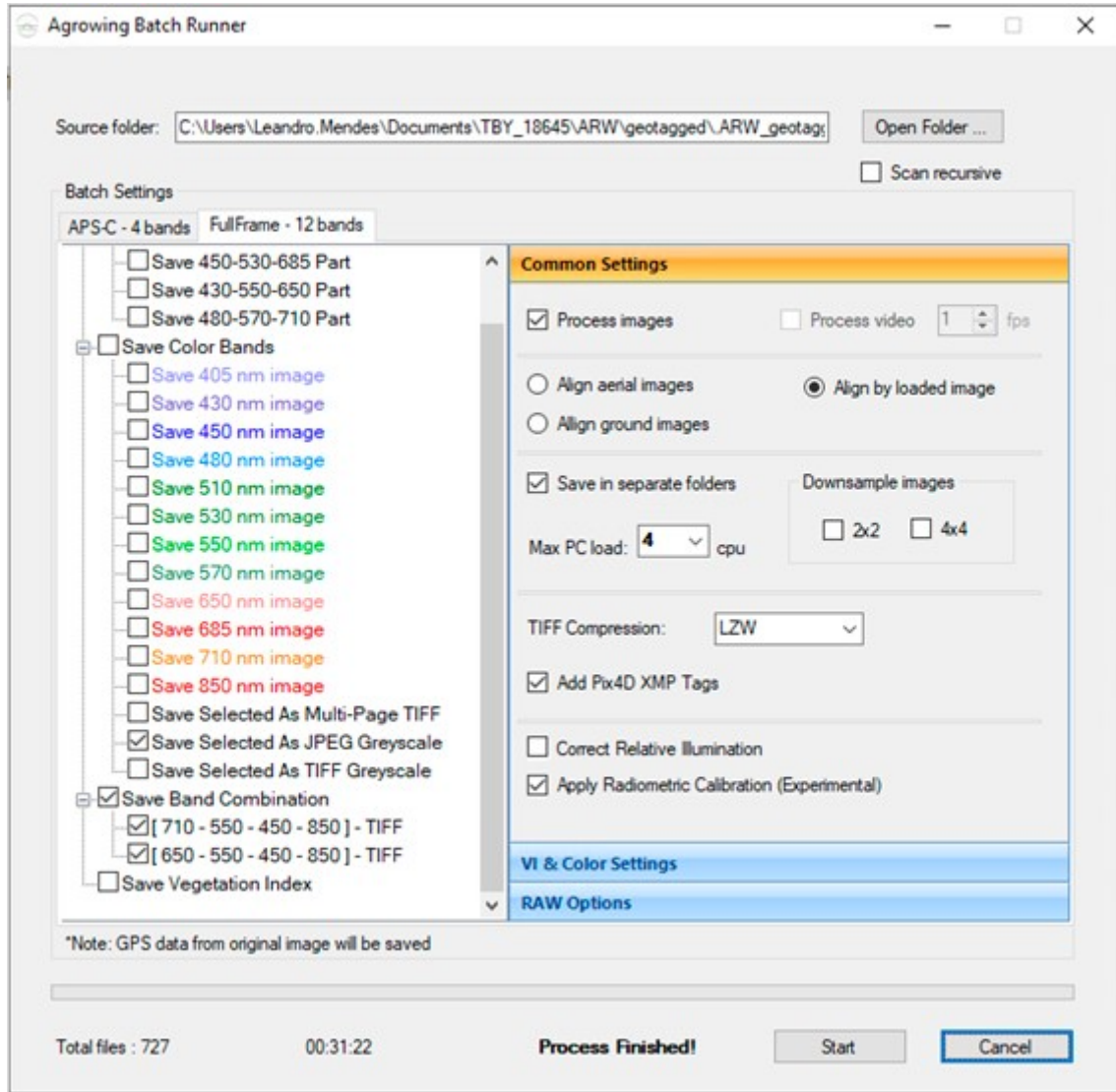
Right-click on "Save Band Combination" to generate the combinations of bands that will be processed.




Once you have selected all the settings, click on "Start".

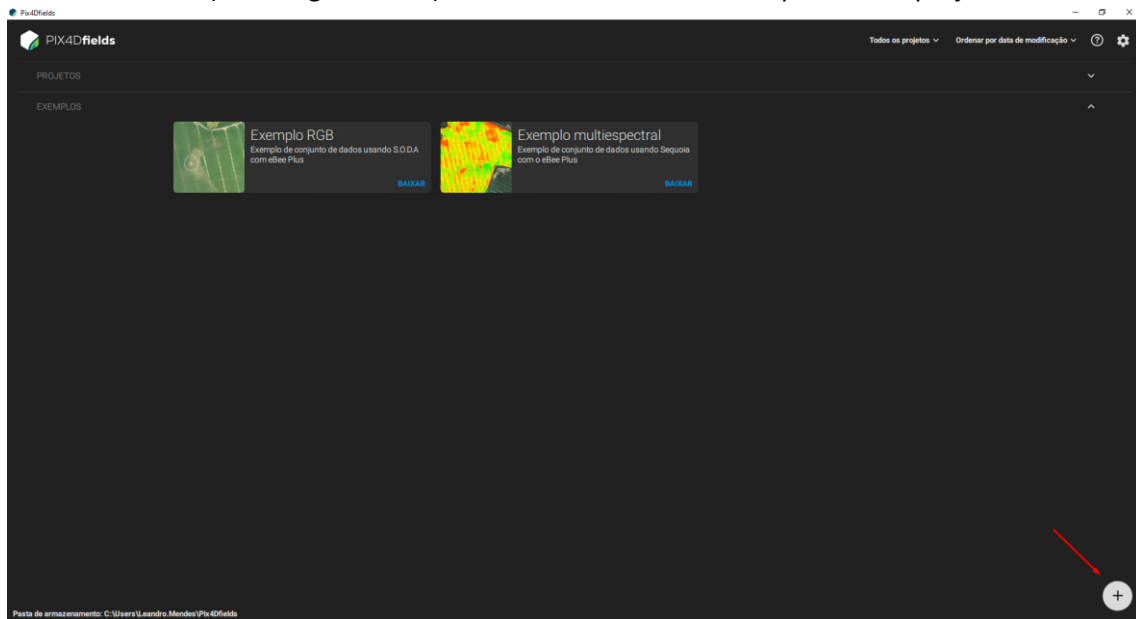


Once the processing is finished, the new images will be saved in a new subfolder within the "folder." ARW\_geotagged".

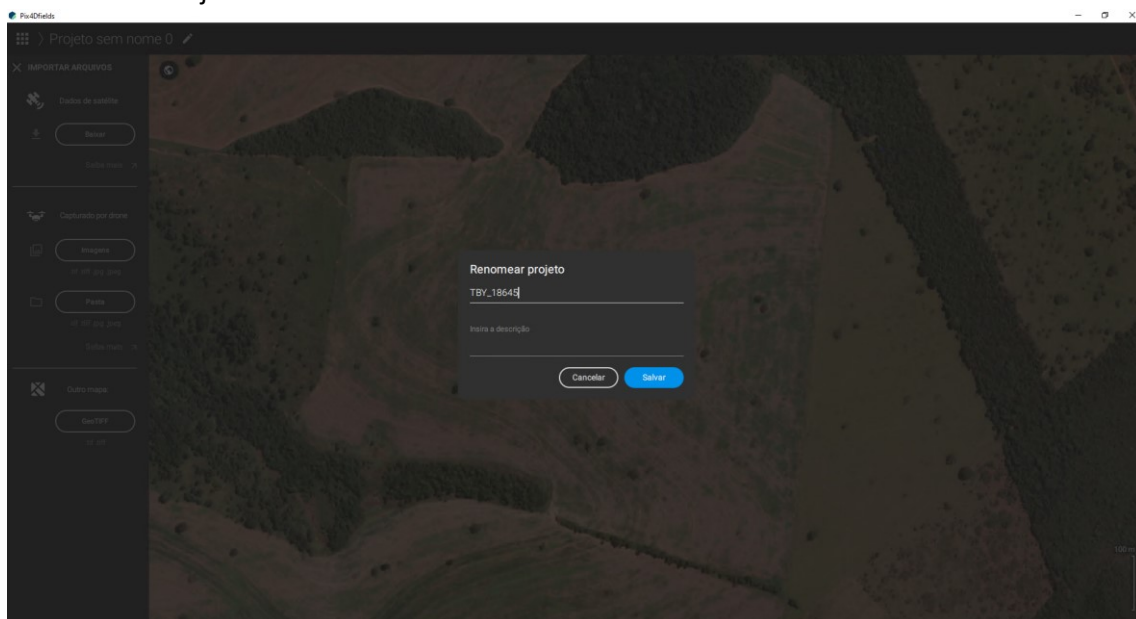




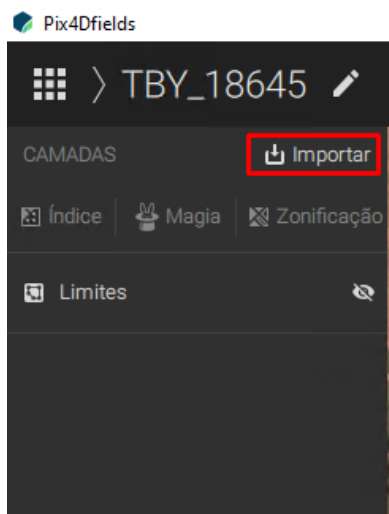
In "Pix4d Fields" (lower right corner) look for the Icon  and open a New project.



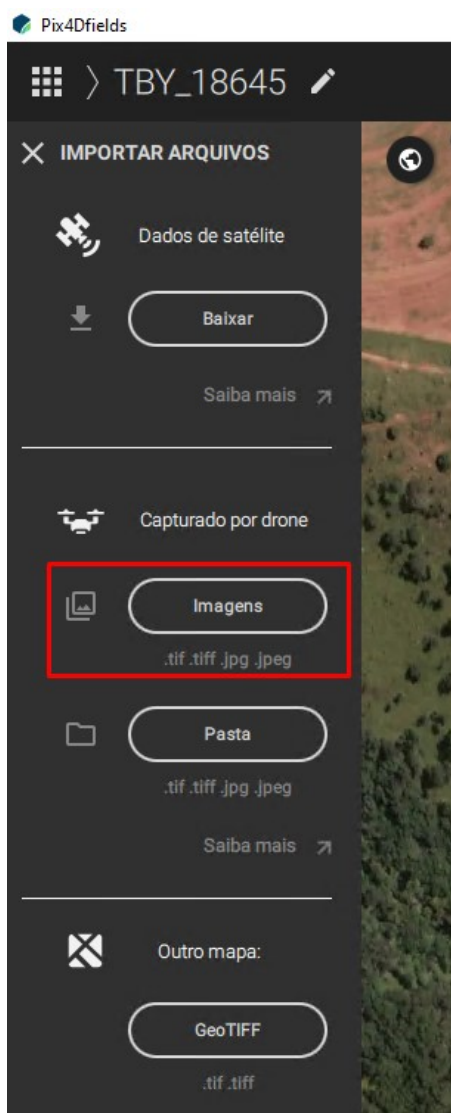
Rename the Project.



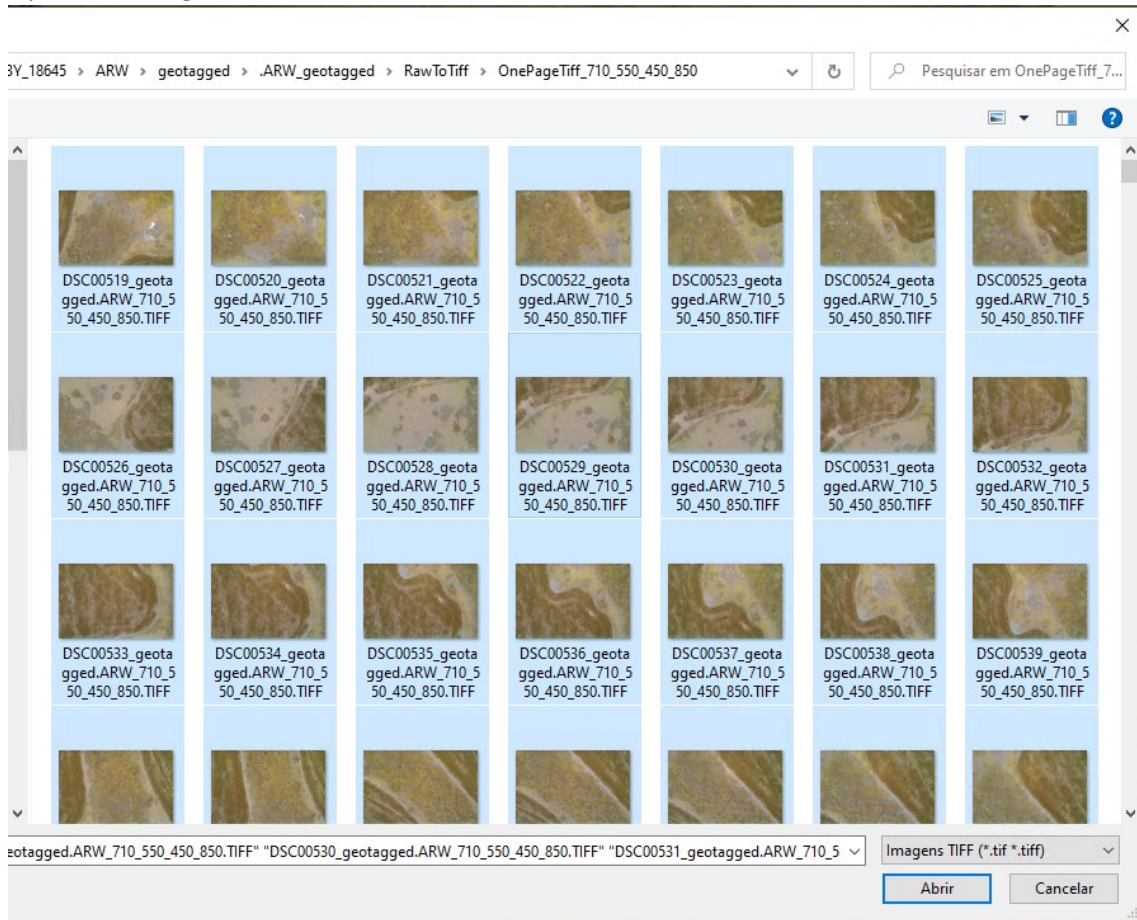
To upload the images, click on "Import".



Then click on "images" and find the location where the images were saved.



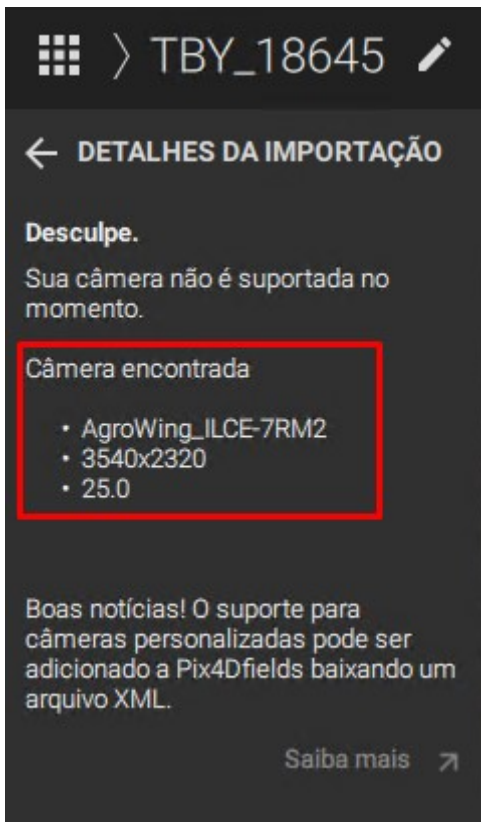
Upload all images.



If the error message "Your camera is not currently supported" appears, you will not be able to process the images before solving the issue as describes on the next page.



To resolve "Your camera is not currently supported" it is necessary to mount an XML file which includes the camera specifications and measurements.

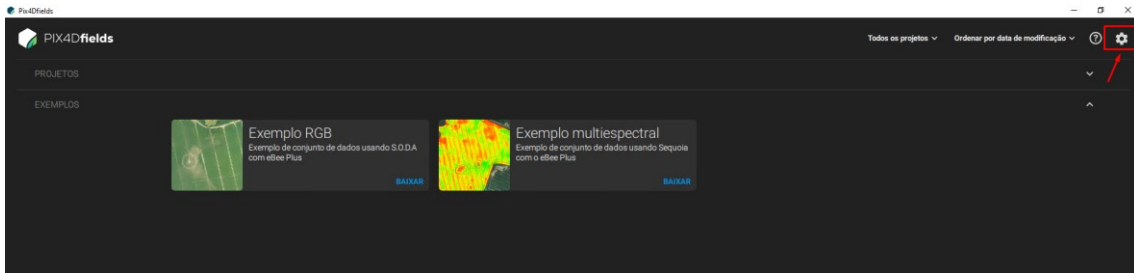


VETORGEO\_CONFIGURATION\_OF\_AGROWING\_SENSOR\_3.xml - Bloco de Notas

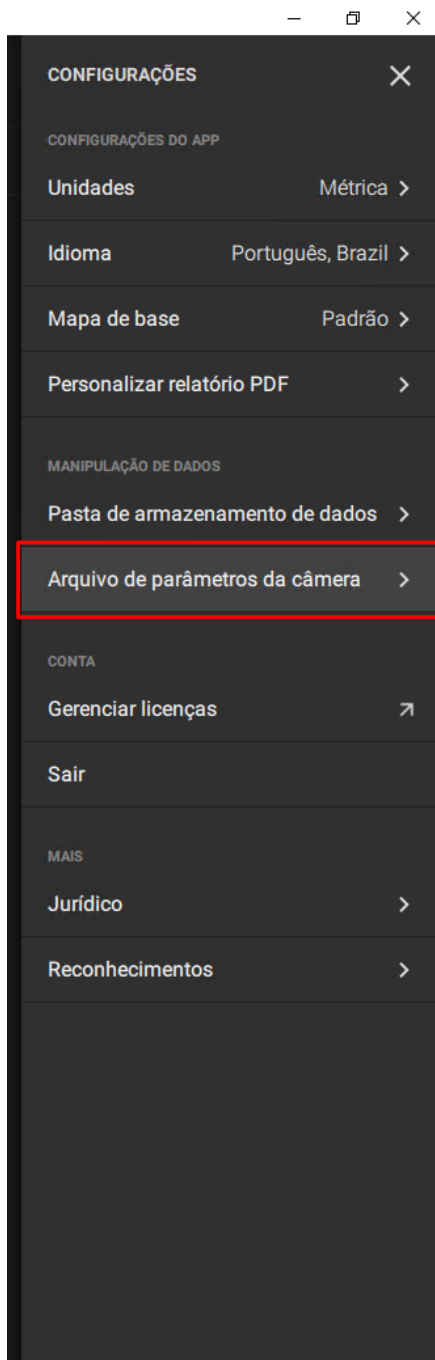
Arquivo Editar Formatar Exibir Ajuda

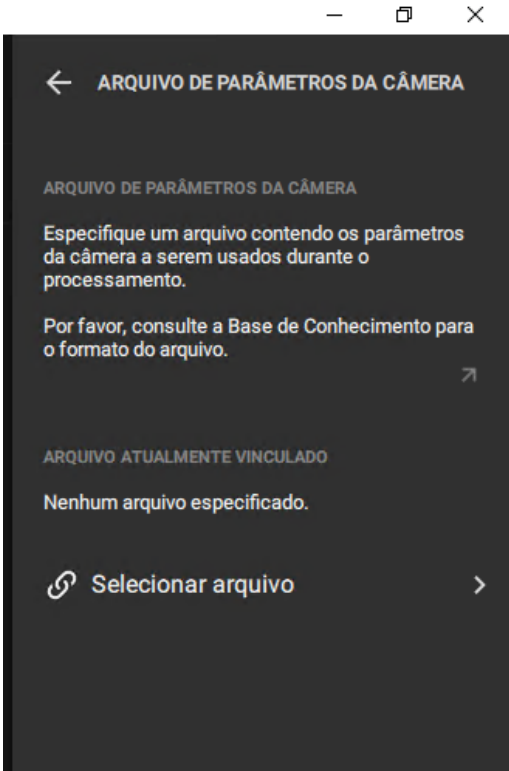
```
<band name="NIR" centralWaveLength="860" width="20" weight="1"/>
</bandConfig>
</camera>
<camera name="AgroWing_ILCE-7RM2_25.0_3540x2320">
  <imageWidth>3540</imageWidth>
  <imageHeight>2320</imageHeight>
  <pixelSize>4.514588</pixelSize>
  <principalPointXmm>7.99082</principalPointXmm>
  <principalPointYmm>5.236922</principalPointYmm>
  <lensType>perspective</lensType>
  <focalLengthmm>25</focalLengthmm>
  <distortion>5</distortion>
  <radialK1>0</radialK1>
  <radialK2>0</radialK2>
  <radialK3>0</radialK3>
  <tangentialT1>0</tangentialT1>
  <tangentialT2>0</tangentialT2>
  <cameraModelSource>exif</cameraModelSource>
  <bandConfig>
    <band name="Red" centralWaveLength="660" width="20" weight="1"/>
    <band name="Green" centralWaveLength="570" width="20" weight="1"/>
    <band name="Blue" centralWaveLength="430" width="20" weight="1"/>
    <band name="NIR" centralWaveLength="860" width="20" weight="1"/>
  </bandConfig>
</camera>
```

After the XML File is generated with all the necessary information, click on the settings button (top right) of the initial screen PIX4D Fields.

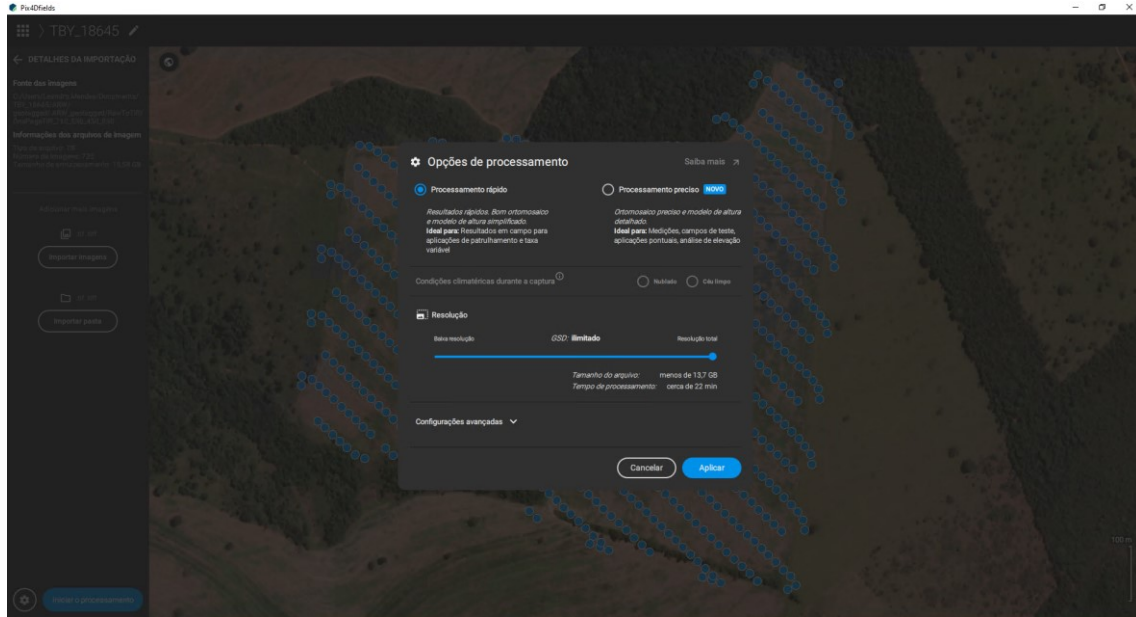


Select "Camera Parameters File" and load the XML that was created.

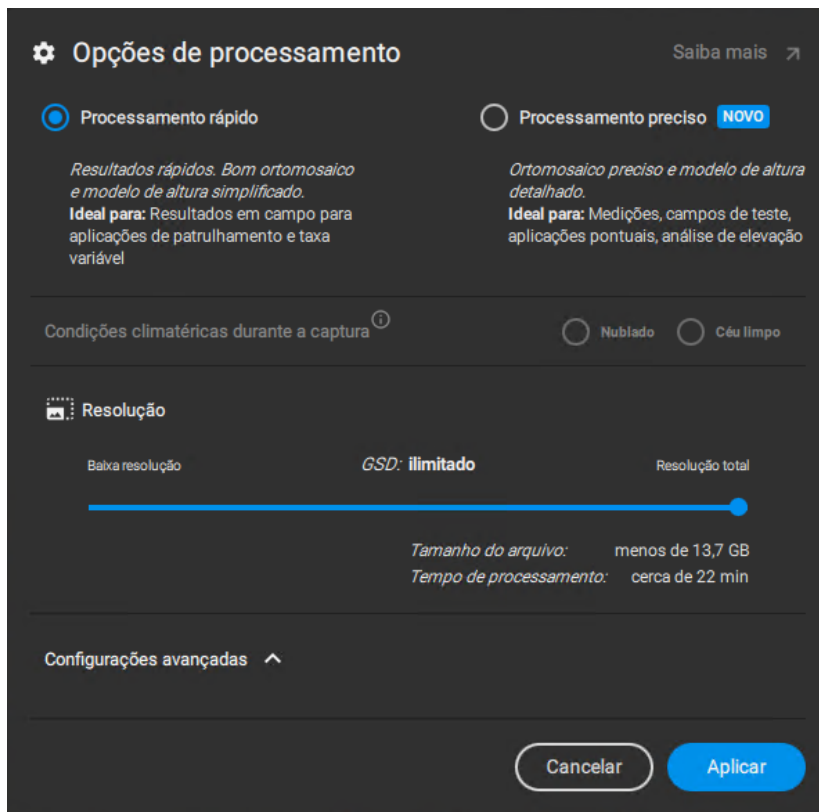


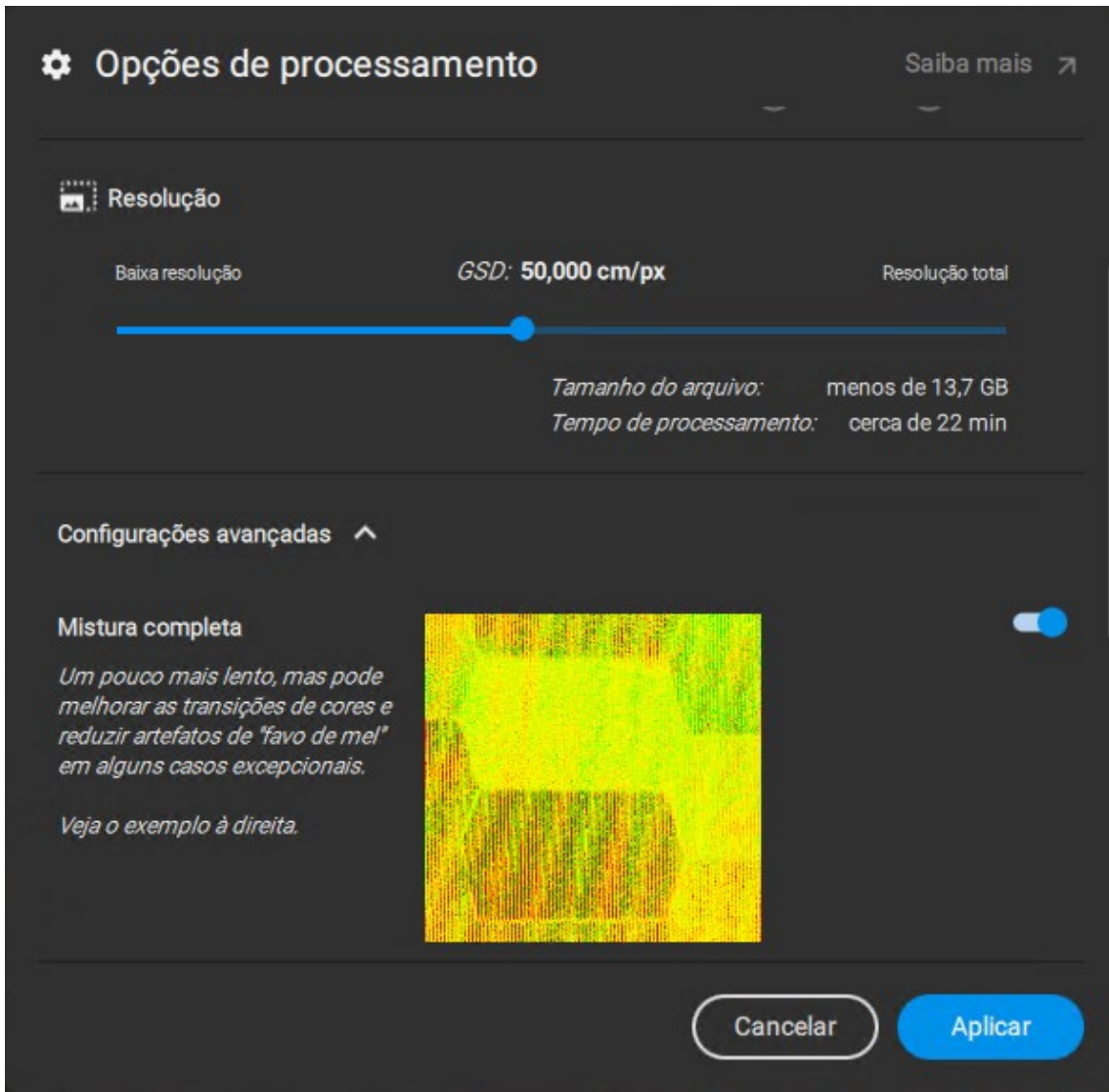


The images import will be repeated without the error.

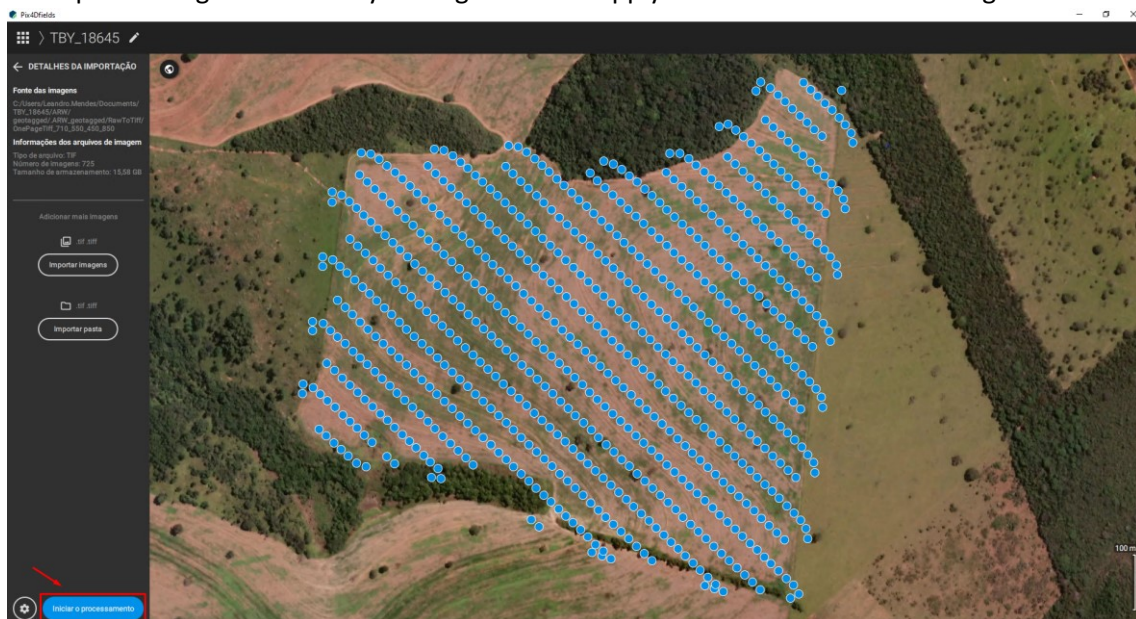


In the processing options change the size of the GSD and in the advanced settings the option "Full Mix".



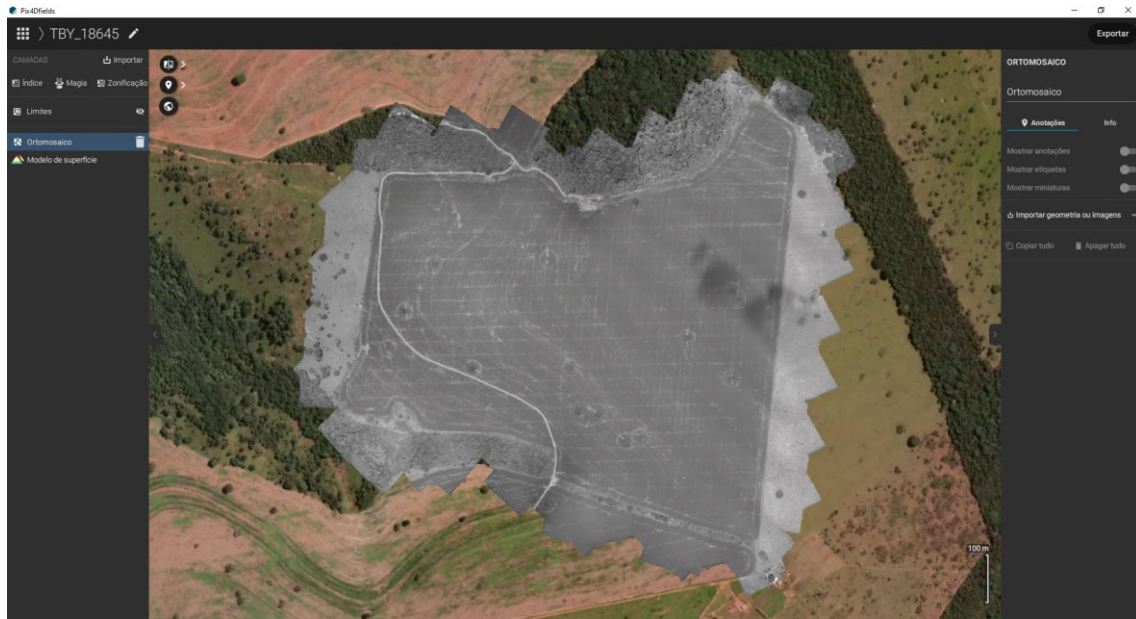


After performing the necessary settings click on "Apply" and then "Start Processing".

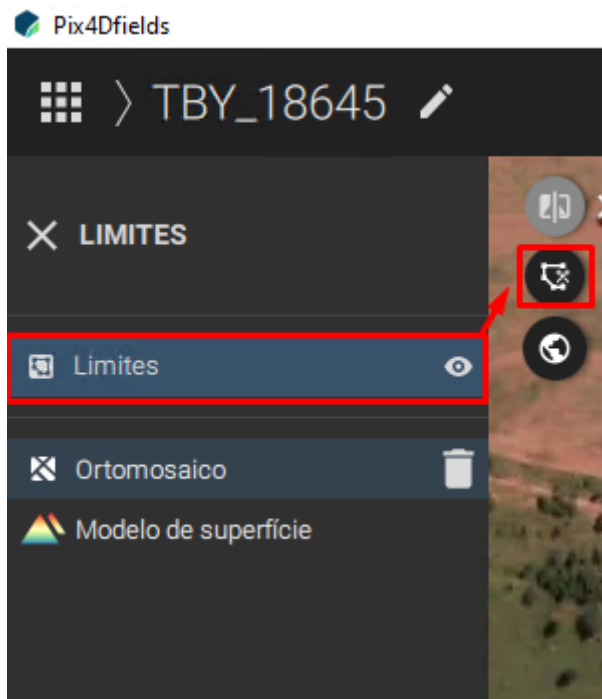





The full mosaic can be used or a limited area of interest. To define a limited area select "Limits".



With the "Limits" option enabled, select the "Draw Limit" tool and start marking the desired area.





After the area limits are marked click on the icon  to save the limit.



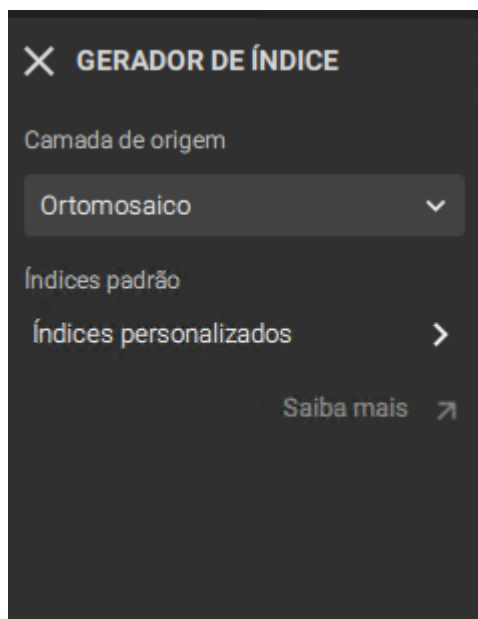
With the "Limits" option still enabled and the desired area limitation saved, cutting and maintaining the desired area can be done by clicking on "Cut".



The mosaic ready for the analysis.

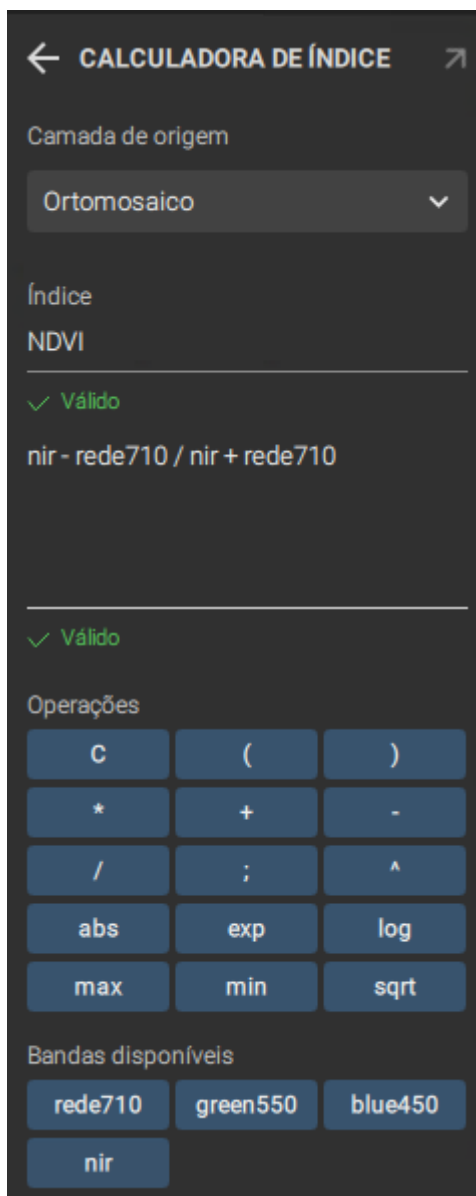
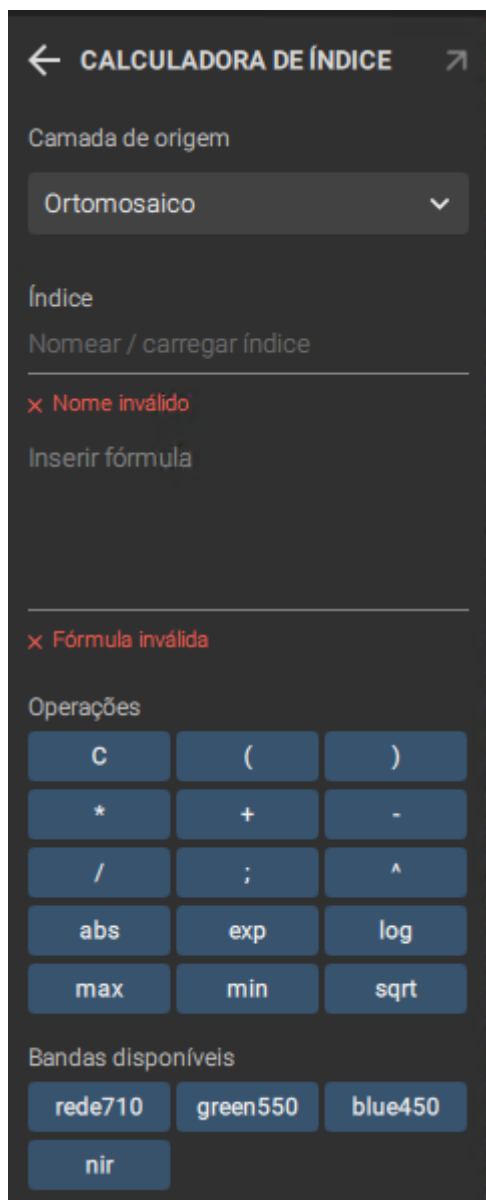


To apply an index click on "Indices".

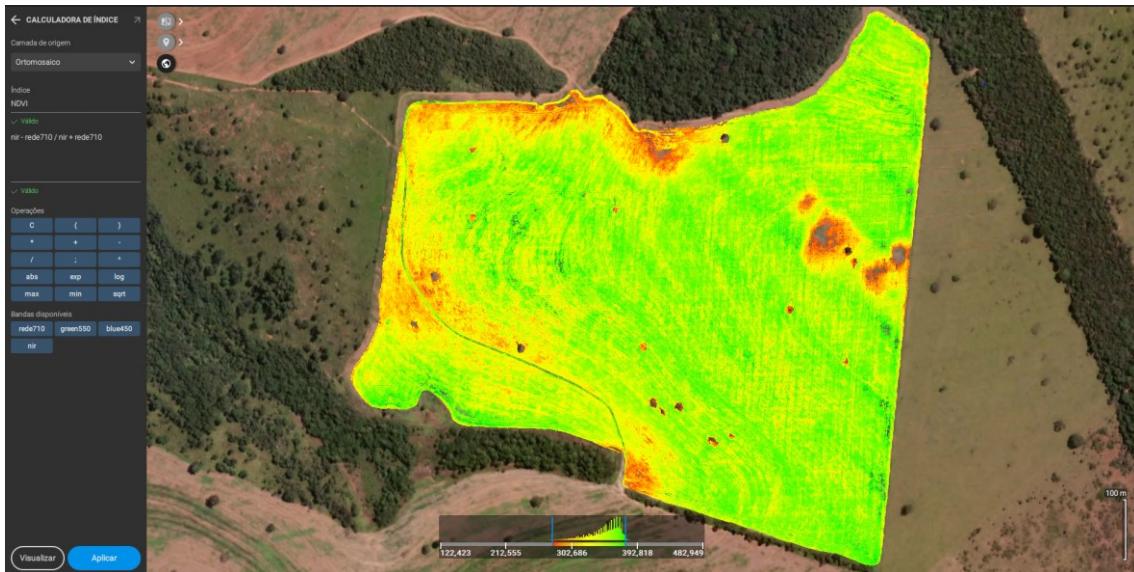


Click on "Custom Indices" and as an example use the  $NDVI = \frac{NIR - RED}{NIR + RED}$ .

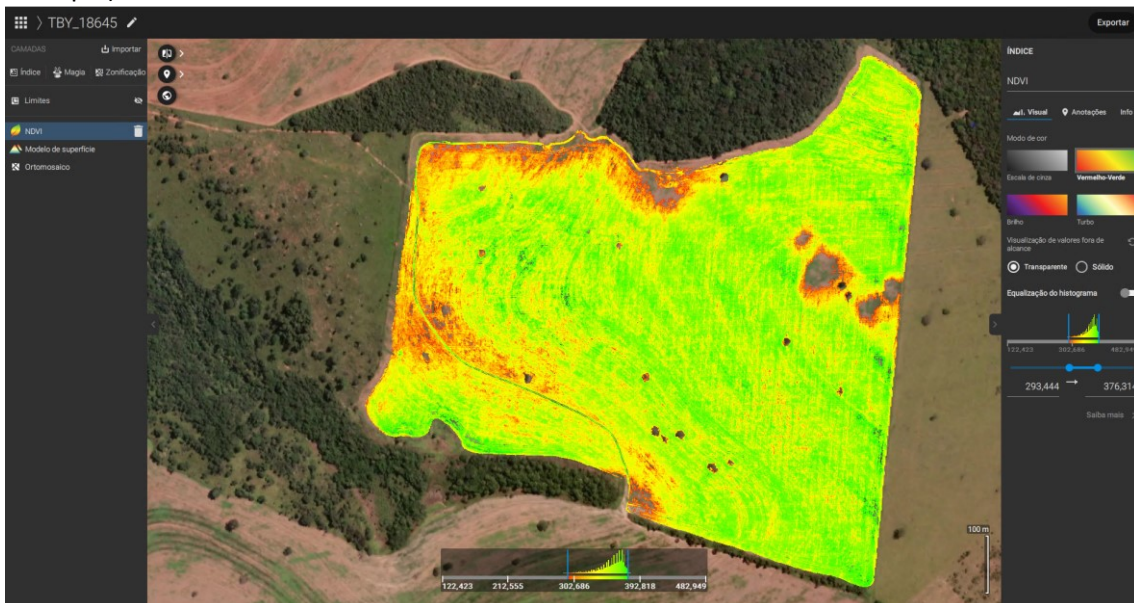
Name and insert the formula according to the available bands (this is just an example), which not NDVI but NDRE, because we have 710 in place of 650.



Click "View" to check if the index was applied correctly and then "Apply" (just an example, any index can be used).

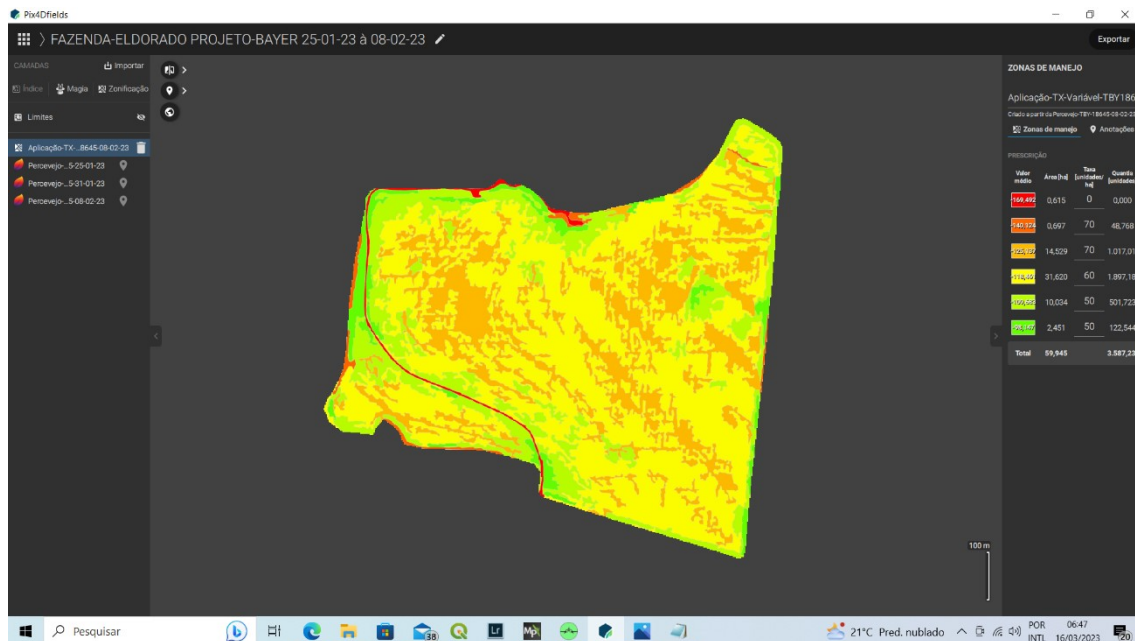


On the right side configure the histogram or any other option that the software offers (just an example).



## Insect spraying map example for tractors

Variable spray rate is now available to be used.



For machinery spraying it is possible to output the map in three different file versions

Geojson

Shape file

Kml

98% of the machinery in Brazil work with shape file format except John Deere's machinery.

John Deere use different file format which could also be used using Agrocad software and script tools.

Please check this usage video file below:



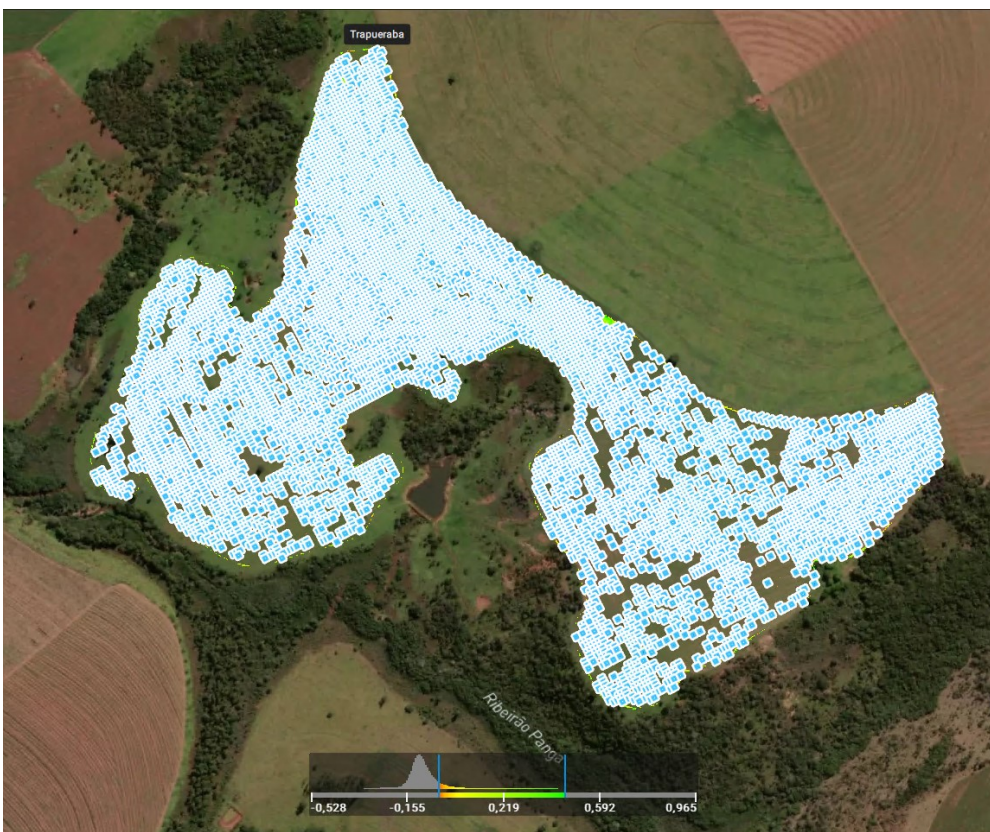
WhatsApp Video  
2023-03-15 at 12.13.

## Weeds Spraying map example using drones

The sensor's high resolution with detector tools in AWbasic enable the detection and isolation of the spectral signature of the Large leaf weed *Trapueraba*.

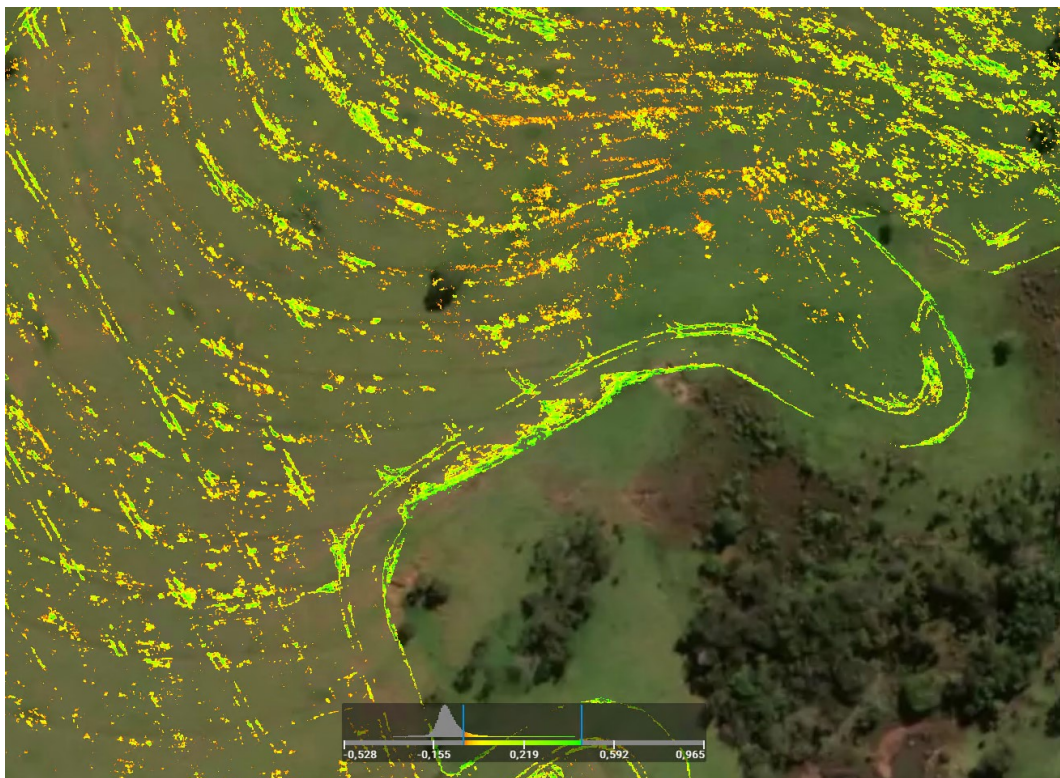


In Barzil this kind of sprayng (Catação) is called focused spraying.





This example shows 96% accuracy for spraying the specific weed.

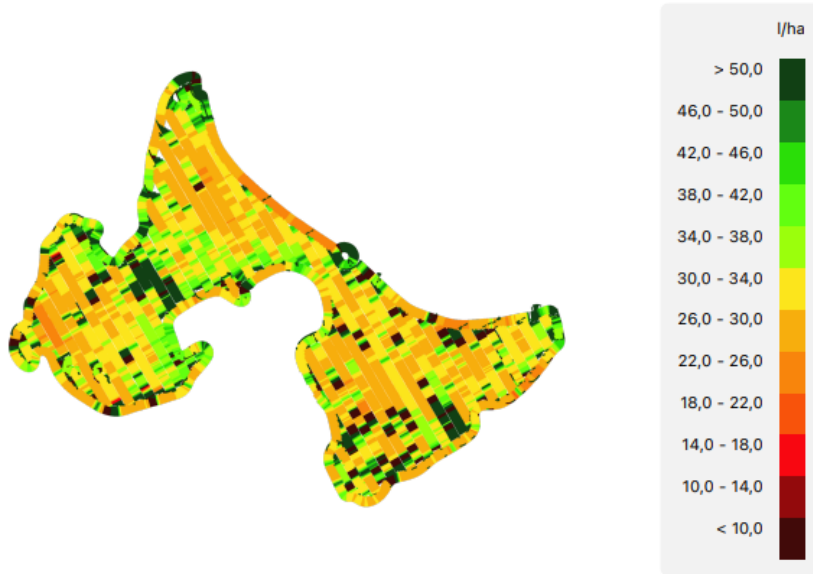


The result of VetorGeo's application (Performed and measured by Bayer software Climate field view) is deployed with Machinery.



Sao Joaquim T 4 • Aplicações • Pos Emergente • 6 de mar. de 2023

Agro Junco • Sao Joaquim • 2023 Milho • 73,3 ha



| Produto | Quantidade | Taxa do Produto |
|---------|------------|-----------------|
| Wetcity | 4,87 l     | 0,1 l/ha        |
| Ad+     | 4,87 l     | 0,1 l/ha        |
| Click   | 73,01 l    | 1,0 l/ha        |
| Preciso | 48,67 l    | 0,7 l/ha        |

**Notas**

Total de Produto aplicado: 2.433,7 l - Área aplicada: 74,4 ha - Taxa média de Produto: 32,7 l/ha - Velocidade: 13,8 km/h