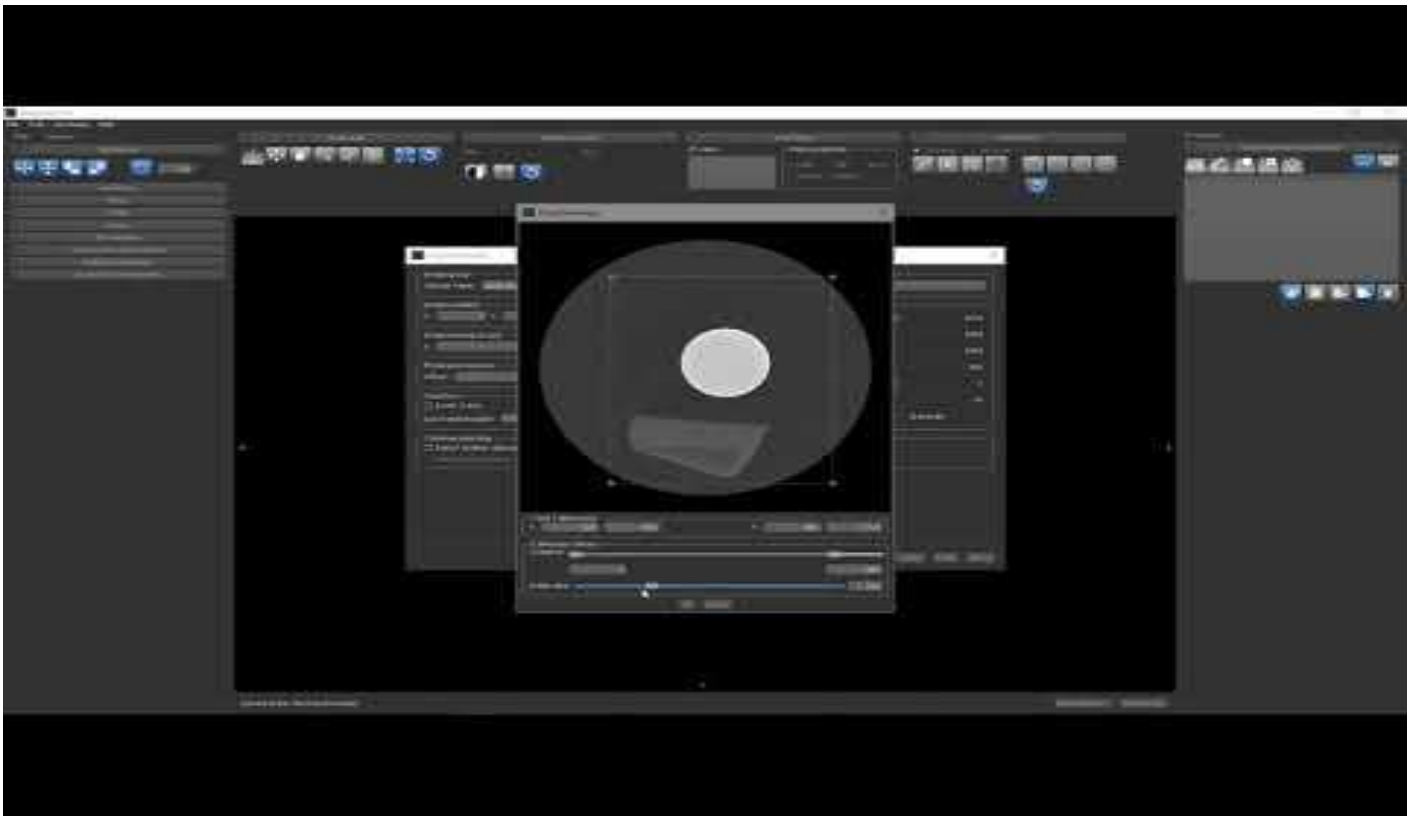
MS57 Training guide: Segmentation workflow Dragonfly ORS (RBINS)

The Dragonfly ORS segmentation training guide aims to show the basic automatic segmentation option, independent of version updates, using the free (for students, institutes, university workers, etc.) software Dragonfly ORS (version 2021.1.0.977).

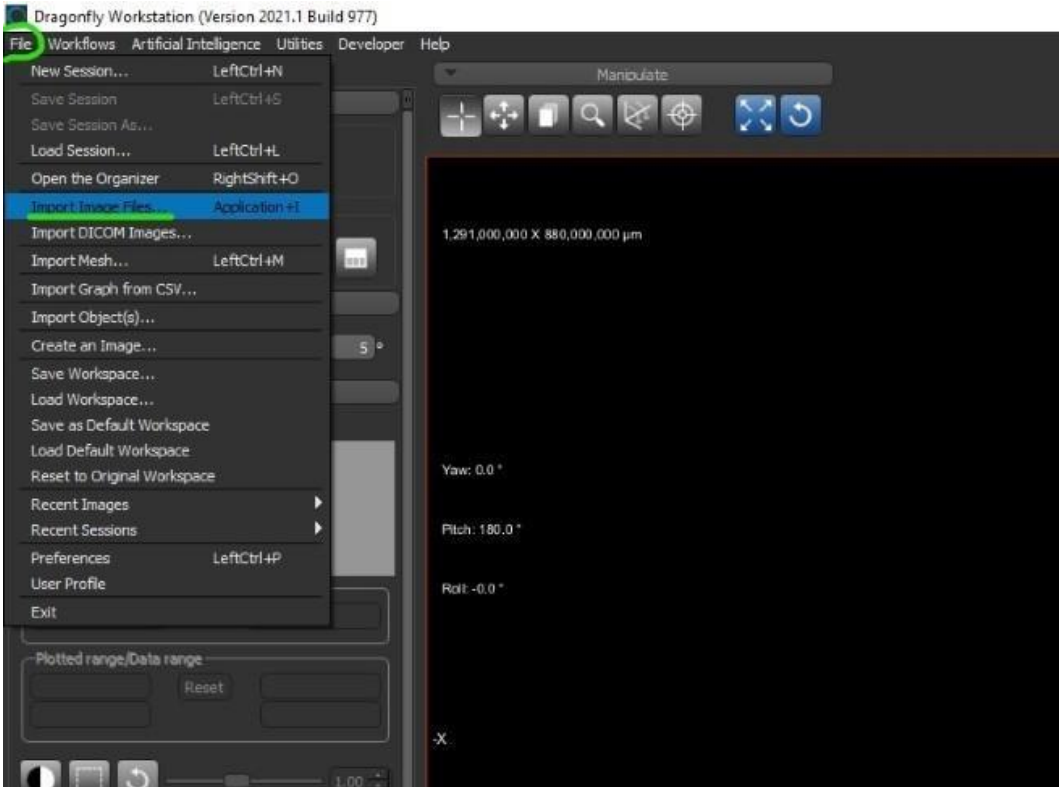
1) Data import

💡 ORS Dragonfly tutorial: [Image Import in Dragonfly]



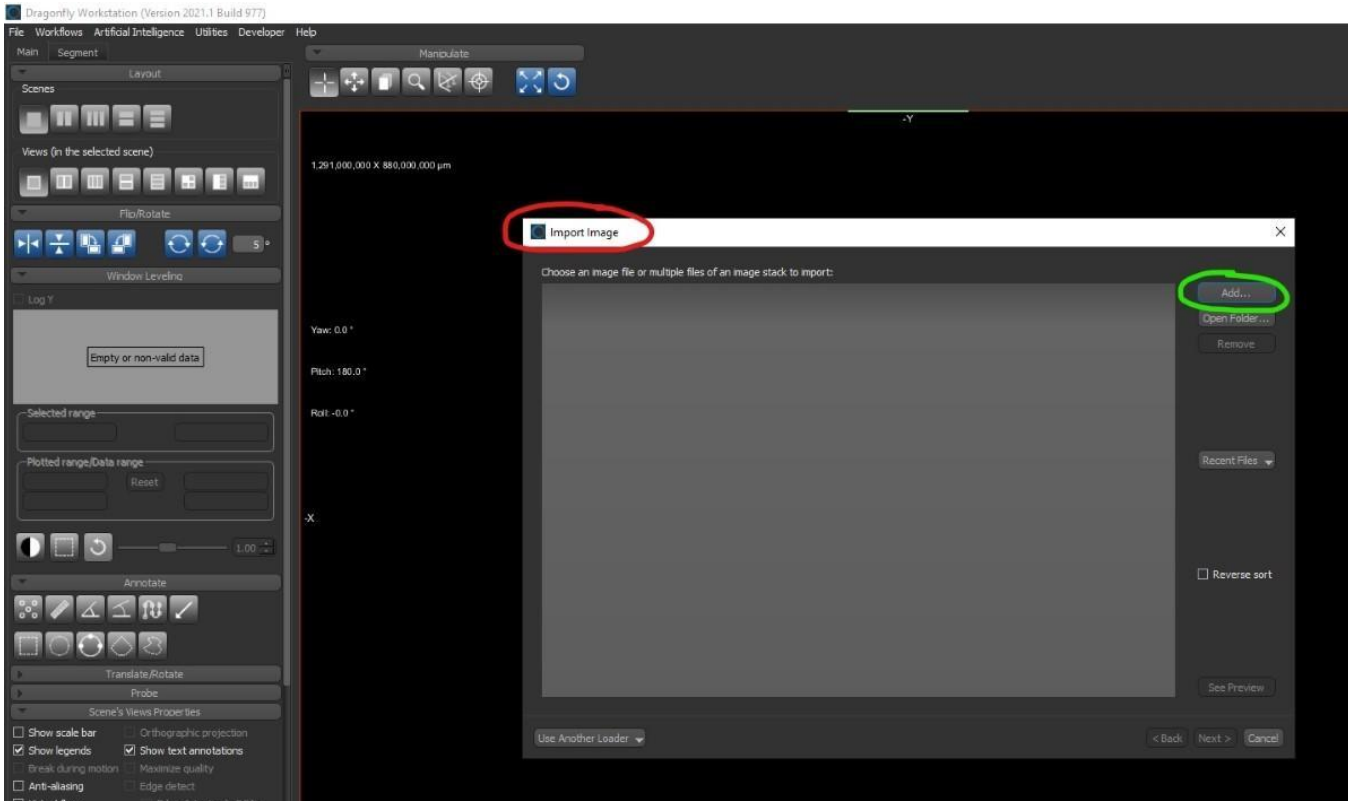
- **Open ORS Dragonfly**
- **Import your dataset** (dataset = stack of TIFF images acquired after the reconstruction process)

File -> Import Image Files



In the “Import image” panel:

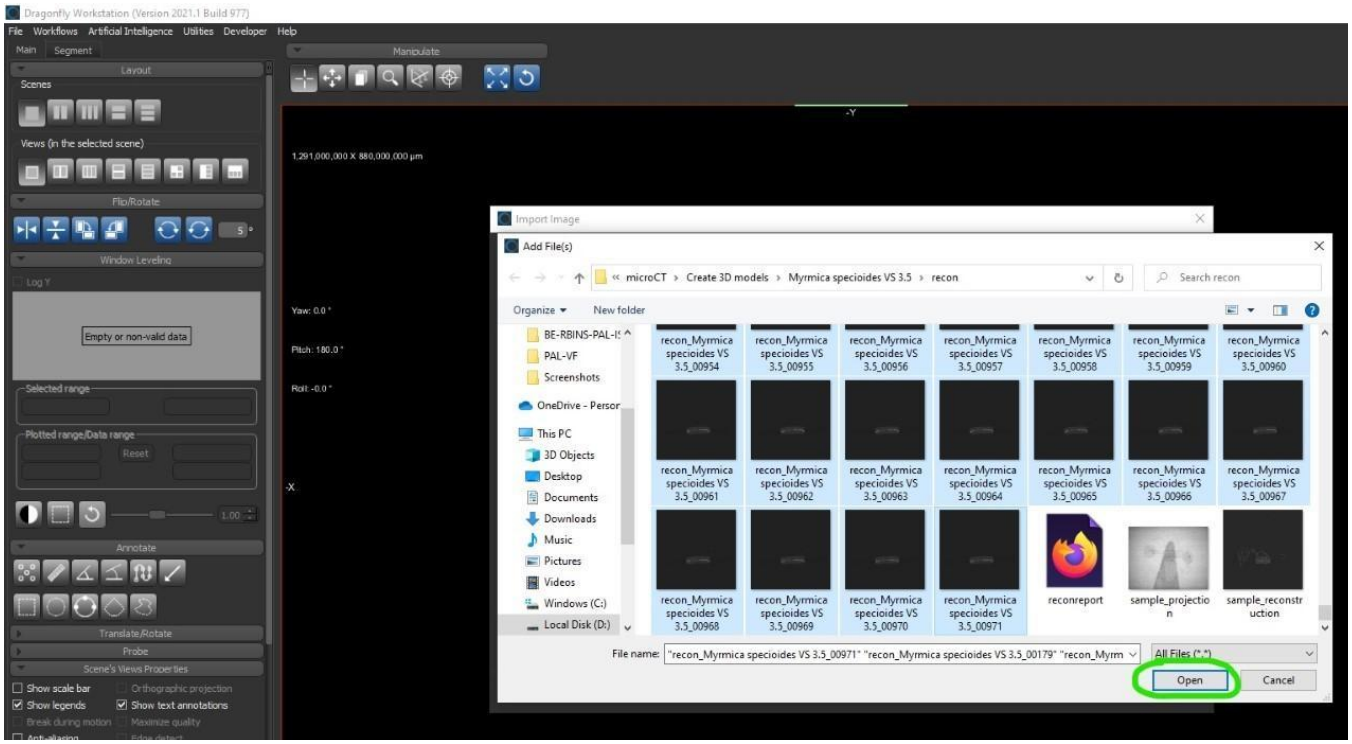
- Add...



=> find the location of the folder including all reconstructed images and open it

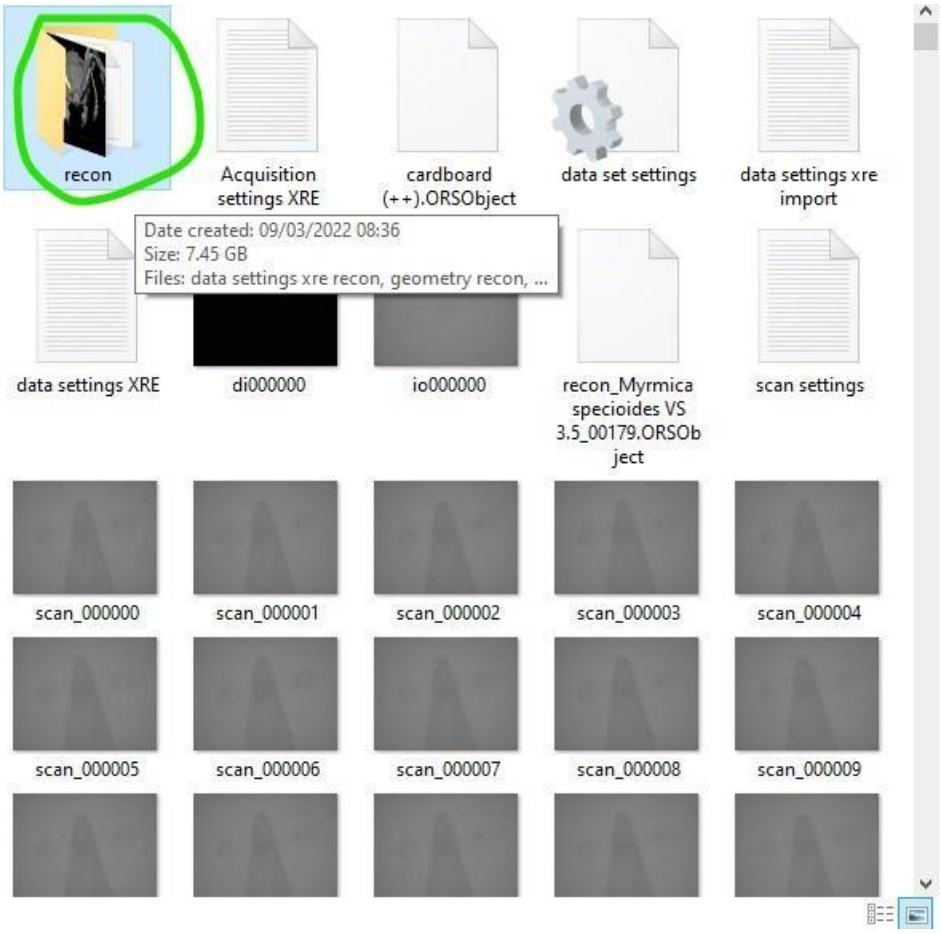
- select all the TIFF images of the stack

- Open

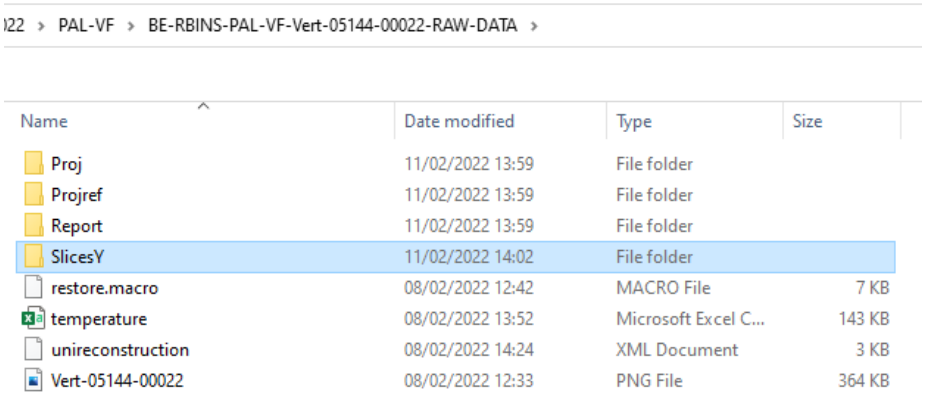


Where can I find these TIFF images?

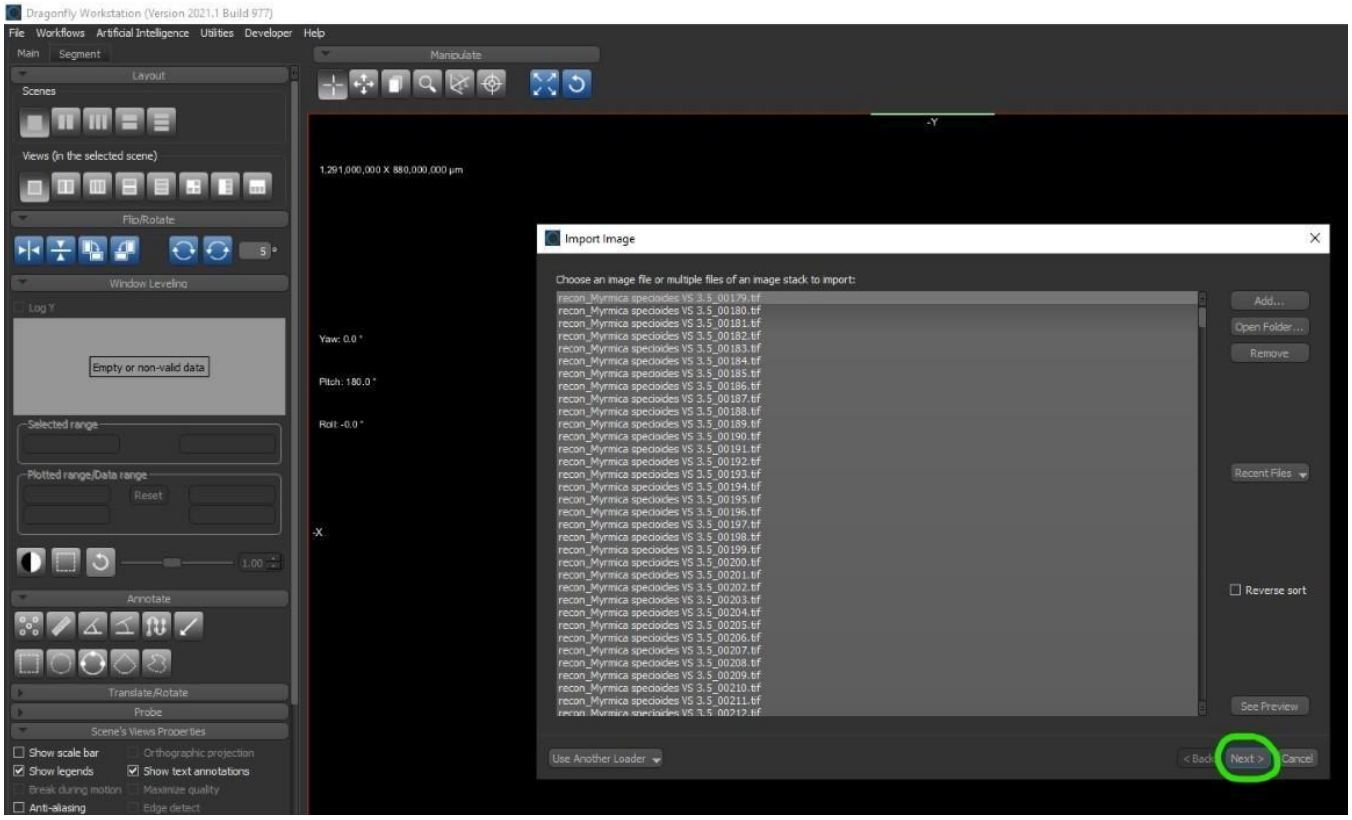
micro-CT scan from XRE UniTOM: in the “recon” folder



micro-CT scan from RX Solutions EasyTOM: in the “SliceY” folder

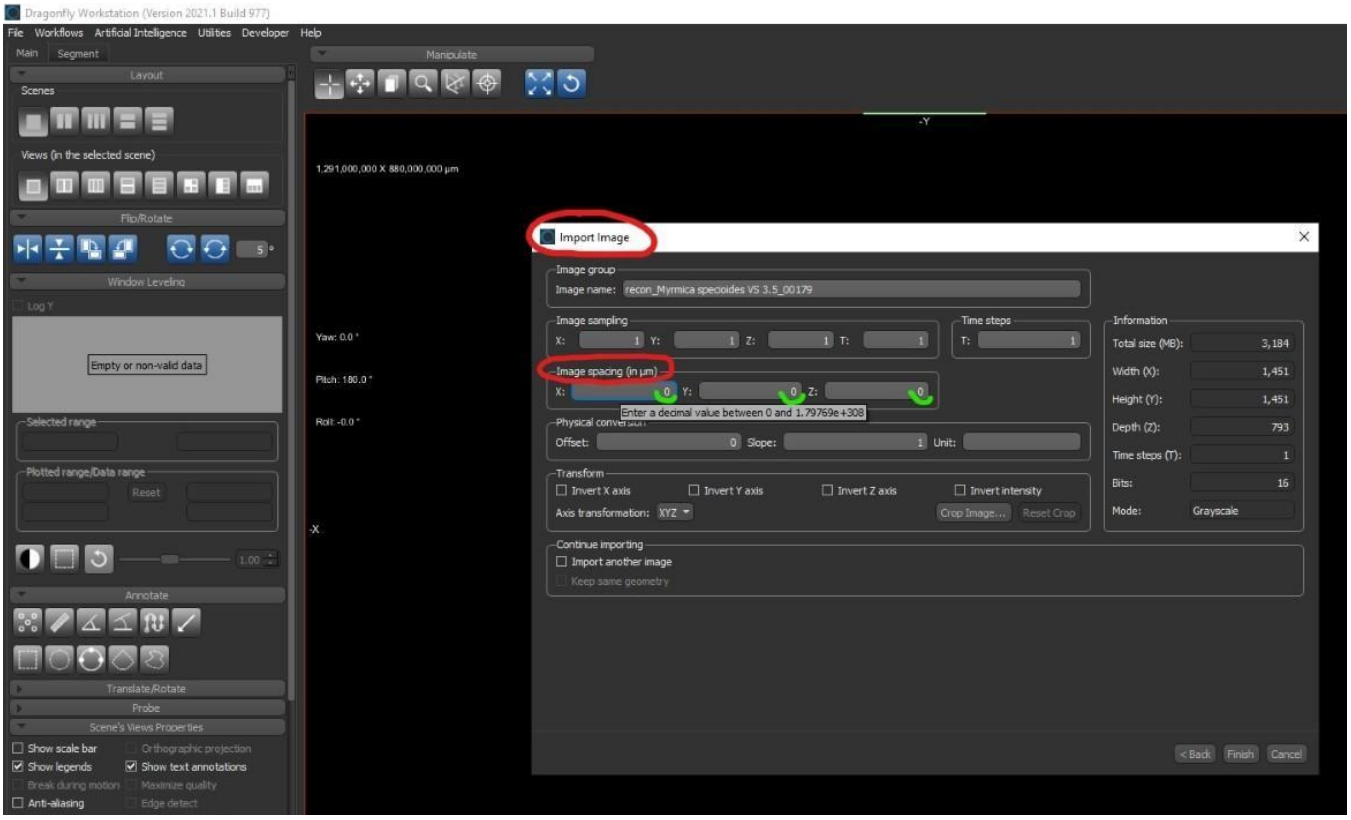


- Next



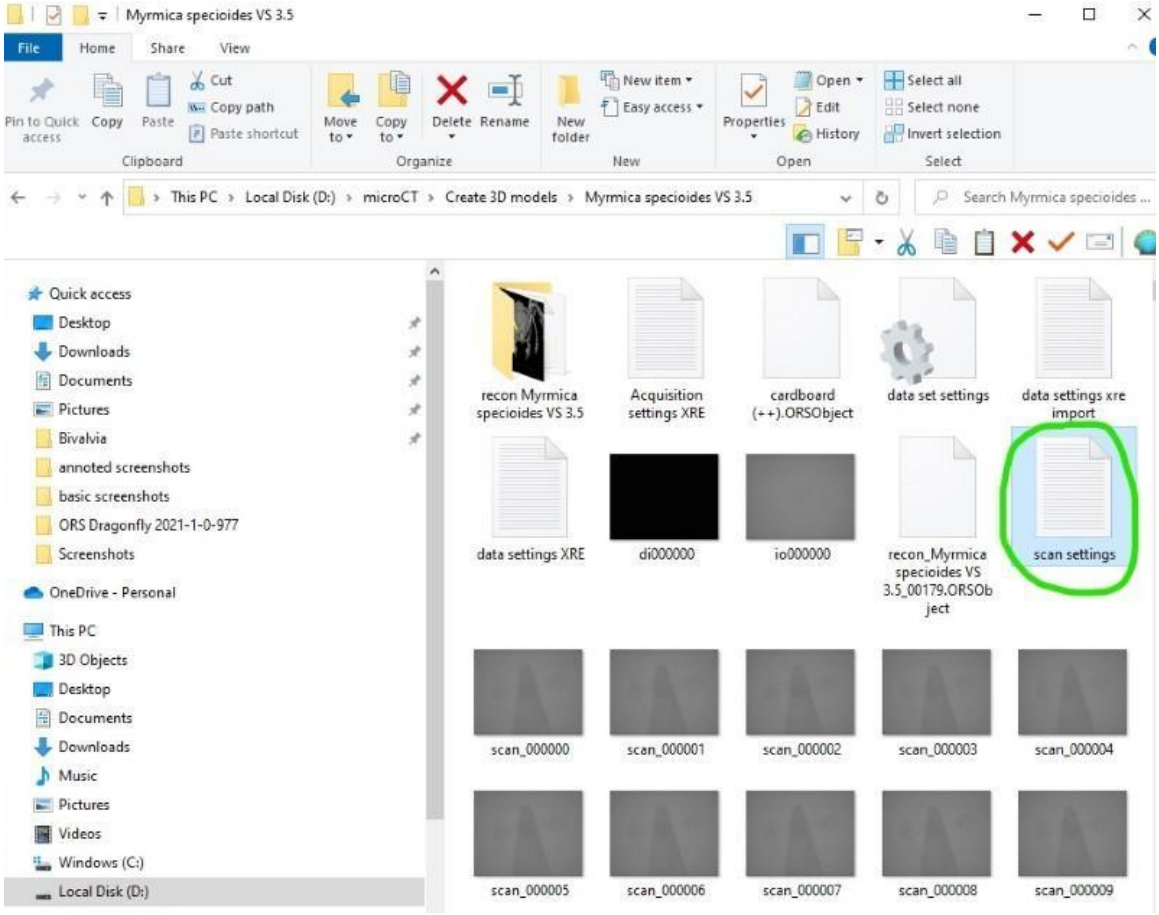
- Fill the 3 “image spacing” boxes with the scan voxel size (same value for X/Y/Z)

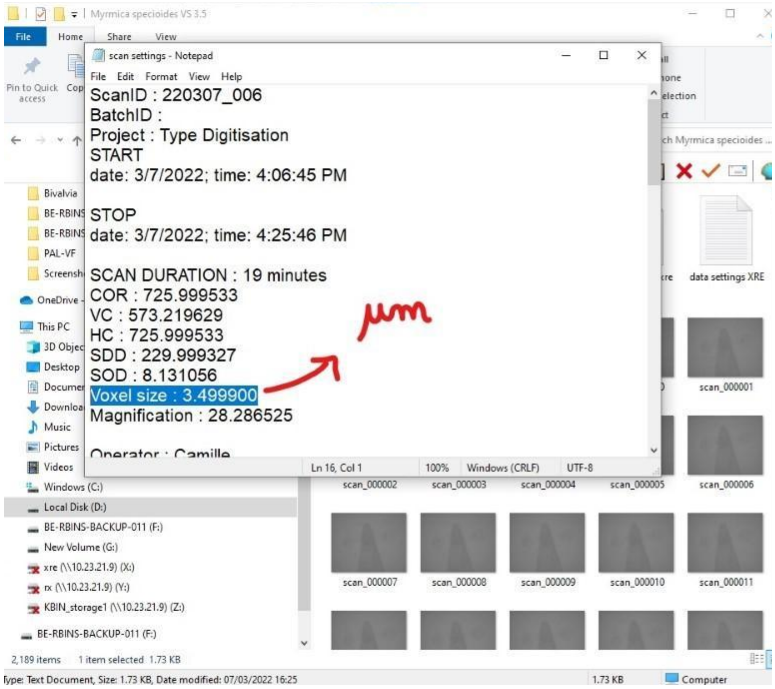
! unit ; image spacing requested **in µm in this case:** don’t forget to check the default unit of your Dragonfly software



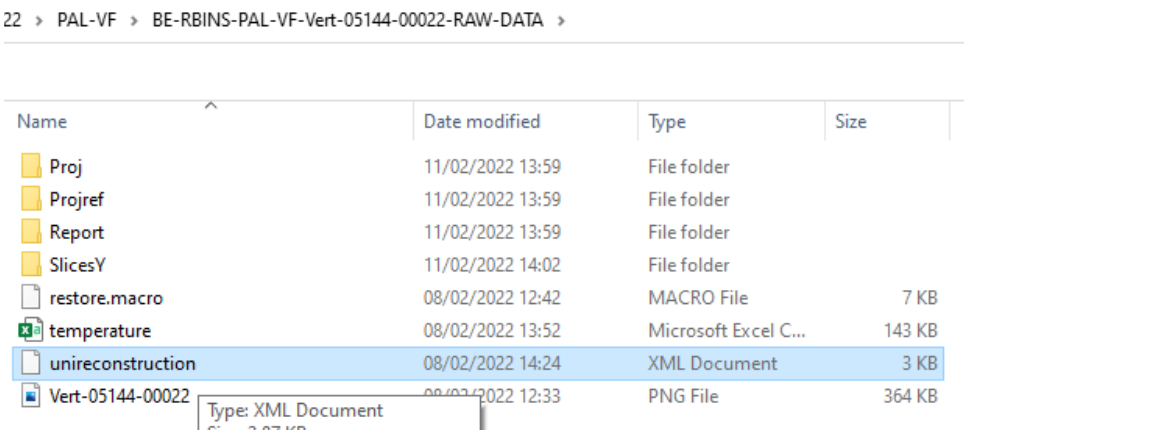
Where can I find the voxel size?

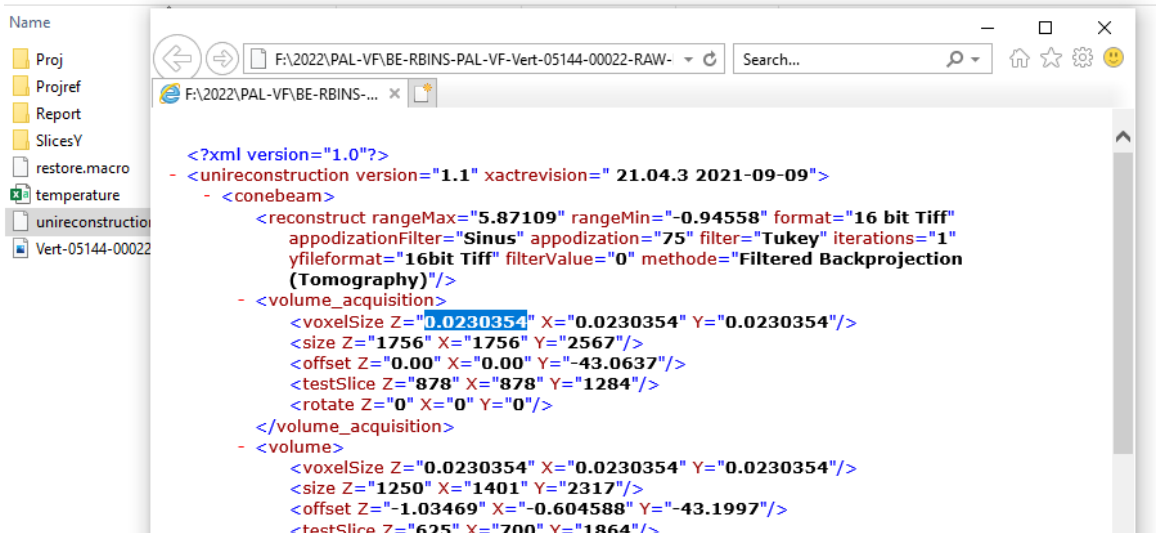
• micro-CT scan from XRE UniTOM: “scan settings” file -> Voxel size (unit: µm)



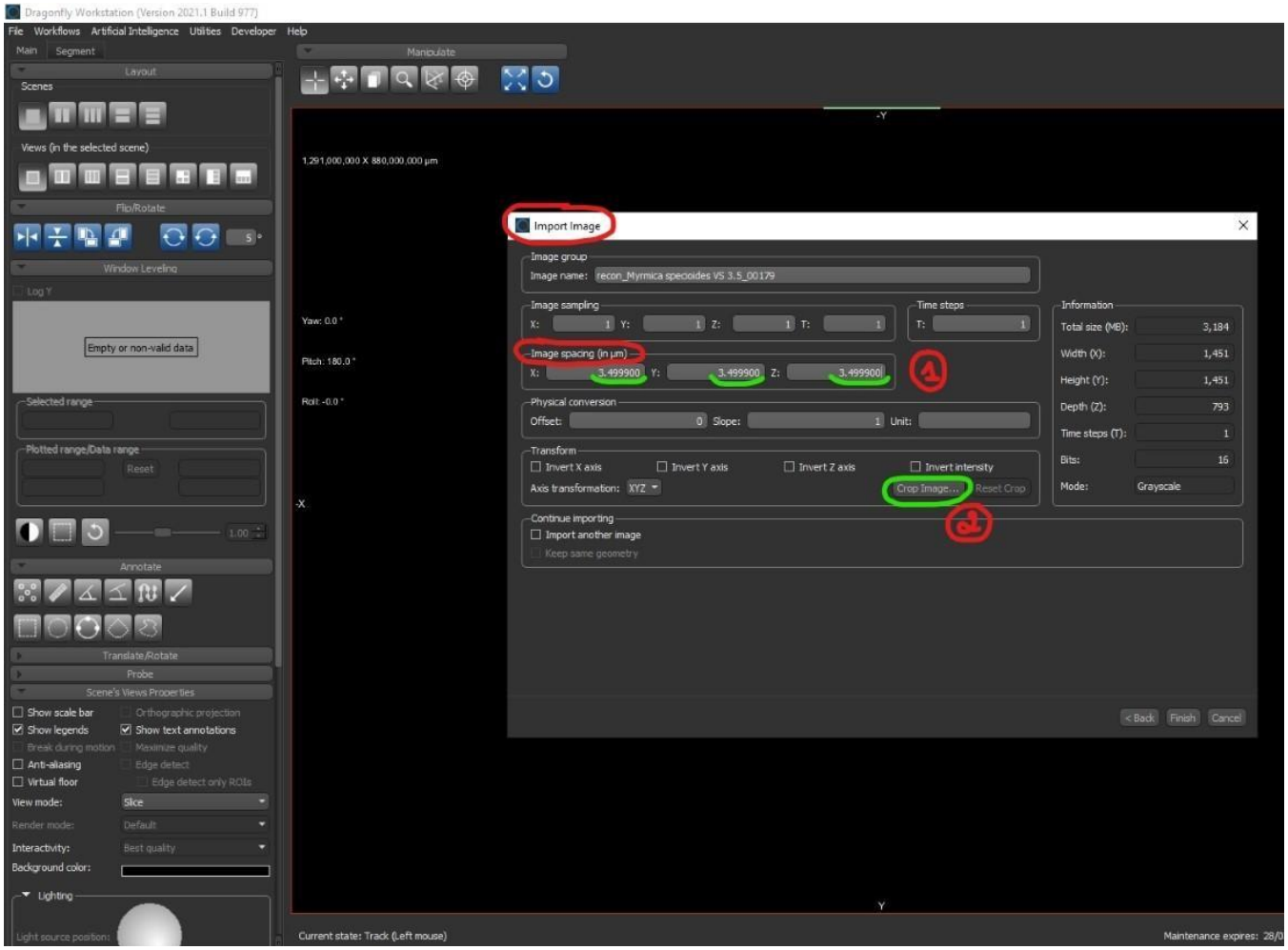


micro-CT scan from RX Solutions EasyTOM: “unireconstruction” file -> voxelSize Z (unit: mm)





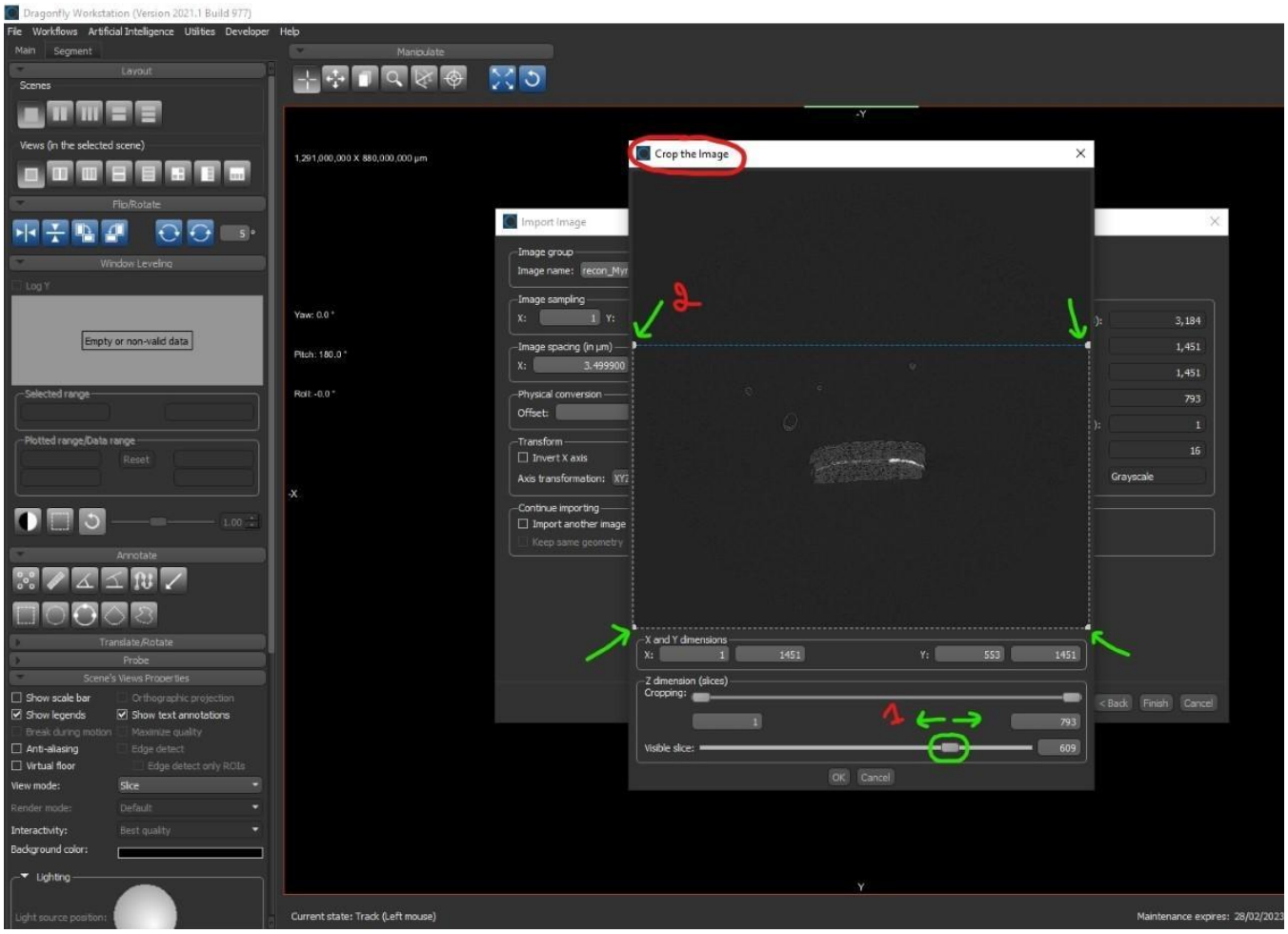
- 💡 only for scans from RX: in “Transform” -> check “Invert Y axis”
- In “Transform” -> Crop Image...



Crop the reconstructed stack of images in X/Y/Z dimensions in order to only keep your sample, remove useless information and thus reduce the dataset size

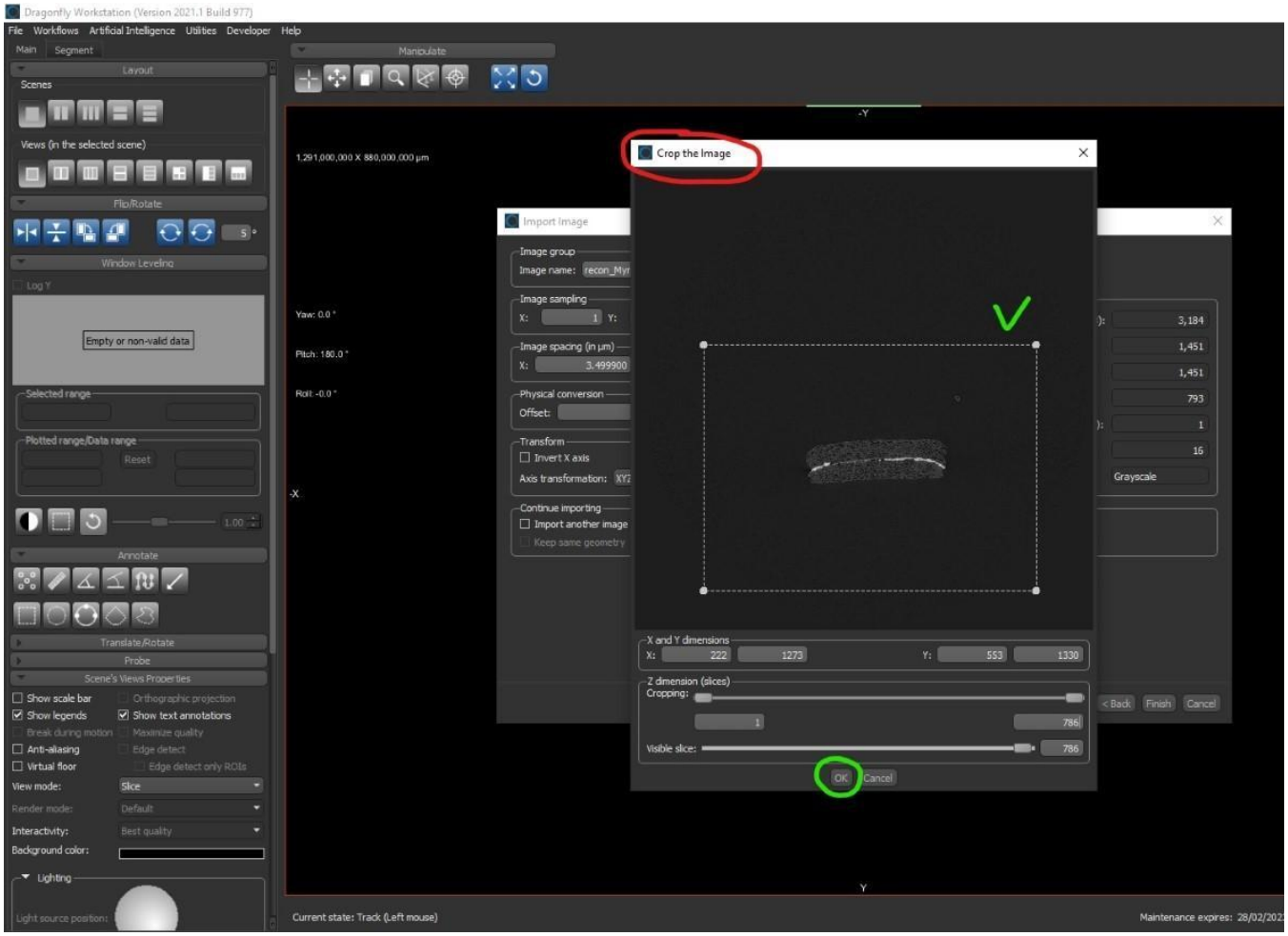
By sliding the “visible slice” cursor, check the stack of reconstructed images:

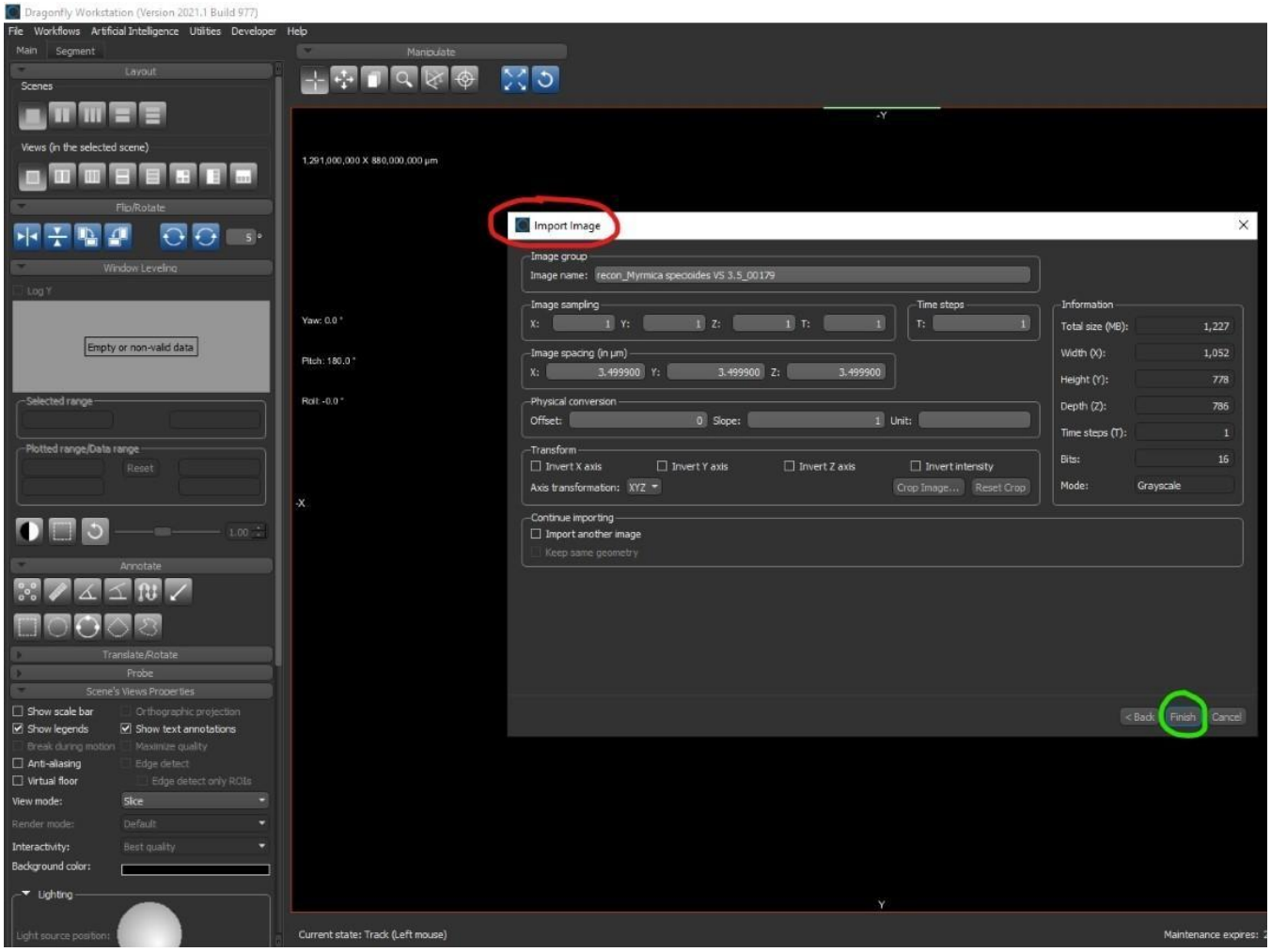
In X and Y dimension: adjust the frame to the 3D sample size (grab the dotted lines)



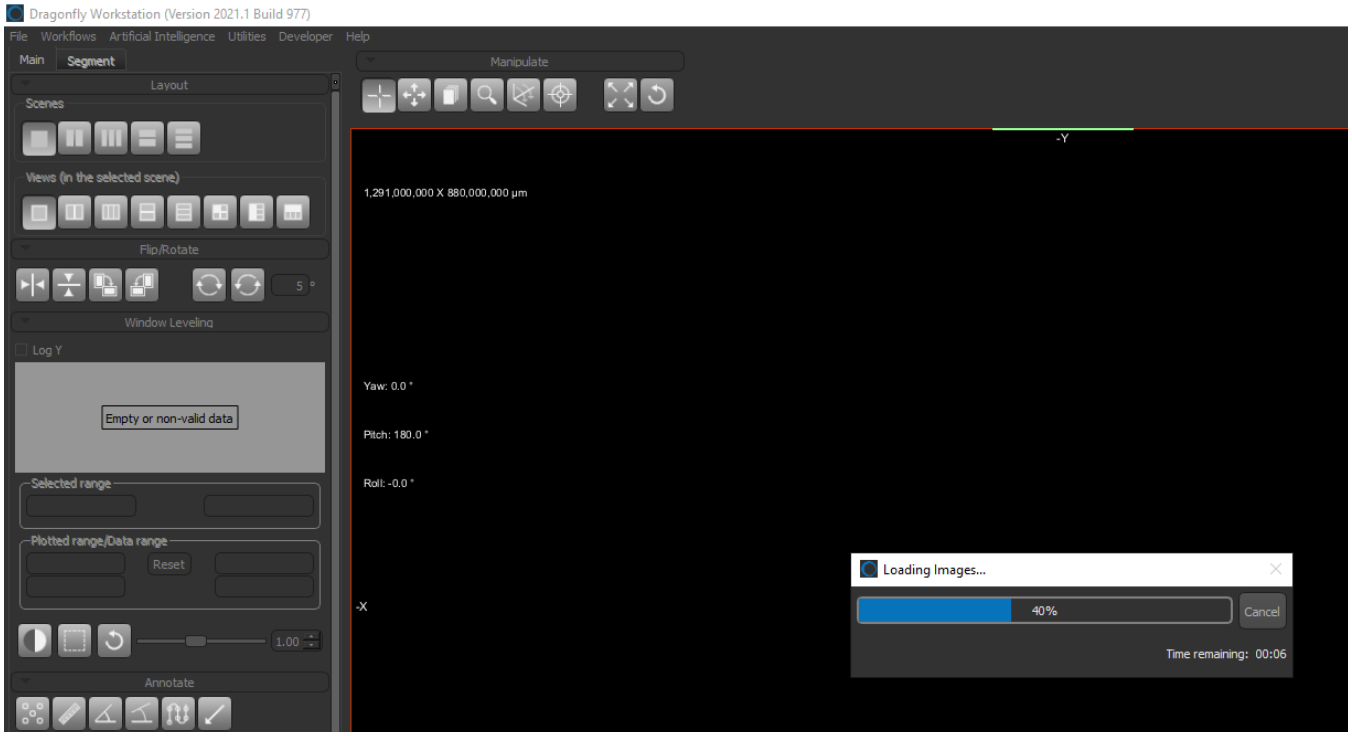
In Z dimension: remove end slides without relevant information (choose the 1st and the last slices to consider)

Once it's done:


Dragonfly Workstation (Version 2021.1 Build 977)
File Workflows Artificial Intelligence Utilities Developer Help
Main Segment
Manipulate
Layout
Scenes
Views (in the selected scene)
Flip/Rotate
Window Leveling
Log Y
Empty or non-valid data
Selected range
Plotted range/Data range
Reset
Annotate
Translate/Rotate
Probe
Scene's Views Properties
Show scale bar
Orthographic projection
Show legends
Show text annotations
Break during motion
Maximize quality
Anti-aliasing
Edge detect
Virtual floor
Edge detect only ROIs
View mode:
Slice
Render mode:
Default
Interactivity:
Best quality
Background color:
Lighting
Light source position:
1,291,000,000 X 880,000,000 µm
Yaw: 0.0 °
Pitch: 180.0 °
Roll: -0.0 °
-Y
-X
Y
Import Image
Image group
Image name:
recon_Myr
Image sampling
X:
1
Y:
Image spacing (in µm)
X:
3.499900
Physical conversion
Offset:
Transform
Invert X axis
Axis transformation:
XY
Continue importing
Import another image
Keep same geometry
Crop the Image
X and Y dimensions
X:
222
1273
Y:
553
1330
Z dimension (slices)
Cropping:
1
786
Visible slice:
786
OK
Cancel
3,184
1,451
1,451
793
1
16
Grayscale
< Back
Finish
Cancel
Current state: Track (Left mouse)
Maintenance expires: 28/02/202

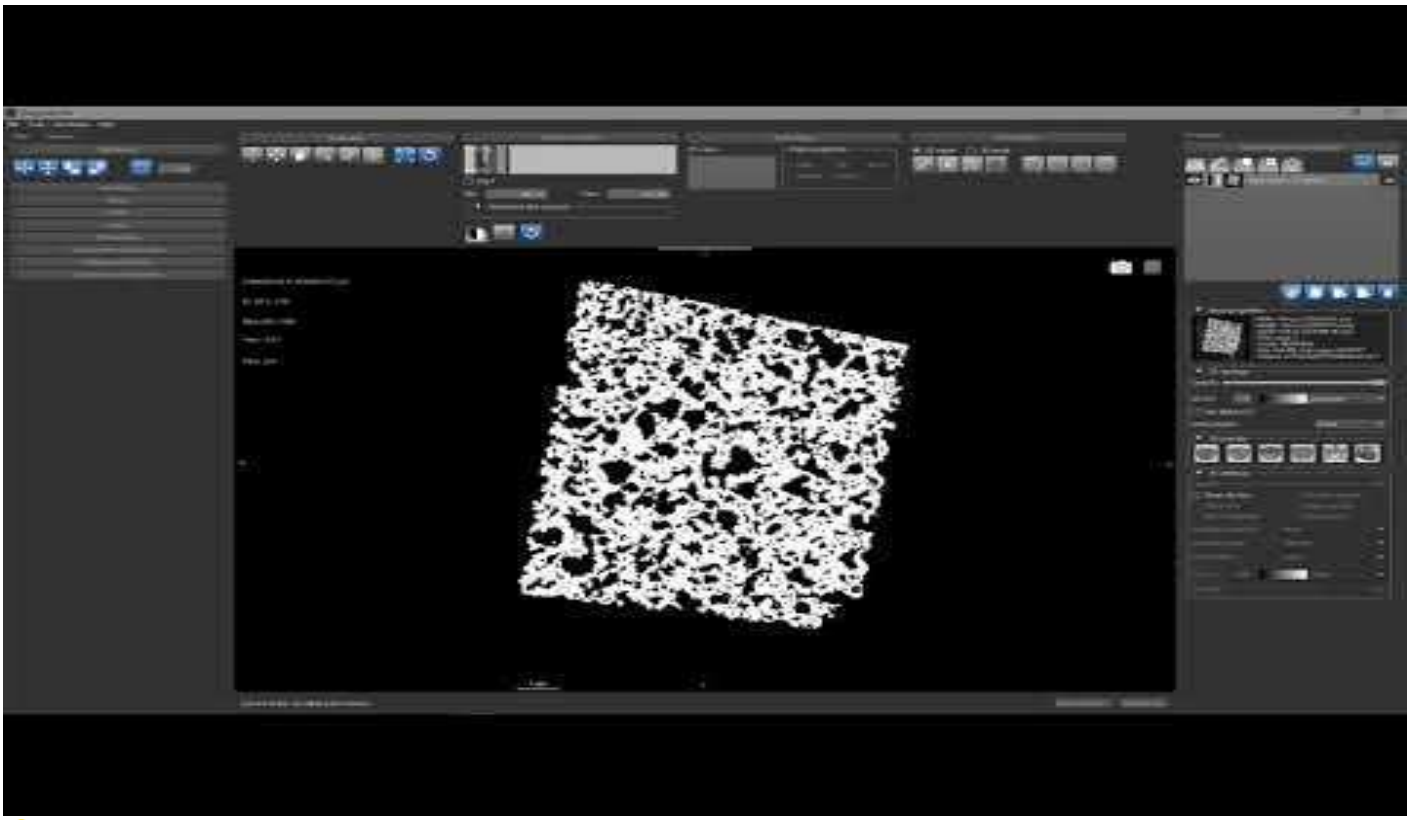


Loading images...

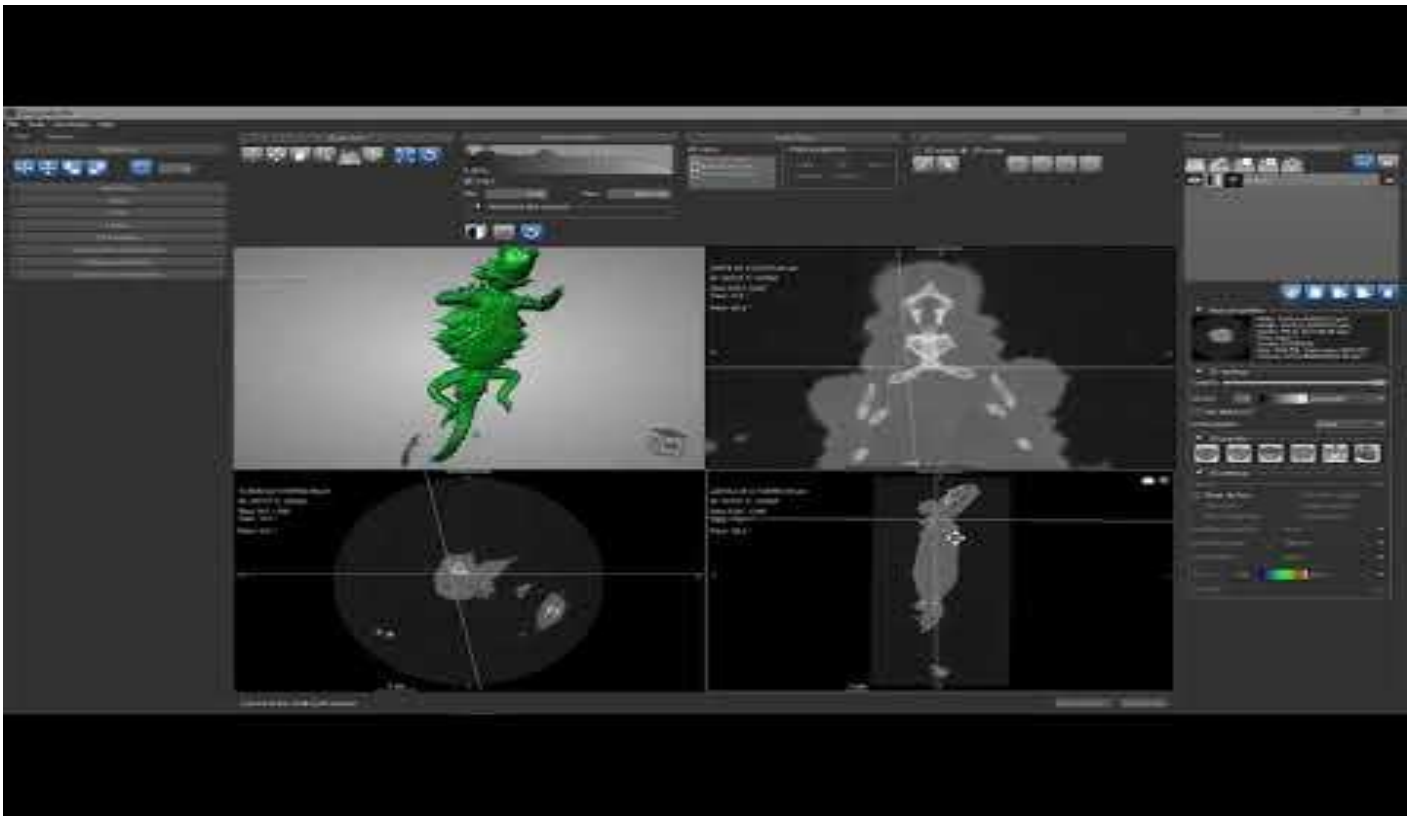


2) Display and manipulate your dataset

💡 ORS Dragonfly tutorial: Window Levelling controls in Dragonfly

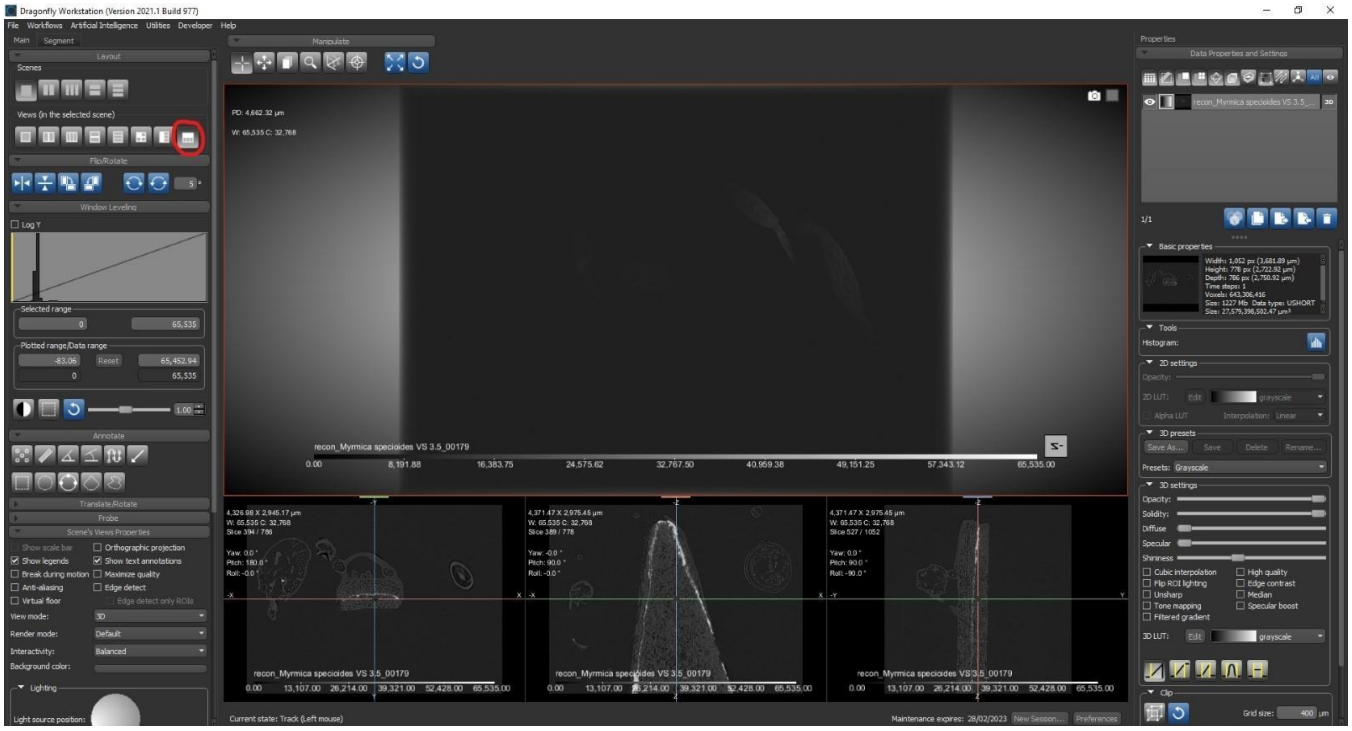


💡 ORS Dragonfly tutorial: Manipulate panel in Dragonfly



- Display your dataset in a 4-views layout: 1x 3D & 3x 2D (plans perpendicular to X, Y or Z axis)

=> In the “Main” tab, in “Layout”, click on one 4-views layout



💡 To simply activate/select one specific view (2D or 3D), just one left click (1x LC) on the corresponding window => the frame becomes red

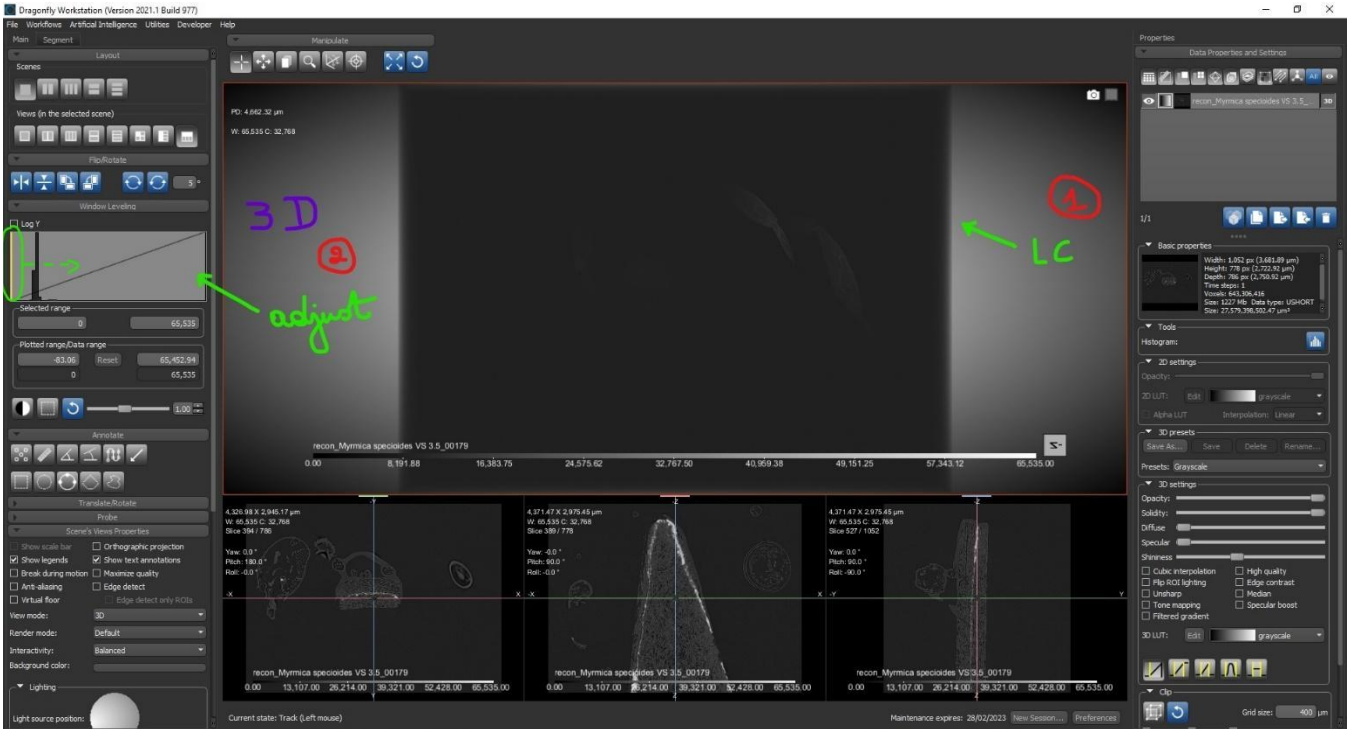
💡 To only display one specific view (2D or 3D), just double left click (2x LC) on the corresponding window

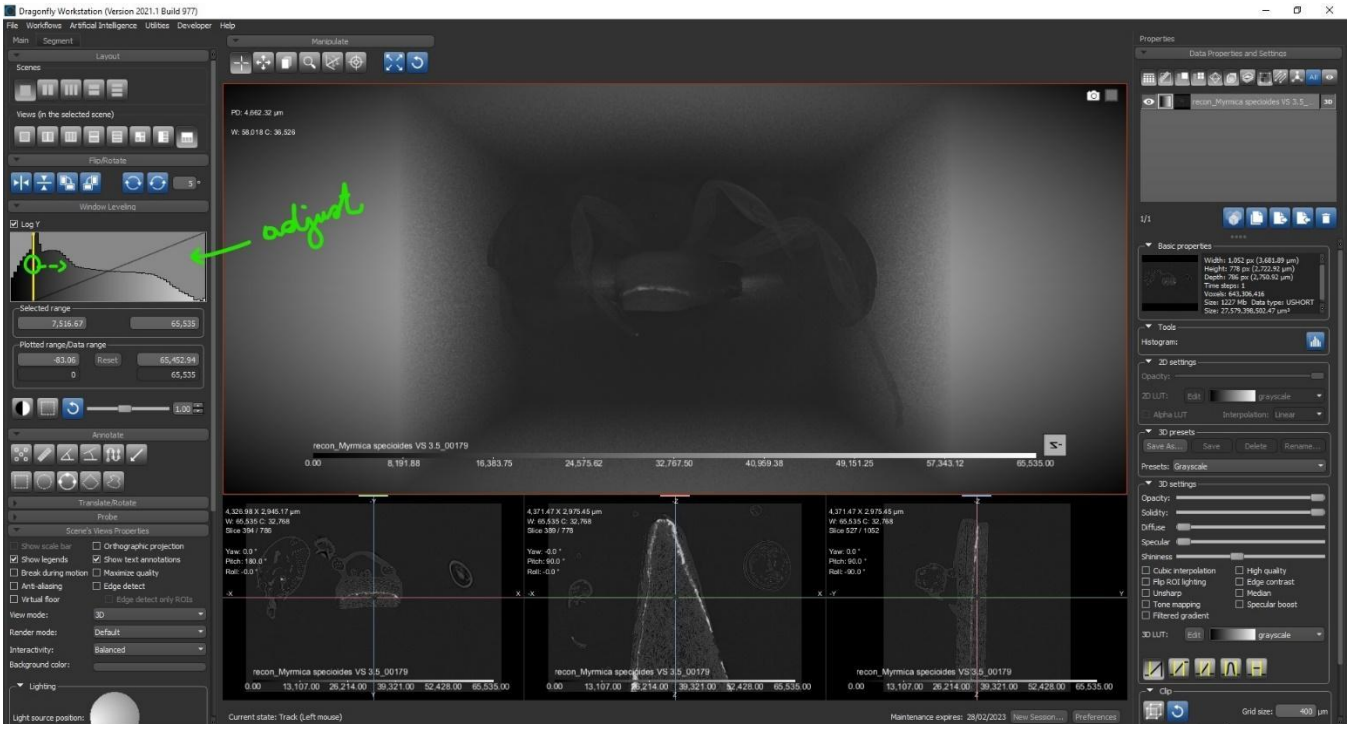
- Adjust the window leveling of your different views (= brightness and contrast adjustment):

There are 2 windows leveling to adjust: one for the 3D view and one for all the 2D views

For the 3D view:

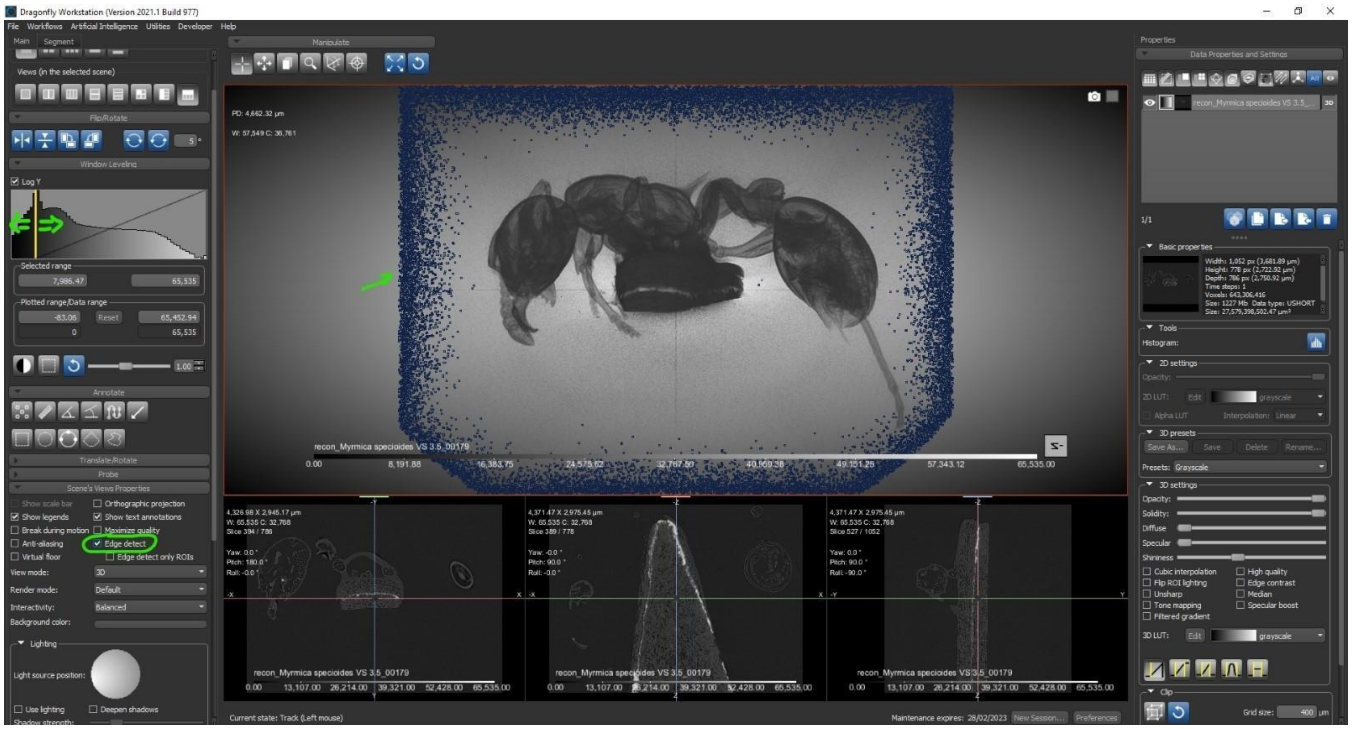
Adjust the lowest limit of the range to remove the air around the sample





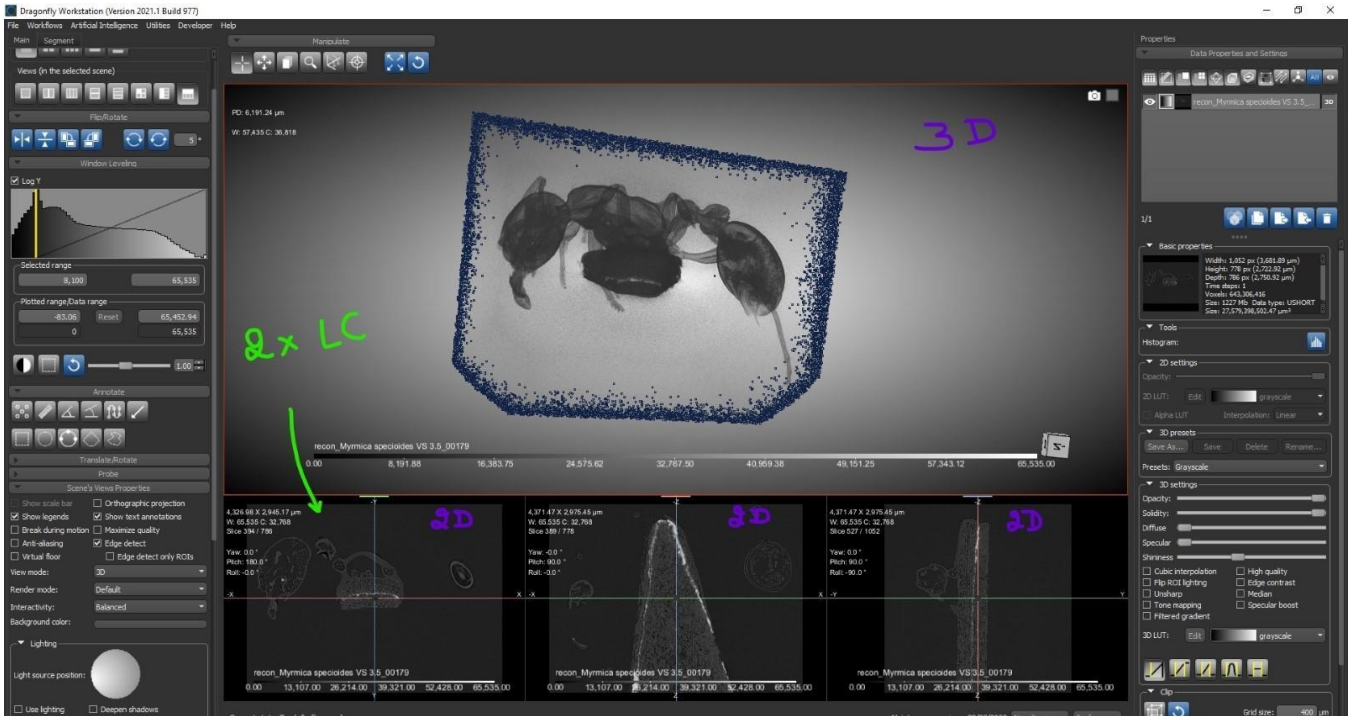
💡 To find the **best lowest limit of the range** to adjust the window levelling of the **3D viewer**:

In the “Main” tab: ✅ “**Edge detect**”

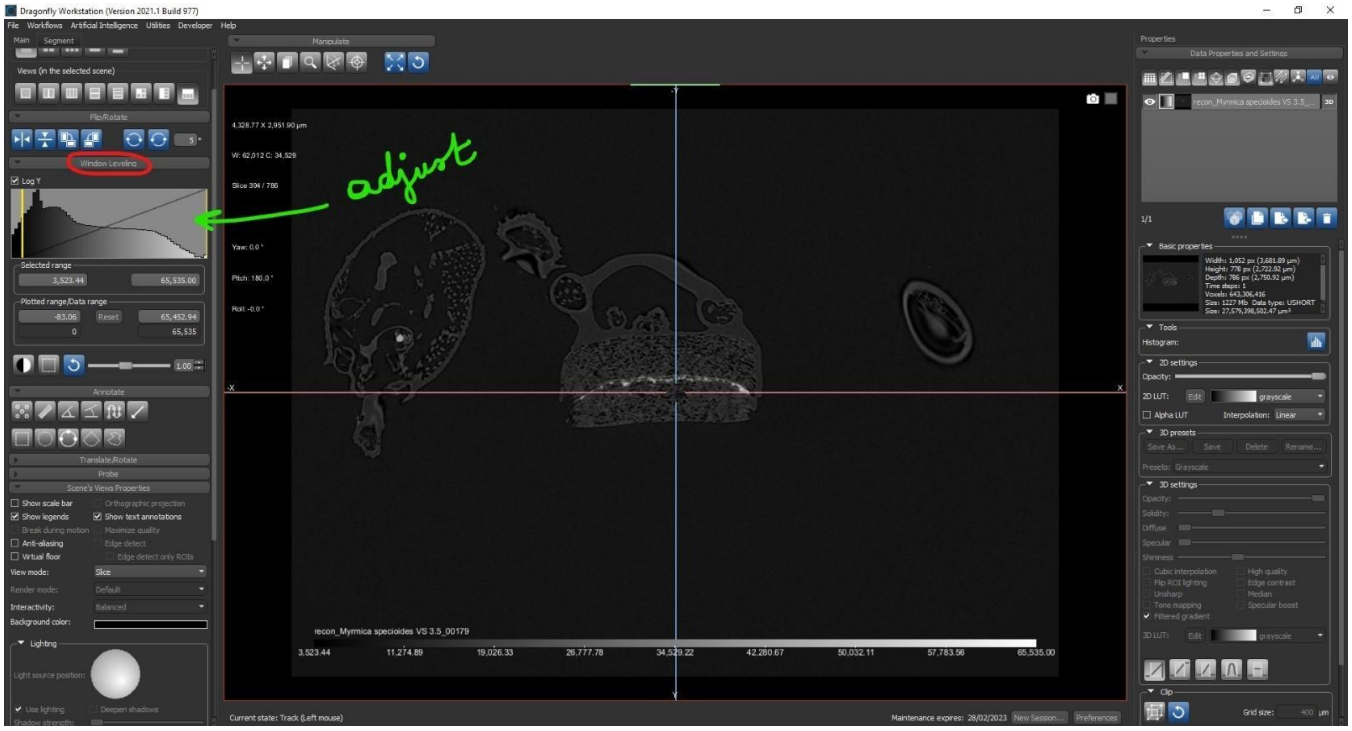


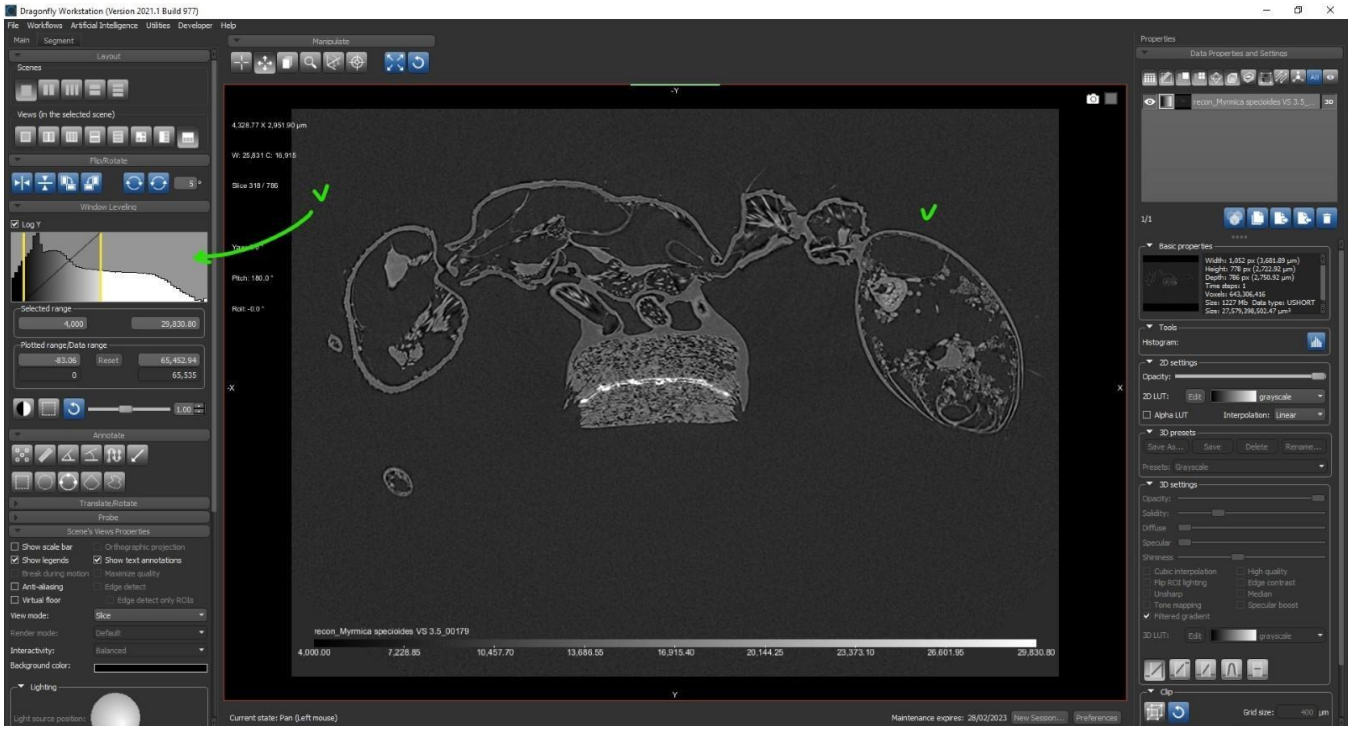
For the 2D view:

Open one 2D view by double clicking on it with the left button of the mouse

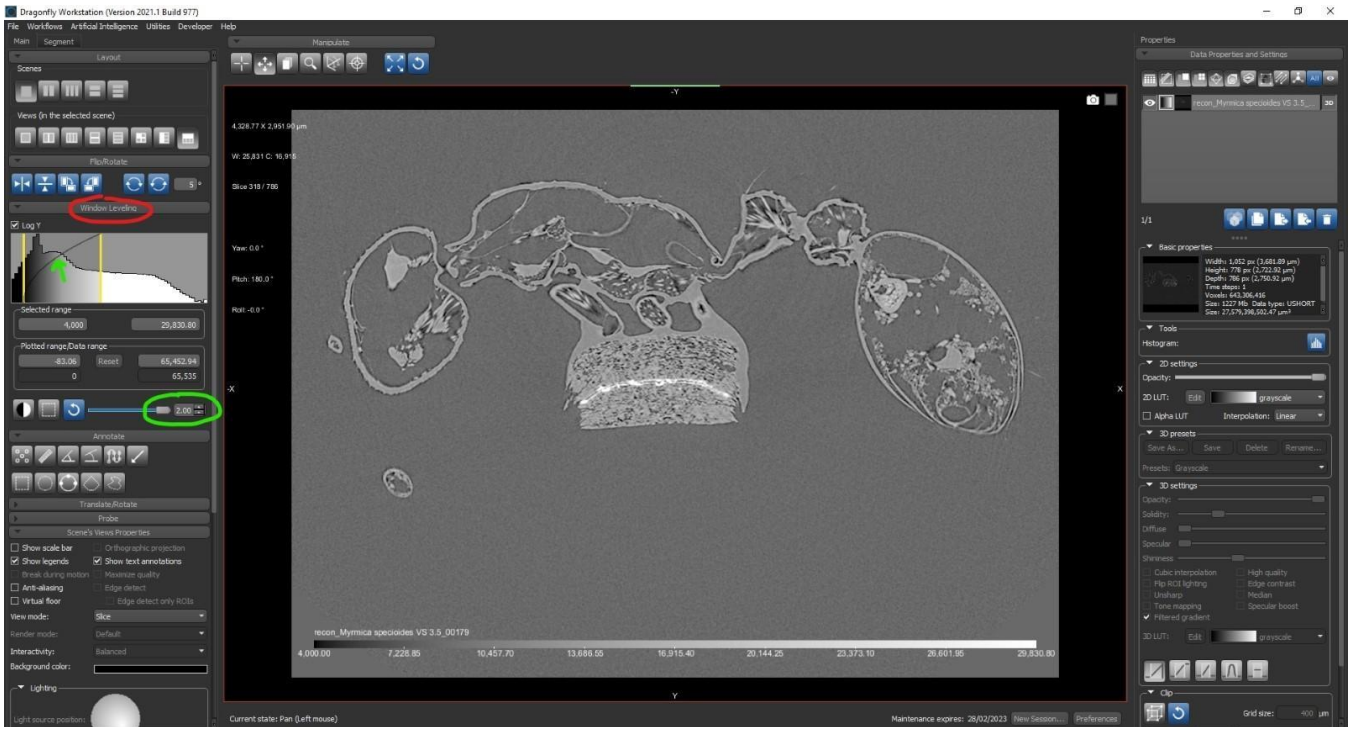


Adjust the range of the window leveling to get the best brightness and contrast in your 2D image

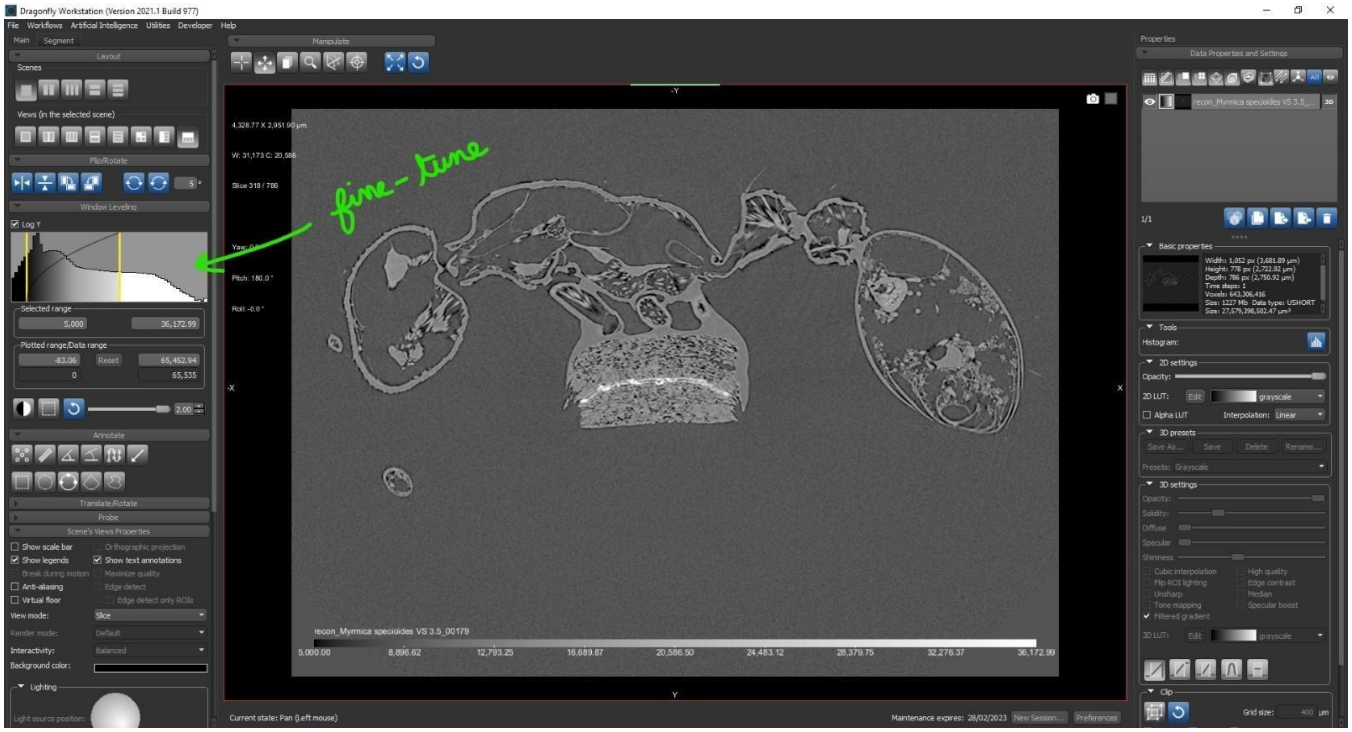




From time to time, depending on the micro-CT scan, you can get a better visualization of the edges of your specimen by sliding this cursor to the right (in this example: value = 2.00).



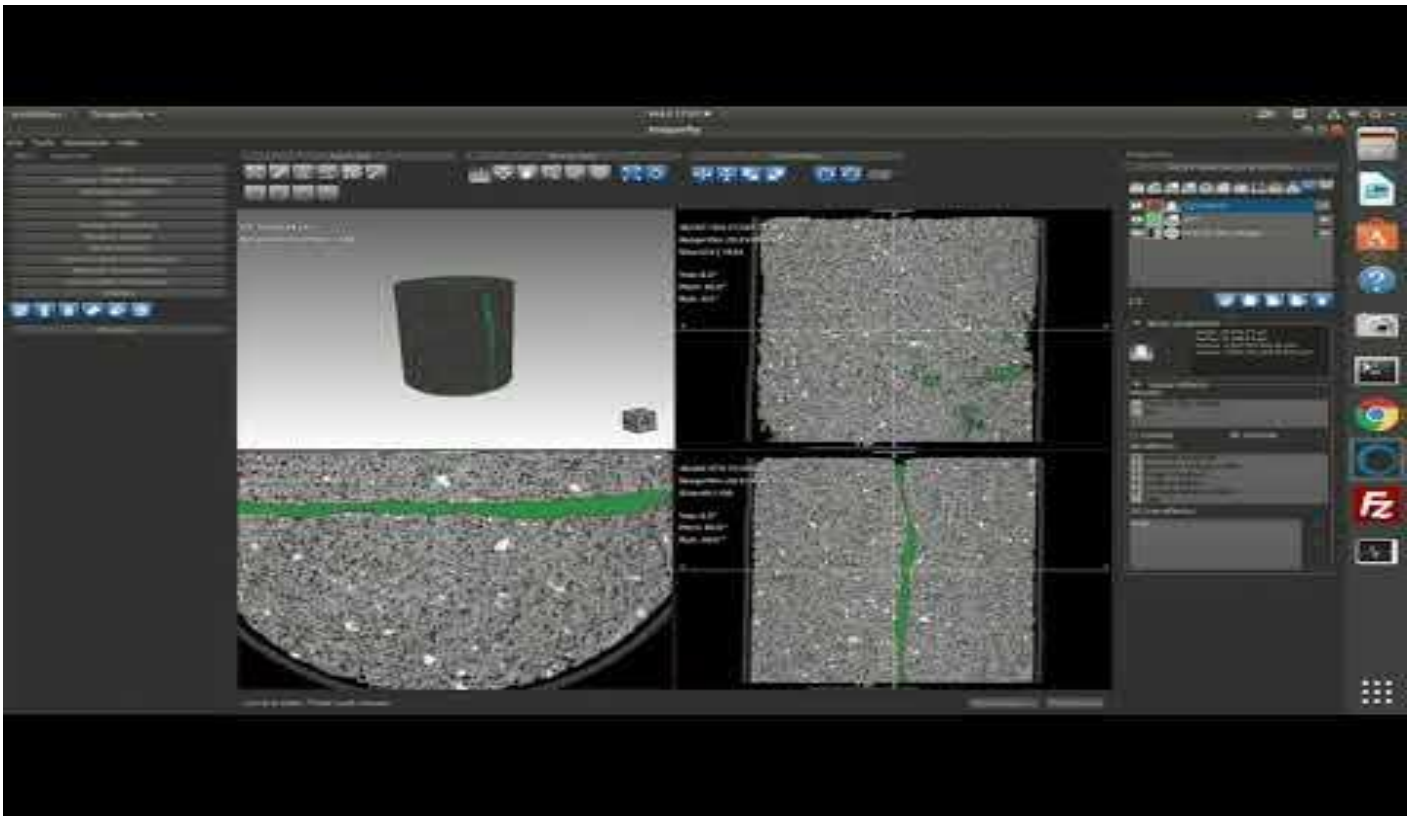
Then, you can fine-tune the range of the window leveling.



3) Image segmentation

The goal of the segmentation task is to assign labels to specific pixels.

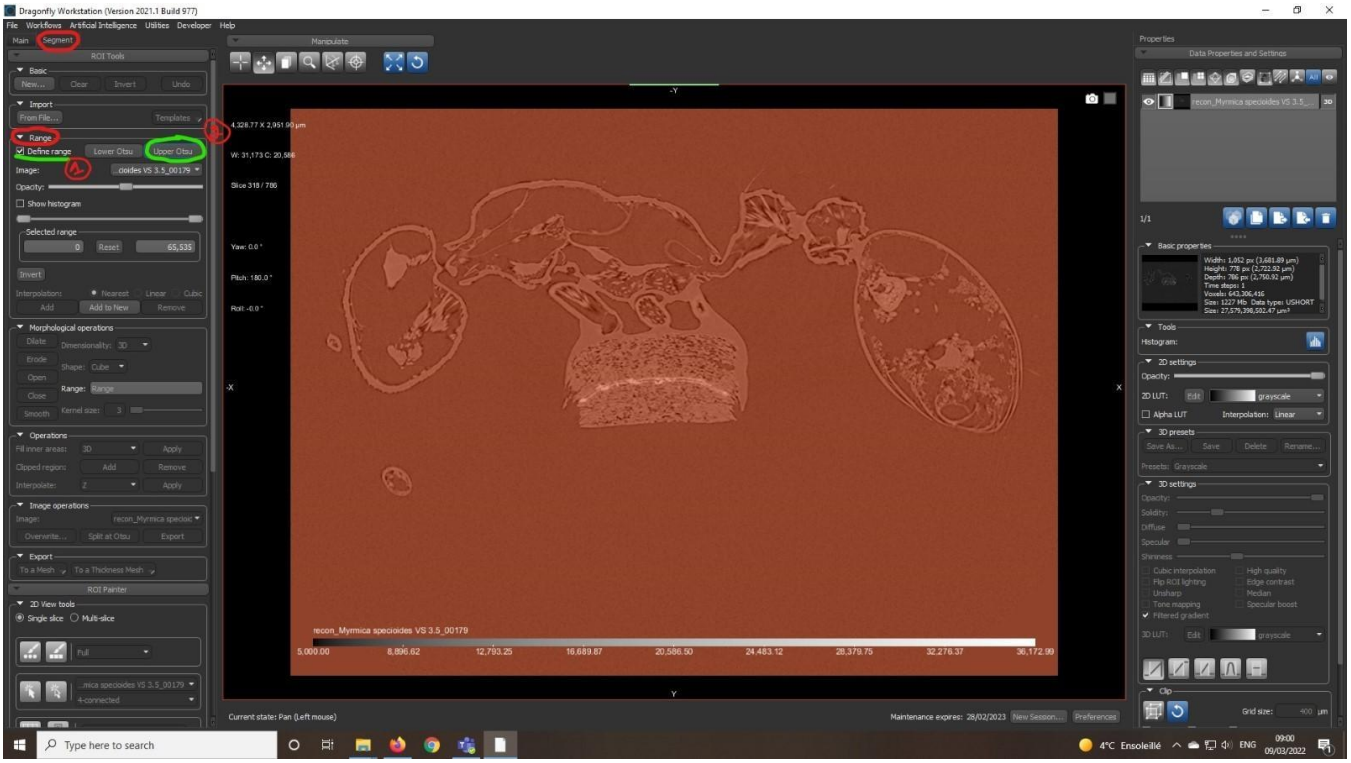
💡 ORS Dragonfly tutorial: [Thickness Mesh and ROIs Tutorial for DF 4.1]



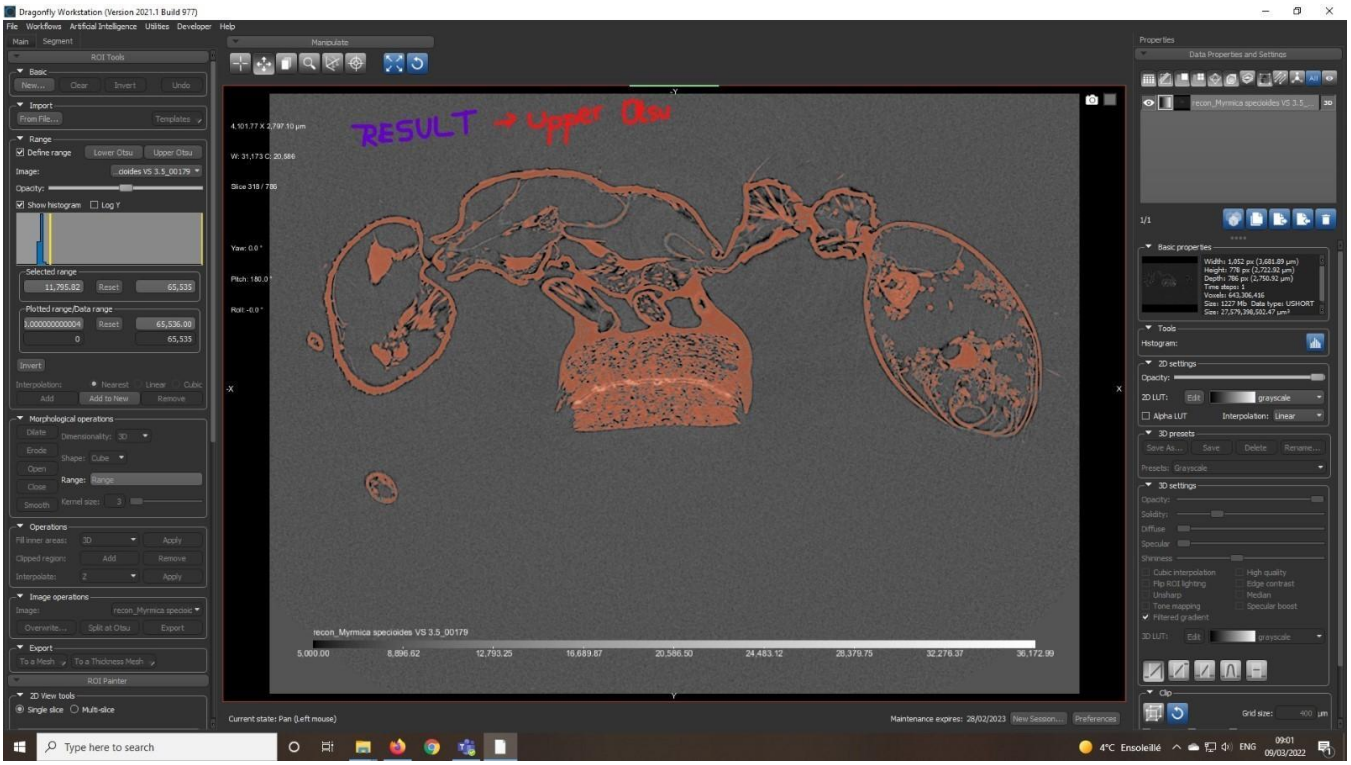
In this case, the segmentation will enable us to extract an ant from its surrounding environment by labelling pixels corresponding to its body.

- Open one 2D viewer
- In the segment tab -> Range -> ✅ Define range

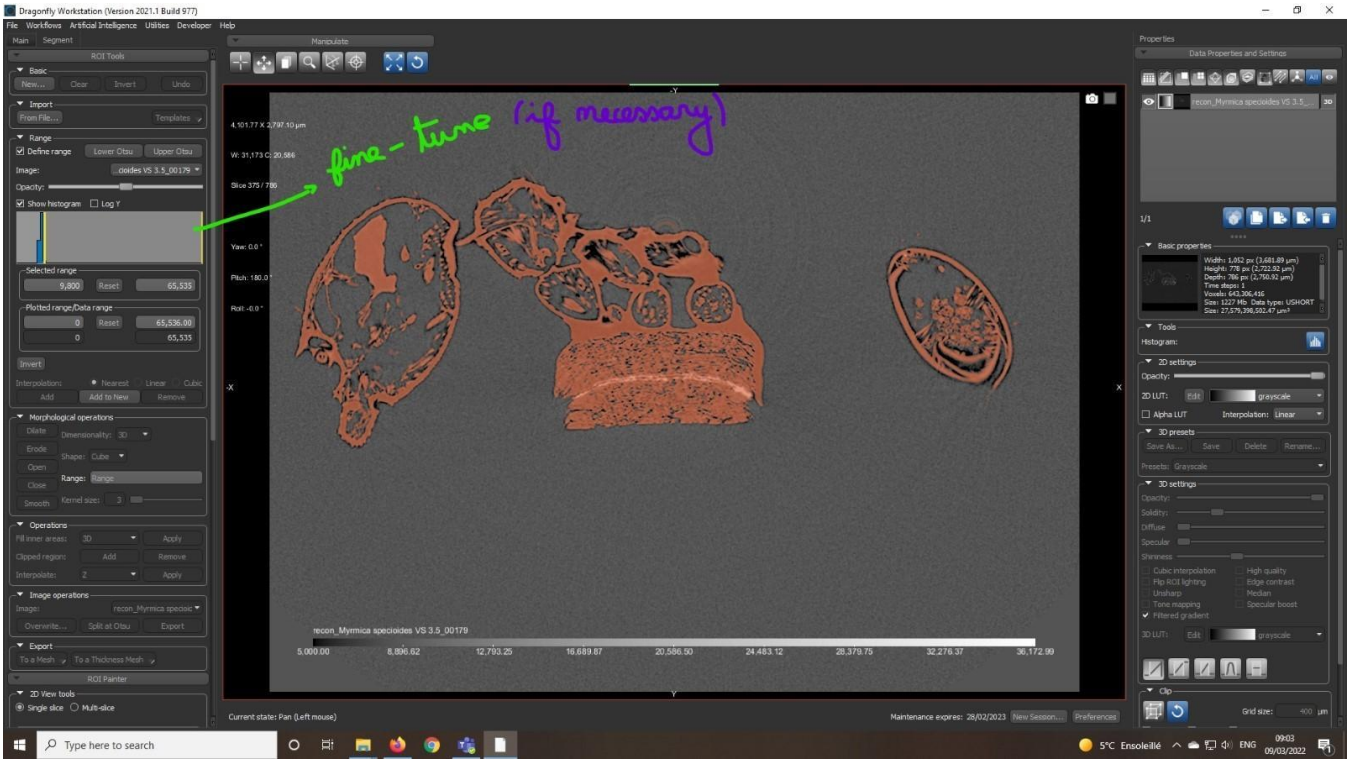
red color = pre-selected pixels for segmentation



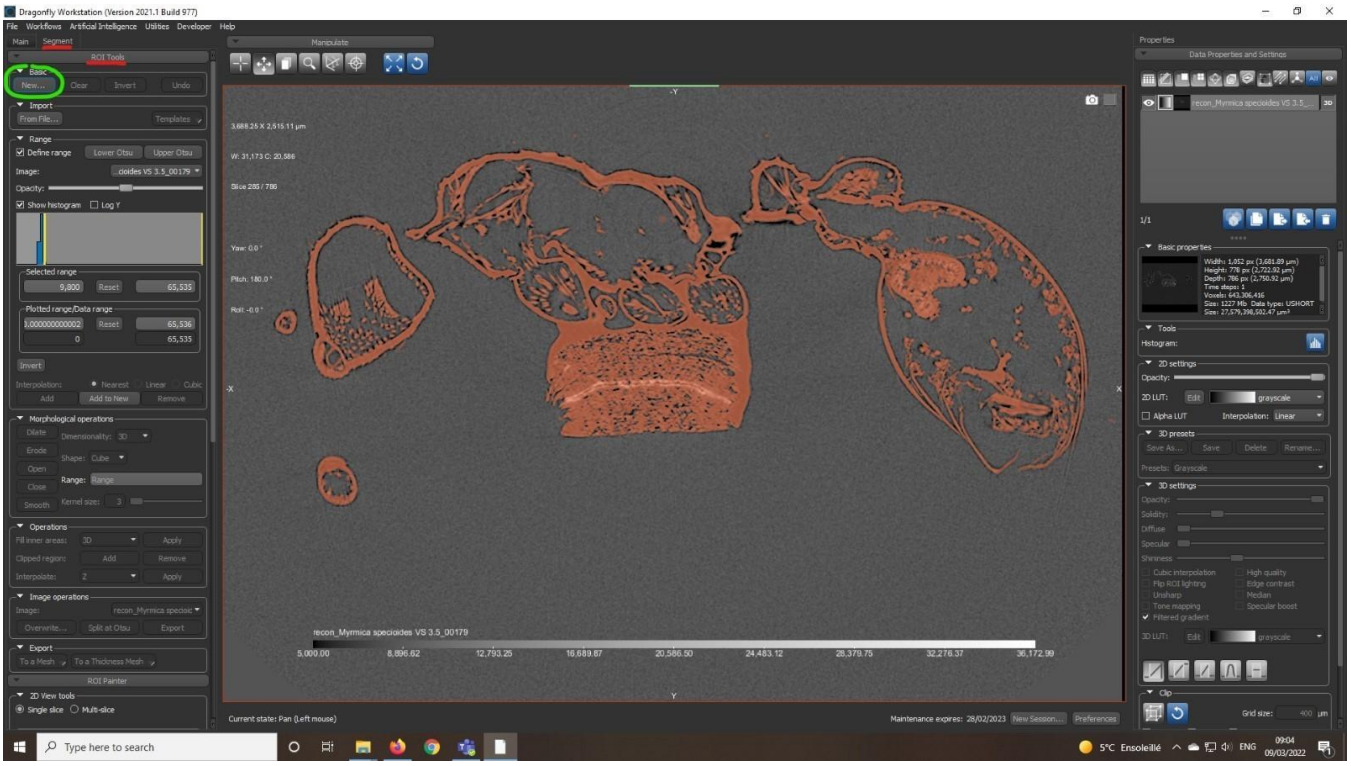
- click on “Upper Otsu” to adjust the range automatically



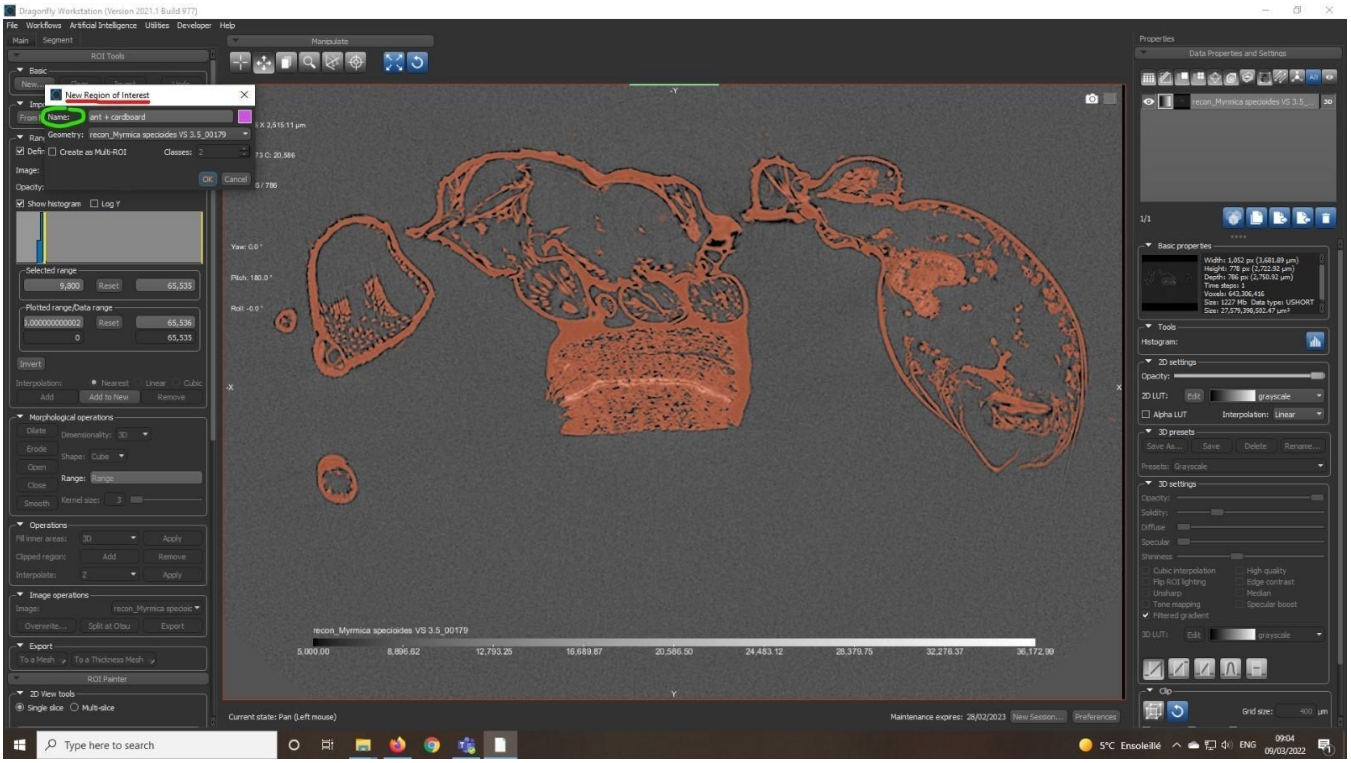
- Then, if necessary, fine tune the window levelling range manually to get the perfect selection area



- In the “Segment” tab, ROI tools, Basic, click on “New” to create a new ROI

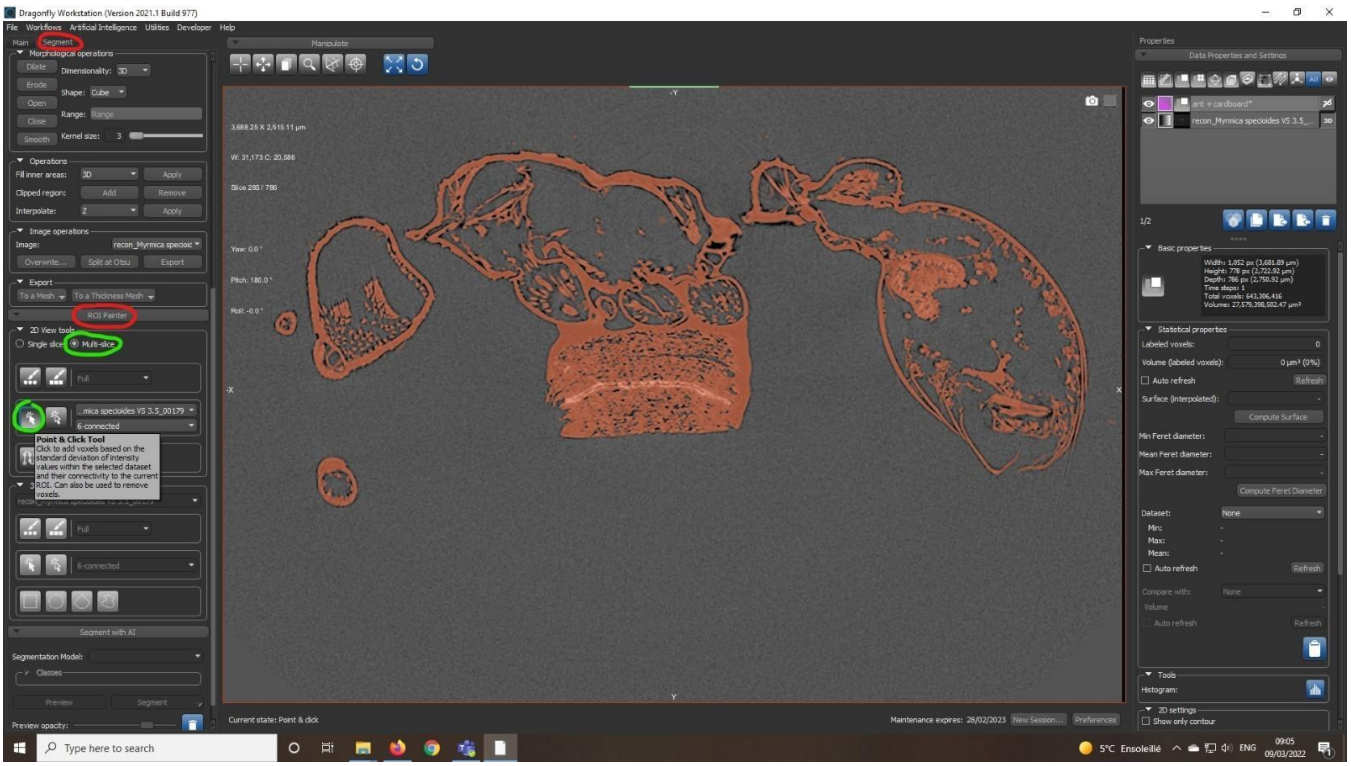


- In the “New Region of Interest” tab, give a name to this ROI and select the geometry of your raw dataset

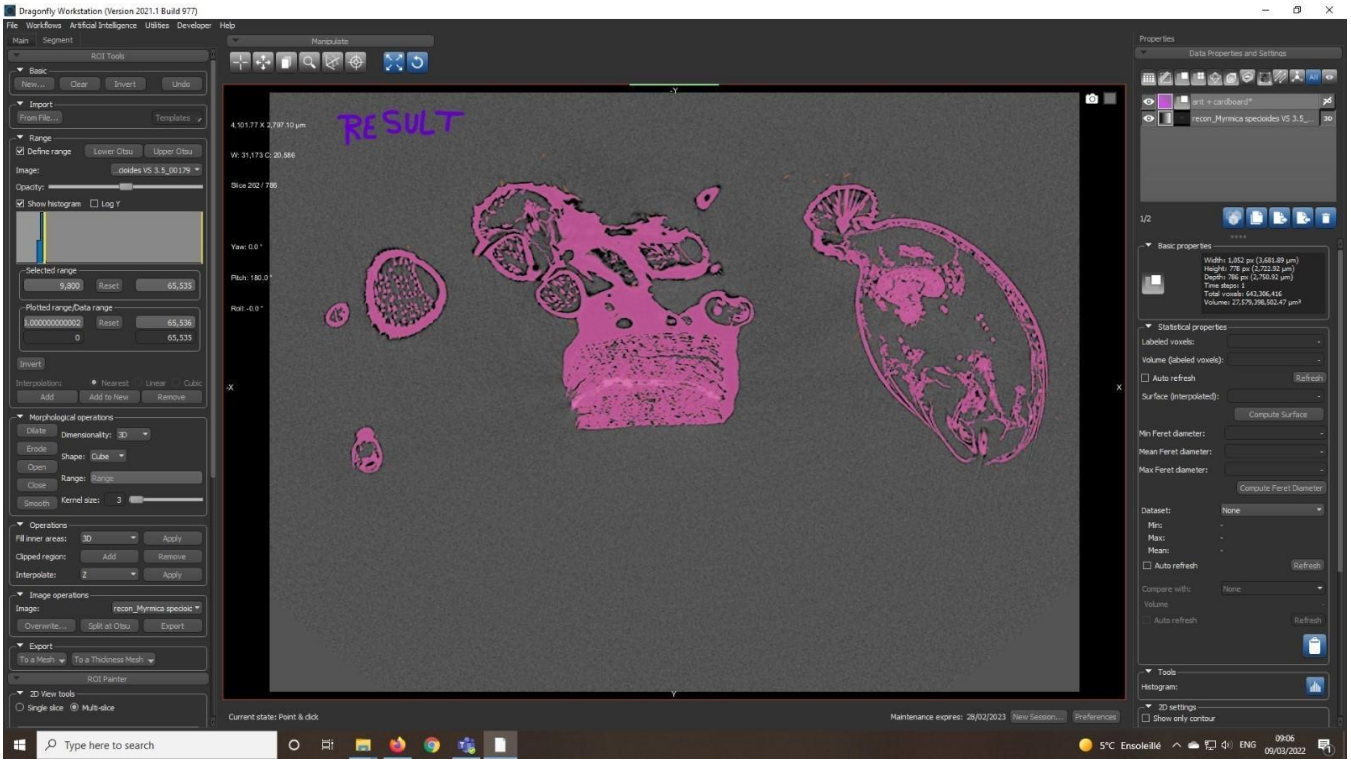


- In the “Segment” tab, 2D view tools, select “Multi-slice” and choose the “Point and Click Tool”

(in the version BETA Build 711: Segment tab ; ROI painter ; 3D mode point and click tool)



- Then, paint your selection area by keeping CTRL + left click and pointing the cursor on the selection area + left click



- Check if all the specimen is painted in a proper way by quickly going through all the slides
- You can also check the segmentation result in the 3D view mode

4) Credits

- Author: Camille Locatelli
- Date: August 2021
- Version: 1.0
- CC: CC BY