

# OCTExplorer 3.8.0

## User Manual

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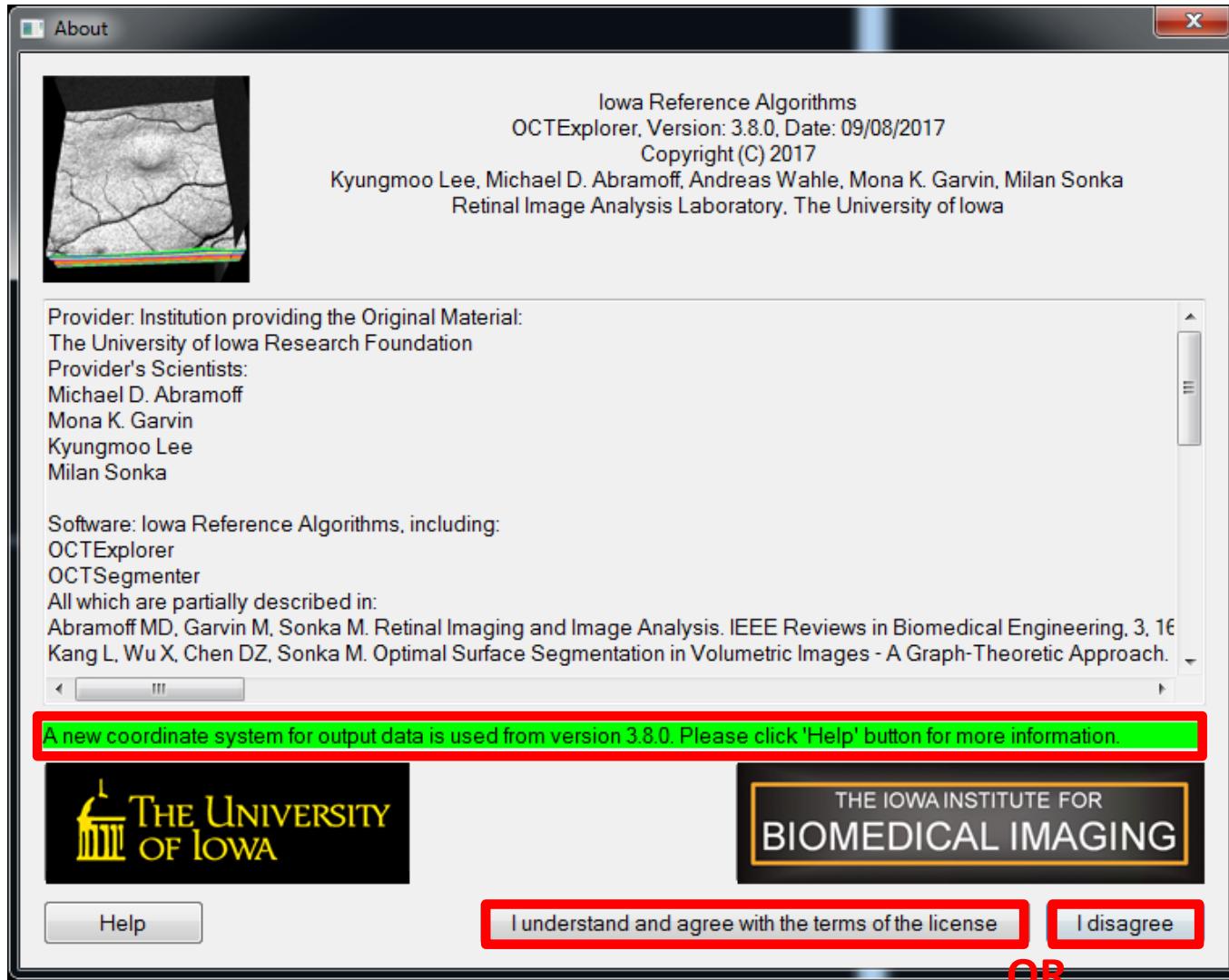
# Requirements

- **OS: Microsoft Windows**
  - Windows 7 or above recommended
  - Other OSs are not supported.
- **Minimum hardware**
  - Screen resolution: 1024 x 768 pixels
  - Memory size: 4 GB

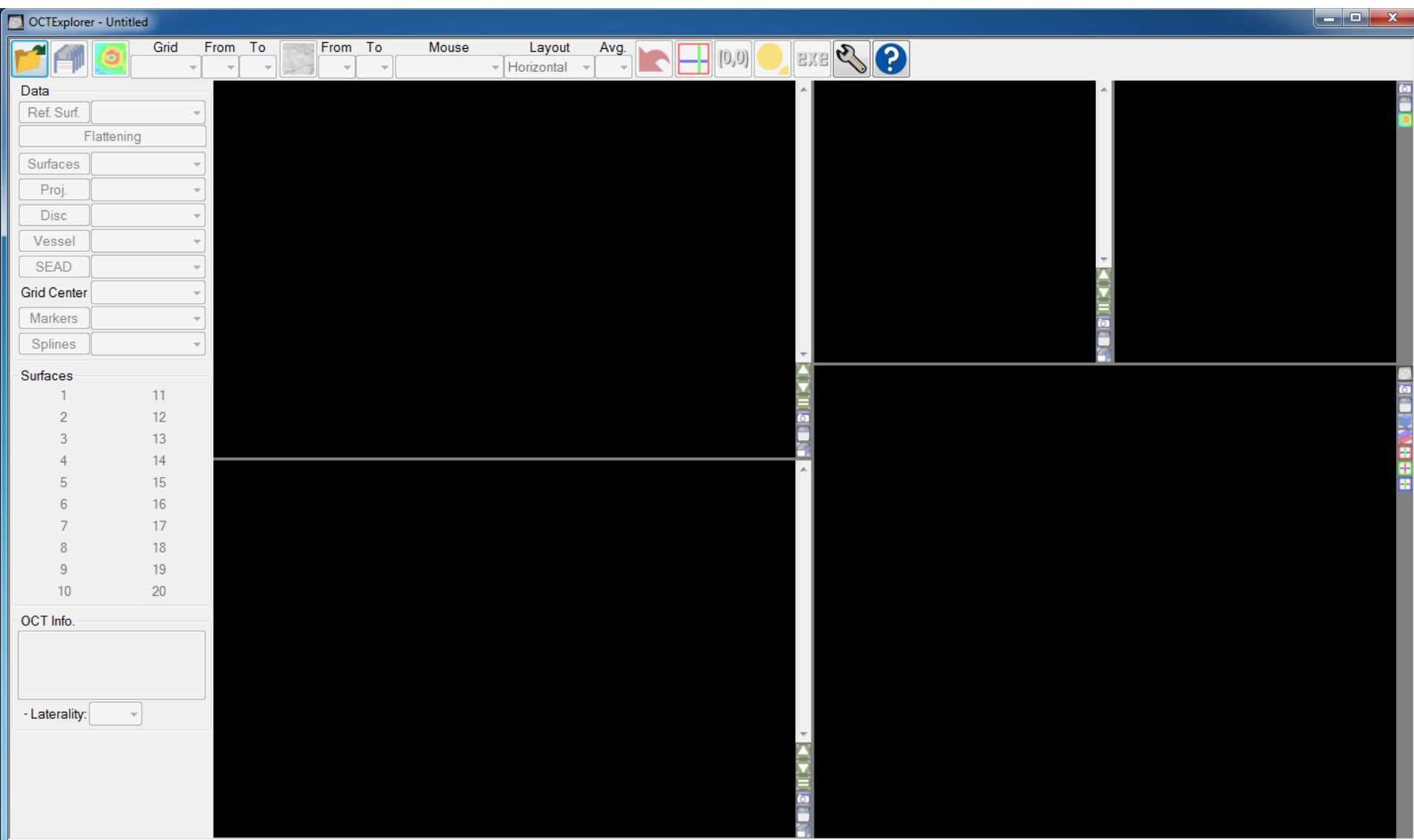
# Installation

- **64-bit version:**
  - Run ‘OCTExplorer-3.8.0-x64-Setup.exe’.
- **32-bit version:**
  - Does not support it because more than 2 GB memory is required to segment retinal layers.

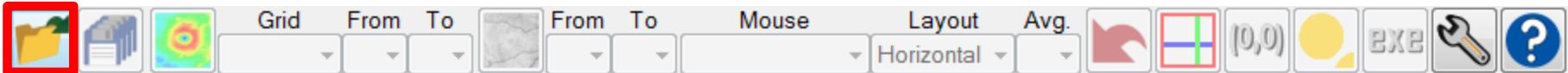
# License



# Appearance



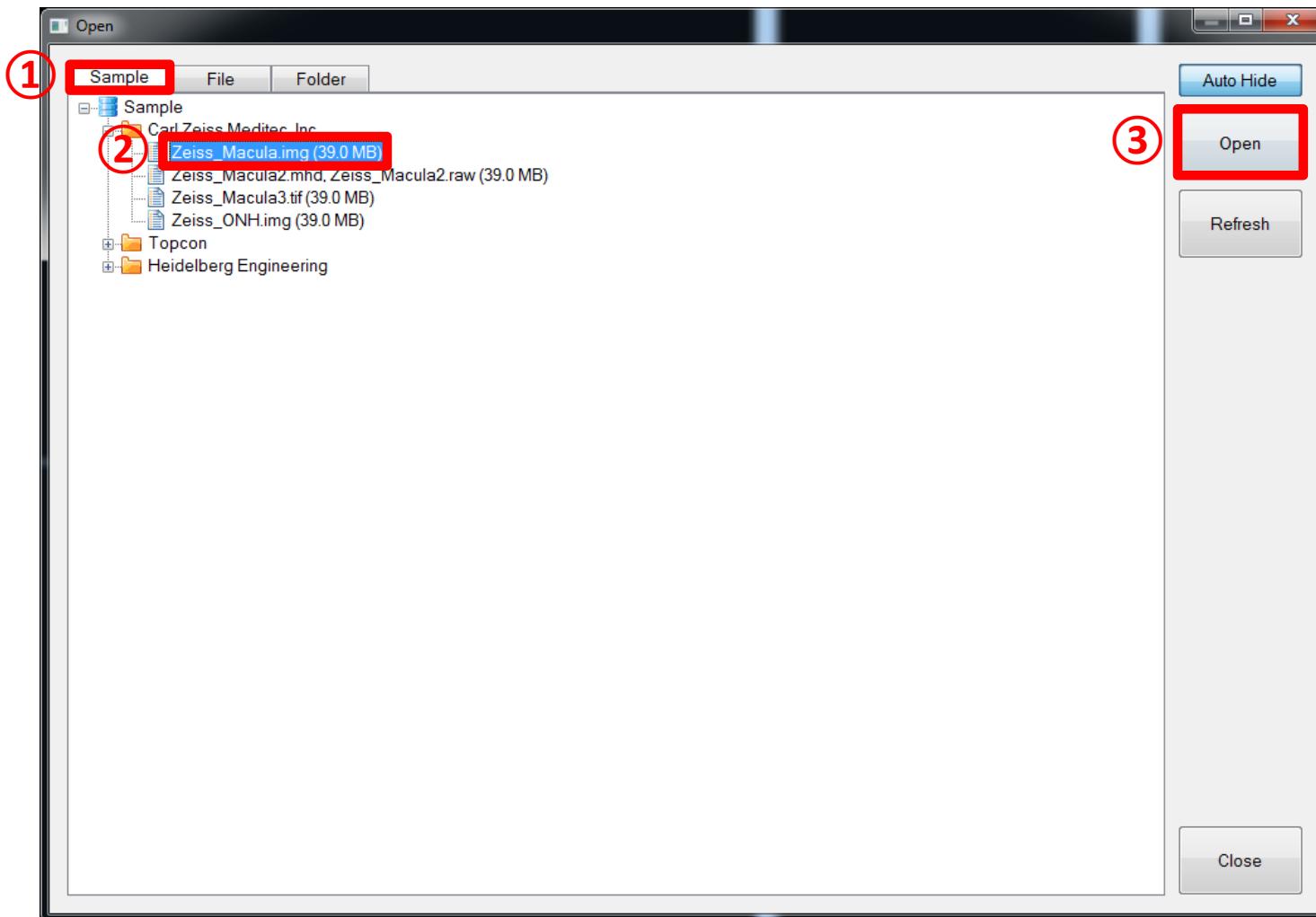
# Opening OCT Scans



- **Supported OCT scans**

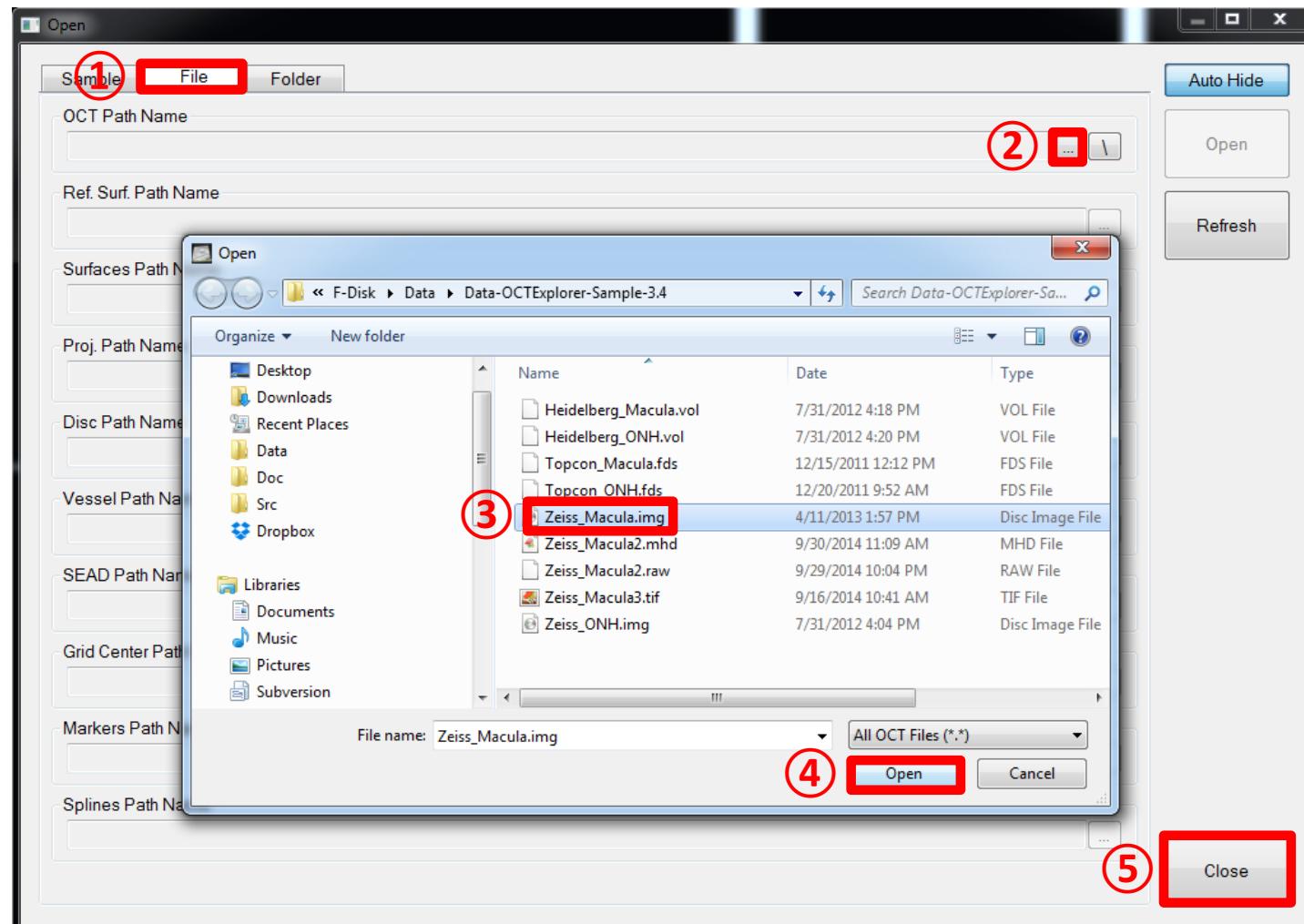
- Carl Zeiss Meditec, Inc. ('.img' exported from research browser)
  - Please contact this company to get the research browser.
- Topcon ('.fds')
- Heidelberg Engineering ('.vol')
  - Please contact this company for file conversion from 'E2E' to 'vol'.
- Optovue, Inc. ('.OCT')
- Bioptigen, Inc. ('.OCT')
- Optos plc ('.dicom')
- Iowa DICOM ('.DICOM')
- Vienna DICOM ('.dcm')
- Metalmage ('.mhd', '.raw', '.mha')
- Analyze ('.hdr', '.img')
- NIFTI ('.nii.gz')
- 3D TIFF ('.tif', '.tiff')
  - 8-bit (grayscale, 0 ~ 255), 16-bit (grayscale, 0 ~ 65535), 24-bit (RGB, 0 ~ 255), 32-bit (RGBA, 0 ~ 255)
- Image sequence consisting of B-scan images ('.tif', '.tiff', '.bmp', '.jpg', '.jpeg', '.gif', '.png')
  - TIFF: 8-bit (grayscale, 0 ~ 255), 16-bit (grayscale, 0 ~ 65535), 24-bit (RGB, 0 ~ 255), 32-bit (RGBA, 0 ~ 255)
  - Others: 8-bit (grayscale, 0 ~ 255), 24-bit (RGB, 0 ~ 255), 32-bit (RGBA, 0 ~ 255)

# Opening Remote Sample OCT Scans

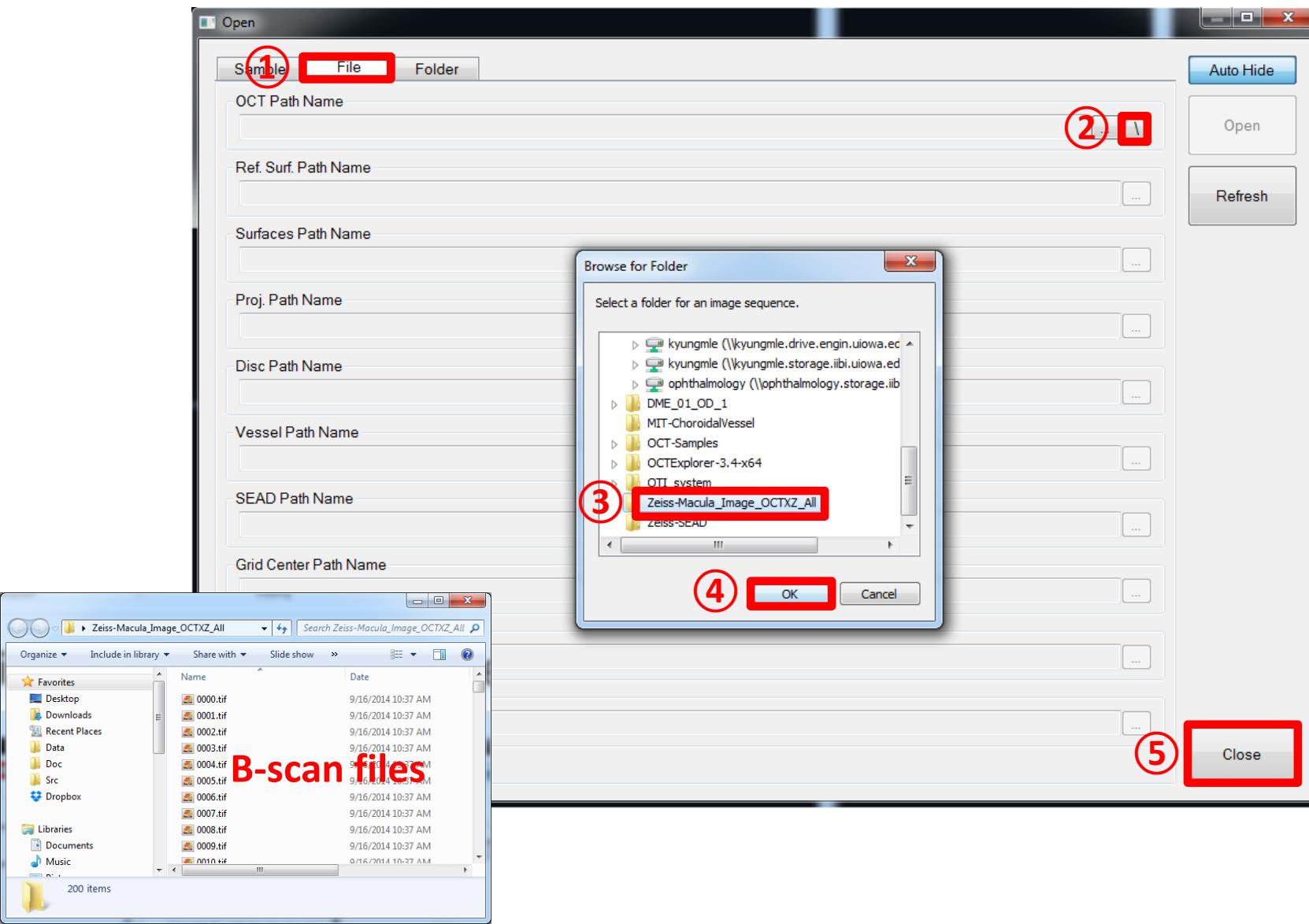


If you cannot open sample OCT scans, please see slide 44 (Options).

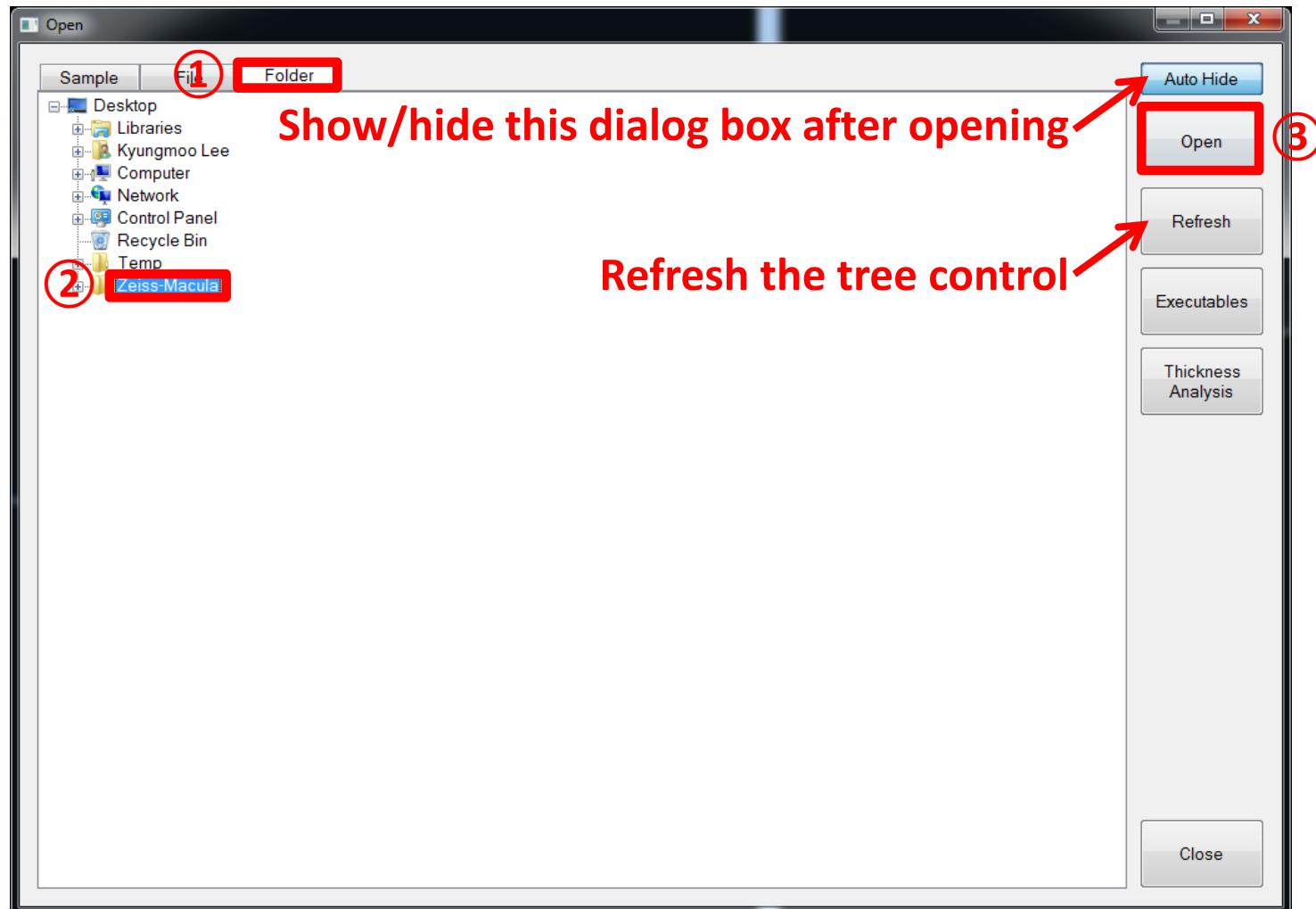
# Opening Local OCT Scans



# Opening Local Image Sequences



# Opening Local Folders Including OCT Scans

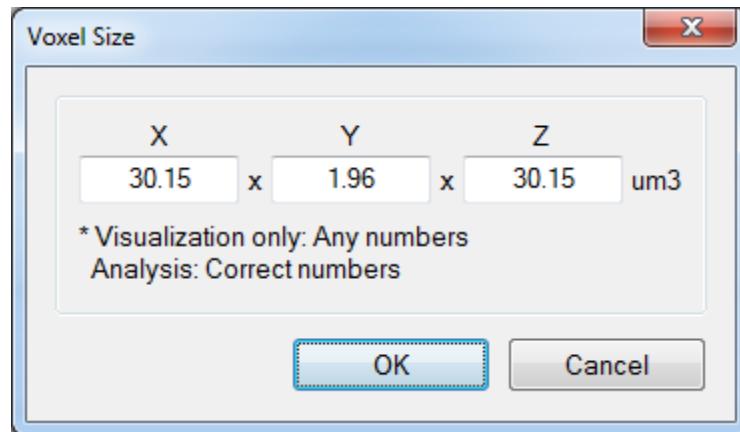


# Opening Local Folders Including OCT Scans

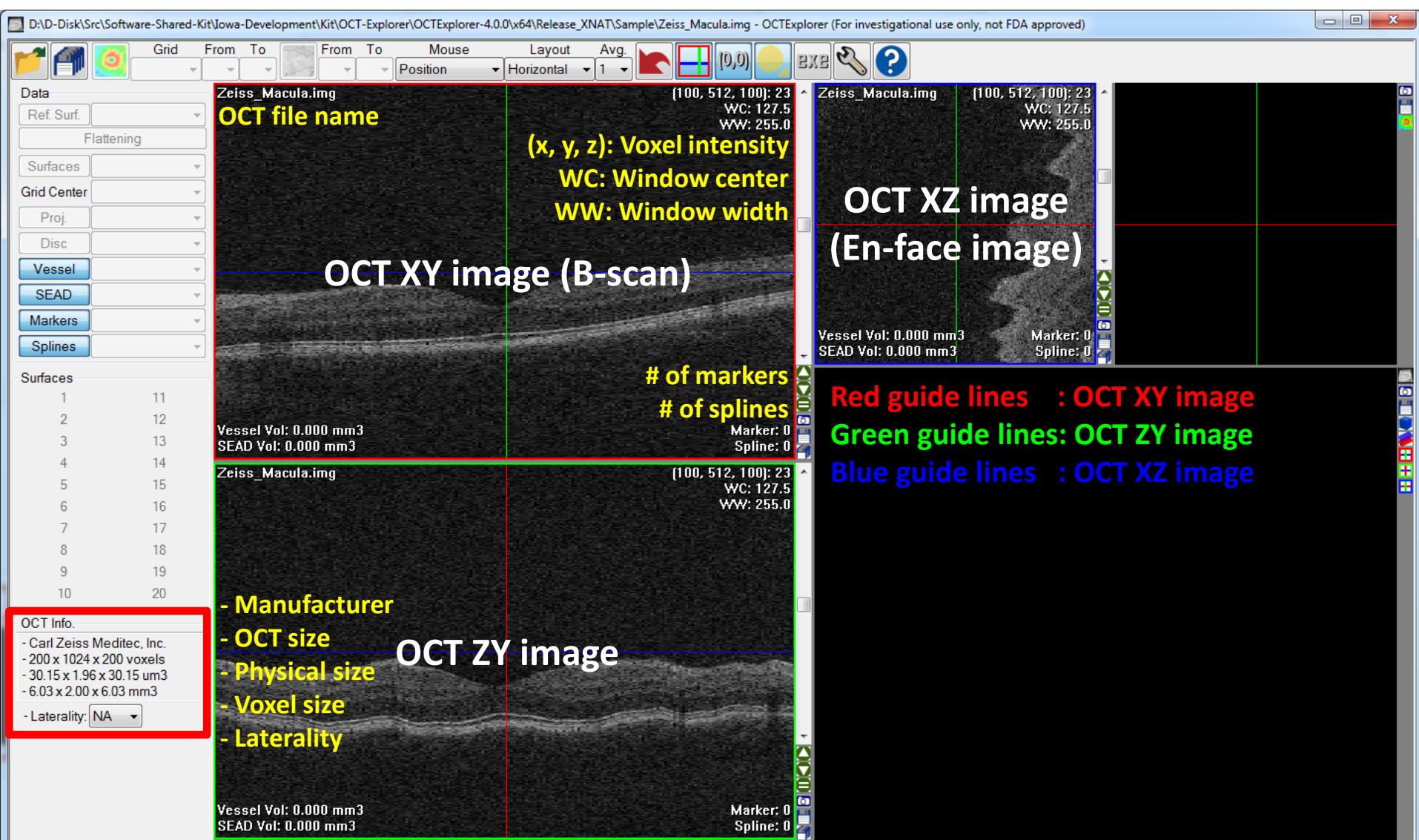
- File names
  - **Surfaces** : ‘\*\_Surfaces\_\*.xml’
  - **Reference surface**: ‘\*\_RefSurf\_\*.xml’
  - **Projection image** : ‘\*\_Proj\_\*.tif, tiff, bmp, jpg, jpeg, gif, png’
  - **Disc image** : ‘\*\_Disc\_\*.tif, tiff, bmp, jpg, jpeg, gif, png’
  - **Vessel volume** : ‘\*\_Vessel\_\*.mhd’
  - **SEAD volume** : ‘\*\_SEAD\_\*.mhd’
  - **Grid center** : ‘\*\_GridCenter\_\*.xml’
  - **Markers** : ‘\*\_Markers\_\*.xml’
  - **Splines** : ‘\*\_Splines\_\*.xml’

# Voxel Size

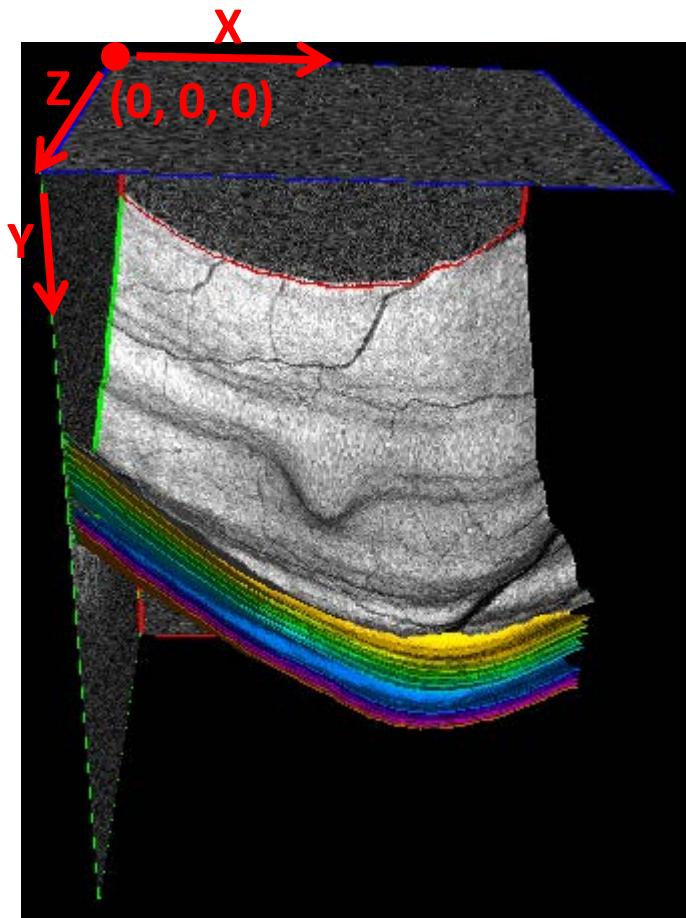
- Please input the voxel size to open TIFF OCT scans and OCT image sequences.



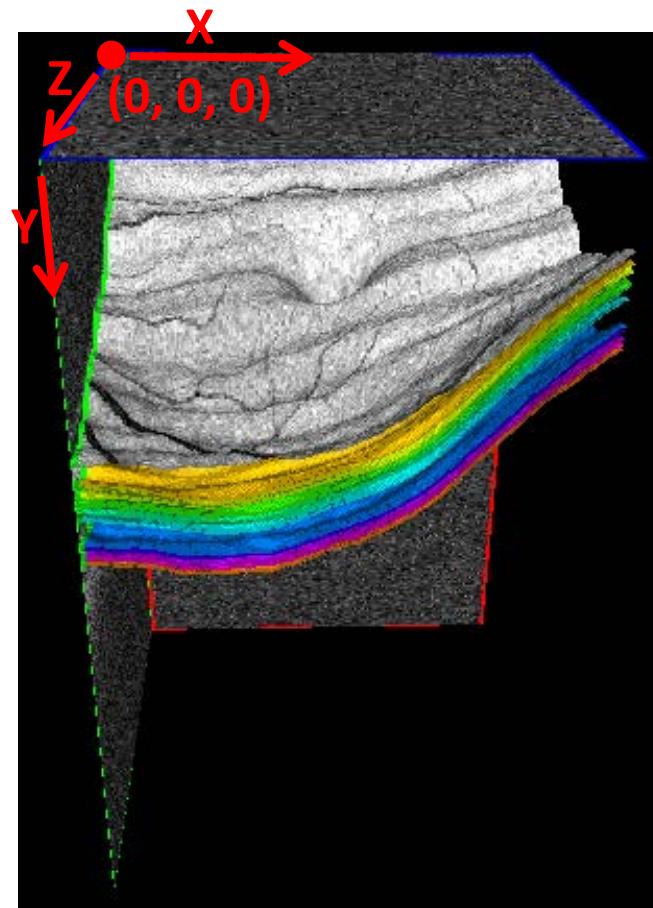
# After Opening an OCT Scan



# Orientation

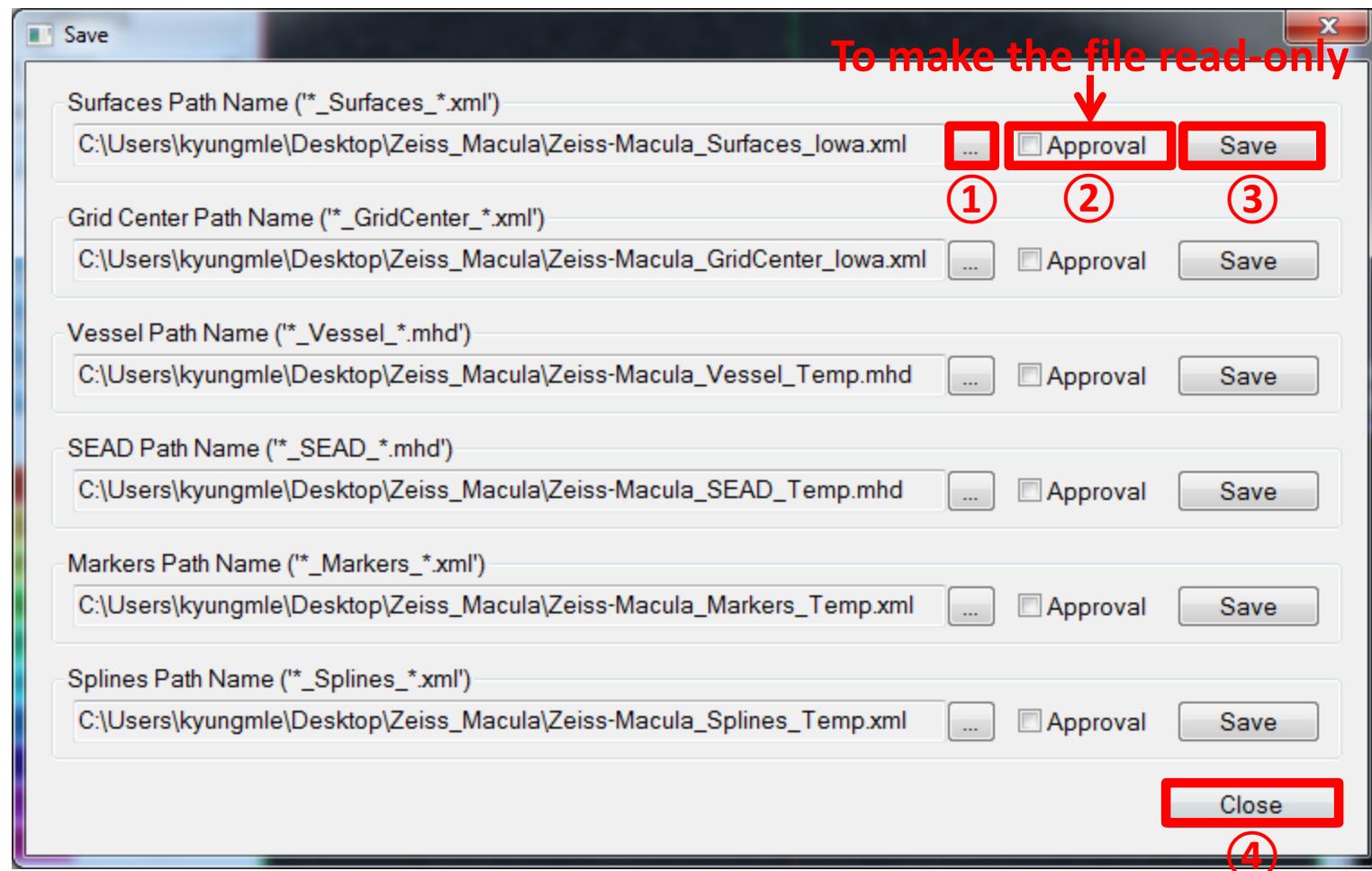


OD

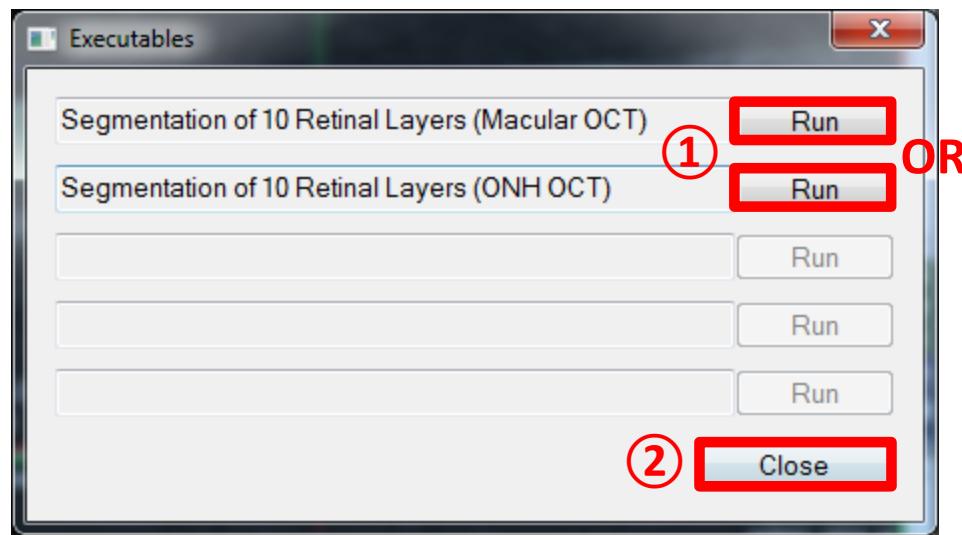
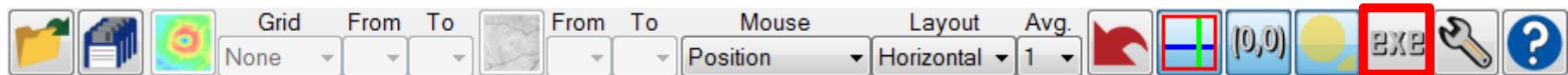


OS

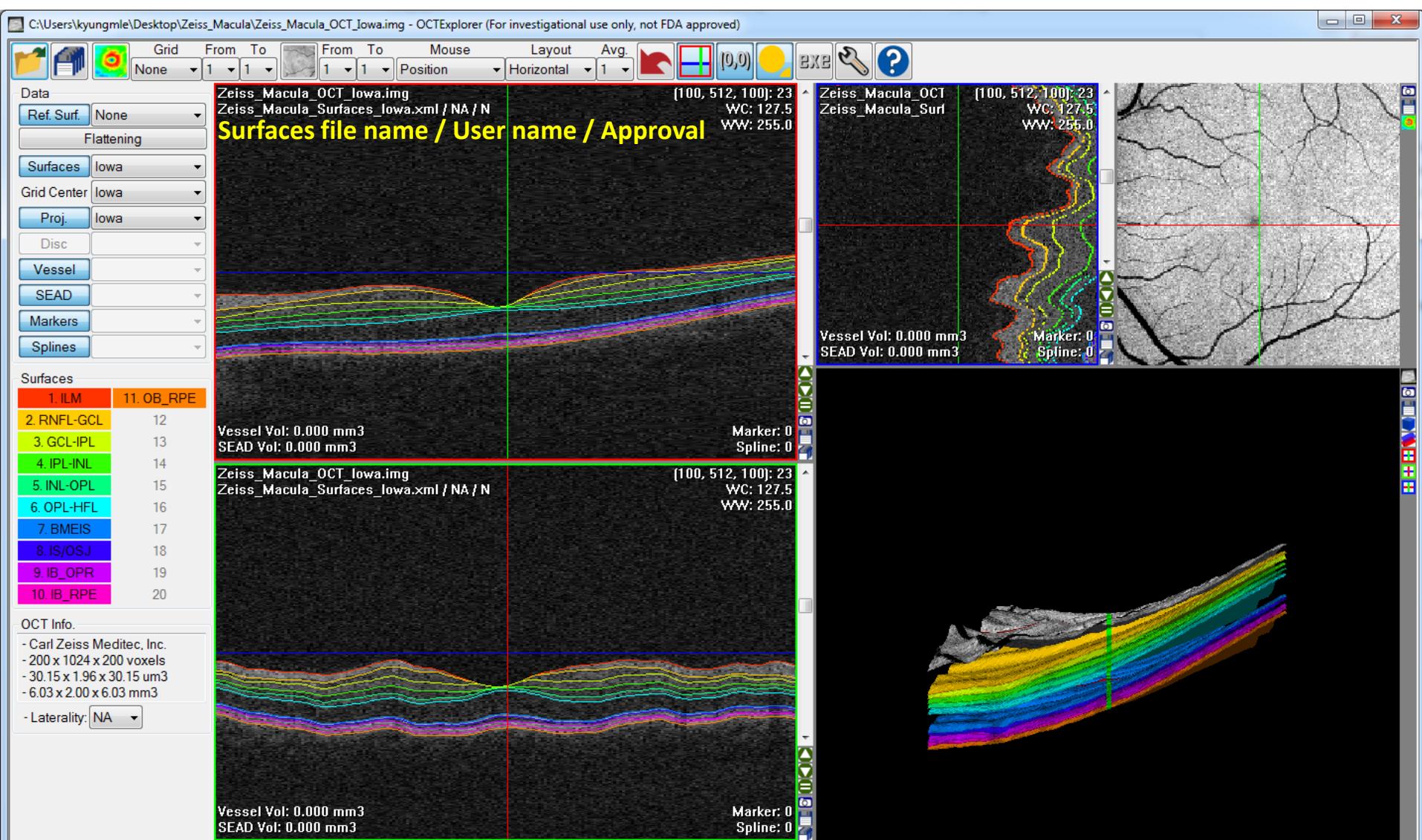
# Saving Files



# Retinal Layer Segmentation



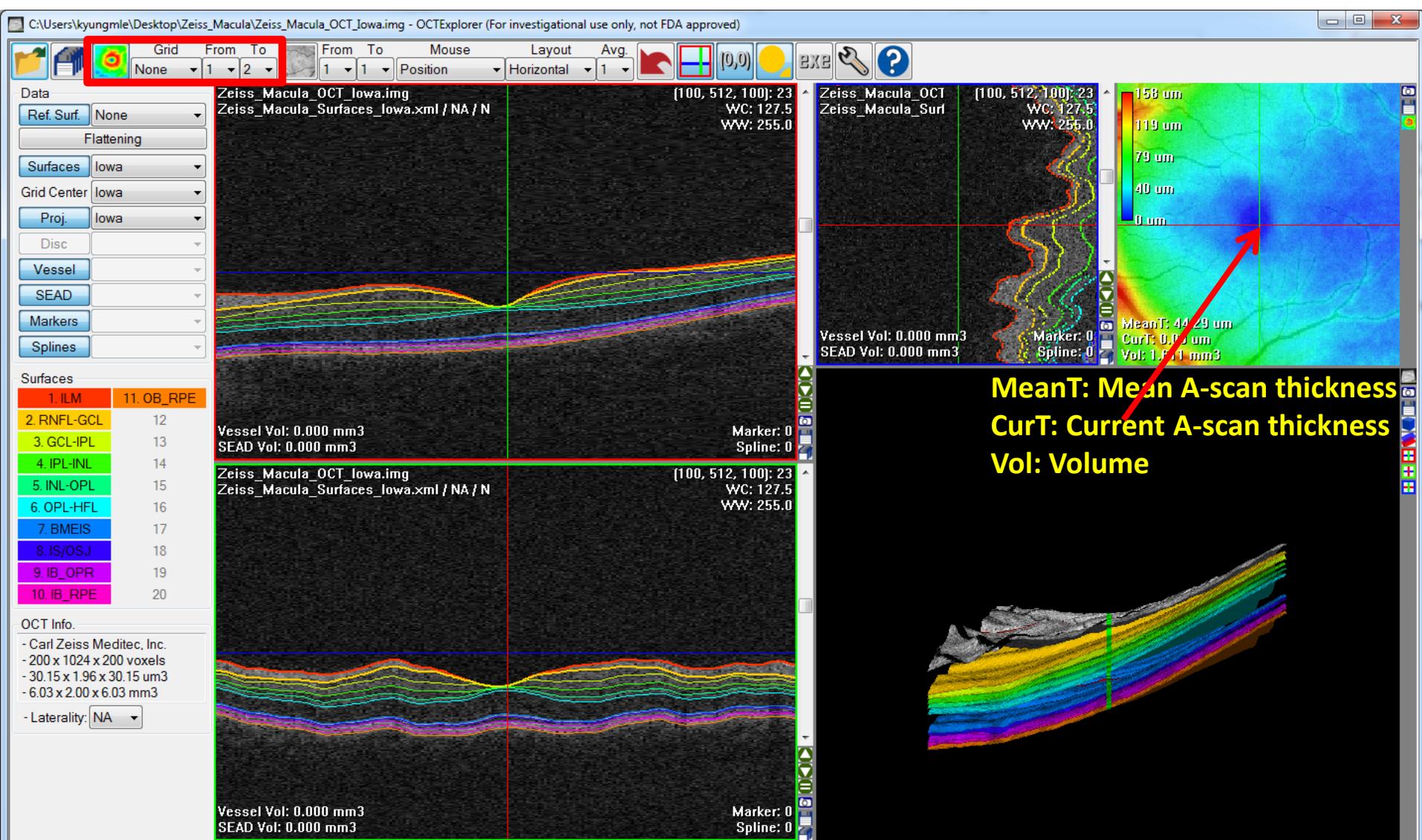
# After Retinal Layer Segmentation



# Retinal Surface Names

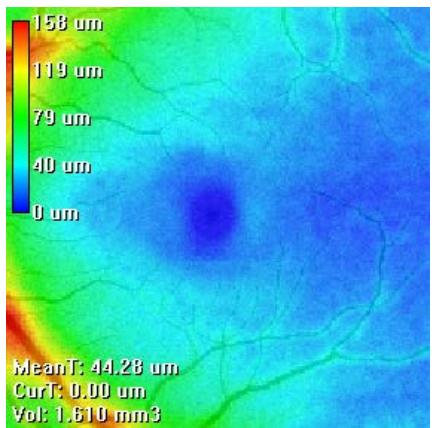
1. ILM (**ILM**)
2. RNFL-GCL (**RNFL-GCL**)
3. GCL-IPL (**GCL-IPL**)
4. IPL-INL (**IPL-INL**)
5. INL-OPL (**INL-OPL**)
6. OPL-Henle fiber layer (**OPL-HFL**)
7. Boundary of myoid and ellipsoid of inner segments (**BMEIS**)
8. IS/OS junction (**IS/OSJ**)
9. Inner boundary of OPR (**IB\_OPR**)
  - OPR: Outer segment PR/RPE complex
10. Inner boundary of RPE (**IB\_RPE**)
11. Outer boundary of RPE (**OB\_RPE**)

# Retinal Layer Thickness

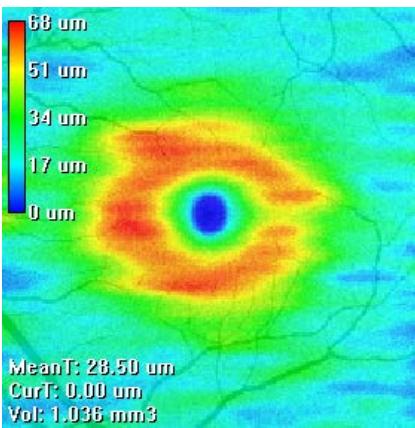


# Retinal Layer Thickness

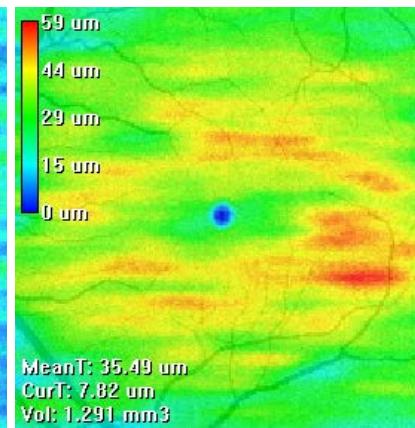
- From 1, To 2: RNFL
- From 2, To 3: GCL
- From 3, To 4: IPL
- From 4, To 5: INL
- From 5, To 6: OPL
- From 6, To 7: ONL
- From 7, To 8: IS/OS
- From 8, To 9: Outer segment
- From 9, To 10: OPR + Subretinal virtual space
- From 10, To 11: RPE
- From 1, To 11: Total retina



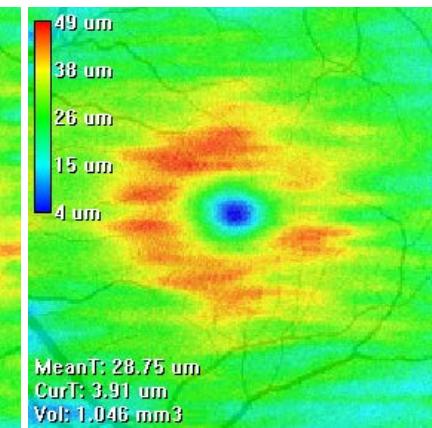
From 1, To 2



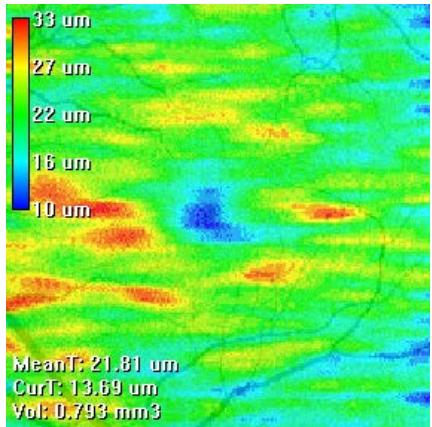
From 2, To 3



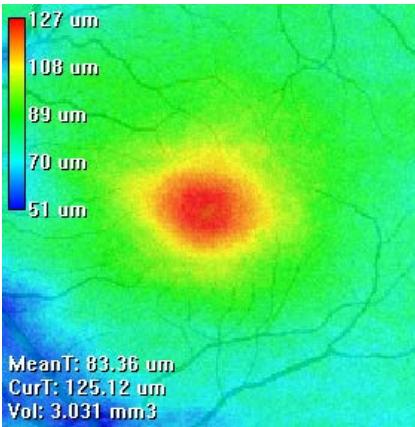
From 3, To 4



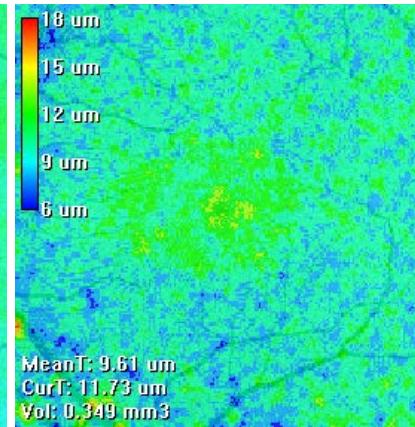
From 4, To 5



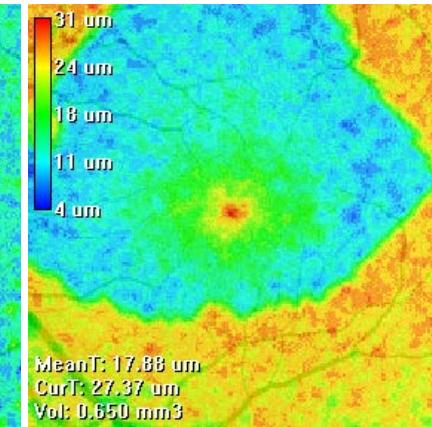
From 5, To 6



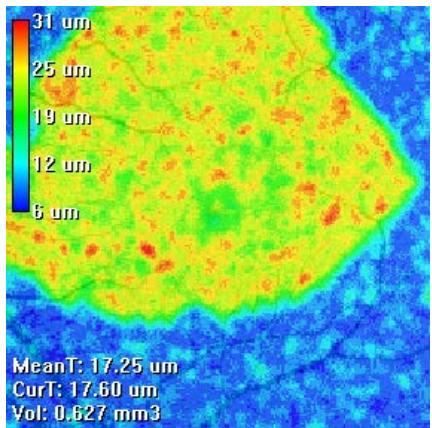
From 6, To 7



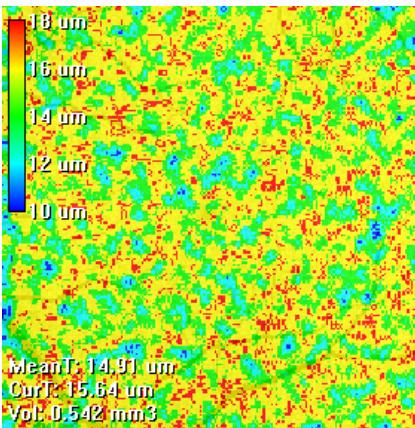
From 7, To 8



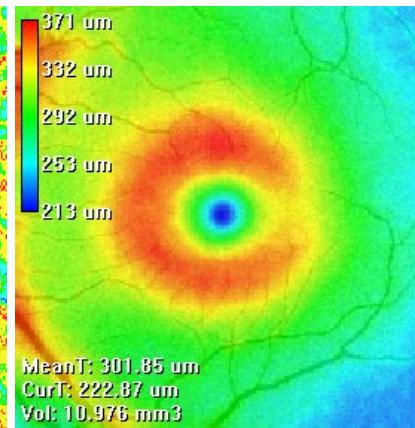
From 8, To 9



From 9, To 10



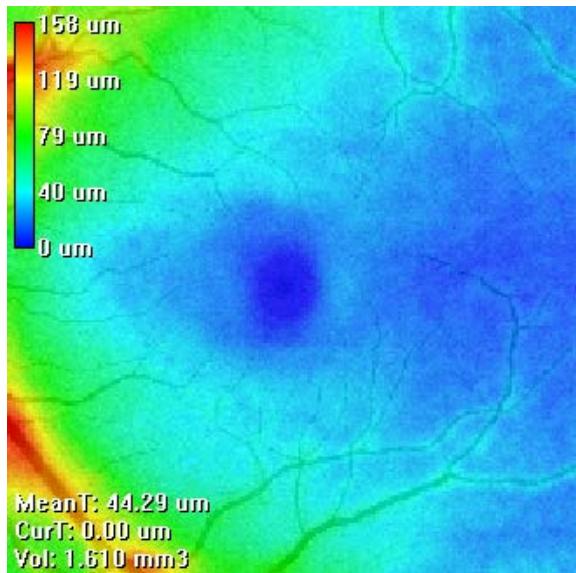
From 10, To 11



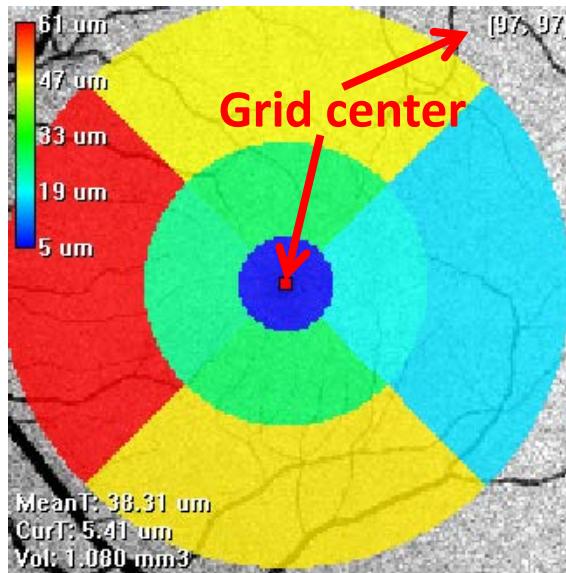
From 1, To 11

# Retinal Layer Thickness

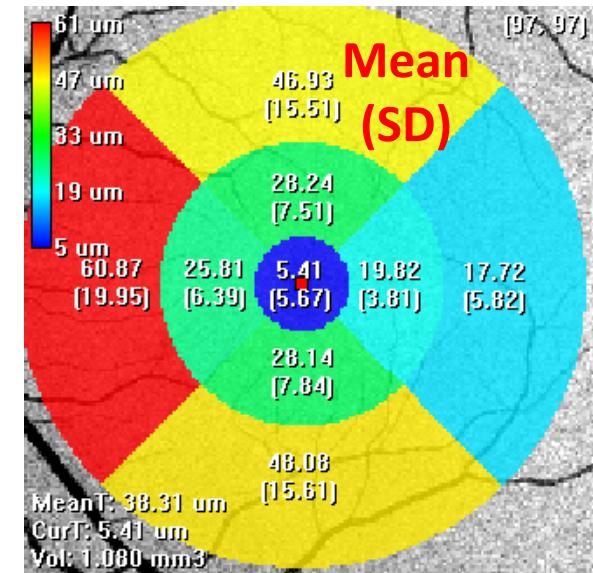
- Grid: None, Quality, Quantity



None

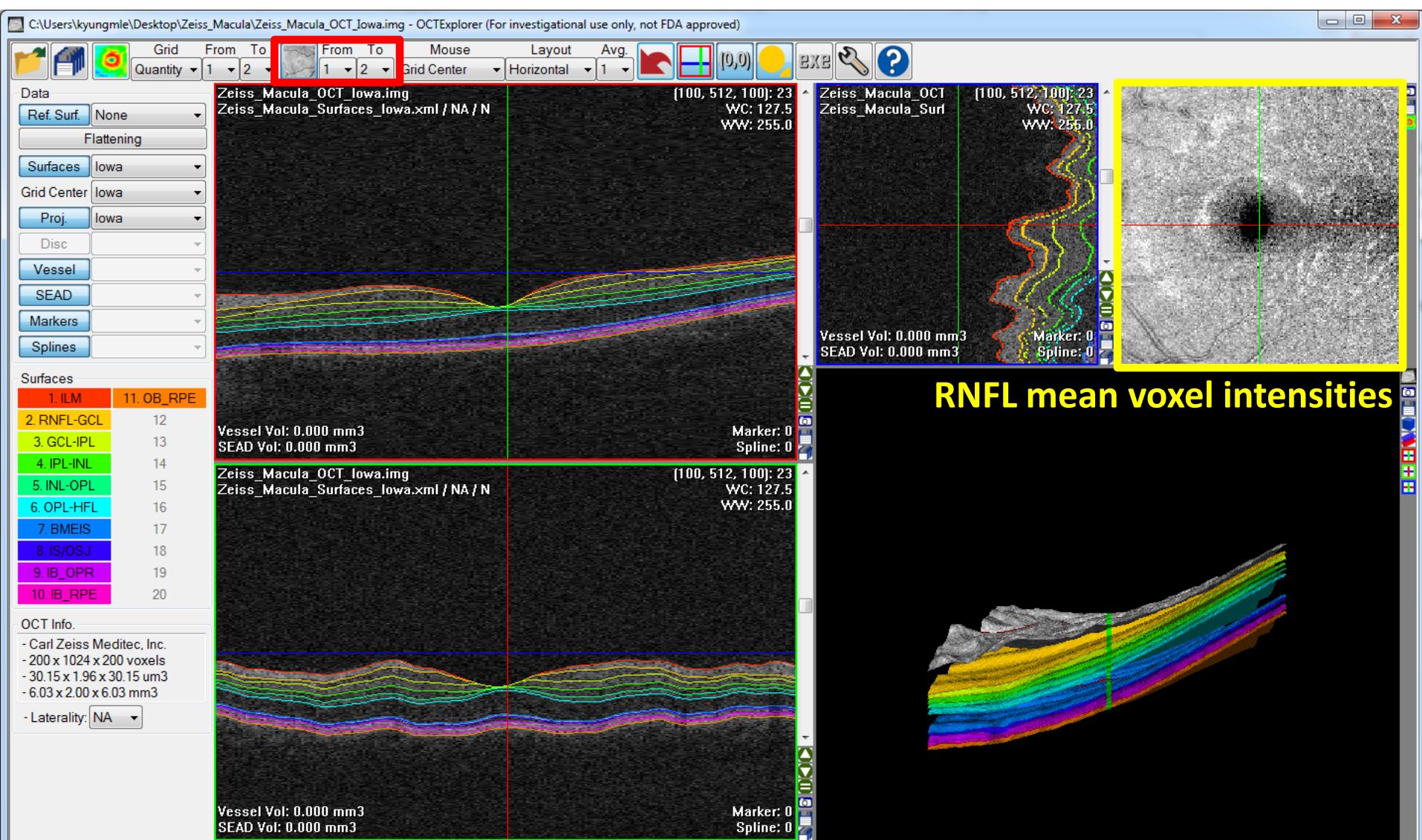


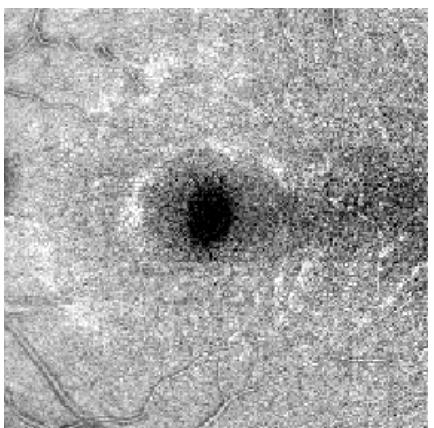
Quality – ETDRS grid



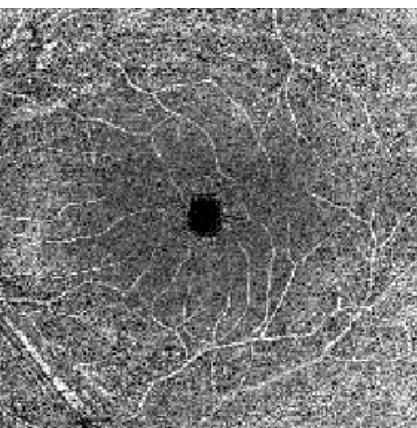
Quantity – ETDRS grid

# Creating Projection Images

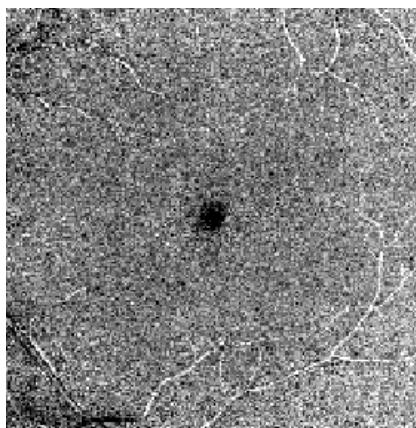




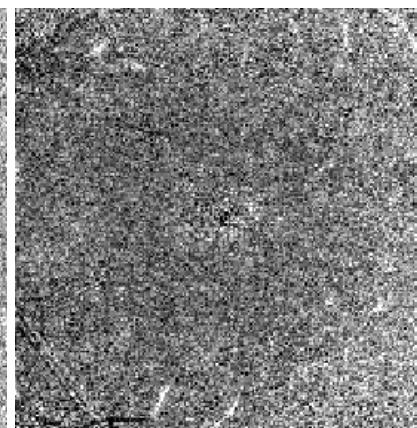
From 1, To 2



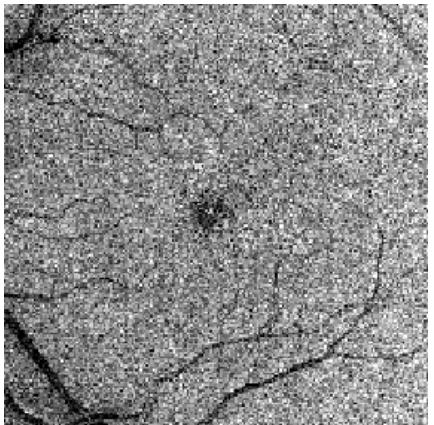
From 2, To 3



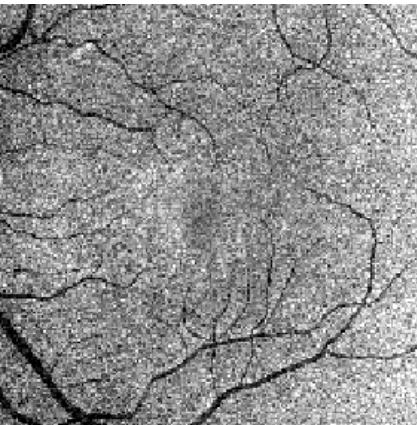
From 3, To 4



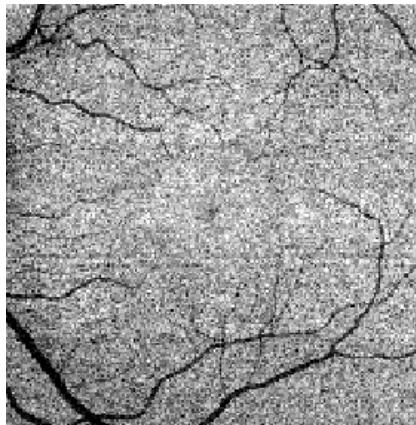
From 4, To 5



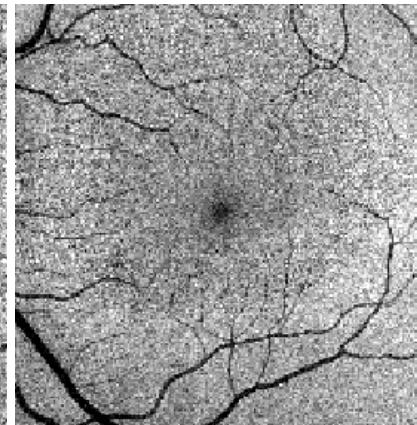
From 5, To 6



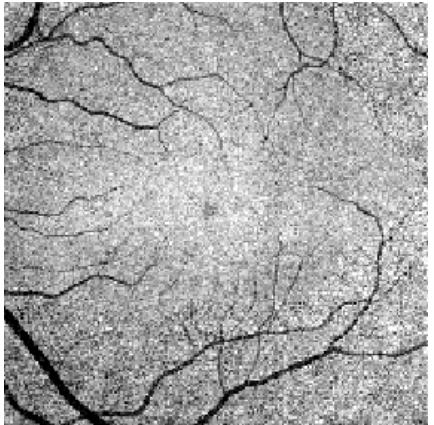
From 6, To 7



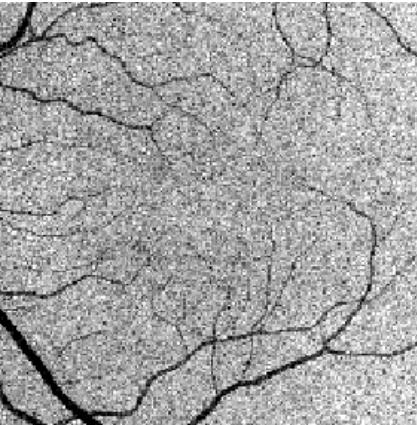
From 7, To 8



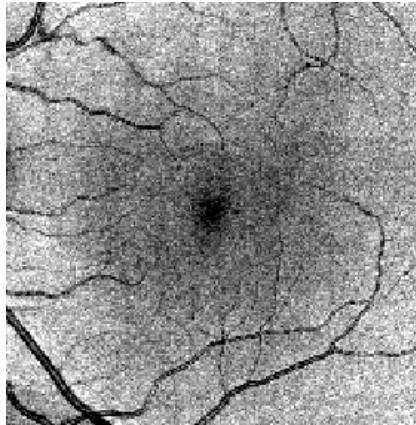
From 8, To 9



From 9, To 10



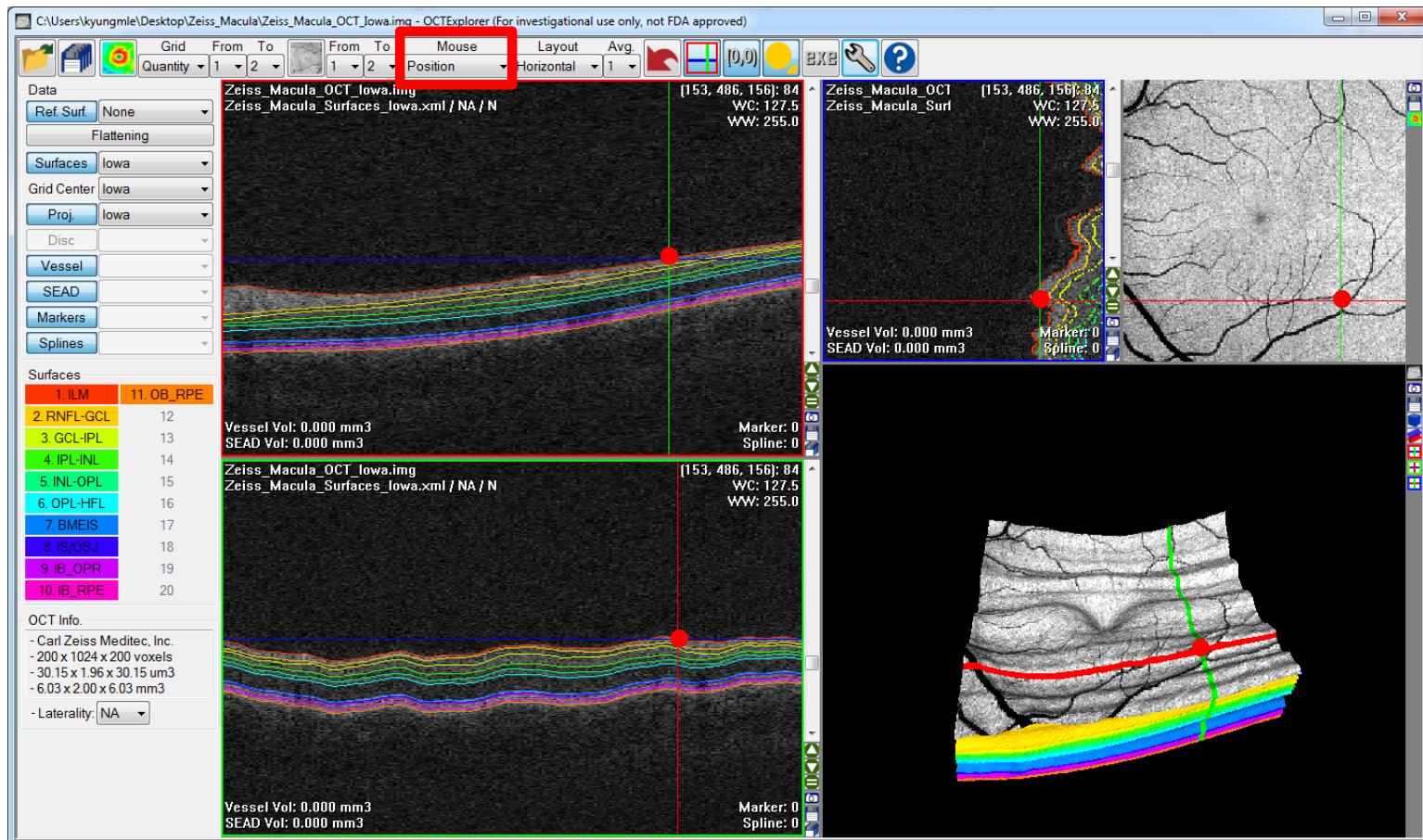
From 10, To 11



From 1, To 11

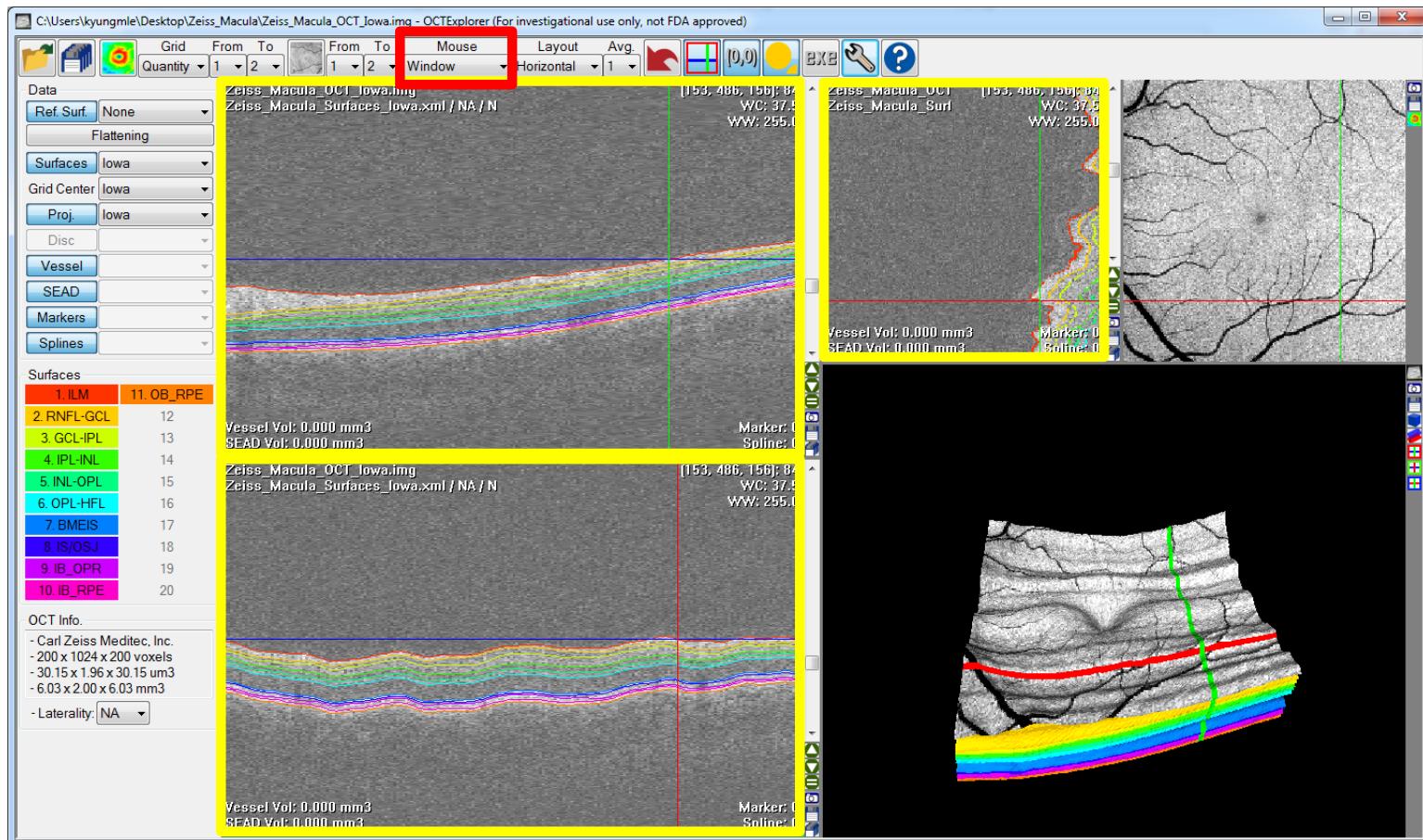
# Mouse – Position

- Left mouse button click



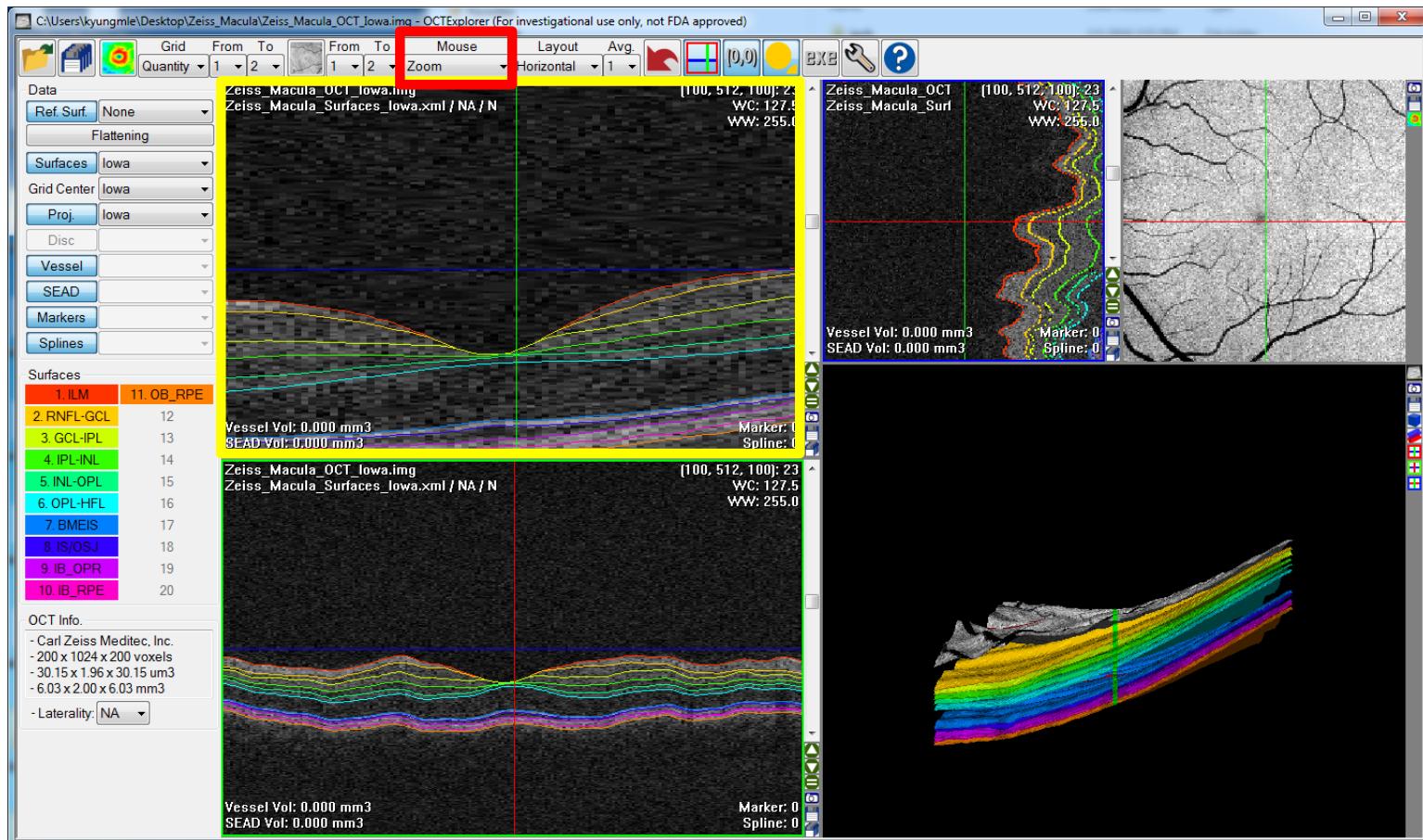
# Mouse – Window

- Left mouse button drag
  - Left/right: Window center (WC)
  - Up/down: Window width (WW)



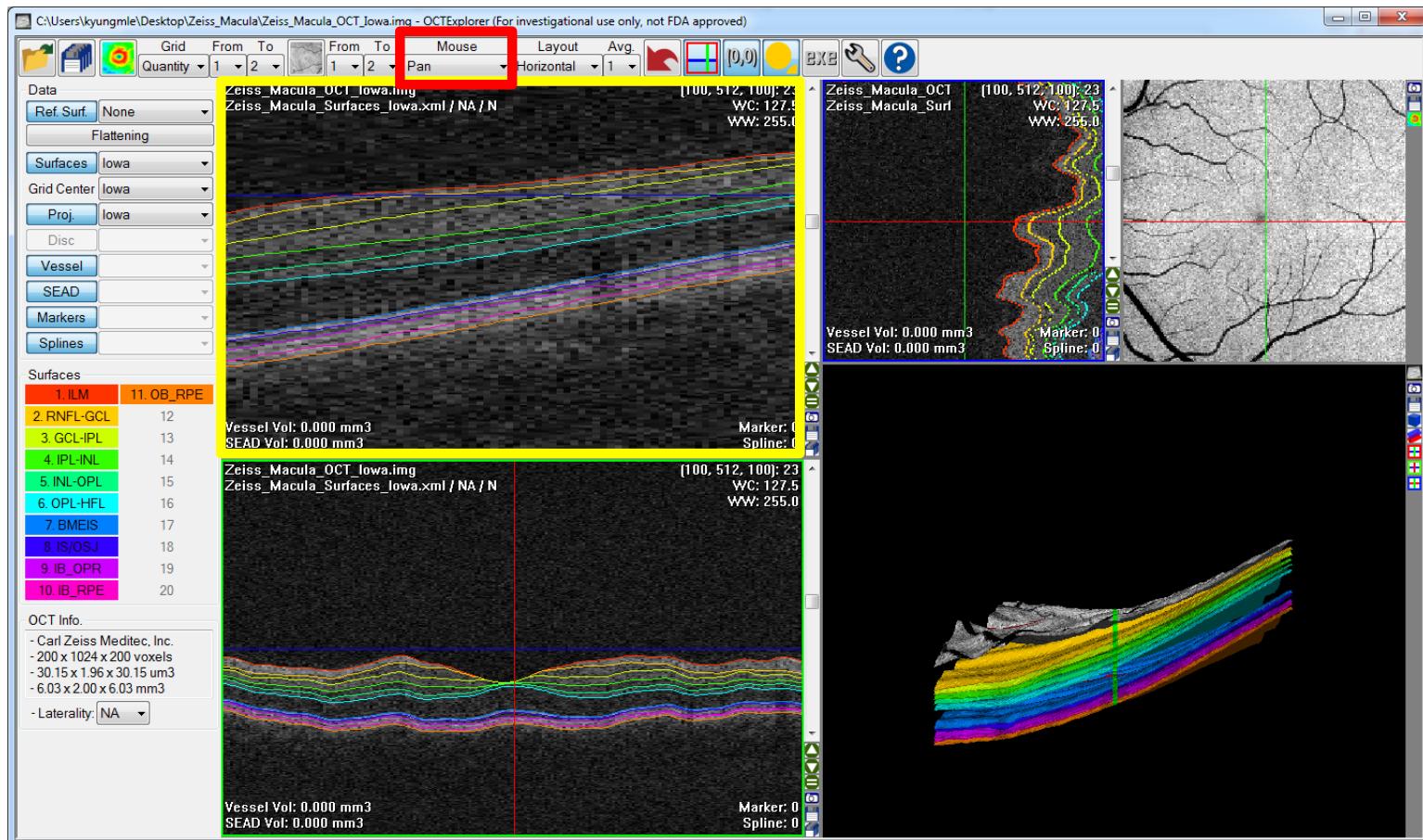
# Mouse – Zoom

- Left mouse button drag
  - Up/down: Zoom out/in



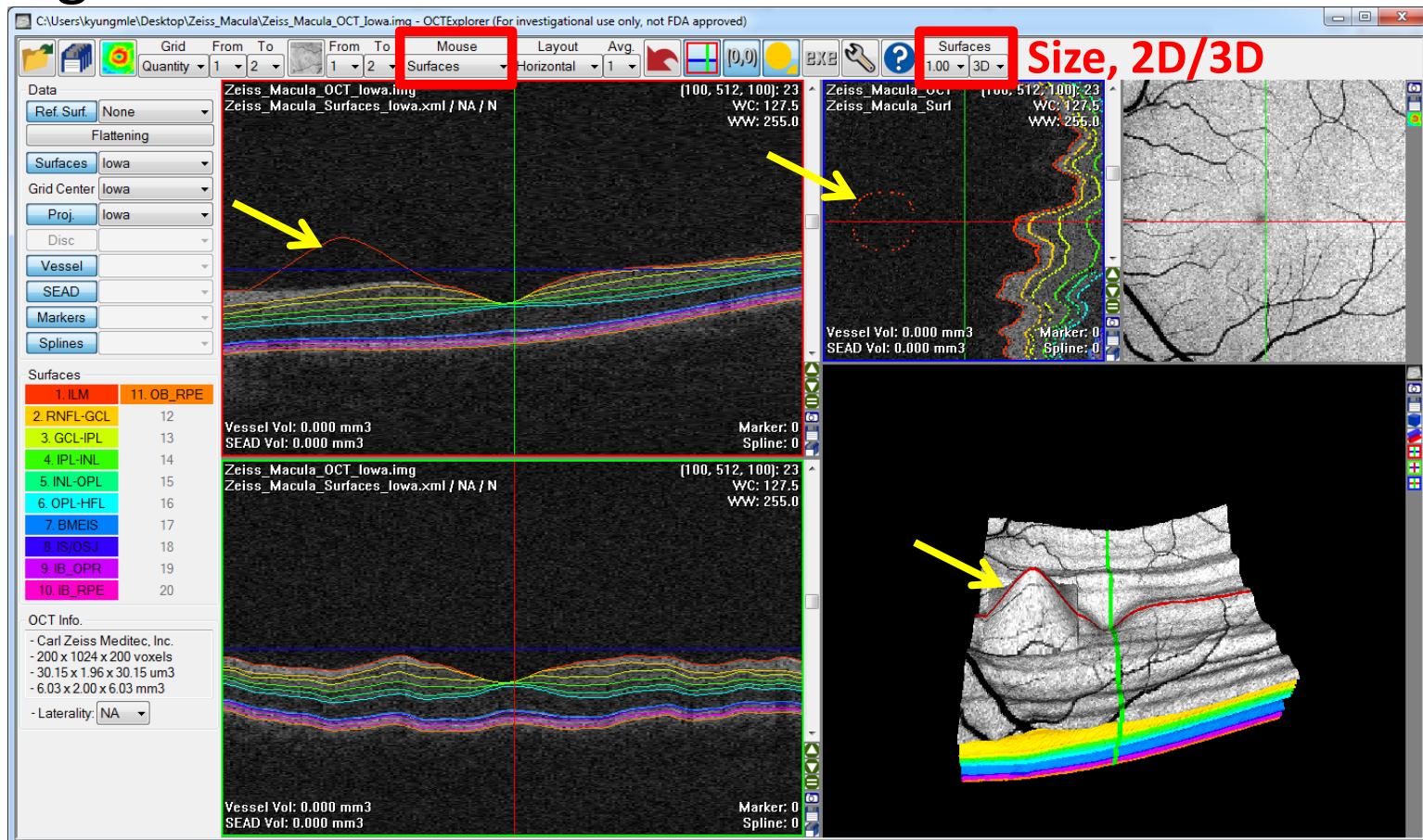
# Mouse – Pan

- Left mouse button drag



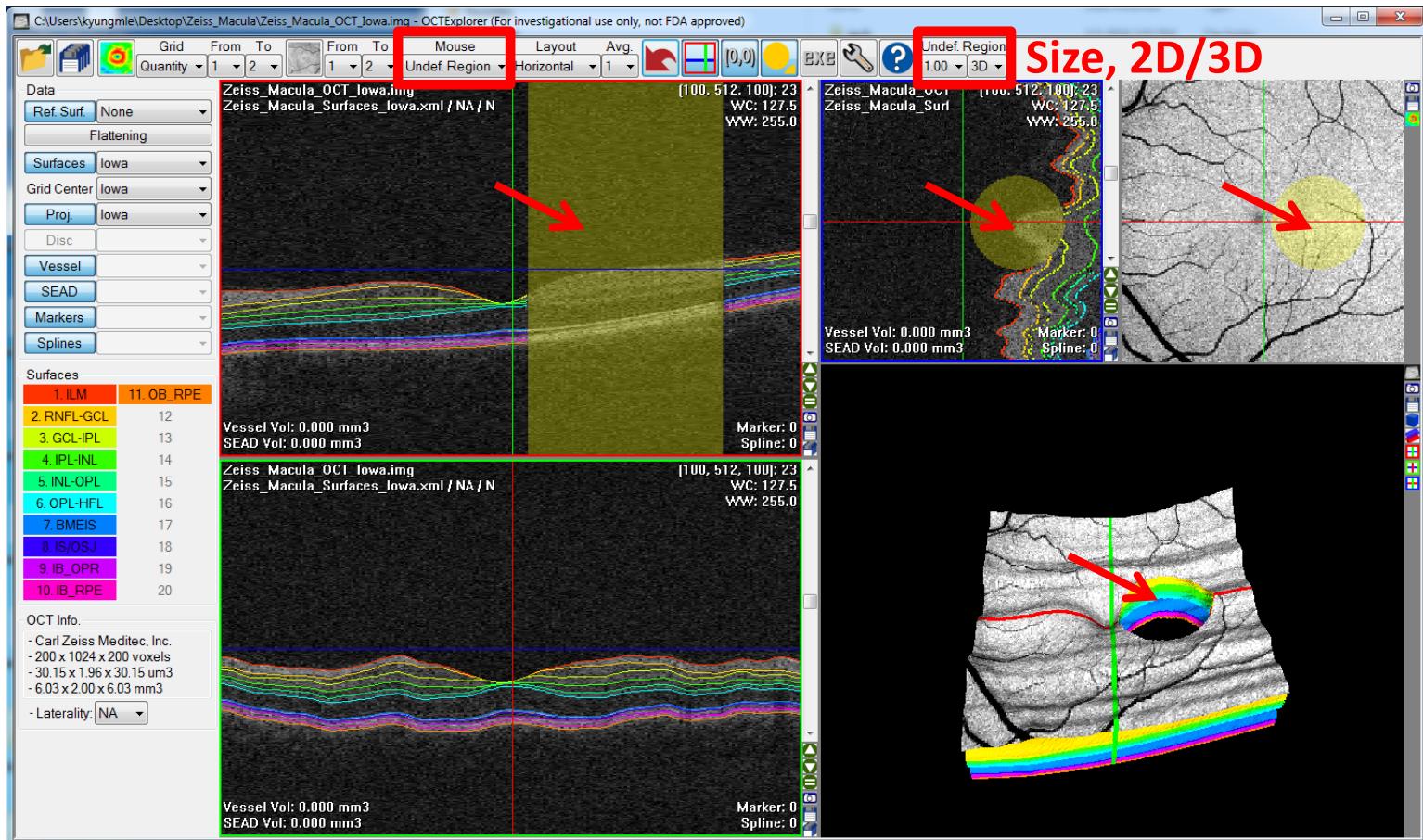
# Mouse – Surfaces

- Left mouse button drag
  - Up/down: Move
- Right mouse button click: Undo



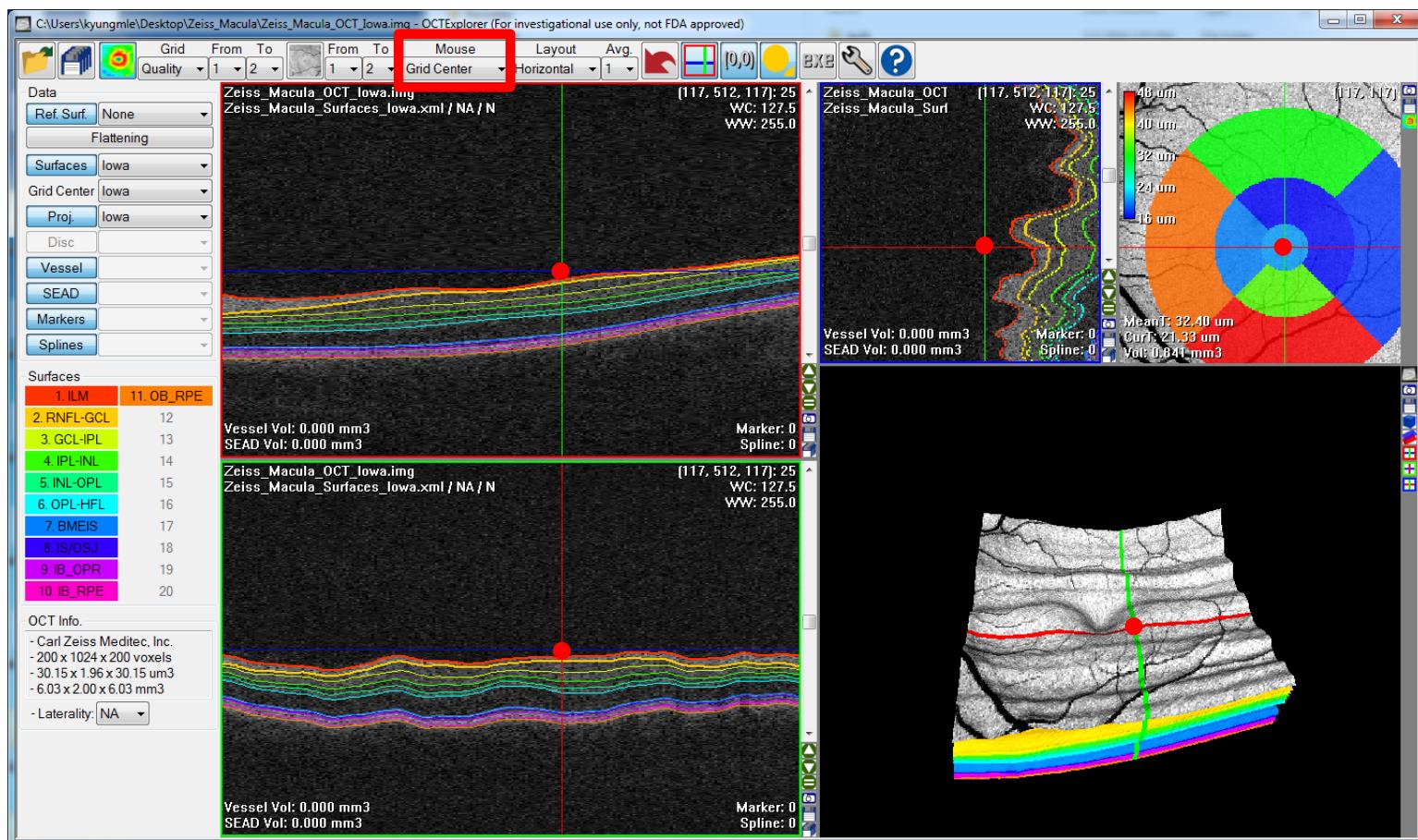
# Mouse – Undefined Region

- Left mouse button click/drag : Select
- Right mouse button click/drag: Deselect



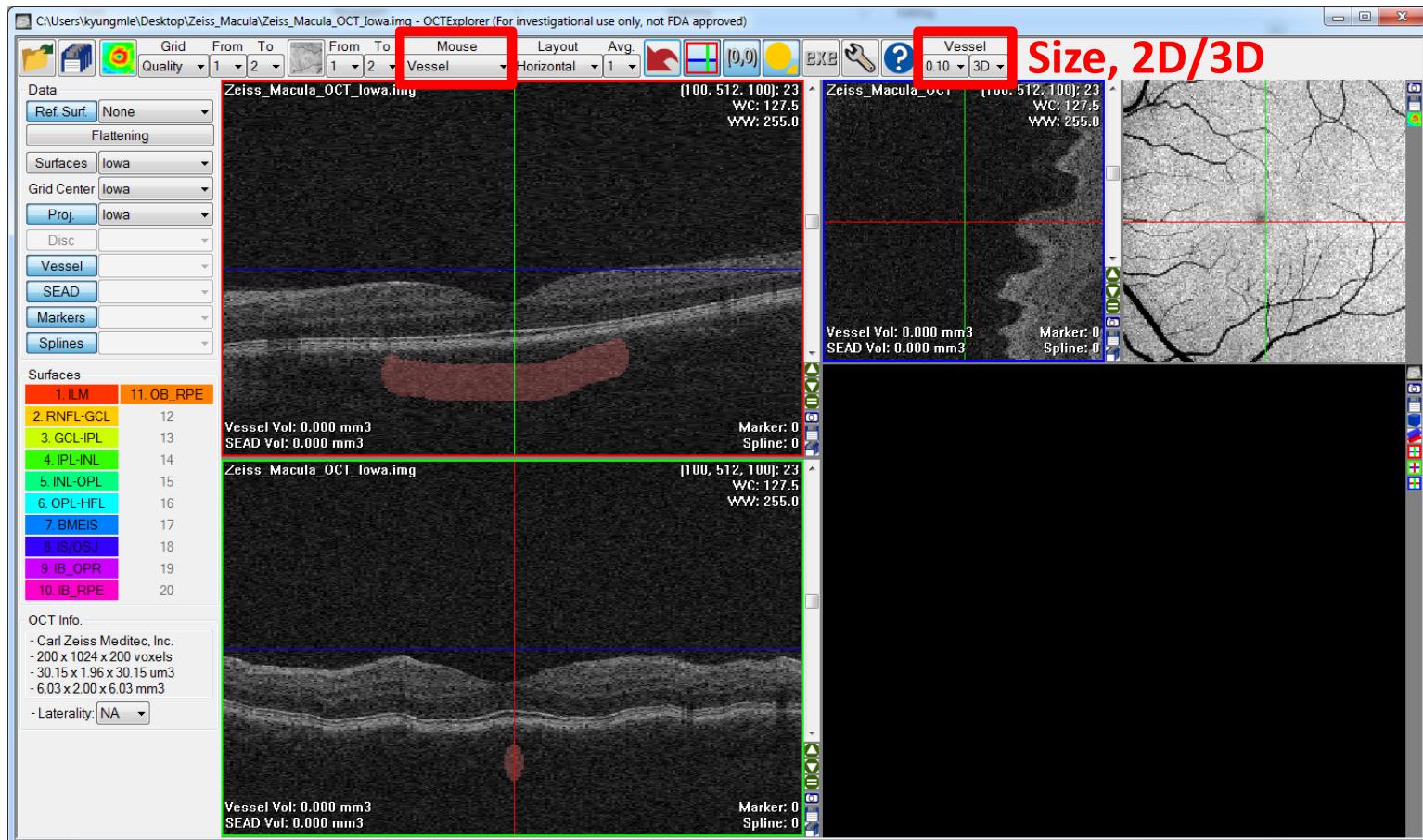
# Mouse – Grid Center

- Left mouse button click



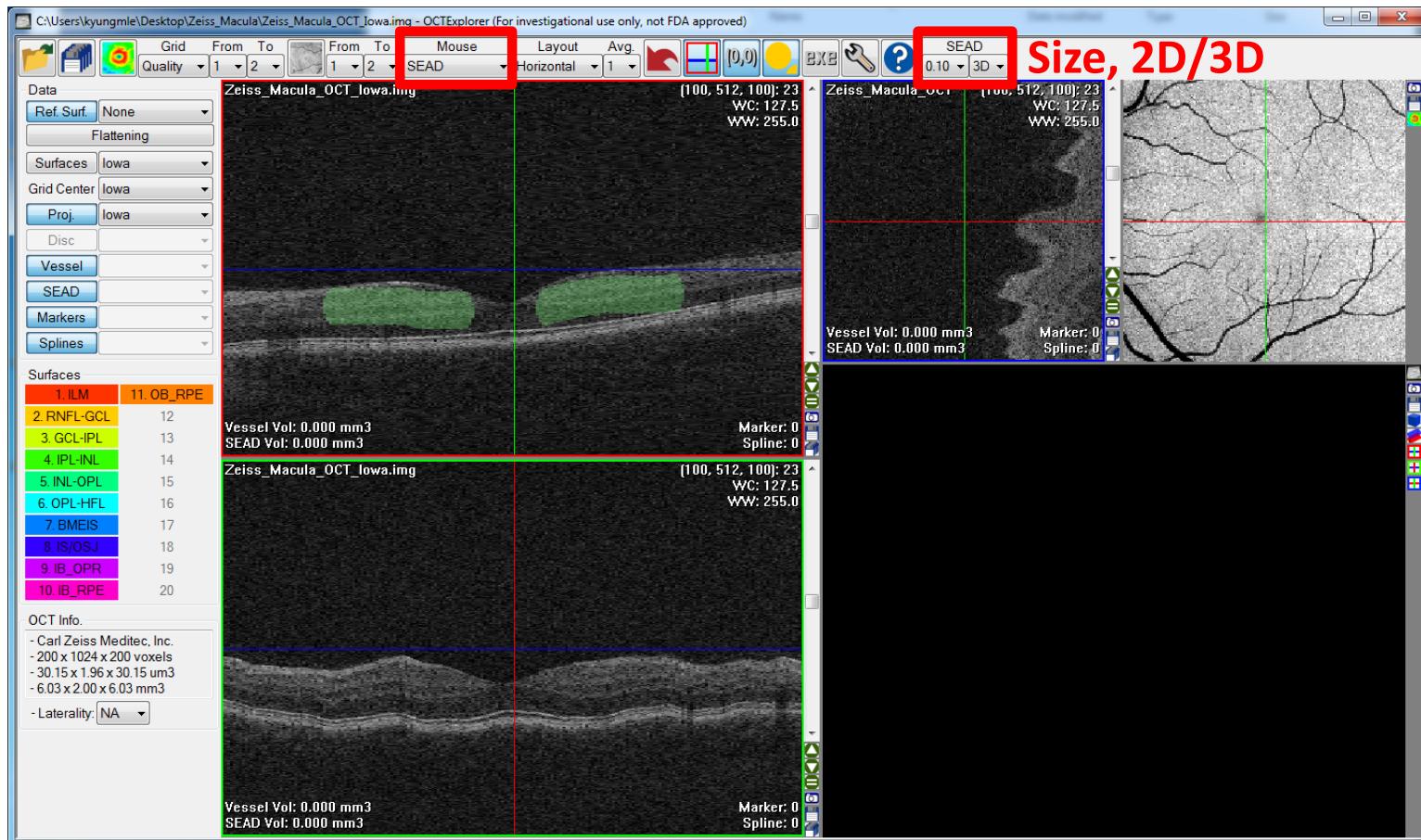
# Mouse – Vessel

- Left mouse button click/drag : Select
- Right mouse button click/drag: Deselect



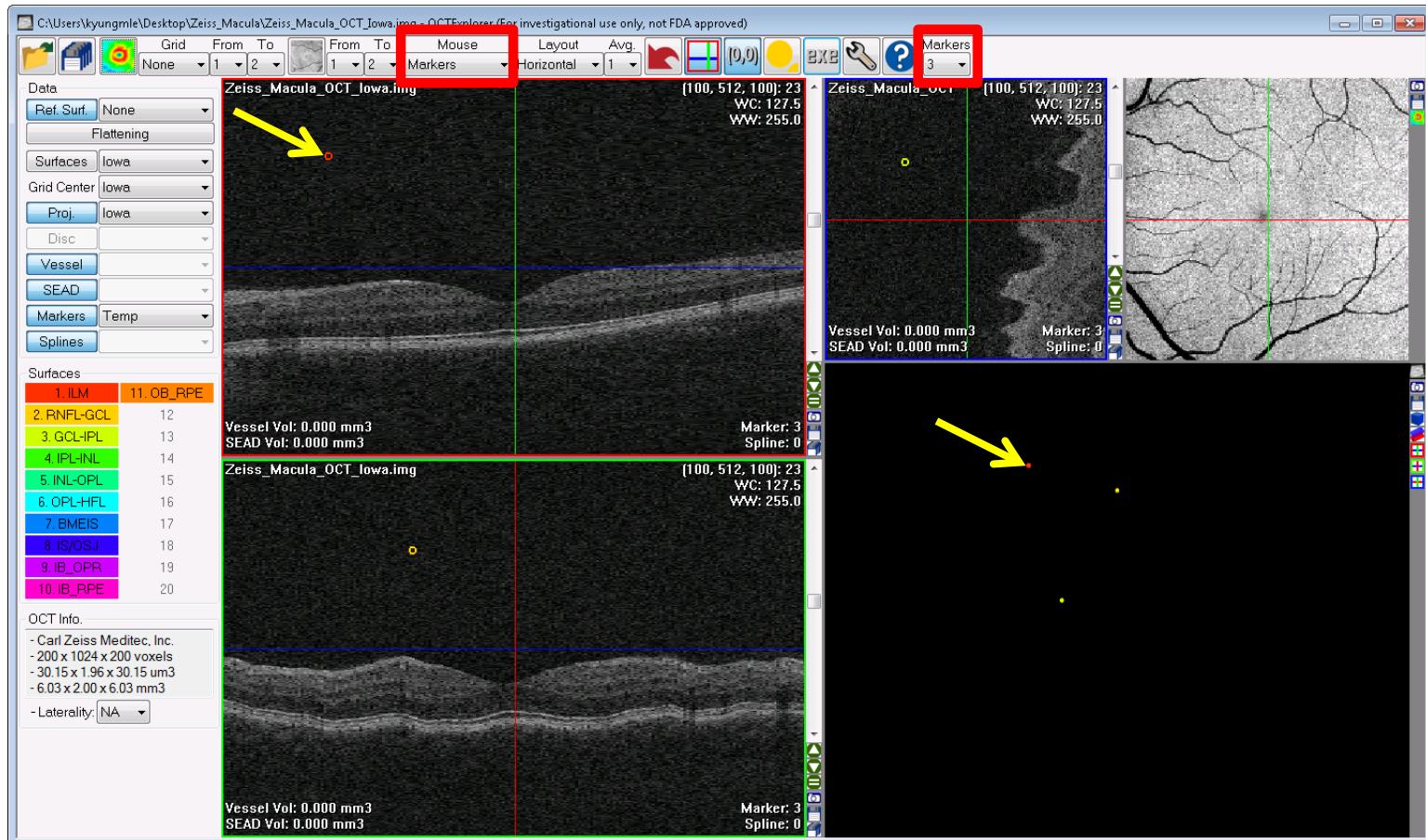
# Mouse – SEAD

- Left mouse button click/drag : Select
- Right mouse button click/drag: Deselect



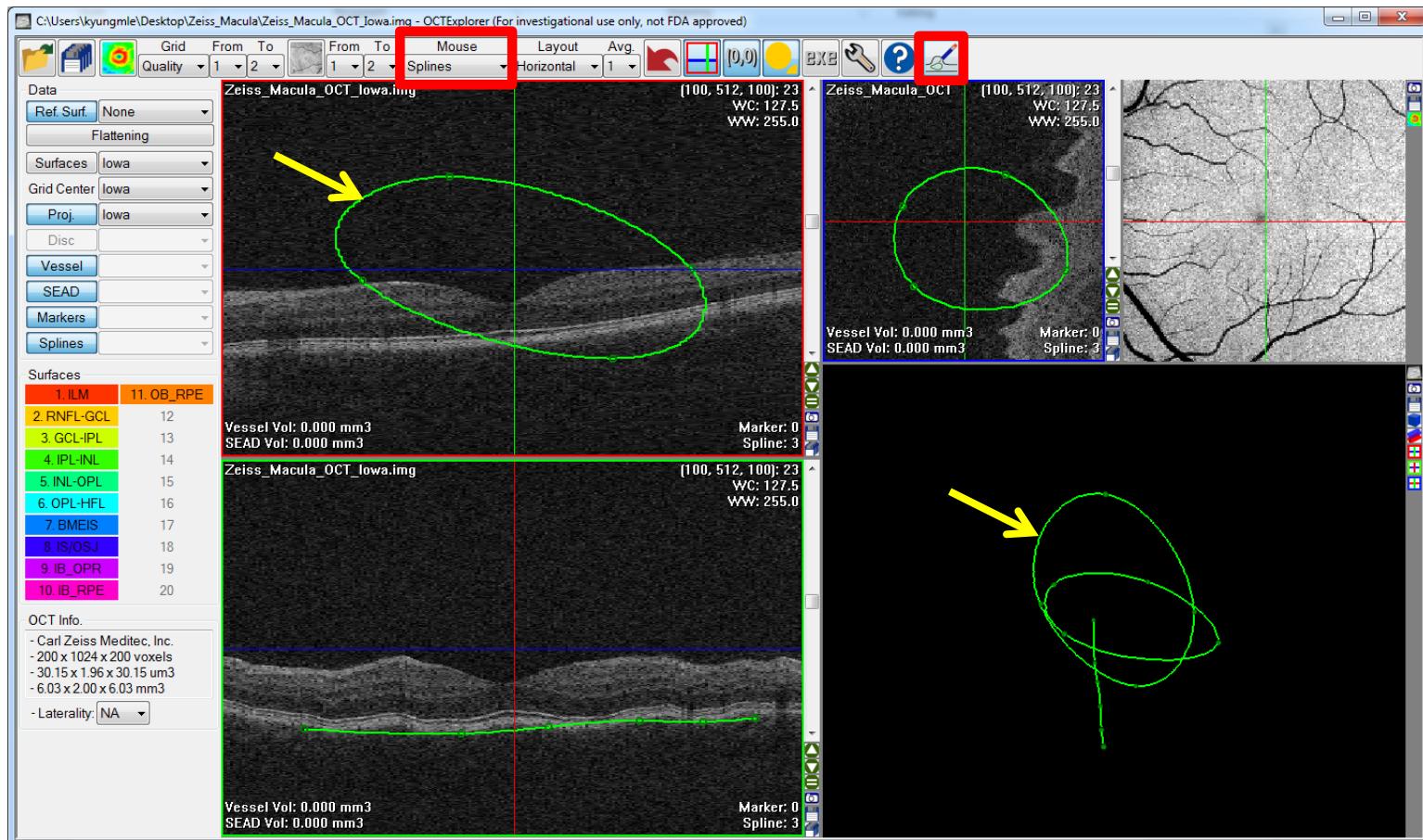
# Mouse – Markers

- Left mouse button click: Add
- Left mouse button double click: Delete
- Left mouse button drag: Move

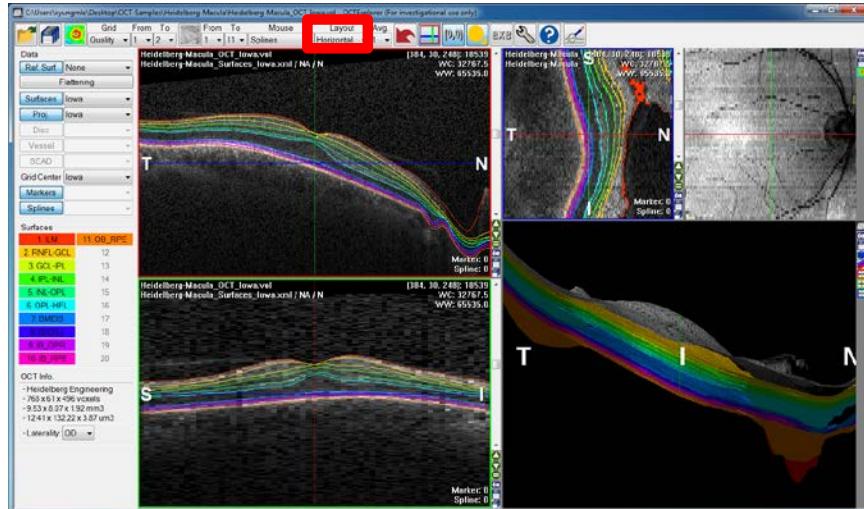


# Mouse – Splines

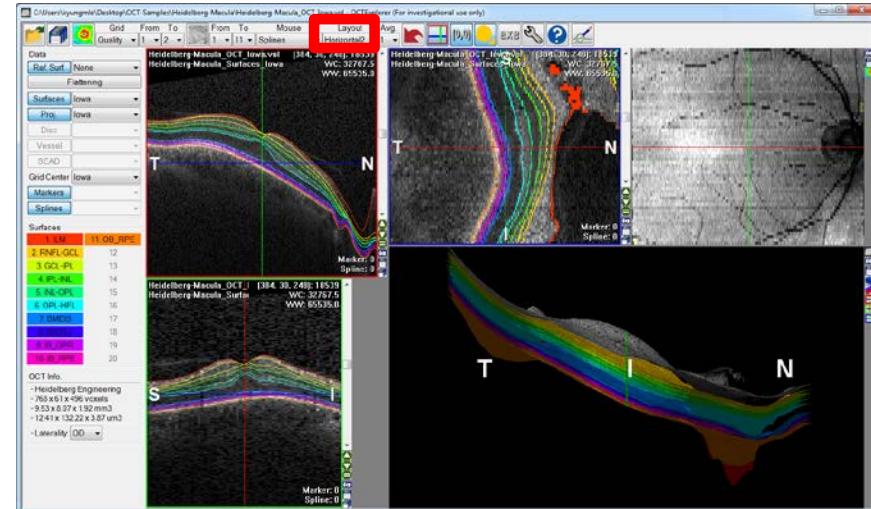
- ‘Add Spline’ button click + left mouse button click: Add
- Left mouse button double click: Delete
- Left mouse button drag: Move



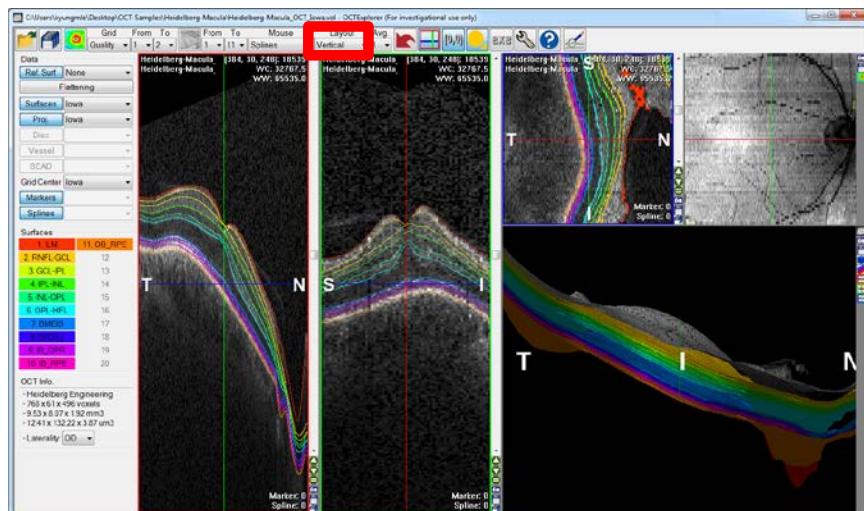
# Layout



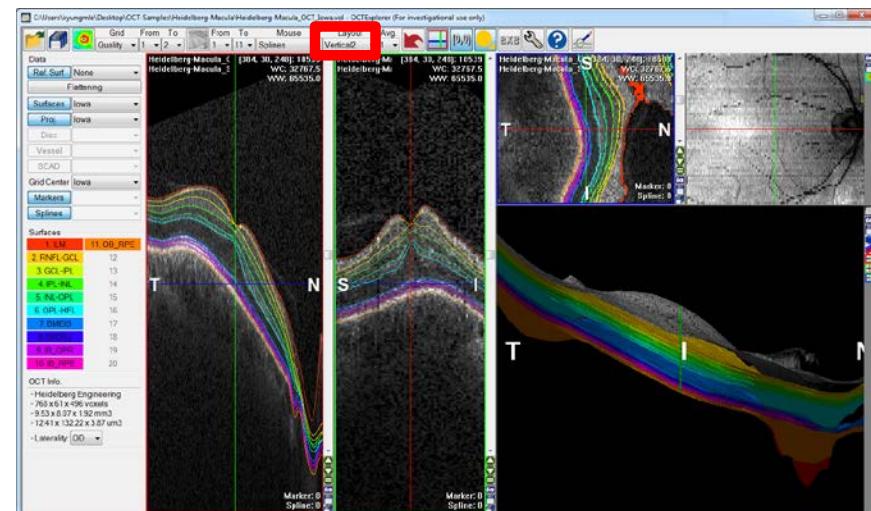
Horizontal



Horizontal2



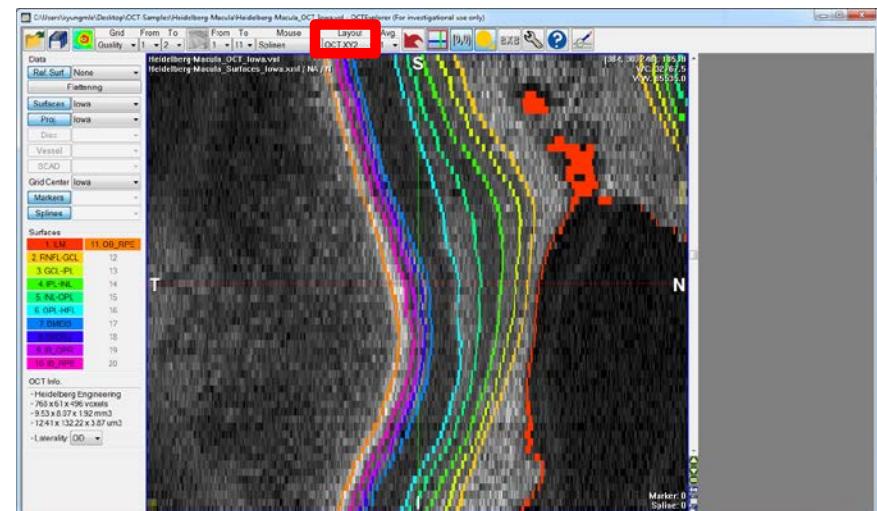
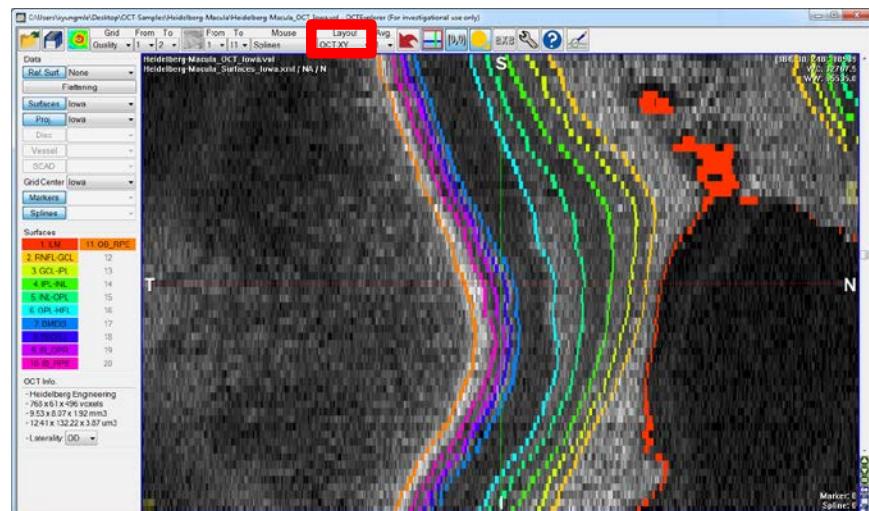
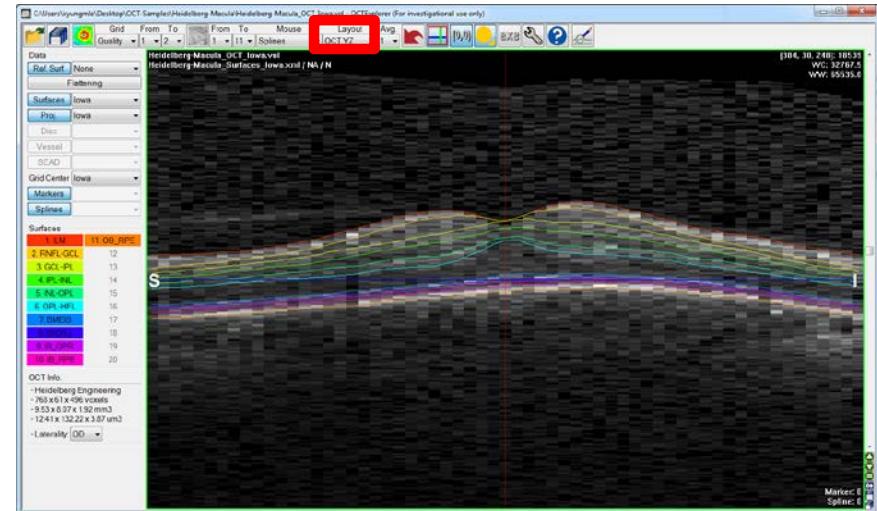
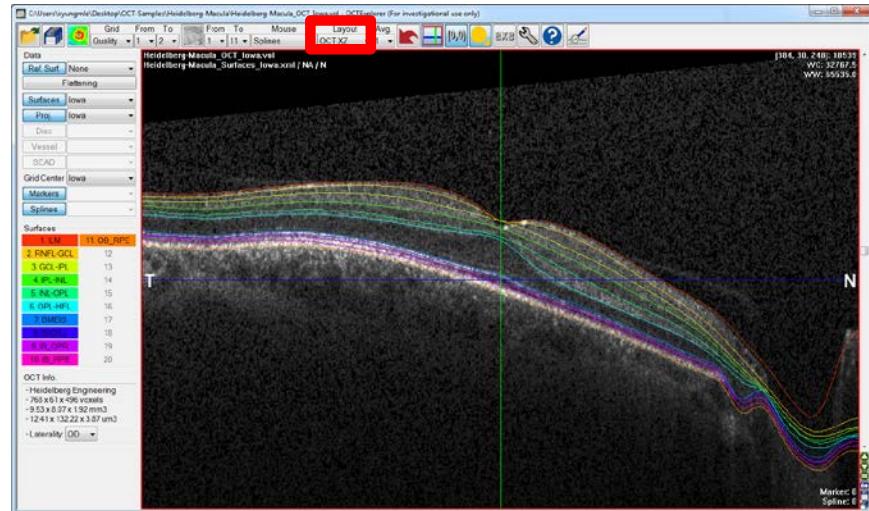
Vertical



Vertical2

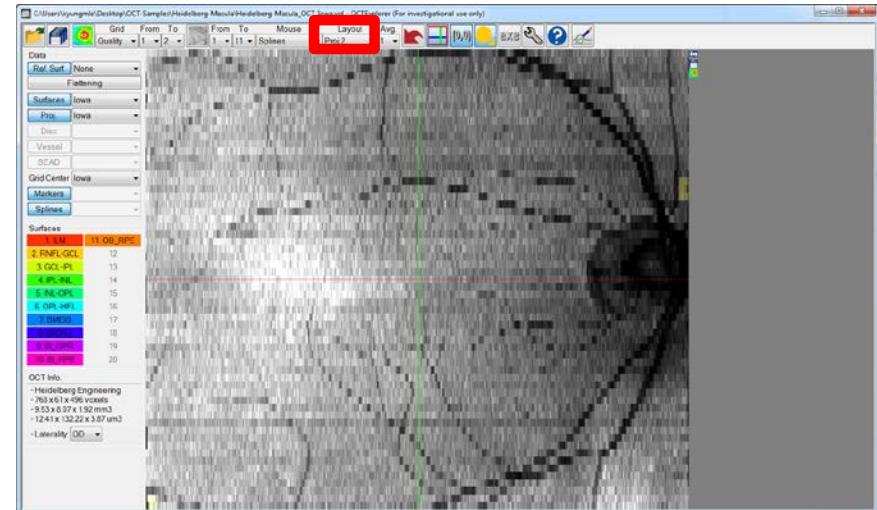
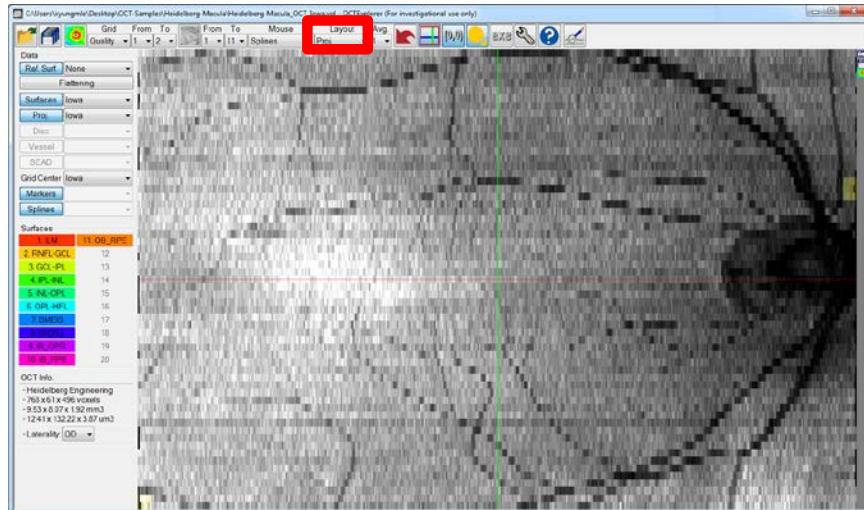
The layout ending with '2' considers the OCT physical size.

# Layout



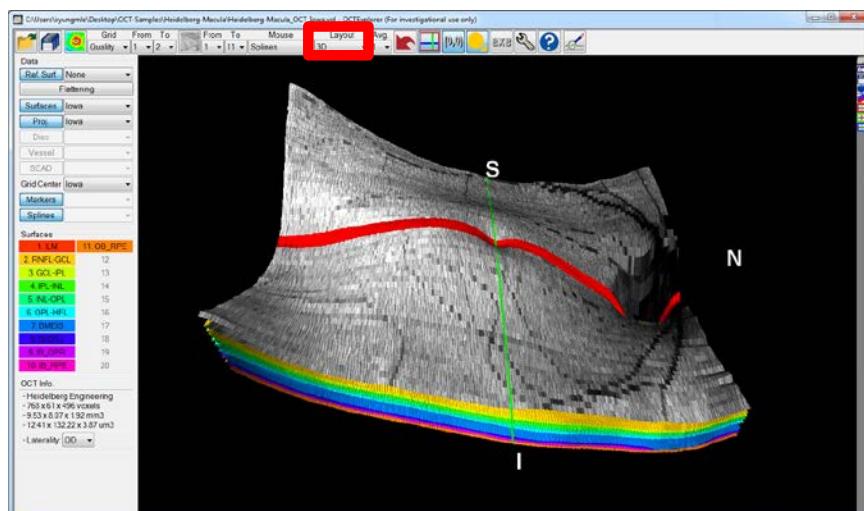
The layout ending with '2' considers the OCT physical size.

# Layout



Proj.

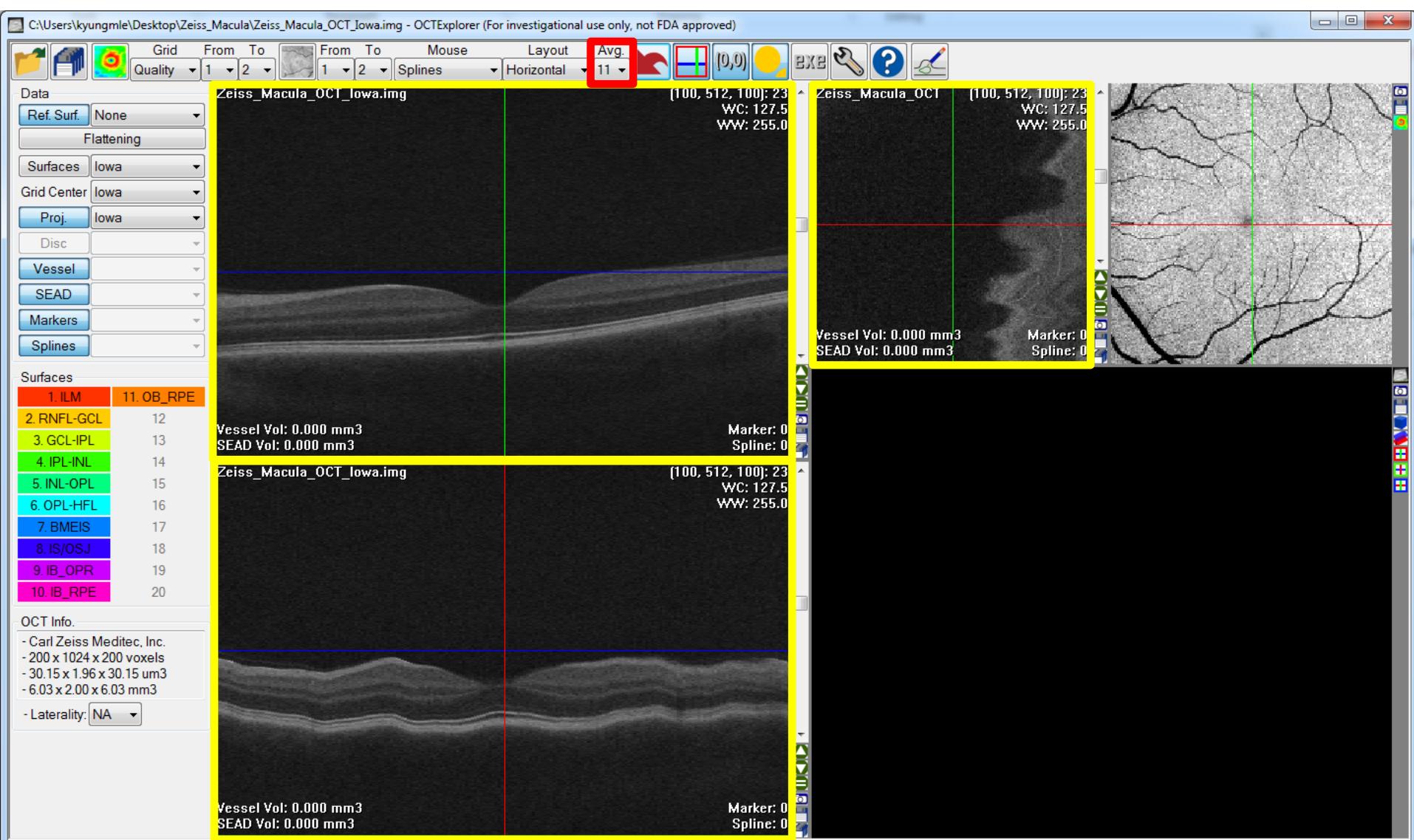
Proj.2



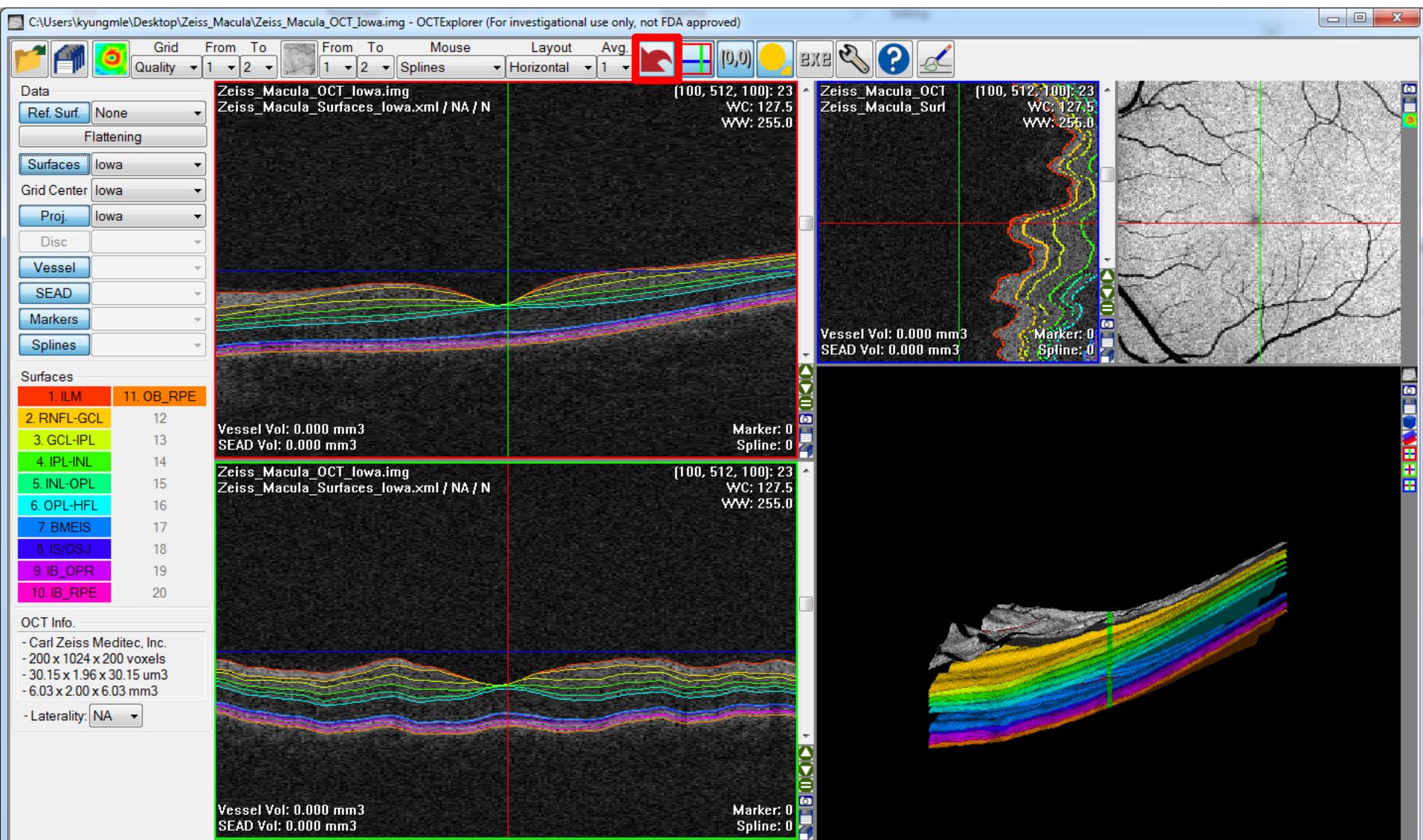
3D

The layout ending with '2' considers the OCT physical size.

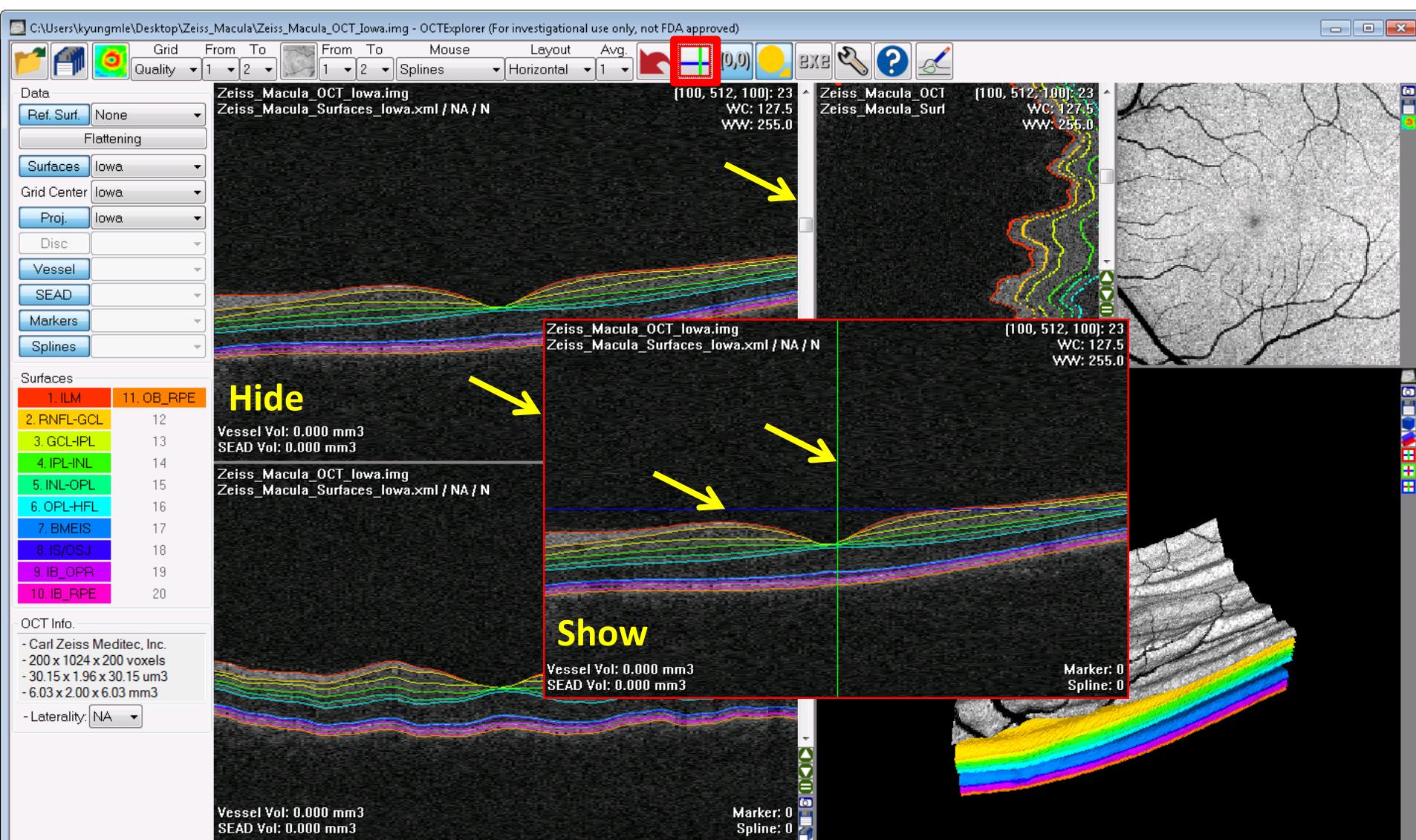
# Moving Average Filtering



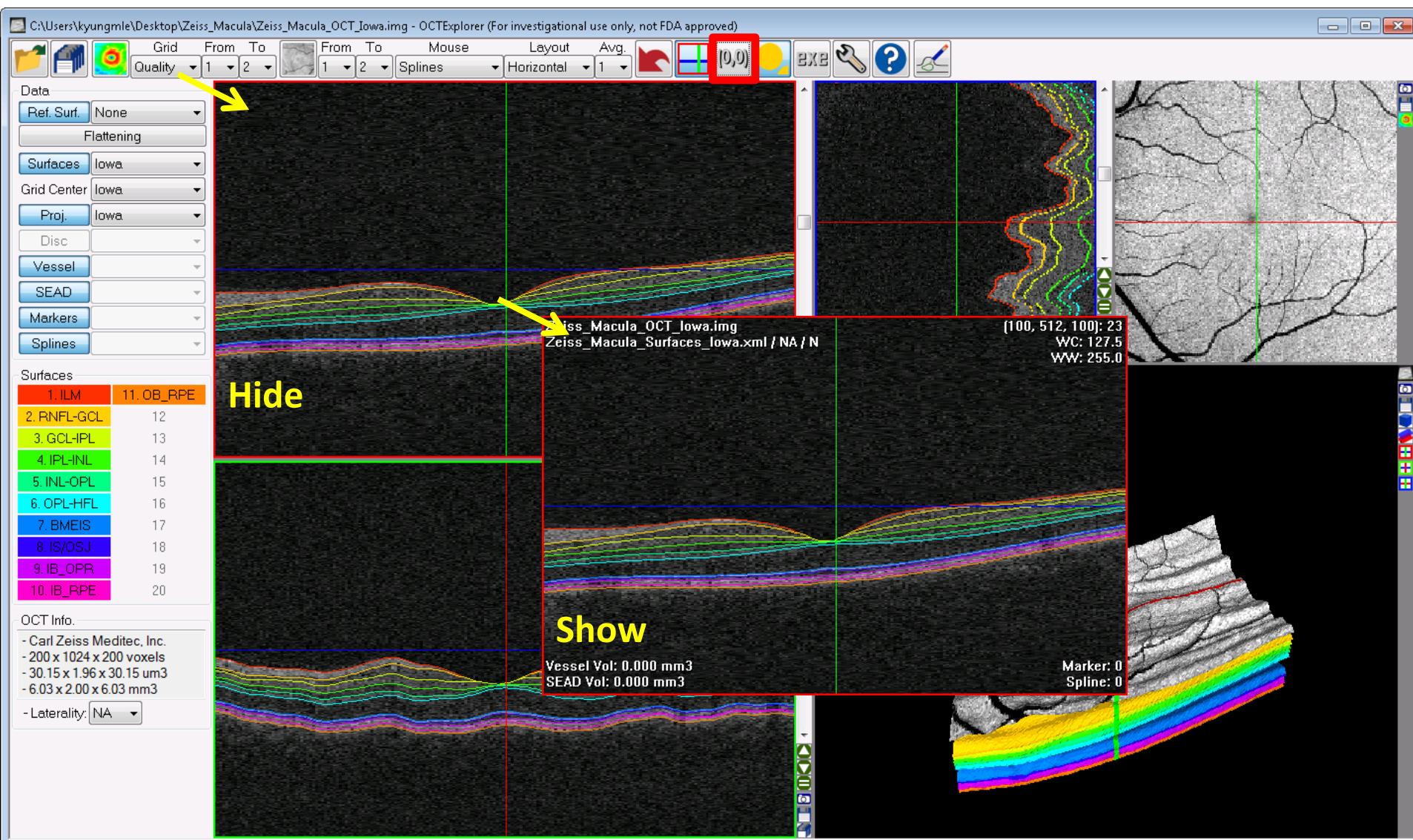
# Reset



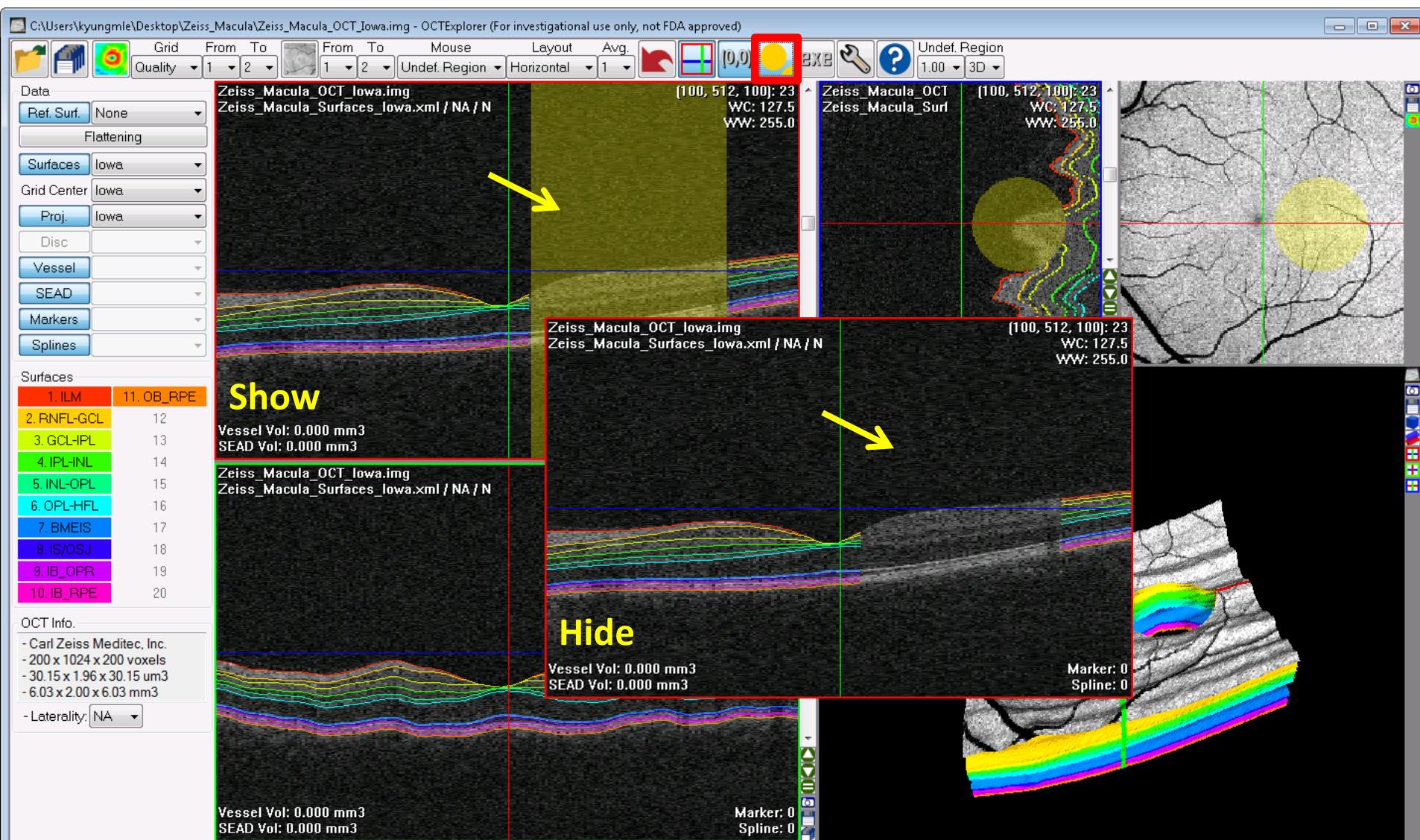
# Show/Hide Guide Lines



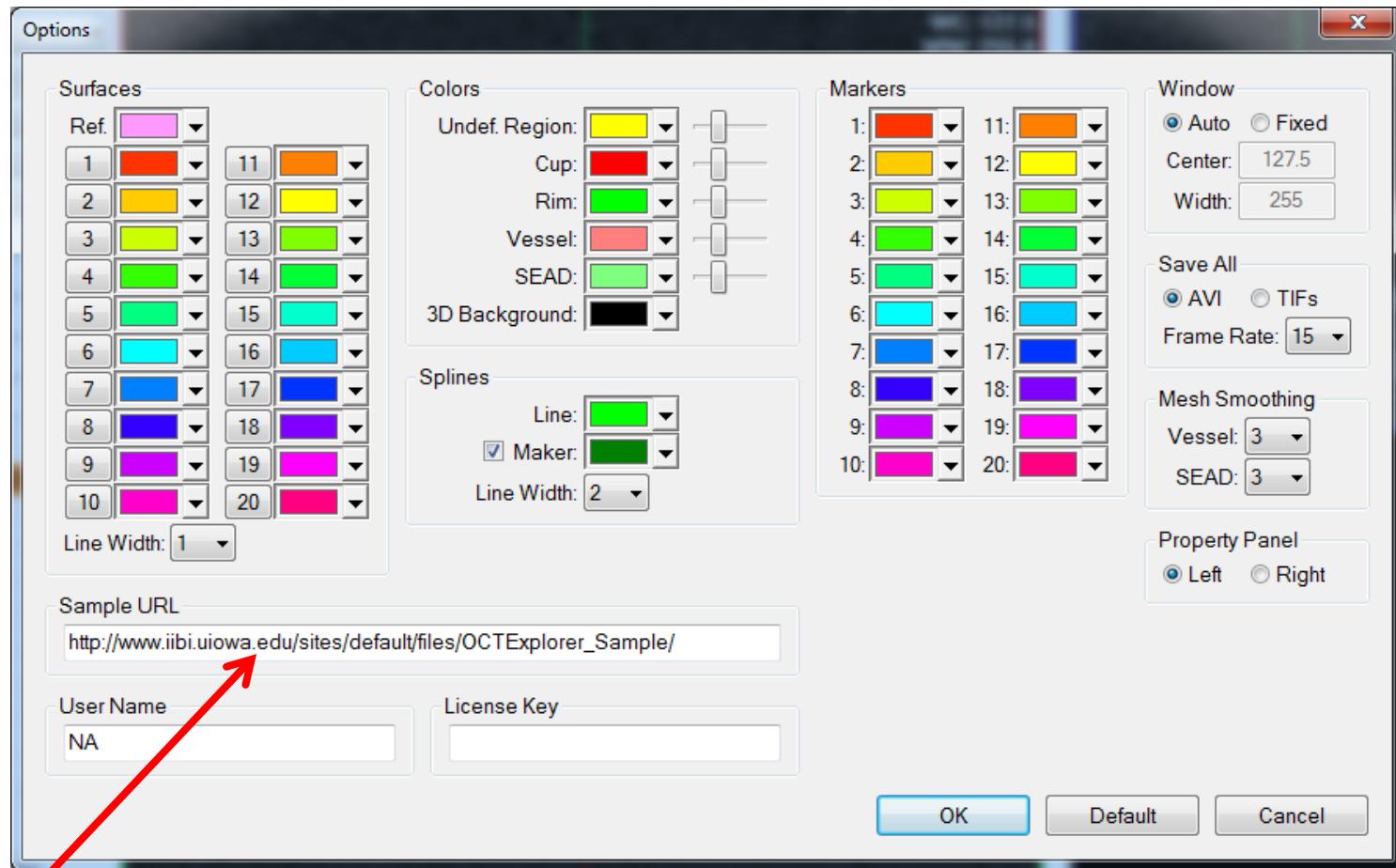
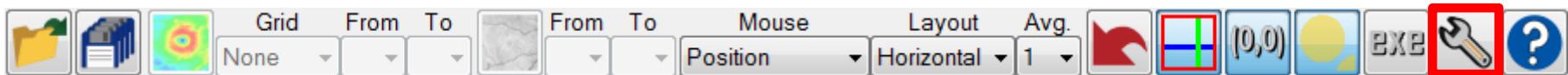
# Show/Hide Overlay



# Show/Hide Undefined Region

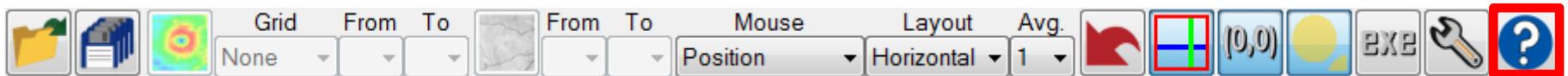


# Options

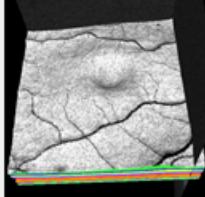


Sample URL: [http://www.iibi.uiowa.edu/sites/default/files/OCTExplorer\\_Sample/](http://www.iibi.uiowa.edu/sites/default/files/OCTExplorer_Sample/)

# About



**About**



Iowa Reference Algorithms  
OCTExplorer, Version: 3.8.0, Date: 09/08/2017  
Copyright (C) 2017  
Kyungmoo Lee, Michael D. Abramoff, Andreas Wahle, Mona K. Garvin, Milan Sonka  
Retinal Image Analysis Laboratory, The University of Iowa

Provider: Institution providing the Original Material:  
The University of Iowa Research Foundation

Provider's Scientists:  
Michael D. Abramoff  
Mona K. Garvin  
Kyungmoo Lee  
Milan Sonka

Software: Iowa Reference Algorithms, including:  
OCTExplorer  
OCTSegmenter

All which are partially described in:  
Abramoff MD, Garvin M, Sonka M. Retinal Imaging and Image Analysis. IEEE Reviews in Biomedical Engineering. 3, 16  
Kang L, Wu X, Chen DZ, Sonka M. Optimal Surface Segmentation in Volumetric Images - A Graph-Theoretic Approach.

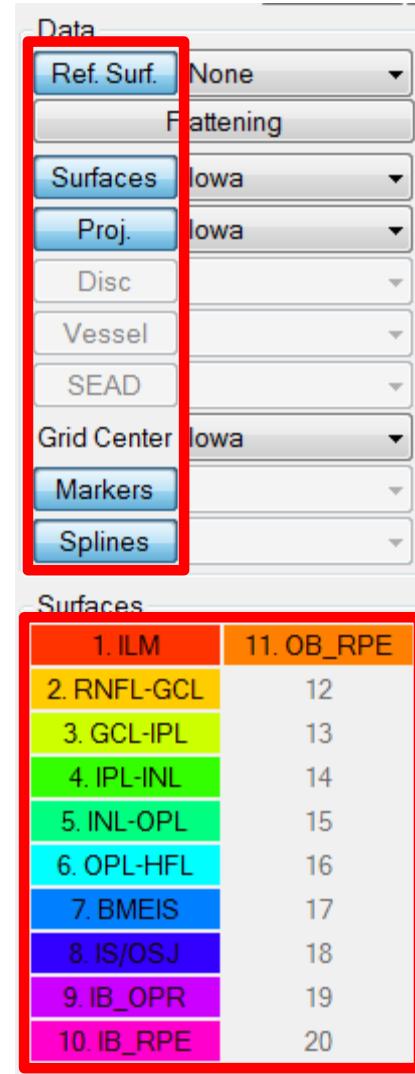
A new coordinate system for output data is used from version 3.8.0. Please click 'Help' button for more information.

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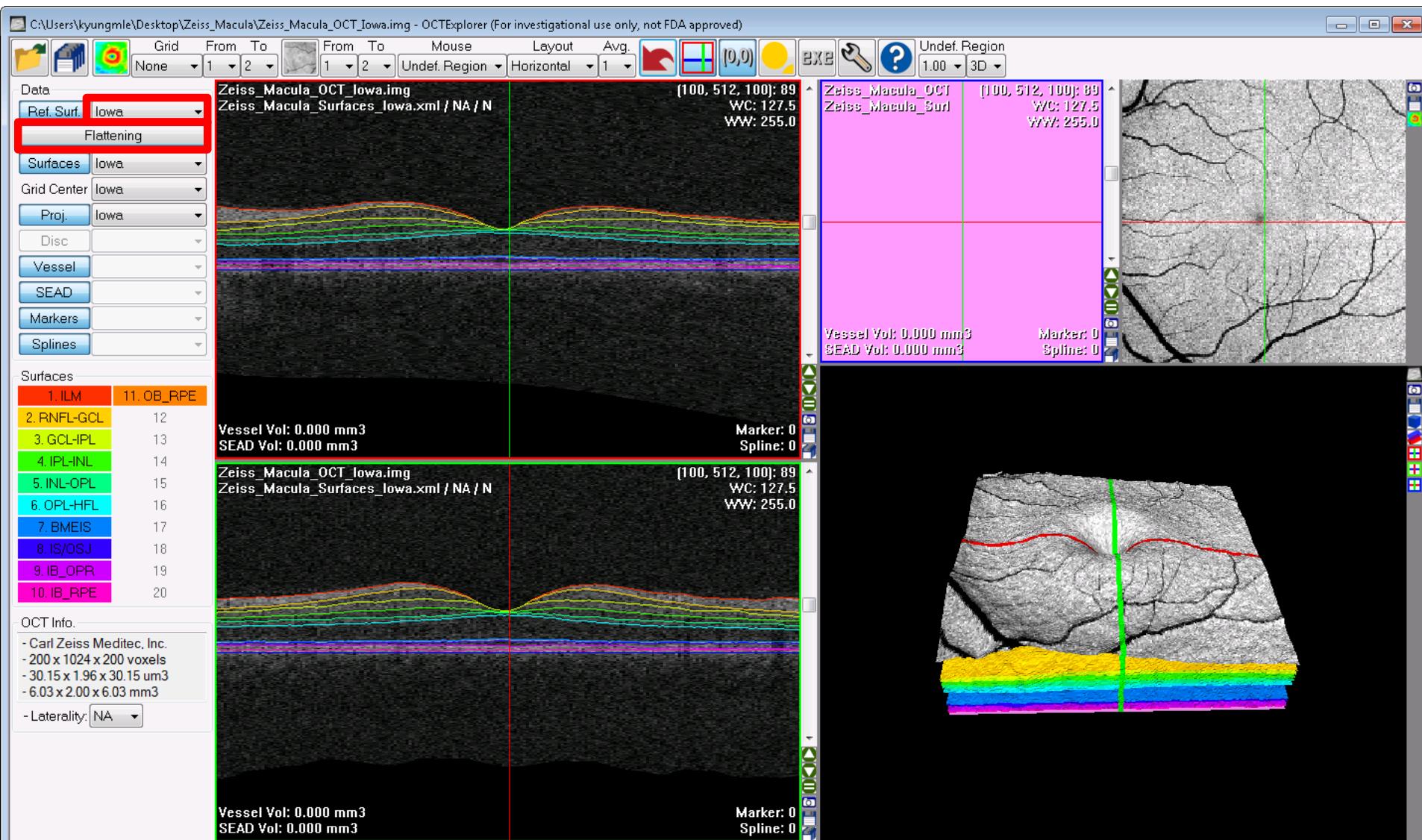
**Help** **Close**

# Show/Hide Buttons

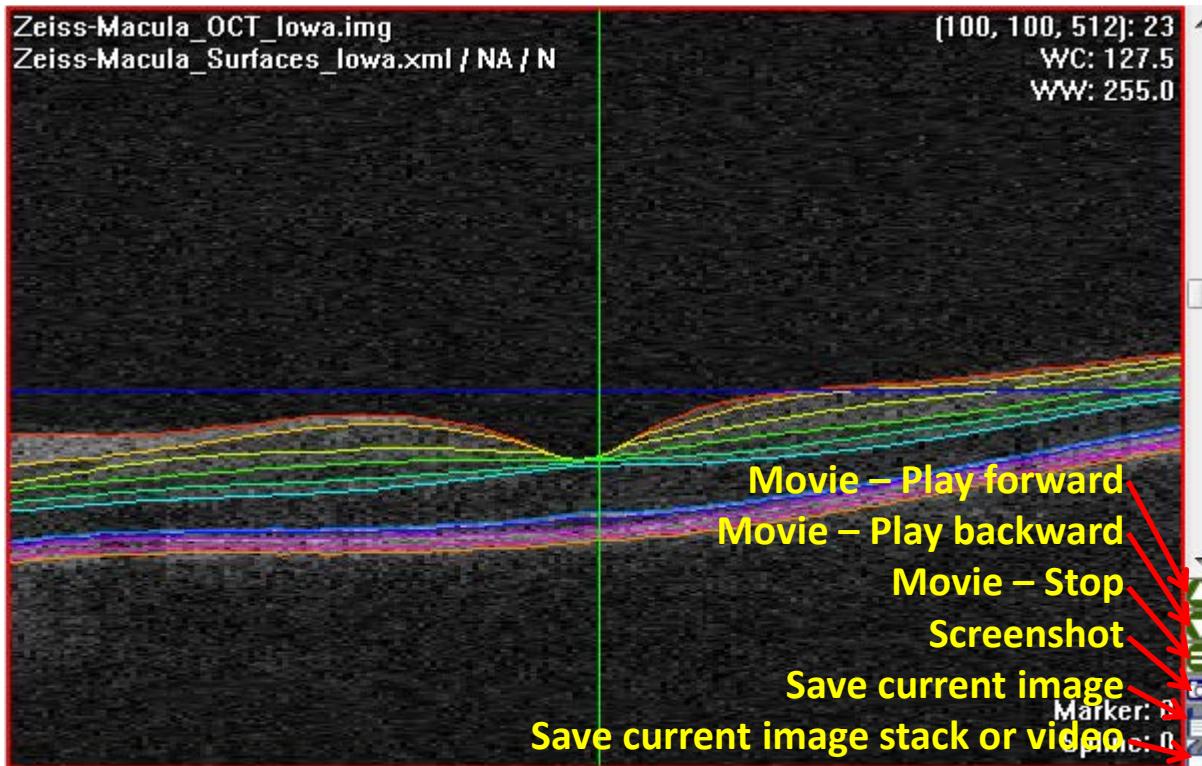


- Space bar: Show/hide surfaces

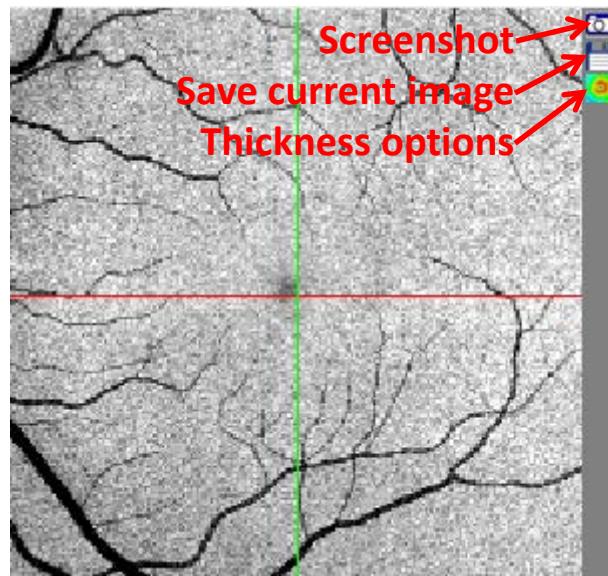
# OCT Flattening



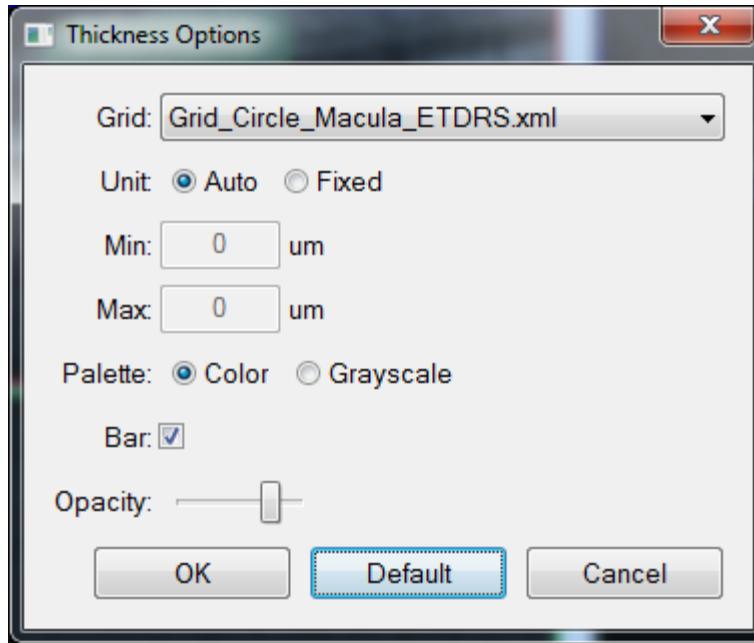
# OCT Images



# Projection Image

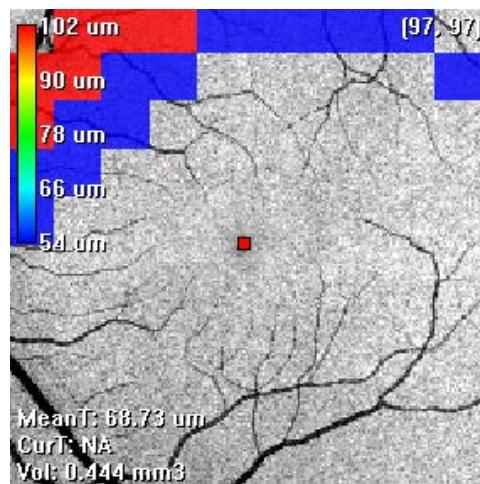
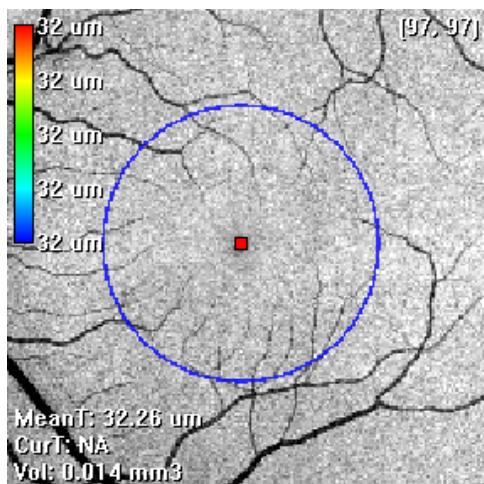
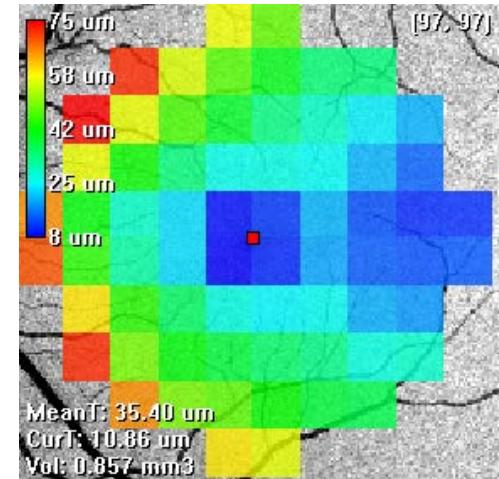
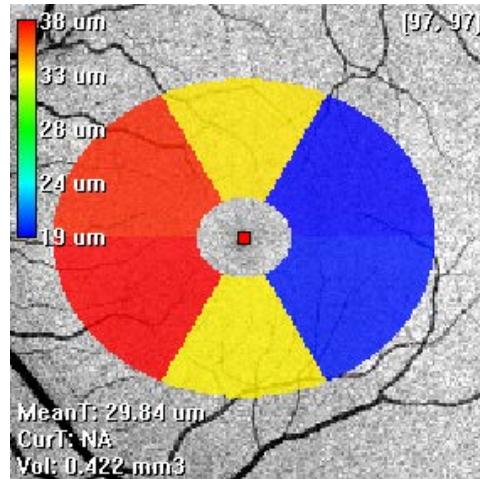
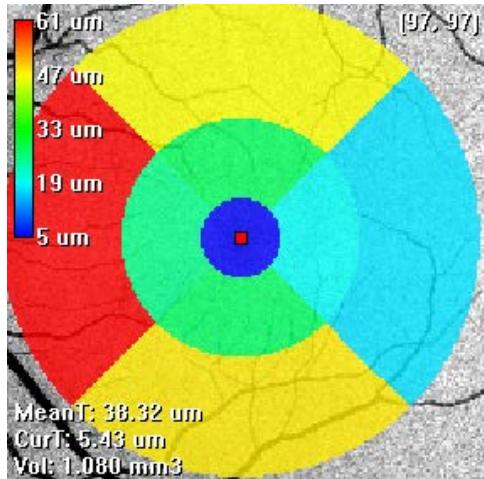


# Projection Image – Thickness Options



- **Grid**
  - **ETDRS grid** : 'Grid\_Circle\_Macula\_ETDRS.xml'
  - **GCIPL grid** : 'Grid\_Ellipse\_Macula\_GCIPL.xml'
  - **10-2 HVF grid** : 'Grid\_Square\_Macula\_10-2HVF.xml'
  - **R-1.73mm grid**: 'Grid\_Circle\_ONH\_R-1.73mm.xml'
  - **NFB grid** : 'Grid\_MultiSquares\_Macula\_NFB.xml'

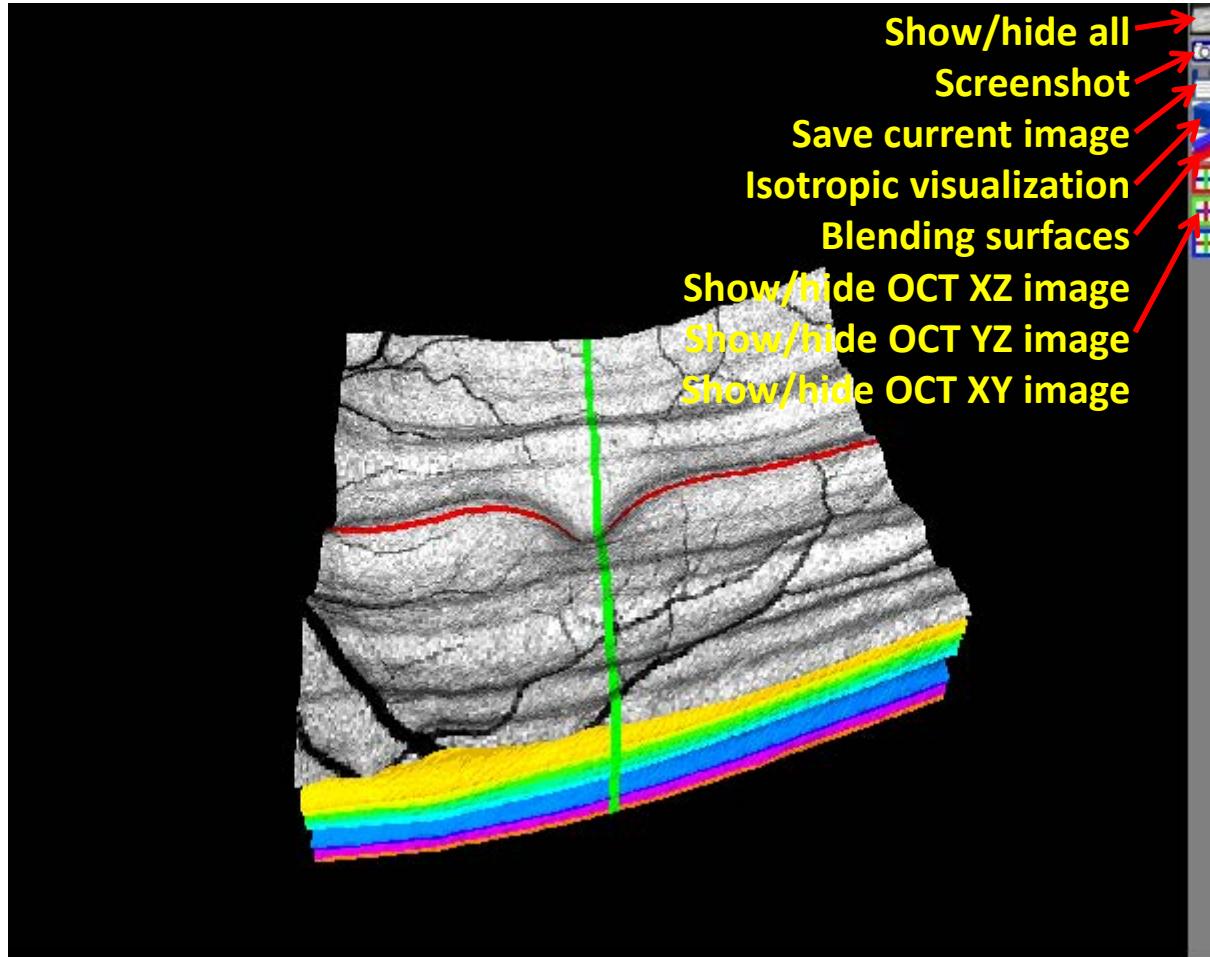
# Projection Image – Grids



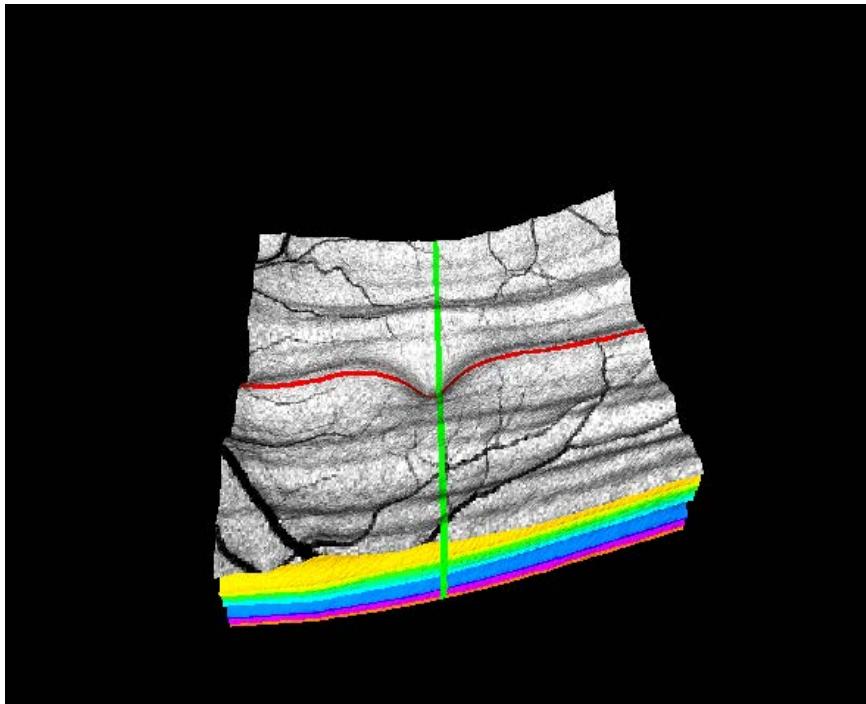
# 3D

- Left mouse button: Position
- Left mouse button drag: Rotation
- Left mouse button double click: Delete markers or splines
- Middle mouse button drag or (shift + right mouse button drag): Pan
- Right mouse button drag (up/down): Zoom out/in

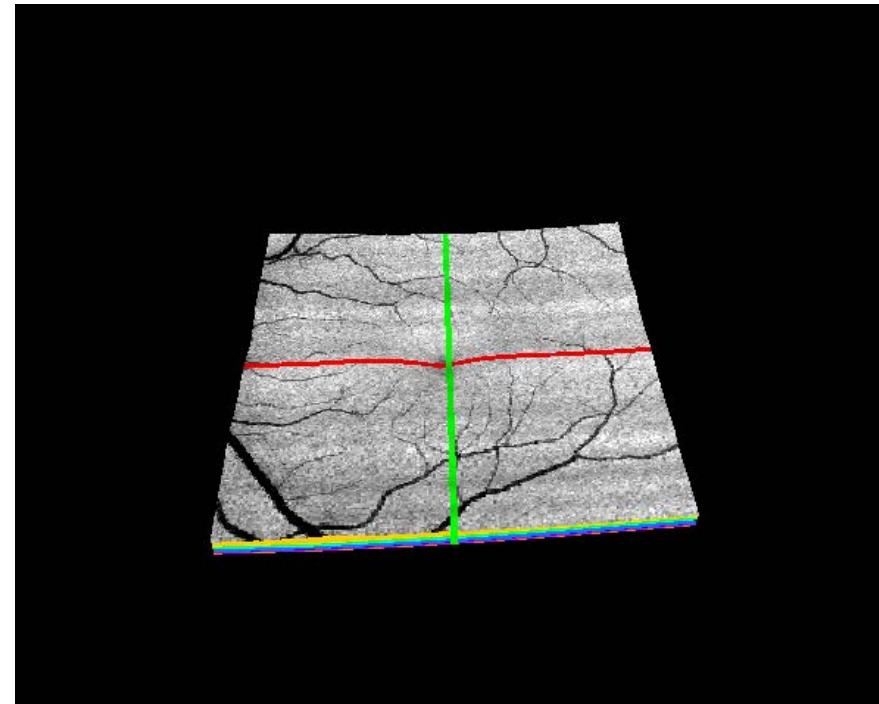
# 3D



# 3D – Isotropic Visualization

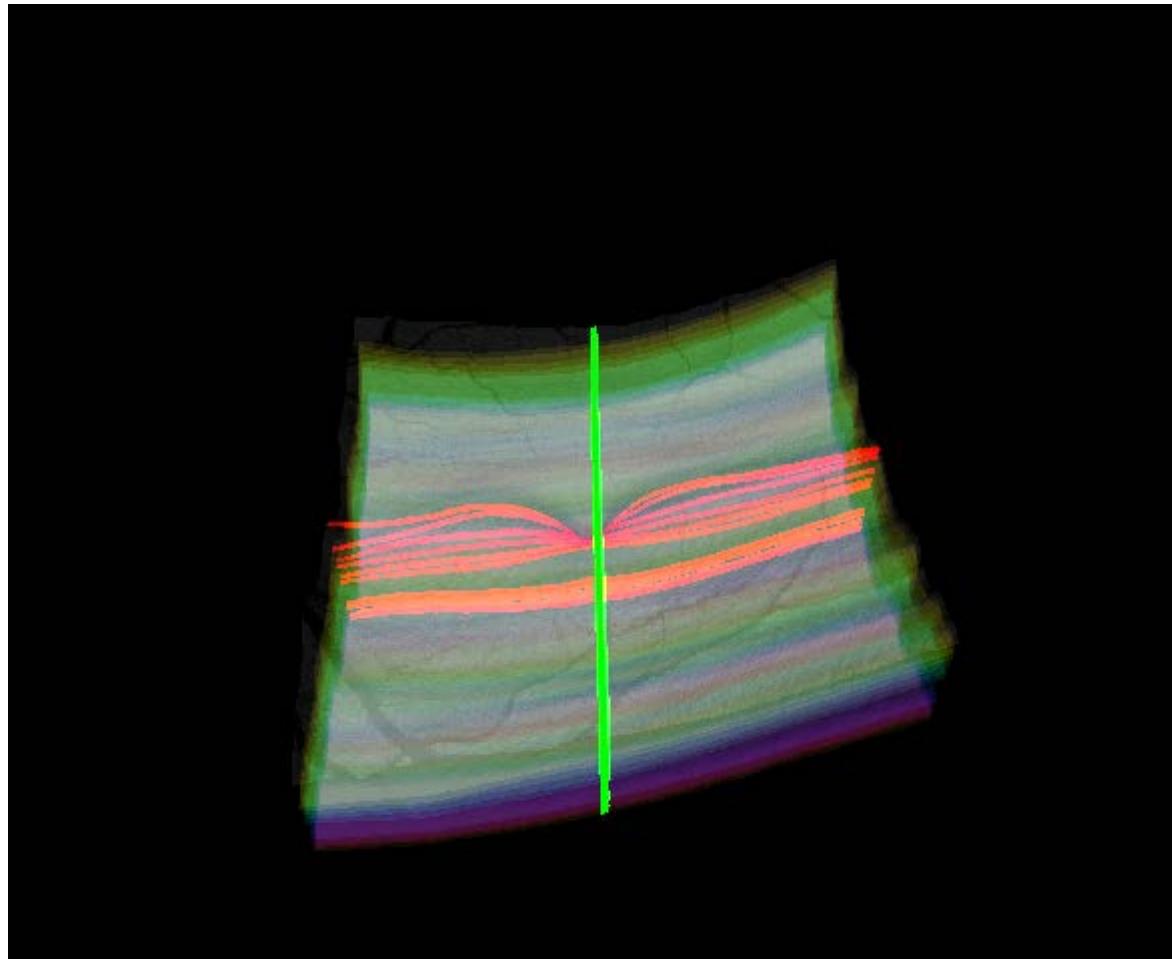


Non-isotropic  
(5 times scaled up in Z-axis)

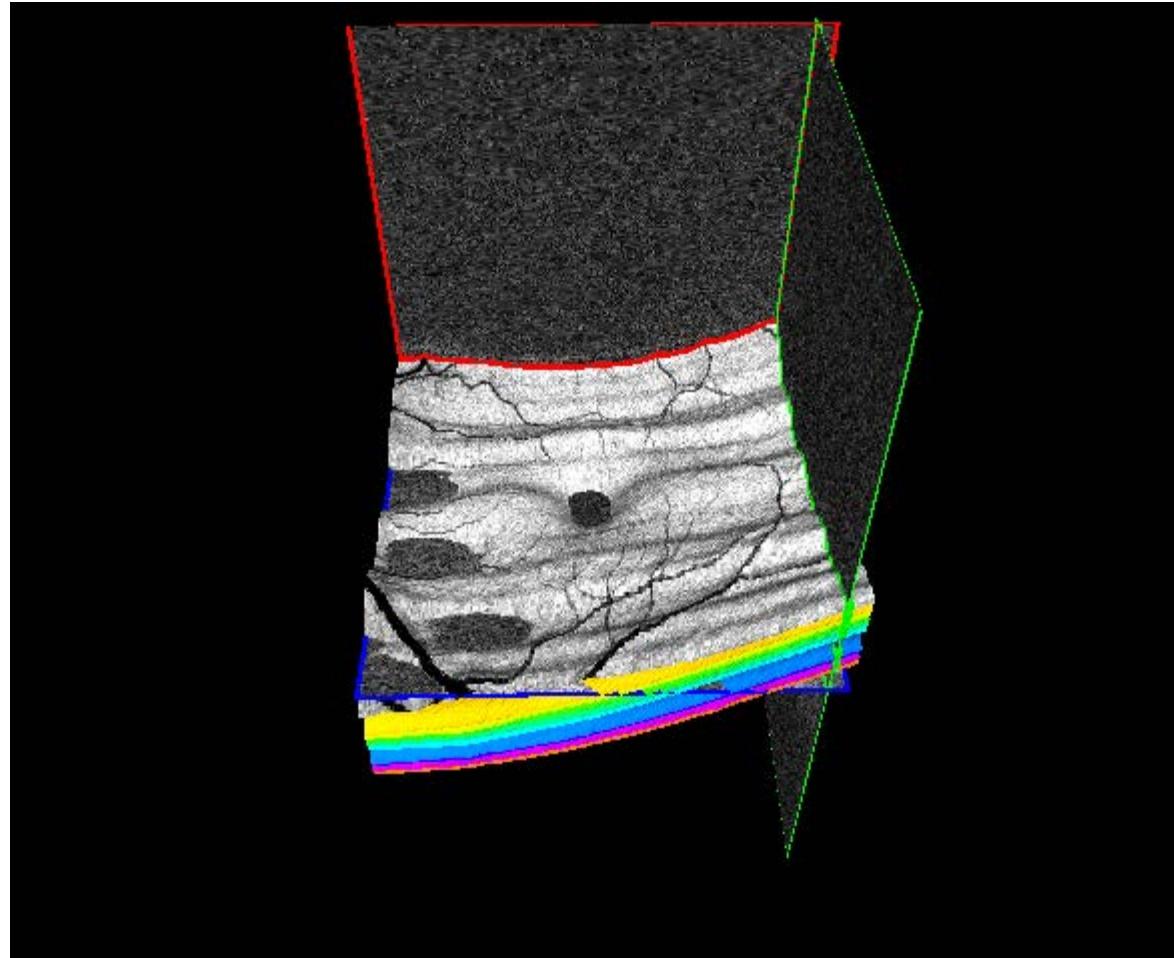


Isotropic

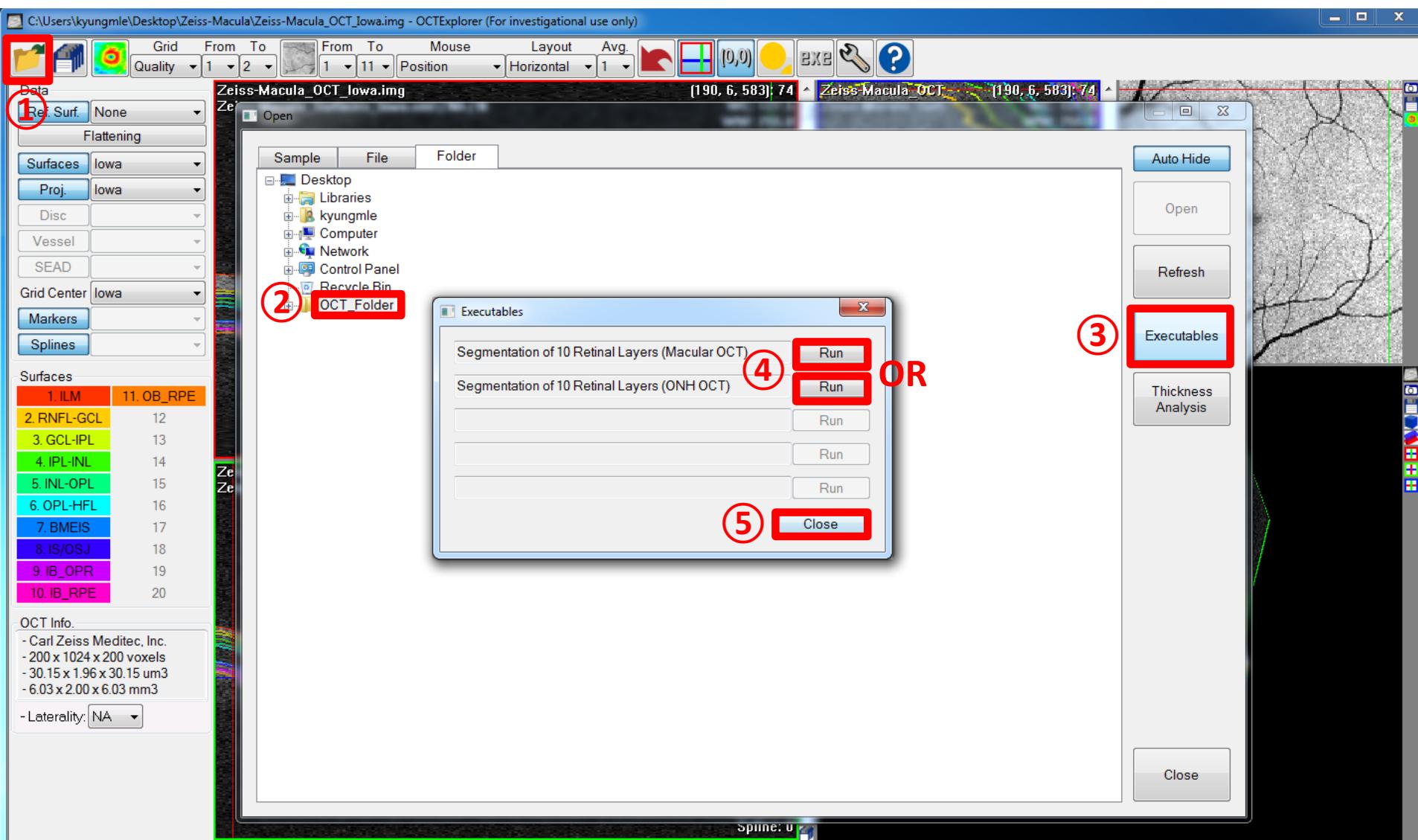
# 3D – Blending Surfaces



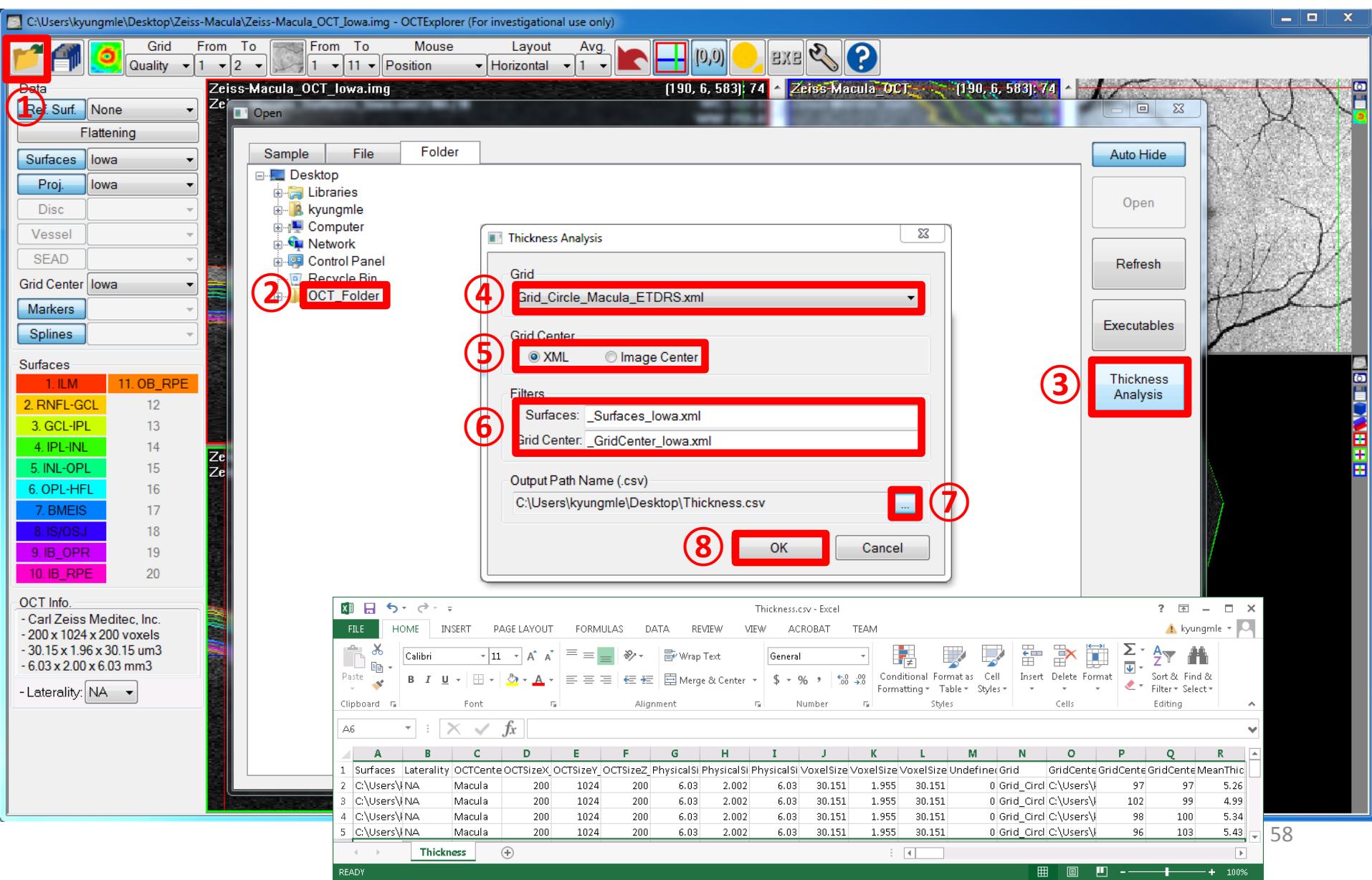
# 3D – Show/Hide OCT Images



# Batch Processing – Layer Segmentation



# Batch Processing – Layer Analysis



# **Thank you!**