Fiber Bundle Volume Measurement

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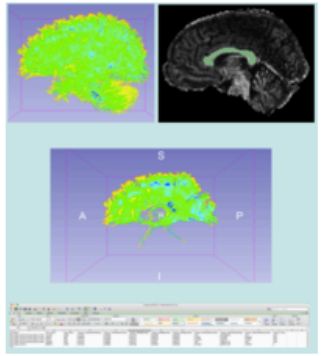
Pre-requisite

- This tutorial is a follow-up tutorial of the "Fiber Bundle Selection And Scalar Measurement" by Fan Zhang, PhD. Please go through this ahead, which is available at:

  https://github.com/SlicerDMRI/slicerdmri.github.io/blob/master/docs/tutorials/FiberBundleSelectionAndScalarMeasurement.pptx

Fiber Bundle Selection and Scalar Measurements [edit]

- The Fiber Bundle Selection and Scalar Measurements Tutorial guides through the use of the Diffusion Bundle Selection module and the Fiber Tract Scalar Measurement module for diffusion MRI tractography data analysis.
- Author: Fan Zhang, University of Sydney Australia, Brigham and Women's Hospital
- Dataset: Fiber Bundle Selection And Scalar Measurement Tutorial Dataset



Learning Objectives

The aim is to calculate the volume of the fiber bundle that passes through the Corpus Callosum(CC). Following this tutorial, you'll be able to:

1) Fiber bundle to label map:

convert fiber bundles to label map;

2) Fiber bundle volume measurements:

calculate volume measurements from the fiber bundles.

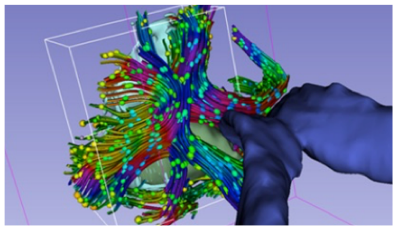
3D Slicer

The tutorial uses the 3DSlicer (Version 4.6.2 Stable Release) software available at

http://download.slicer.org

Disclaimer

It is the responsibility of the user of 3DSlicer to comply with both the terms of the license and with the applicable laws, regulations and rules. Slicer is a tool for research, and is not FDA approved.



Slicer DMRI

An open-source project to improve and extend diffusion magnetic resonance imaging software in 3D Slicer:

http://slicerdmri.github.io

Please read the **Diffusion MRI Analysis** tutorial to install SlicerDMRI:

https://github.com/SlicerDMRI/slicerdmri.github.io/blob/master/docs/tutorials/DiffusionMRIanalysis.pdf

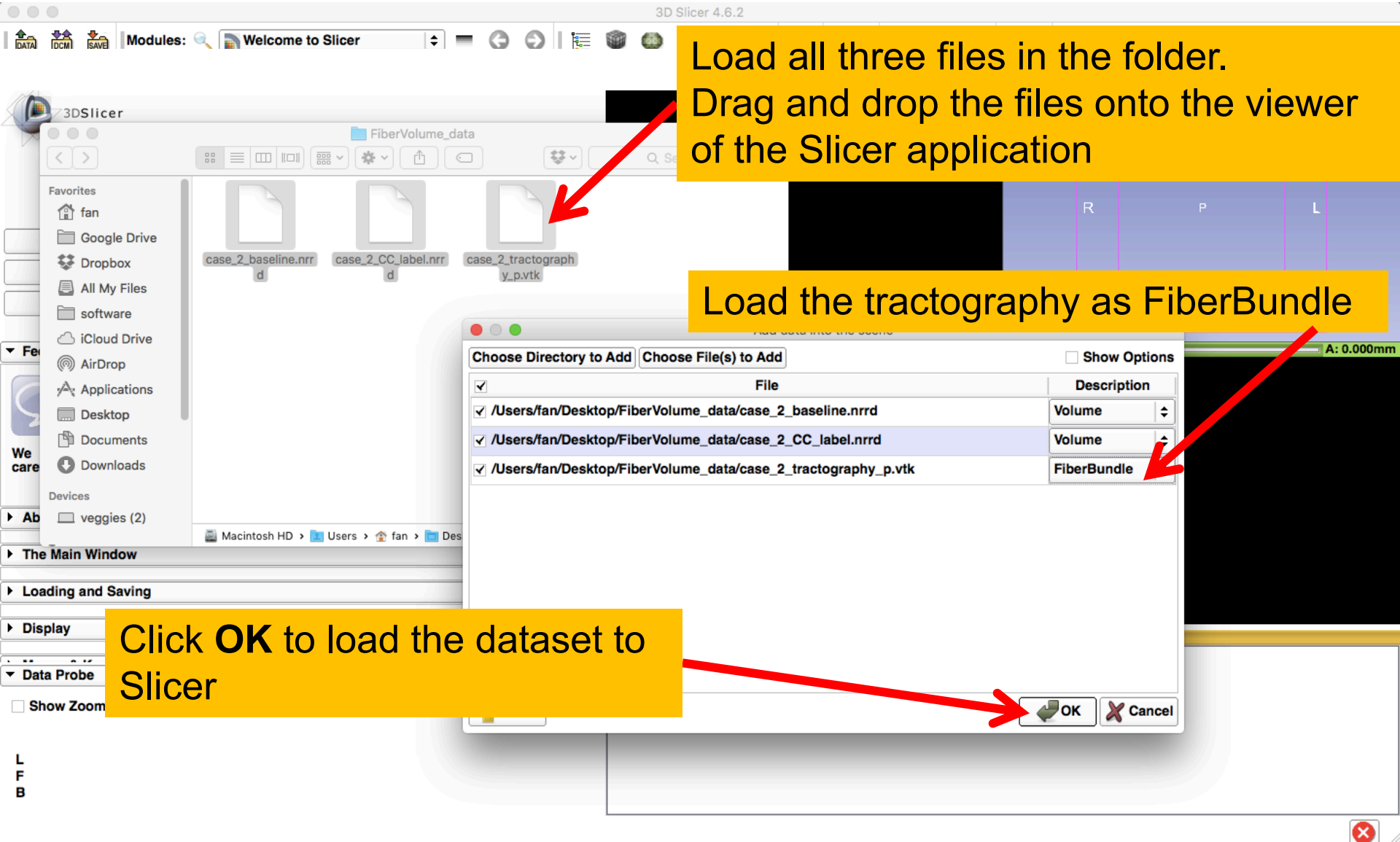
Tutorial Data

Download sample data, at http://www.na-mic.org/Wiki/images/4/4c/FiberVolume_data.zip

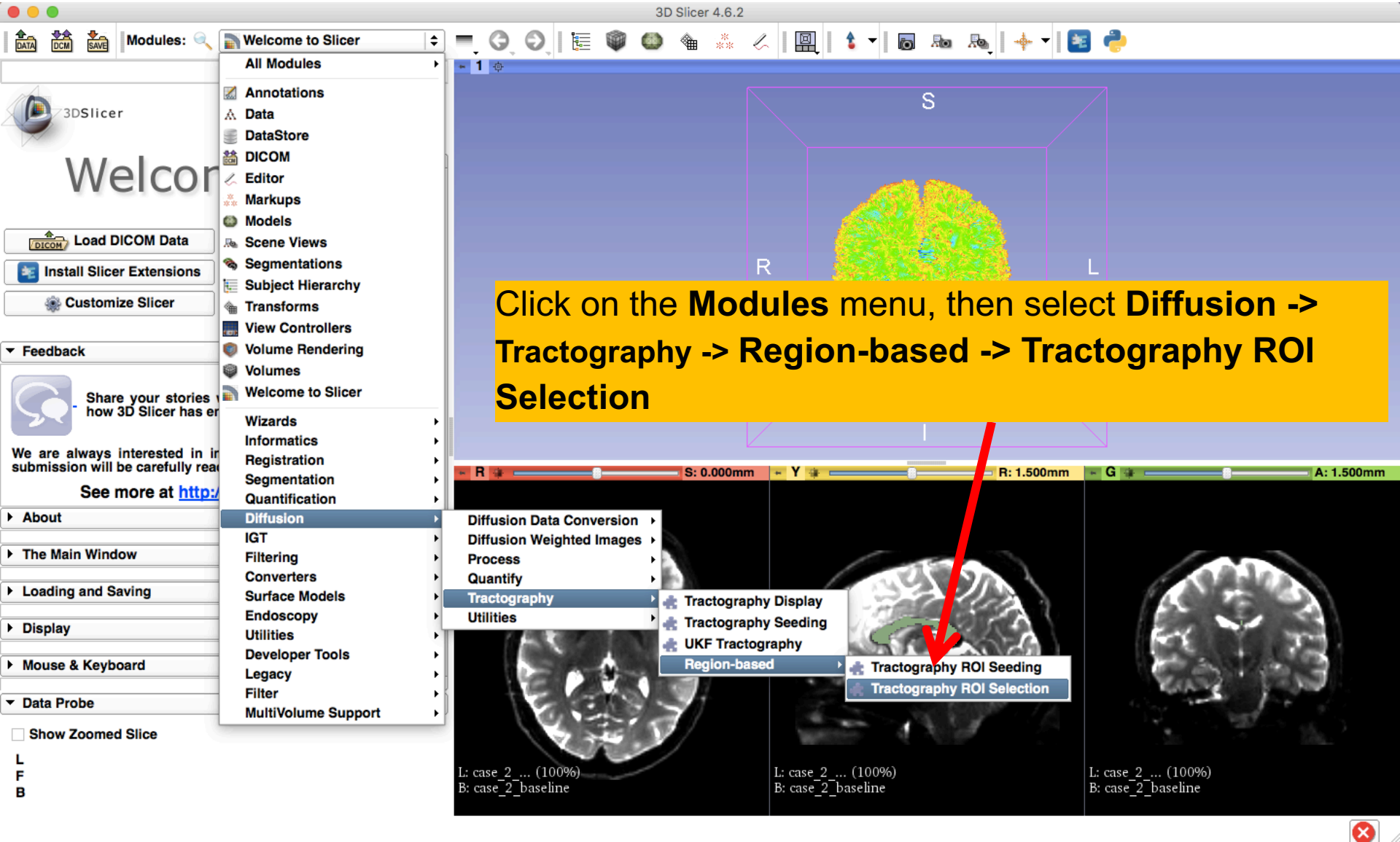
The following data are provided:

- Baseline image
- Down sampled whole brain tractography (conducted as in the DWI tutorial and down-sampled to about 10000 fibers using Tractography Display module)
- Corpus callosum label map (drawn as in the DWI tutorial)

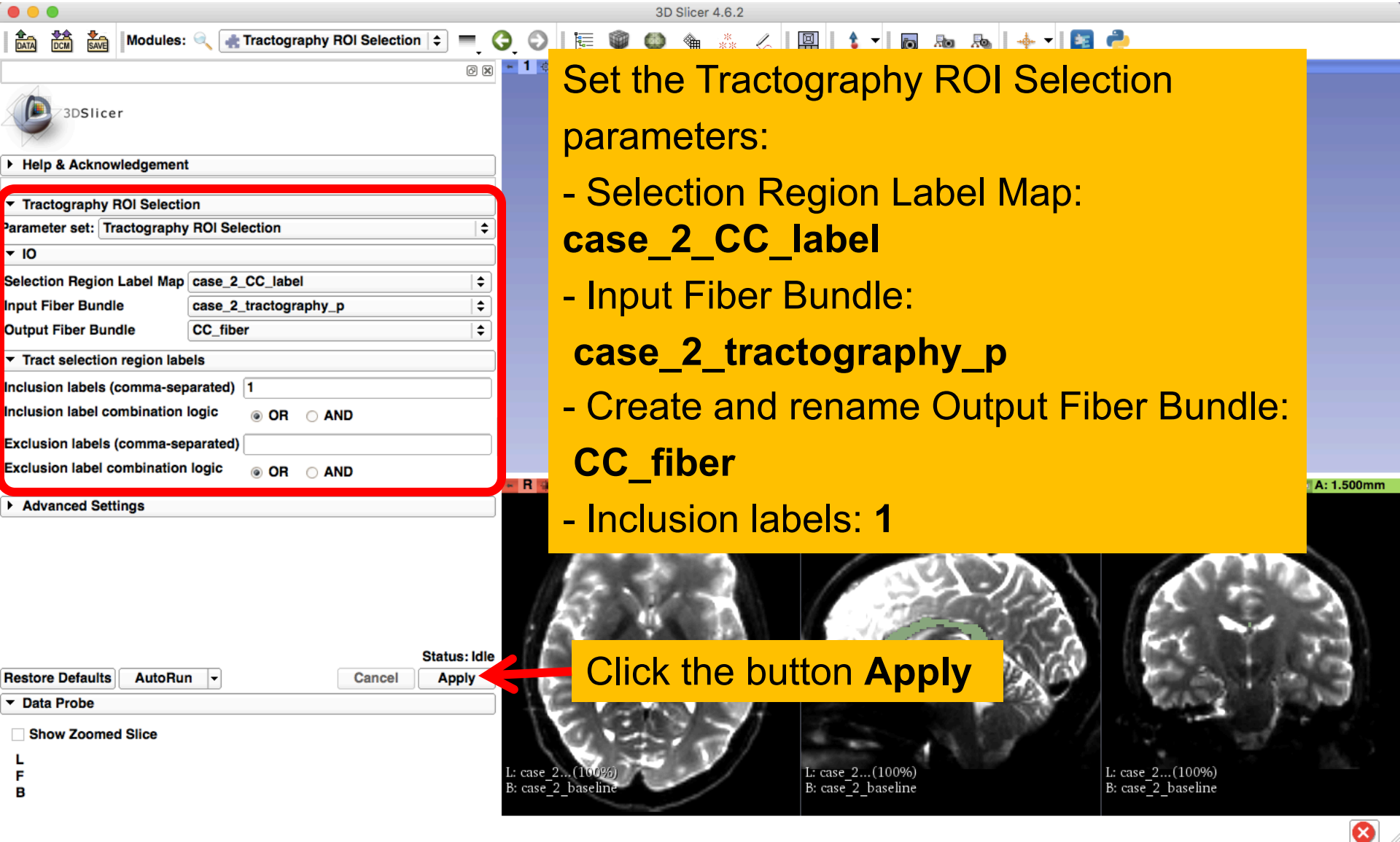
Load Data


Load all three files in the folder.
Drag and drop the files onto the viewer of the Slicer application
Load the tractography as FiberBundle
Click **OK** to load the dataset to Slicer
3D Slicer 4.6.2
Modules:
Welcome to Slicer
3DSlicer
FiberVolume_data
Favorites
fan
Google Drive
Dropbox
All My Files
software
iCloud Drive
AirDrop
Applications
Desktop
Documents
Downloads
Devices
veggies (2)
case_2_baseline.nrrd
case_2_CC_label.nrrd
case_2_tractography_p.vtk
Choose Directory to Add
Choose File(s) to Add
Show Options
File
Description
/Users/fan/Desktop/FiberVolume_data/case_2_baseline.nrrd
Volume
/Users/fan/Desktop/FiberVolume_data/case_2_CC_label.nrrd
Volume
/Users/fan/Desktop/FiberVolume_data/case_2_tractography_p.vtk
FiberBundle
OK
Cancel
The Main Window
Loading and Saving
Display
Data Probe
Show Zoom
R
P
L
A: 0.000mm

Tractography ROI Selection



Single Label Selection

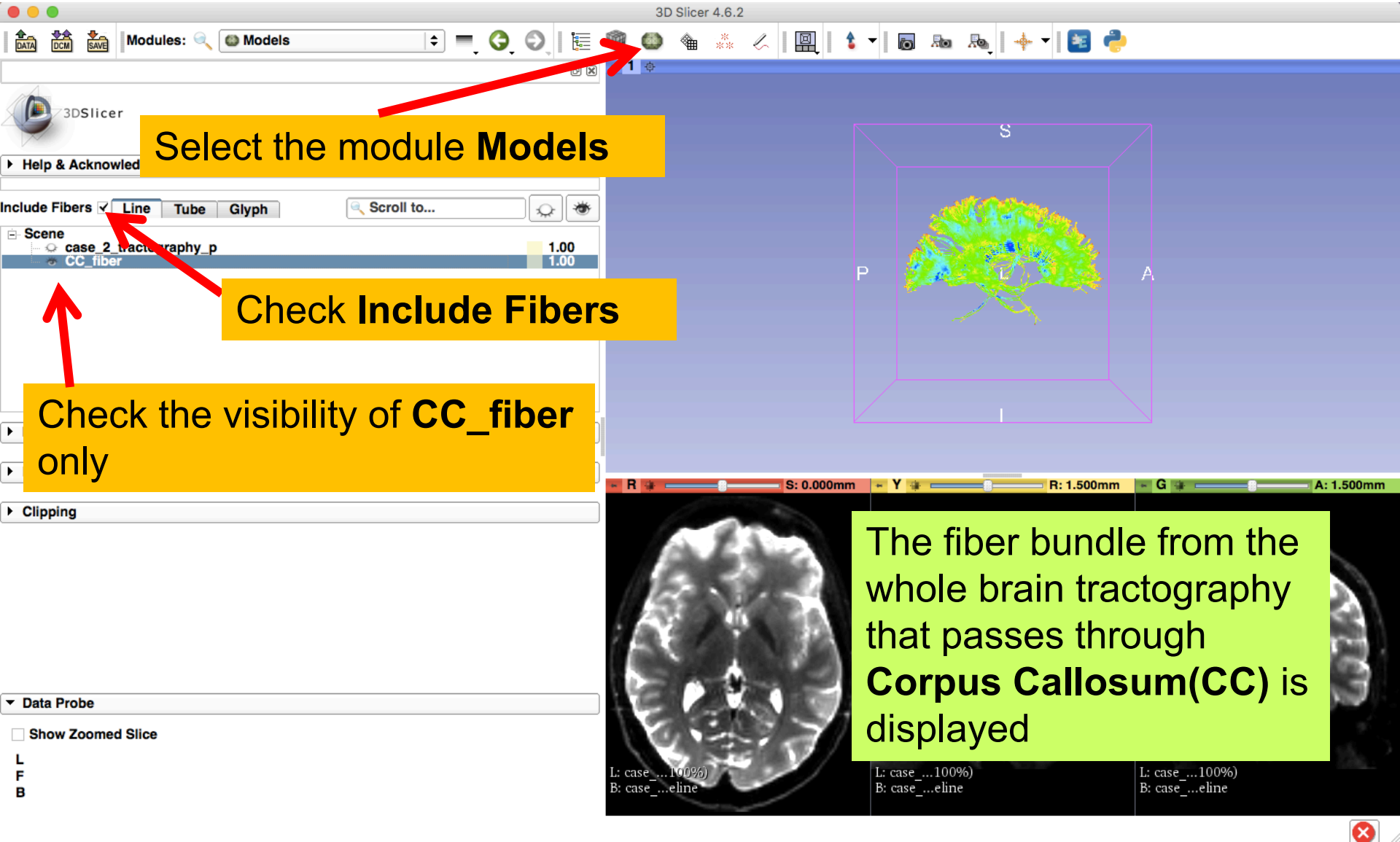


Set the Tractography ROI Selection parameters:

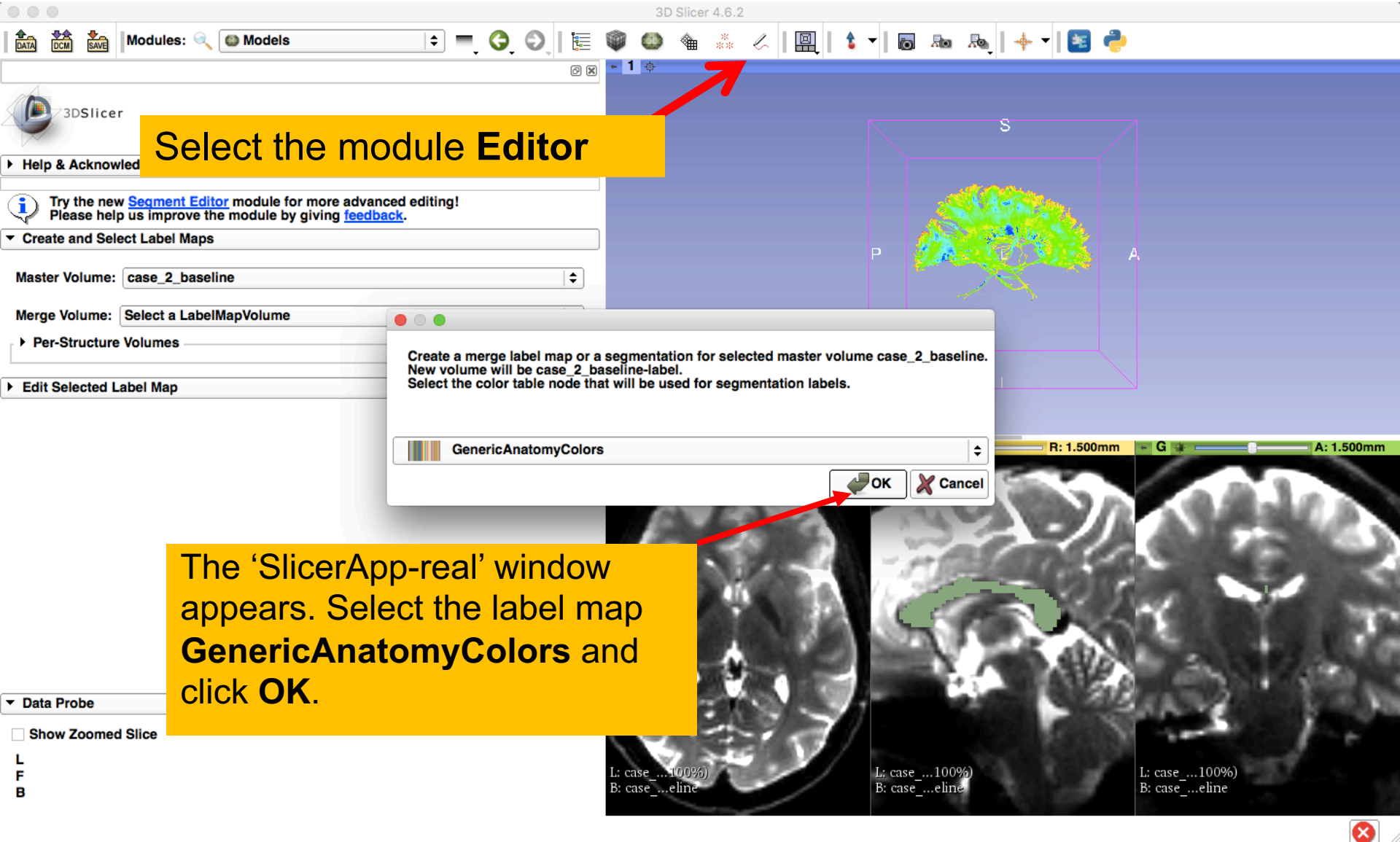
- Selection Region Label Map: **case_2_CC_label**
- Input Fiber Bundle: **case_2_tractography_p**
- Create and rename Output Fiber Bundle: **CC_fiber**
- Inclusion labels: **1**

Click the button **Apply**

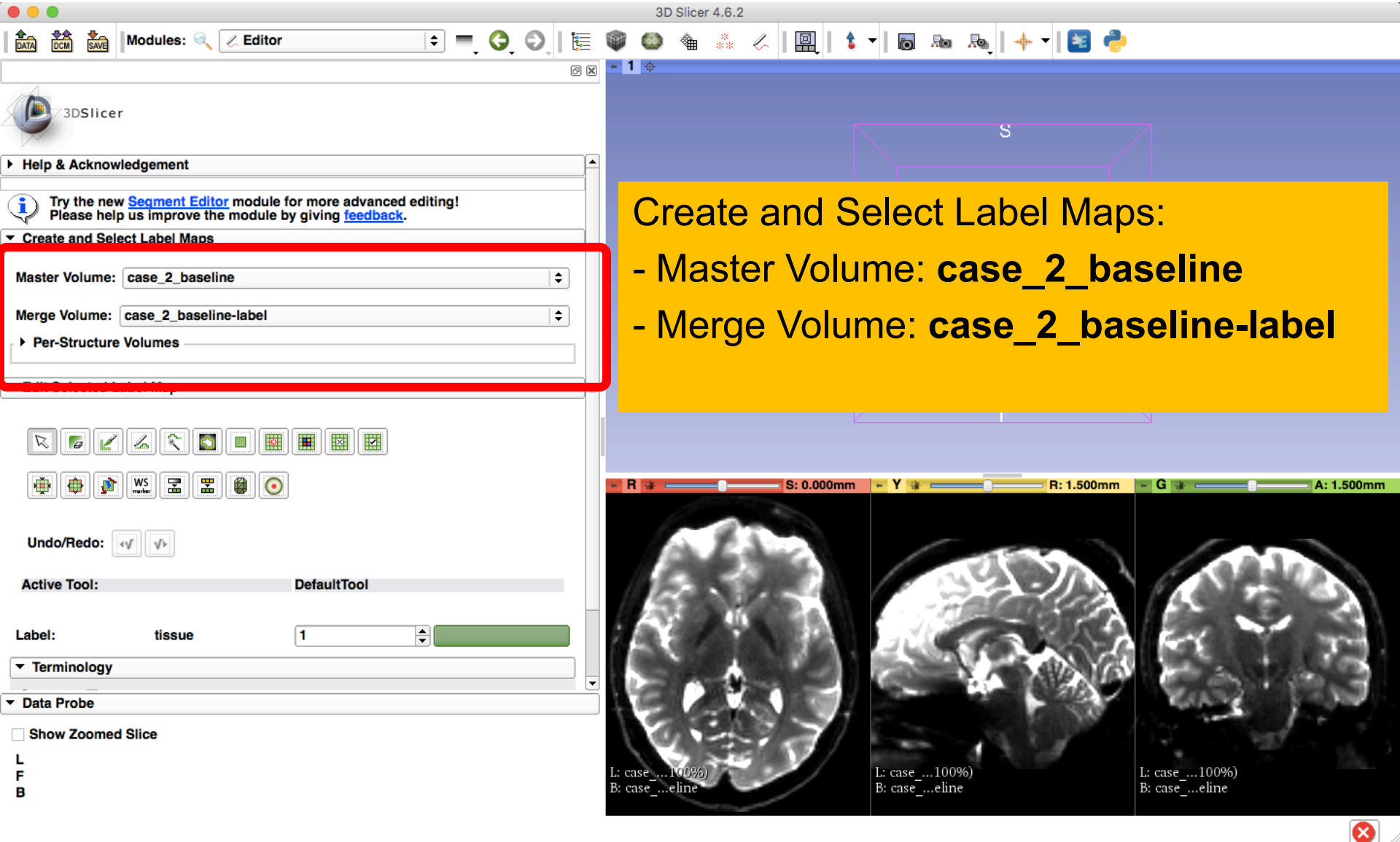
Single Label Selection



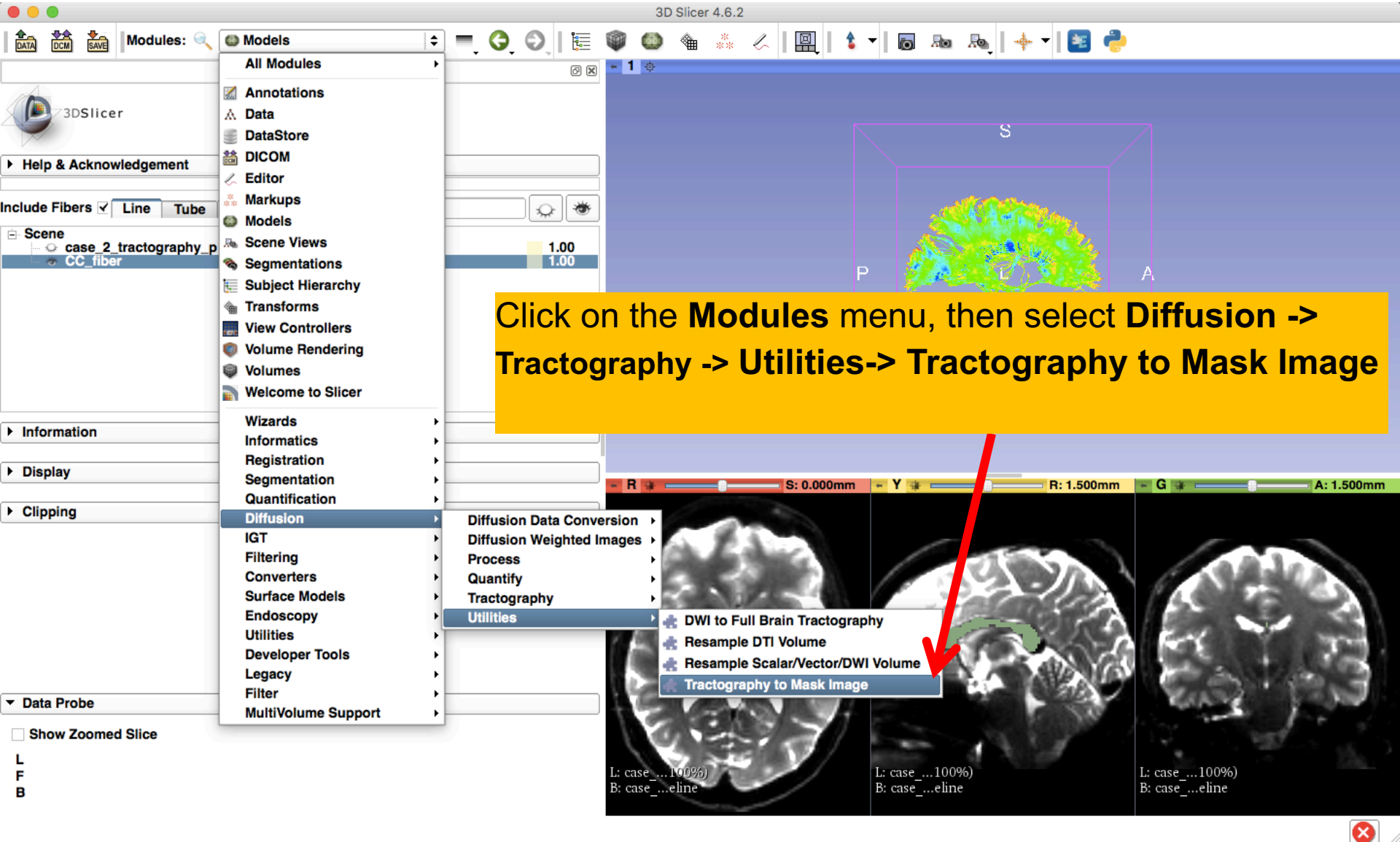
Fiber bundle to label map



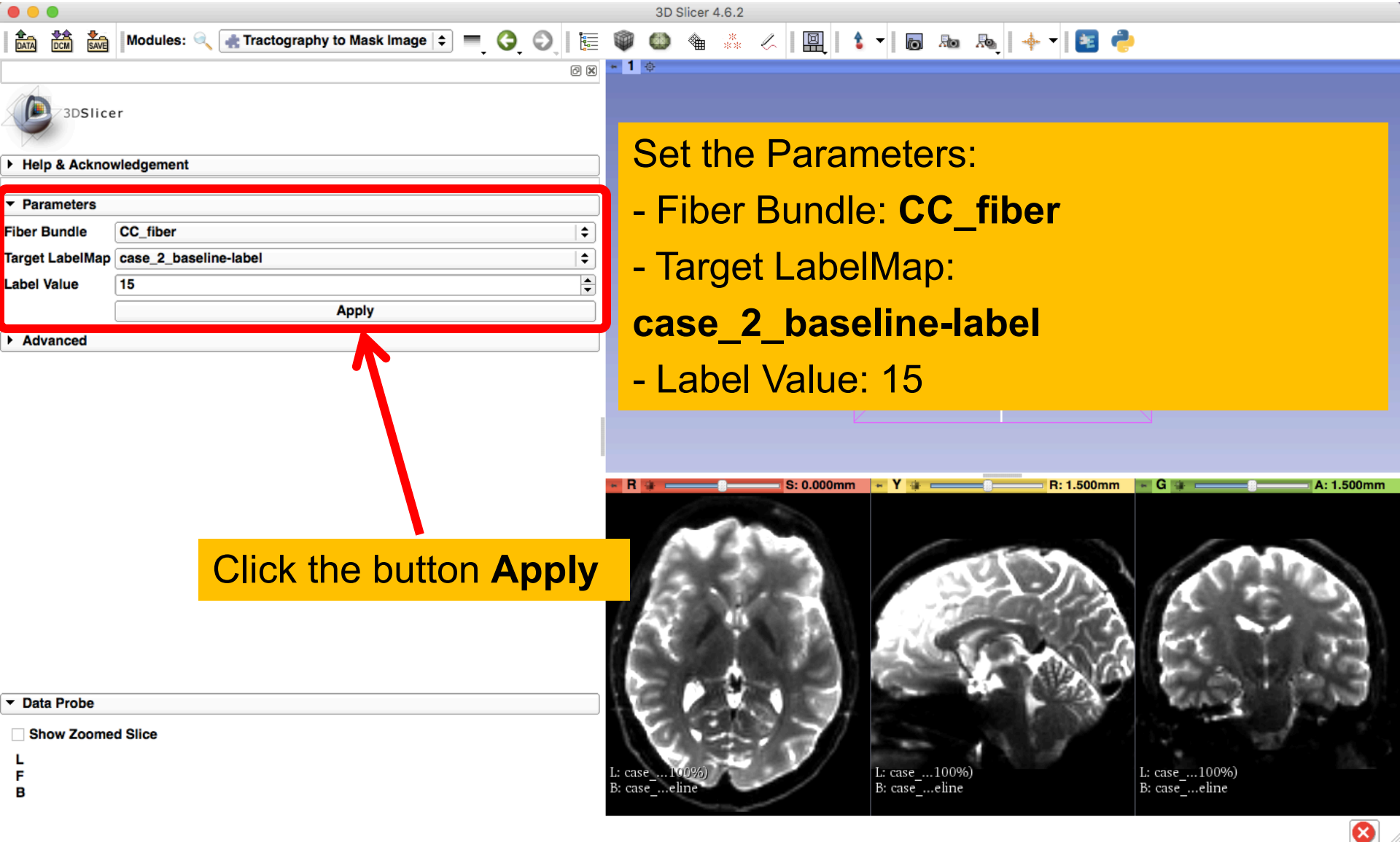
Fiber bundle to label map



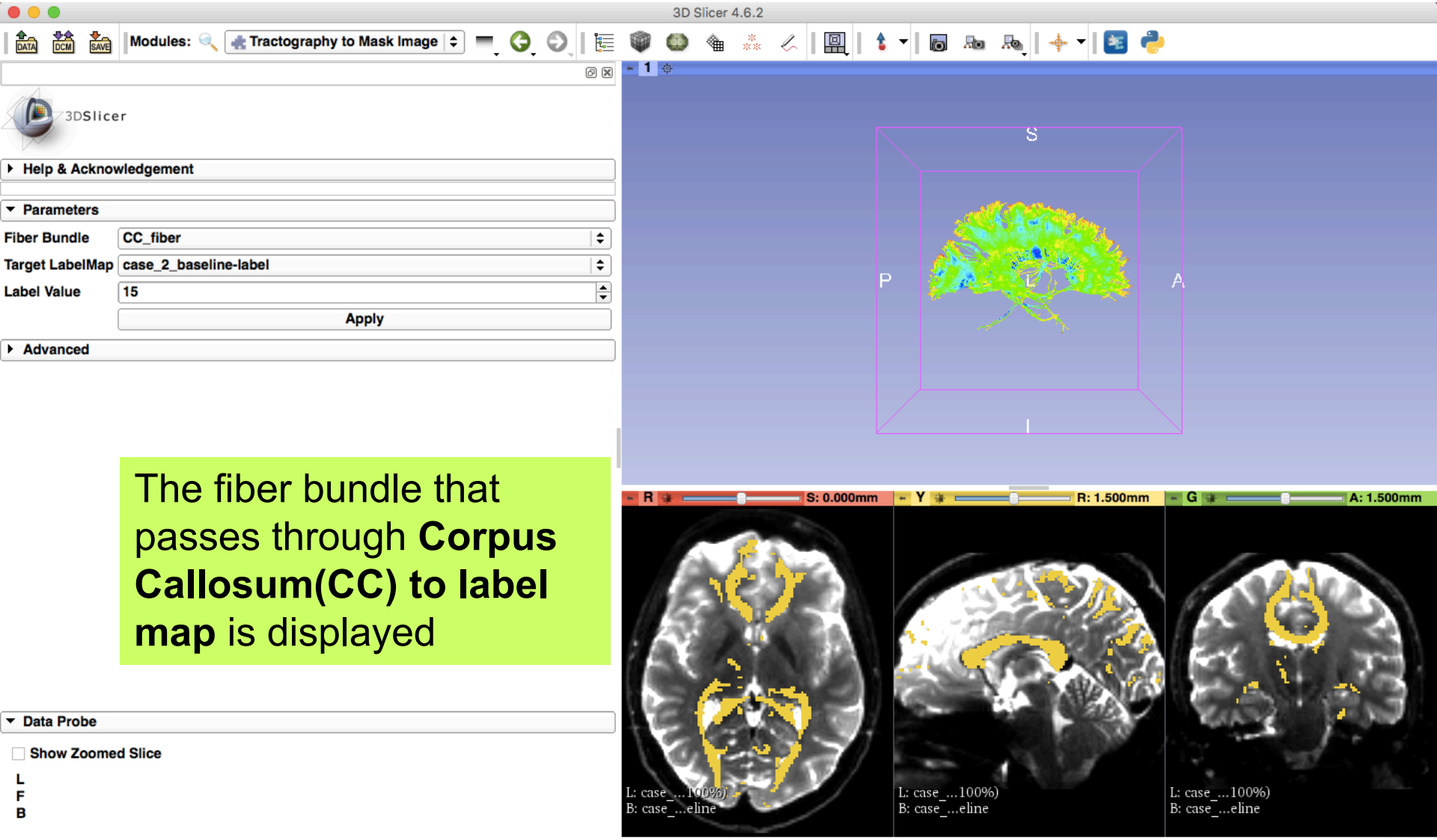
Fiber bundle to label map



Fiber bundle to label map

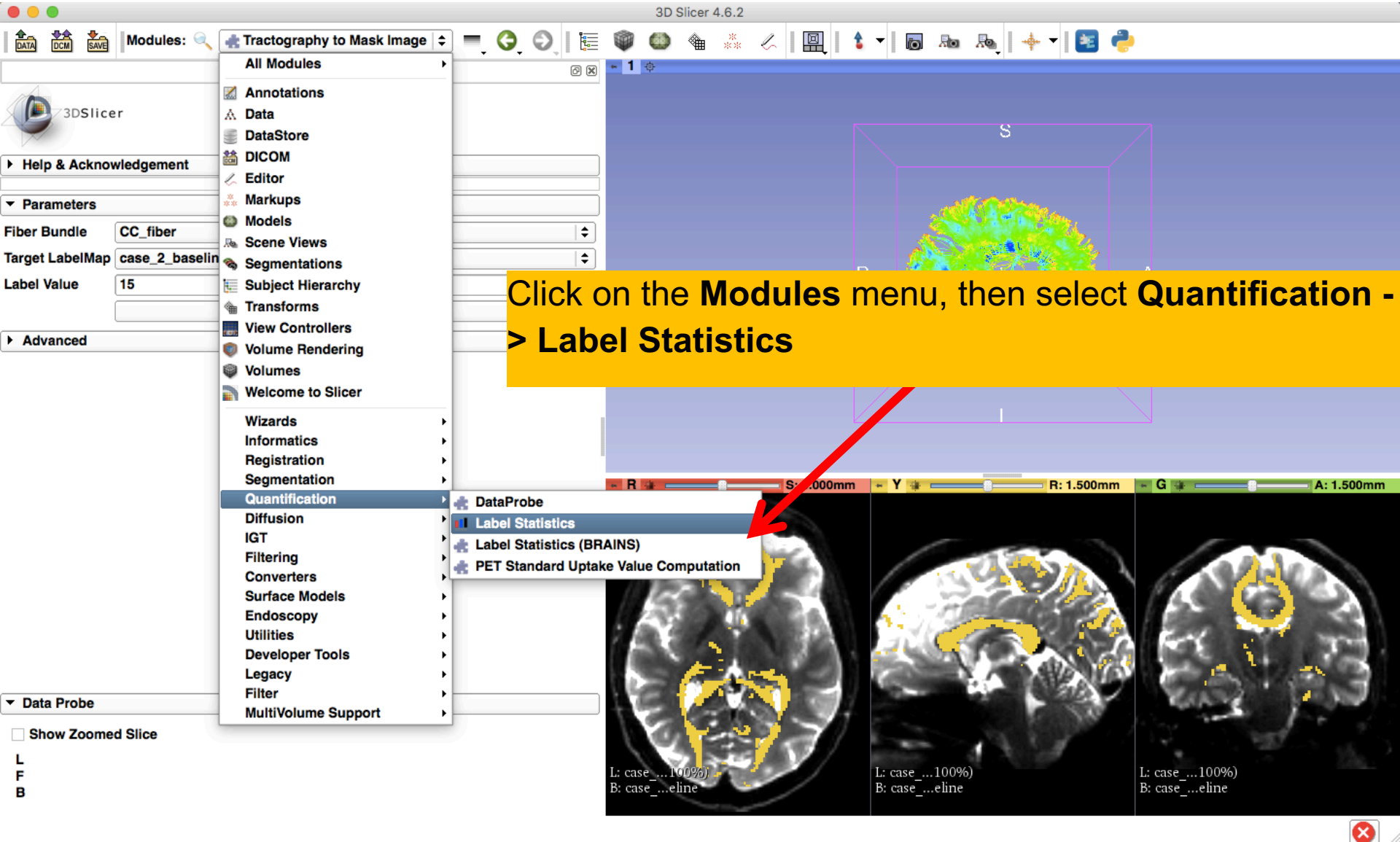


Fiber bundle to label map

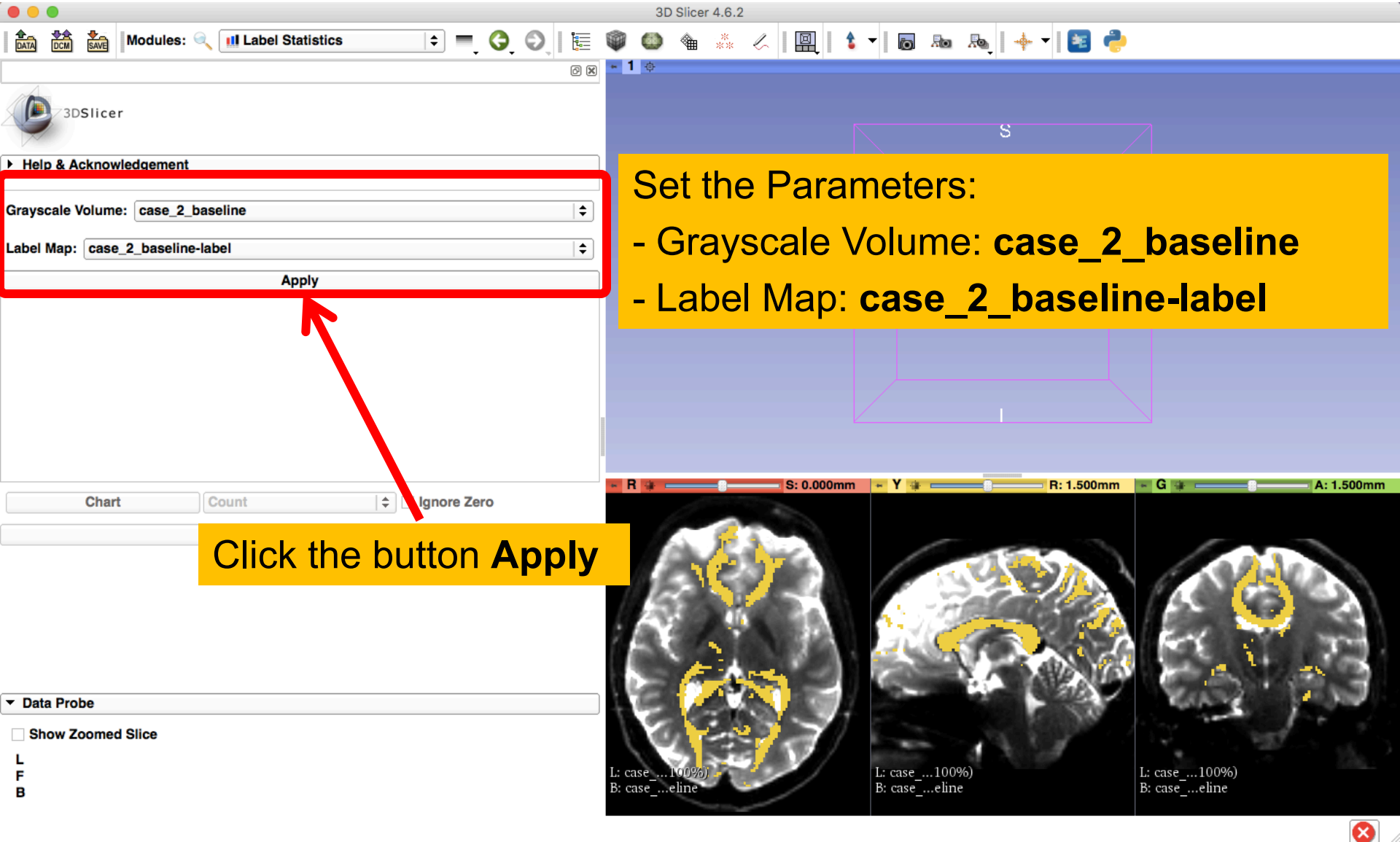


The fiber bundle that passes through **Corpus Callosum(CC) to label map** is displayed

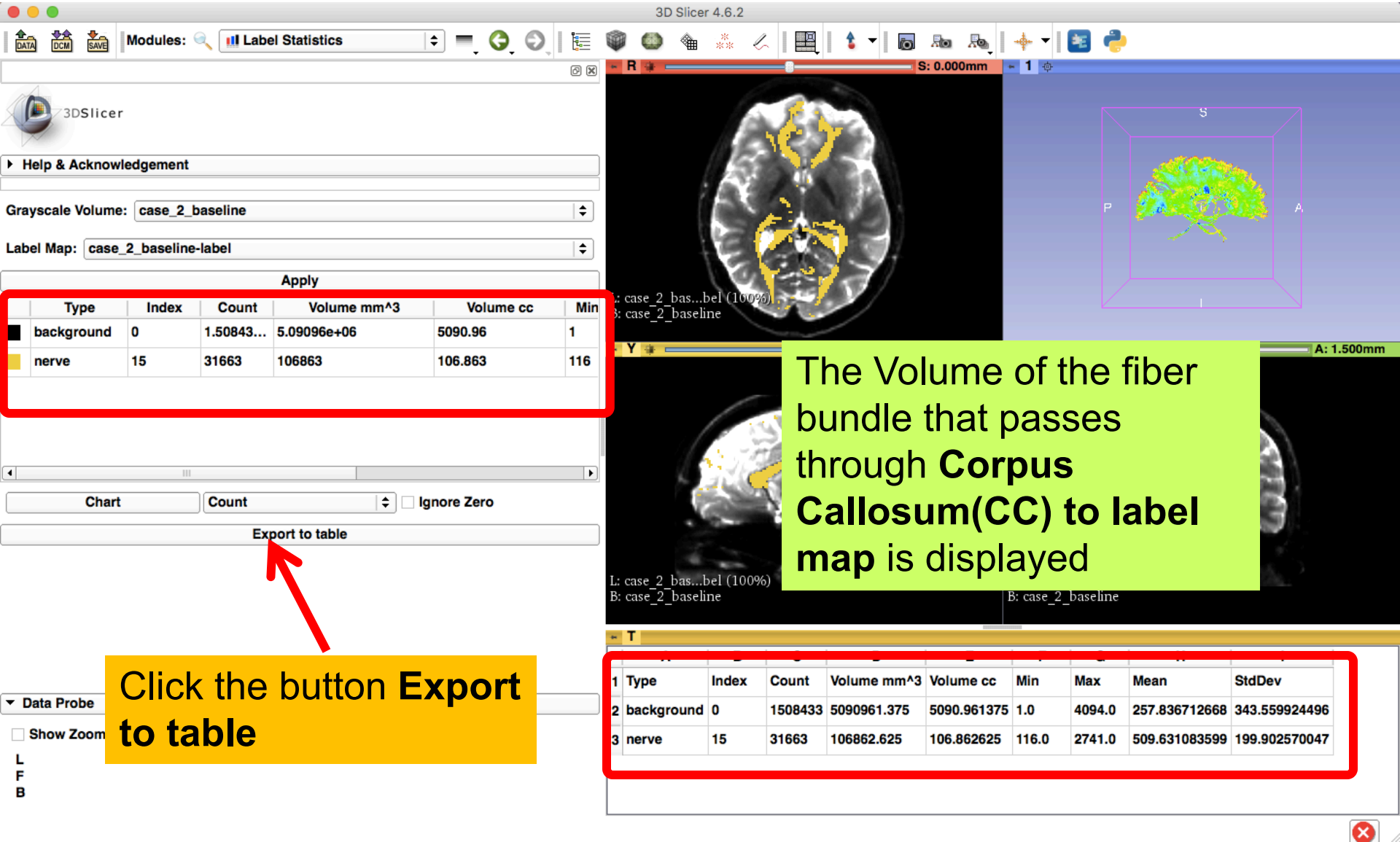
Fiber bundle volume measurements



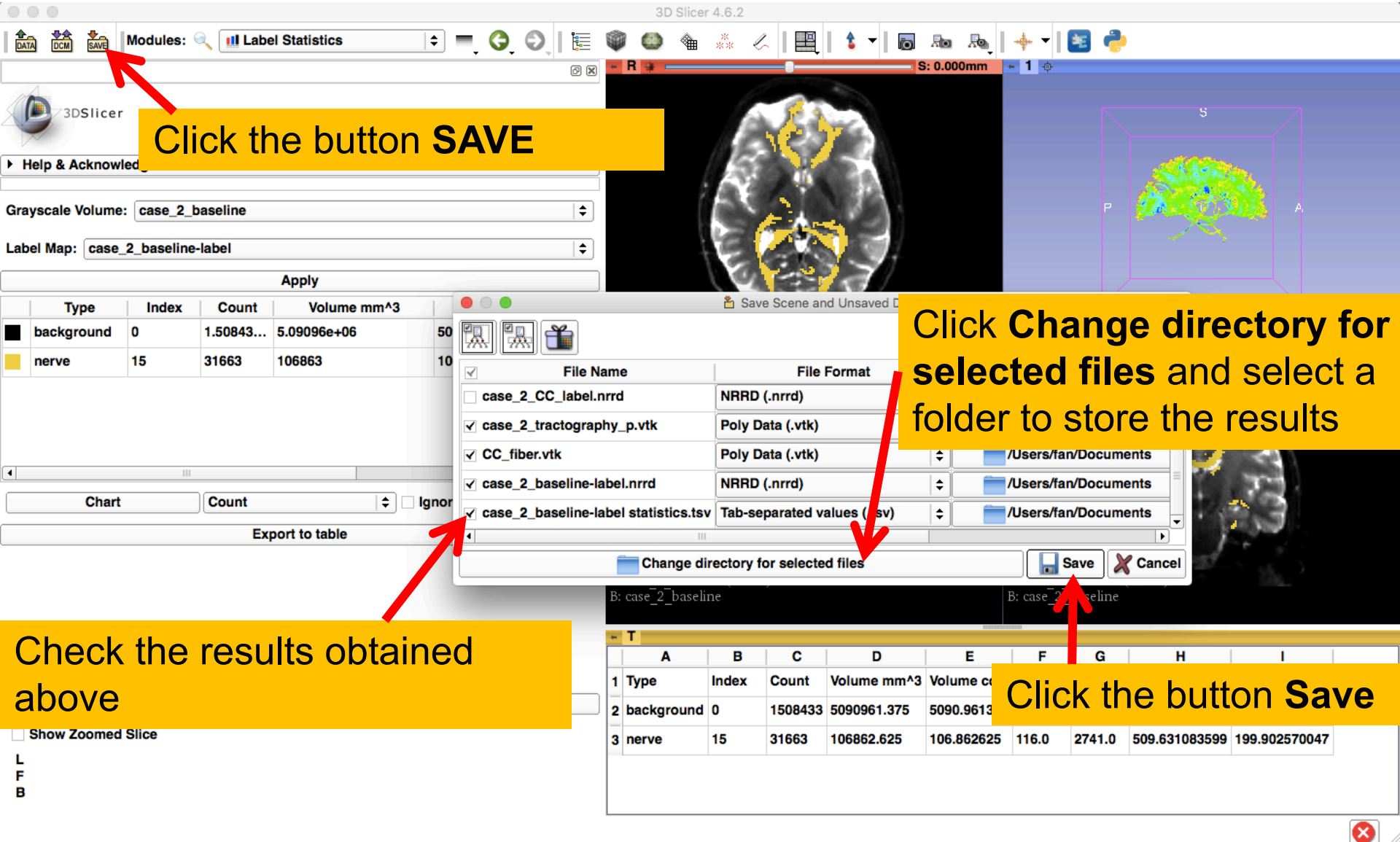
Fiber bundle volume measurements



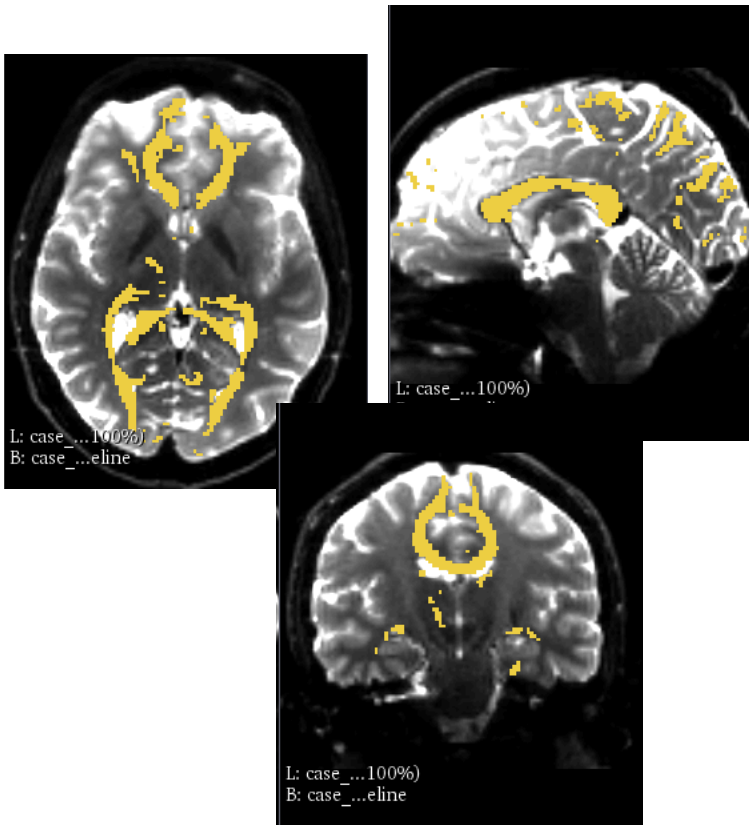
Fiber bundle volume measurements



Save the Results



Conclusion



This tutorial guided you through converting fiber bundle to label map and measuring fiber bundle volume for conducting further tractography processing.

	A	B	C	D	E	F	G	H	I
1	Type	Index	Count	Volume mm^3	Volume cc	Min	Max	Mean	StdDev
2	background	0	1508433	5090961.375	5090.961375	1.0	4094.0	257.836712668	343.559924496
3	nerve	15	31663	106862.625	106.862625	116.0	2741.0	509.631083599	199.902570047

Acknowledgments

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Neuroimage Analysis Center (NAC)

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