



*National Alliance for Medical Image Computing  
Neuroimage Analysis Center*

# **Data Loading & and Visualization**

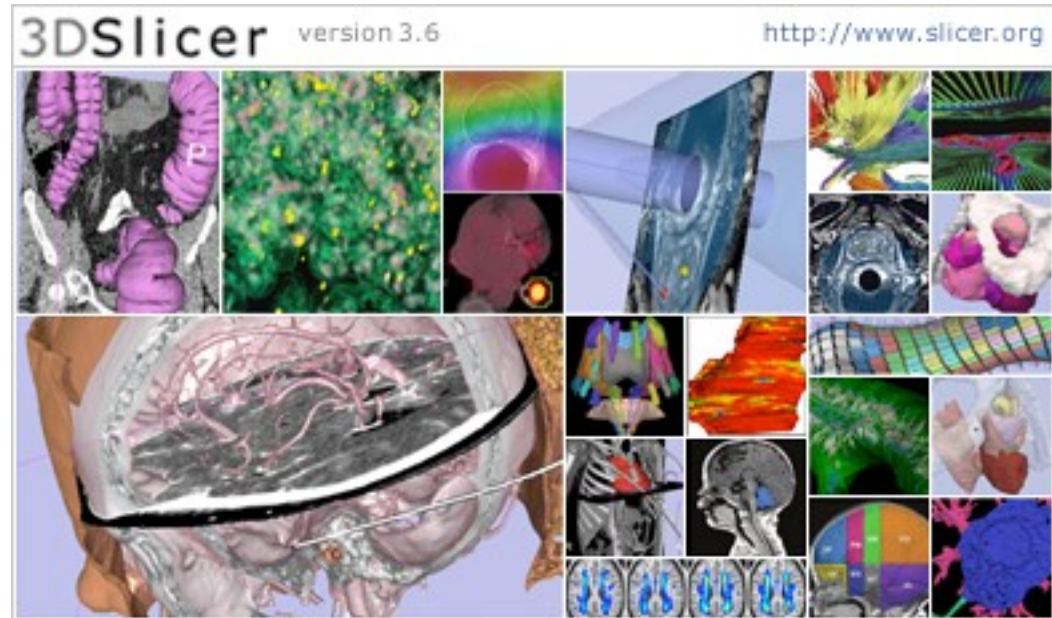
Sonia Pujol, Ph.D.

Surgical Planning Laboratory  
Harvard Medical School



*Leonardo da Vinci (1452-1519), Virgin and Child  
Alte Pinakothek, München*

- An **end-user application** for image analysis
- An **open-source environment** for software development
- A software platform that is both **easy to use** for clinical researchers and **easy to extend** for programmers



- Slicer3 is a **multi-platform** software that is developed and maintained on:
  - Windows XP
  - Linux x86\_64
  - Linux x86
  - Mac OSX – Darwin x86-Intel
  - Mac OSX – Darwin Power PC



# Download Slicer 3.6

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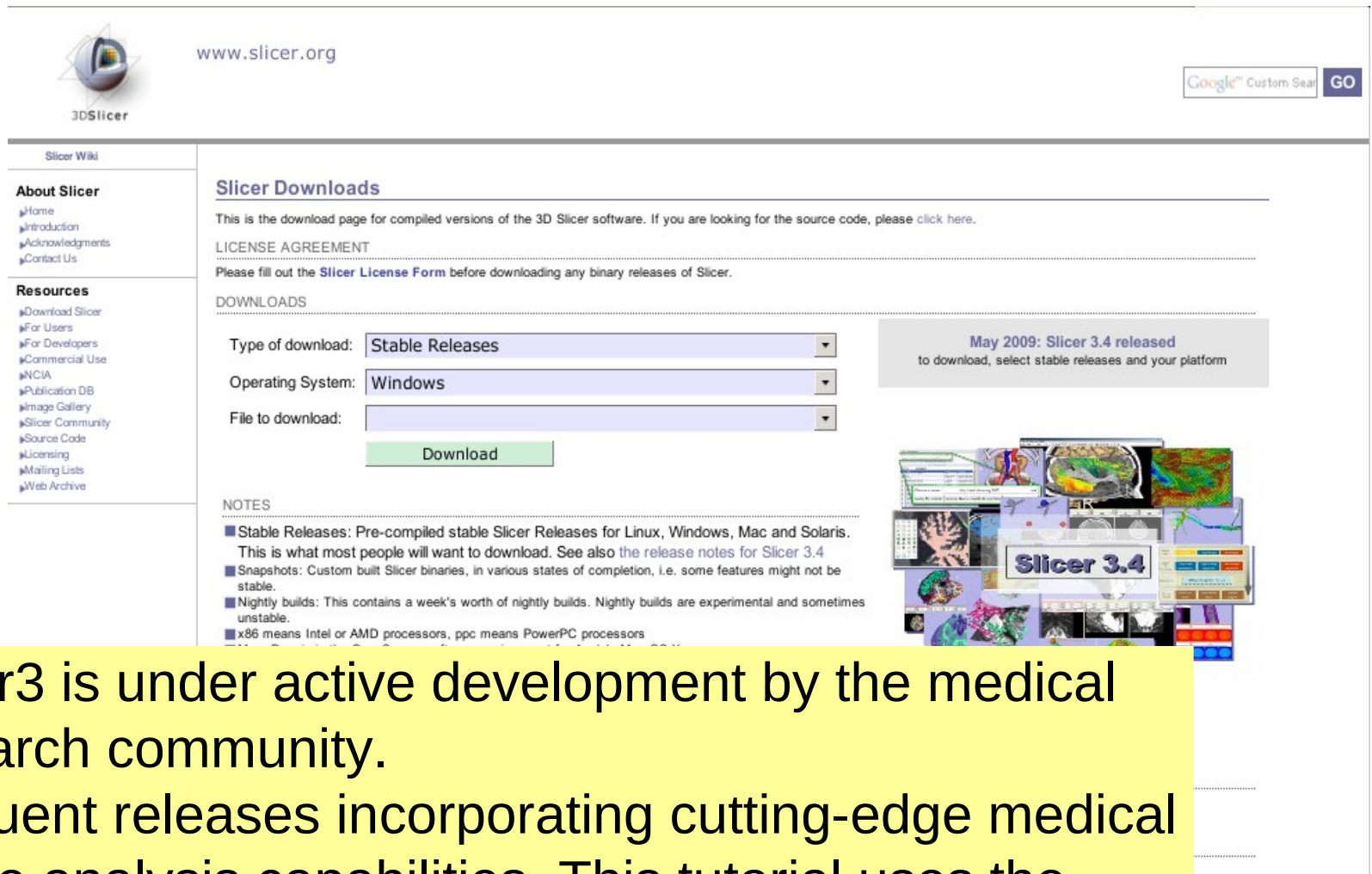
- Download and install the Slicer3.6 software from the Slicer web site

<http://www.slicer.org/pages/Special:SlicerDownloads>

## 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.

# Download Slicer3.6



The screenshot shows the 'Slicer Downloads' page on www.slicer.org. The page includes a navigation menu on the left with sections for 'About Slicer' and 'Resources'. The main content area features a 'Slicer Downloads' heading, a brief introduction, a 'LICENSE AGREEMENT' section, and a 'DOWNLOADS' section with three dropdown menus for 'Type of download' (set to 'Stable Releases'), 'Operating System' (set to 'Windows'), and 'File to download'. A green 'Download' button is positioned below these menus. To the right, a grey box announces 'May 2009: Slicer 3.4 released to download, select stable releases and your platform'. Below this, a collage of images shows various 3D medical models and software interfaces, with 'Slicer 3.4' prominently displayed in the center. A 'NOTES' section at the bottom provides details about 'Stable Releases', 'Snapshots', 'Nightly builds', and processor compatibility (x86 and ppc).

Slicer3 is under active development by the medical research community. Frequent releases incorporating cutting-edge medical image analysis capabilities. This tutorial uses the current stable Slicer3.6 release version.

# Download Slicer3.6



The screenshot shows the 3DSlicer website's download page. At the top left is the 3DSlicer logo and the URL www.slicer.org. A Google Custom Search bar is in the top right. A yellow callout box on the left contains the text "Select the type of download 'Stable Releases'" with a red arrow pointing to the "Type of download" dropdown menu in the "DOWNLOADS" section. The dropdown menu is currently set to "Stable Releases". Below it are dropdown menus for "Operating System" (set to "Windows") and "File to download". A green "Download" button is positioned below these menus. To the right of the download form is a grey box with the text "May 2009: Slicer 3.4 released to download, select stable releases and your platform". Below the download form is a "NOTES" section with a bulleted list of information about stable releases, snapshots, nightly builds, and hardware requirements. At the bottom right of the page is a collage of images related to Slicer 3.4, including medical imaging software interfaces and 3D models.

www.slicer.org

Google™ Custom Search GO

Select the type of download 'Stable Releases'

Download Slicer software. If you are looking for the source code, please [click here](#).

**Resources**

- Download Us
- Download Slicer
- For Users
- For Developers
- Commercial Use
- NCIA
- Publication DB
- Image Gallery
- Slicer Community
- Source Code
- Licensing
- Mailing Lists
- Web Archive

**LICENSE AGREEMENT**

Please fill out the **Slicer License Form** before downloading any binary releases of Slicer.

**DOWNLOADS**

Type of download: Stable Releases

Operating System: Windows

File to download:

Download

**May 2009: Slicer 3.4 released**  
to download, select stable releases and your platform

**NOTES**

- **Stable Releases:** Pre-compiled stable Slicer Releases for Linux, Windows, Mac and Solaris. This is what most people will want to download.
- **Snapshots:** Custom built Slicer binaries, in various states of completion, i.e. some features might not be stable.
- **Nightly builds:** This contains a week's worth of nightly builds. Nightly builds are experimental and sometimes unstable.
- **x86** means Intel or AMD processors, **ppc** means PowerPC processors
- **Mac:** Darwin is the OpenSource software environment for Apple's Mac OS X
- **Hardware/OS requirement:** Either Windows XP or more recent, Linux (x86 or x86\_64), Mac OS X (ppc or Intel), min 2 GB of RAM and a dedicated graphic accelerator with at least 128 MB of on-board graphic memory. Shared memory graphics will result in slow render speeds.
- **X11 for Mac:** On Mac OS X you will need to install X11 from the CD. As an alternative, we had good experience with `xquartz`.





# Download Slicer3.6



www.slicer.org

Google™ Custom Search **GO**

Select the Operating System appropriate for your computer.

- » Knowledge Base
- » Contact Us
- Resources**
- » Download Slicer
- » For Users
- » For Developers
- » Commercial Use
- » NCIA
- » Publication DB
- » Image Gallery
- » Slicer Community
- » Source Code
- » Licensing
- » Mailing Lists
- » Web Archive

## LICENSE AGREEMENT

Please fill out the [Slicer License Form](#) before downloading any binary releases of Slicer.

## DOWNLOADS

Type of download:

Operating System:

File to download:

May 2009: Slicer 3.4 released  
to download, select stable releases and your platform



## NOTES

- **Stable Releases:** Pre-compiled stable Slicer Releases for Linux, Windows, Mac and Solaris. This is what most people will want to download. See also the [release notes for Slicer 3.4](#)
- **Snapshots:** Custom built Slicer binaries, in various states of completion, i.e. some features might not be stable.
- **Nightly builds:** This contains a week's worth of nightly builds. Nightly builds are experimental and sometimes unstable.
- **x86** means Intel or AMD processors, **ppc** means PowerPC processors
- **Mac:** Darwin is the OpenSource software environment for Apple's Mac OS X
- **Hardware/OS requirement:** Either Windows XP or more recent, Linux (x86 or x86\_64), Mac OS X (ppc or Intel), min 2 GB of RAM and a dedicated graphic accelerator with at least 128 MB of on-board graphic memory. Shared memory graphics will result in slow render speeds.
- **X11 for Mac:** On Mac OS X you will need to install X11 from the CD. As an alternative, we had good experience with xquartz.

## DOCUMENTATION AND TRAINING

- Please visit the [documentation pages](#) for the 'live' reference manual for 3D Slicer.
- Instructions on how to use Slicer can be found on the [training pages](#).

## OTHER RESOURCES

- [Mantis Tracker:](#) Report bugs and make feature requests here



# Download Slicer3.6

Select the corresponding latest Slicer3.6 release and click on Download.

www.slicer.org

Google Custom Search GO

Type of download: Stable Releases

Operating System: Windows

File to download:

- Slicer3-3.6-RC3-2010-06-04-win32.exe
- Slicer3-3.6-RC2-2010-05-25-win32.exe
- Slicer3-3.6-RC1-2010-05-09-win32.exe
- Slicer3-3.5-alpha-2010-02-15-win32.exe
- Slicer3-3.4.3-2010-04-15-win32.exe
- Slicer3-3.4.2-2010-01-06-win32.exe
- Slicer3-3.4.1-2009-10-15-win32.exe
- Slicer3-3.4-2009-05-21-win32.exe
- Slicer3-3.2.2008-08-08-win32.exe
- Slicer3-3.0.2008-02-13-win32.exe
- Slicer3-3.0.2008-01-17-win32.exe
- Slicer2.6-opt-win32-x86-2006-12-08.zip
- Slicer2.6-opt-win32-x86-2006-12-07.zip
- Slicer2.6-opt-win32-x86-2006-05-19.zip
- Slicer2.5.1-opt-win32-x86-2005-11-23.zip
- Slicer2.5-opt-win32-x86-2005-05-23.zip
- Slicer2.4-dev-win32-x86-2005-02-01.zip

NOTES

- Stable Releases: This is what most people use. It is the most stable.
- Snapshots: Custom builds of the software.
- Nightly builds: This is the most up-to-date version, but it is unstable.
- x86 means Intel or AMD.
- Mac: Darwin is the operating system.
- Hardware/OS requirements: Intel (or AMD), min 2 GB of RAM, 1 GB of free disk space. Shared memory is not supported.
- X11 for Mac: On Mac OS X, you need to have X11 installed. See the experience with X11.

DOCUMENTATION AND

- Please visit the documentation pages for the software reference manual for 3D Slicer.
- Instructions on how to use Slicer can be found on the training pages.

OTHER RESOURCES

- Mantis Tracker: Report bugs and make feature requests here

May 2009: Slicer 3.4 released to download, select stable releases and your platform

Slicer 3.4

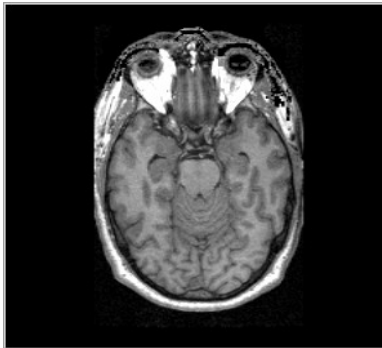




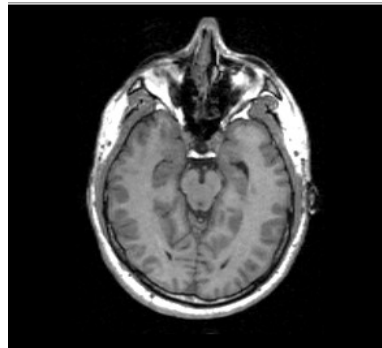
# Download the training dataset

---

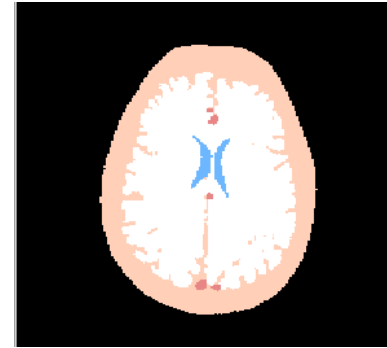
- This course is built upon three datasets of a single healthy subject brain:



MR DICOM  
GRASS



MR Nrrd  
SPGR

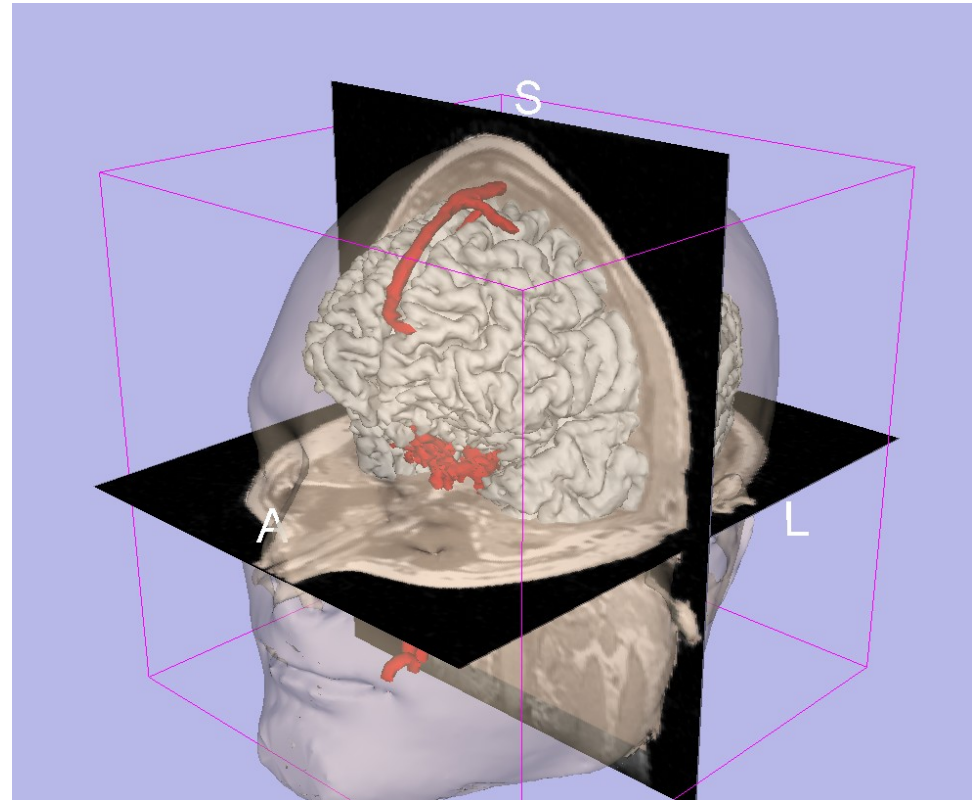


Pre-computed  
Label Map

- Download and unzip the training dataset  
Slicer3VisualizationDataset.zip  
<http://www.slicer.org/slicerWiki/index.php/Slicer3.6:Training>

# Learning objective

Following this tutorial, you'll be able to **load and visualize volumes** within Slicer3, and to **interact in 3D** with structural images and models.



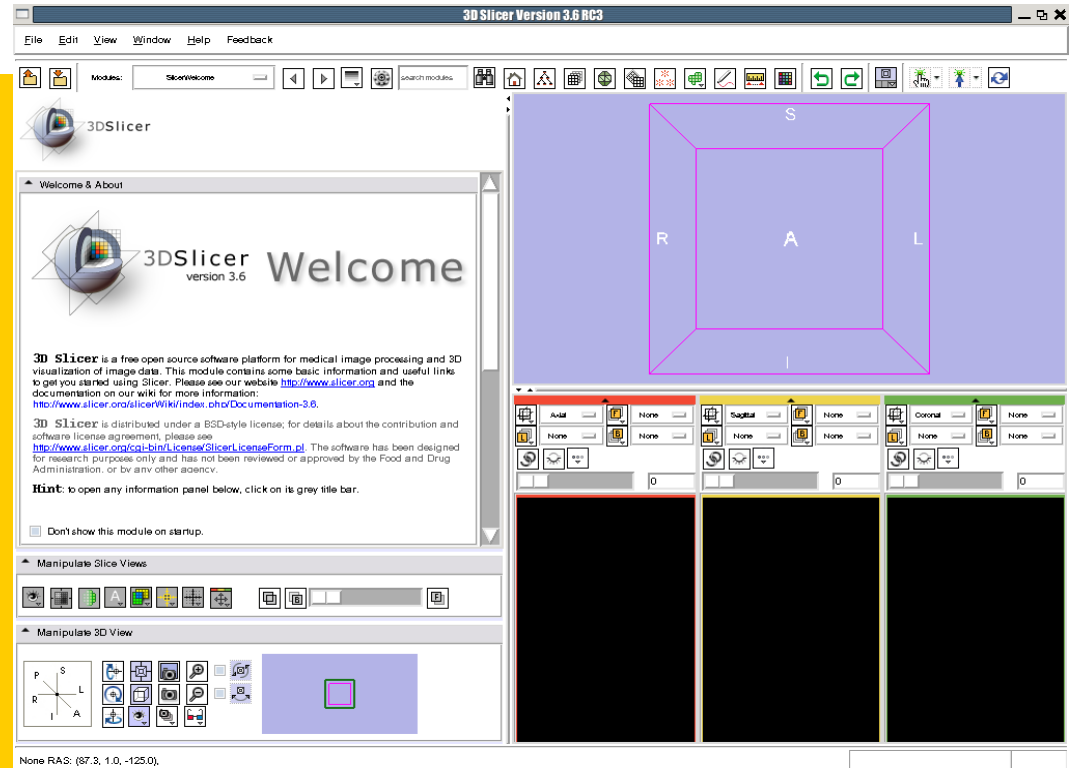
Linux/Mac users  
Launch the Slicer3  
executable located in  
the Slicer3.6 directory

Windows users

Select

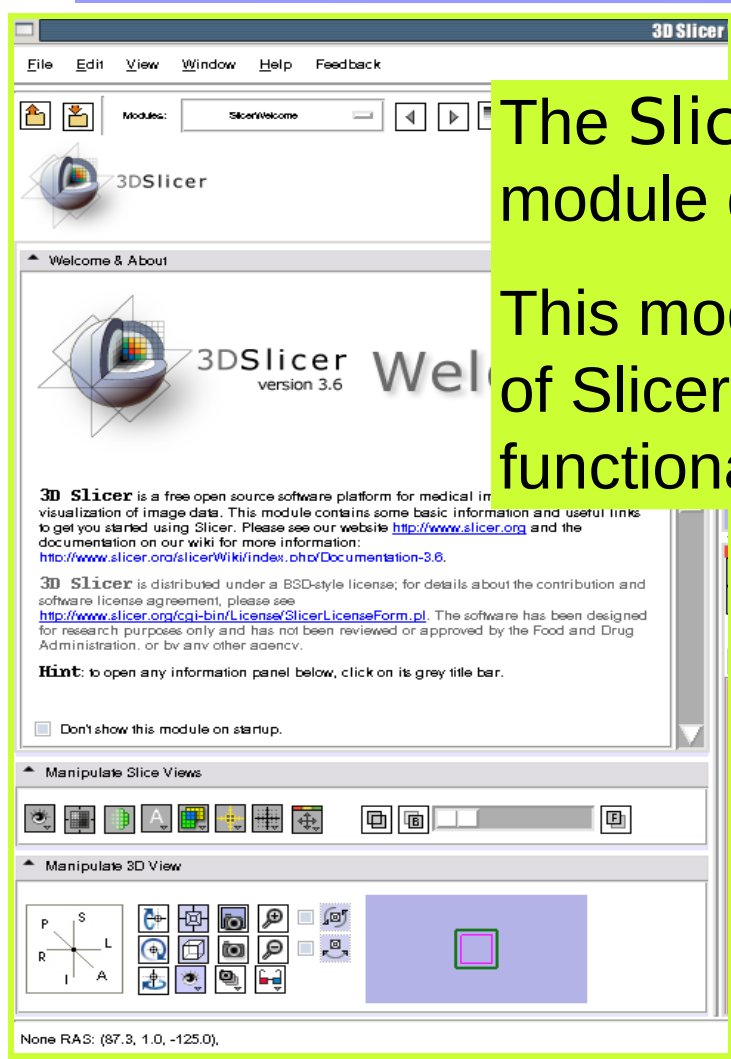
Start → All Programs

→ Slicer3-3.6-RC3-2010-05-21 → Slicer3





# Slicer Welcome



The SlicerWelcome module is the module displayed by default.

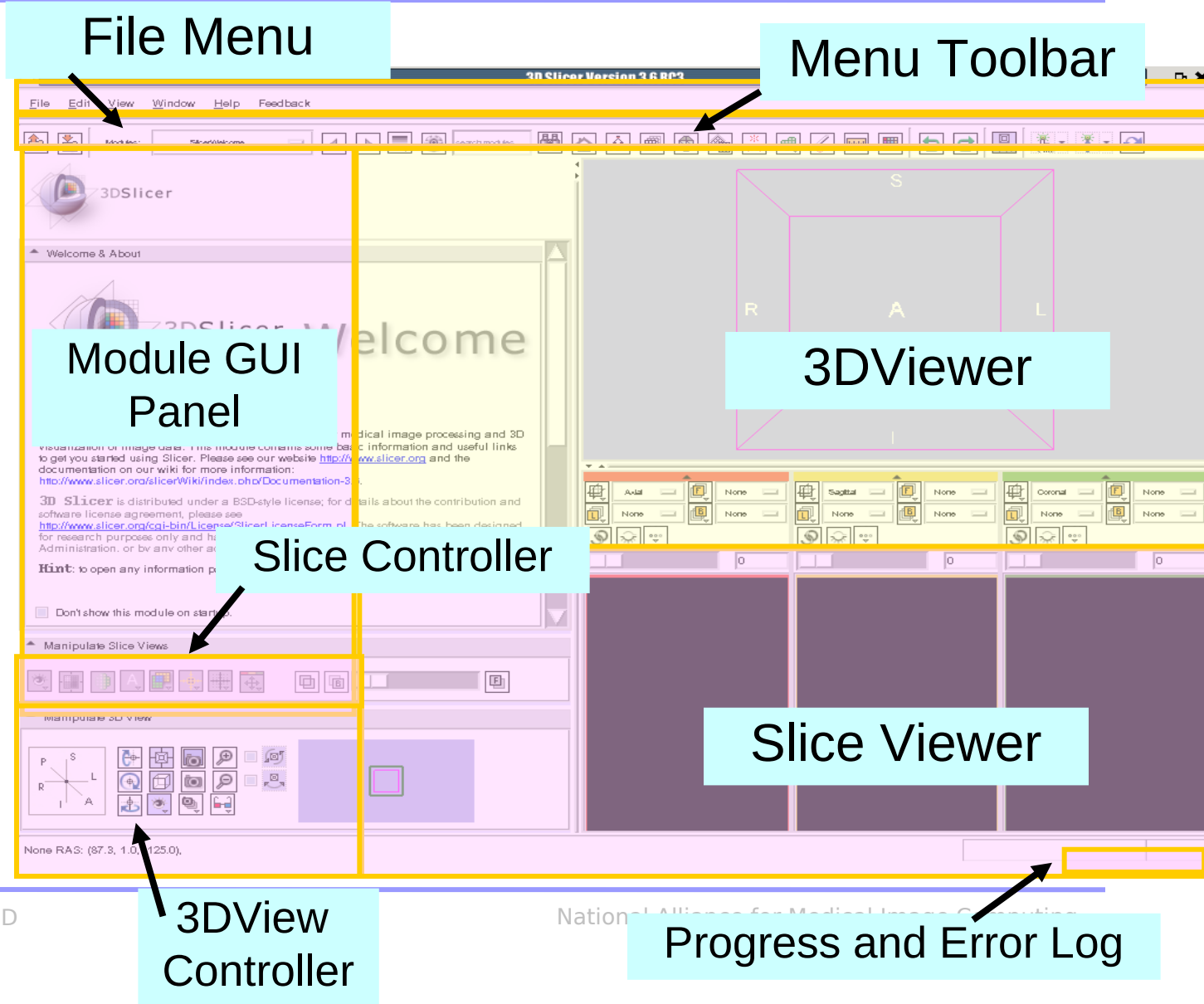
This module gives an overview of the GUI of Slicer3, and data loading & saving functionalities.



# Slicer3 GUI

The Graphical User Interface (GUI) of Slicer3.6 integrates 8 main components:

- the File Menu
- the Menu Toolbar
- the Module GUI Panel
- the 3D Viewer
- the Slice Viewer
- the Slice Controller
- the 3D View Controller



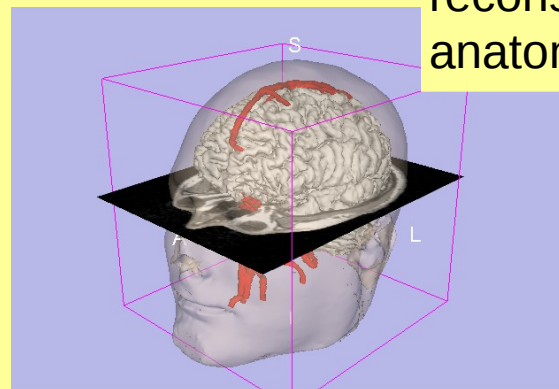


# Overview

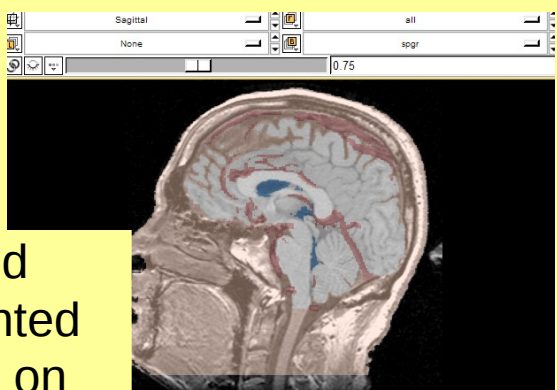
Part 1. Loading and visualizing multiple volumes simultaneously



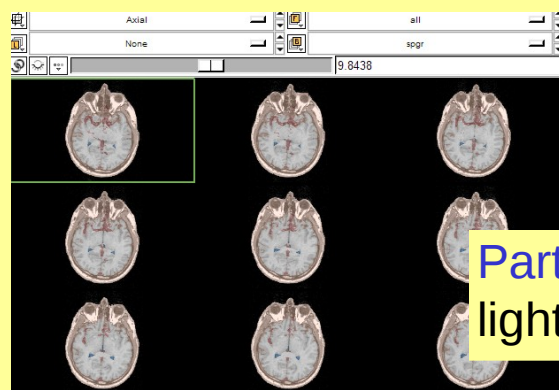
Part 3. Visualizing 3D reconstructions of anatomical surfaces



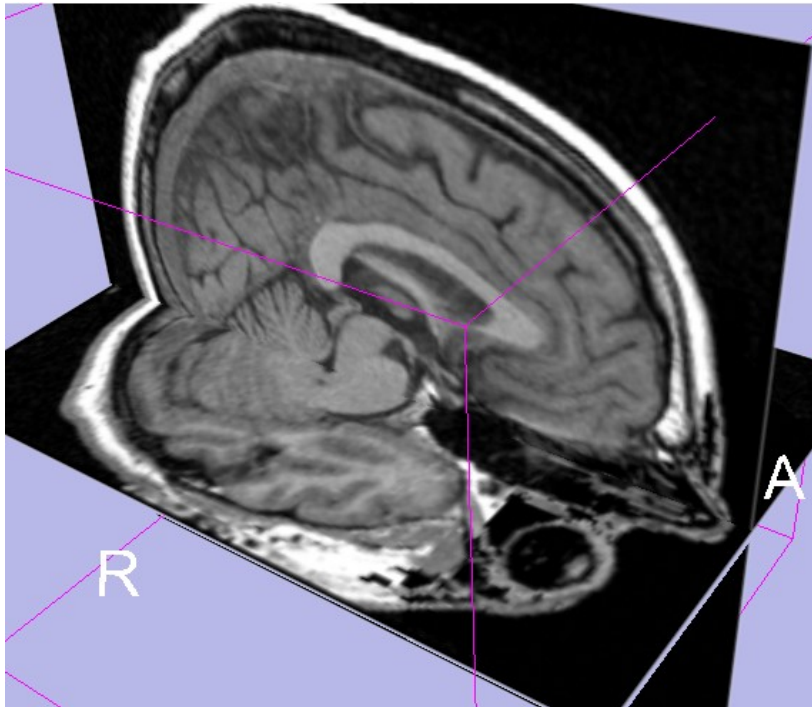
Part 2. Loading and visualizing segmented structures overlaid on grayscale images



Part 4. The lightbox viewer

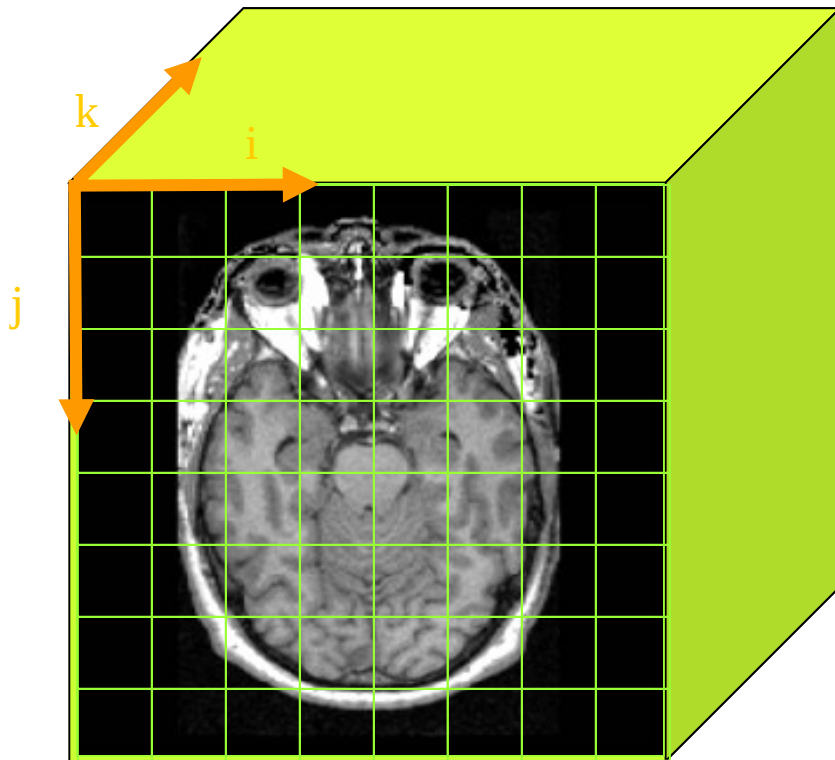


Part 5. Saving data



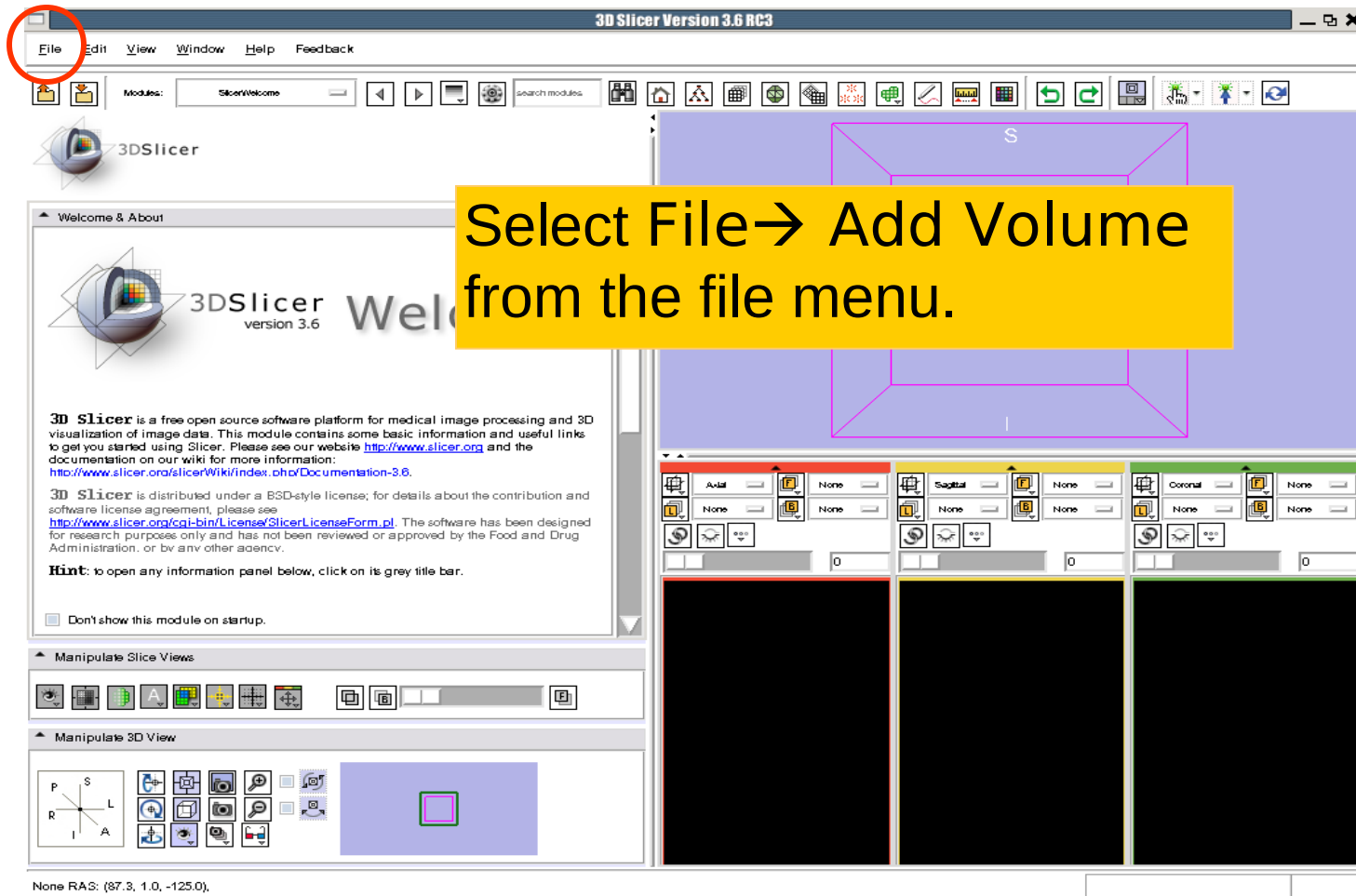
## Part 1: Loading and visualizing multiple volumes simultaneously

# Data Representation

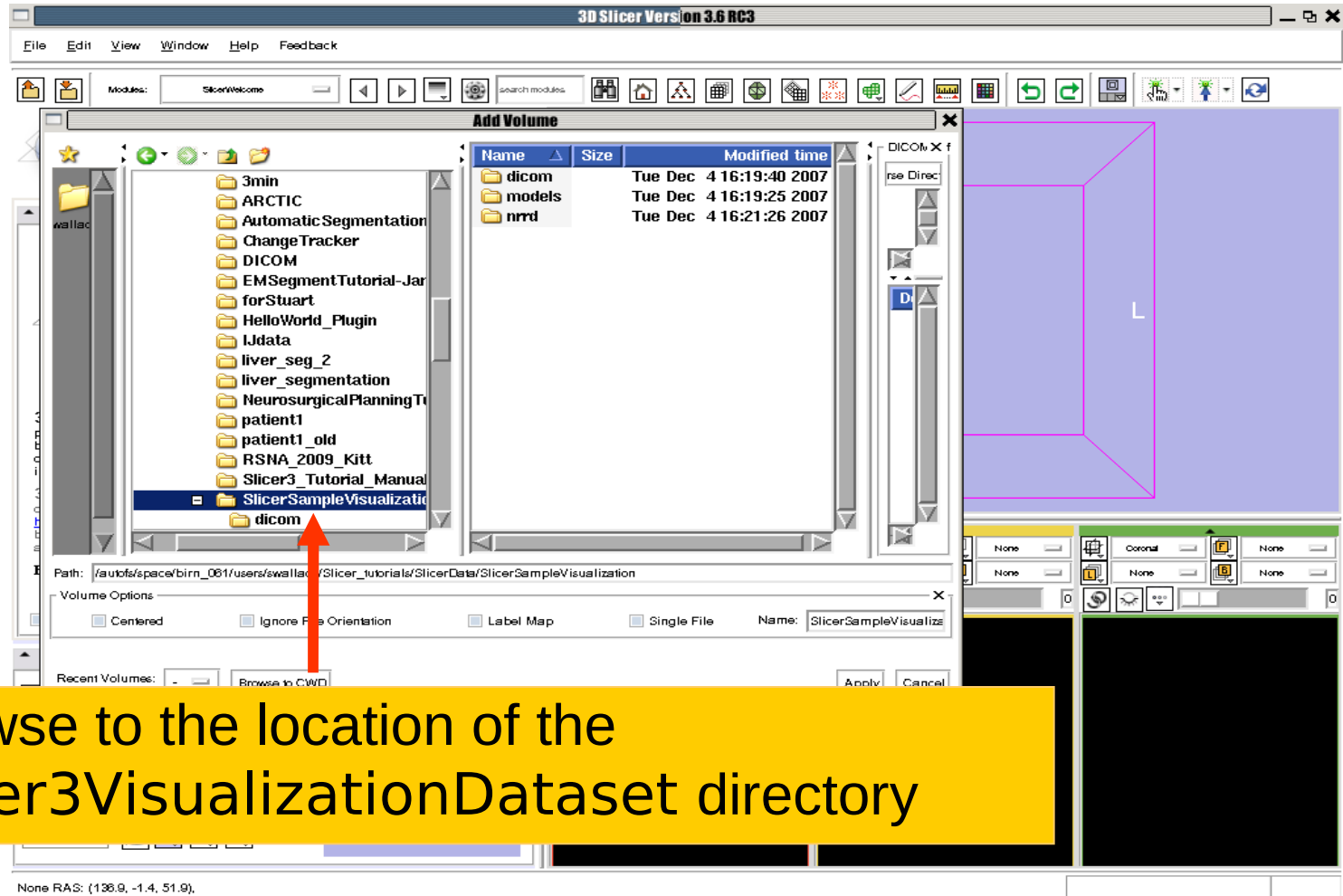


- The result of a volumetric acquisition is a **3D volume of data** related to the patient.
- The 3D raster dataset is sampled on a discrete grid with elements called **voxels** which contain the **signal intensity**.

# Loading Volumes



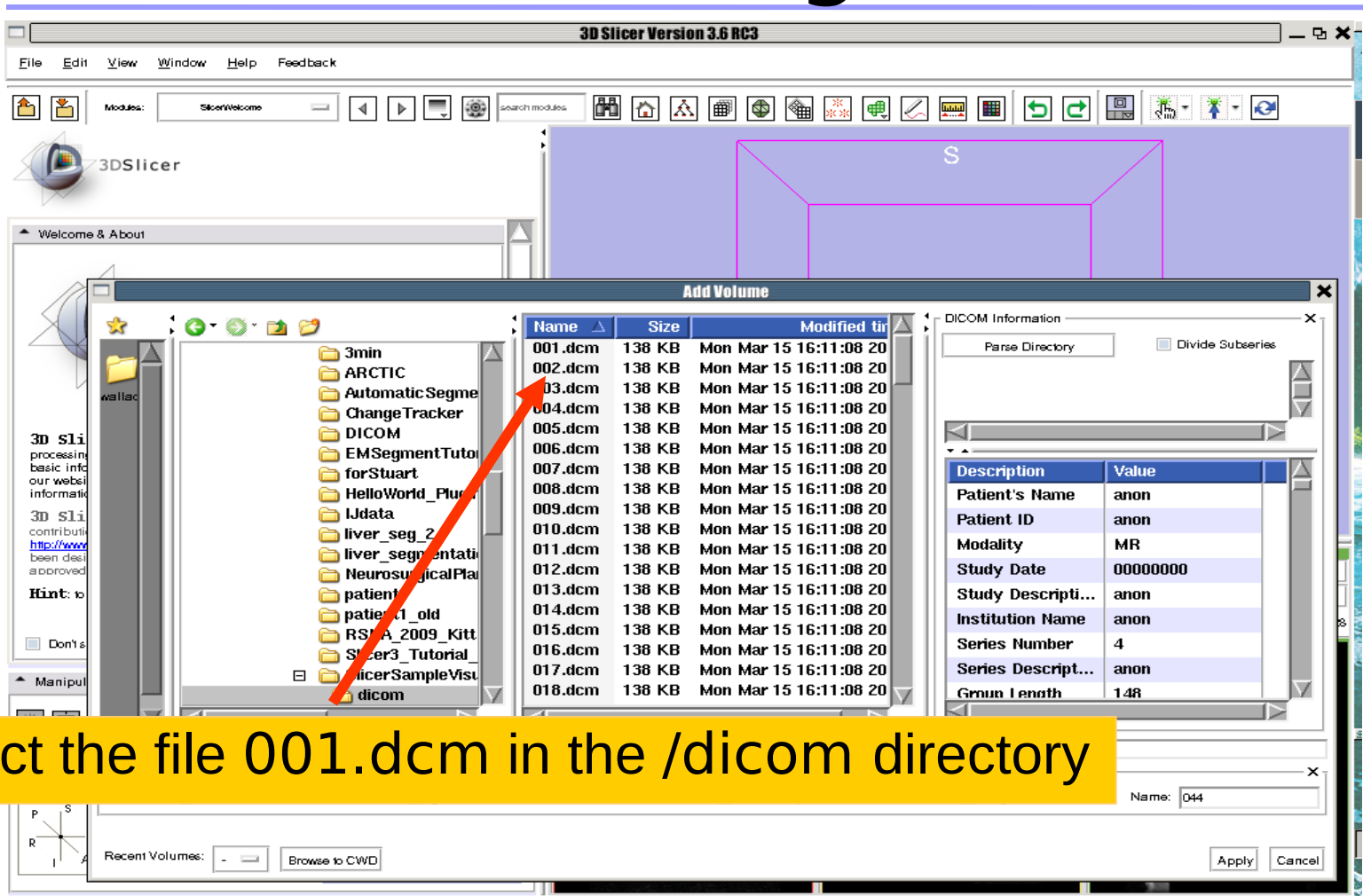
# Loading Volumes



Browse to the location of the Slicer3VisualizationDataset directory



# Loading Volumes



**Add Volume**

| Name    | Size   | Modified time          |
|---------|--------|------------------------|
| 001.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 002.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 003.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 004.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 005.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 006.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 007.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 008.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 009.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 010.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 011.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 012.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 013.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 014.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 015.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 016.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 017.dcm | 138 KB | Mon Mar 15 16:11:08 20 |
| 018.dcm | 138 KB | Mon Mar 15 16:11:08 20 |

**DICOM Information**

Parse Directory  Divide Subseries

| Description        | Value    |
|--------------------|----------|
| Patient's Name     | anon     |
| Patient ID         | anon     |
| Modality           | MR       |
| Study Date         | 00000000 |
| Study Descripti... | anon     |
| Institution Name   | anon     |
| Series Number      | 4        |
| Series Descript... | anon     |
| Group Length       | 1.48     |

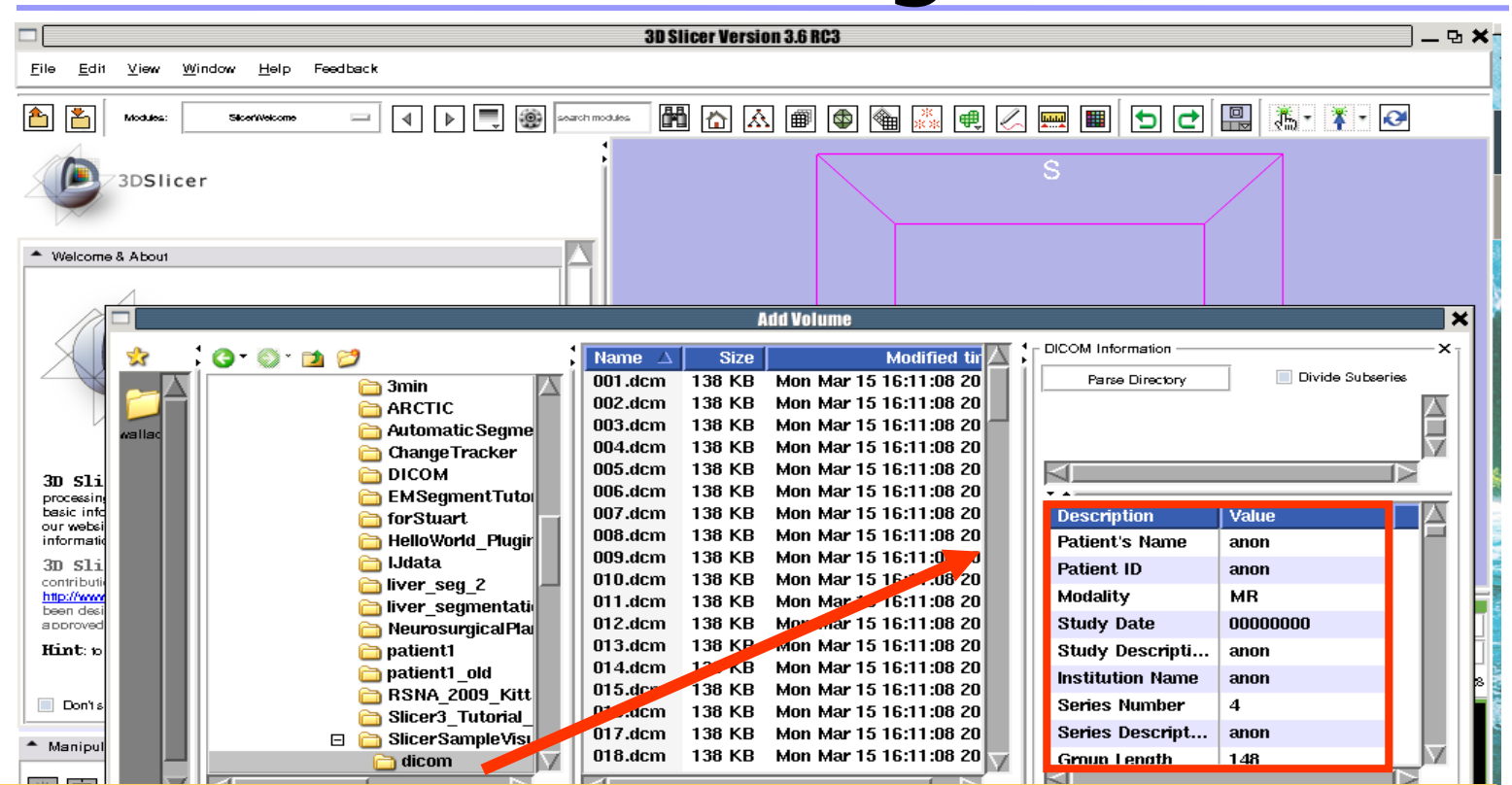
Name: 044

Apply Cancel

Select the file 001.dcm in the /dicom directory

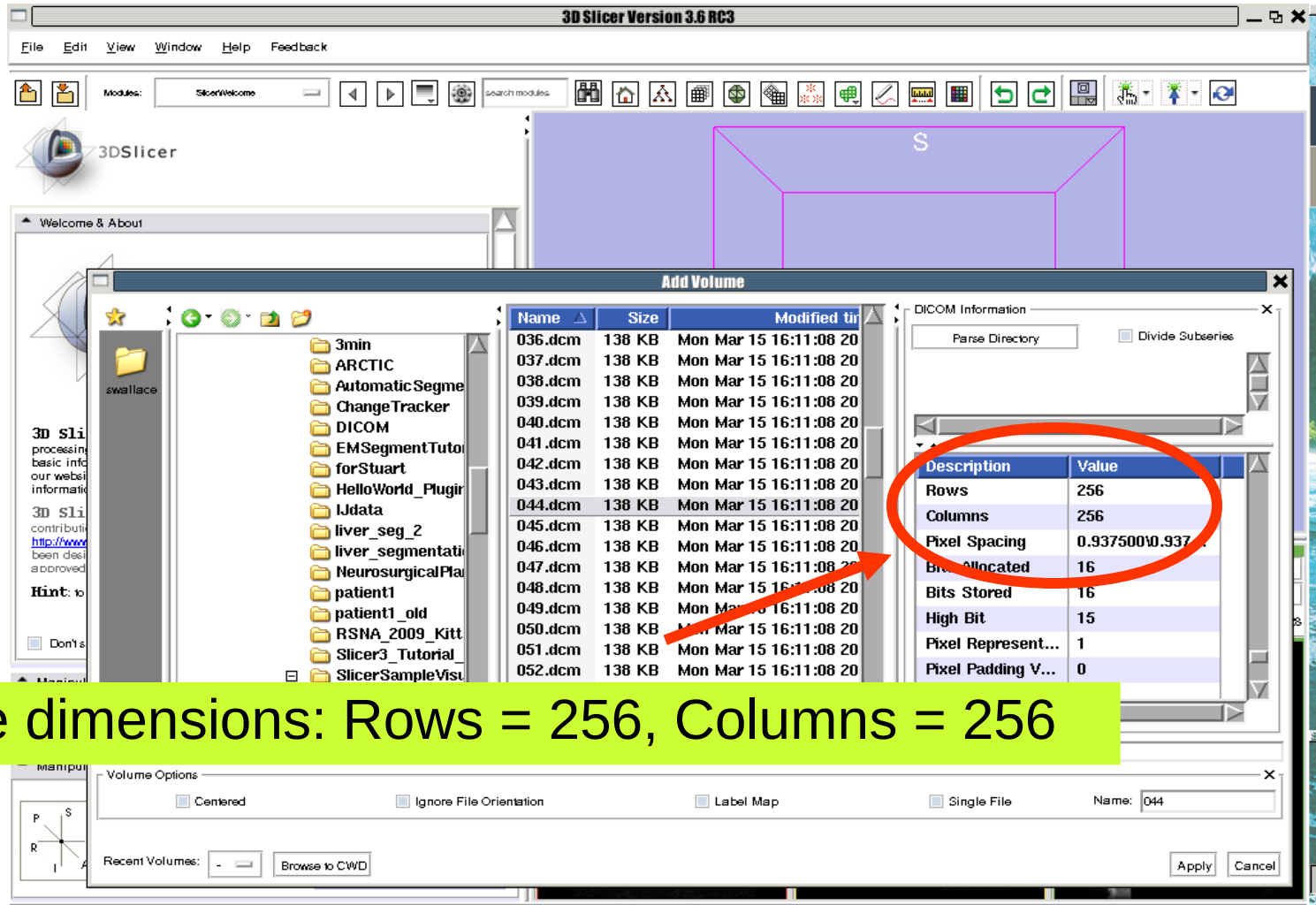
001 RAS: (109.0, 5.4, 43.6), Bg IJK: (128, 83, 145), Bg: Out of Frame.

# Loading Volumes



Slicer displays the Dicom header information of the images. Browse through the Dicom information panel to display the dimensions of the images.

# Loading Volumes



3D Slicer Version 3.6 RC3

File Edit View Window Help Feedback

Modules: SlicerWelcome

Welcome & About

**Add Volume**

| Name    | Size   | Modified               | Time |
|---------|--------|------------------------|------|
| 036.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 037.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 038.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 039.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 040.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 041.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 042.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 043.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 044.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 045.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 046.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 047.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 048.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 049.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 050.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 051.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |
| 052.dcm | 138 KB | Mon Mar 15 16:11:08 20 |      |

DICOM Information

Parse Directory  Divide Subseries

| Description        | Value             |
|--------------------|-------------------|
| Rows               | 256               |
| Columns            | 256               |
| Pixel Spacing      | 0.937500 0.937500 |
| Bits Allocated     | 16                |
| Bits Stored        | 16                |
| High Bit           | 15                |
| Pixel Represent... | 1                 |
| Pixel Padding V... | 0                 |

Volume Options

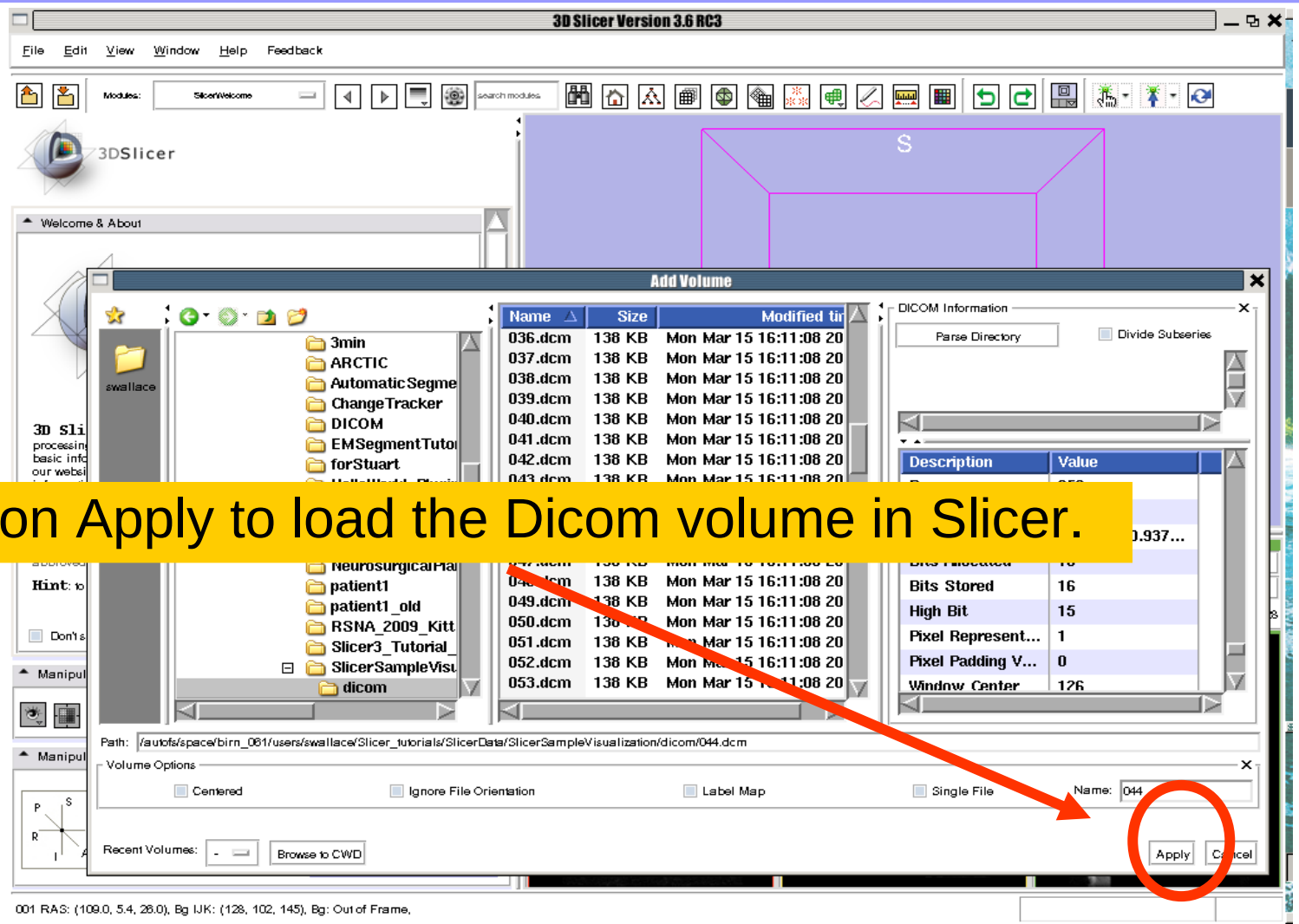
Centered  Ignore File Orientation  Label Map  Single File

Name: 044

Recent Volumes:

Image dimensions: Rows = 256, Columns = 256

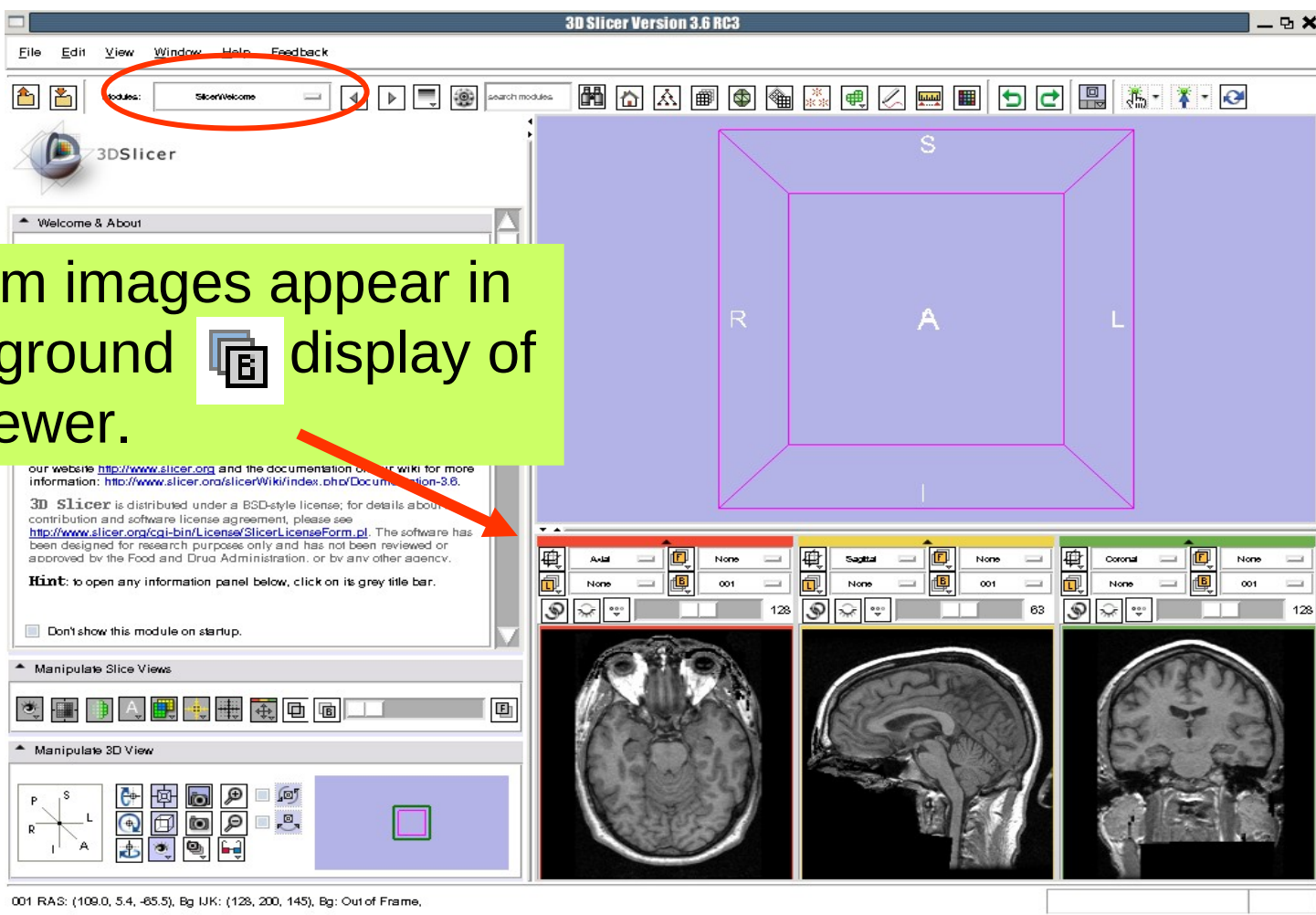
# Loading Volumes



Click on Apply to load the Dicom volume in Slicer.

# Loading Volumes

The Dicom images appear in the Background  display of the 2DViewer.







# Loading Volumes

3D Slicer Version 3.4

File Edit View Window Help Feedback

Modules: SlicerWelcome search modules

Welcome & About

3D Slicer version 3.4 Welcome

3D Slicer is a free open source software platform for medical image processing data. This module contains some basic information and useful links to get you started. Our website <http://www.slicer.org> and the documentation on our wiki for more information <http://www.slicer.org/slicerWiki/index.php/Documentation-3.4>.

3D Slicer is distributed under a BSD-style license; for details about the contribution agreement, please see <http://www.slicer.org/cgi-bin/License/SlicerLicenseForm> designed for research purposes only and has not been reviewed or approved by the Administration, or by any other agency.

Hint: to open any information panel below, click on its grey title bar.

Don't show this module on startup.

Overview

Basic & Extended Modules

Loading Scenes & Data

Saving Scenes & Data

Manipulate Slice Views

Manipulate 3D View

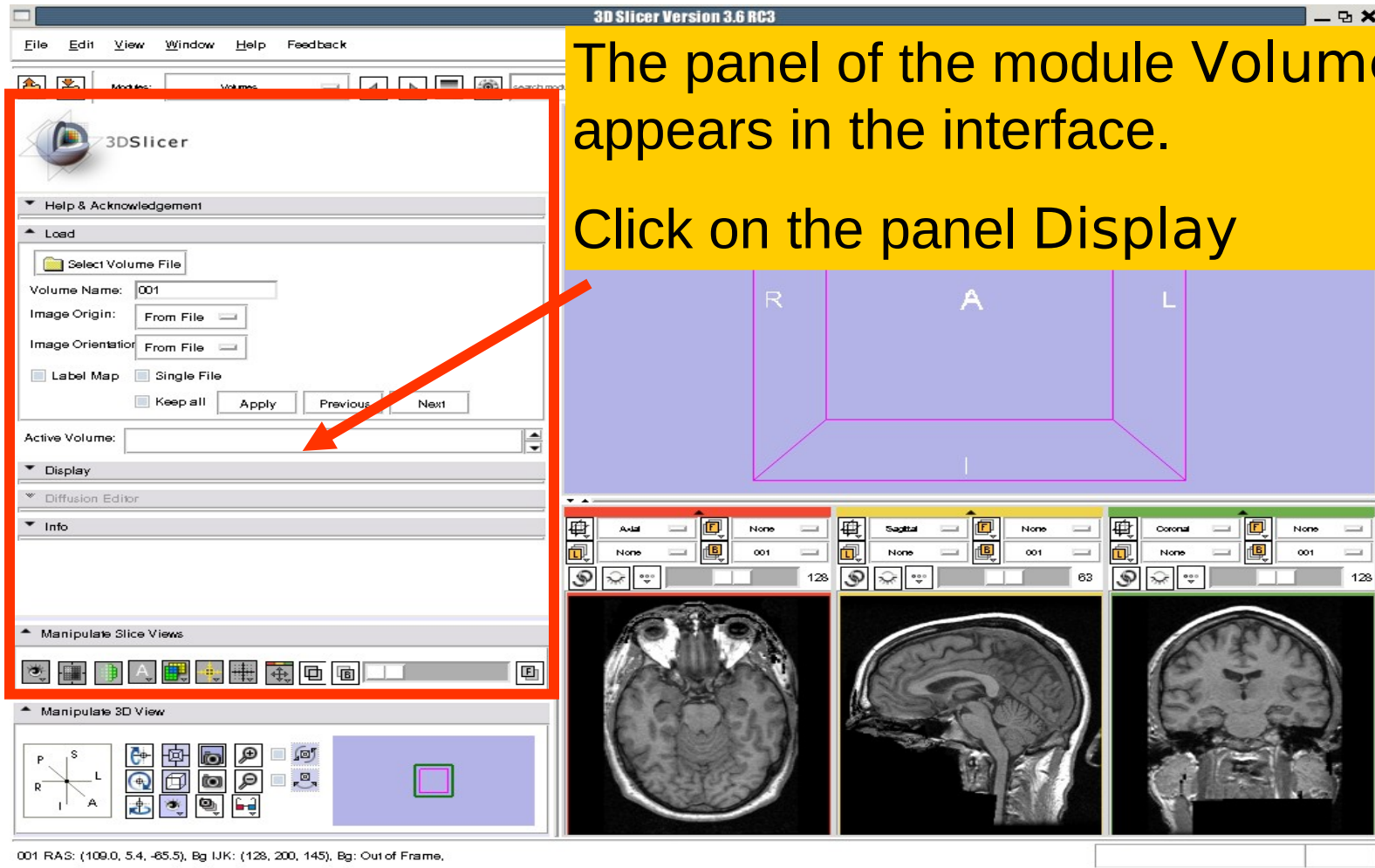
Left click on the menu Modules and select All Modules to display the list of 95 modules available for image analysis and 3D visualization.

Select the module Volumes

Sp: 0.938mm

Lb: None R: 122.2  
Fg: None A: 7.8  
Bg: Out of Frame S: -117.3

# Loading Volumes



The screenshot shows the 3D Slicer interface with the Volumes module selected. The 'Load' section is highlighted with a red box, and a red arrow points to the 'Active Volume' dropdown menu. The 'Display' section is also visible. The 3D view shows a brain volume with a purple bounding box and labels R, A, L, and I. The bottom panel shows three slice views: Axial, Sagittal, and Coronal.

3D Slicer Version 3.6 RC3

File Edit View Window Help Feedback

3DSlicer

Help & Acknowledgement

Load

Select Volume File

Volume Name: 001

Image Origin: From File

Image Orientation: From File

Label Map  Single File

Keep all Apply Previous Next

Active Volume:

Display

Diffusion Editor

Info

Manipulate Slice Views

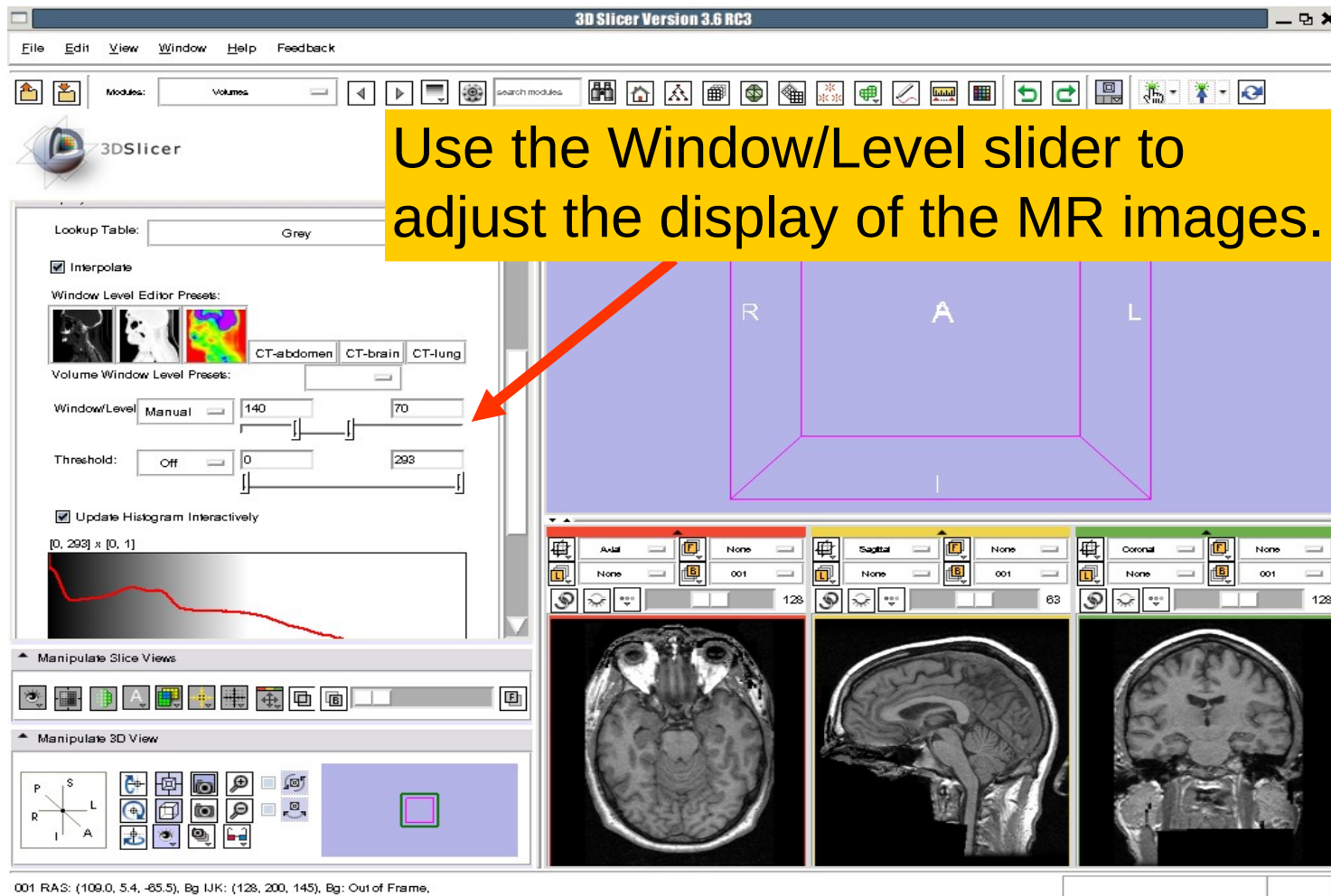
Manipulate 3D View

001 RAS: (109.0, 5.4, -65.5), Bg IJK: (128, 200, 145), Bg: Out of Frame.

The panel of the module Volumes appears in the interface.

Click on the panel Display

# Loading Volumes



3D Slicer Version 3.6 RC3

File Edit View Window Help Feedback

Modules: Volumes

Use the Window/Level slider to adjust the display of the MR images.

Lookup Table: Grey

Interpolate

Window Level Editor Presets:

Volume Window Level Presets:

Window/Level: Manual 140 70

Threshold: Off 0 293

Update Histogram Interactively

[0, 293] x [0, 1]

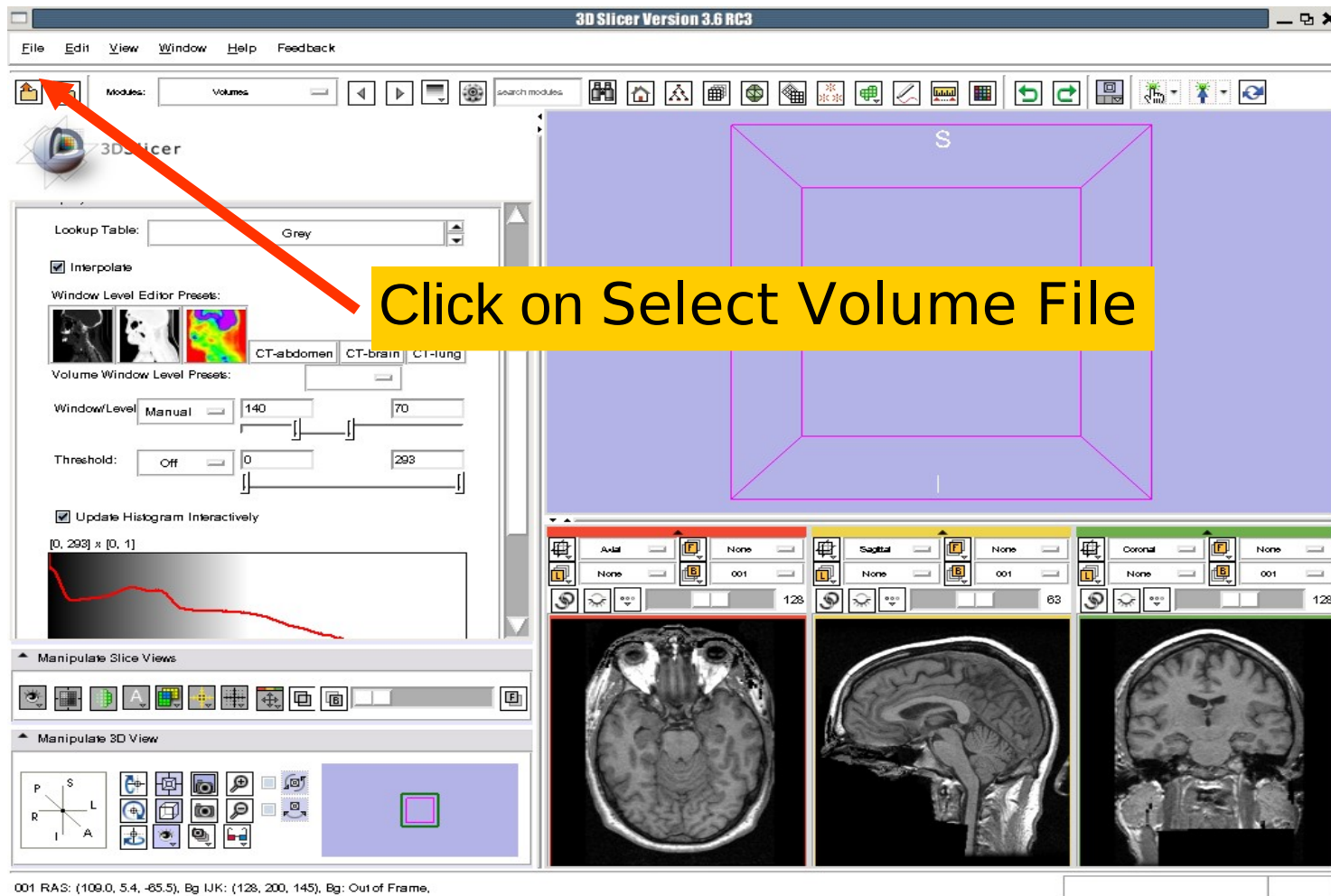
Manipulate Slice Views

Manipulate 3D View

001 RAS: (109.0, 5.4, -85.5), Bg IJK: (128, 200, 145), Bg: Out of Frame.

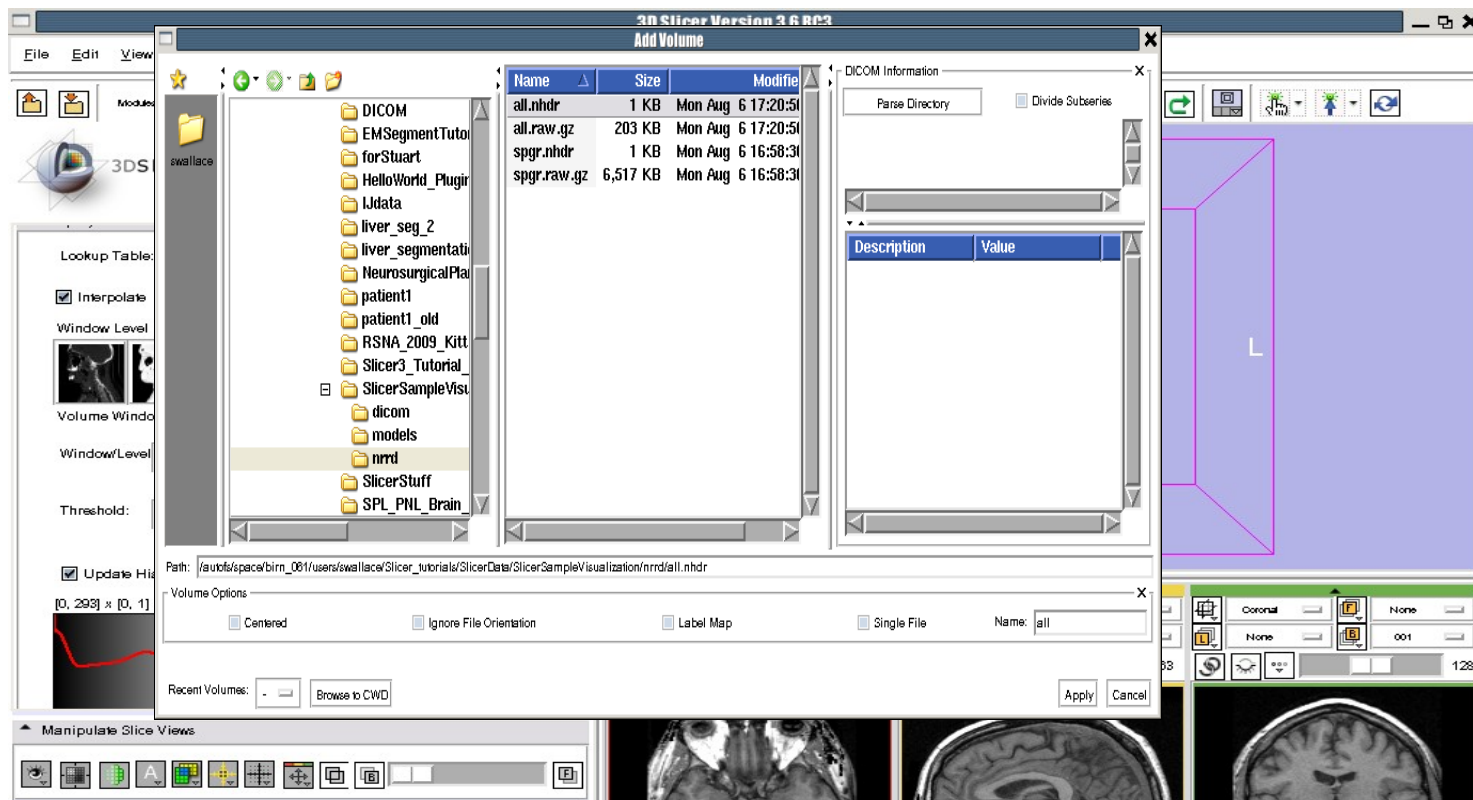
The screenshot displays the 3D Slicer interface. A yellow callout box with a red arrow points to the 'Window/Level' slider in the 'Volume Window Level Presets' section, which is set to 140 and 70. The interface shows three MR image slices: Axial, Sagittal, and Coronal. The status bar at the bottom indicates the current slice coordinates: 001 RAS: (109.0, 5.4, -85.5), Bg IJK: (128, 200, 145), Bg: Out of Frame.

# Loading Volumes



The screenshot displays the 3D Slicer software interface. The title bar reads "3D Slicer Version 3.6 RC3". The menu bar includes "File", "Edit", "View", "Window", "Help", and "Feedback". The toolbar contains various icons for file operations, including a folder icon with a red arrow pointing to it. A yellow callout box with the text "Click on Select Volume File" is positioned over the folder icon. The main 3D view area is currently empty, showing a purple background with a white wireframe box. The left sidebar contains the "Volumes" module, which includes a "Lookup Table" set to "Grey", an "Interpolate" checkbox, and "Window Level Editor Presets" for "CT-abdomen", "CT-brain", and "CT-lung". Below these are "Volume Window Level Presets" with "Window/Level" set to "Manual" (140, 70) and "Threshold" set to "Off" (0, 293). The "Update Histogram Interactively" checkbox is checked, and a histogram is visible. The bottom of the interface shows three slice views: Axial, Sagittal, and Coronal, each with its own toolbar and a corresponding 2D image of a brain scan. The status bar at the bottom indicates "001 RAS: (109.0, 5.4, -85.5), Bg IJK: (128, 200, 145), Bg: Out of Frame."

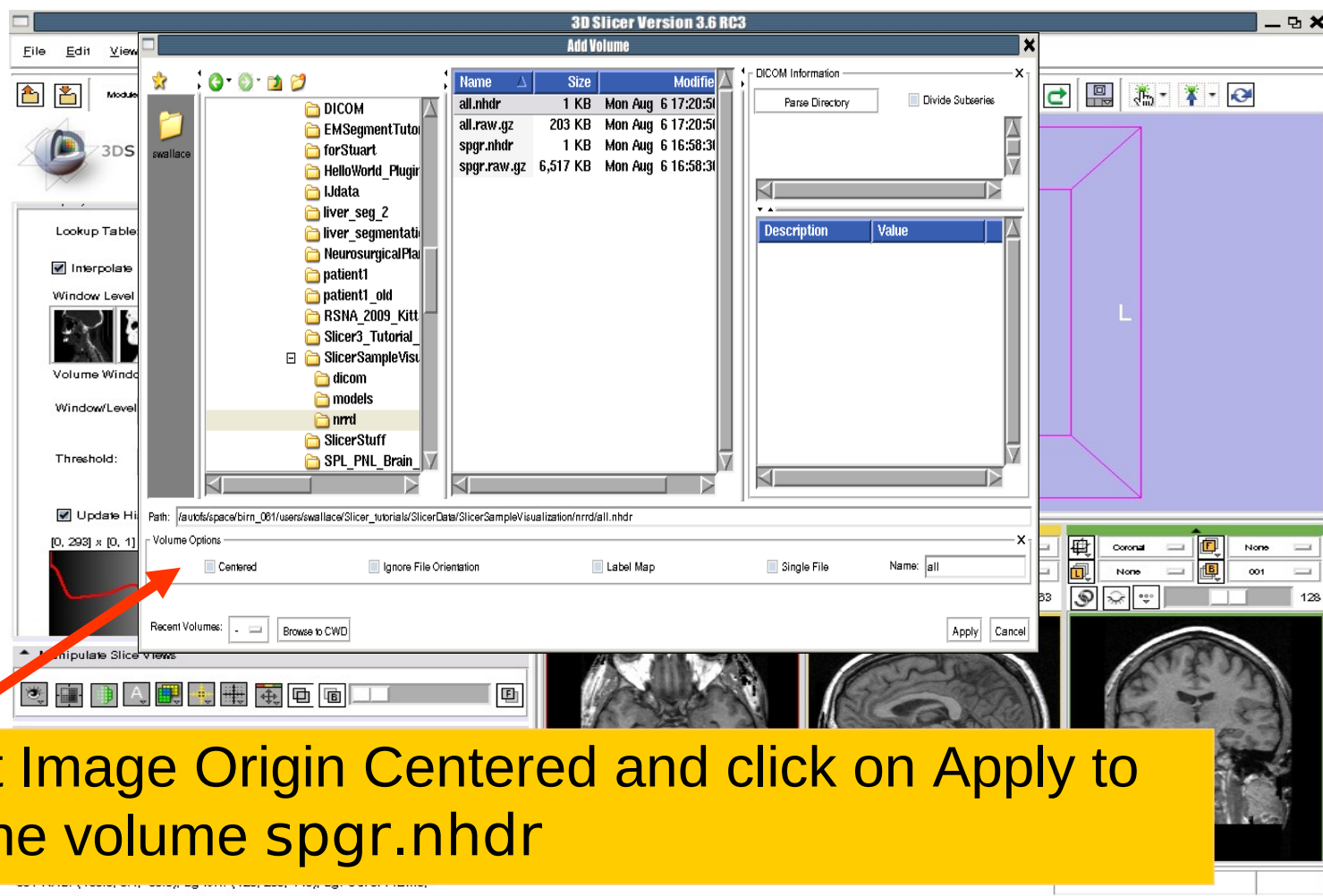
# Loading Volumes



Browse to find the header file of the spgr volume spgr.nhdr located in the directory Slicer3VisualizationDataset/nrrd and click on Open.

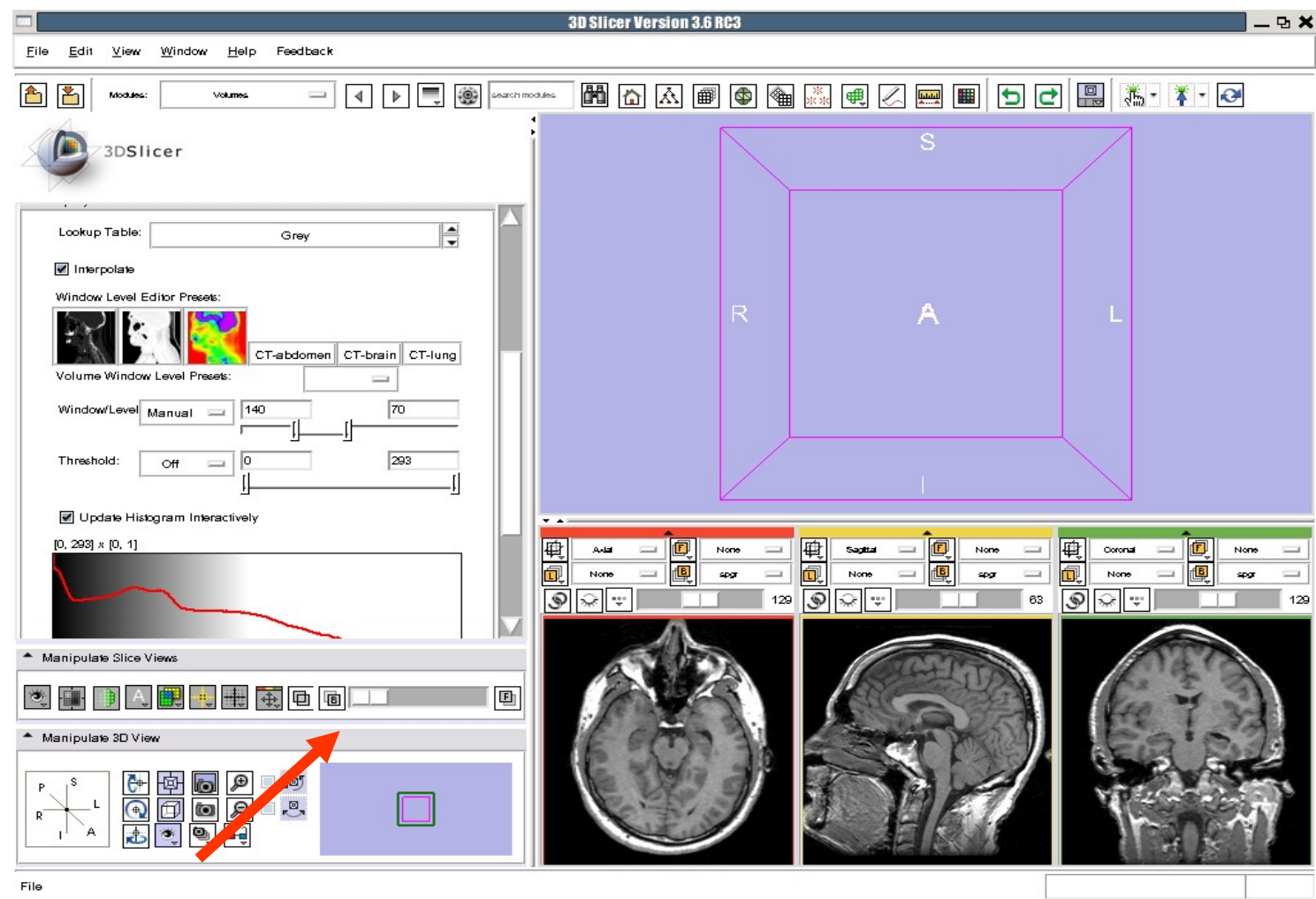


# Loading Volumes



Select Image Origin Centered and click on Apply to load the volume spgr.nhdr

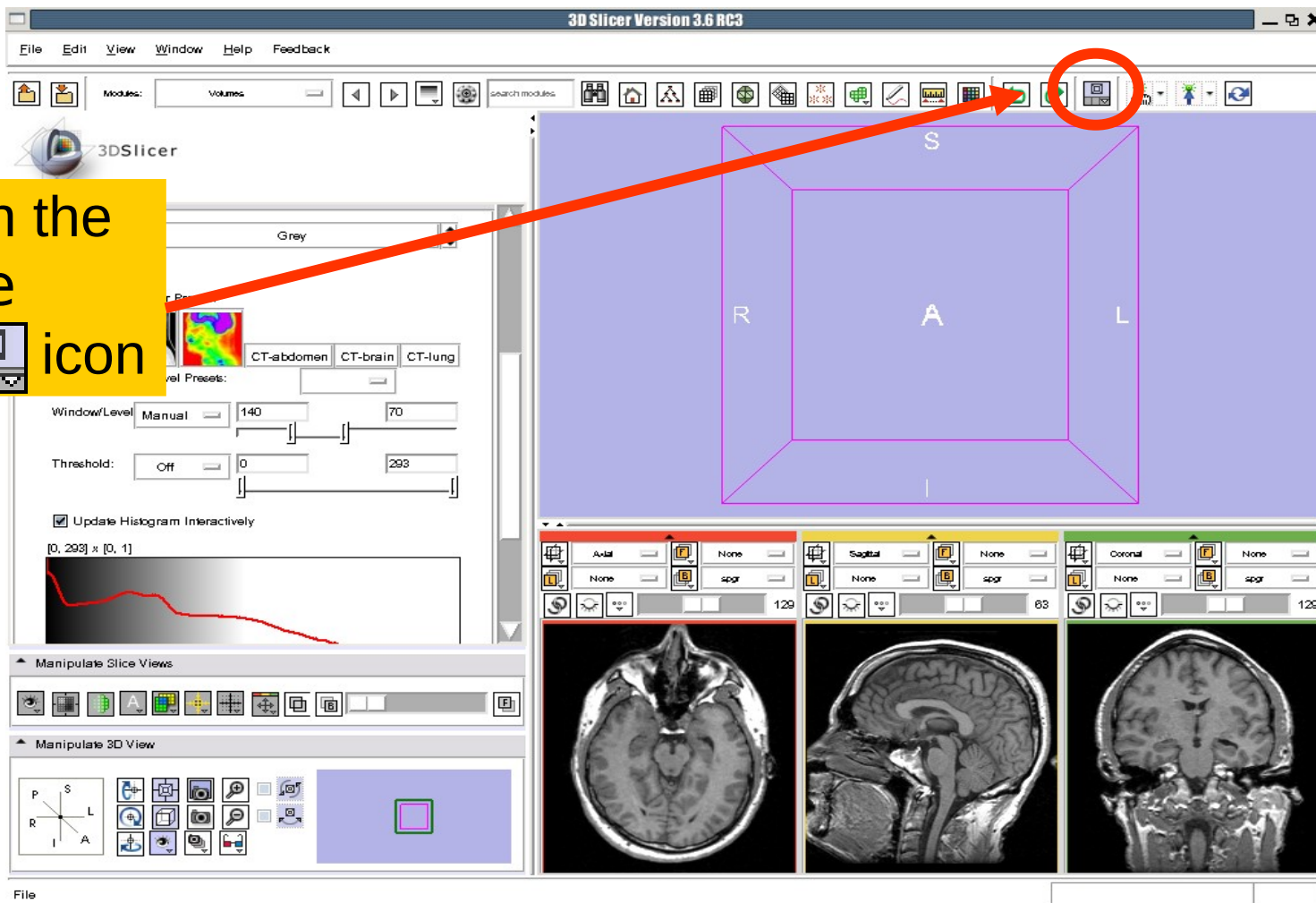
# Loading Volumes



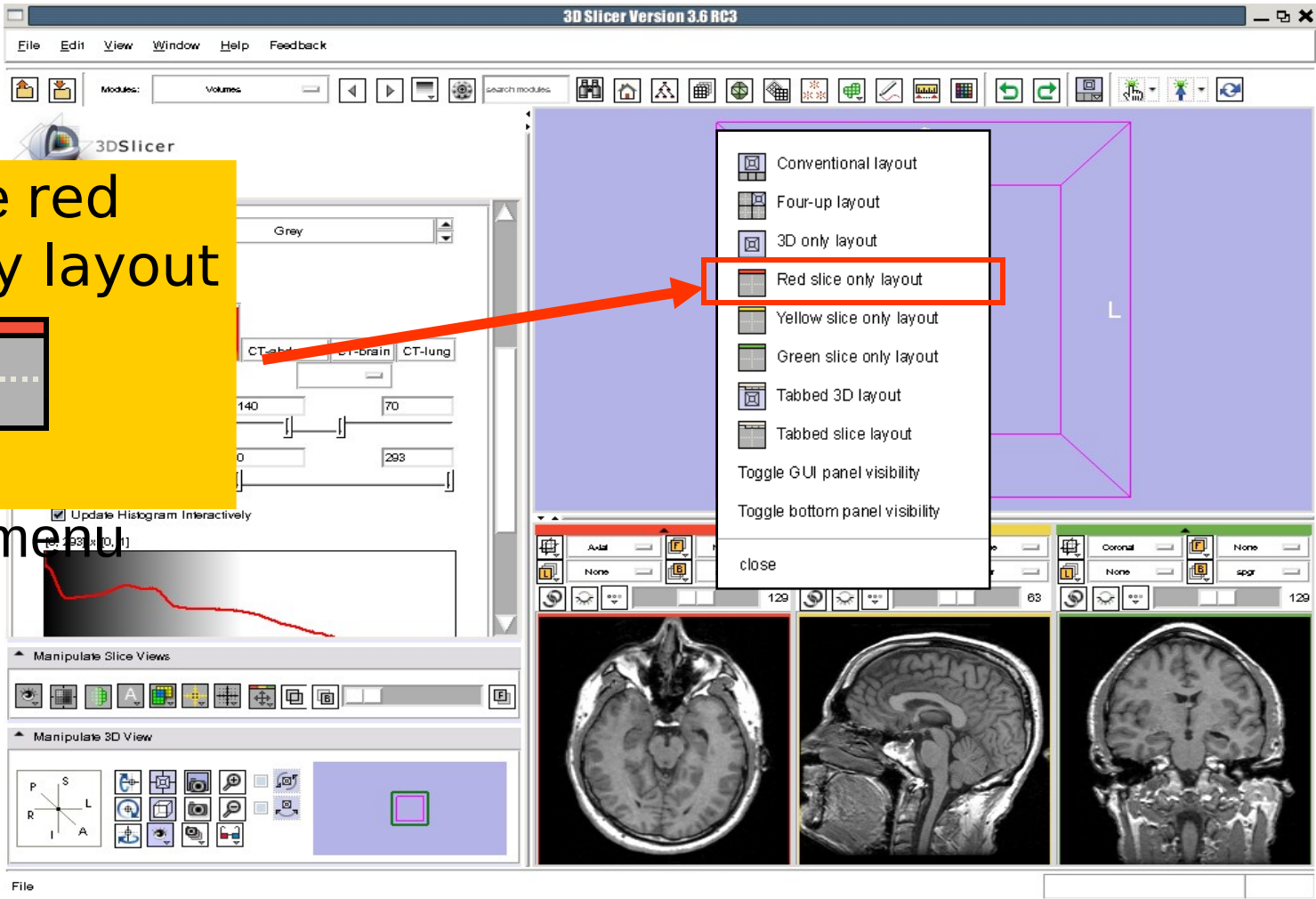
The spgr volume appears in the Background display of the 2D Viewer.

# Exploring the data

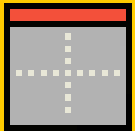
Click on the  
choose  
view icon



# Exploring the data



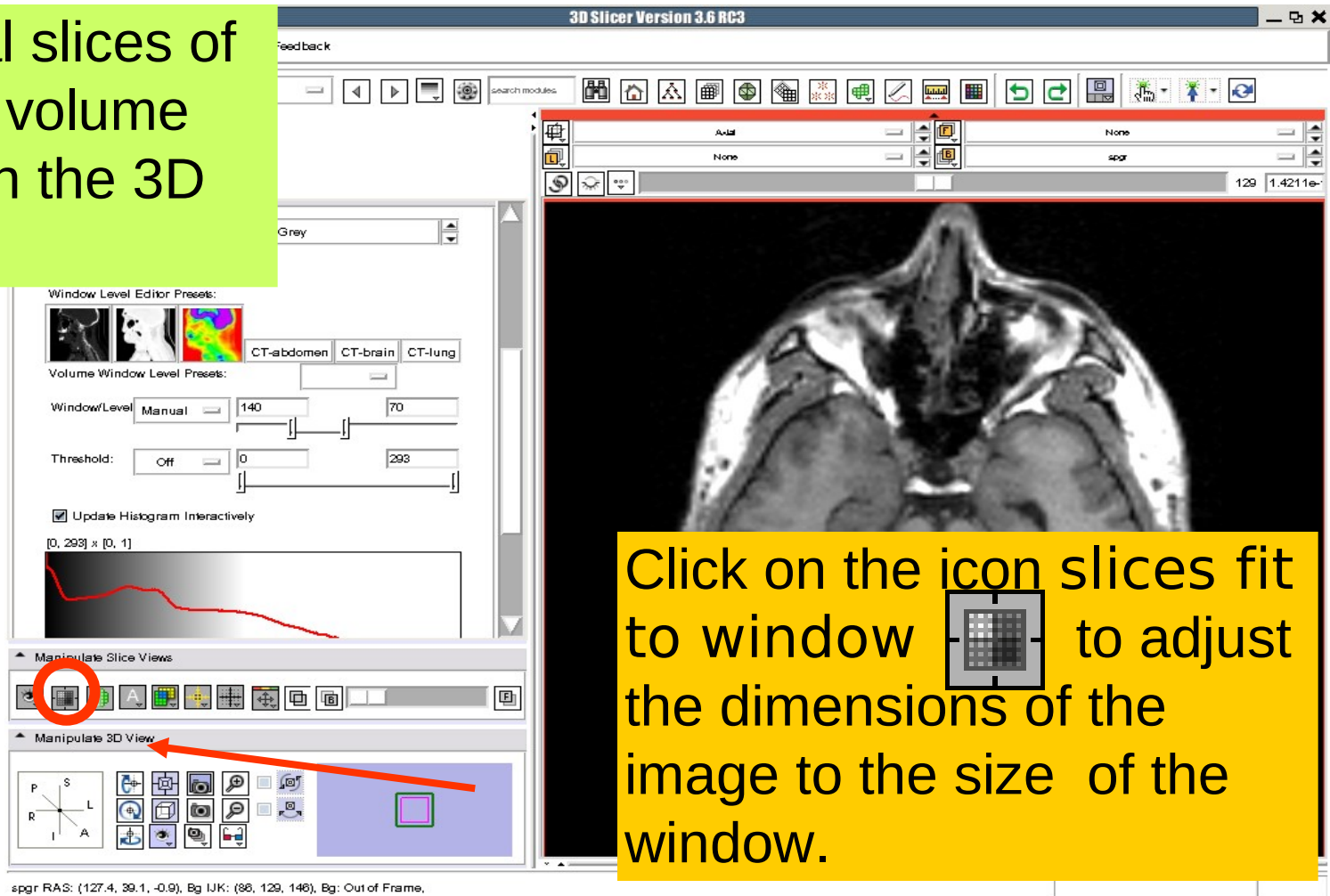
Select the red slice only layout

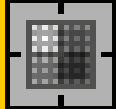


from the menu


# Exploring the data

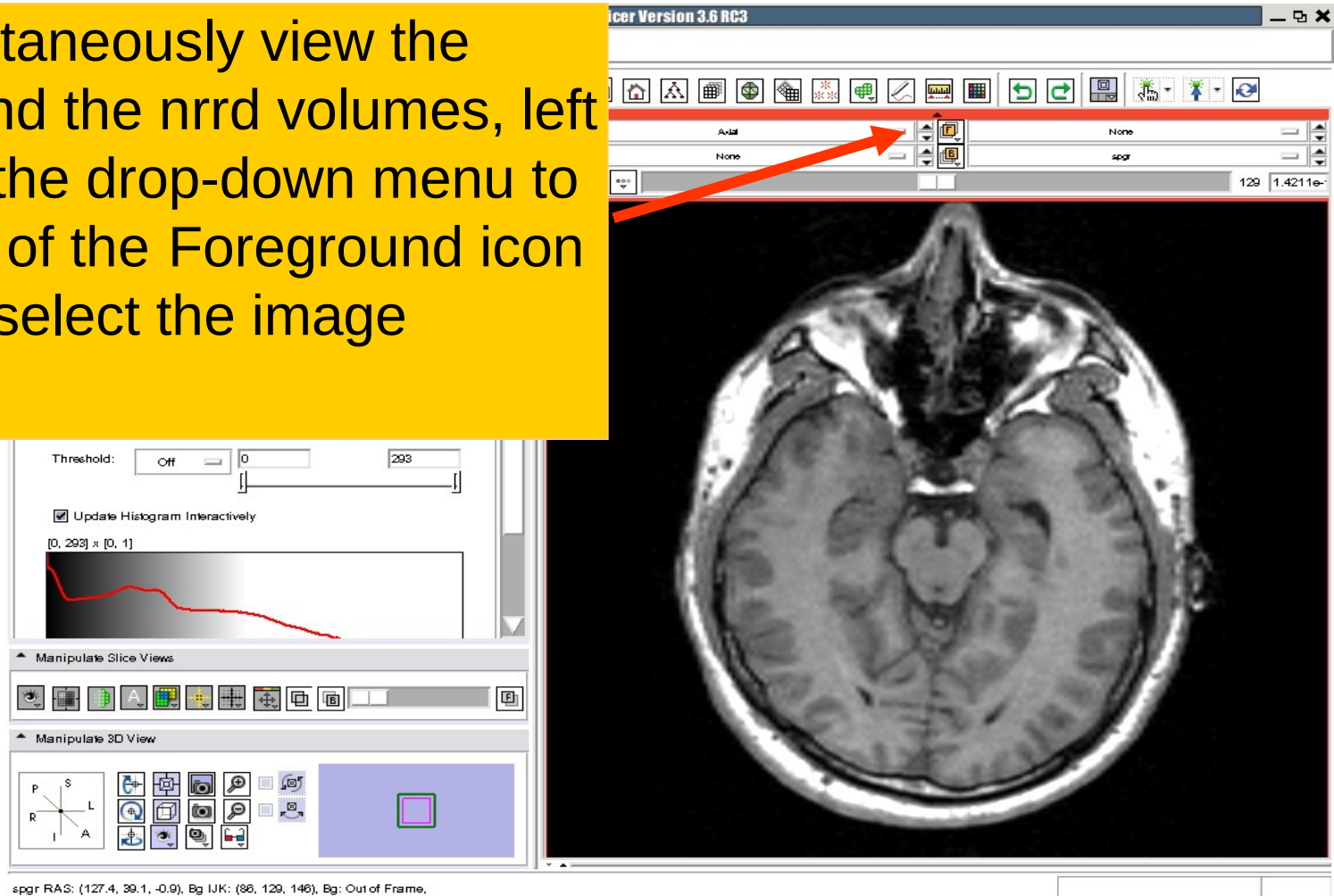
The axial slices of the spgr volume appear in the 3D viewer.



The screenshot shows the 3D Slicer 3.6 RC3 interface. The top toolbar contains various icons for navigation and manipulation. The 'Window Level Editor' panel on the left shows 'Window/Level' set to 'Manual' with values 140 and 70, and 'Threshold' set to 'Off' with values 0 and 293. A histogram is visible below these settings. The 'Manipulate Slice Views' panel at the bottom left has a red circle around the 'Fit to Window' icon. A red arrow points from this icon to the '3D View' window on the right, which displays an axial MRI slice of a head. A yellow callout box over the 3D view contains the text: 'Click on the icon slices fit to window  to adjust the dimensions of the image to the size of the window.'

# Exploring the data



To simultaneously view the dicom and the nrrd volumes, left click on the drop-down menu to the right of the Foreground icon  and select the image 001.dcm

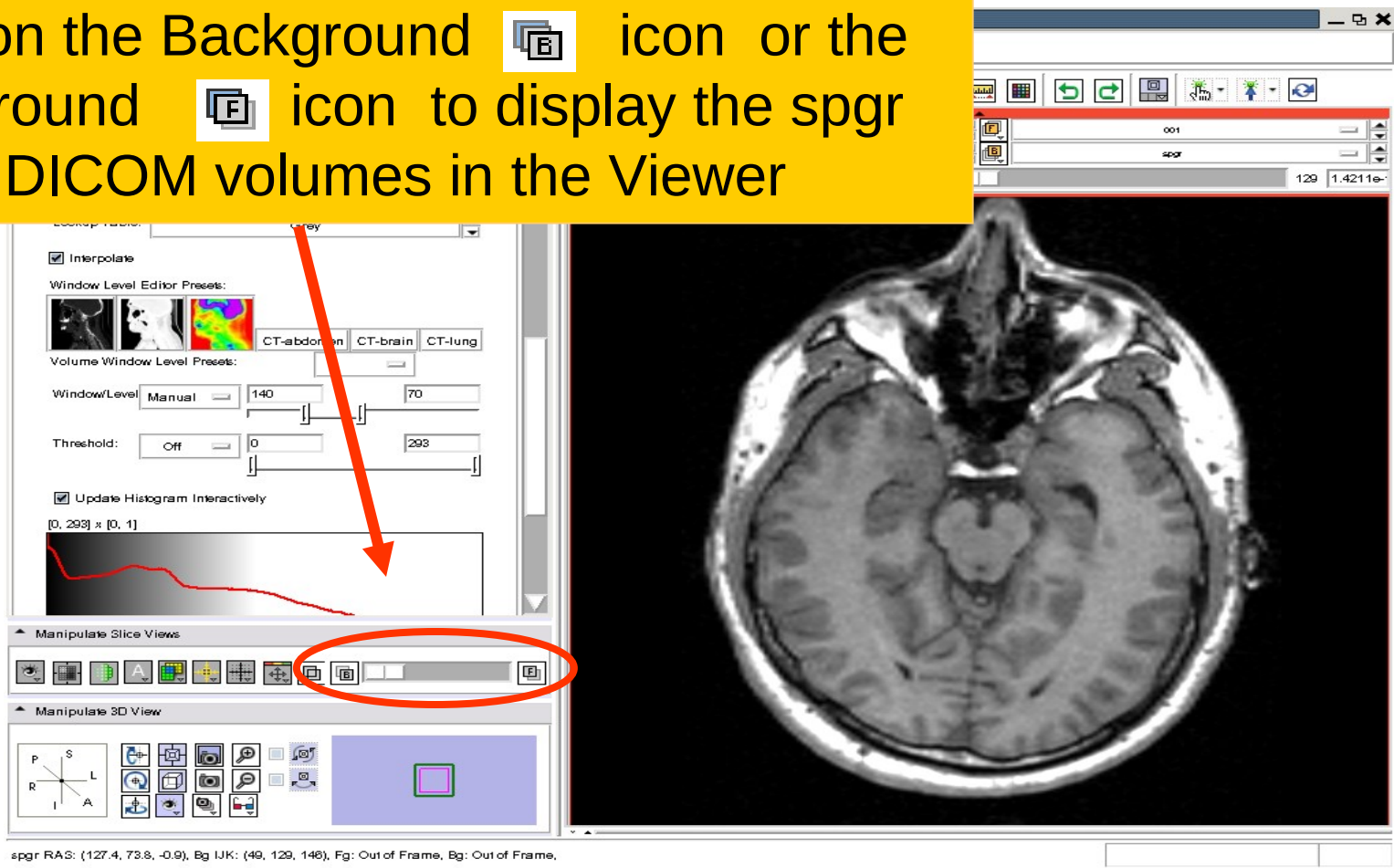


The screenshot shows the 3DSlicer software interface. The main window displays an axial MRI slice of a brain. The interface includes a toolbar at the top with various icons for navigation and manipulation. A red arrow points to a drop-down menu in the toolbar, which is used to select the image 001.dcm. The left panel shows a histogram and manipulation tools. The status bar at the bottom displays coordinates: spgr RAS: (127.4, 39.1, -0.9), Bg IJK: (86, 129, 146), Bg: Out of Frame.



# Exploring the data

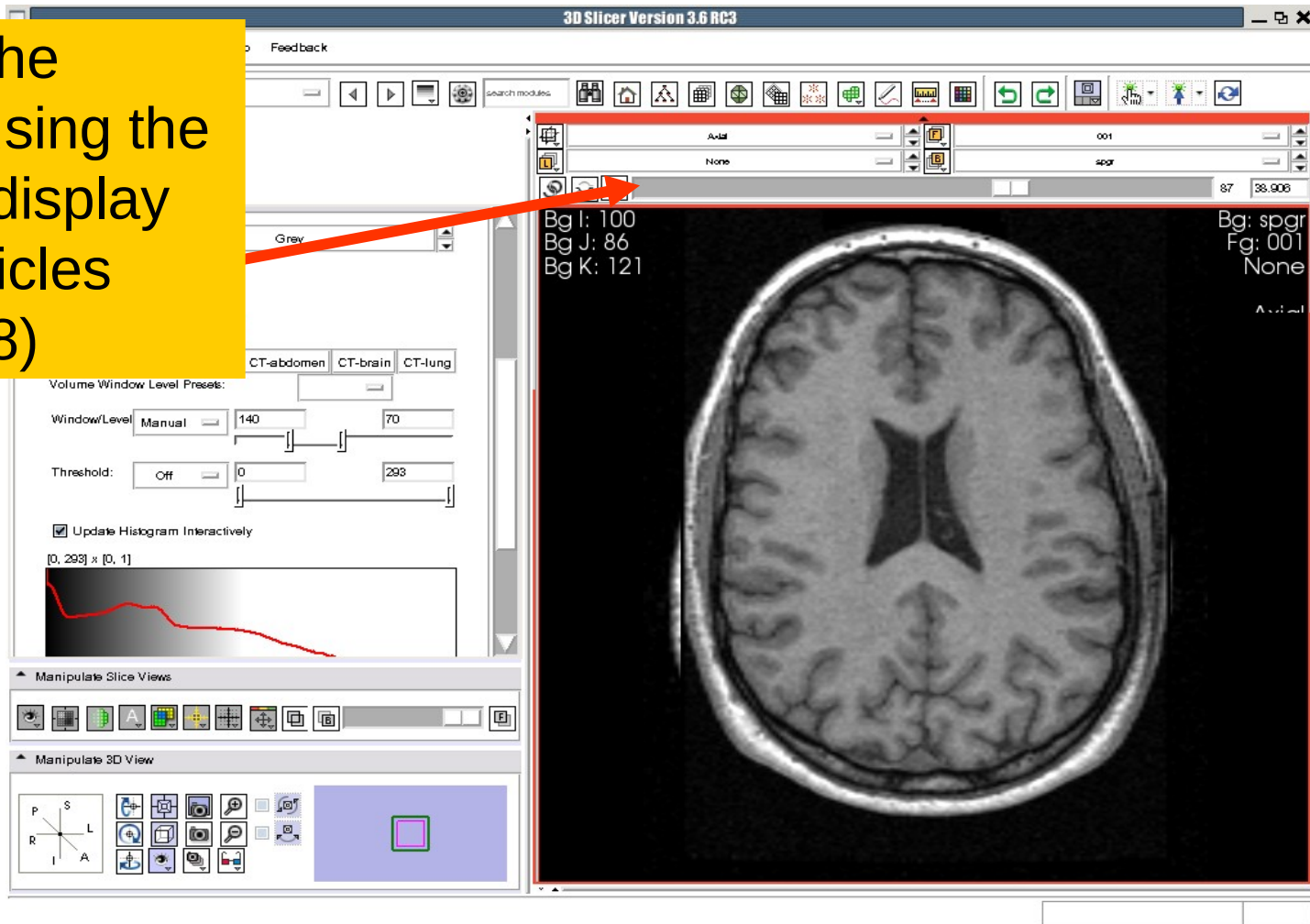
Click on the Background  icon or the Foreground  icon to display the spgr or the DICOM volumes in the Viewer





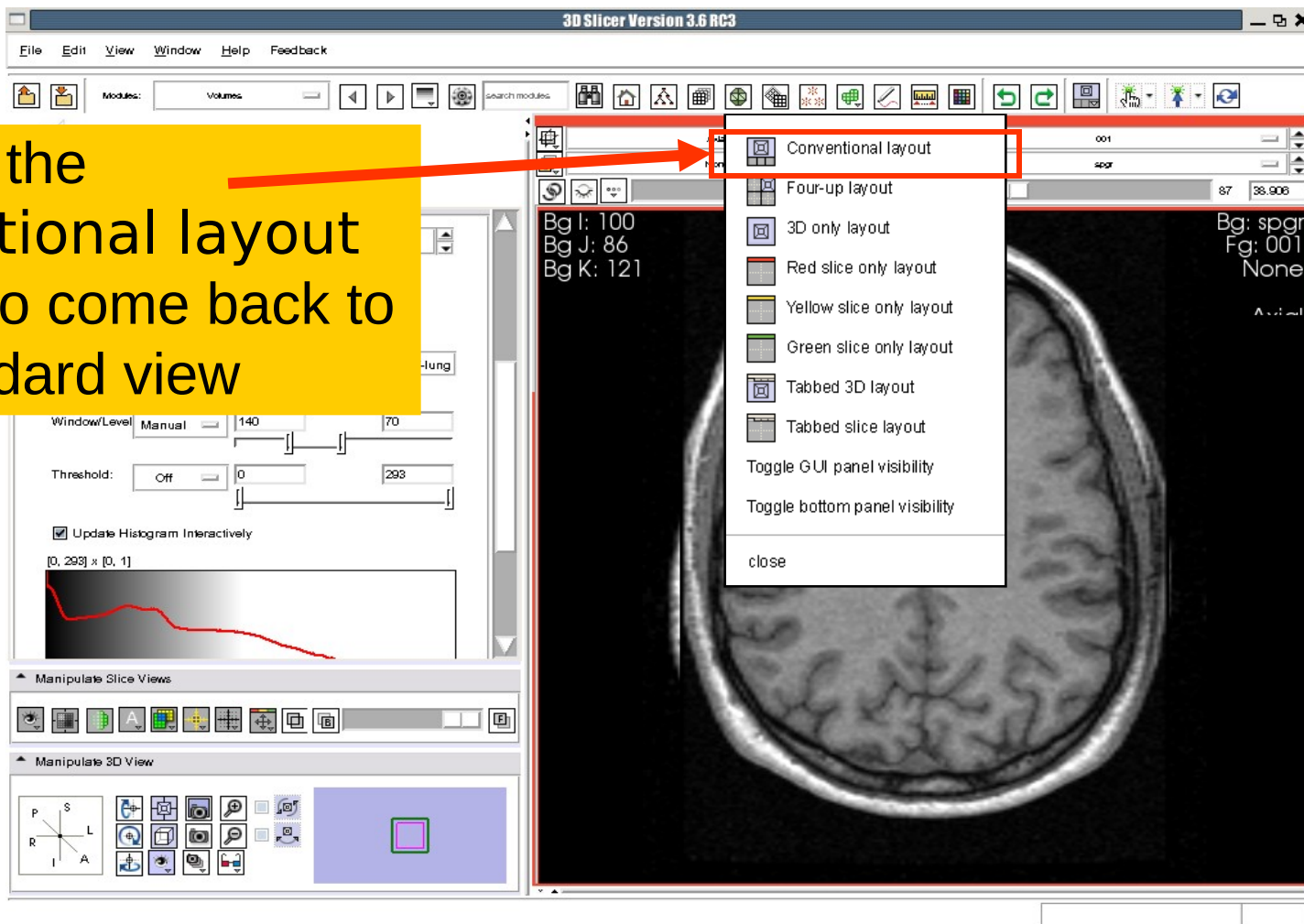
# Exploring the data

Browse the images using the slider to display the ventricles (~slice 38)




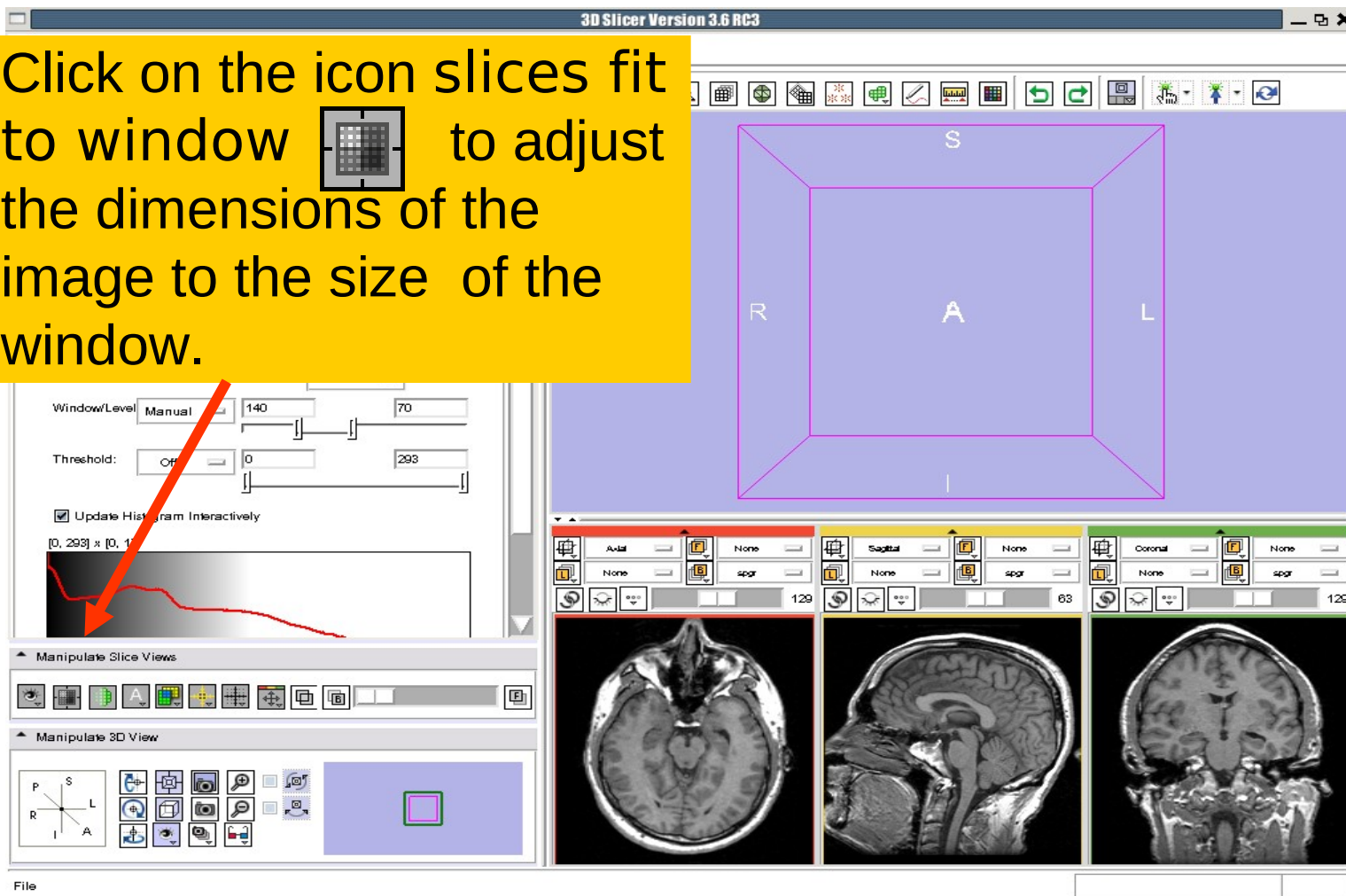
# Exploring the data

Click on the conventional layout icon  to come back to the standard view



# Loading Volumes

Click on the icon slices fit to window  to adjust the dimensions of the image to the size of the window.





## Part 2: Loading and visualizing segmented structures overlaid on grayscale images

# Label map



- **Image segmentation** is the extraction of structural information of particular interest from surrounding image.
- Each pixel is assigned a specific **label value** which corresponds to the anatomical structure that it belongs to.
- The three-dimensional result of the segmentation is a binary array called **label map**.

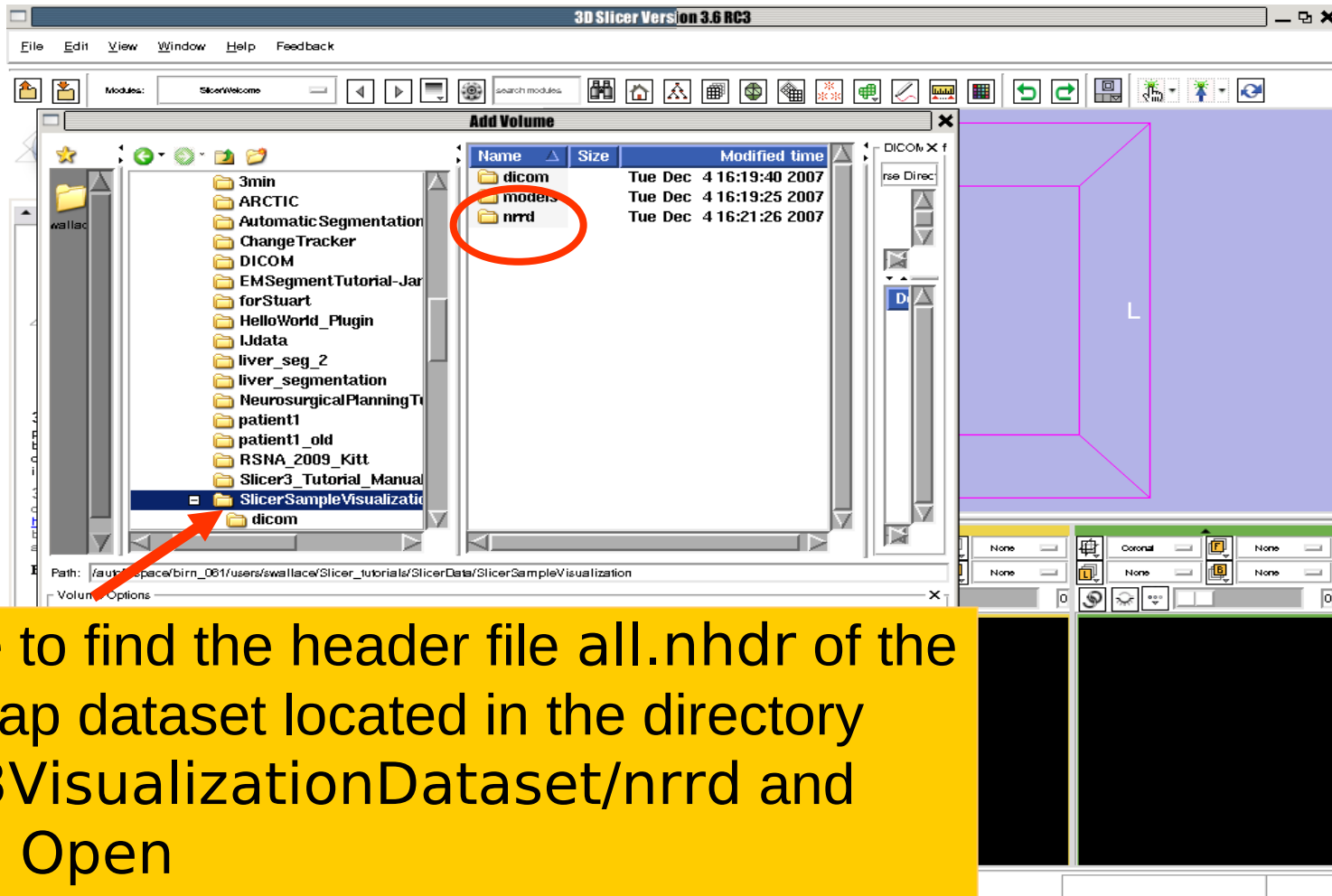


# Loading a label map

Click on Select Volume File

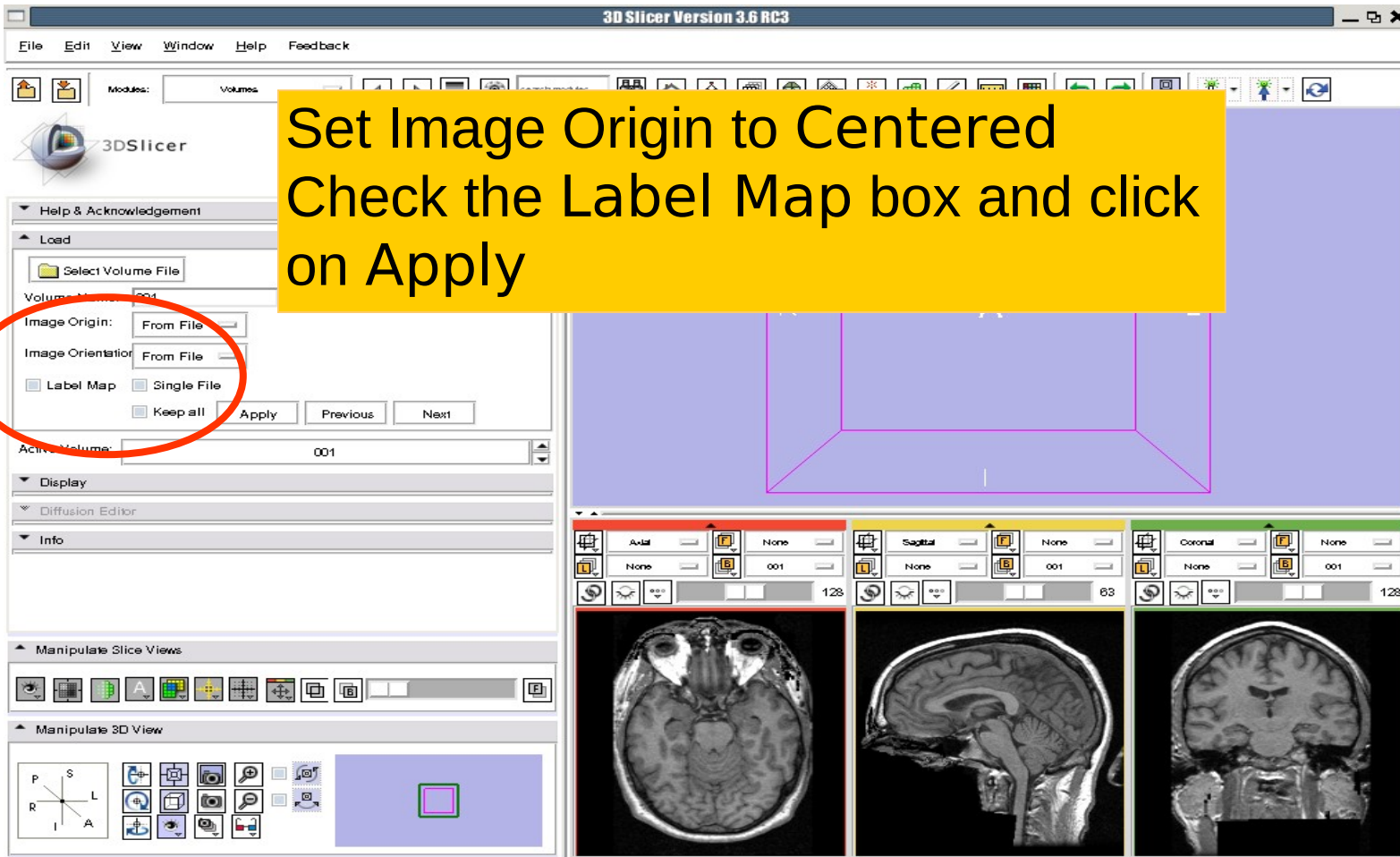
The screenshot shows the 3D Slicer Version 3.6 RC3 interface. On the left, the 'Load' panel is visible, with the 'Select Volume File' button circled in red. Below it, the 'Volume Name' is set to '001', and 'Image Origin' and 'Image Orientation' are both set to 'From File'. There are checkboxes for 'Label Map', 'Single File', and 'Keep all', along with 'Apply', 'Previous', and 'Next' buttons. The 'Active Volume' is also set to '001'. The main 3D view shows a brain slice with axes labeled S (Superior), R (Right), L (Left), and I (Inferior). Below the 3D view, there are three slice view panels: Axial (128), Sagittal (83), and Coronal (128). At the bottom, the status bar displays: '001 RAS: (109.0, 5.4, -65.5), Bg IJK: (128, 200, 145), Bg: Out of Frame.'

# Loading a label map





# Visualizing a label map



**Set Image Origin to Centered  
Check the Label Map box and click  
on Apply**

001  
Image Origin: From File  
Image Orientation: From File  
 Label Map  Single File  
 Keep all Apply Previous Next

Active Volume: 001

Diffusion Editor

Info

Manipulate Slice Views

Manipulate 3D View

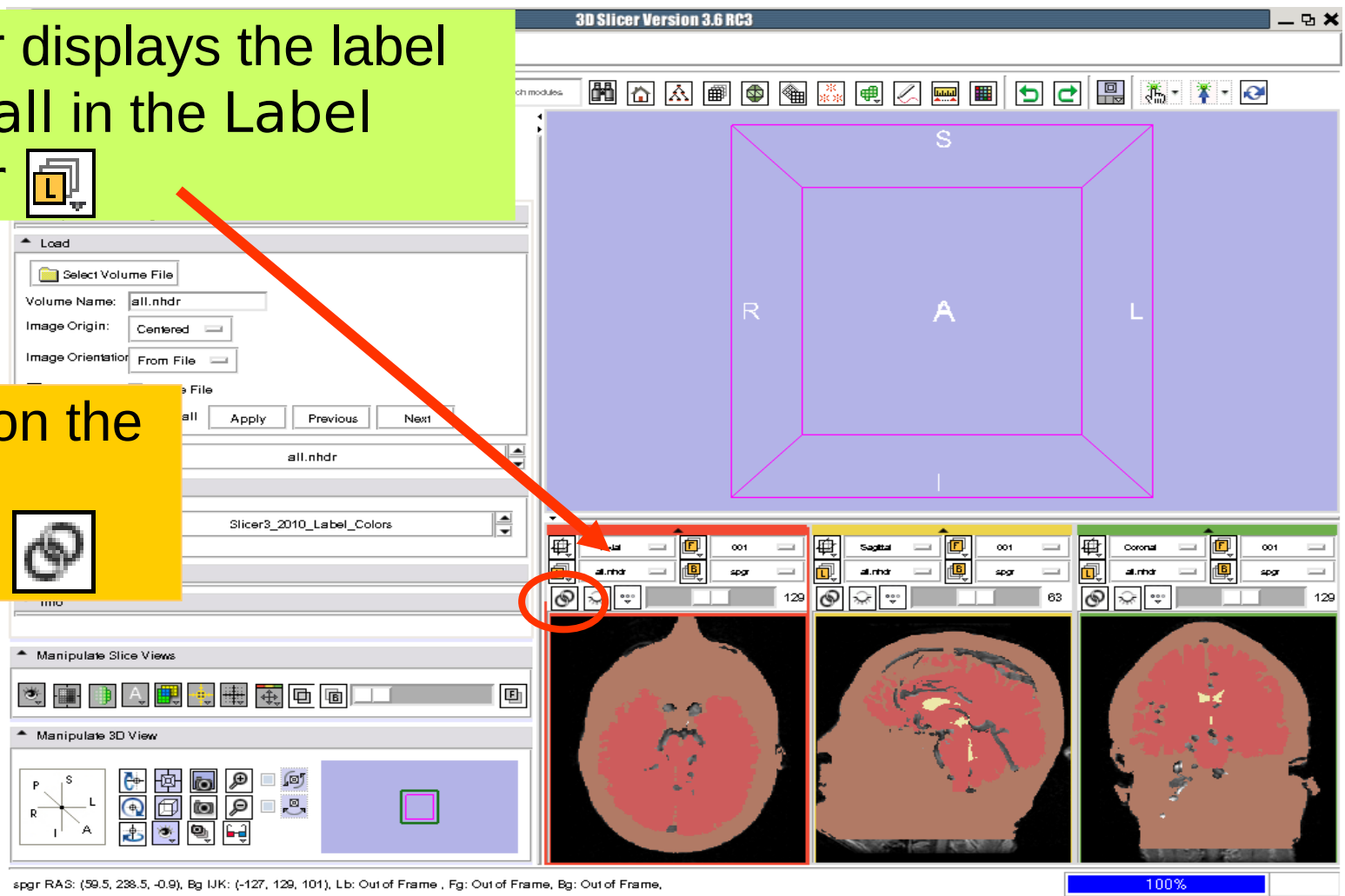
001 RAS: (109.0, 5.4, -65.5), Bg IJK: (128, 200, 145), Bg: Out of Frame.

# Visualizing a label map

Slicer displays the label map all in the Label layer



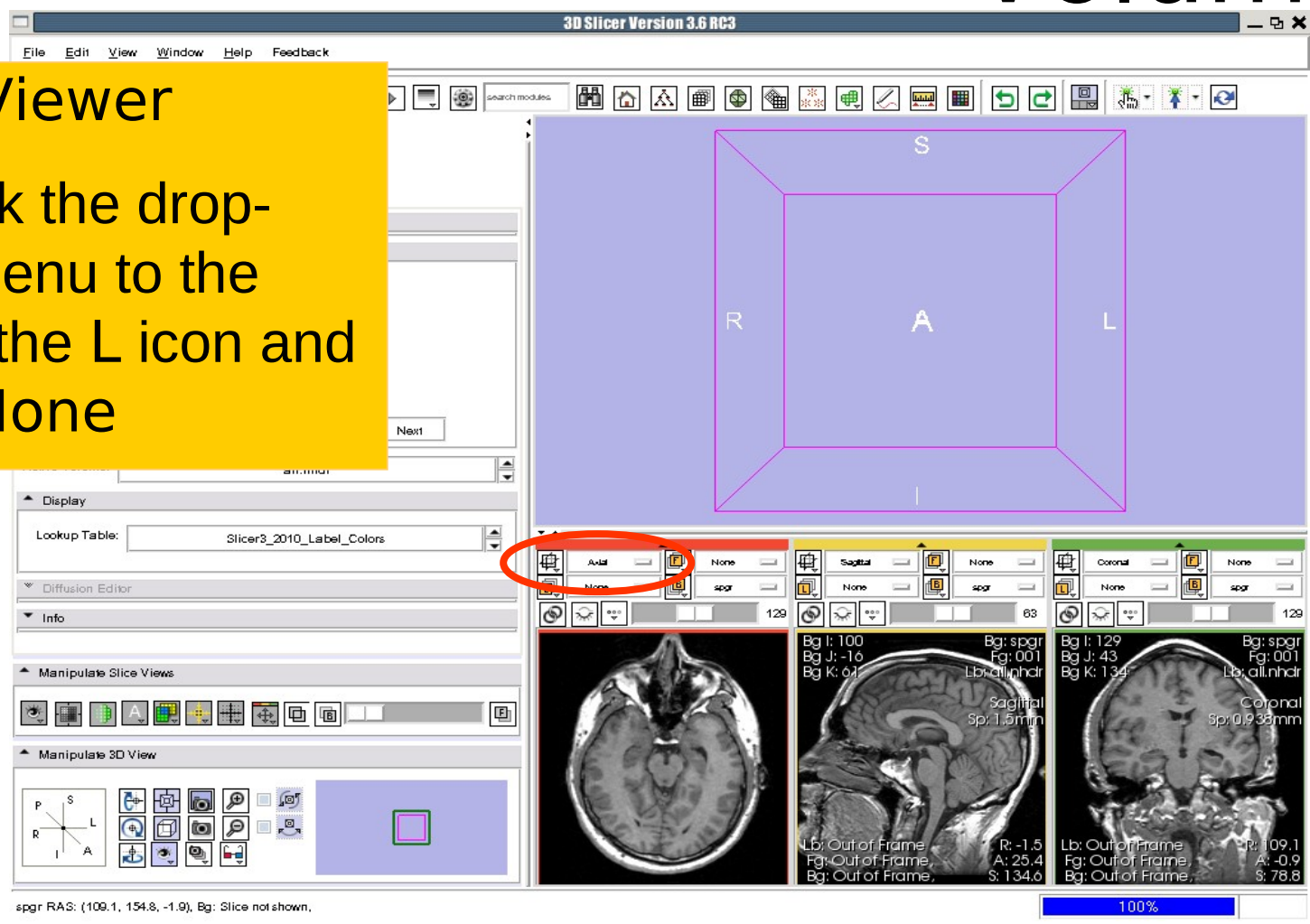
Click on the links icon.



# Visualizing Multiple Volumes

## Label Viewer

Left click the drop-down menu to the right of the L icon and select None

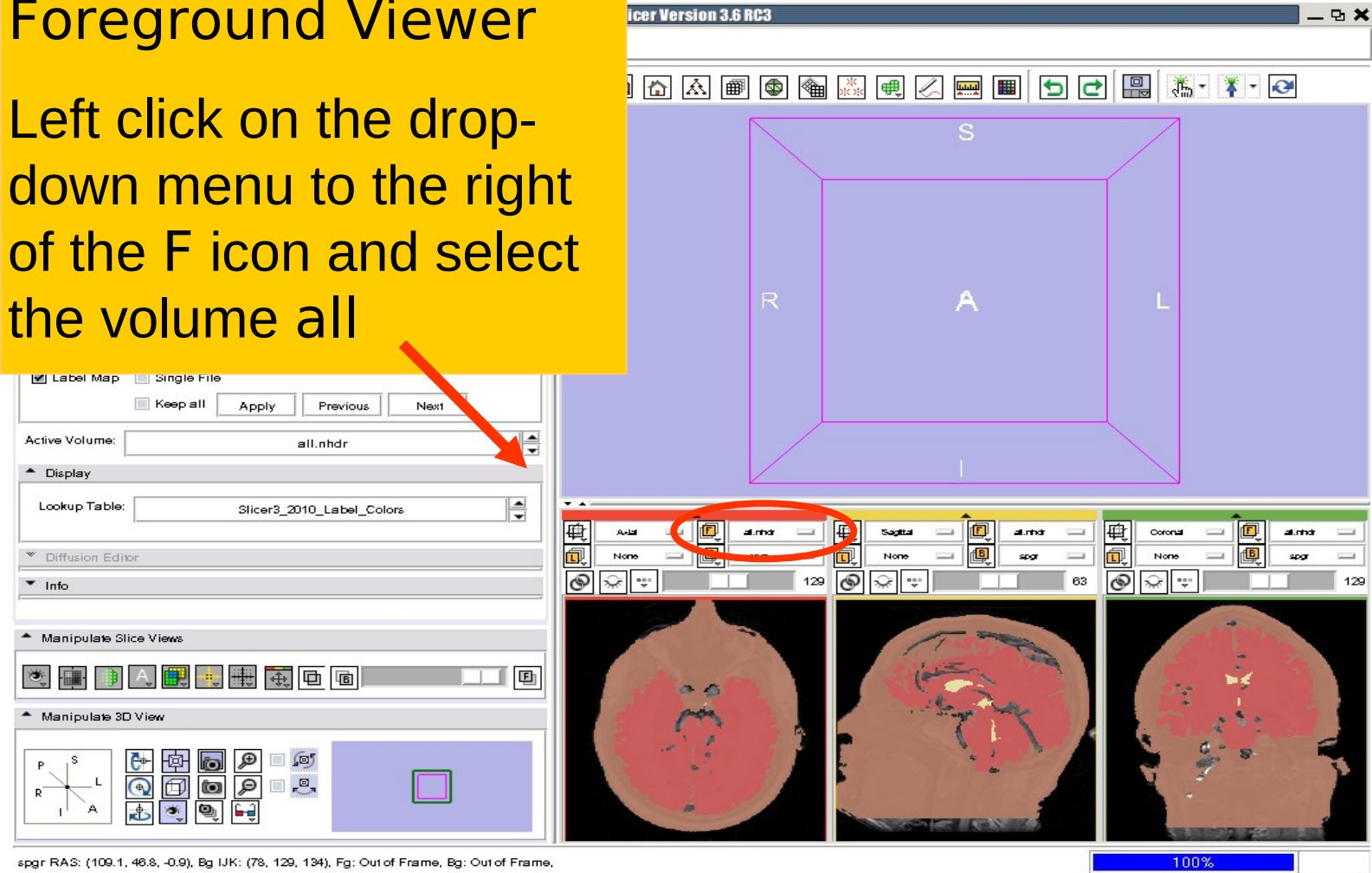




# Visualizing Multiple Volumes

## Foreground Viewer

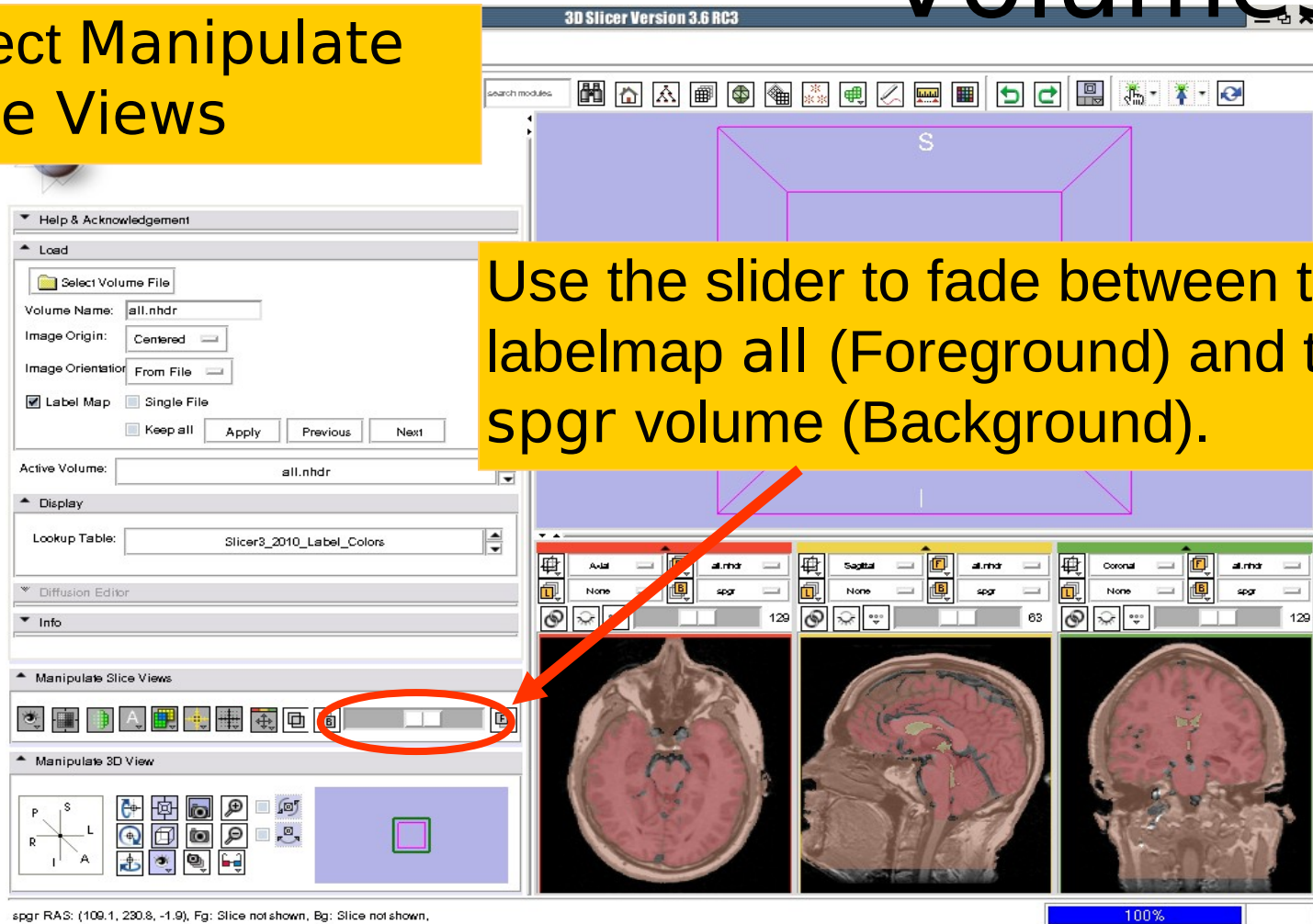
Left click on the drop-down menu to the right of the F icon and select the volume all



Label Map    Single File  
 Keep all   Apply   Previous   Next  
 Active Volume: all.nhdr  
 Display  
 Lookup Table: Slicer3\_2010\_Label\_Colors  
 Diffusion Editor  
 Info  
 Manipulate Slice Views  
 Manipulate 3D View

# Visualizing Multiple Volumes

Select Manipulate  
Slice Views



3D Slicer Version 3.6 RC3

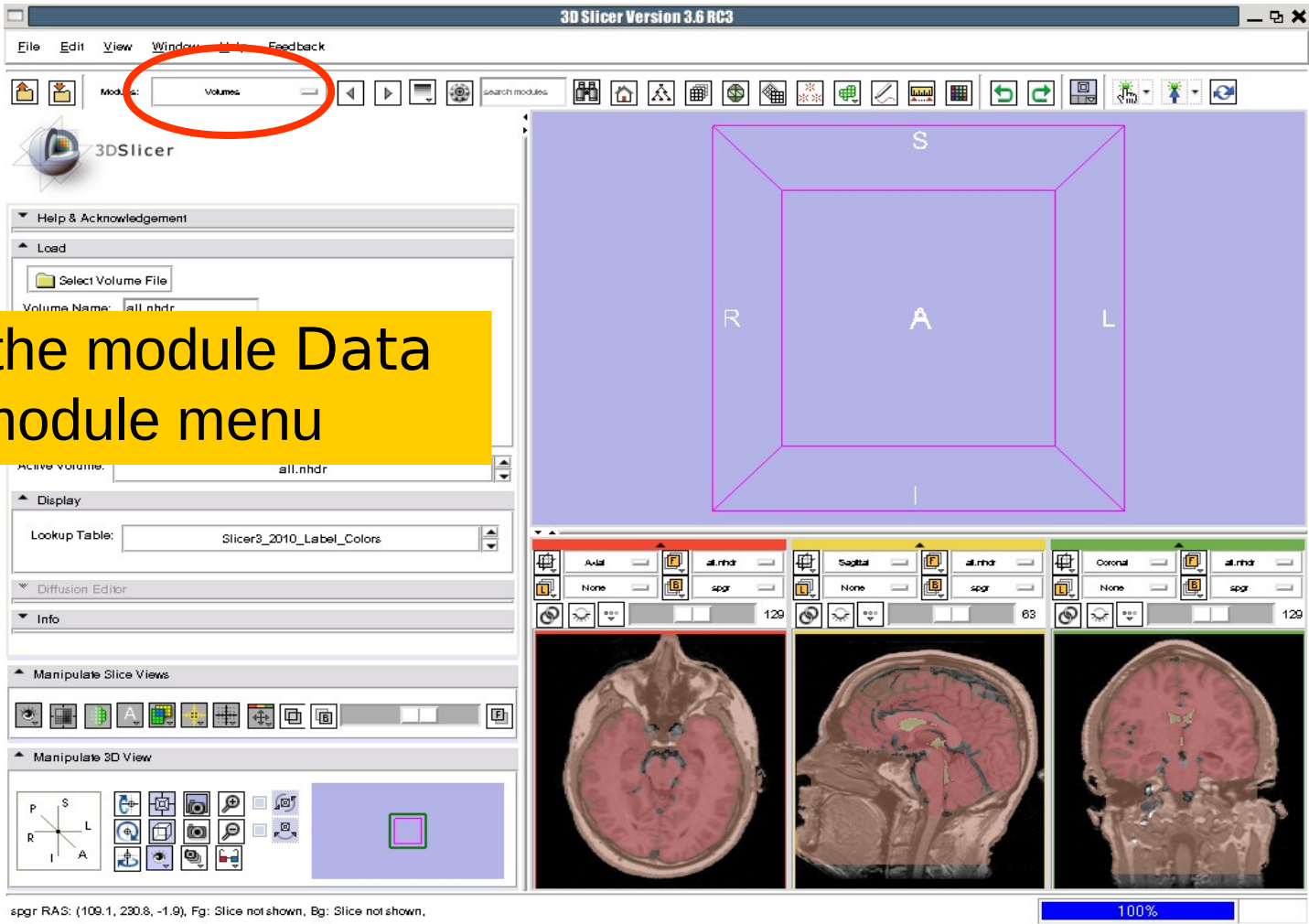
Use the slider to fade between the labelmap all (Foreground) and the spgr volume (Background).

spgr RAS: (109.1, 230.8, -1.9), Fg: Slice not shown, Bg: Slice not shown.

100%

The screenshot displays the 3D Slicer interface. On the left, the 'Load' panel shows 'all.nhdr' as the active volume. The 'Manipulate Slice Views' panel at the bottom left contains a slider control, which is circled in red and pointed to by an orange arrow. The main 3D view area shows a brain scan with a purple wireframe box labeled 'S'. Below the 3D view, three slice views are shown: Axial, Sagittal, and Coronal. Each slice view has a corresponding control panel with a dropdown menu and a slider. The 'Axial' view shows a cross-section of the brain with a red labelmap overlaid on a brown background. The 'Sagittal' and 'Coronal' views show similar cross-sections. The status bar at the bottom indicates the current slice position and zoom level.

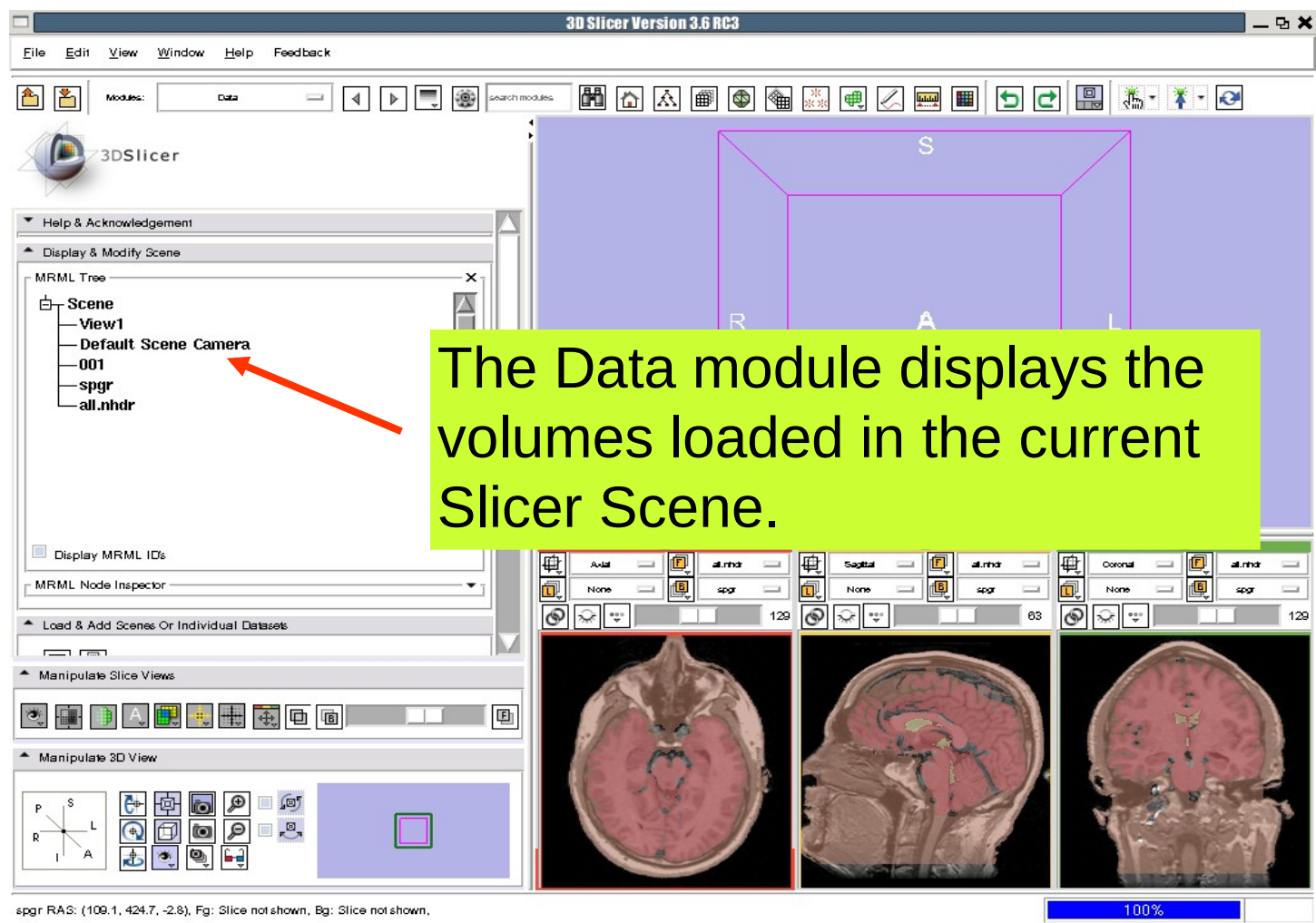
# 3D Visualization



Select the module Data in the module menu



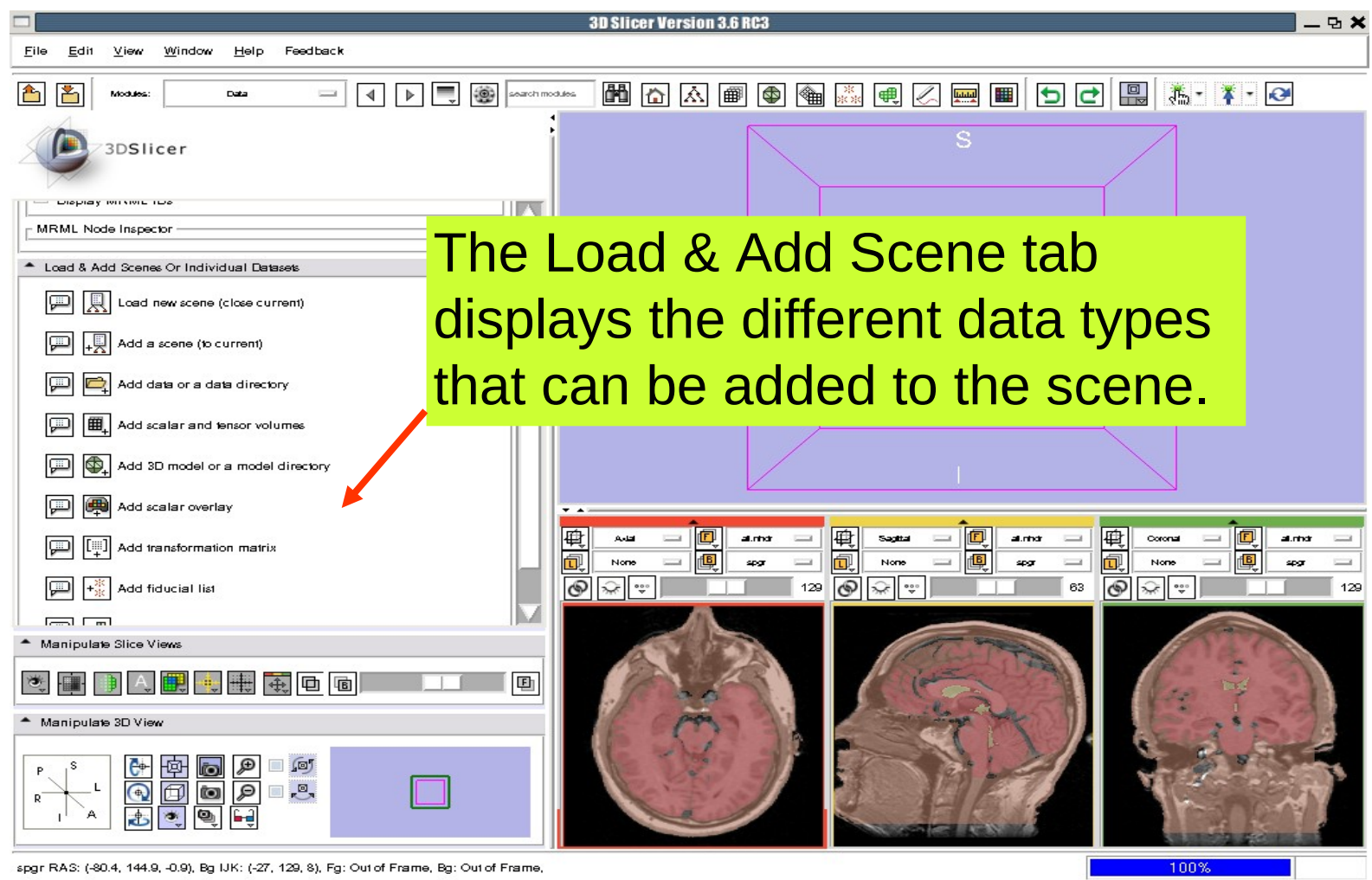
# 3D Visualization



The screenshot shows the 3D Slicer Version 3.6 RC3 interface. The main window displays a 3D volume rendering of a brain scan. A yellow callout box with black text is overlaid on the 3D view, stating: "The Data module displays the volumes loaded in the current Slicer Scene." An orange arrow points from the "Default Scene Camera" entry in the MRML Tree to the 3D view. The MRML Tree on the left shows a hierarchy: Scene -> View1 -> Default Scene Camera -> 001 -> spgr -> all.nhdr. Below the 3D view, there are three orthogonal slice views: Axial, Sagittal, and Coronal. The status bar at the bottom shows "spgr RAS: (109.1, 424.7, -2.8), Fg: Slice not shown, Bg: Slice not shown." and a "100%" zoom level.



# 3D Visualization



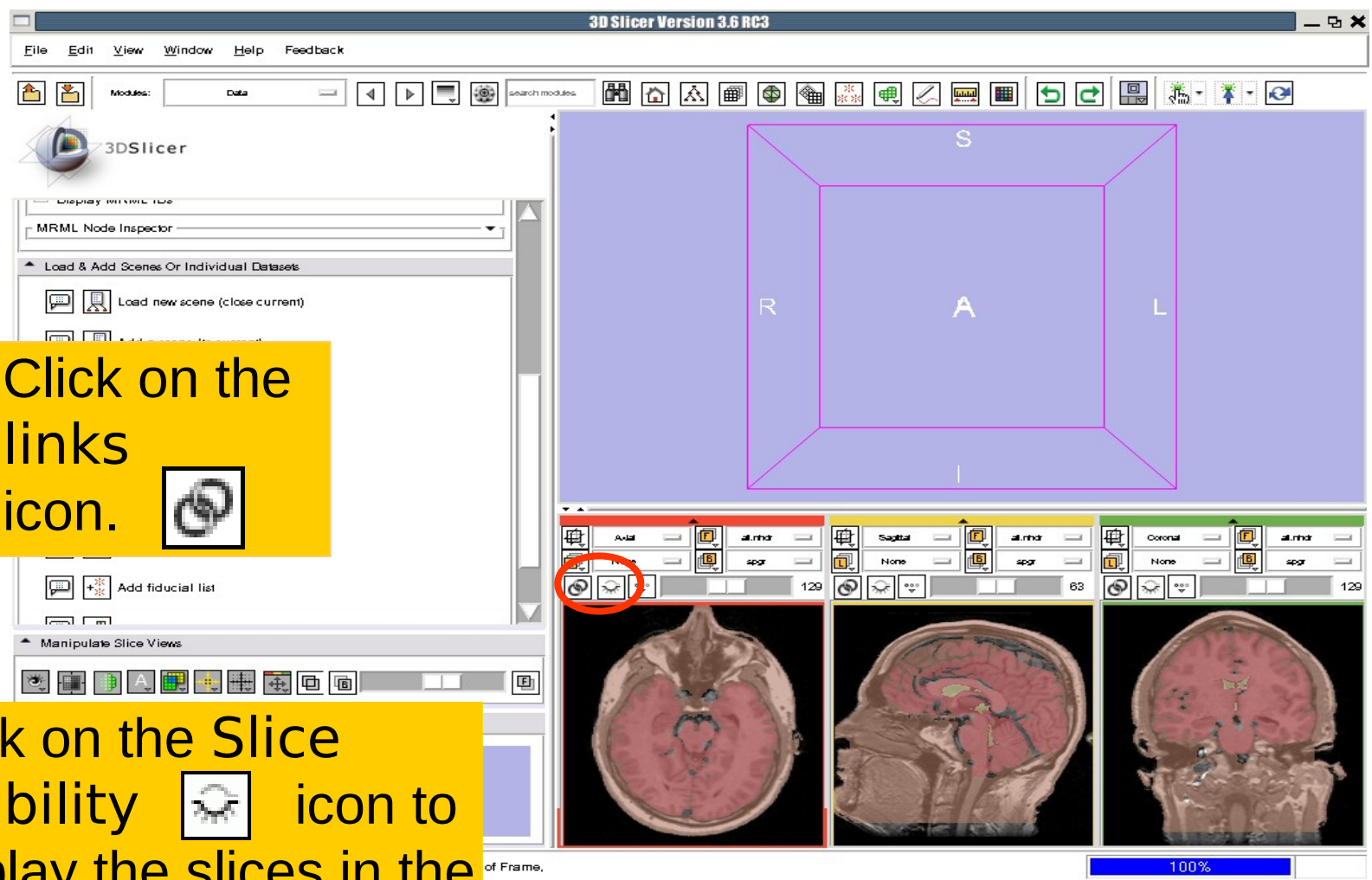
The screenshot shows the 3D Slicer Version 3.6 RC3 interface. The 'Load & Add Scene Or Individual Datasets' panel is active, listing various options for adding data to the scene. A red arrow points from a text box to the 'Add data or a data directory' option. The main 3D view displays a brain scan with a purple wireframe box labeled 'S' indicating a selected region. Below the 3D view are three slice views: Axial, Sagittal, and Coronal. The status bar at the bottom shows the current slice position and zoom level (100%).


**The Load & Add Scene tab displays the different data types that can be added to the scene.**


- Load new scene (close current)
- Add a scene (to current)
- Add data or a data directory
- Add scalar and tensor volumes
- Add 3D model or a model directory
- Add scalar overlay
- Add transformation matrix
- Add fiducial list

spgr RAS: (-80.4, 144.9, -0.9), Bg IJK: (-27, 129, 8), Fg: Out of Frame, Bg: Out of Frame.

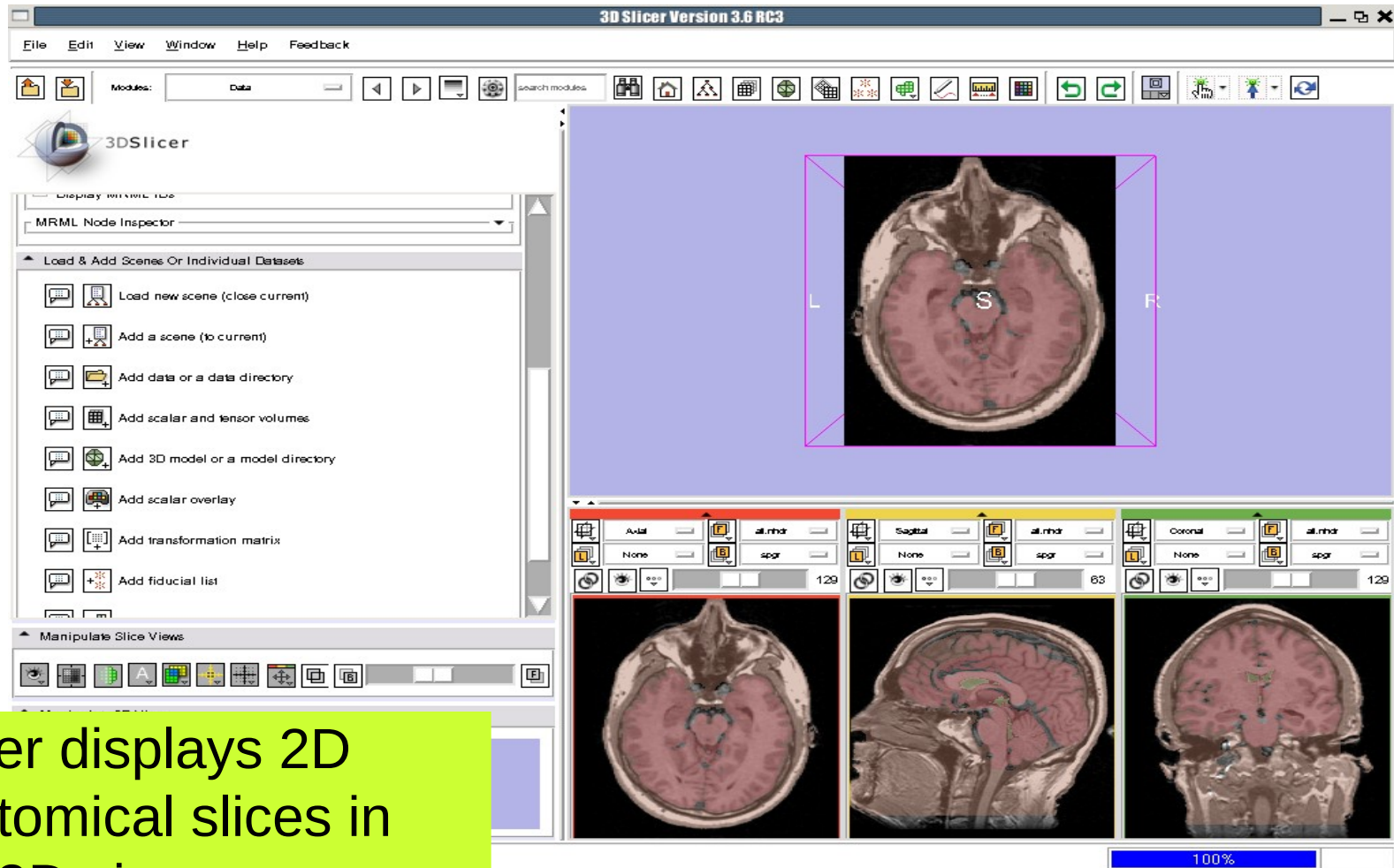
# 3D Visualization



Click on the links icon. 

Click on the Slice Visibility  icon to display the slices in the 3D Viewer

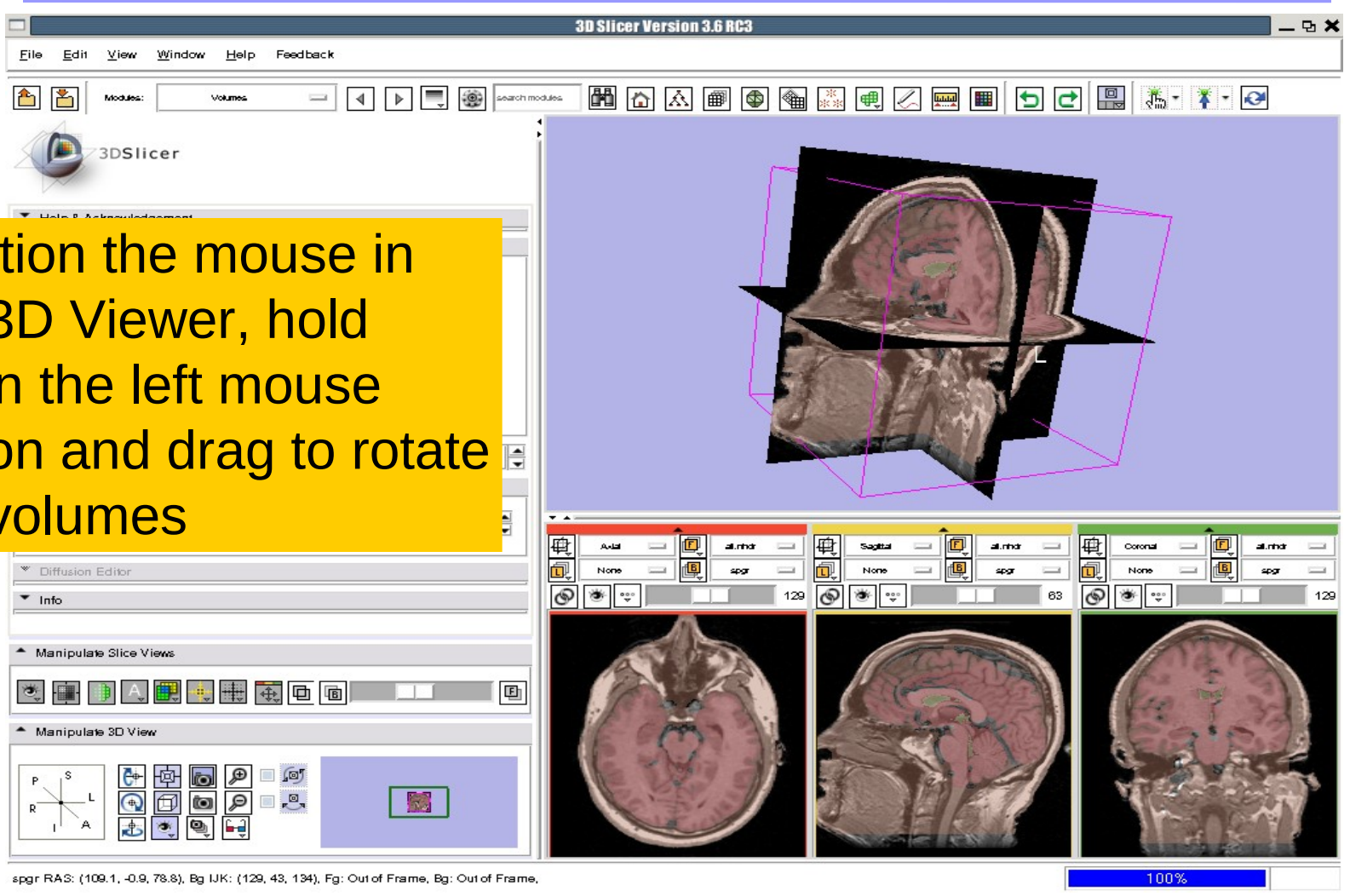
# 3D Visualization

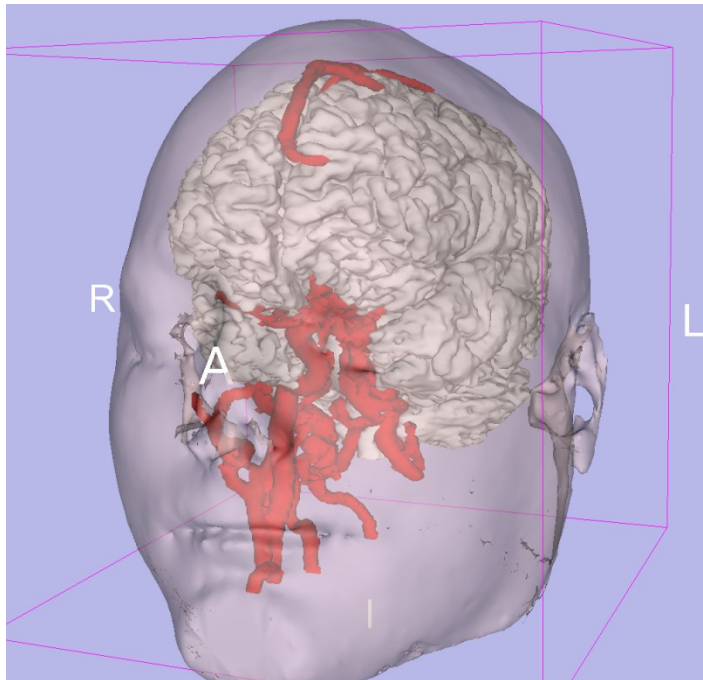


Slicer displays 2D anatomical slices in the 3D viewer

# 3D Visualization

Position the mouse in the 3D Viewer, hold down the left mouse button and drag to rotate the volumes

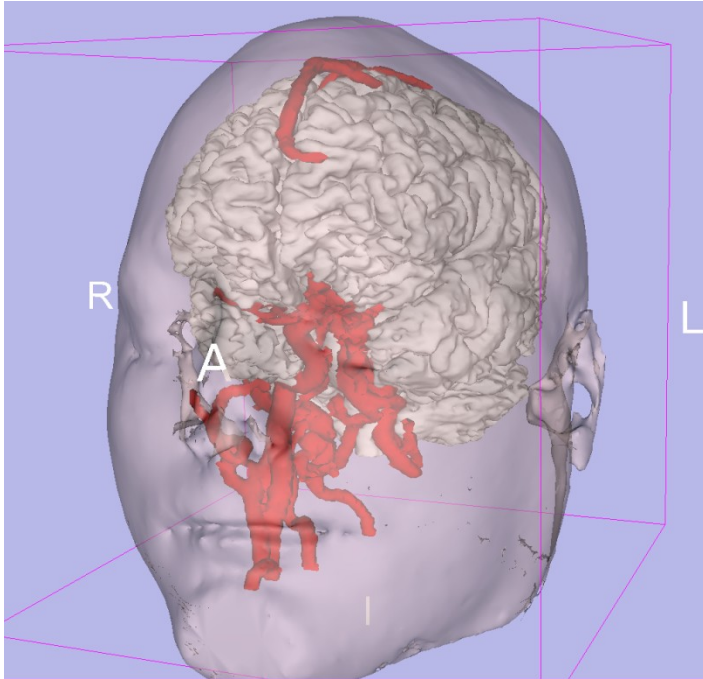




## Part 3: Loading and visualizing 3D models of the anatomy

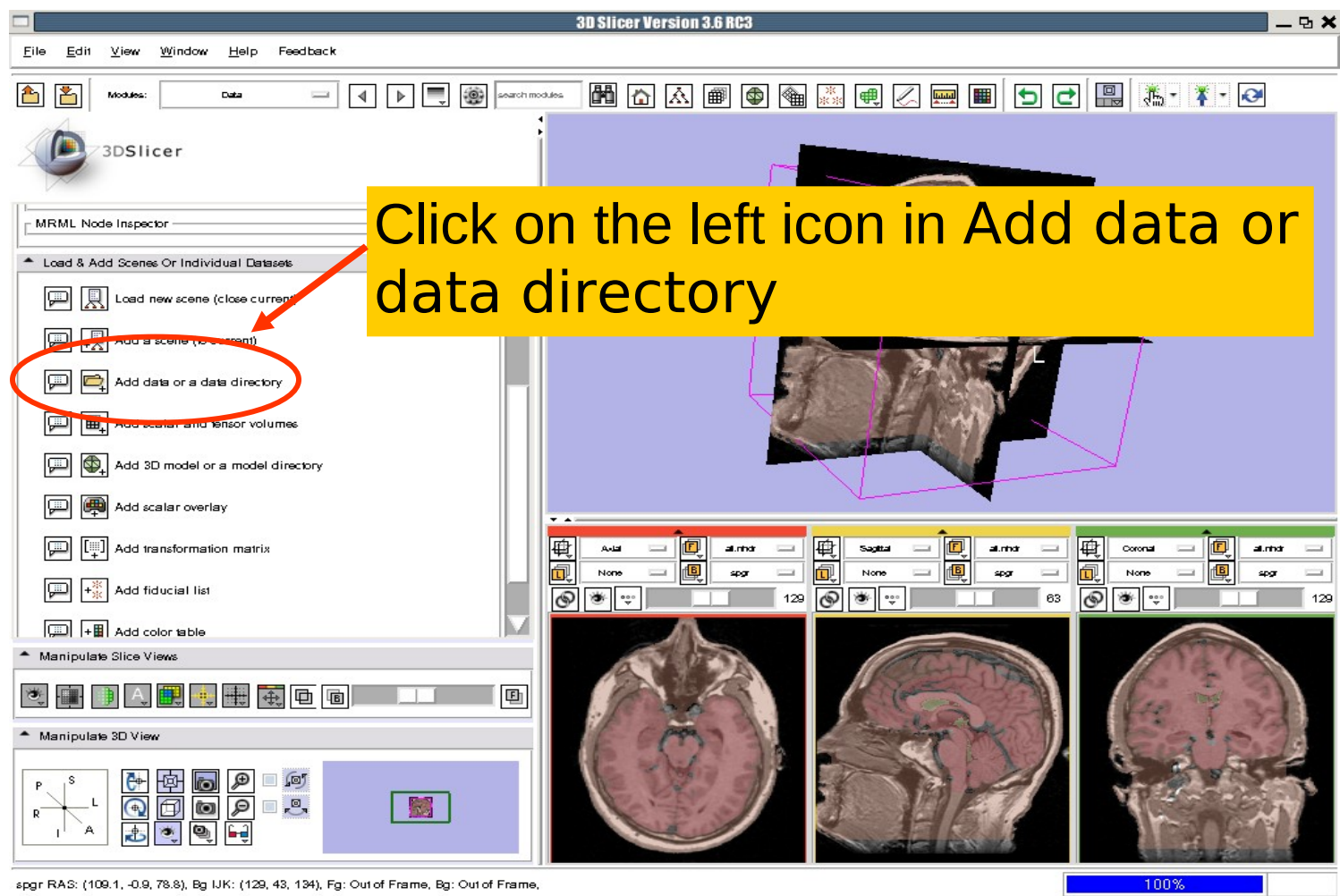


# 3D models



- A **3D model** is a surface reconstruction of an anatomical structure.
- The model is a **triangular mesh** that approximates a surface from a 3D label map.
- The scalar values for surface models are integers which correspond to the **label** that had been assigned in the segmentation process.

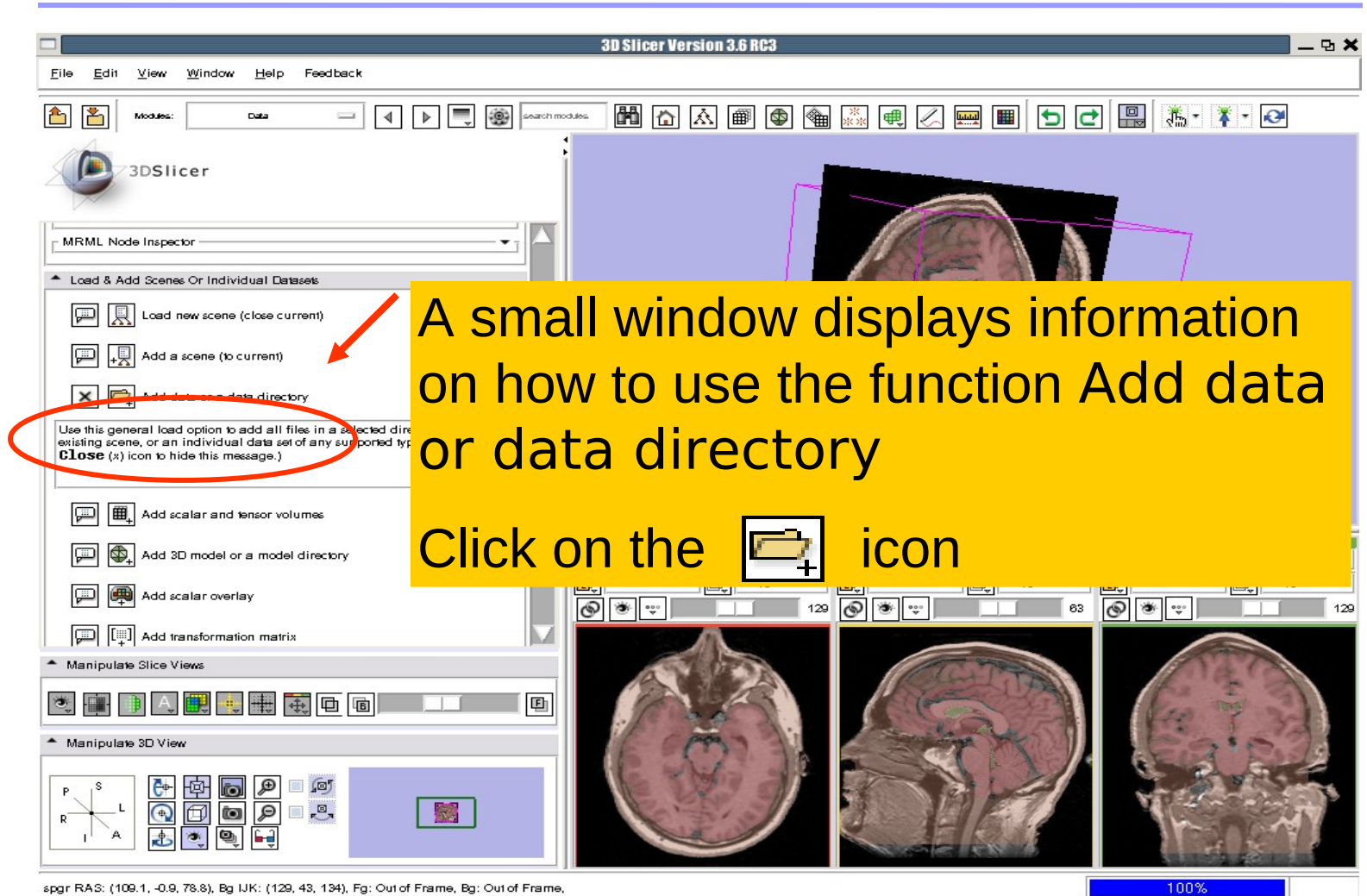
# 3D Visualization



The screenshot shows the 3D Slicer Version 3.6 RC3 interface. The main window displays a 3D visualization of a brain model. On the left, the MRML Node Inspector panel is visible, with the 'Add data or a data directory' option circled in red. A yellow callout box with a red arrow points to this option, containing the text: 'Click on the left icon in Add data or data directory'. Below the MRML Node Inspector are panels for 'Manipulate Slice Views' and 'Manipulate 3D View'. At the bottom, there are three slice view windows (Axial, Sagittal, Coronal) and a status bar showing coordinates and a 100% zoom level.



# 3D Visualization



3D Slicer Version 3.6 RC3

File Edit View Window Help Feedback

Modules: Data

MRML Node Inspector

Load & Add Scenes Or Individual Datasets

- Load new scene (close current)
- Add a scene (to current)
- Add data to current data directory**

Use this general load option to add all files in a selected directory to the current scene, or an individual data set of any supported type. **Close** (x) icon to hide this message.

Add scalar and tensor volumes

Add 3D model or a model directory

Add scalar overlay

Add transformation matrix


Manipulate Slice Views

Manipulate 3D View

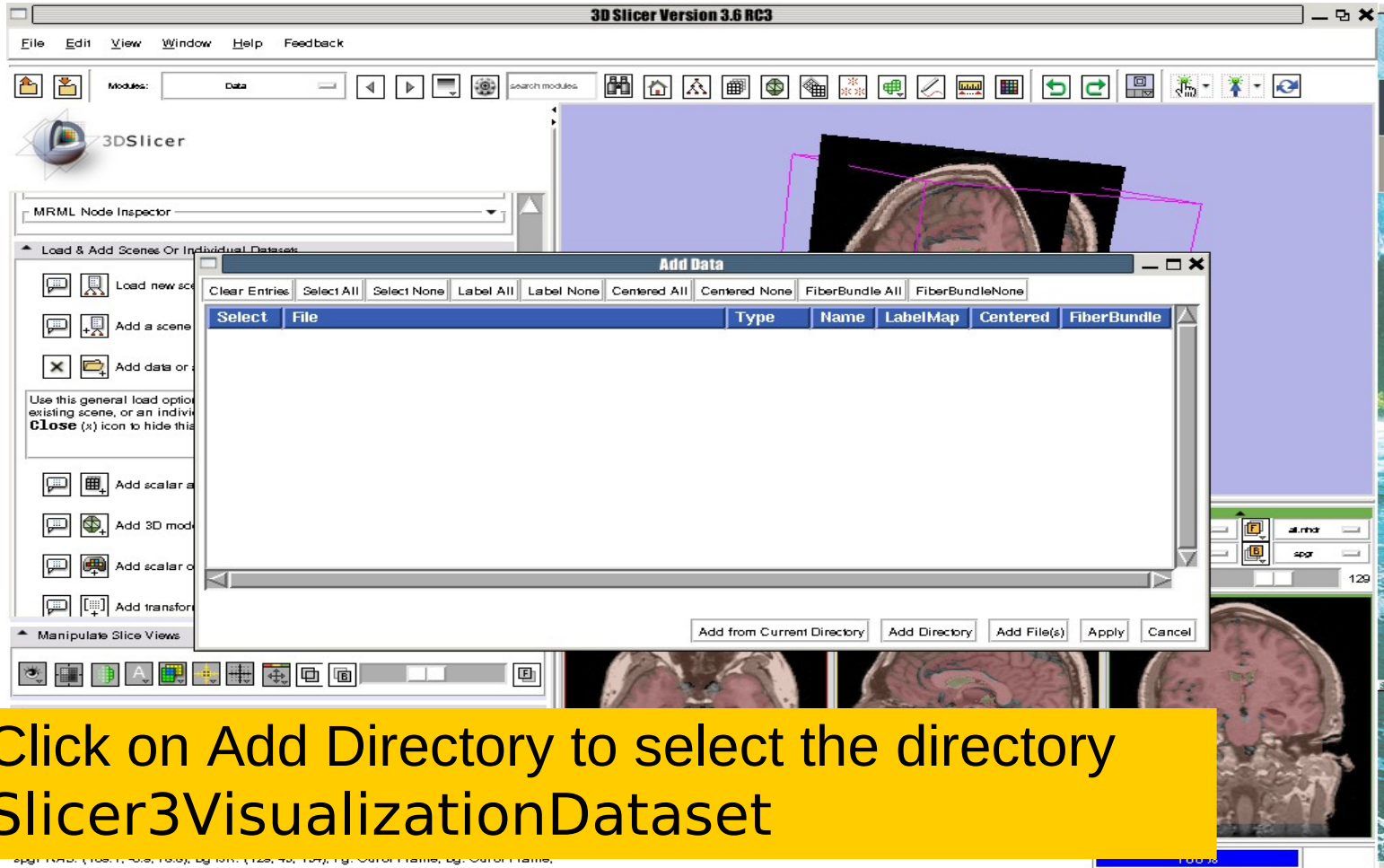
spgr RAS: (109.1, -0.9, 78.8), Bg IJK: (129, 43, 134), Fg: Out of Frame, Bg: Out of Frame.

100%

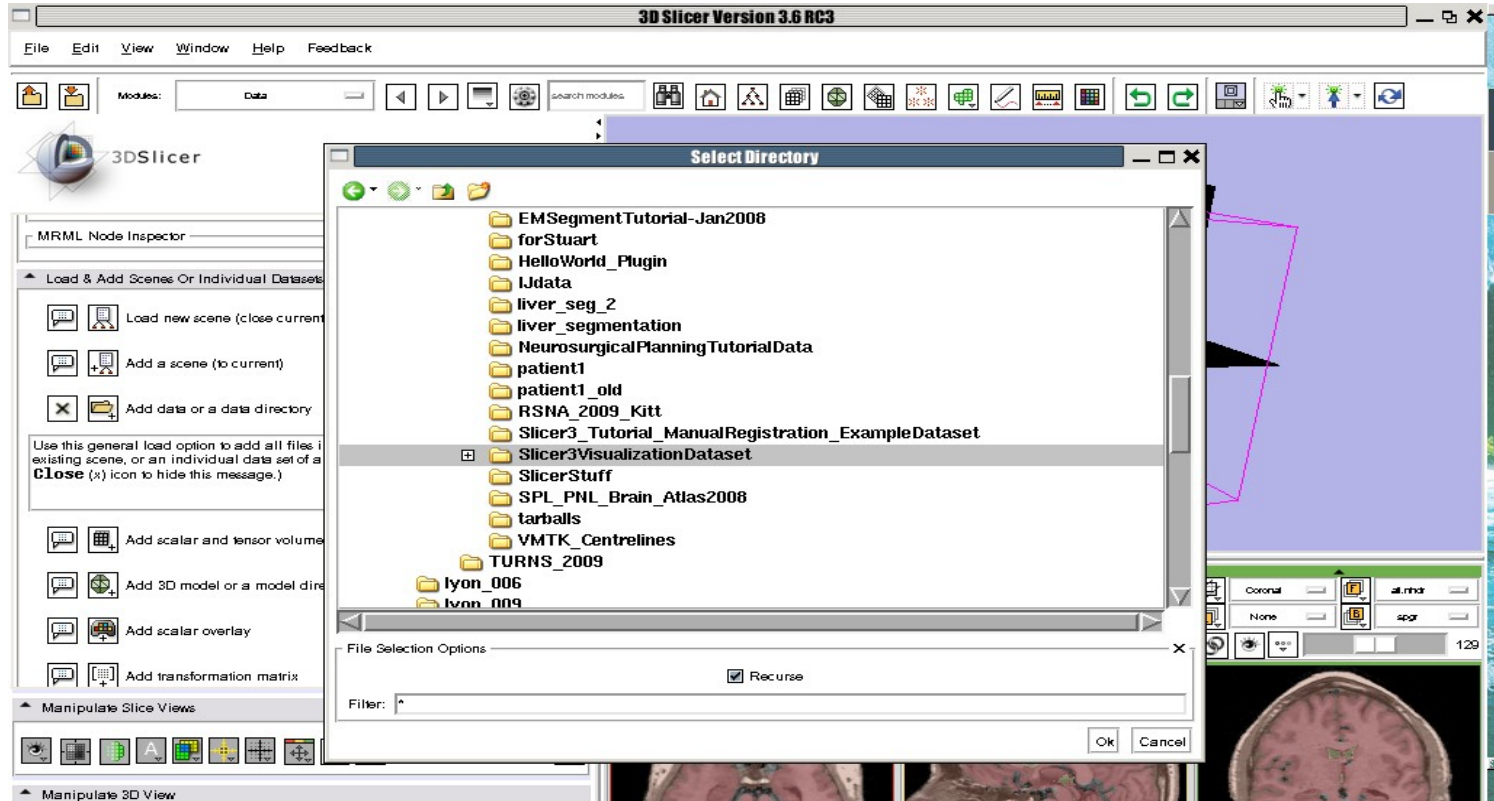
A small window displays information on how to use the function Add data or data directory

Click on the  icon

# 3D Visualization

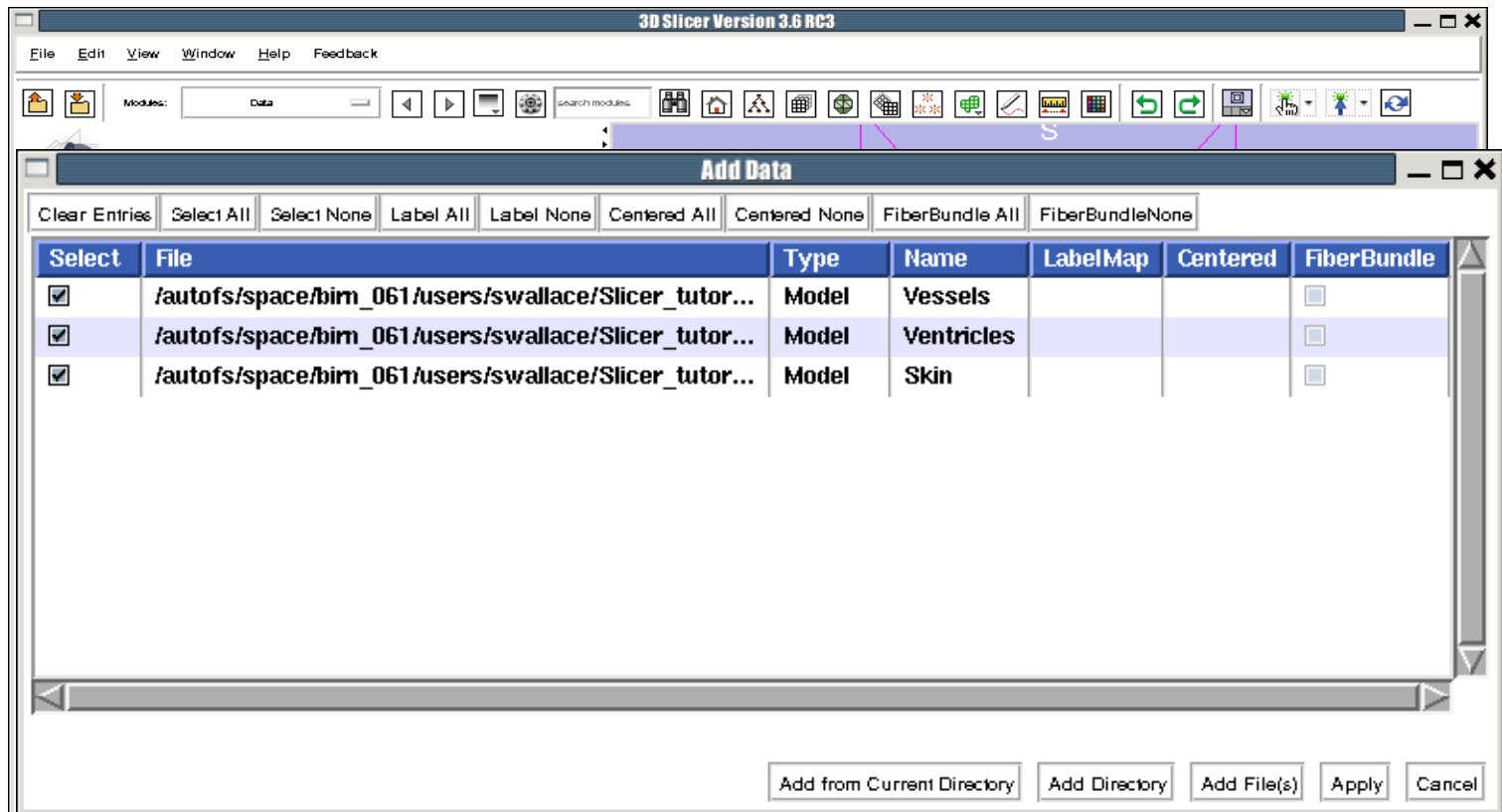


# Loading 3D models



Select the directory  
Slicer3VisualizationDataset/models and click on OK

# Loading 3D models

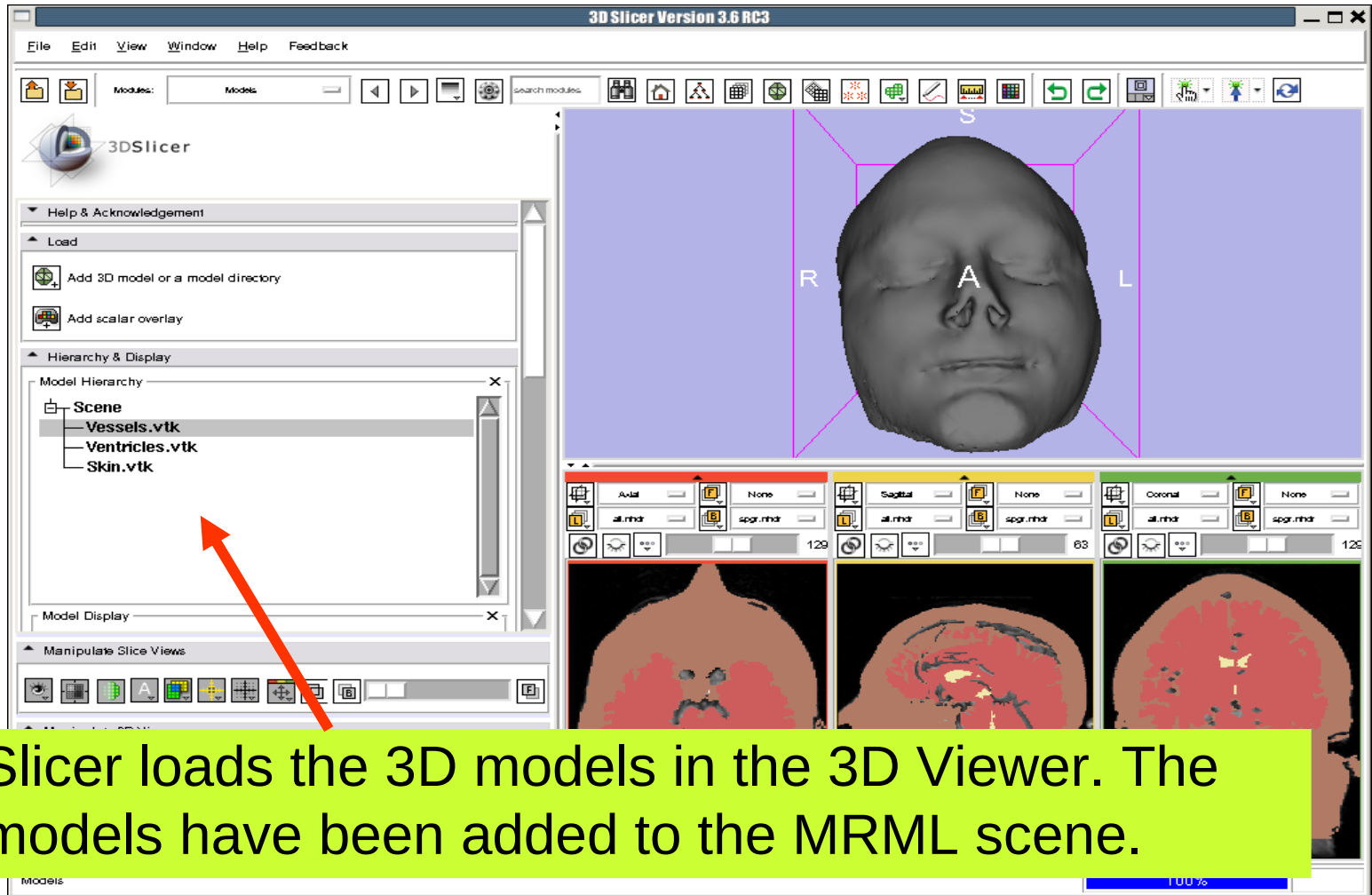


The list of elements present in the models directory appears in the Add Data window.

Click on Apply to load all the 3D models.

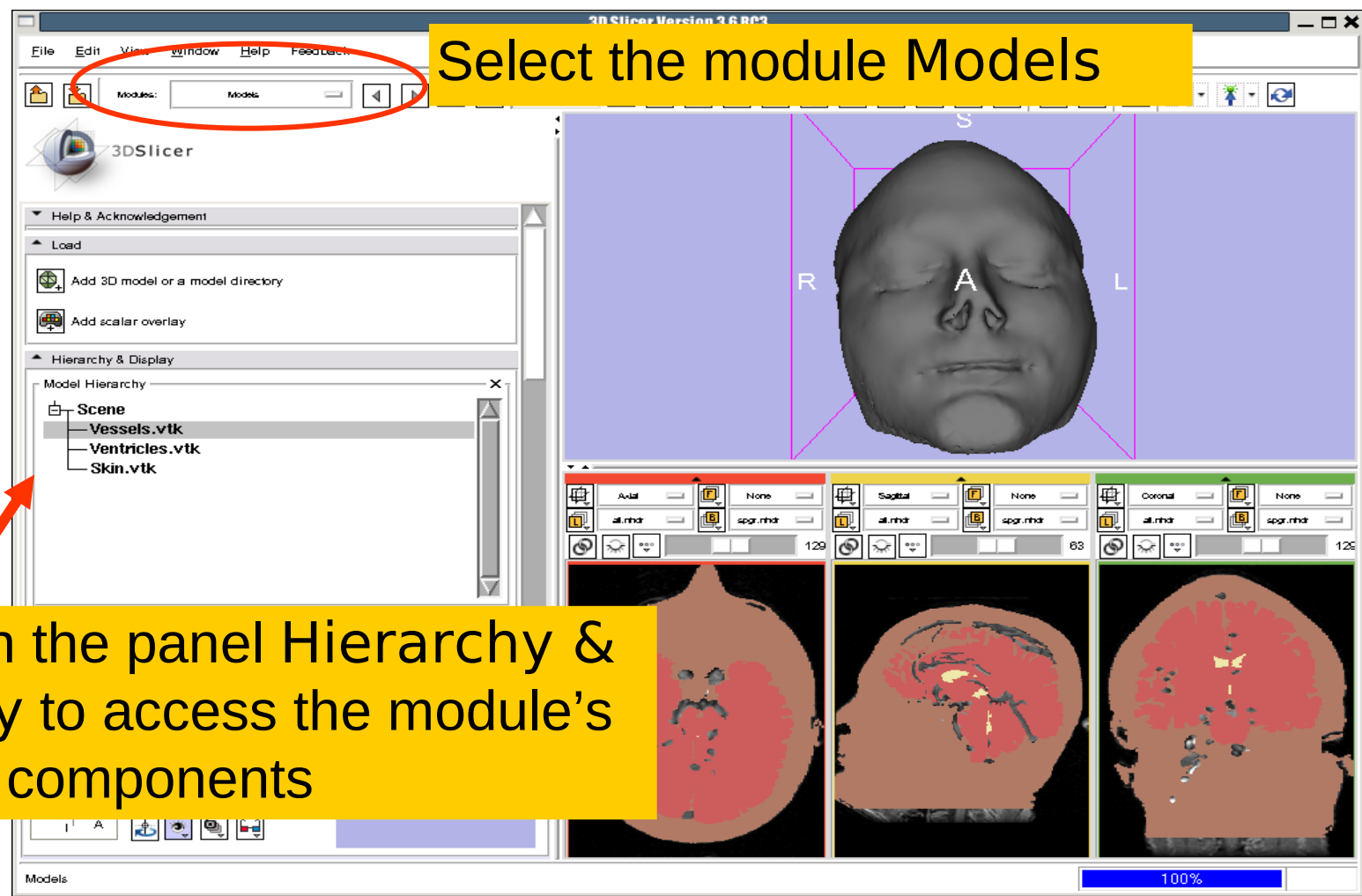


# Loading 3D models



Slicer loads the 3D models in the 3D Viewer. The models have been added to the MRML scene.

# Loading a 3D model

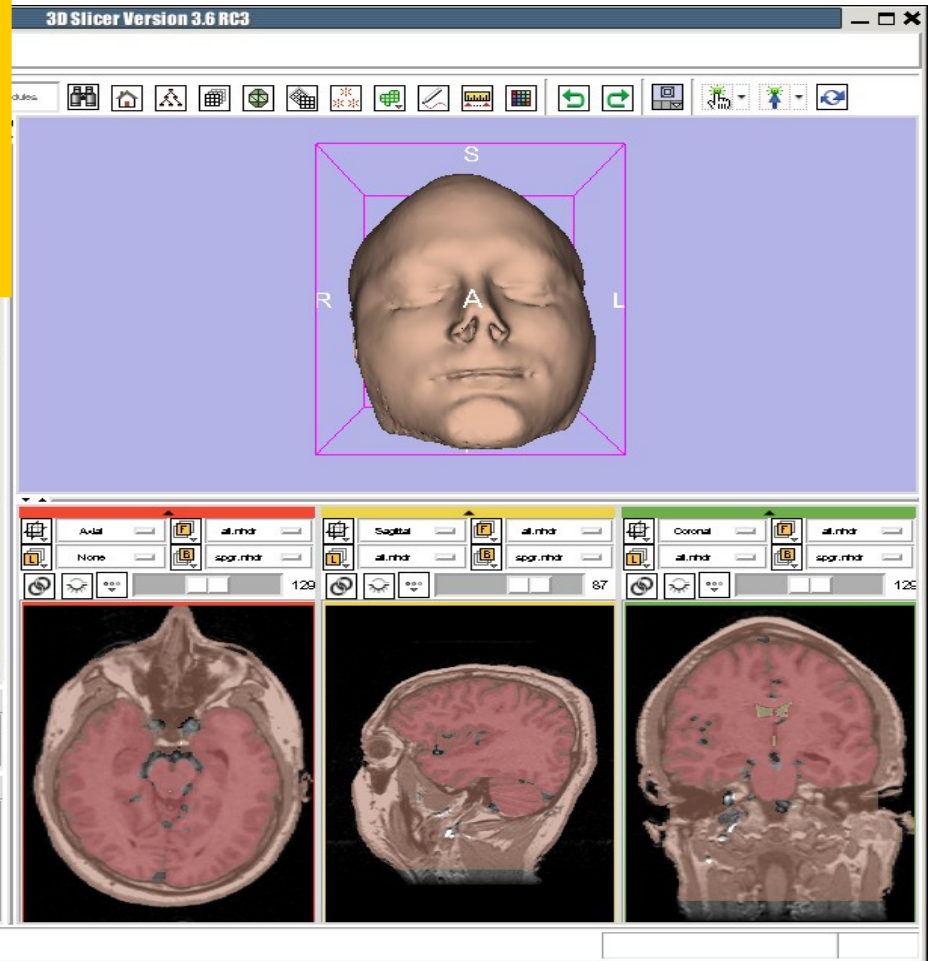
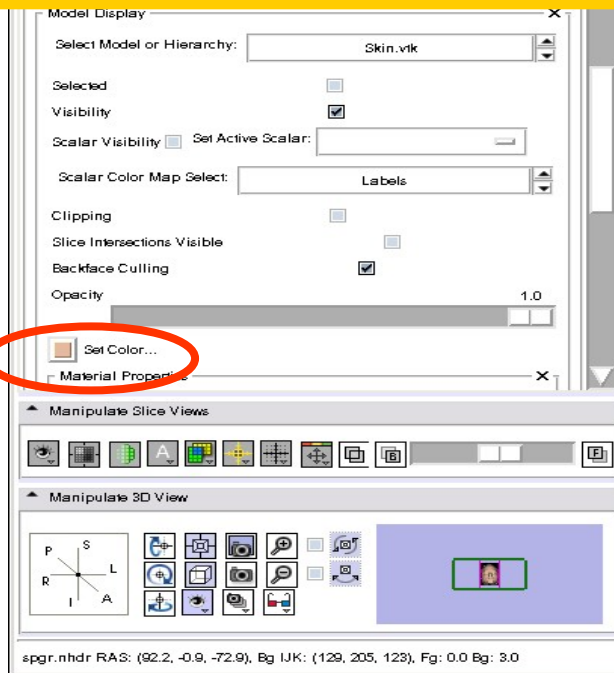


Click on the panel Hierarchy & Display to access the module's display components



# Visualizing a 3D model

Select the model Skin.vtk  
Click on the icon Set Color  
and choose a new color for  
the 3D model of the head.





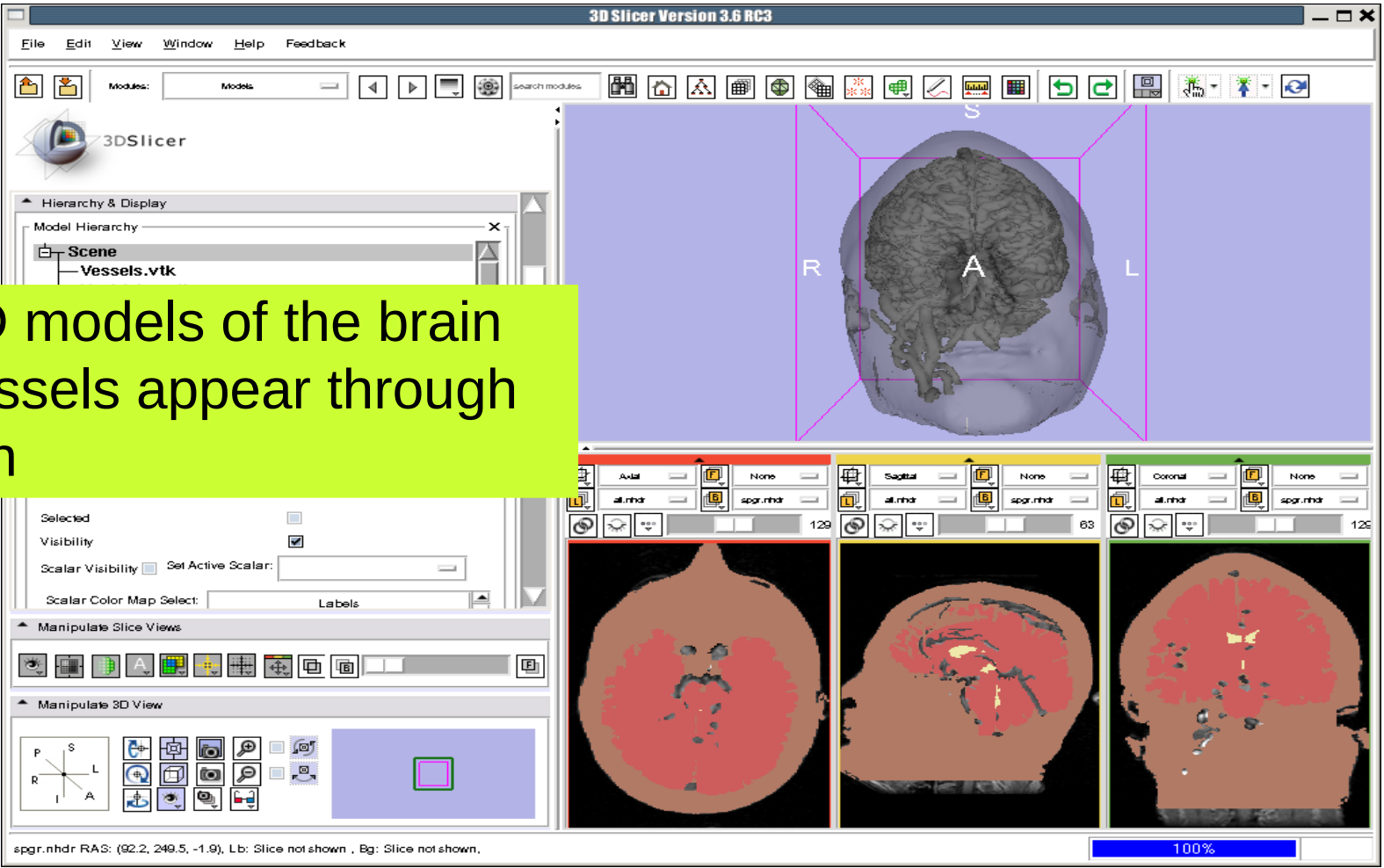
# Visualizing a 3D model

Change the opacity of the skin model from 1.0 to 0.5 using the opacity slider:



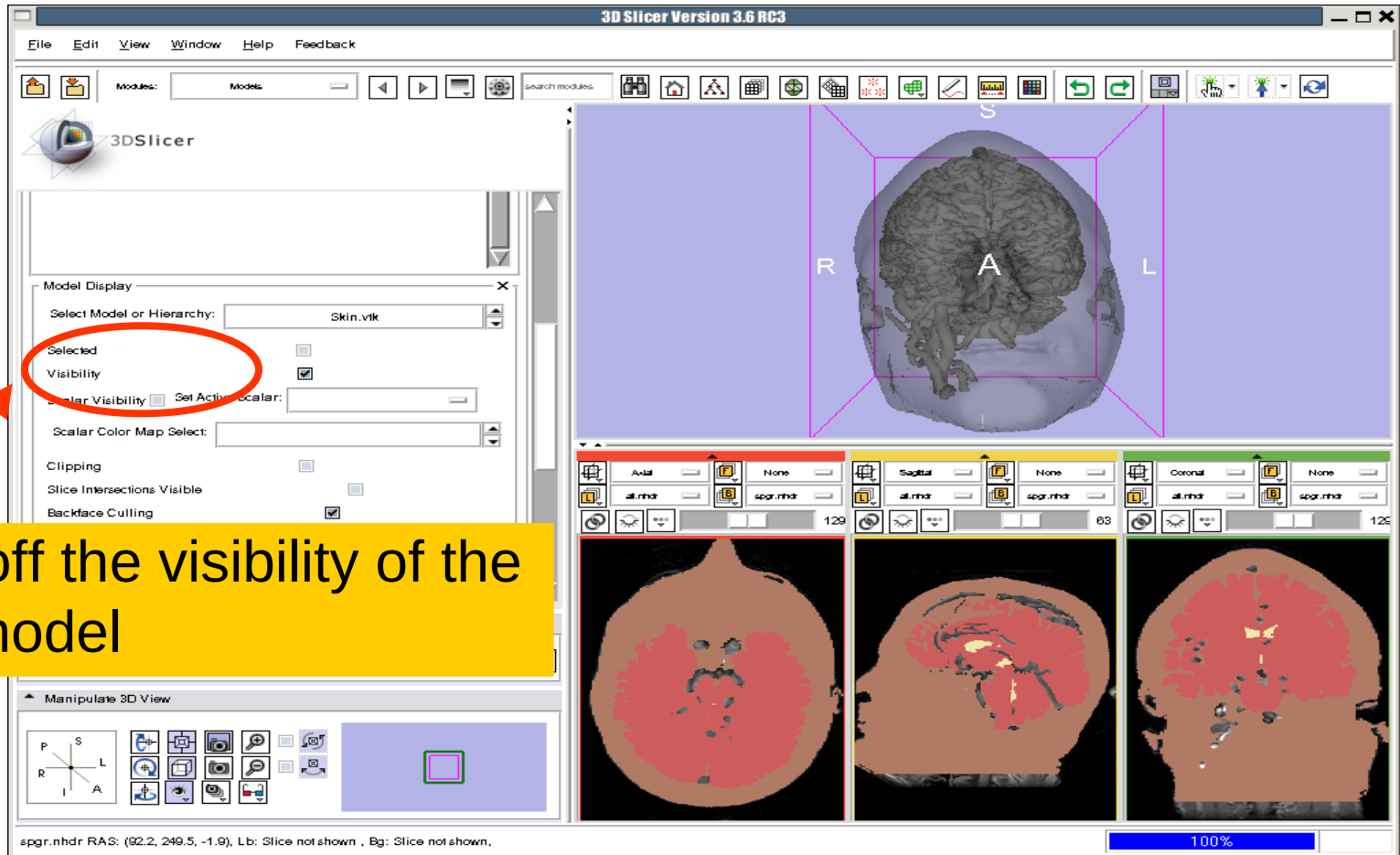


# Visualizing a 3D model



The 3D models of the brain and vessels appear through the skin

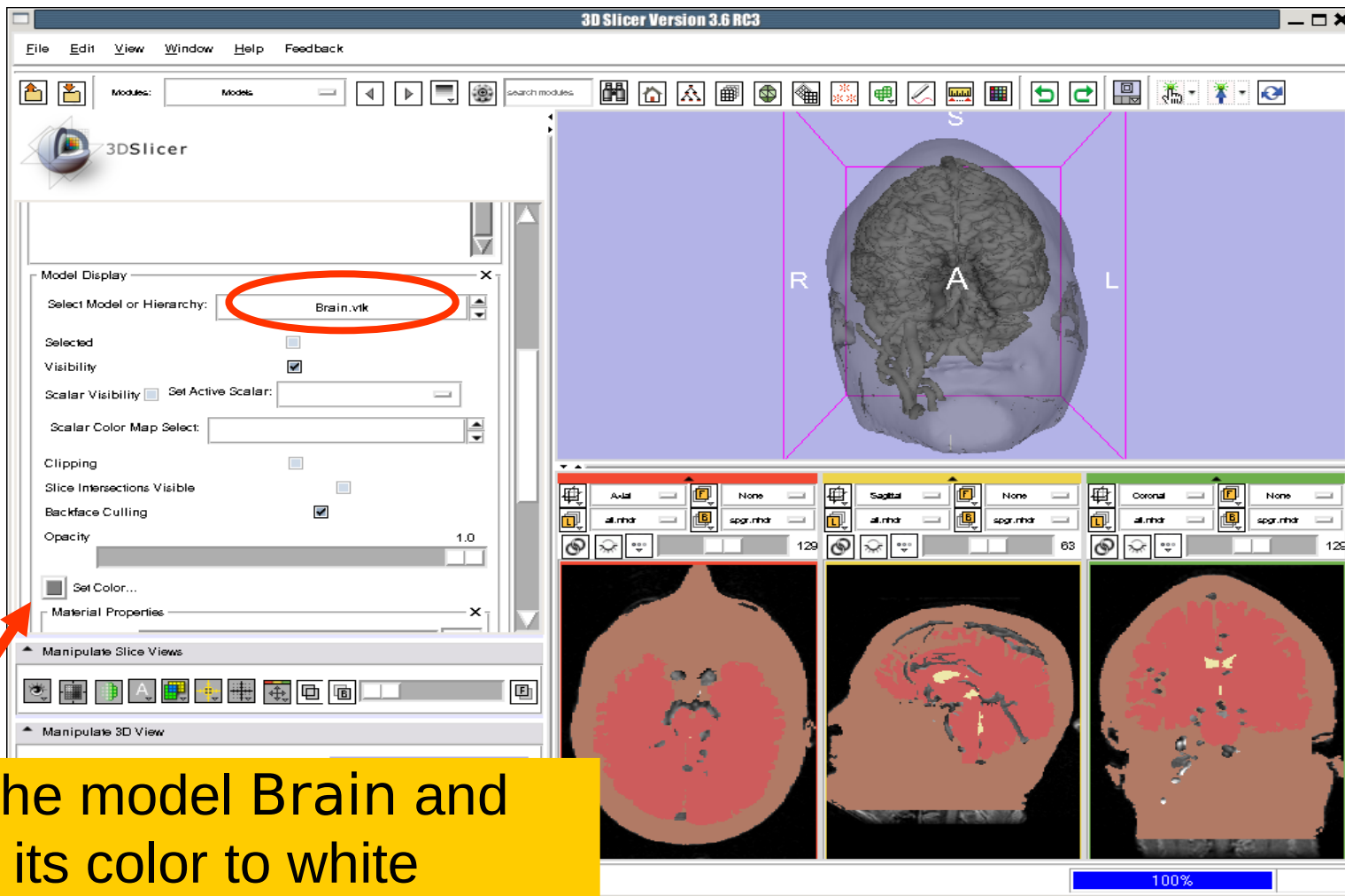
# Visualizing a 3D model



Turn off the visibility of the skin model

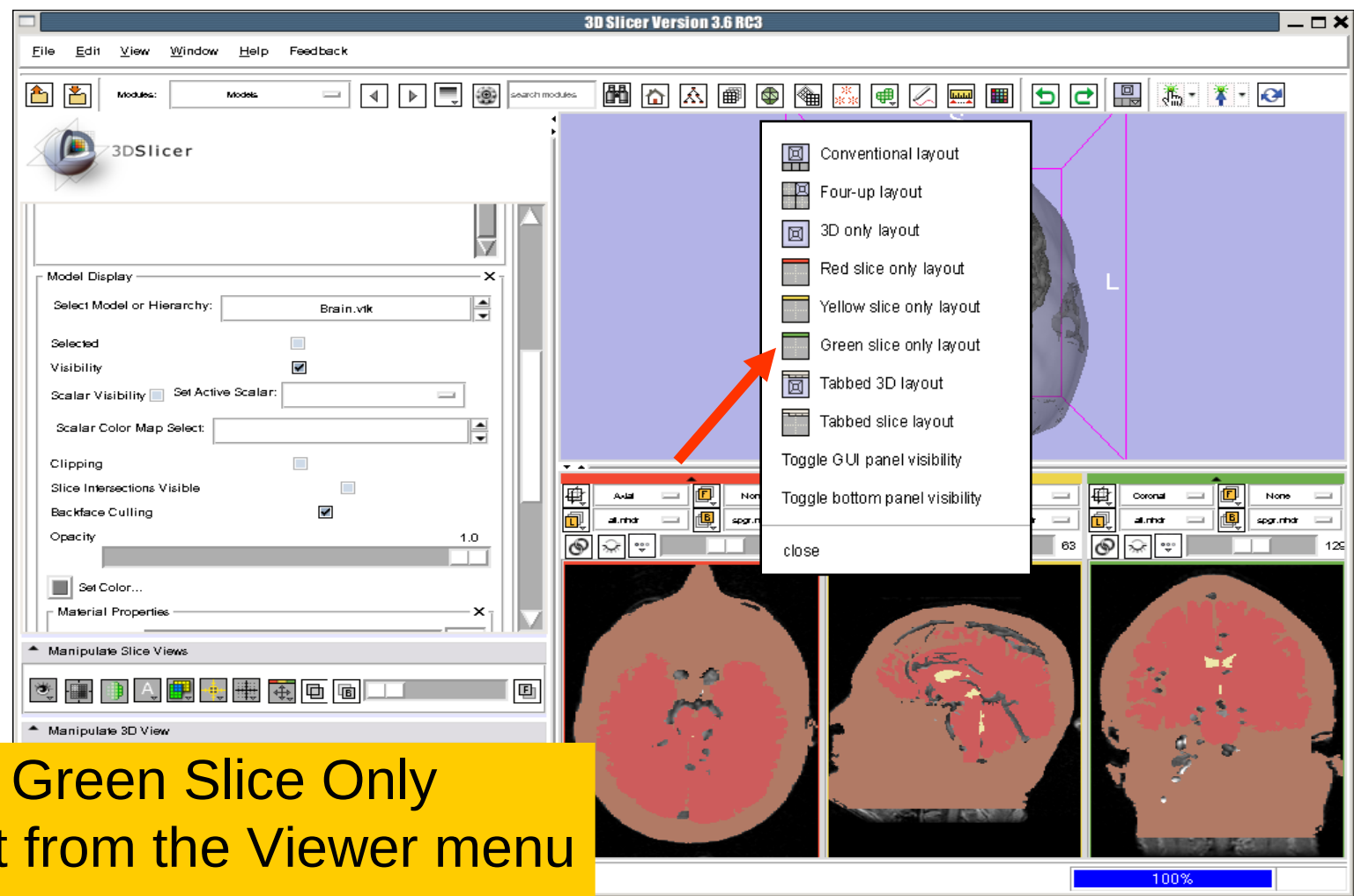


# Visualizing a 3D model





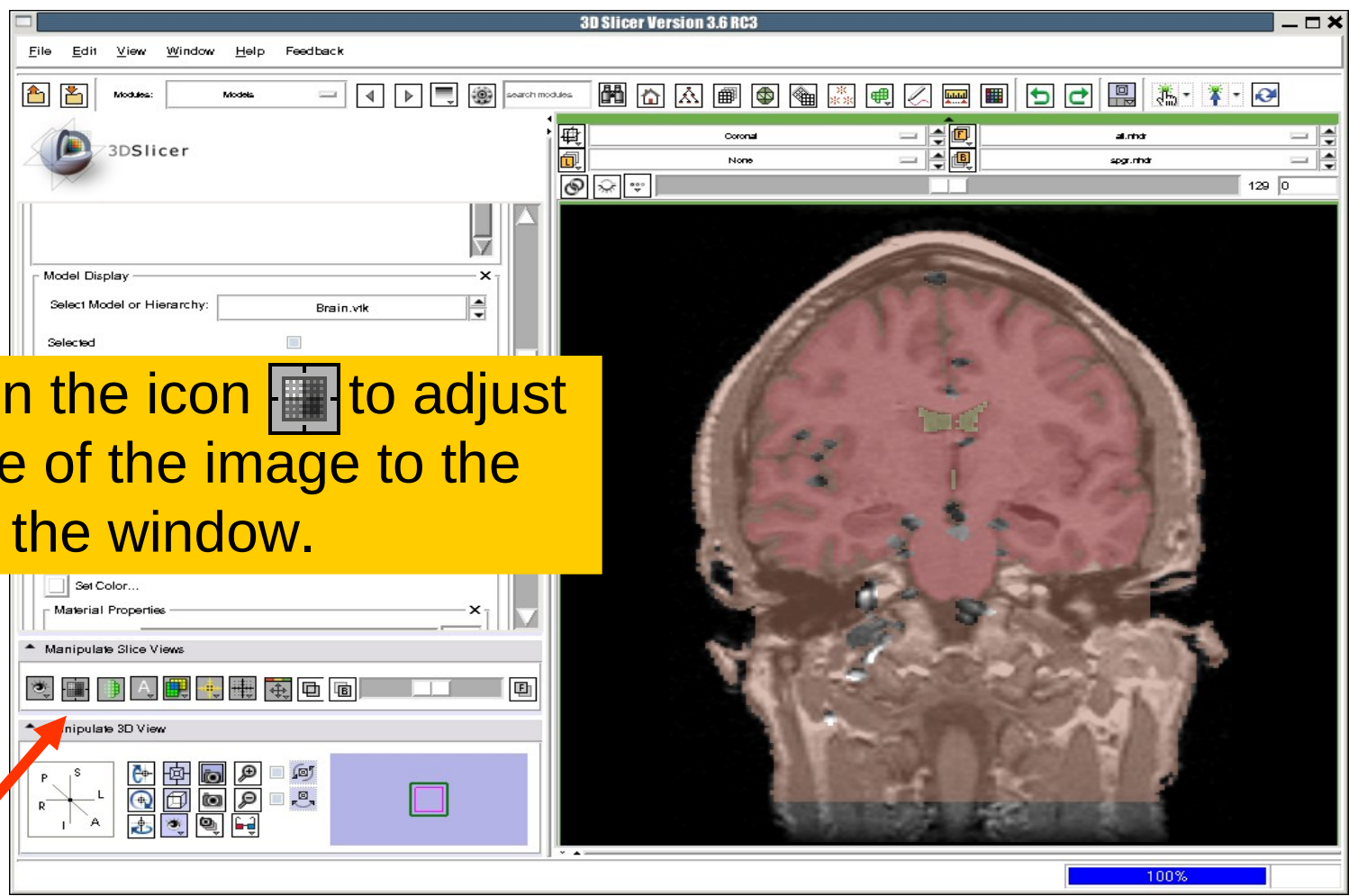
# Visualizing a 3D model



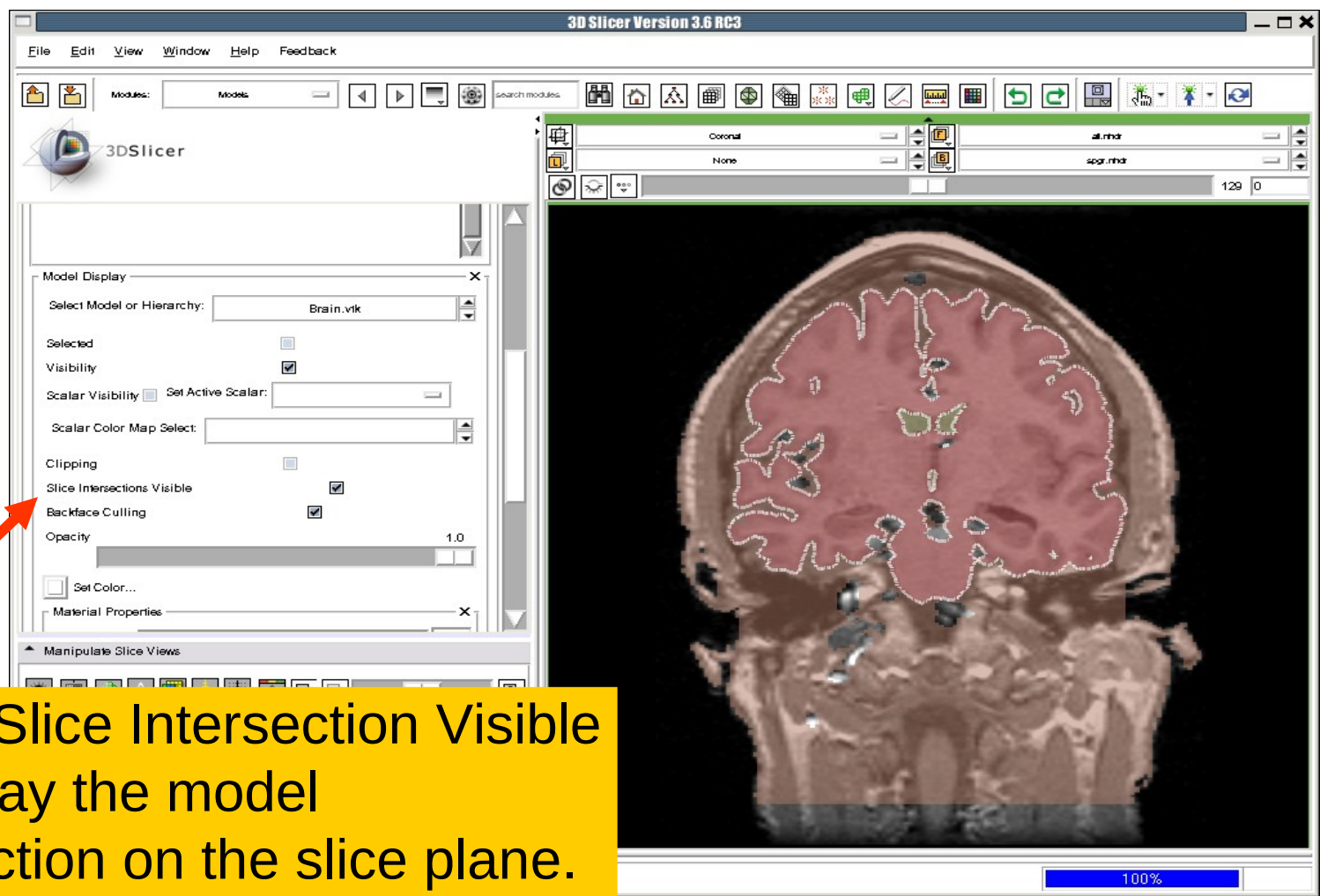
Select Green Slice Only Layout from the Viewer menu



# Visualizing a 3D model

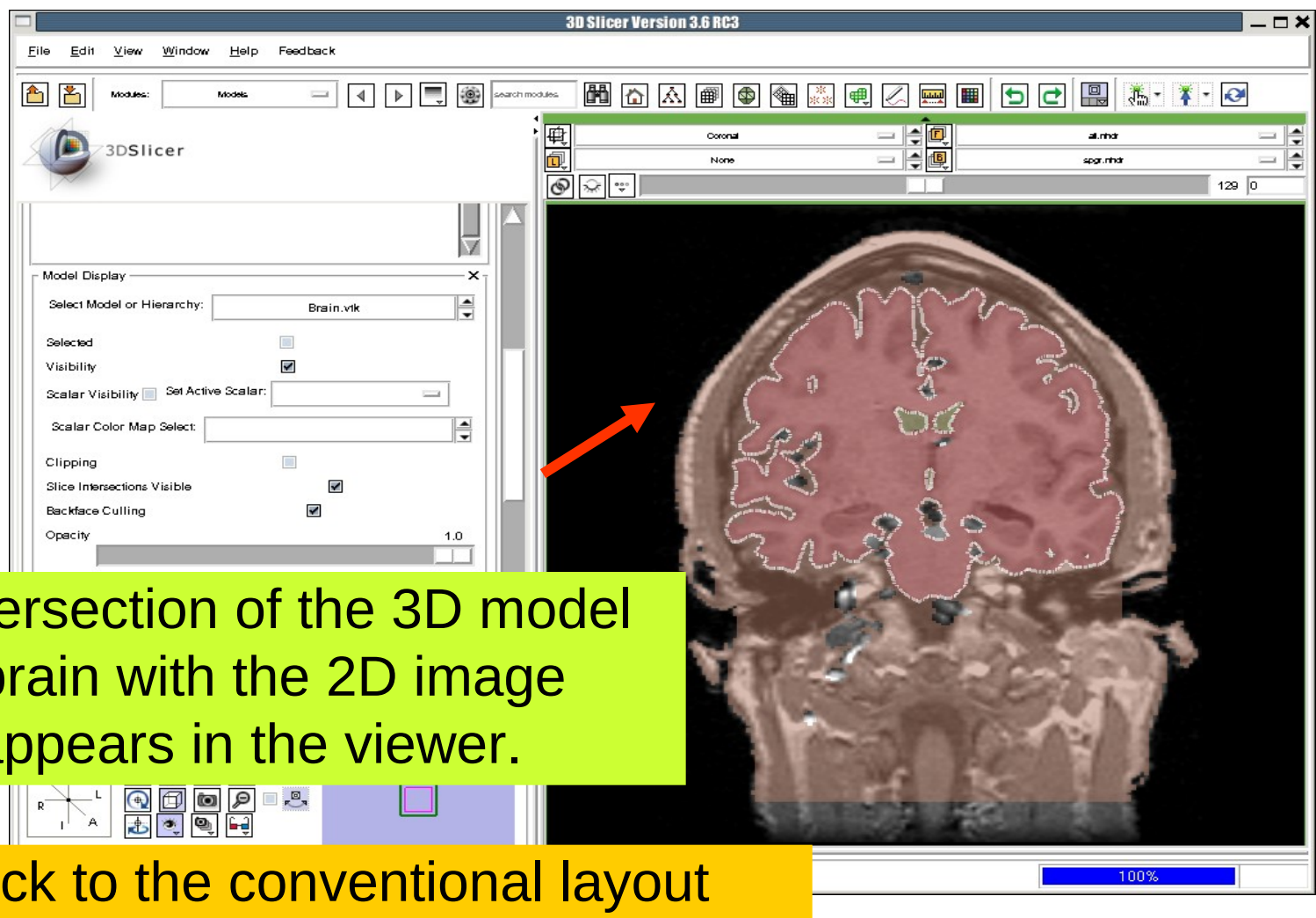


# Visualizing a 3D model



Select Slice Intersection Visible to display the model intersection on the slice plane.

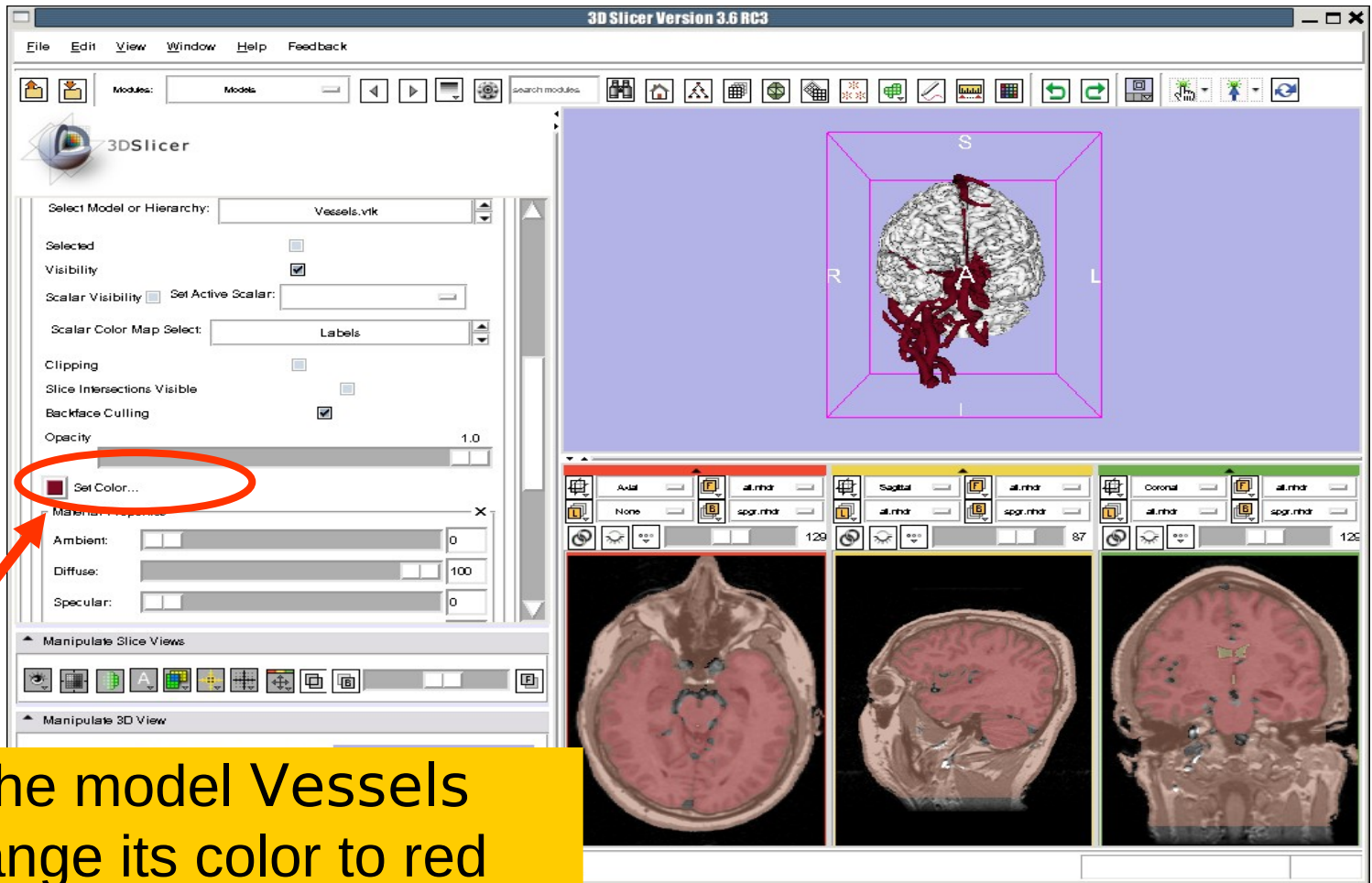
# Visualizing a 3D model



The intersection of the 3D model of the brain with the 2D image plane appears in the viewer.

Go back to the conventional layout

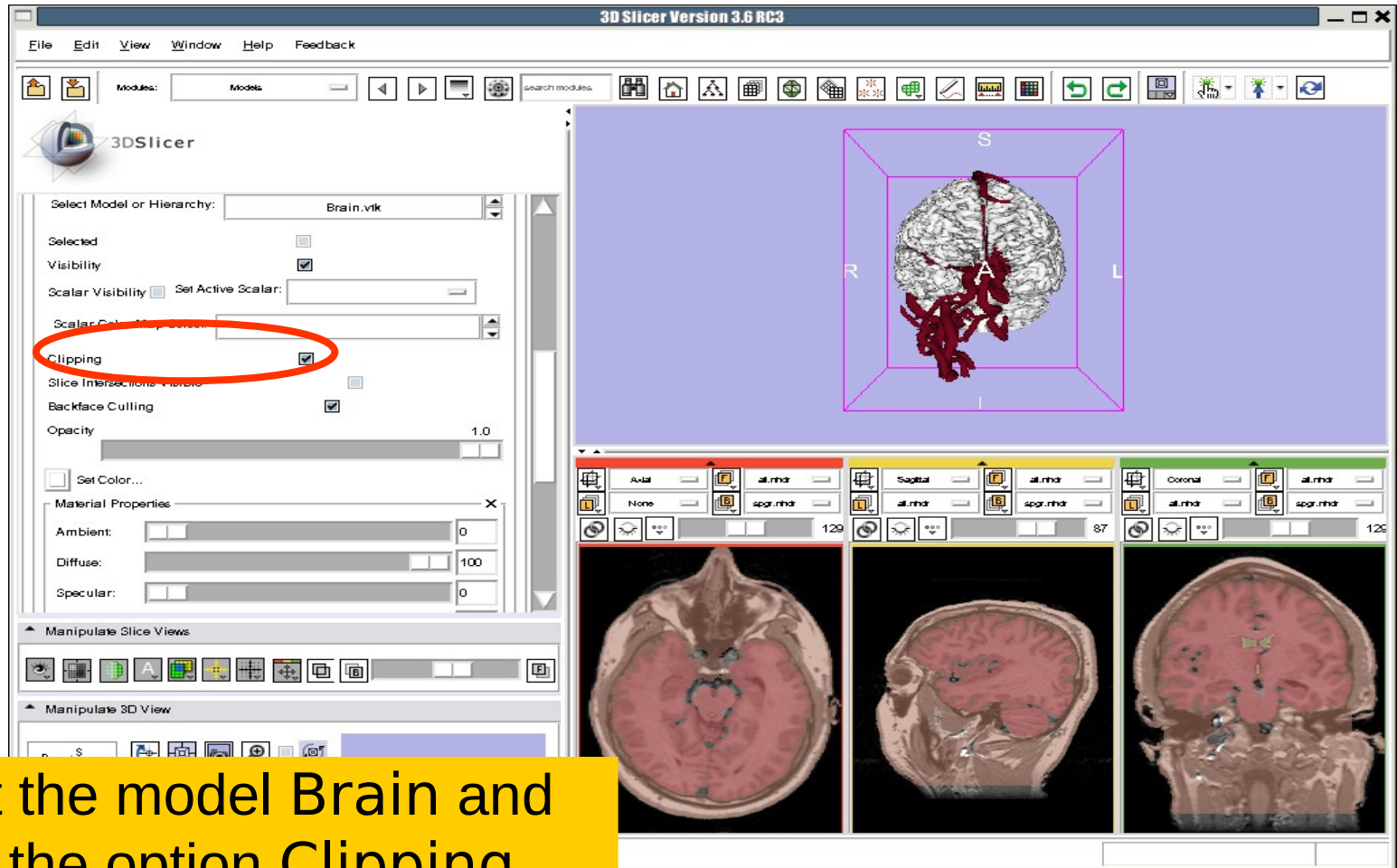
# Visualizing a 3D model



Select the model Vessels and change its color to red



# Visualizing a 3D model

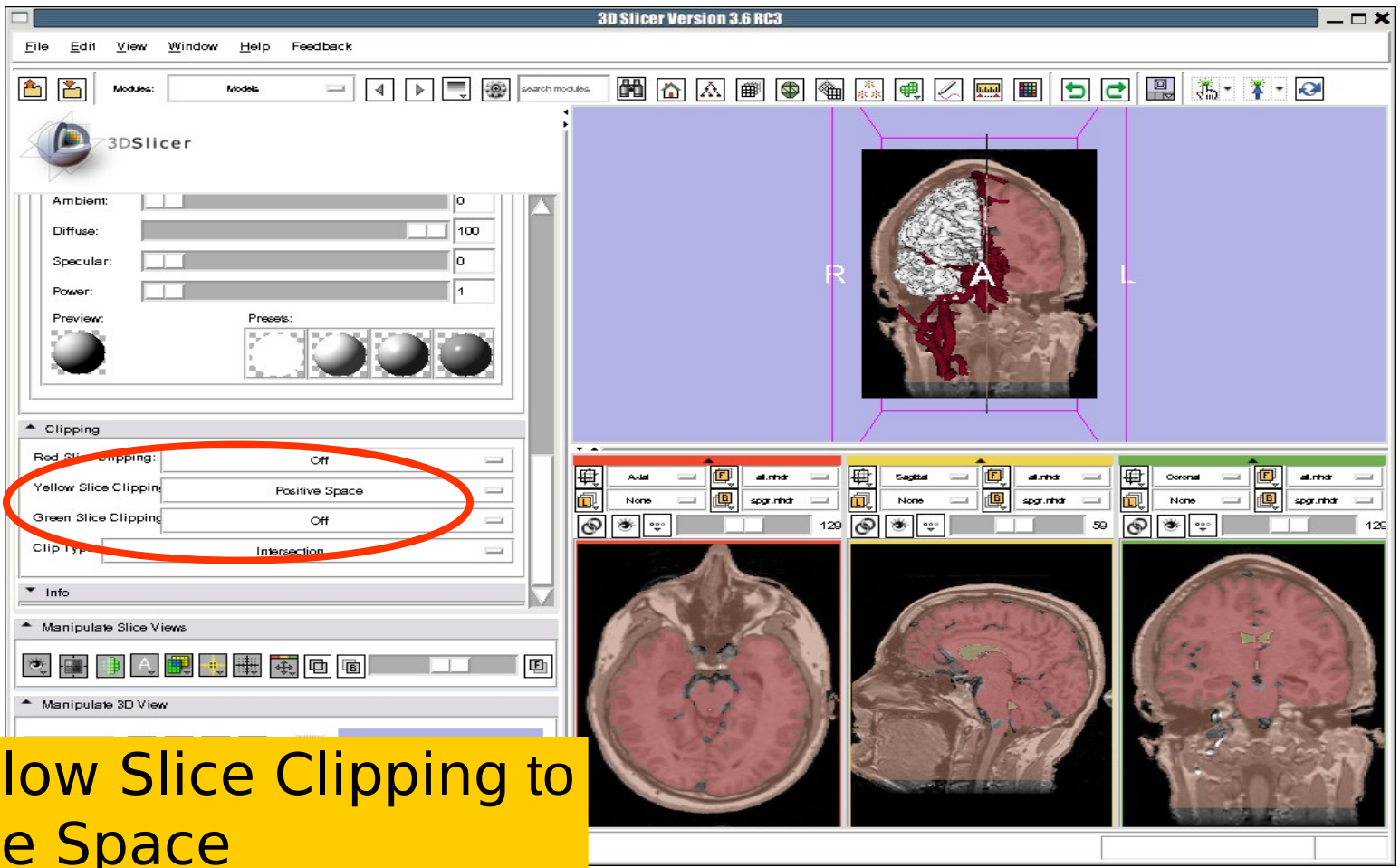


Select the model Brain and select the option Clipping





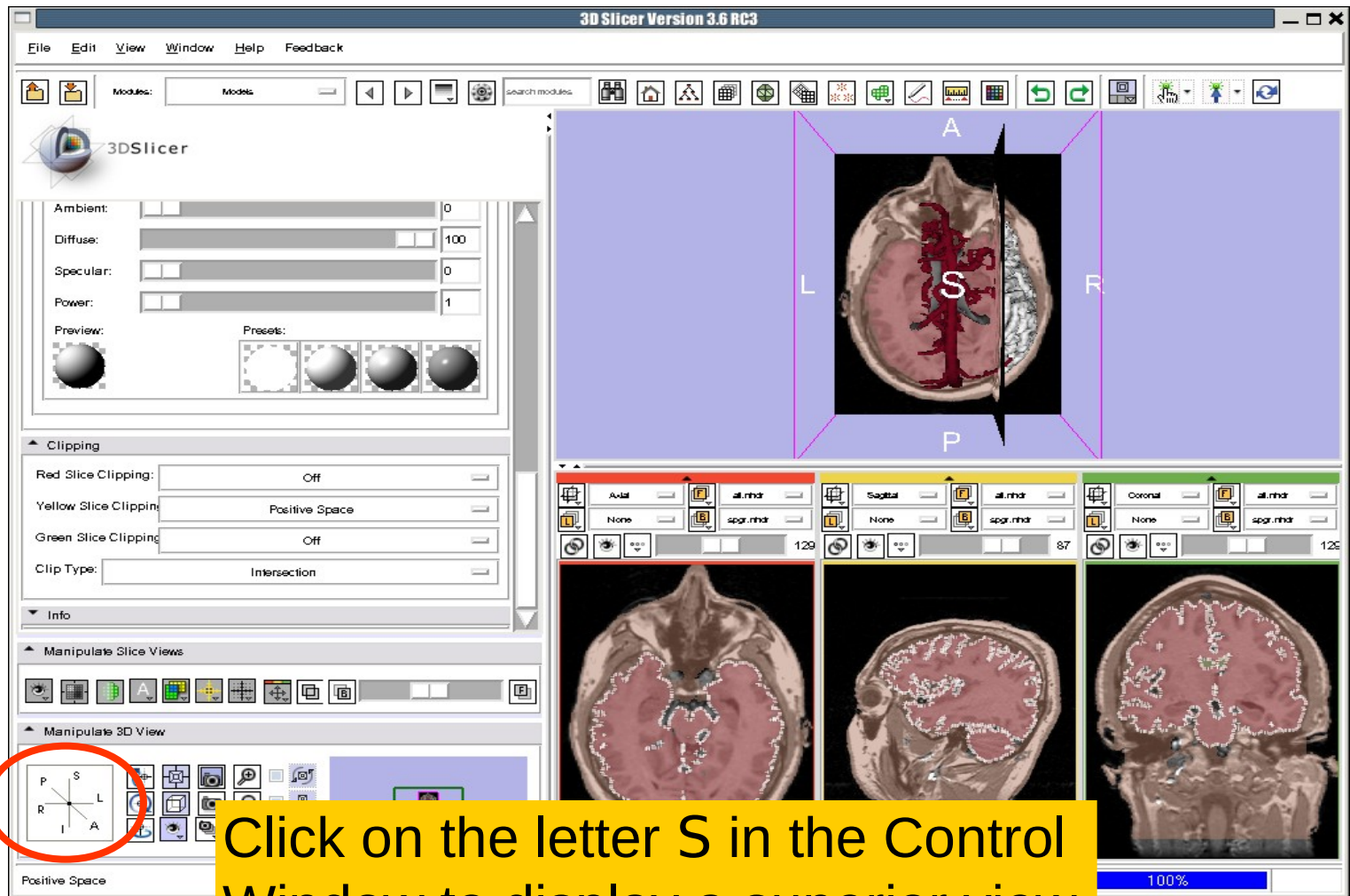
# Visualizing a 3D model



Set Yellow Slice Clipping to Positive Space



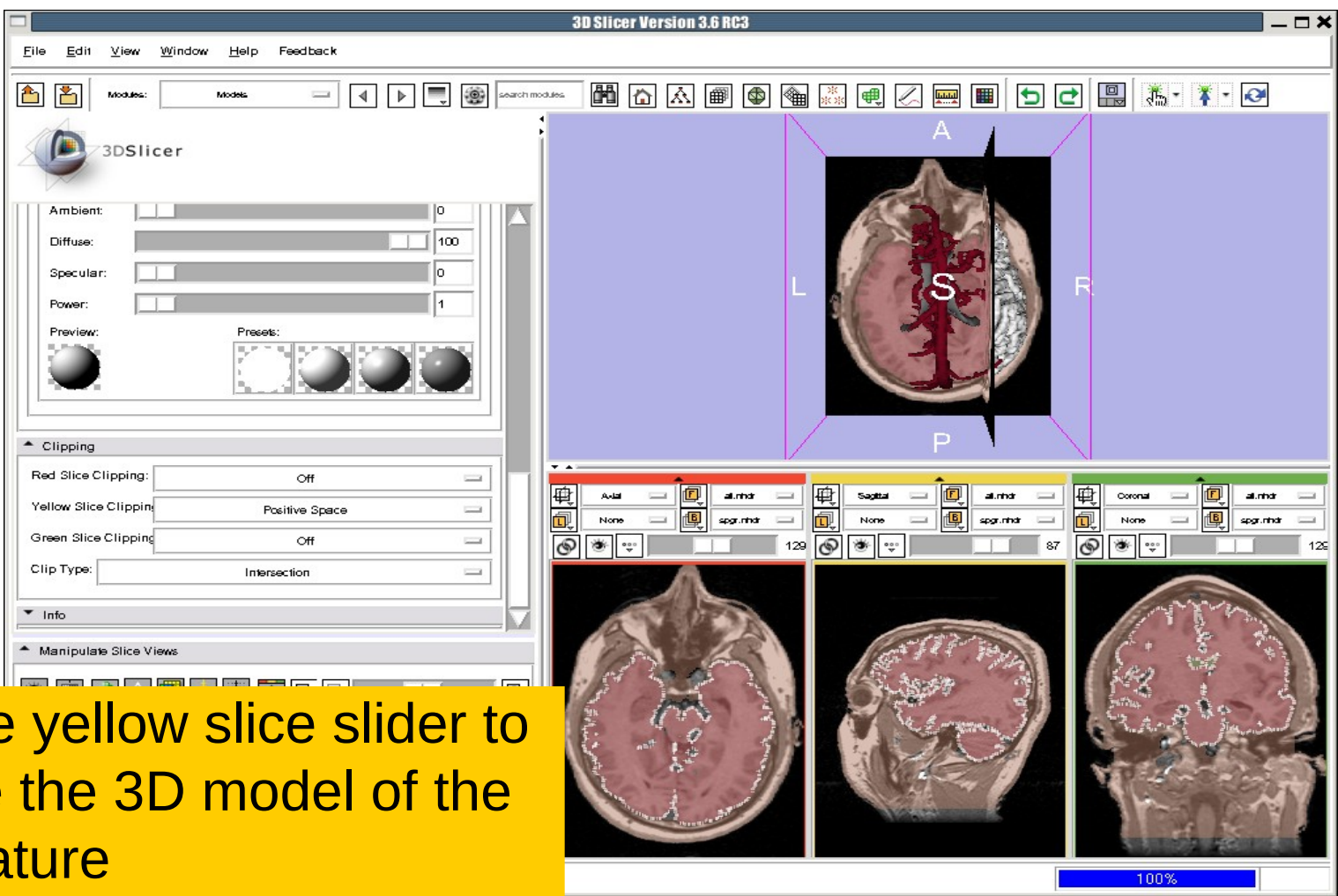
# Visualizing a 3D model



Click on the letter S in the Control Window to display a superior view of the 3D models

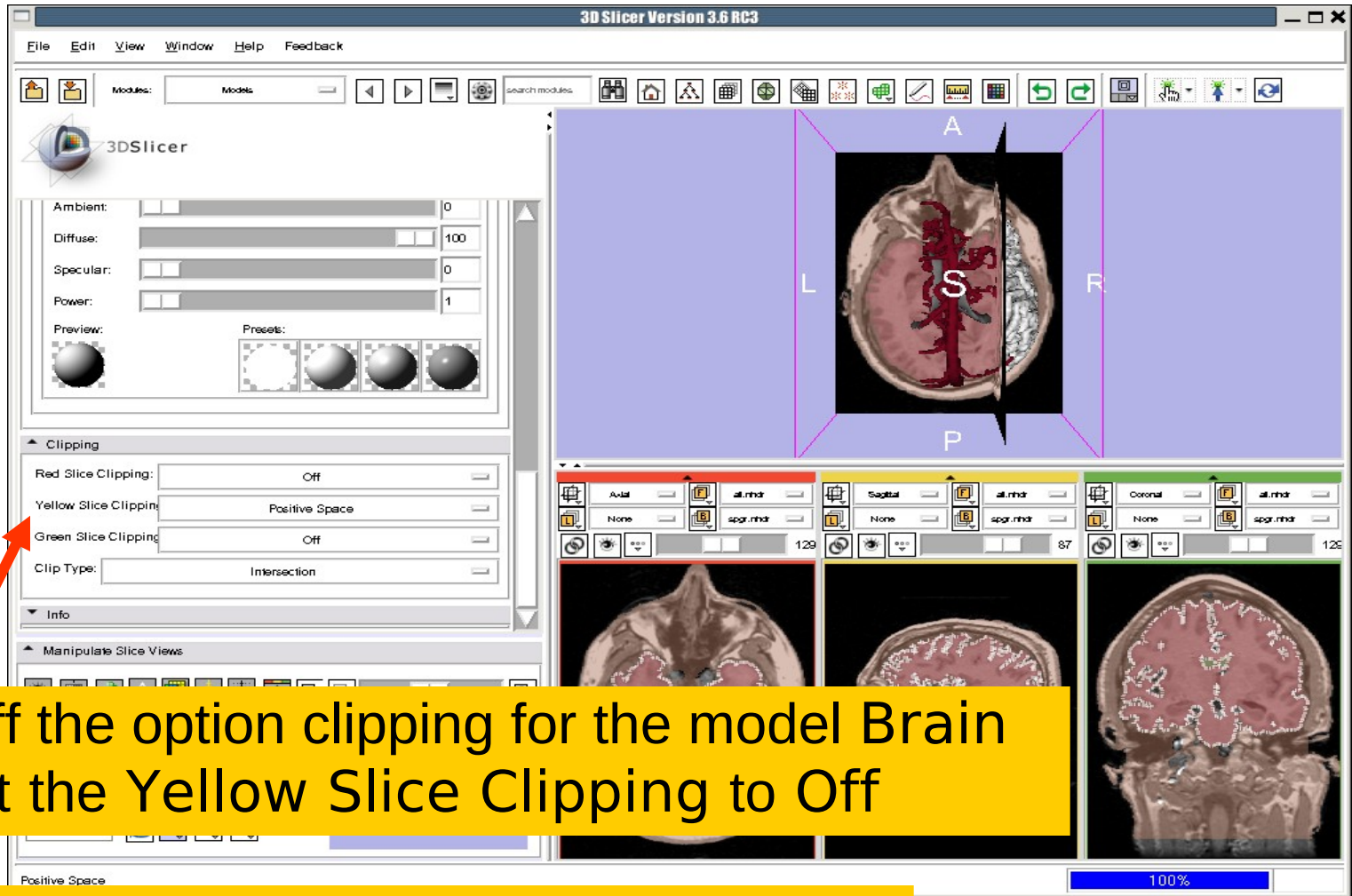


# Visualizing a 3D model



Use the yellow slice slider to expose the 3D model of the vasculature

# Visualizing a 3D model

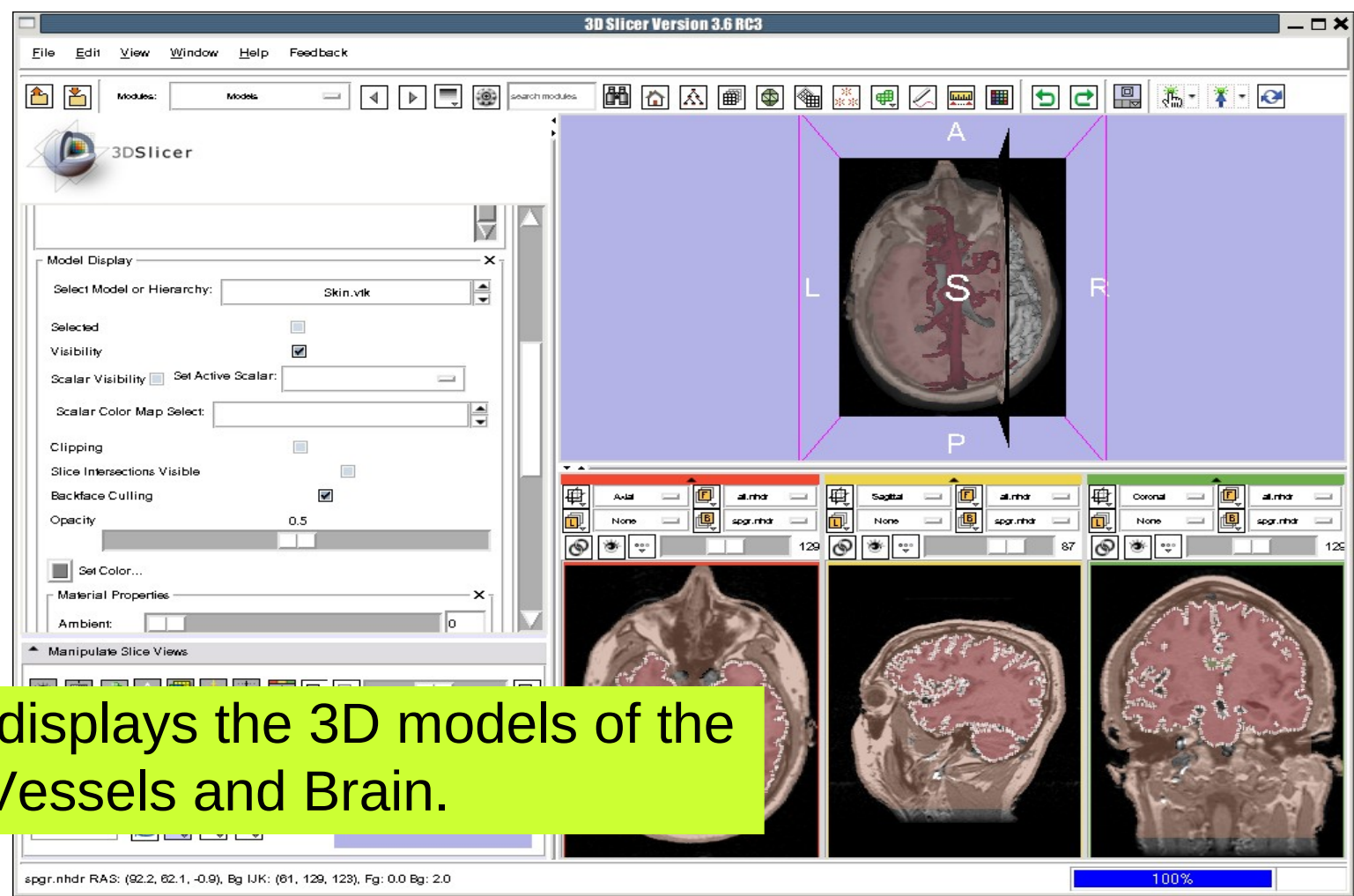


Turn off the option clipping for the model Brain and set the Yellow Slice Clipping to Off

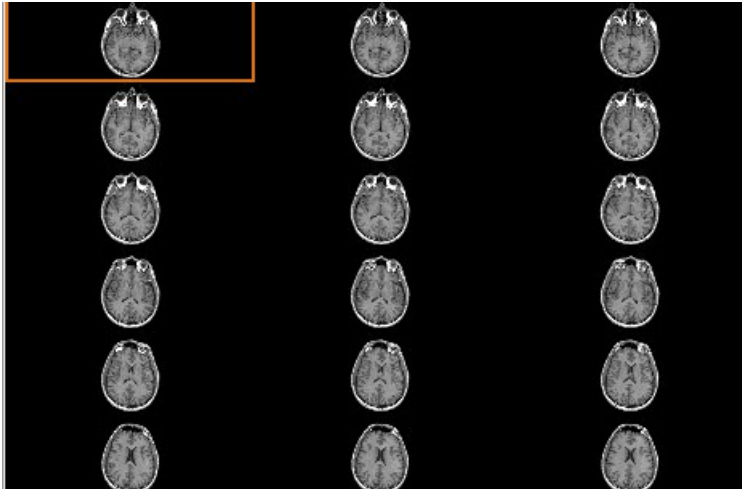
Turn on the visibility of the model Skin



# Visualizing a 3D model



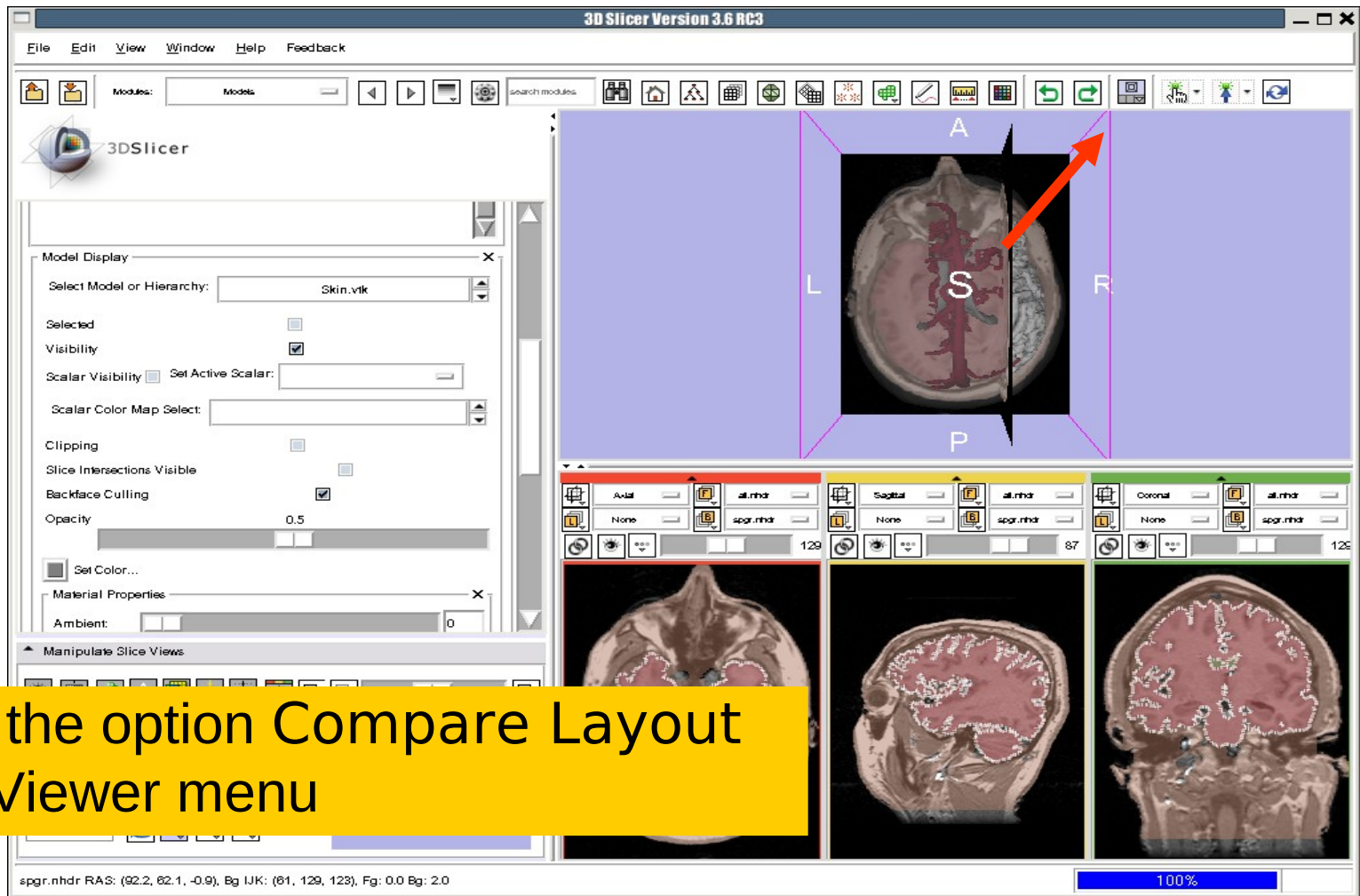
Slicer displays the 3D models of the Skin, Vessels and Brain.



## Part 4: Lightbox viewer



# Visualizing a 3D model

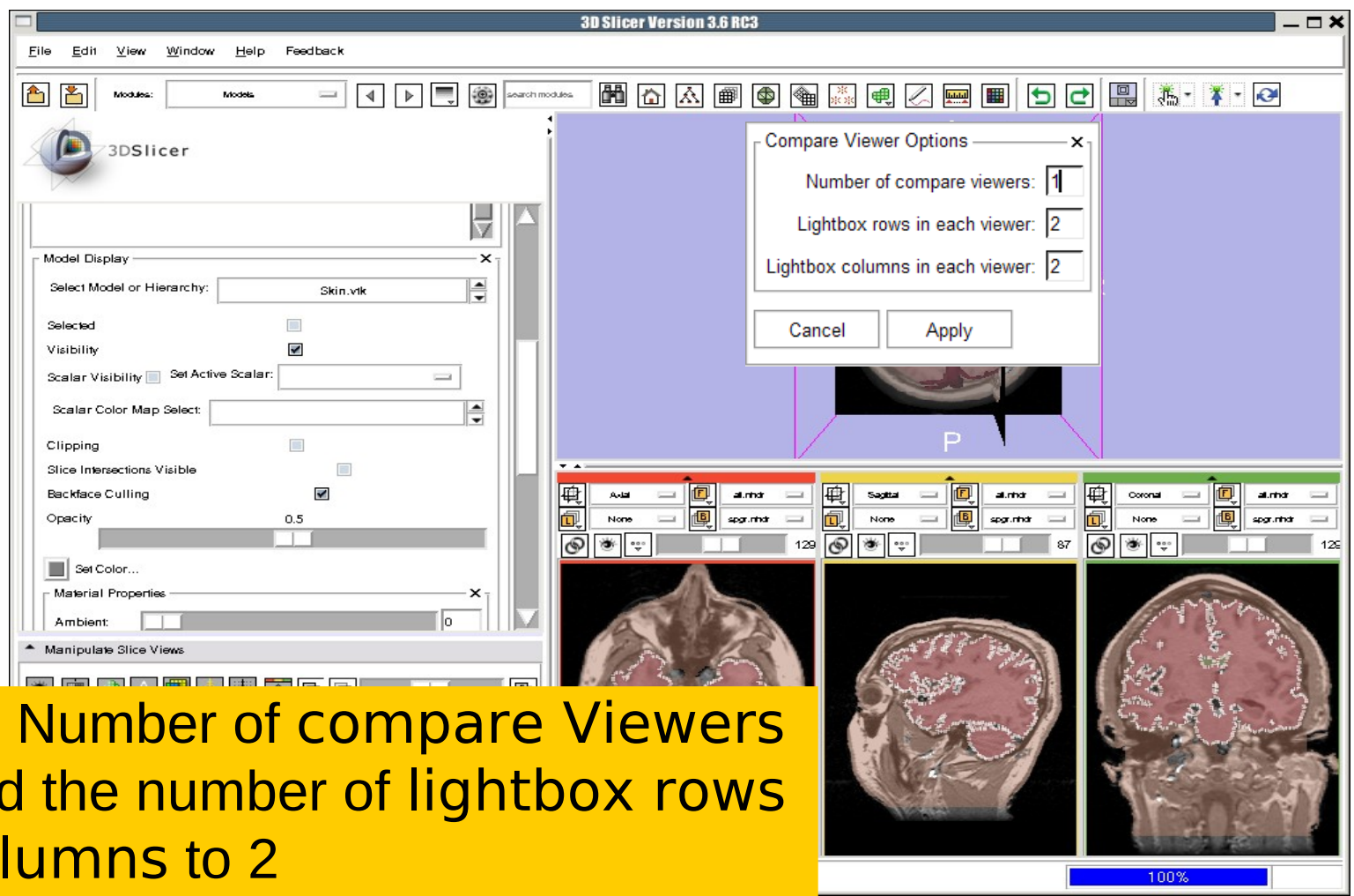


Select the option Compare Layout  
in the Viewer menu





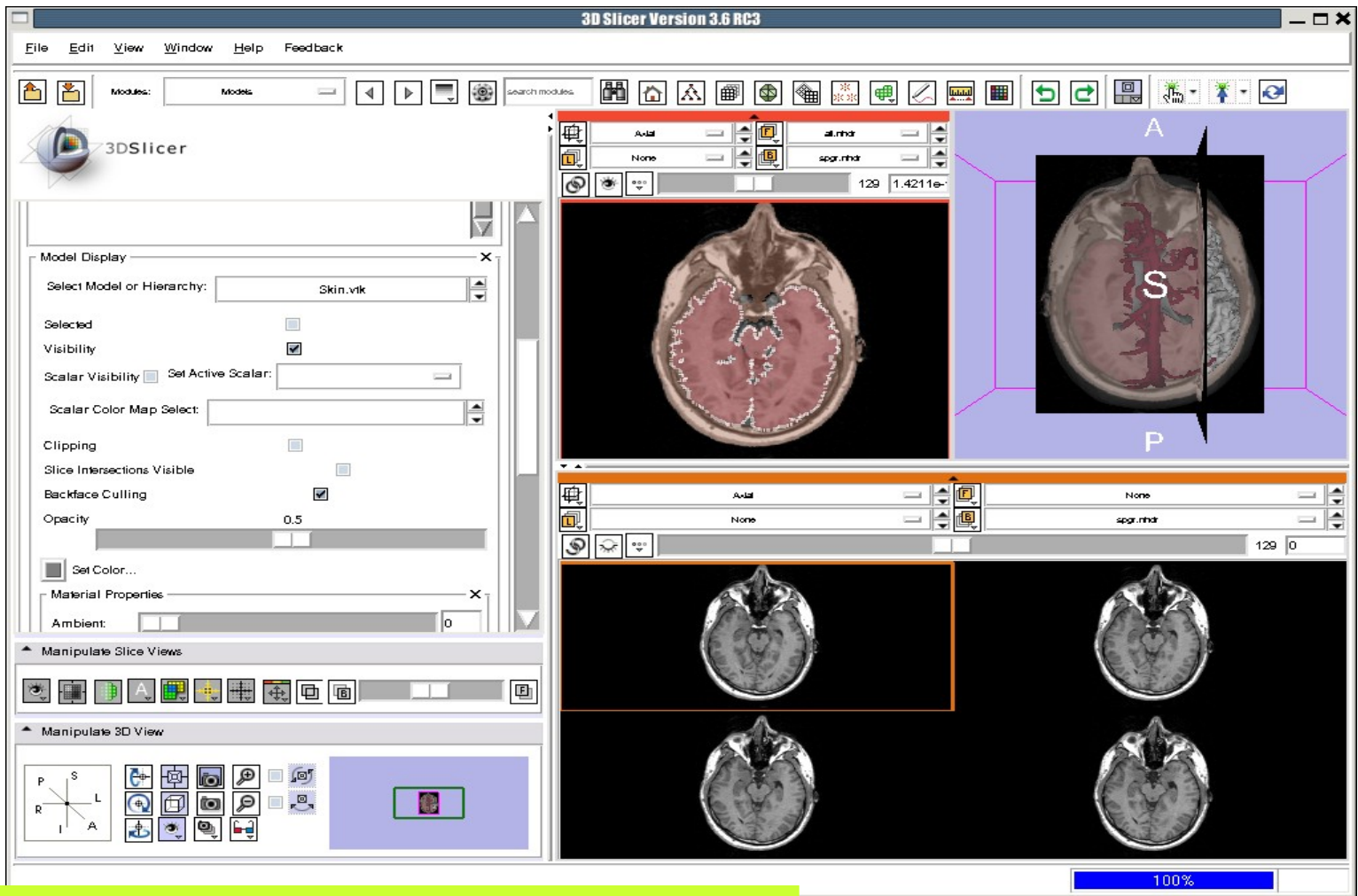
# Visualizing a 3D model



Set the Number of compare Viewers to 1 and the number of lightbox rows and columns to 2

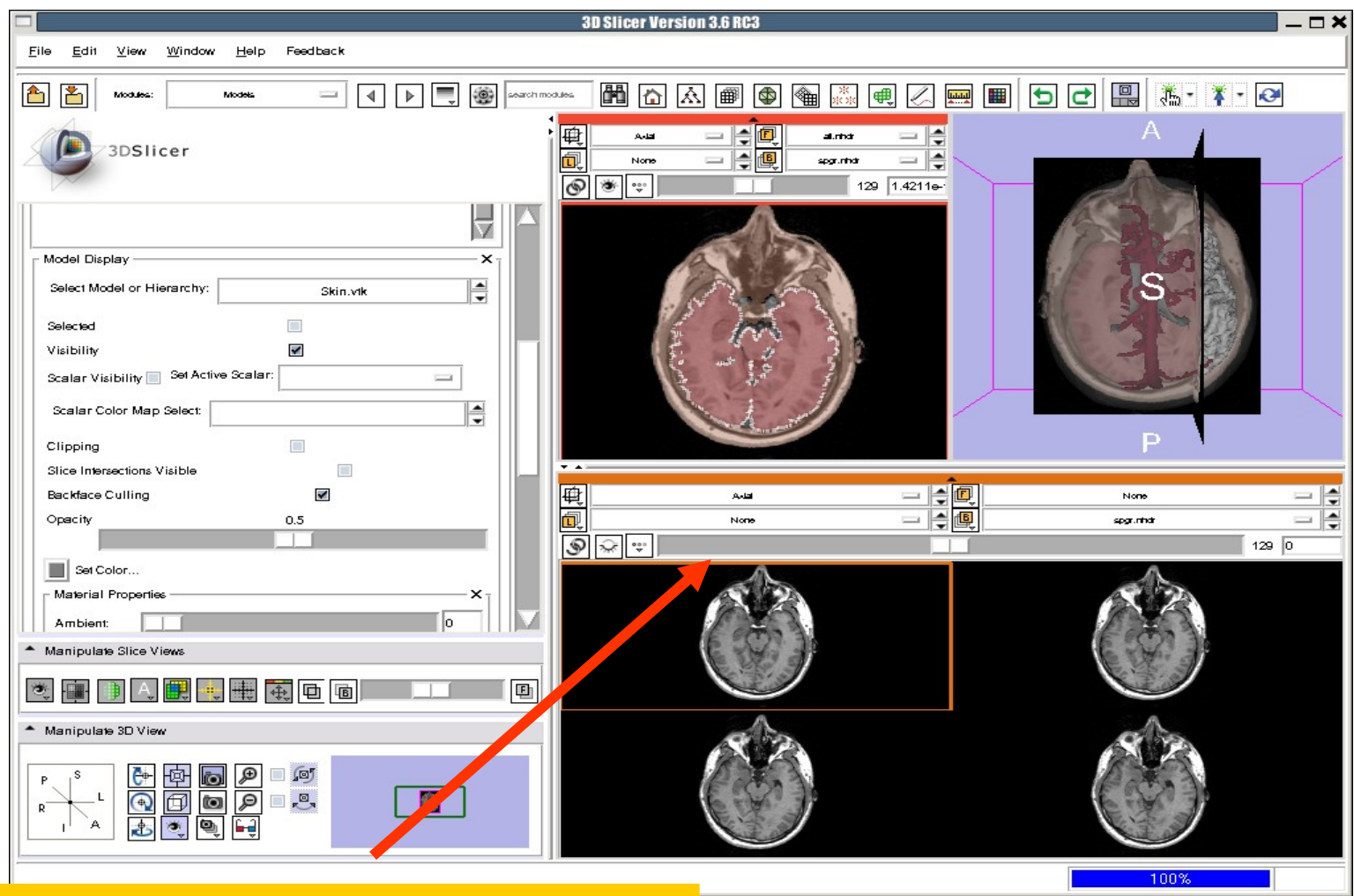
Click on Apply

# Lightbox viewer



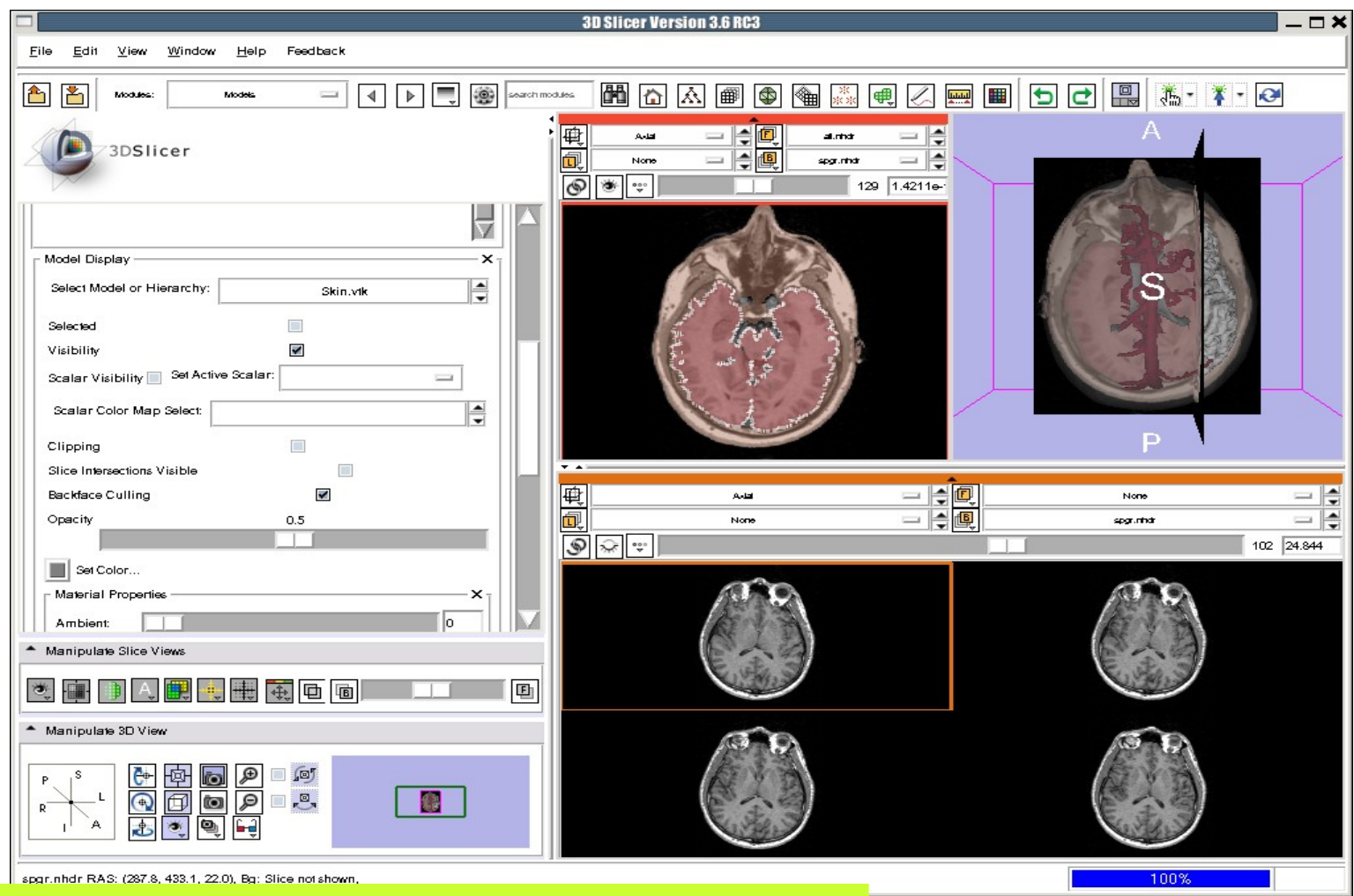
Slicer displays a lightbox view of the Background dataset.

# Lightbox viewer



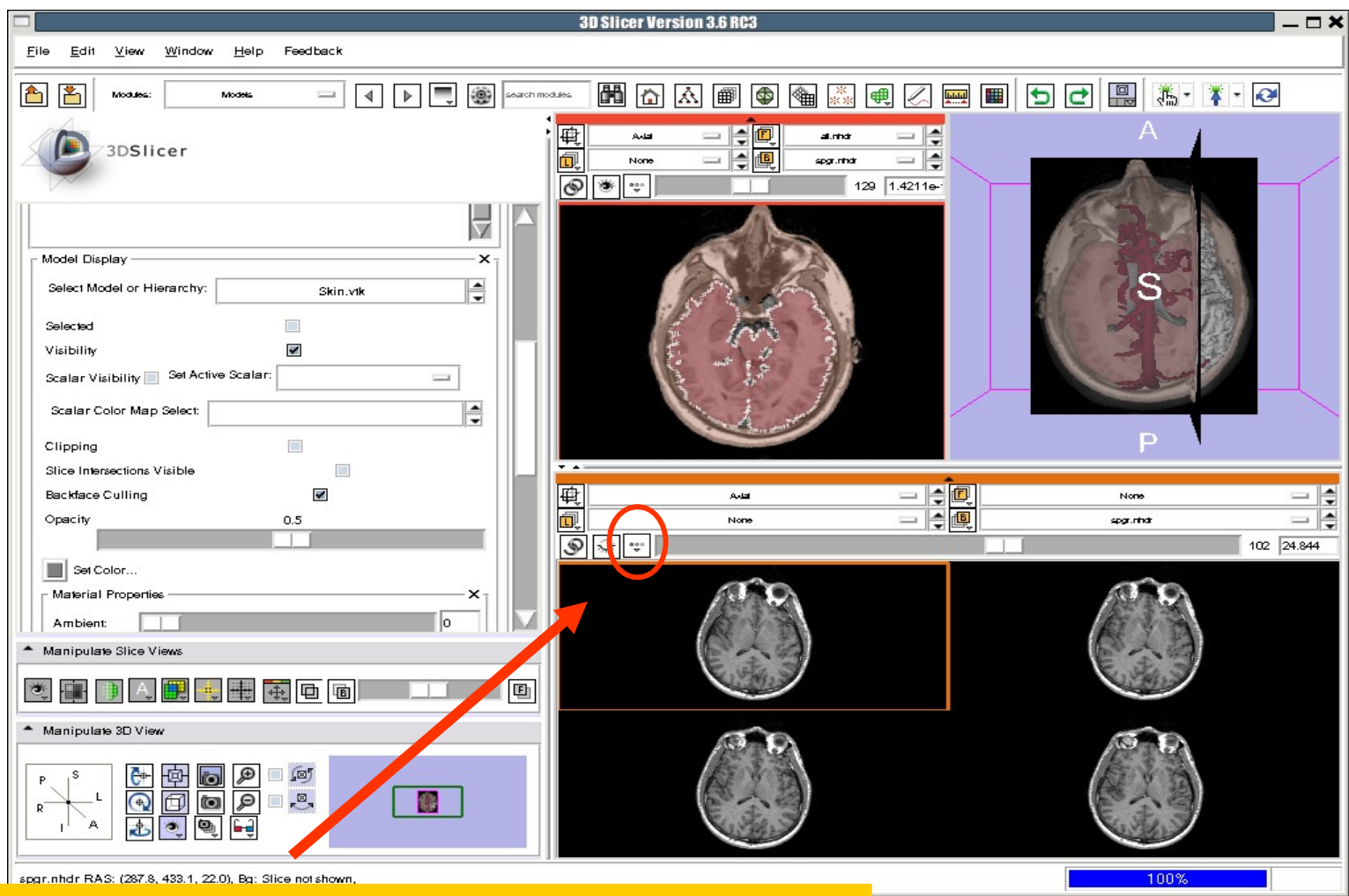
Browse through the spgr volume using the lightbox slider

# Lightbox viewer



Slicer displays 4 adjacent axial slices of the spgr volume simultaneously

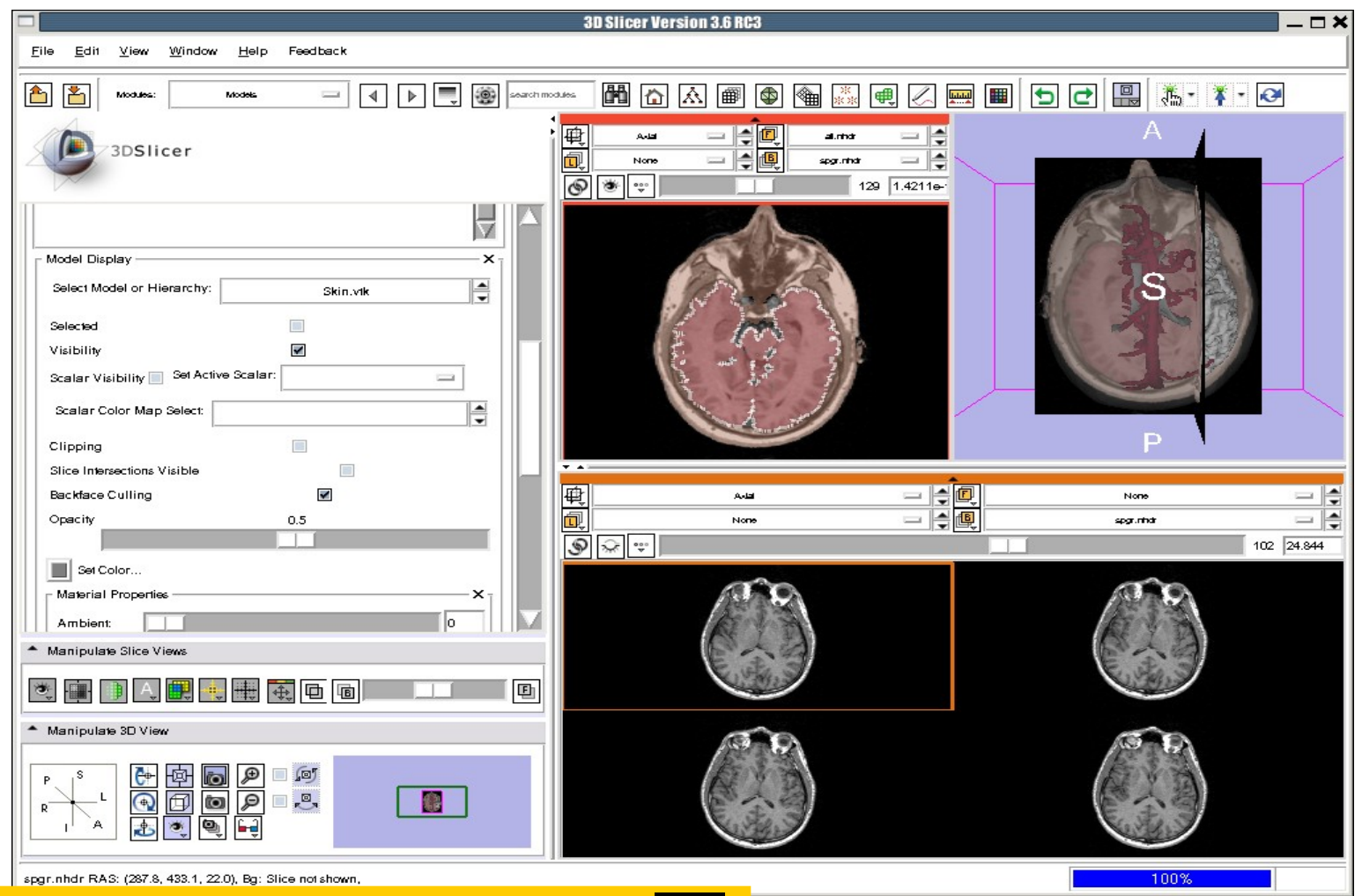
# Lightbox viewer



Left click on the Slice Viewer menu of the Compare Layout viewer



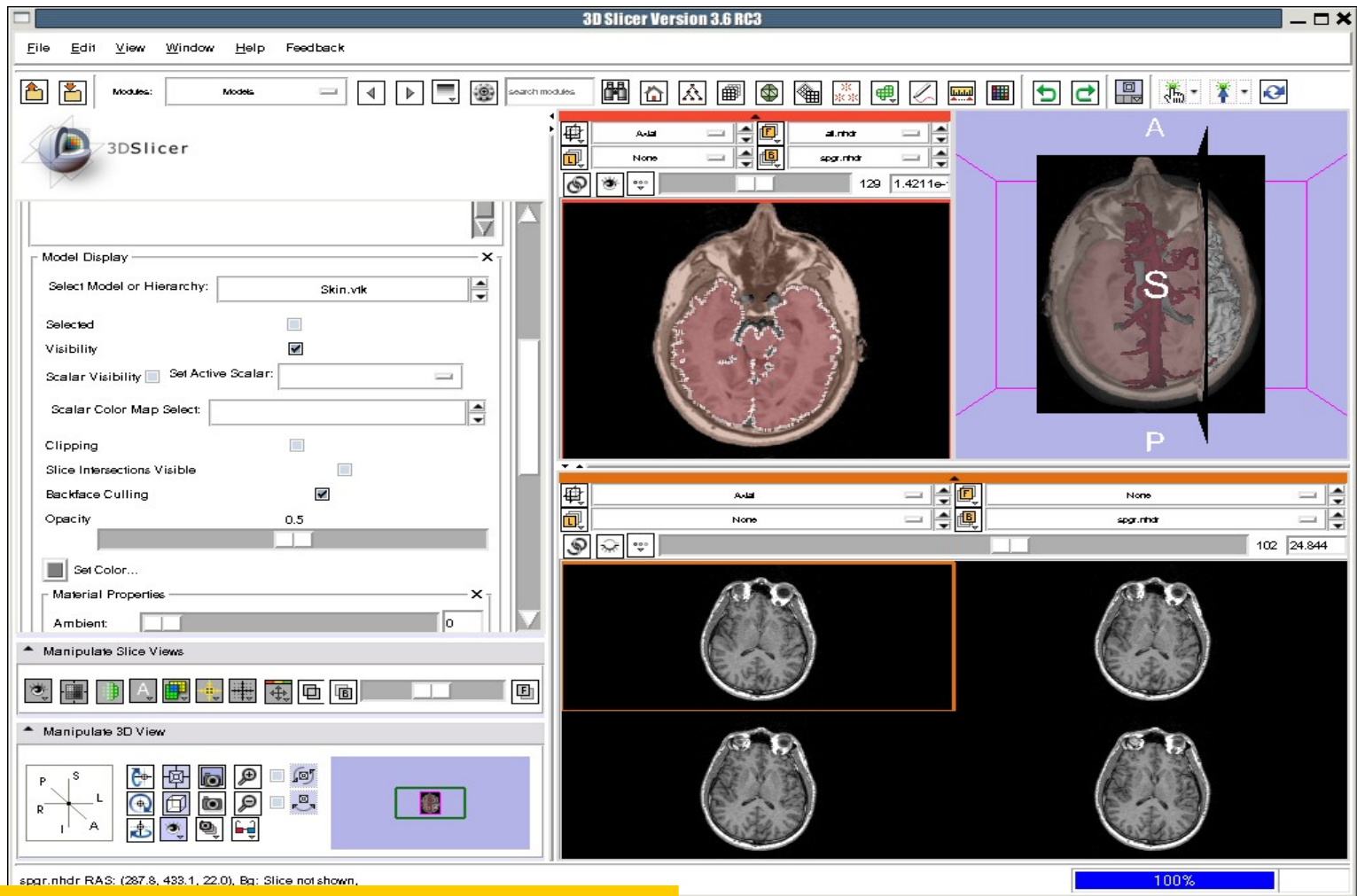
# Lightbox viewer



Select the lightbox view option 

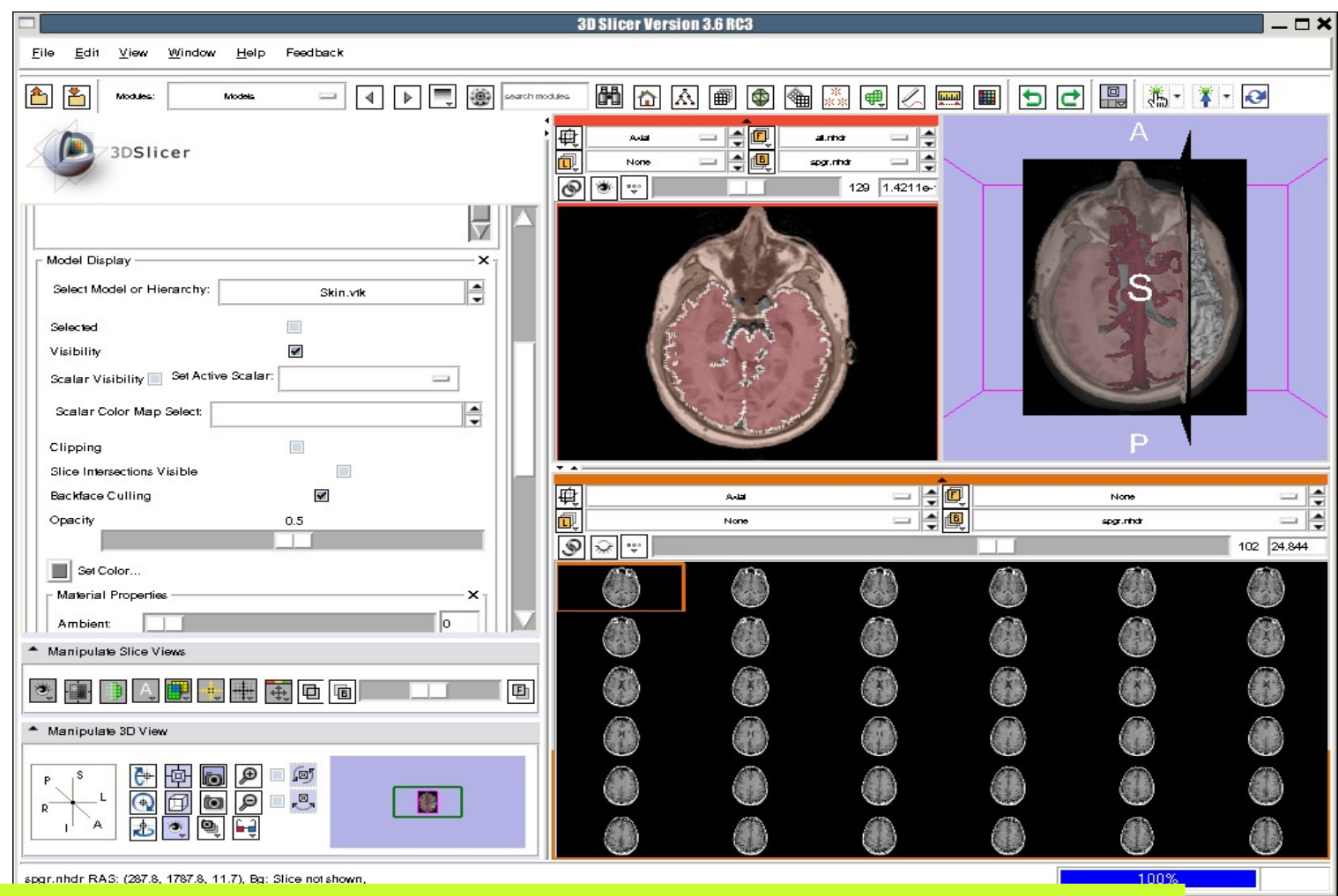


# Lightbox viewer



Set the configuration of the light box view to 6x6

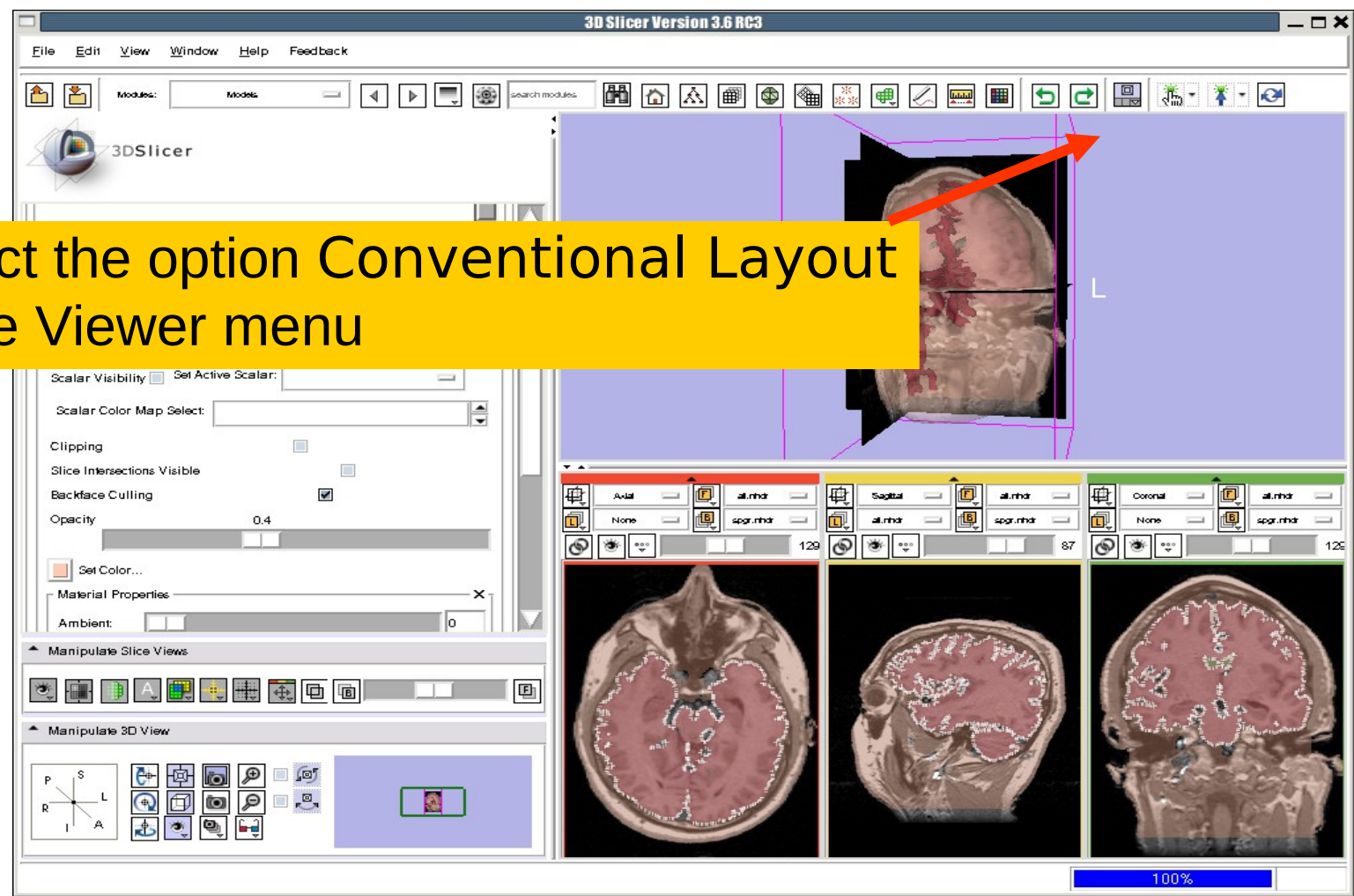
# Lightbox viewer

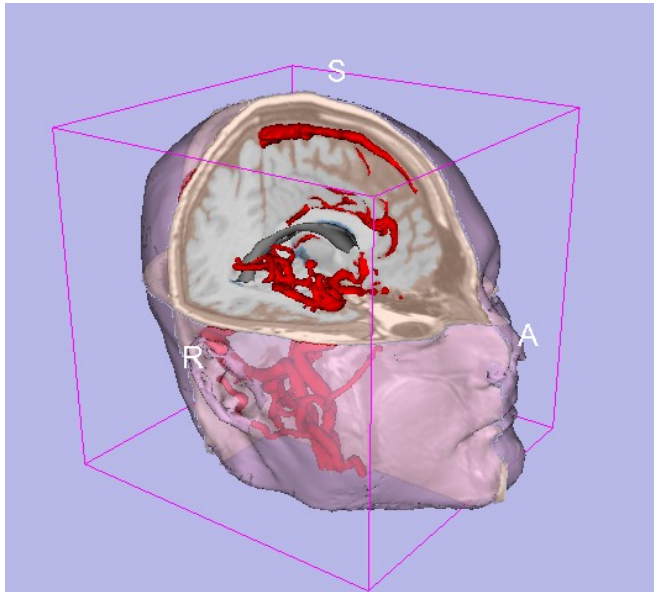


Slicer displays a matrix of 36 adjacent axial slices of the spqr volume.

# Lightbox viewer

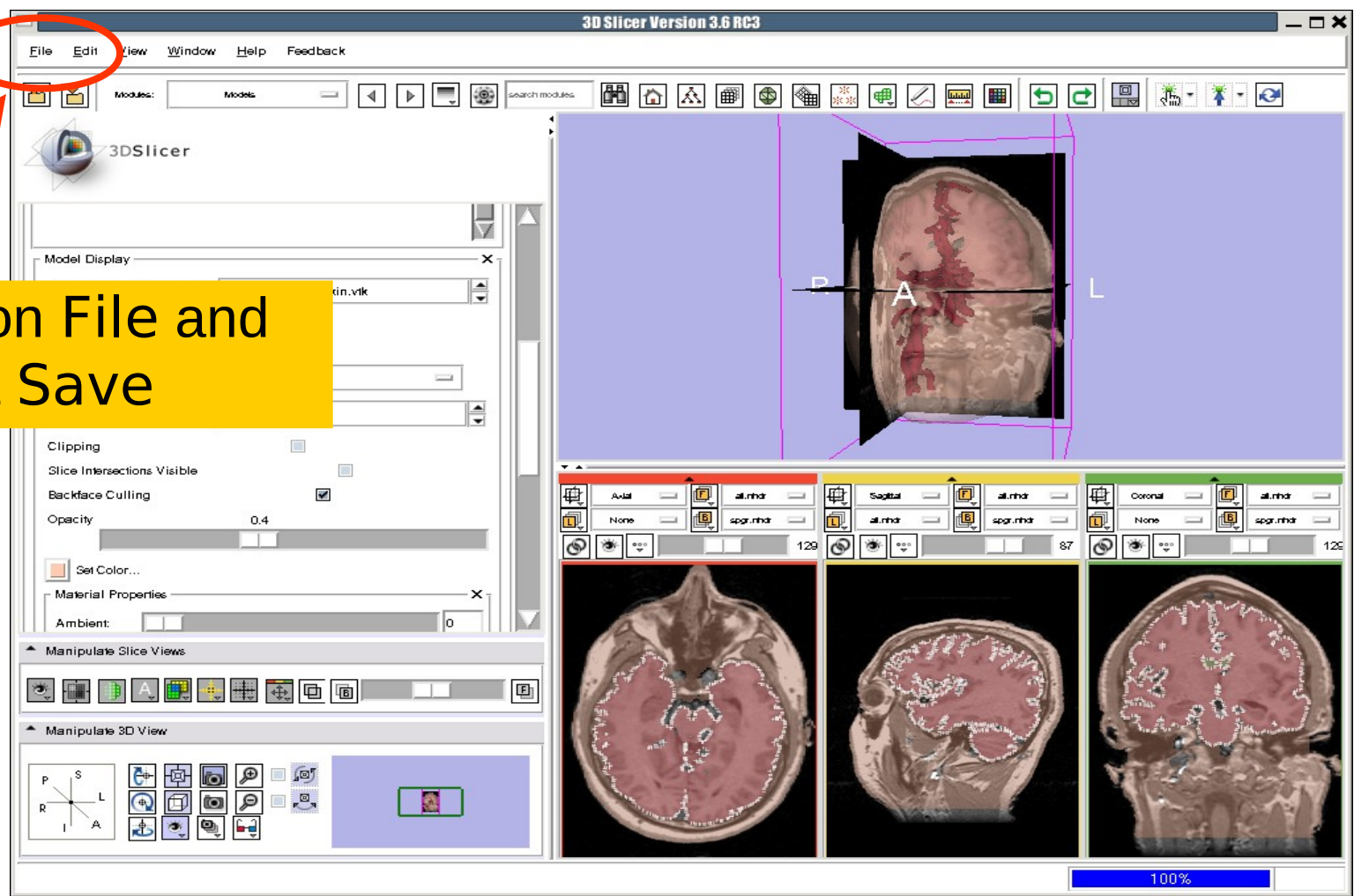
Select the option Conventional Layout in the Viewer menu





## Part 5: Loading and saving a Scene

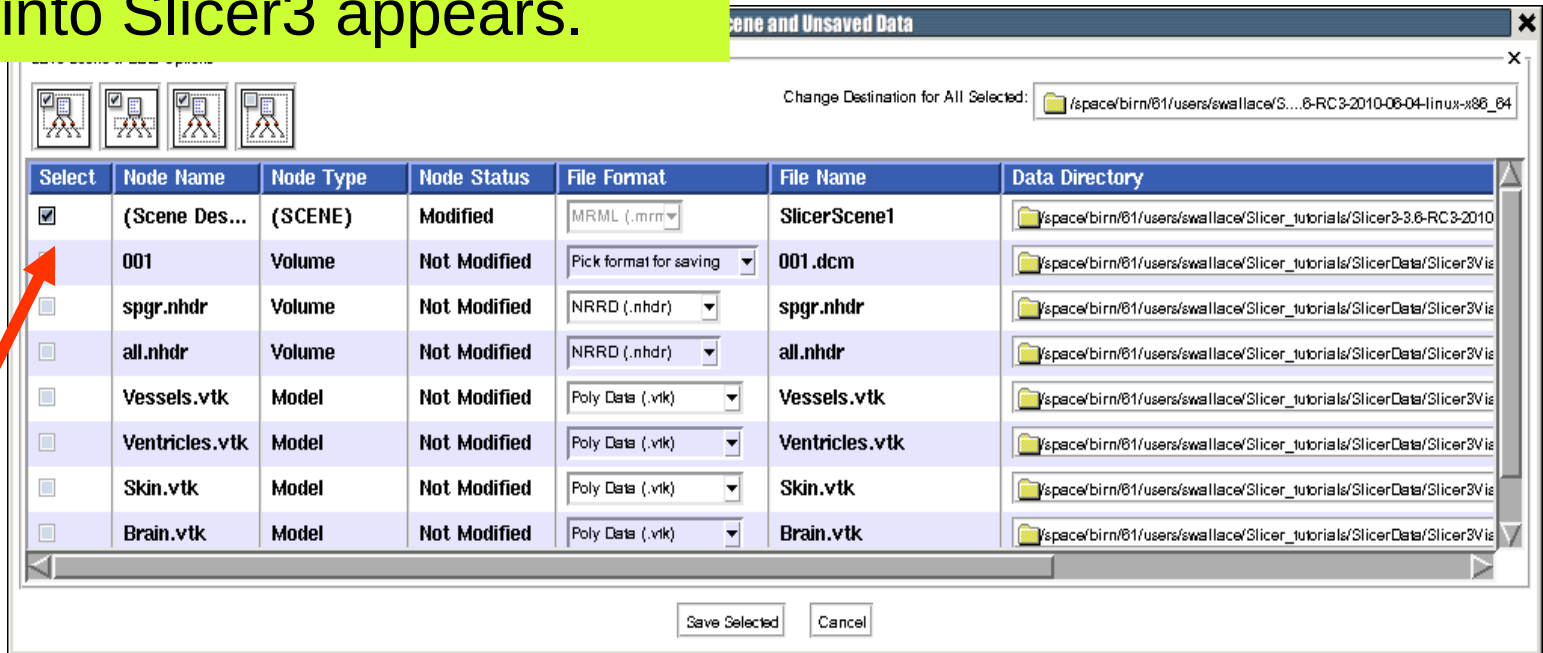
# Saving Data





# Saving Data

The list of elements currently loaded into Slicer3 appears.



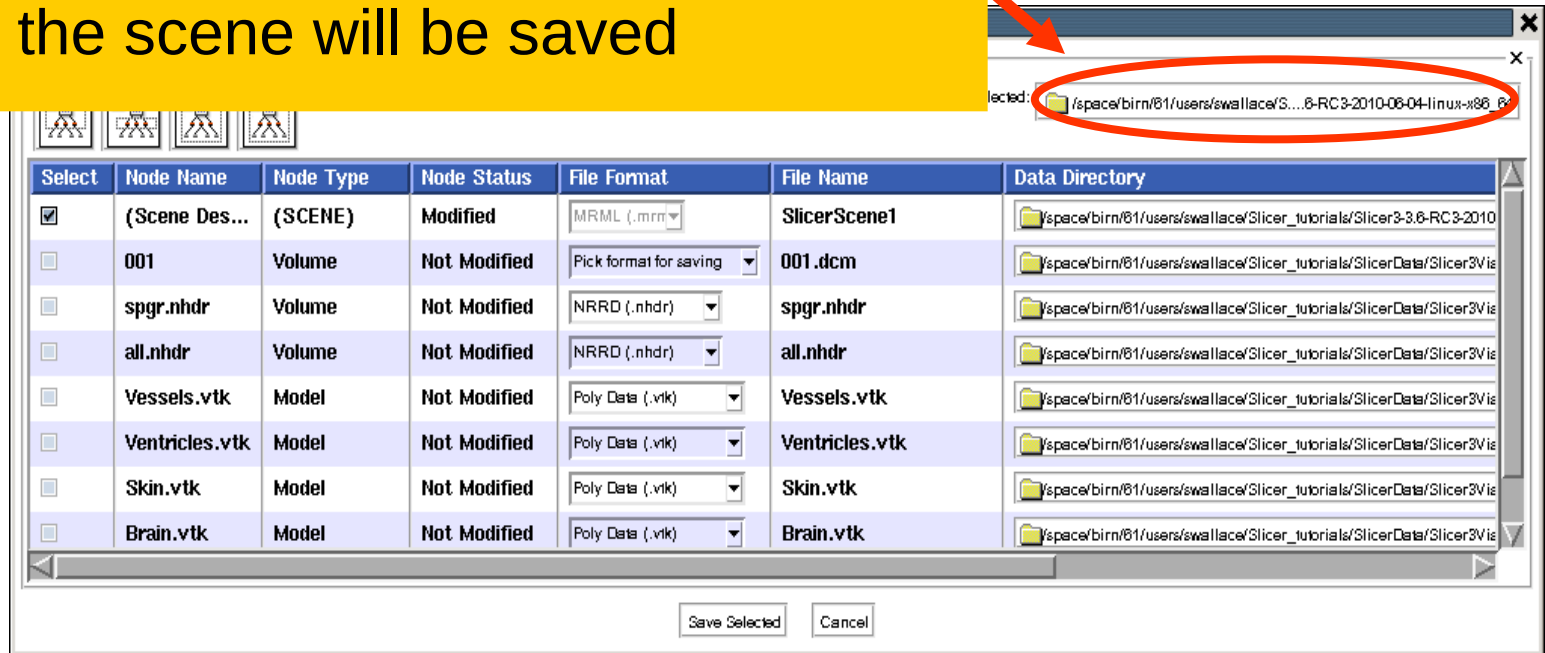
| Select                              | Node Name      | Node Type | Node Status  | File Format            | File Name      | Data Directory   |
|-------------------------------------|----------------|-----------|--------------|------------------------|----------------|--|
| <input checked="" type="checkbox"/> | (Scene Des...  | (SCENE)   | Modified     | MRML (.mrm)            | SlicerScene1   | /space/birn/81/users/swallace/Slicer_tutorials/Slicer3-3.8-RC3-2010  |
| <input type="checkbox"/>            | 001            | Volume    | Not Modified | Pick format for saving | 001.dcm        | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | spgr.nhdr      | Volume    | Not Modified | NRRD (.nhdr)           | spgr.nhdr      | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | all.nhdr       | Volume    | Not Modified | NRRD (.nhdr)           | all.nhdr       | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Vessels.vtk    | Model     | Not Modified | Poly Data (.vtk)       | Vessels.vtk    | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Ventricles.vtk | Model     | Not Modified | Poly Data (.vtk)       | Ventricles.vtk | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Skin.vtk       | Model     | Not Modified | Poly Data (.vtk)       | Skin.vtk       | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Brain.vtk      | Model     | Not Modified | Poly Data (.vtk)       | Brain.vtk      | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |

Make sure only the first check box is selected



# Saving Data

Click on Change Destination for All Selected and browse to the location where the scene will be saved

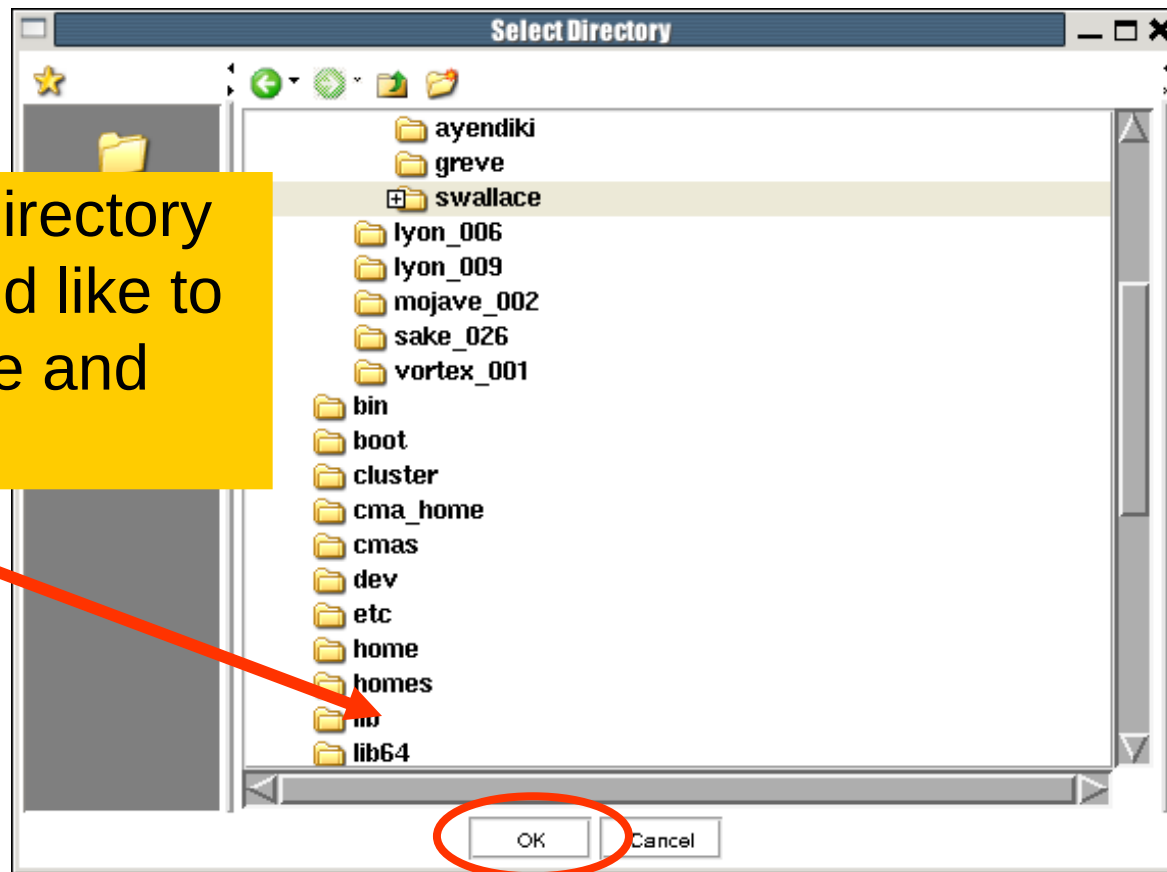


| Select                              | Node Name      | Node Type | Node Status  | File Format            | File Name      | Data Directory   |
|-------------------------------------|----------------|-----------|--------------|------------------------|----------------|--|
| <input checked="" type="checkbox"/> | (Scene Des...  | (SCENE)   | Modified     | MRML (.mrm)            | SlicerScene1   | /space/birn/81/users/swallace/Slicer_tutorials/Slicer3-3.8-RC3-2010  |
| <input type="checkbox"/>            | 001            | Volume    | Not Modified | Pick format for saving | 001.dcm        | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | spgr.nhdr      | Volume    | Not Modified | NRRD (.nhdr)           | spgr.nhdr      | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | all.nhdr       | Volume    | Not Modified | NRRD (.nhdr)           | all.nhdr       | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Vessels.vtk    | Model     | Not Modified | Poly Data (.vtk)       | Vessels.vtk    | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Ventricles.vtk | Model     | Not Modified | Poly Data (.vtk)       | Ventricles.vtk | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Skin.vtk       | Model     | Not Modified | Poly Data (.vtk)       | Skin.vtk       | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |
| <input type="checkbox"/>            | Brain.vtk      | Model     | Not Modified | Poly Data (.vtk)       | Brain.vtk      | /space/birn/81/users/swallace/Slicer_tutorials/SlicerData/Slicer3Vis |

Save Selected    Cancel

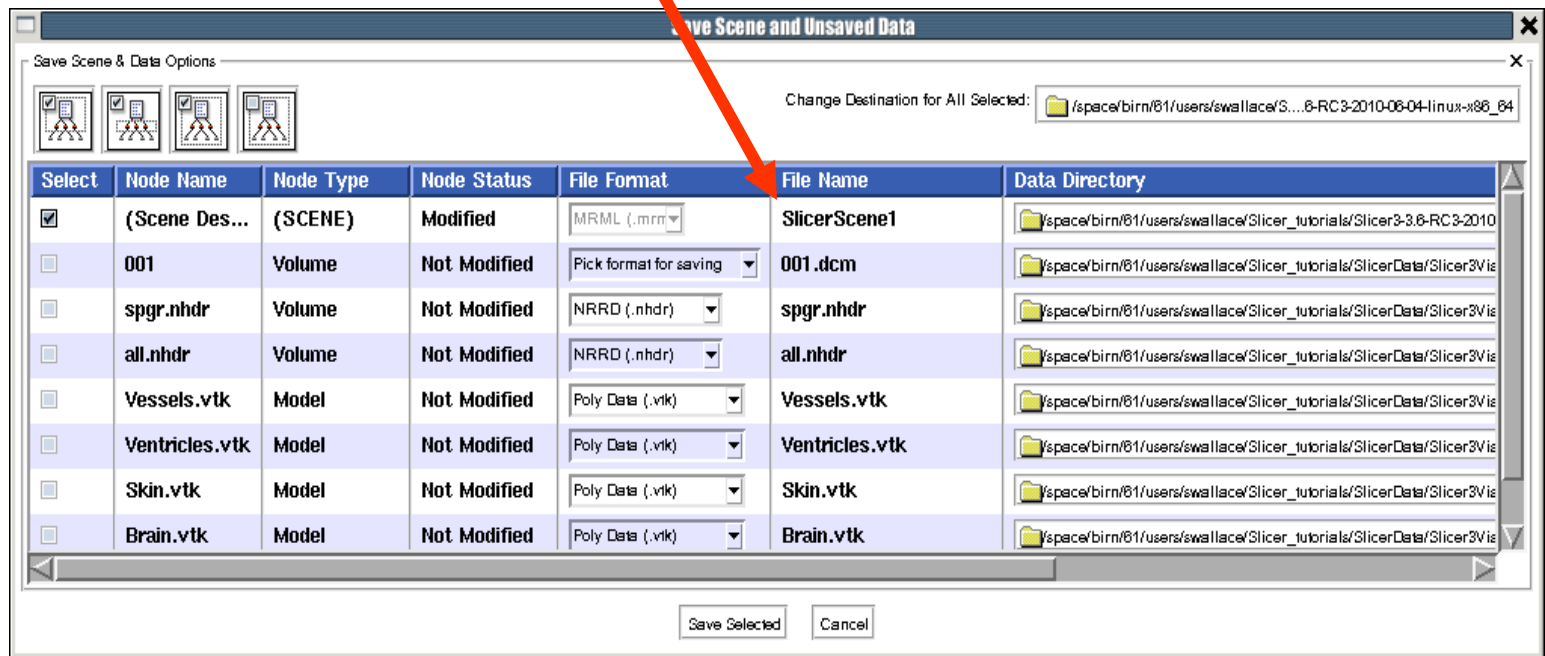
# Saving Data

Browse to the directory where you would like to save your scene and click OK



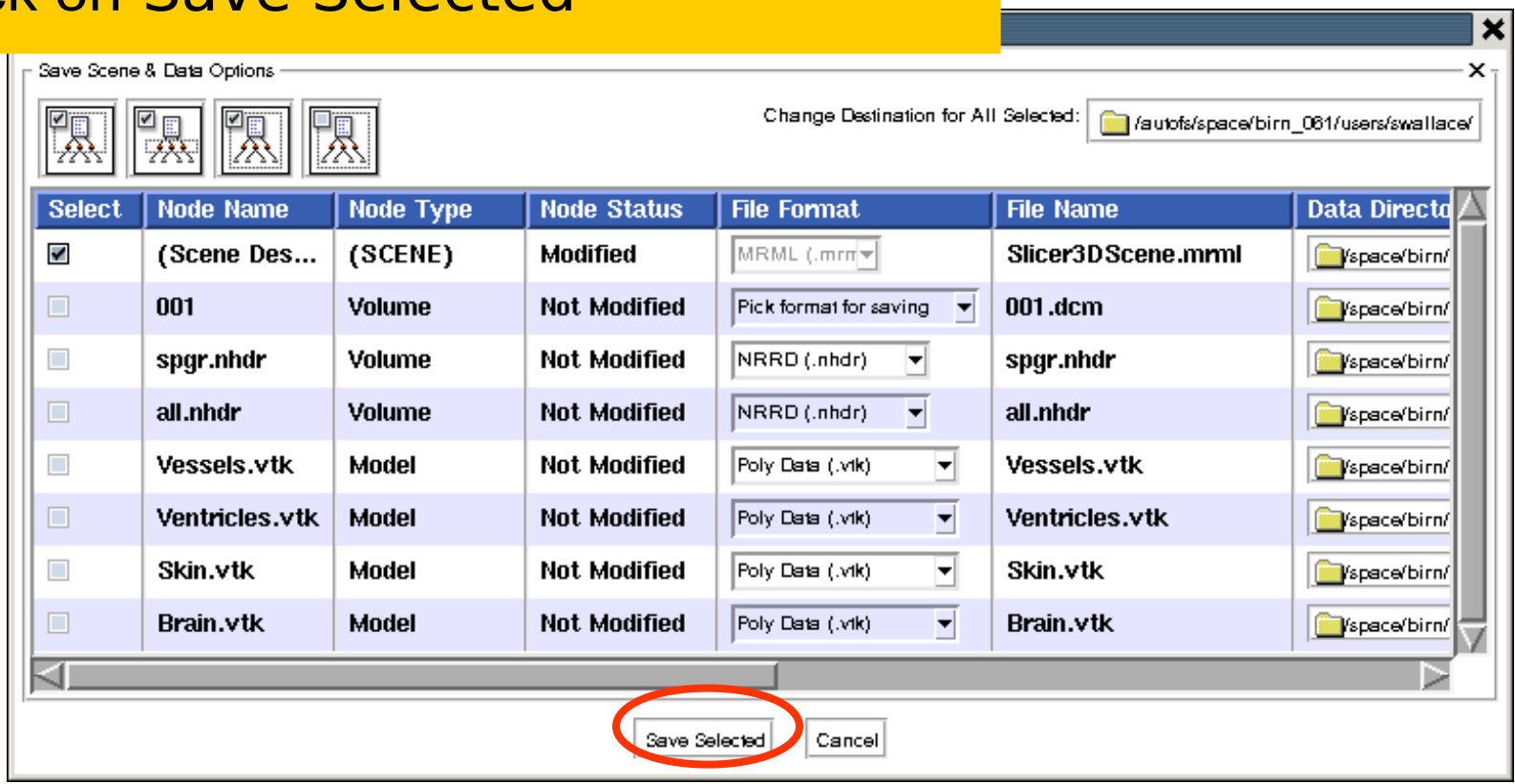
# Saving Data

Double click on the file name SlicerScene1 and change it to Slicer3DScene



# Saving Data

Click on Save Selected



Save Scene & Data Options

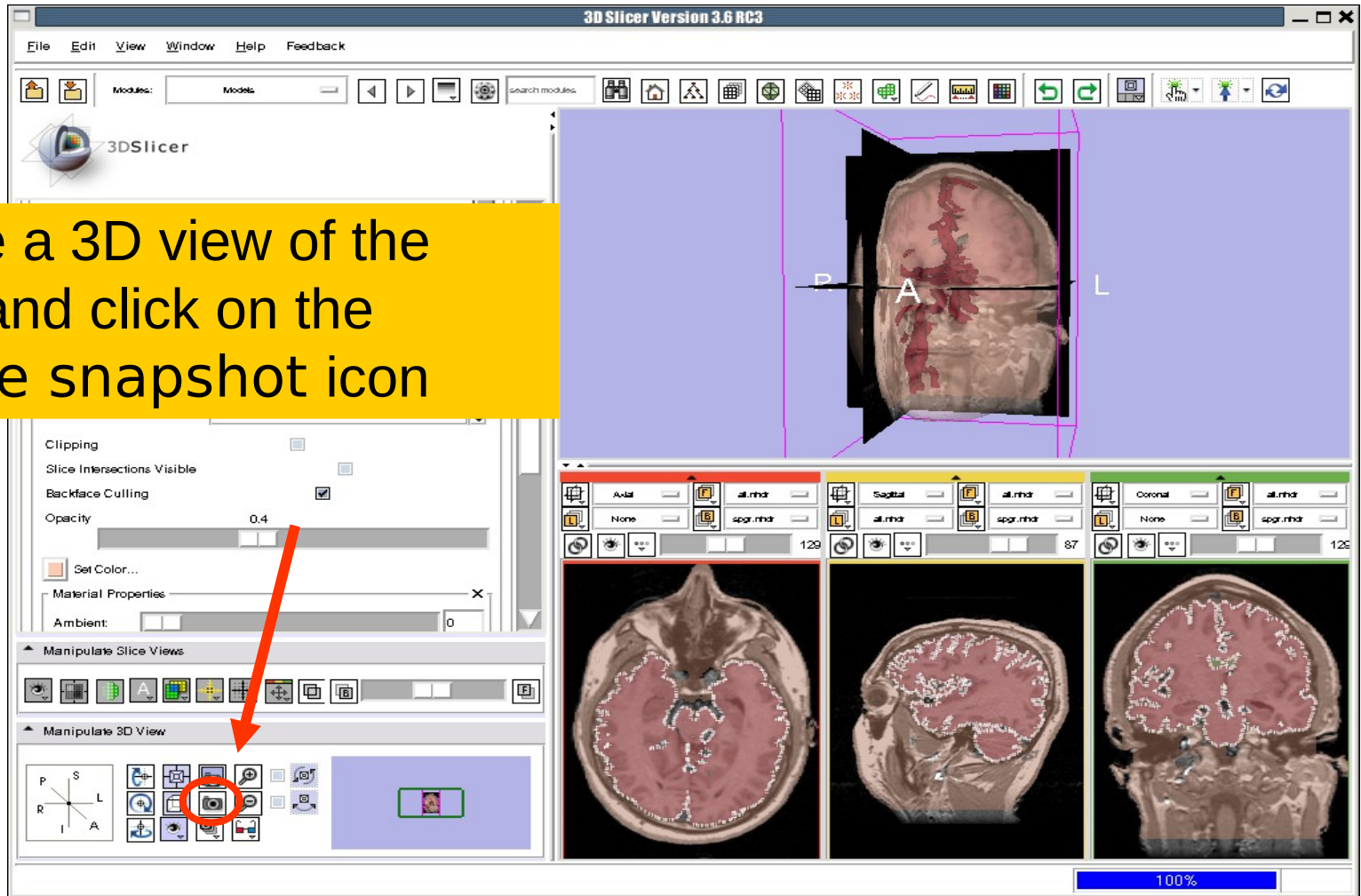
Change Destination for All Selected:

| Select                              | Node Name      | Node Type | Node Status  | File Format            | File Name         | Data Directory |
|-------------------------------------|----------------|-----------|--------------|------------------------|-------------------|----------------|
| <input checked="" type="checkbox"/> | (Scene Des...) | (SCENE)   | Modified     | MRML (.mrm)            | Slicer3DScene.mrm | /space/birn/   |
| <input type="checkbox"/>            | 001            | Volume    | Not Modified | Pick format for saving | 001.dcm           | /space/birn/   |
| <input type="checkbox"/>            | spgr.nhdr      | Volume    | Not Modified | NRRD (.nhdr)           | spgr.nhdr         | /space/birn/   |
| <input type="checkbox"/>            | all.nhdr       | Volume    | Not Modified | NRRD (.nhdr)           | all.nhdr          | /space/birn/   |
| <input type="checkbox"/>            | Vessels.vtk    | Model     | Not Modified | Poly Data (.vtk)       | Vessels.vtk       | /space/birn/   |
| <input type="checkbox"/>            | Ventricles.vtk | Model     | Not Modified | Poly Data (.vtk)       | Ventricles.vtk    | /space/birn/   |
| <input type="checkbox"/>            | Skin.vtk       | Model     | Not Modified | Poly Data (.vtk)       | Skin.vtk          | /space/birn/   |
| <input type="checkbox"/>            | Brain.vtk      | Model     | Not Modified | Poly Data (.vtk)       | Brain.vtk         | /space/birn/   |

Save Selected Cancel

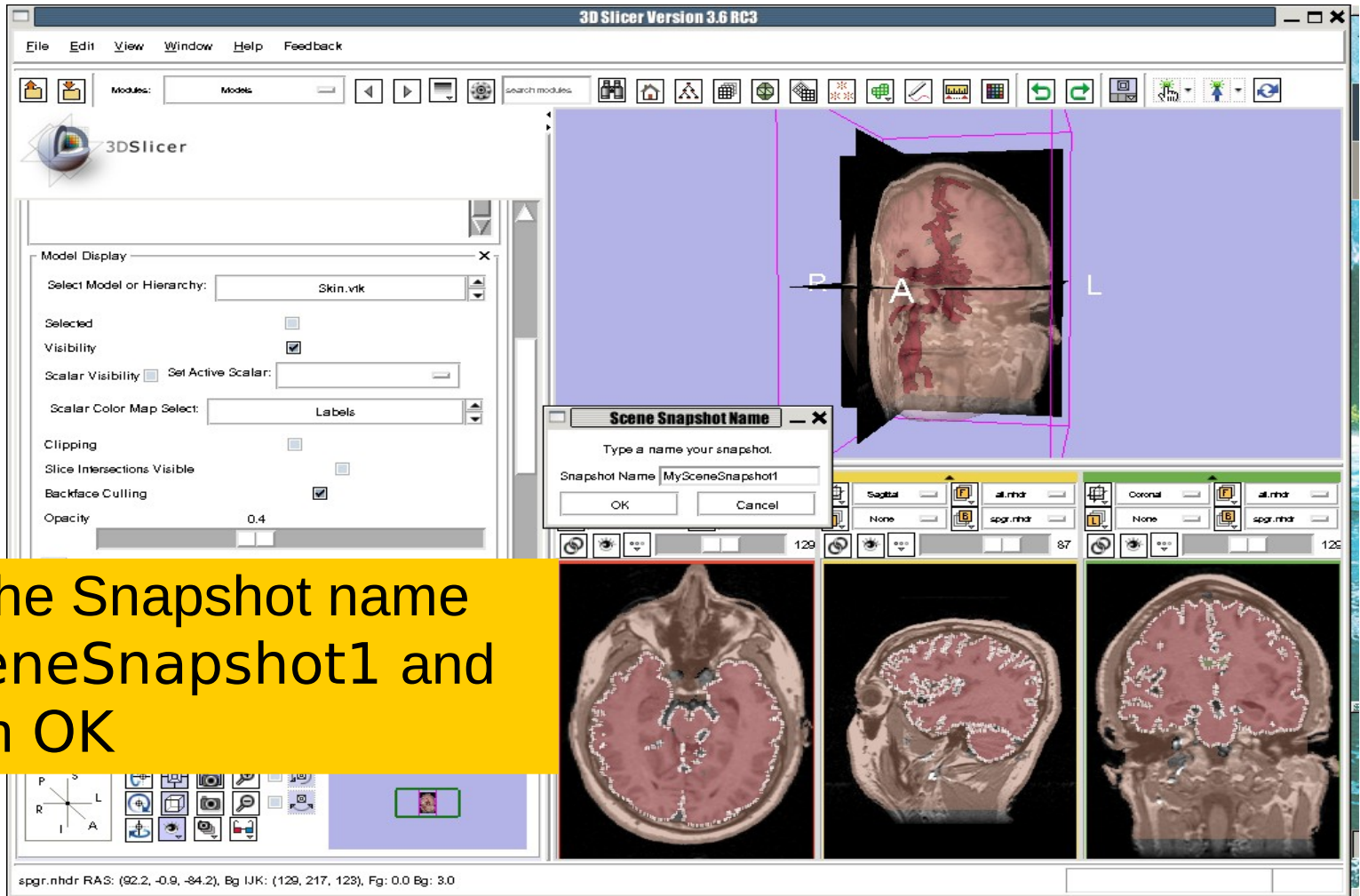
# Creating Scene Snapshots

Choose a 3D view of the scene and click on the capture snapshot icon





# Creating Scene Snapshots



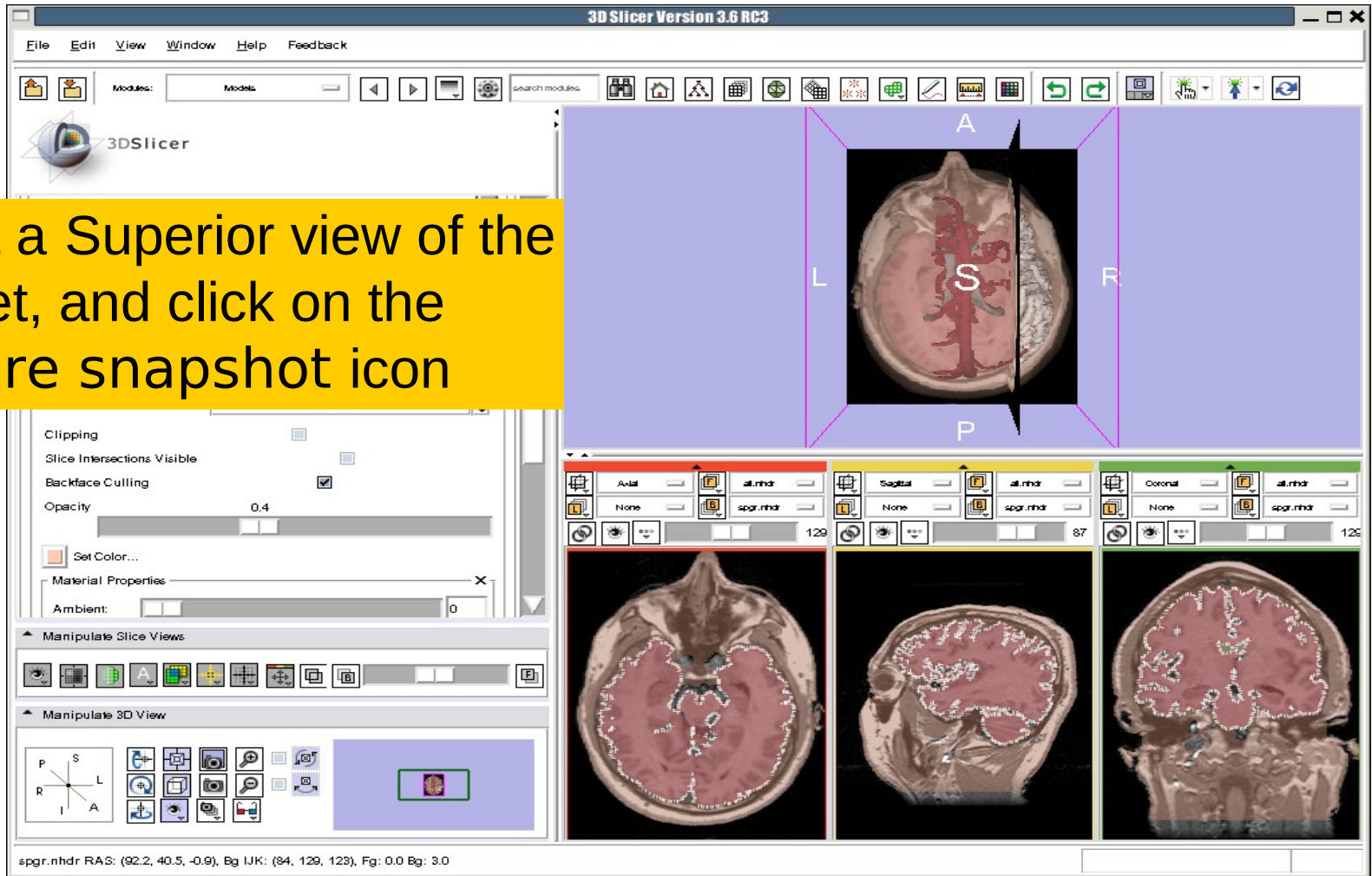
Enter the Snapshot name  
MySceneSnapshot1 and  
click on OK





# Creating Scene Snapshots

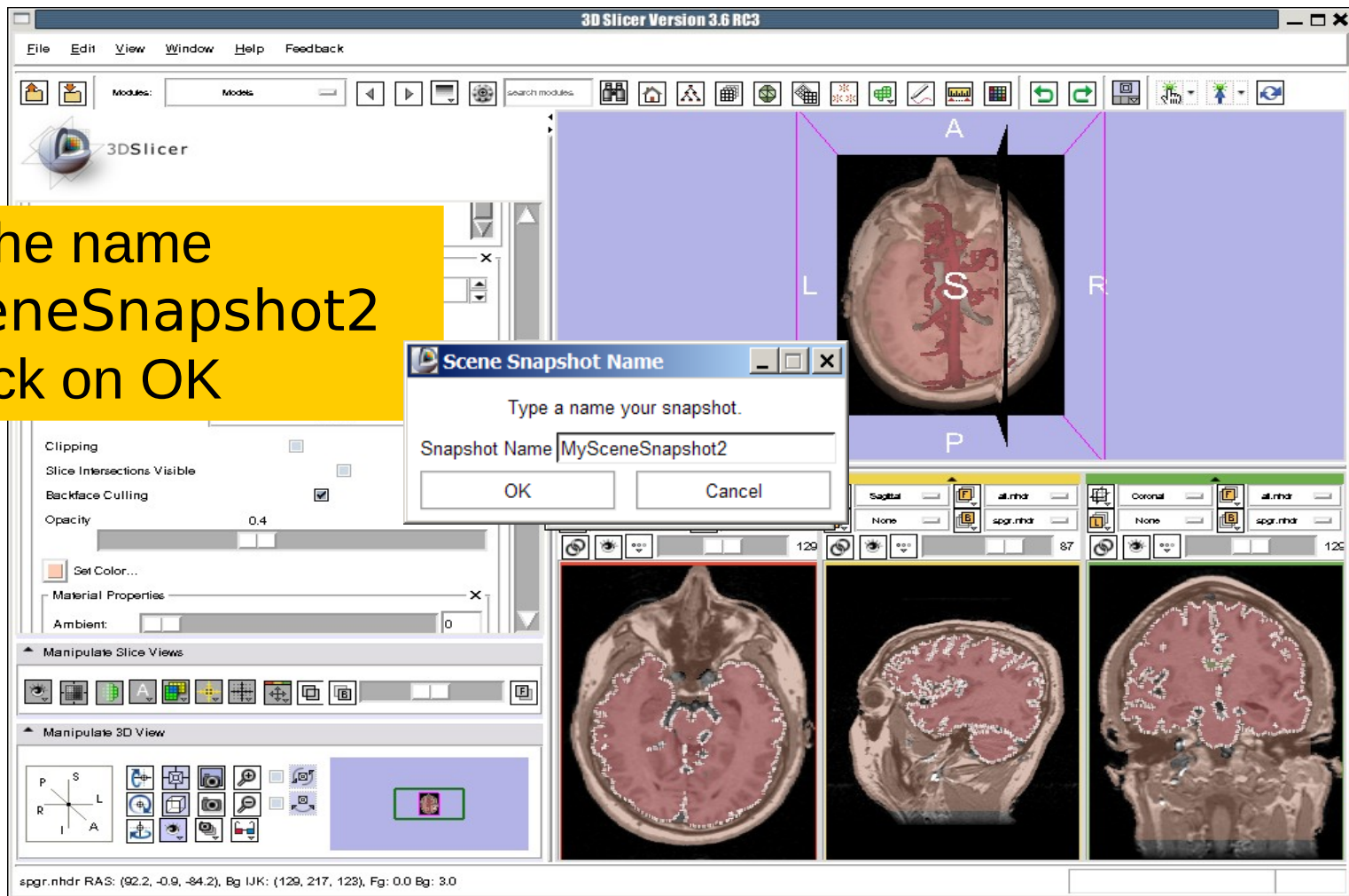
Select a Superior view of the dataset, and click on the capture snapshot icon





# Creating Scene Snapshots

Enter the name  
MySceneSnapshot2  
and click on OK





# Creating Scene Snapshots

Select File → Save and click on Save Selected to include the two scene snapshots in the saved scene

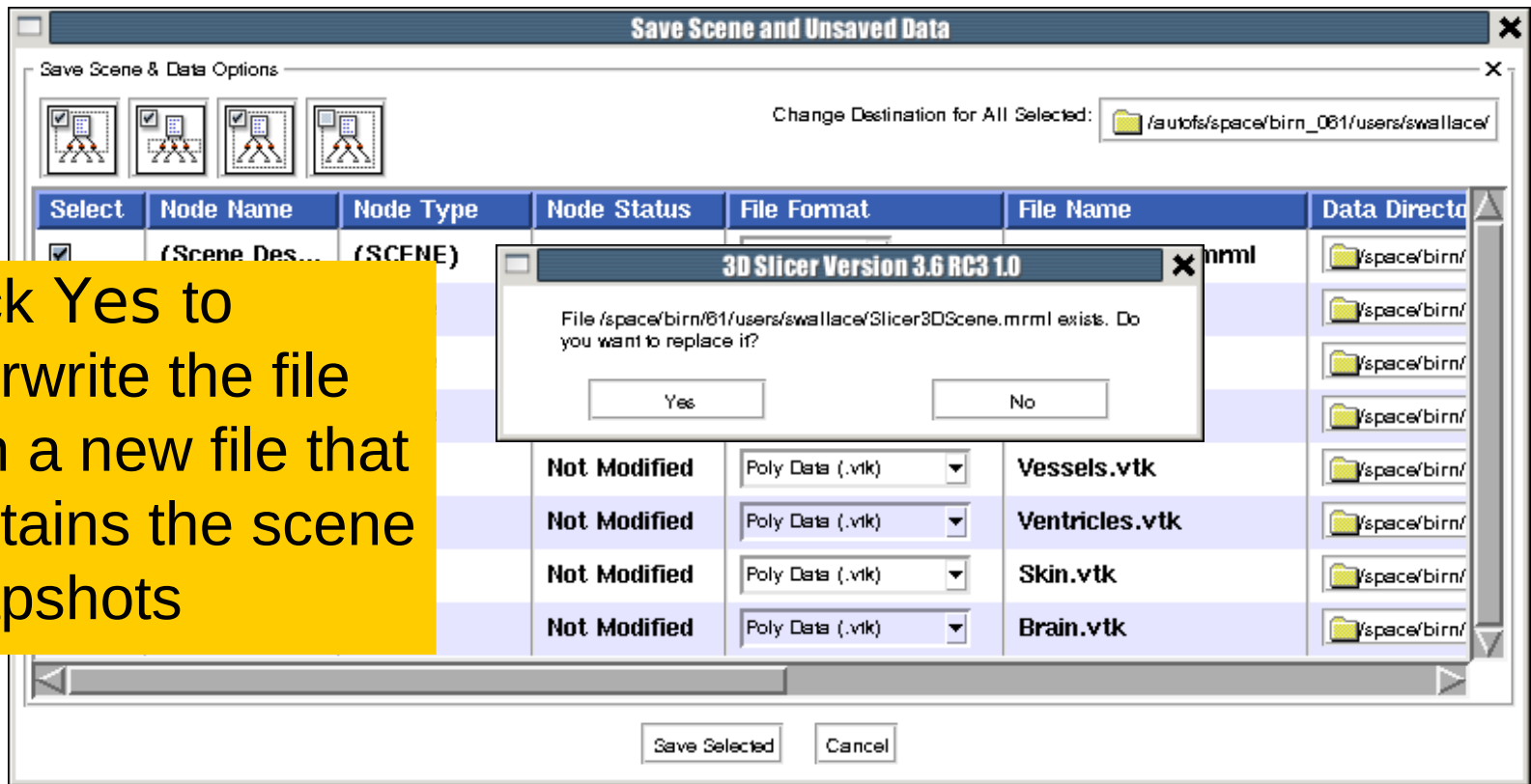
The screenshot shows the 'Save Scene & Data Options' dialog box. It contains a table with the following columns: Select, Node Name, Node Type, Node Status, File Format, File Name, and Data Directory. The 'Scene' node is selected, and the 'Save Selected' button is highlighted.

| Select                              | Node Name      | Node Type | Node Status  | File Format            | File Name         | Data Directory |
|-------------------------------------|----------------|-----------|--------------|------------------------|-------------------|----------------|
| <input checked="" type="checkbox"/> | (Scene Des...) | (SCENE)   | Modified     | Slicer3DScene - (.mrm) | Slicer3DScene.mrm | Yspace/birn/   |
| <input type="checkbox"/>            | 001            | Volume    | Not Modified | Pick format for saving | 001.dcm           | Yspace/birn/   |
| <input type="checkbox"/>            | spgr.nhdr      | Volume    | Not Modified | NRRD (.nhdr)           | spgr.nhdr         | Yspace/birn/   |
| <input type="checkbox"/>            | all.nhdr       | Volume    | Not Modified | NRRD (.nhdr)           | all.nhdr          | Yspace/birn/   |
| <input type="checkbox"/>            | Vessels.vtk    | Model     | Not Modified | Poly Data (.vtk)       | Vessels.vtk       | Yspace/birn/   |
| <input type="checkbox"/>            | Ventricles.vtk | Model     | Not Modified | Poly Data (.vtk)       | Ventricles.vtk    | Yspace/birn/   |
| <input type="checkbox"/>            | Skin.vtk       | Model     | Not Modified | Poly Data (.vtk)       | Skin.vtk          | Yspace/birn/   |
| <input type="checkbox"/>            | Brain.vtk      | Model     | Not Modified | Poly Data (.vtk)       | Brain.vtk         | Yspace/birn/   |

Buttons: Save Selected, Cancel

# Creating Scene Snapshots

Click Yes to overwrite the file with a new file that contains the scene snapshots



Save Scene and Unsaved Data

Save Scene & Data Options

Change Destination for All Selected: /autofs/space/birn\_061/users/swallace/

| Select                              | Node Name      | Node Type | Node Status  | File Format      | File Name      | Data Directory |
|-------------------------------------|----------------|-----------|--------------|------------------|----------------|----------------|
| <input checked="" type="checkbox"/> | (Scene Des...) | (SCENE)   |              |                  |                | /space/birn/   |
|                                     |                |           | Not Modified | Poly Data (.vtk) | Vessels.vtk    | /space/birn/   |
|                                     |                |           | Not Modified | Poly Data (.vtk) | Ventricles.vtk | /space/birn/   |
|                                     |                |           | Not Modified | Poly Data (.vtk) | Skin.vtk       | /space/birn/   |
|                                     |                |           | Not Modified | Poly Data (.vtk) | Brain.vtk      | /space/birn/   |

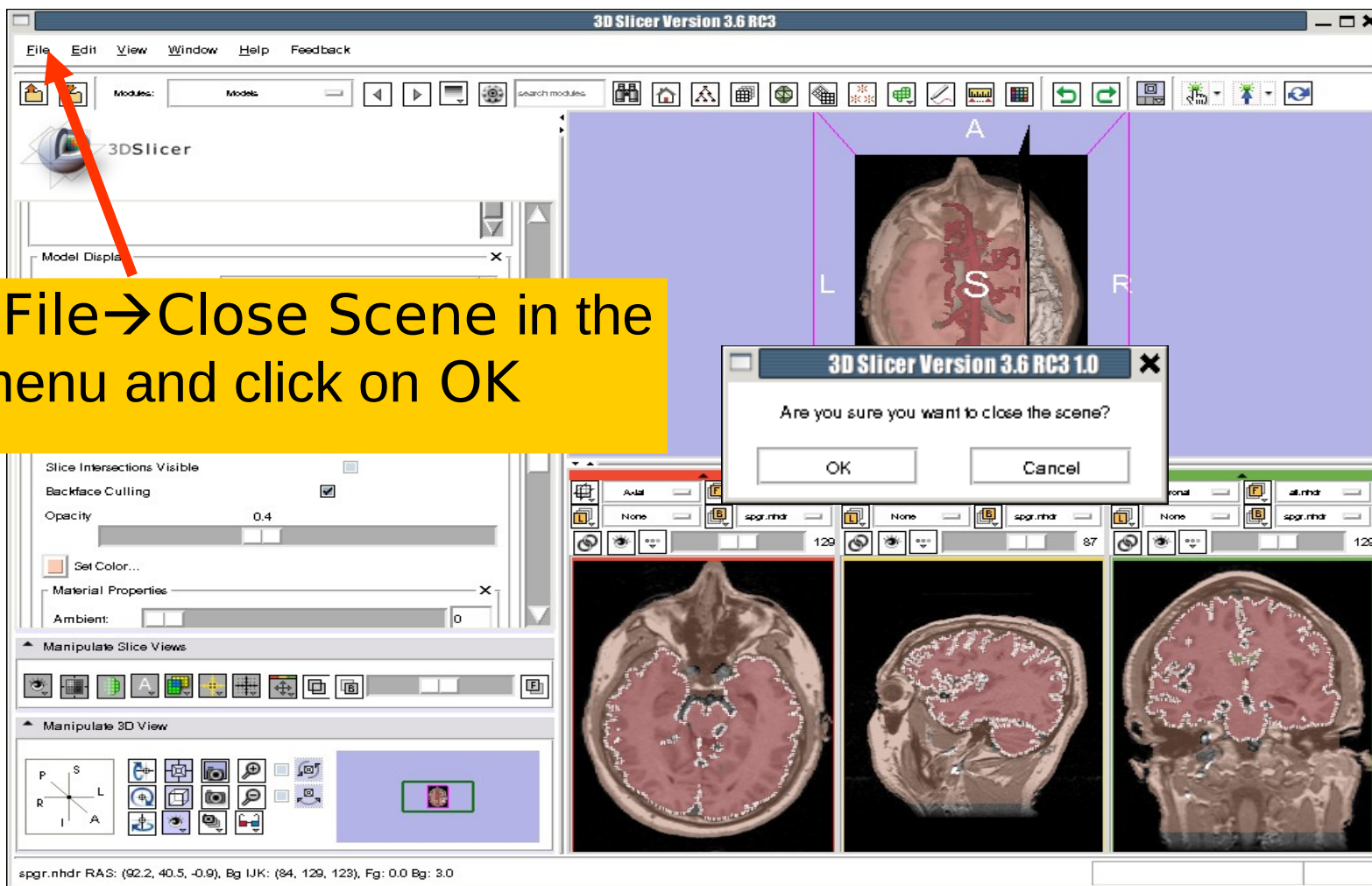
3D Slicer Version 3.6 RC3 1.0

File /space/birn/81/users/swallace/Slicer3DScene.mrml exists. Do you want to replace it?

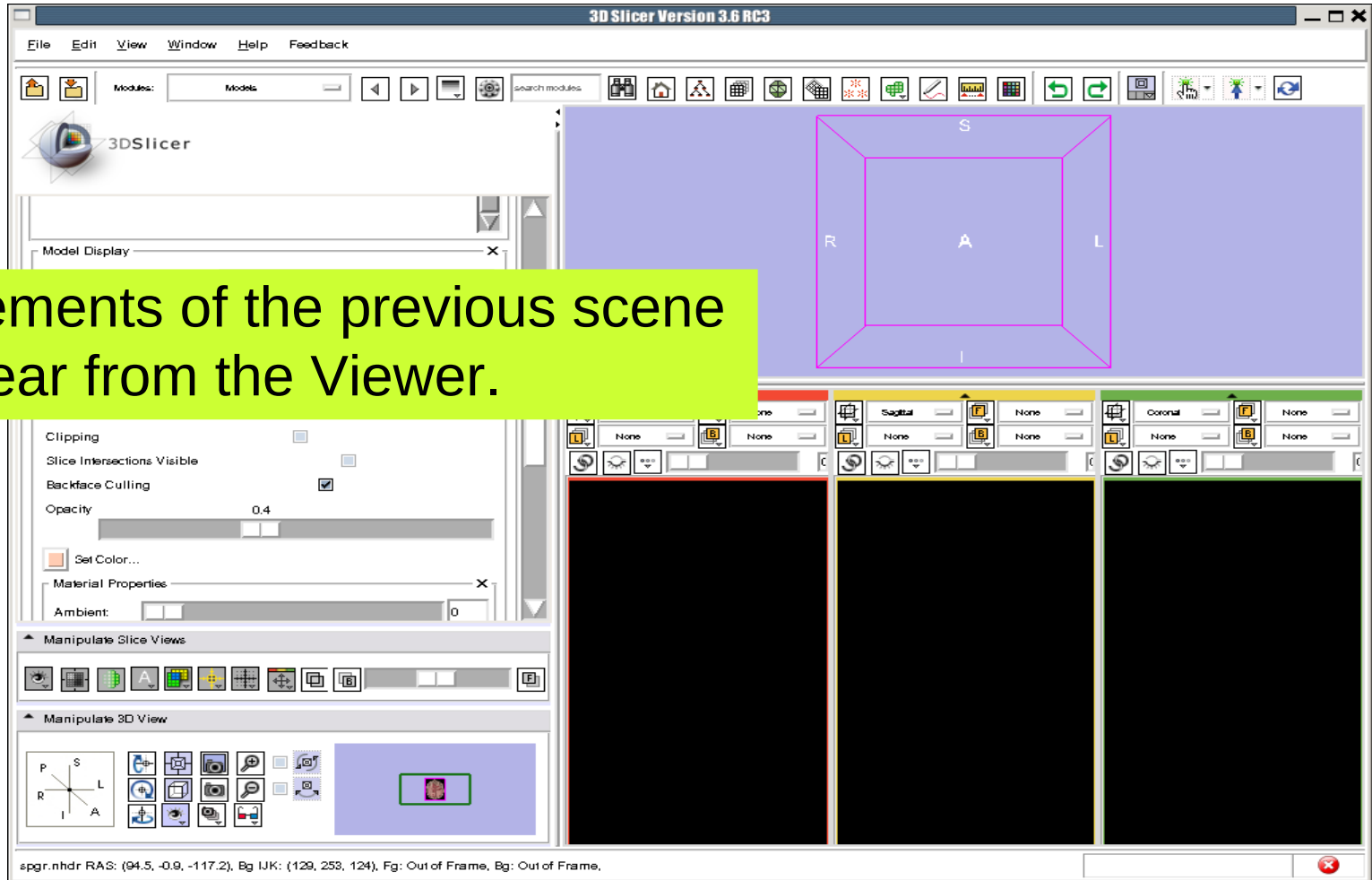
Yes No

Save Selected Cancel

# Saving Data



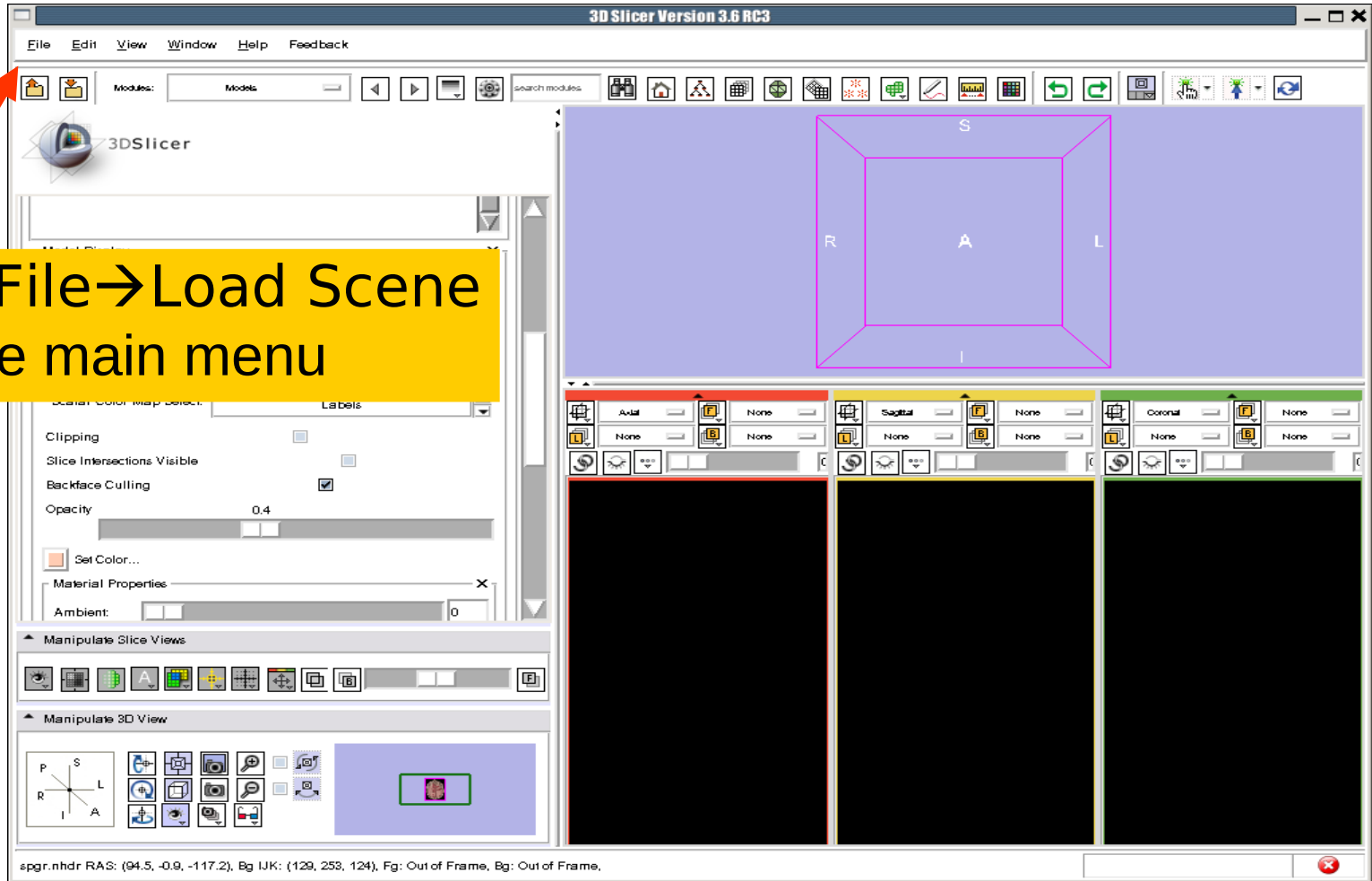
# Saving Data





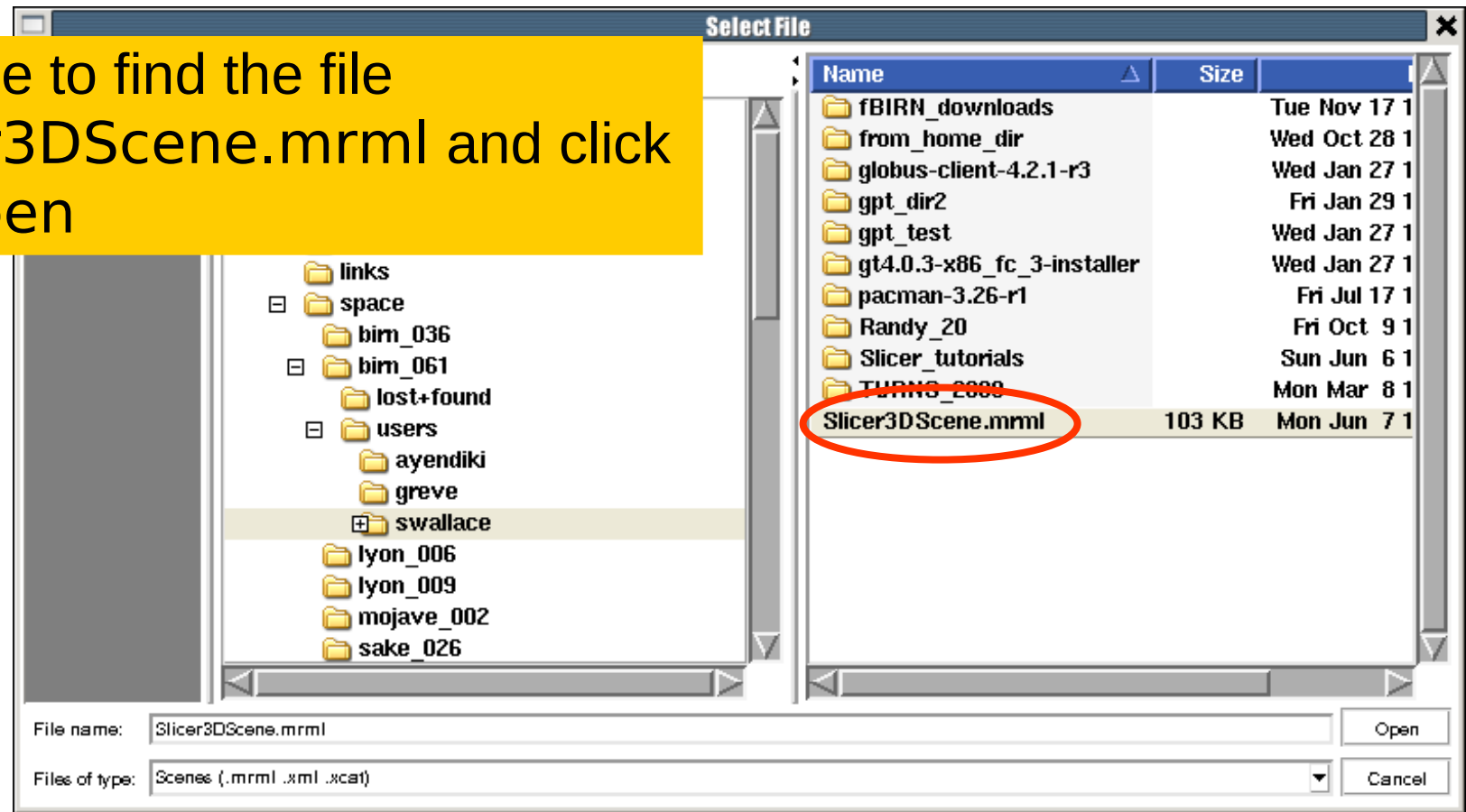
# Saving Data

Select File → Load Scene  
from the main menu

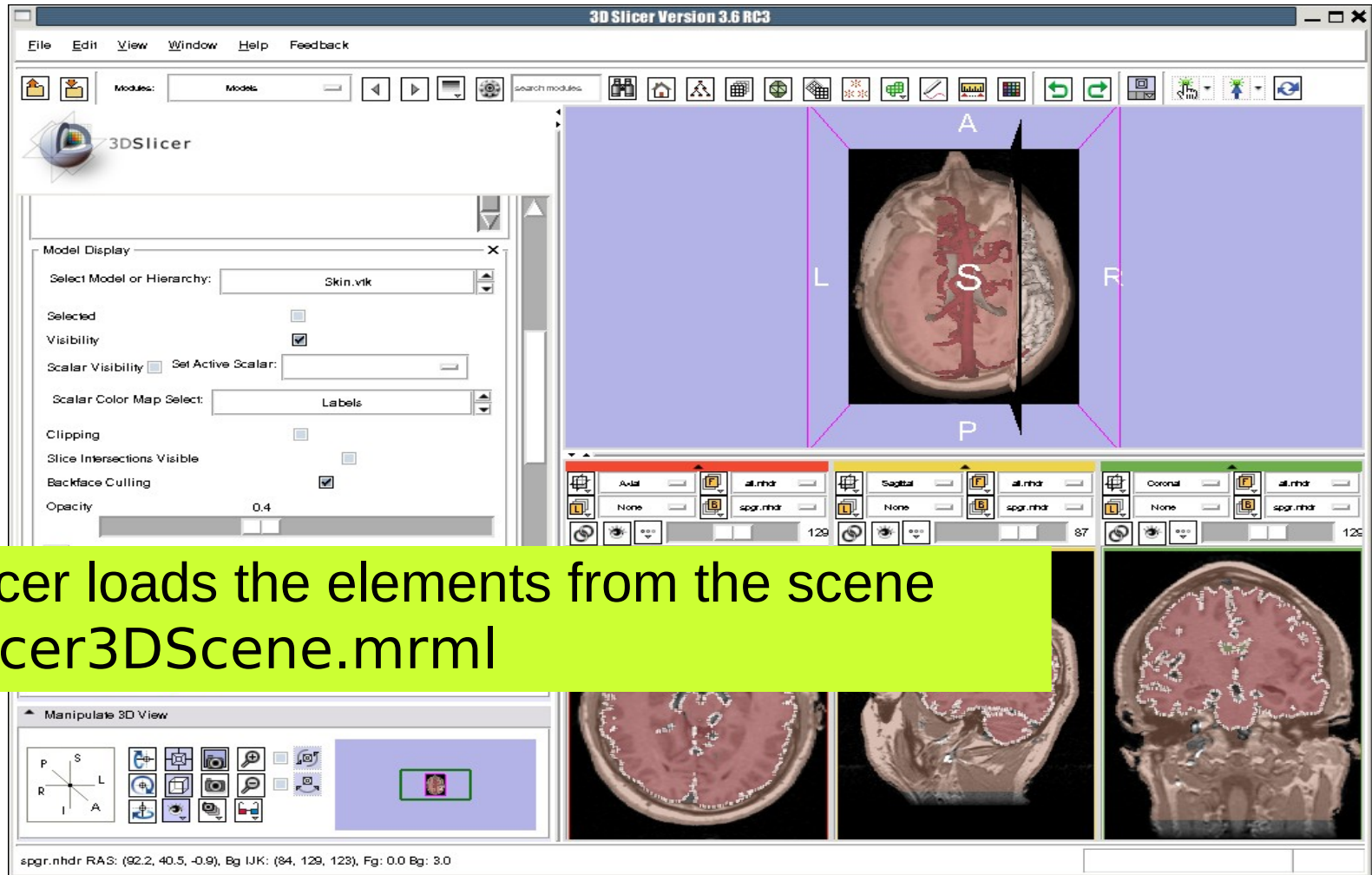


# Saving Data

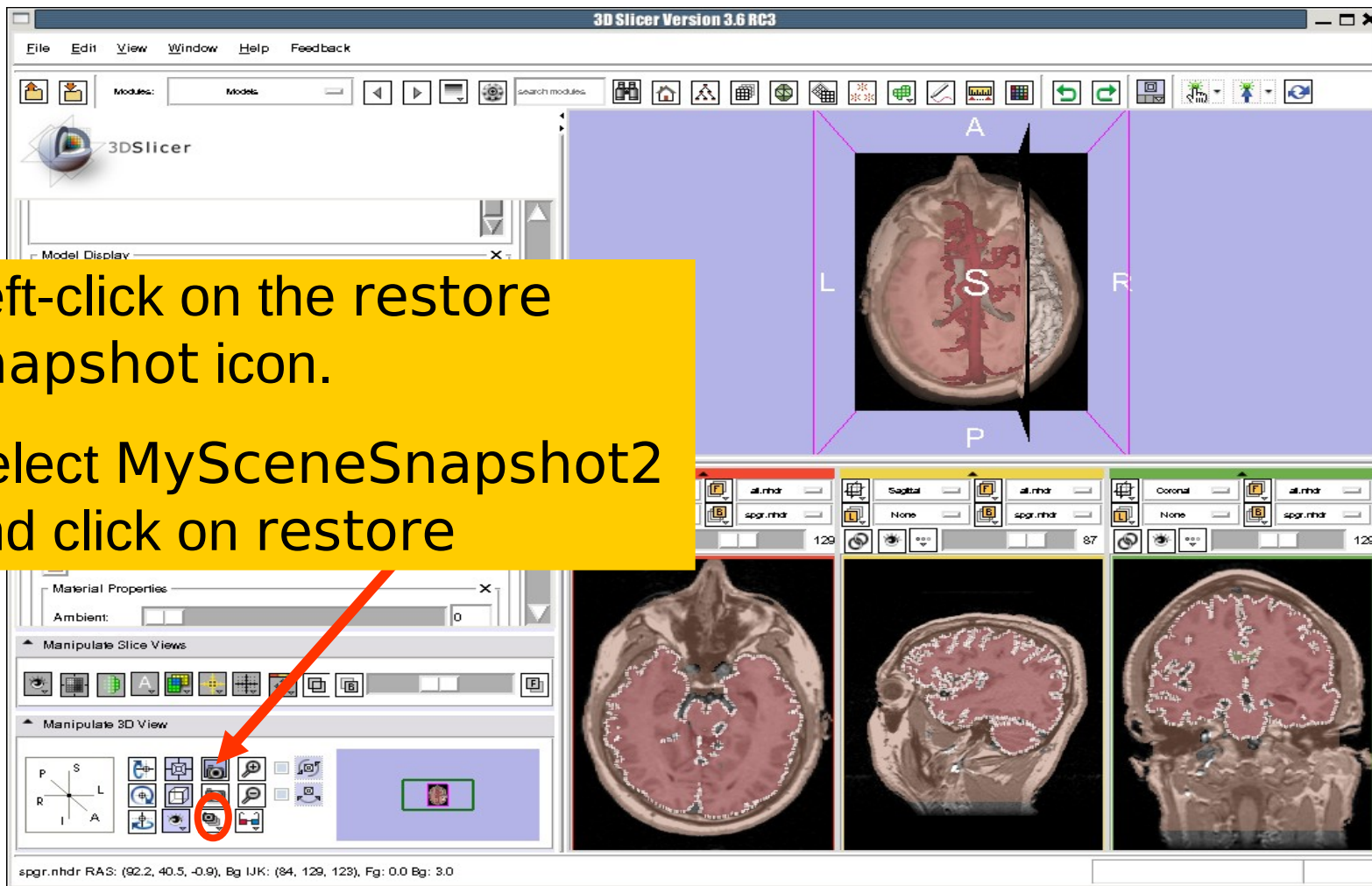
Browse to find the file Slicer3DScene.mrml and click on Open



# Loading a Scene

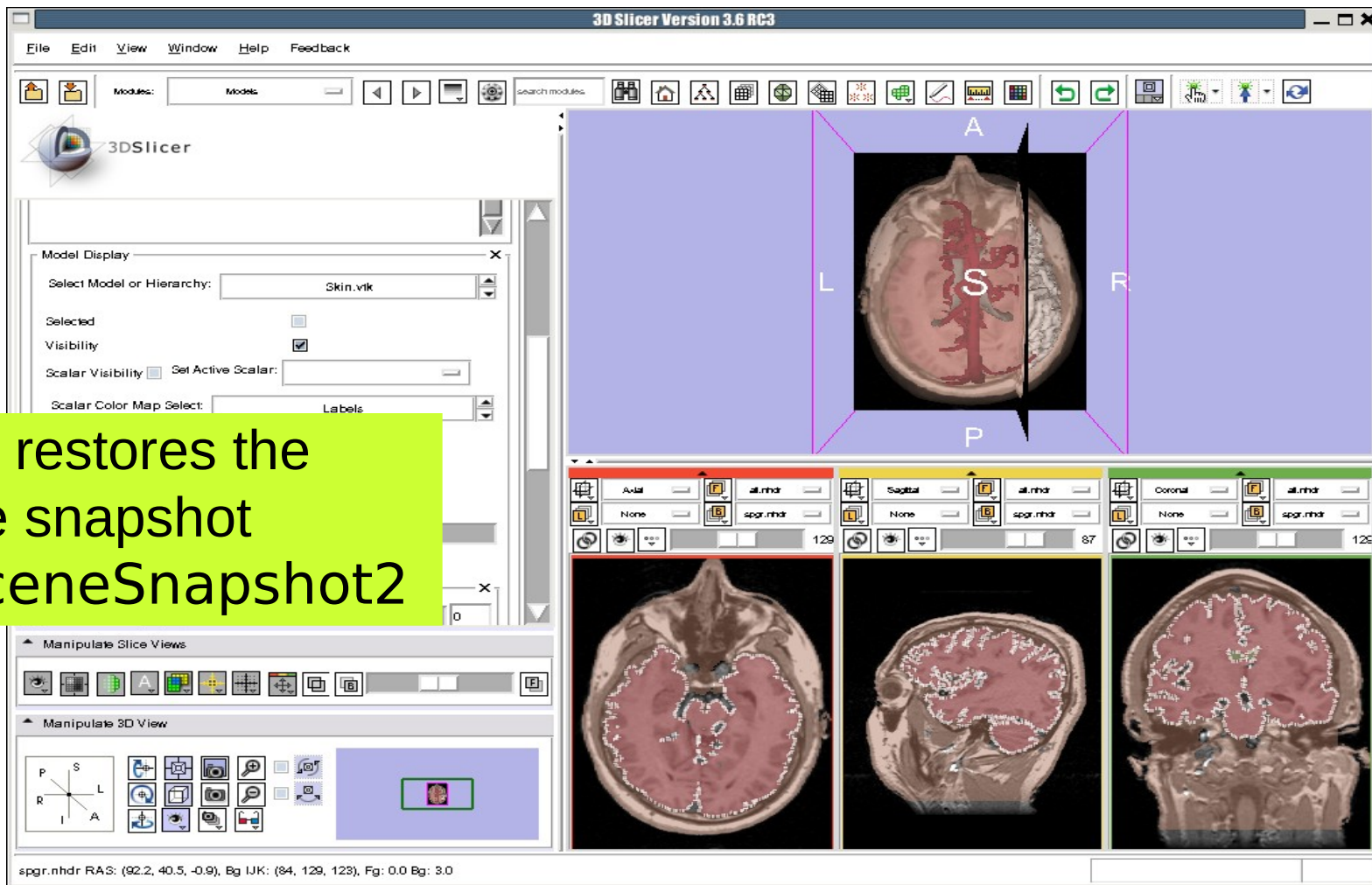


# Loading a Scene

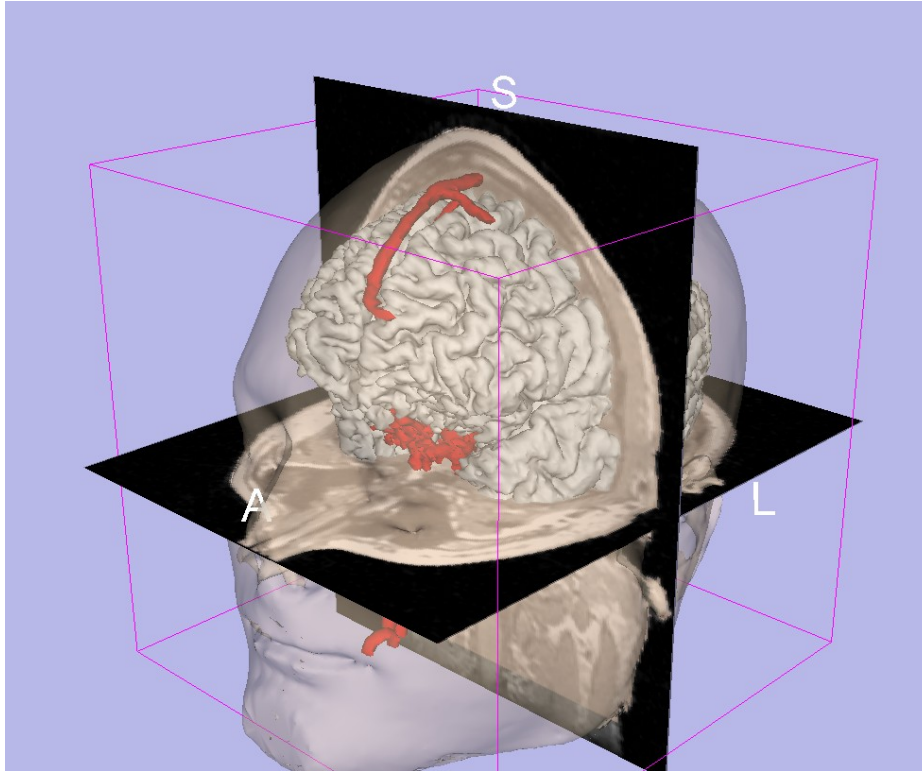


# Loading a Scene

Slicer restores the scene snapshot  
MySceneSnapshot2



# Conclusion



- 3D visualization of anatomical surface reconstructions
- 3D interaction with volumes and models
- Open-source platform





# Acknowledgments

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