Image Registration with 3D Slicer

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Objective

- Guiding you step-by-step through the process of automatically registering two structural MR datasets acquired on two different subjects using rigid and non-rigid registration

- This tutorial is built upon the Registration Case Libray 31 tutorial available at

http://www.na-mic.org/Wiki/index.php/Projects:RegistrationLibrary:RegLib_C19

Motivation

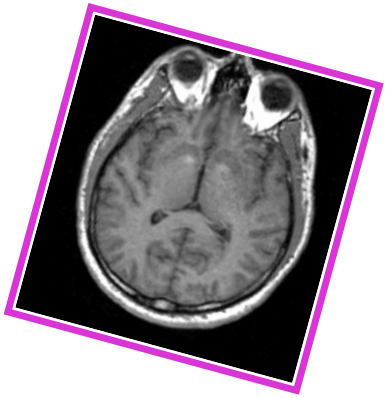


Image 1

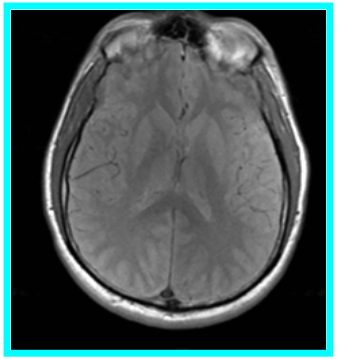
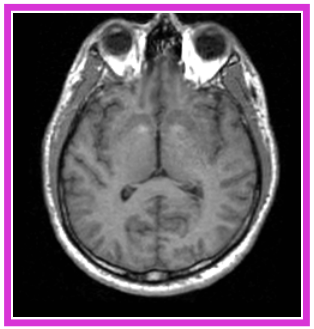


Image 2

Registration algorithms bring different image datasets into spatial alignment, in order to achieve **anatomical agreement**.

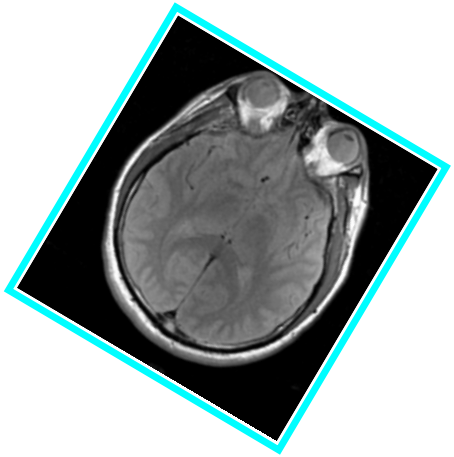
Before Image Registration

Image Space 1



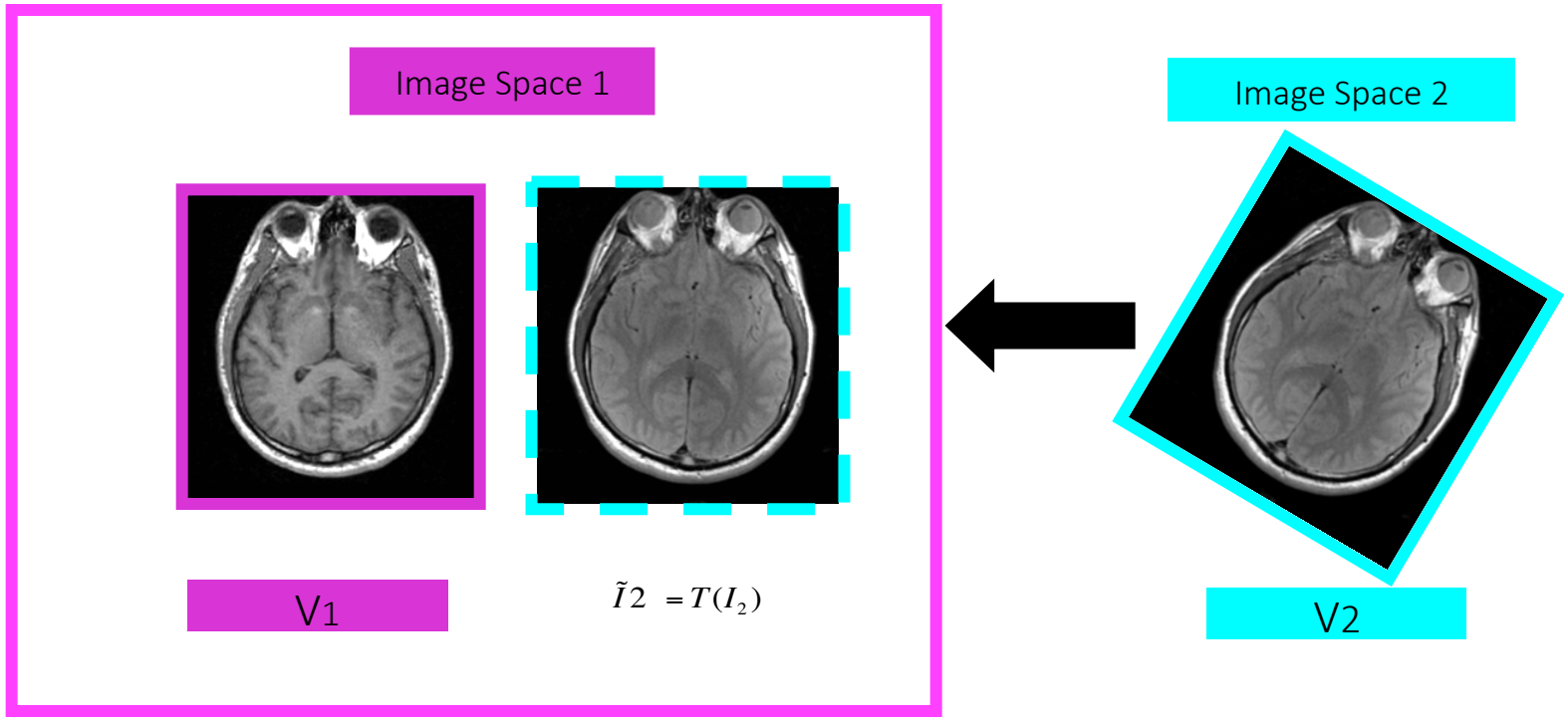
V_1

Image Space 2



V_2

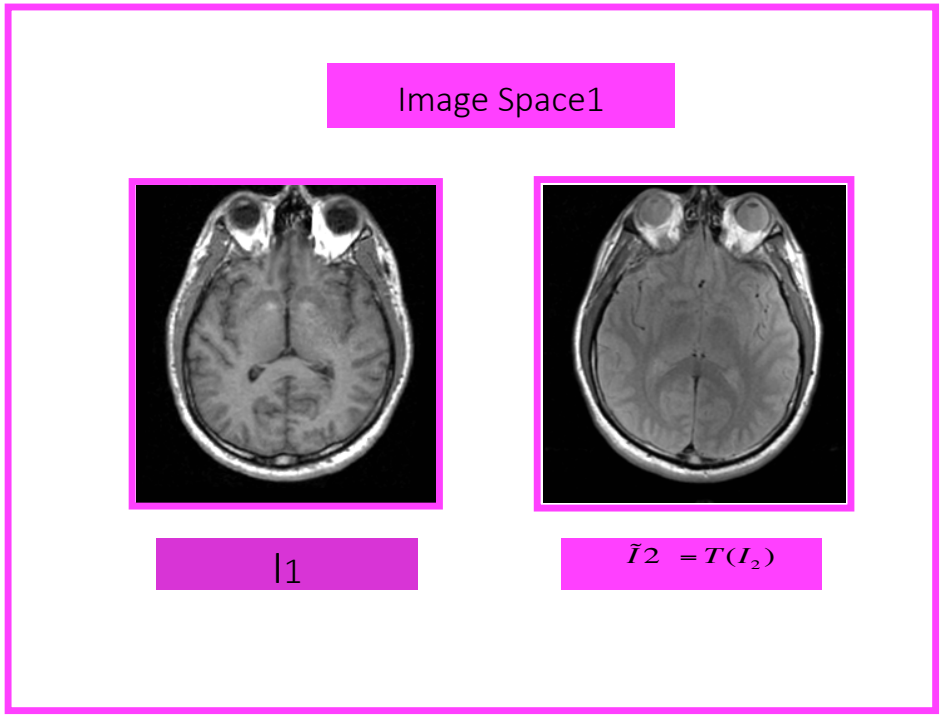
Image Registration



By applying the registration transform T to the initial volume I2, we generate a new volume spatially aligned with the volume I1.

Image registration enables the extraction of complementary information from the two volumes.

After Image Registration

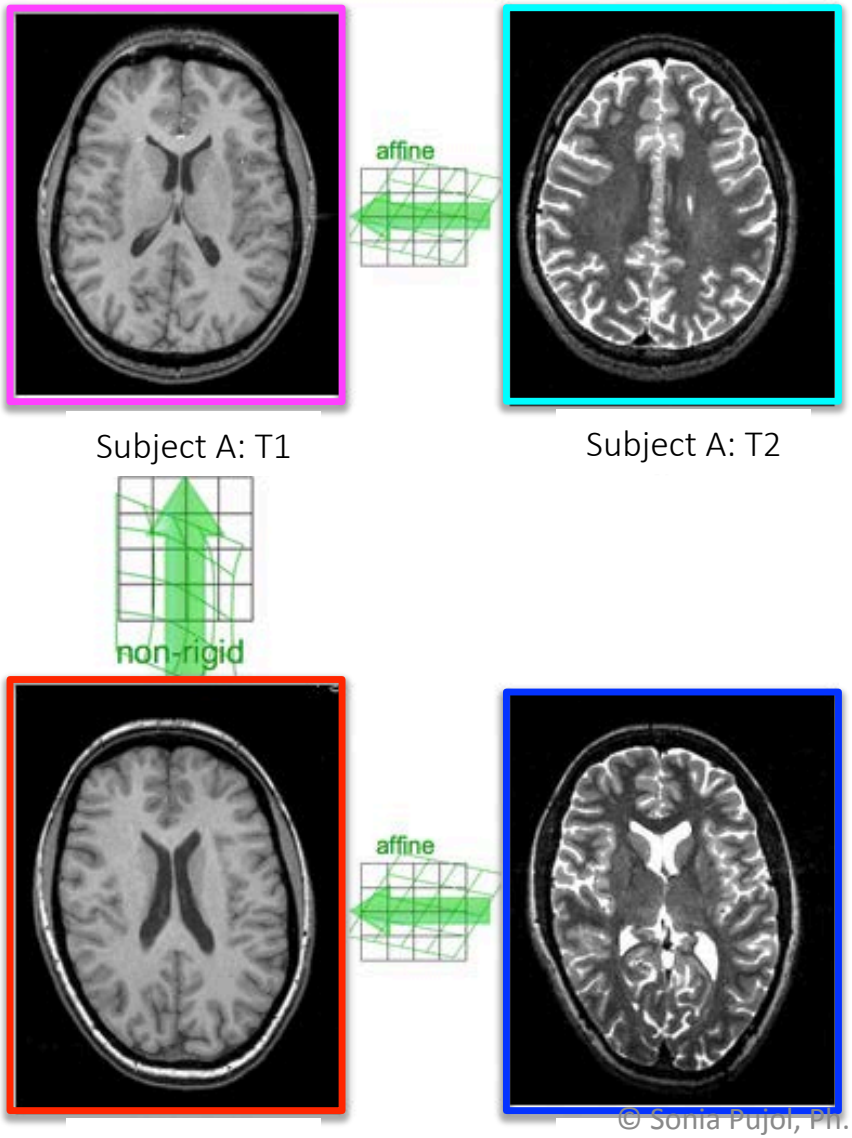


$\tilde{I}_1$

Tutorial Dataset

- Clinical study: Multi-contrast group analysis
- The case includes **T1-weighted** and **T2-weighted MRI scans** of two subjects A and B.
- This dataset is Registration Case #19 of the NA-MIC registration case library (P.I. Dr. Dominik Meier, Ph.D.)

Registration pipeline



Step 1:

Subject A, T2 to T1 registration

Step 2:

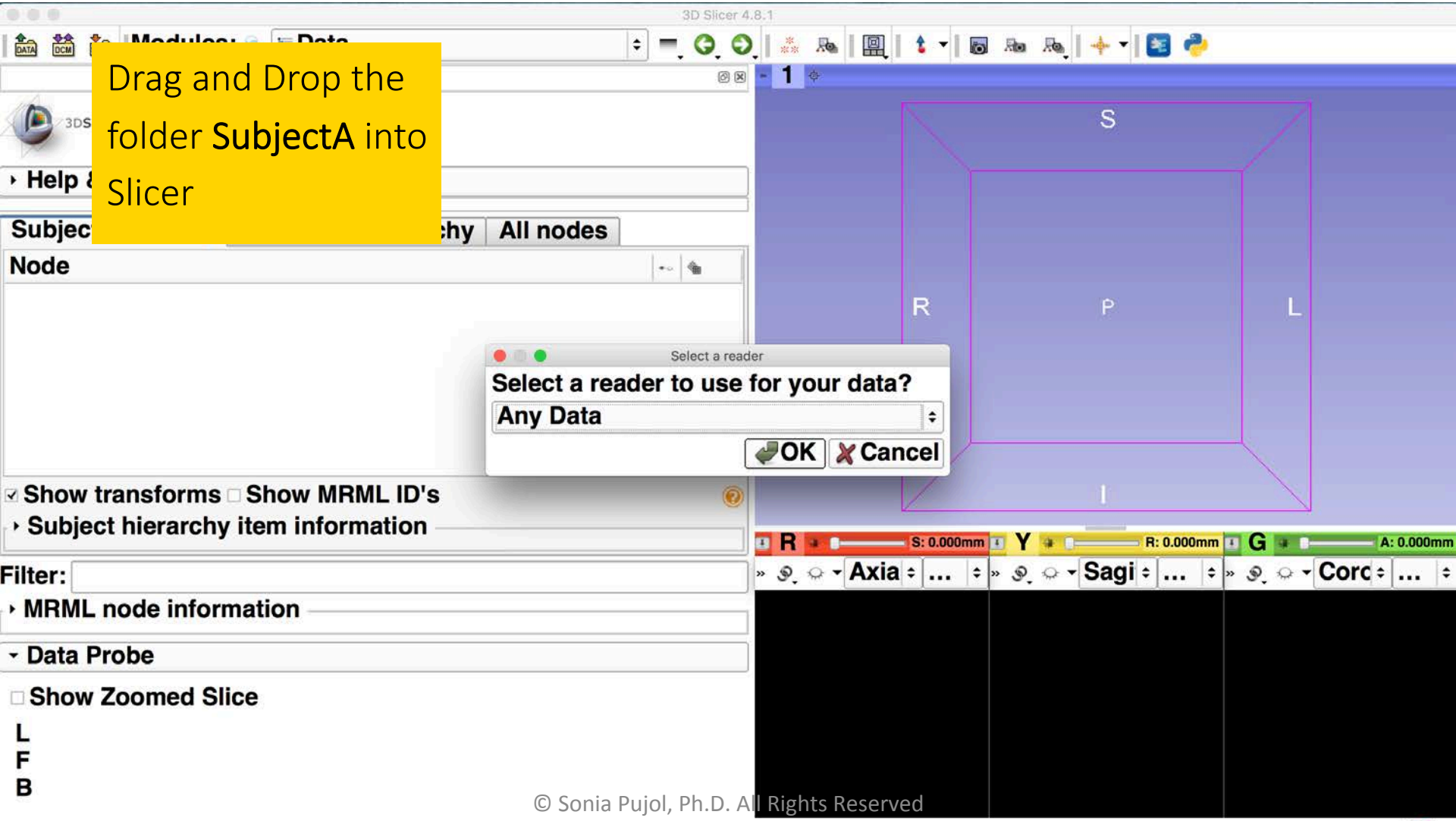
Subject B, T2 to T1 registration

Step 3:

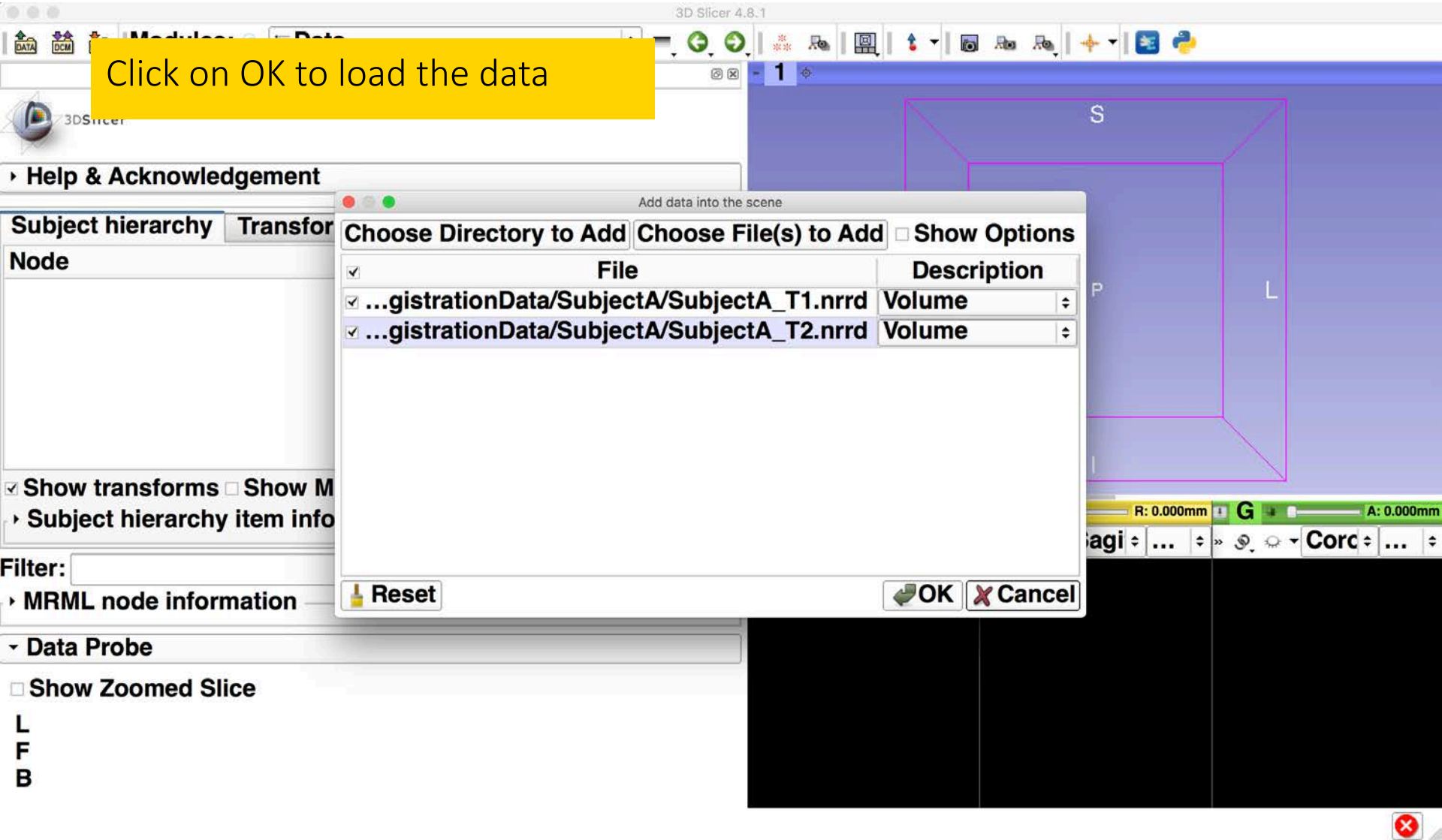
Subject B, T1 to Subject A, T1 registration

Image courtesy of Dominik Meier, Ph.D.

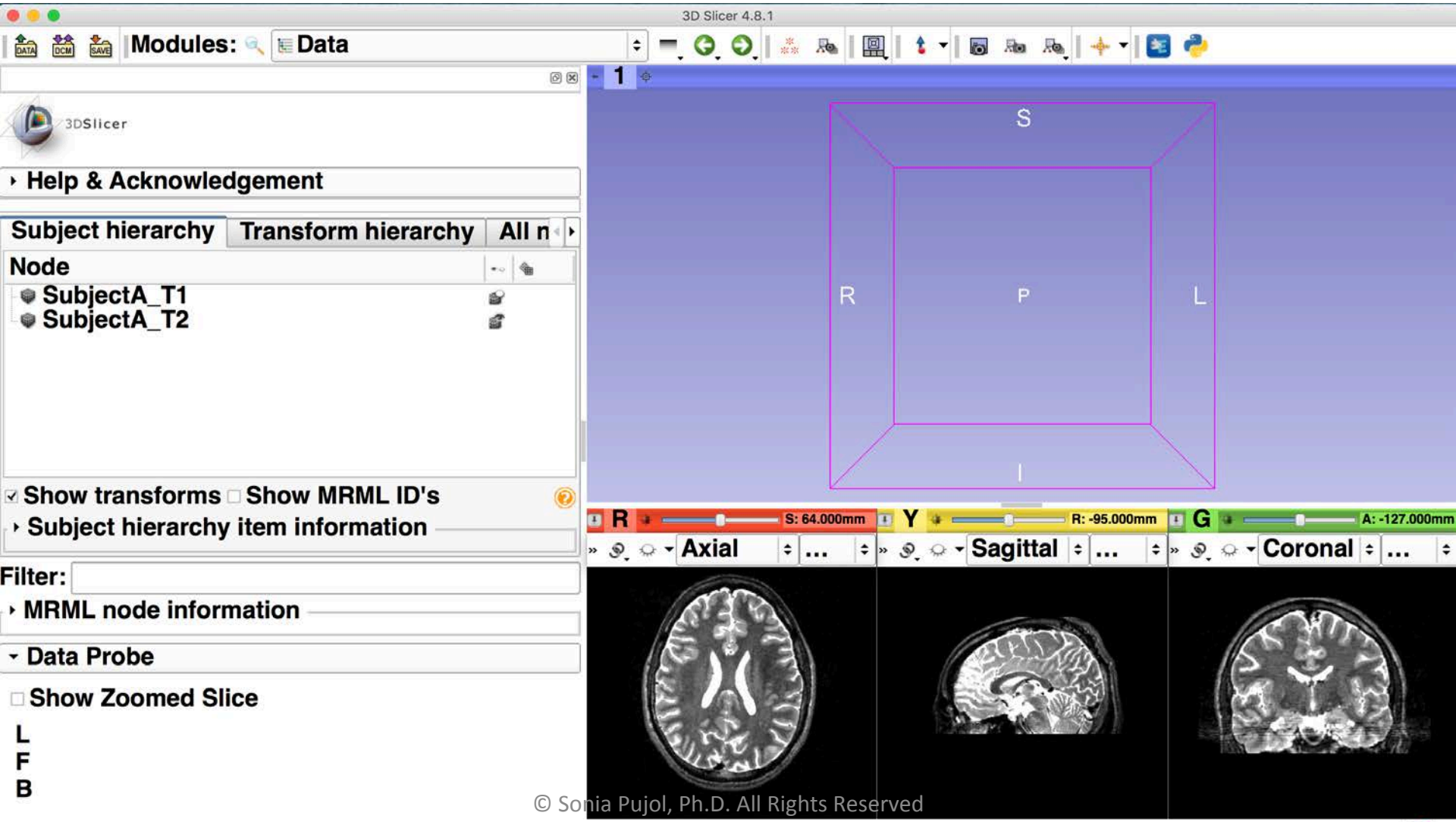
Subject A: Data loading



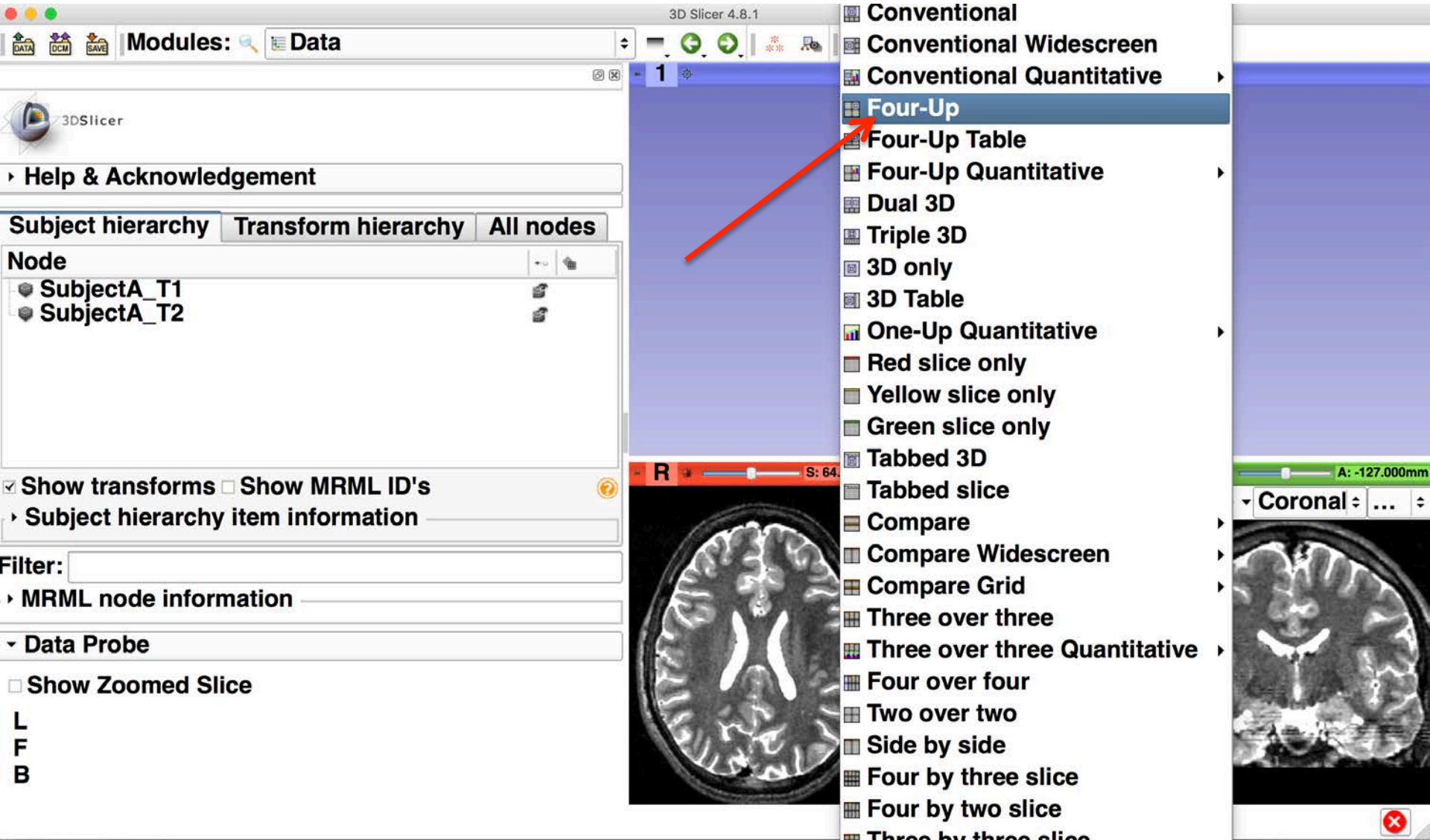
Subject A: Data loading



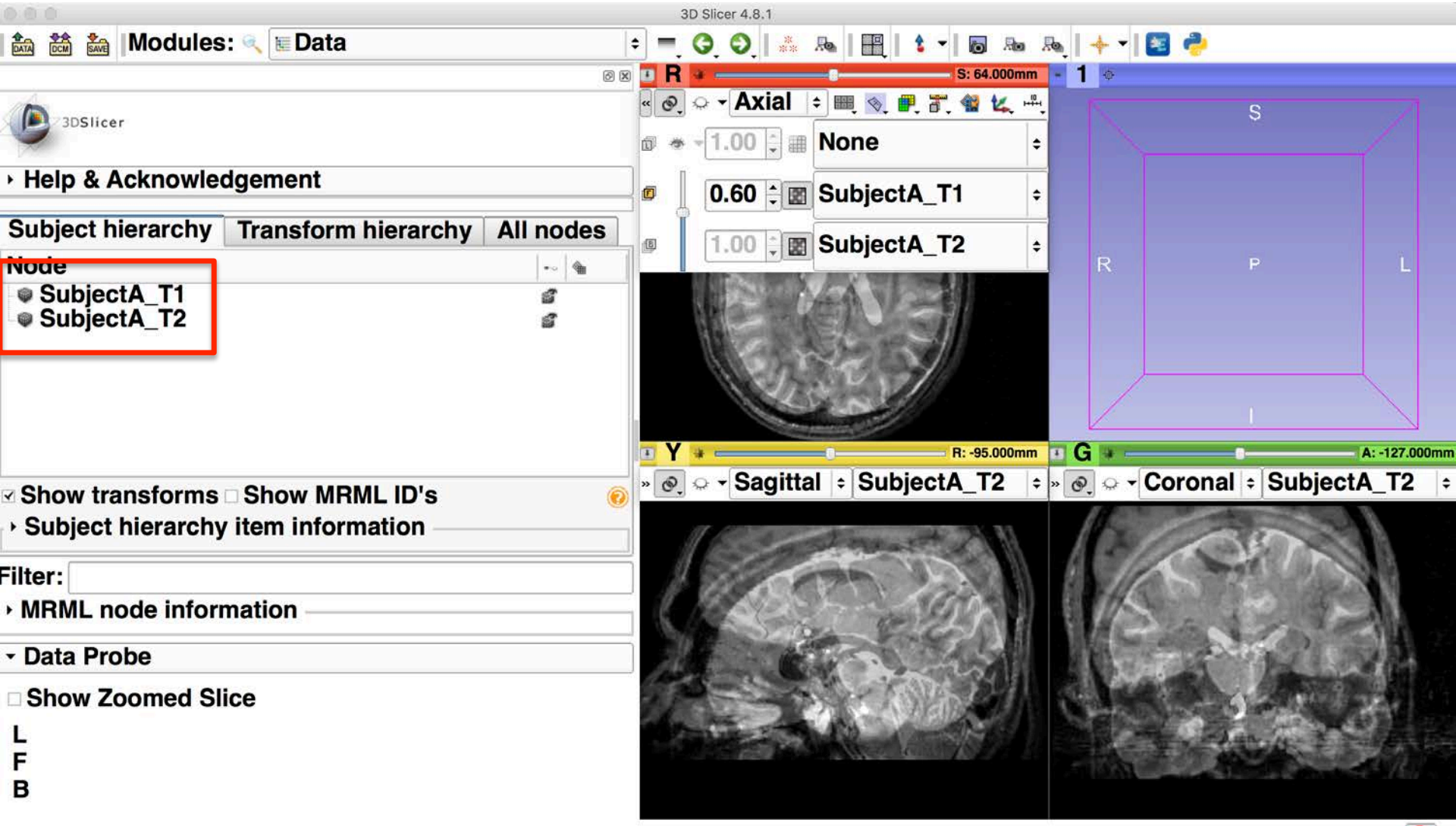
Subject A: Data loading



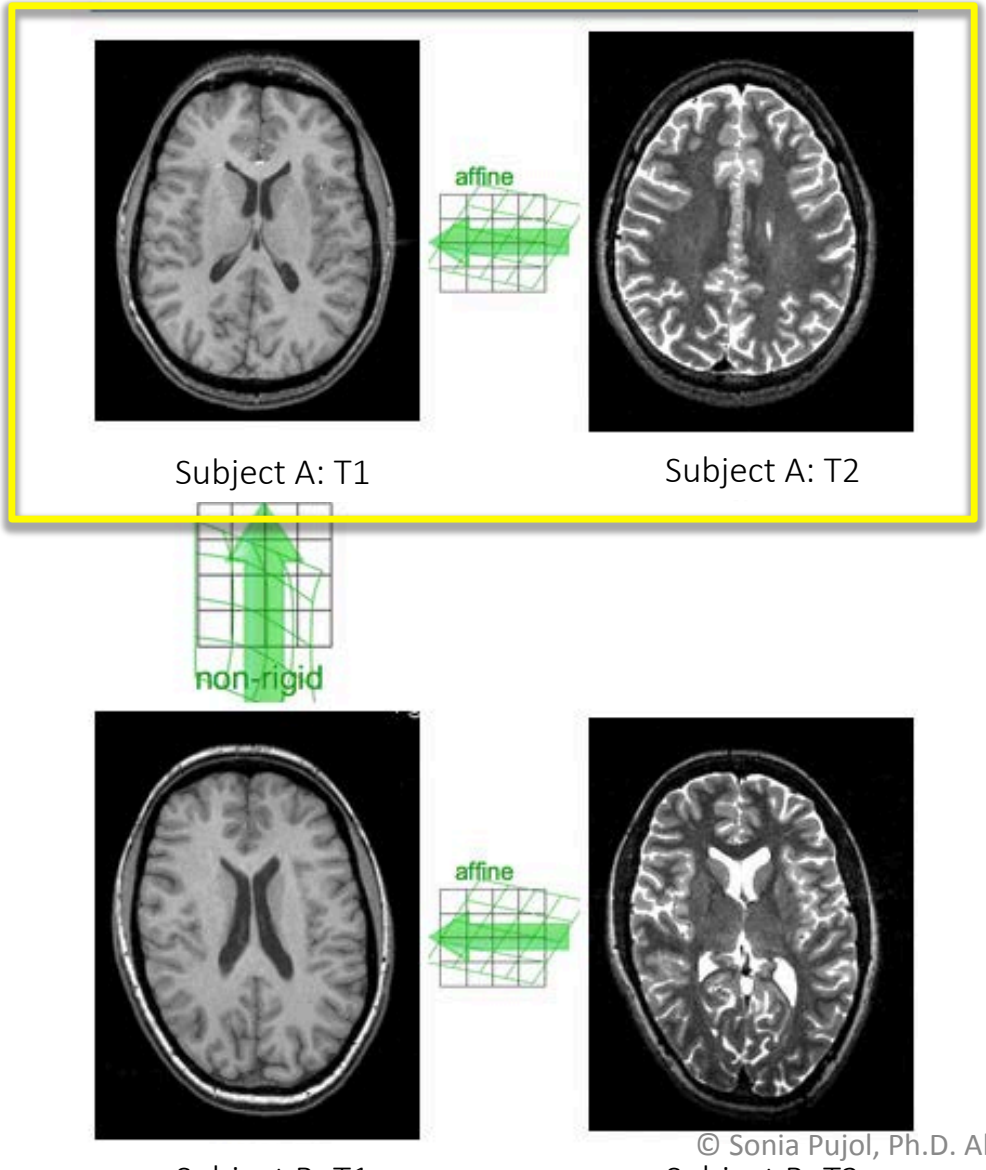
Subject A: Data loading



Subject A: Initial mis-registration



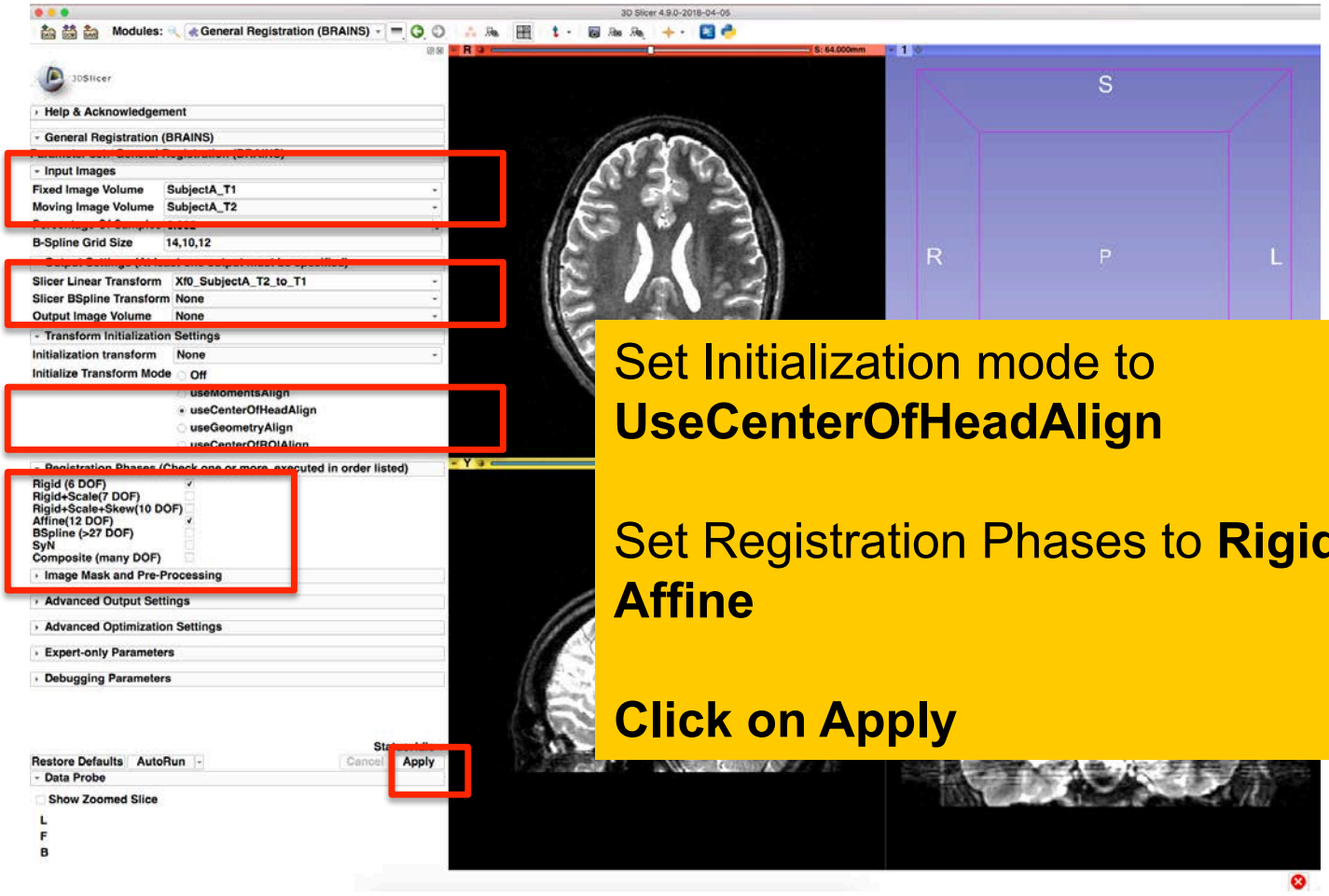
Registration pipeline



Step 1:

Subject A, T2 to T1 registration

Subject A: Data registration

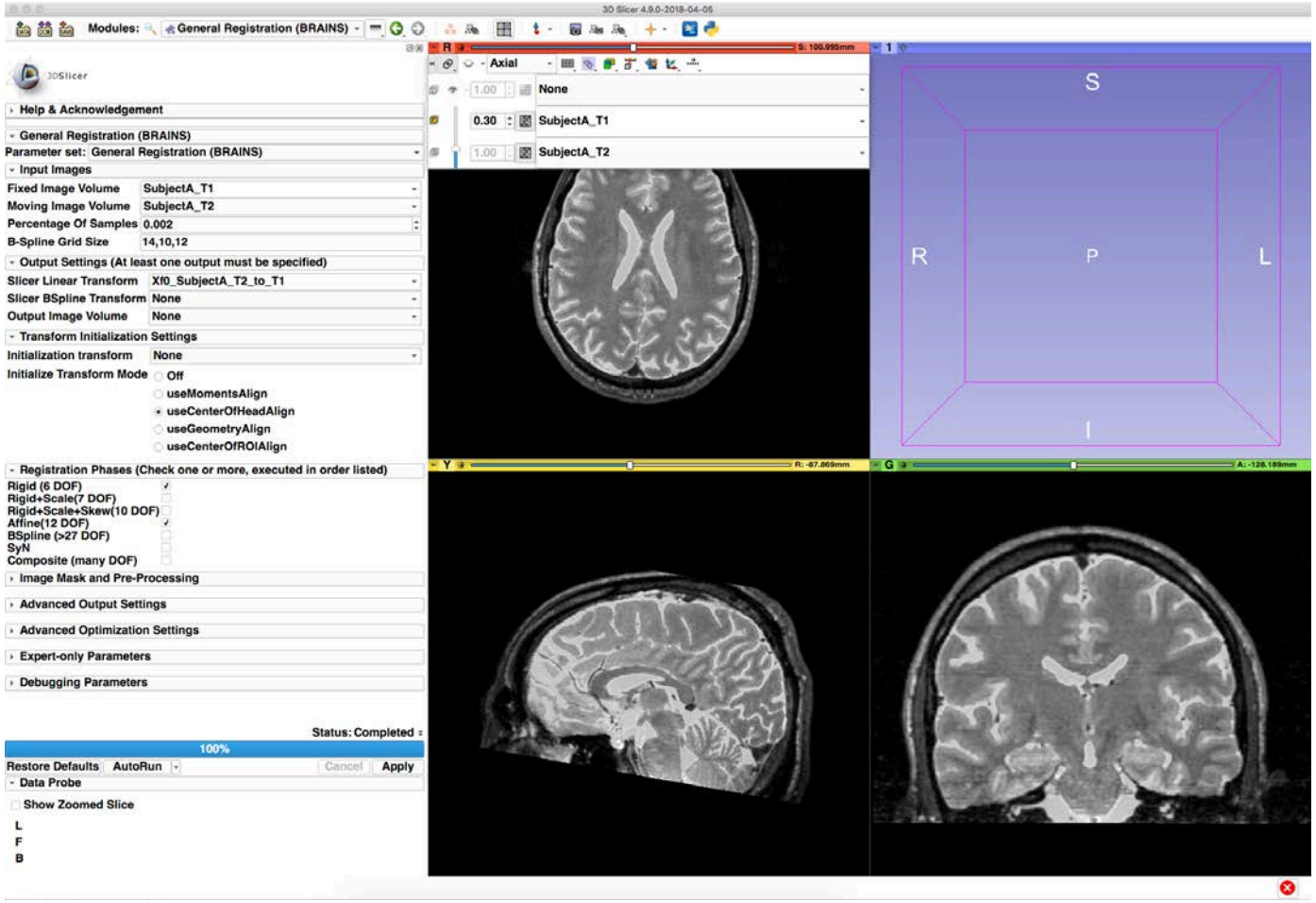


Set Initialization mode to **UseCenterOfHeadAlign**

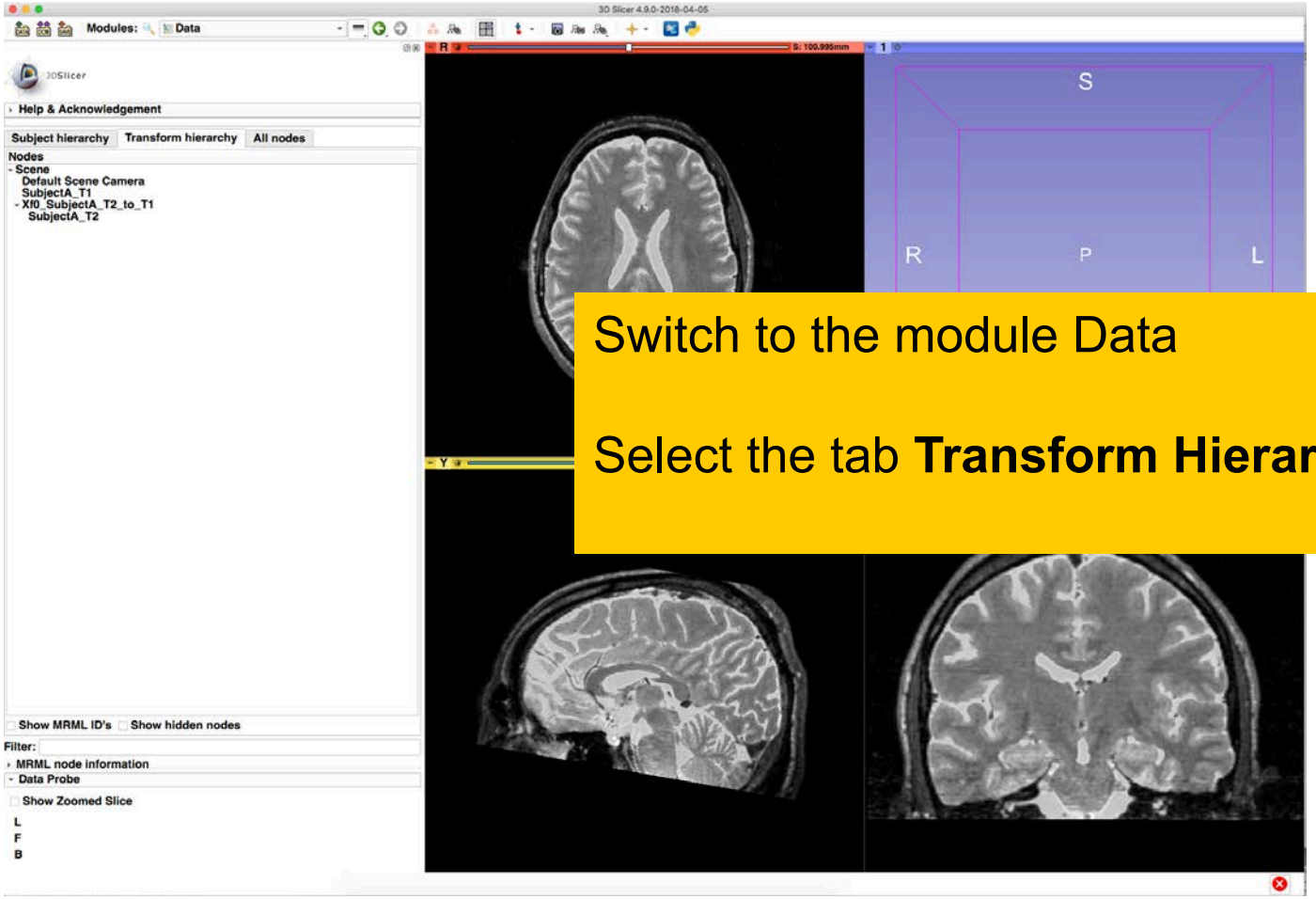
Set Registration Phases to **Rigid** and **Affine**

Click on Apply

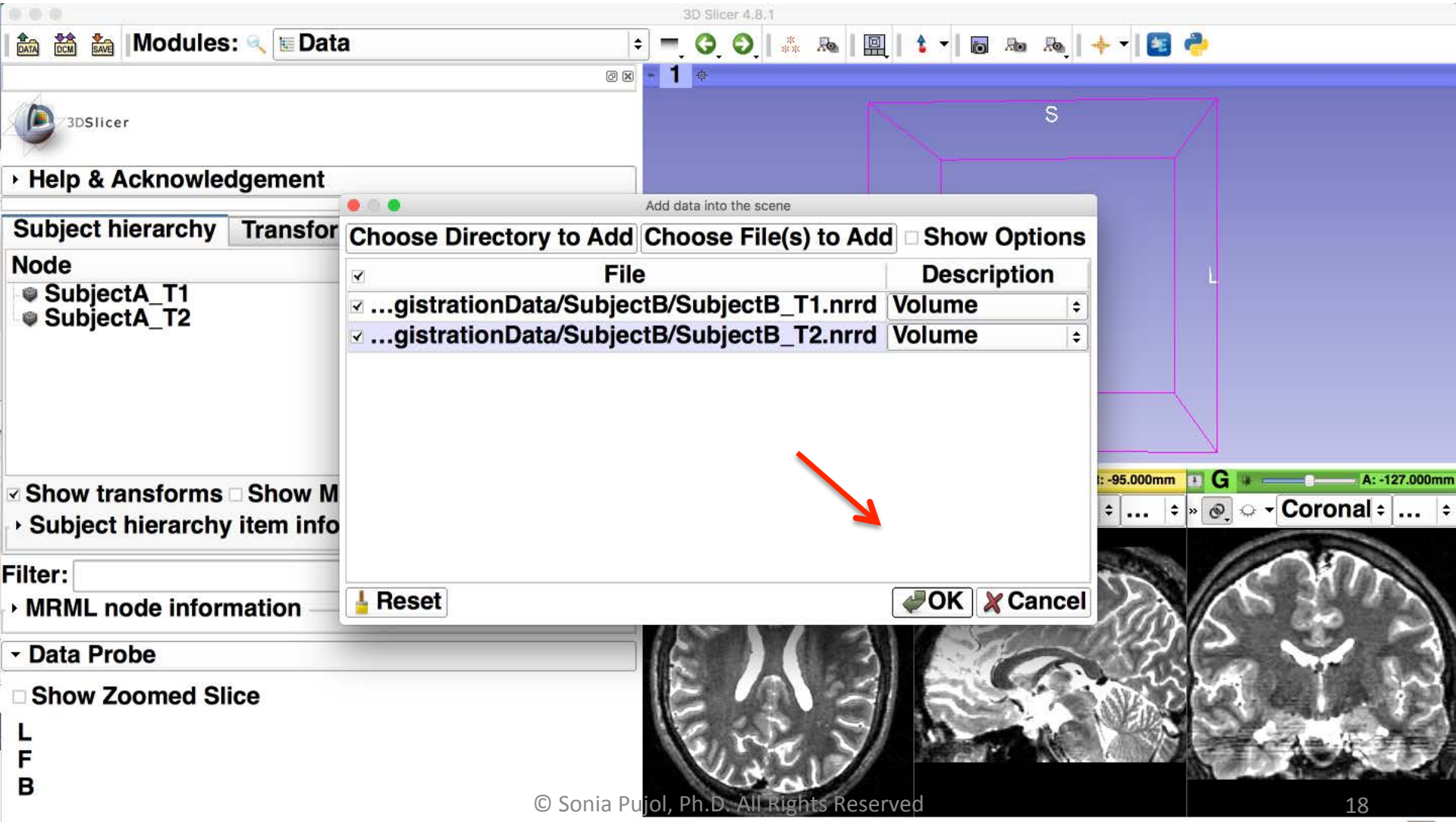
Subject A: Data registration



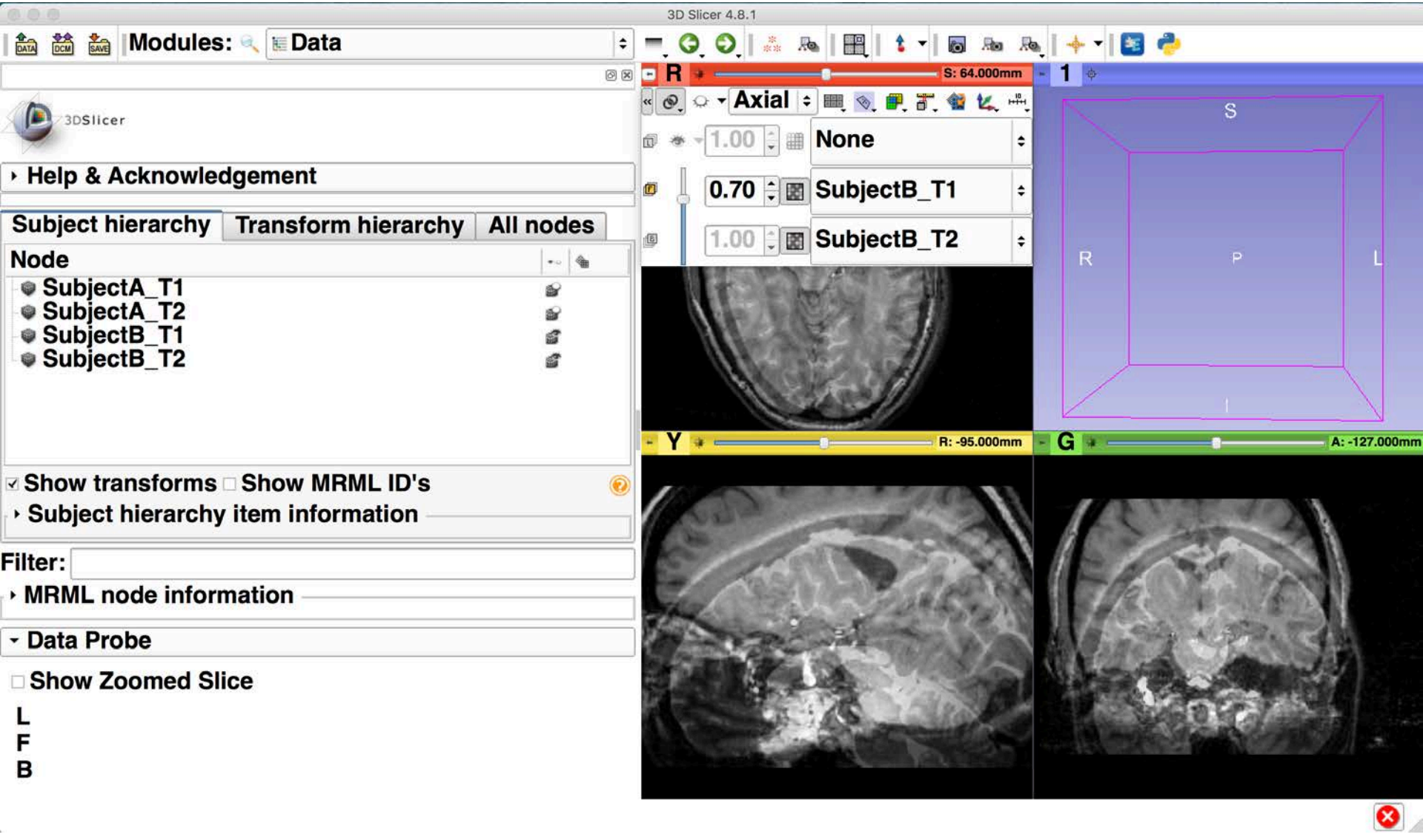
Subject A: Data registration



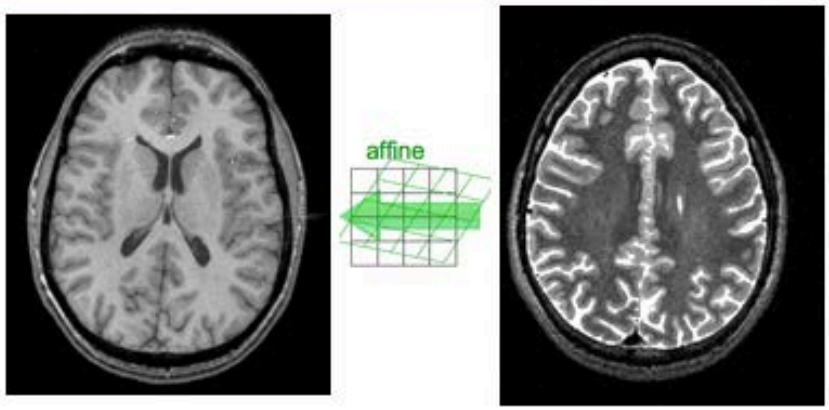
Subject B: Data Loading



Subject B: Initial mis-registration



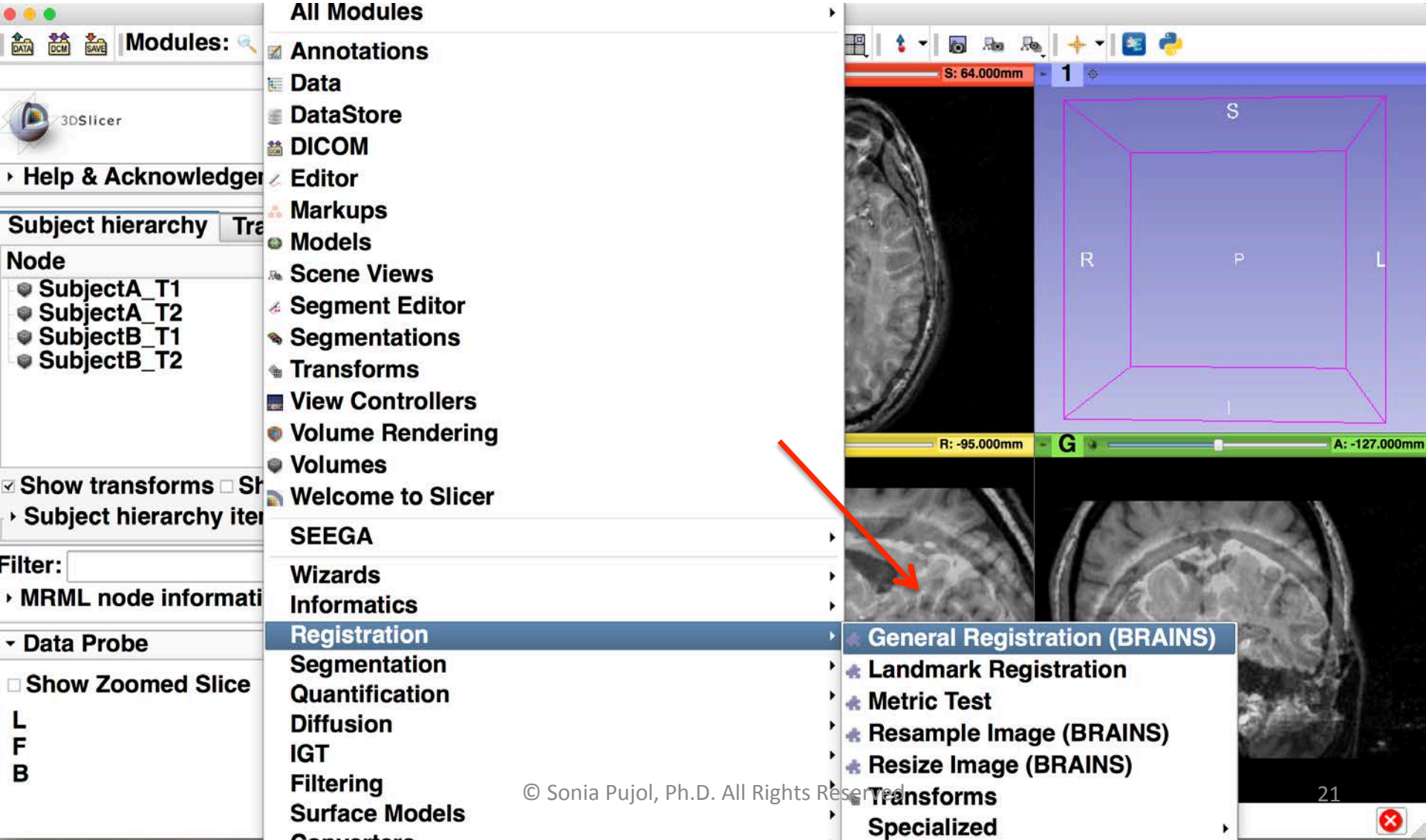
Registration pipeline



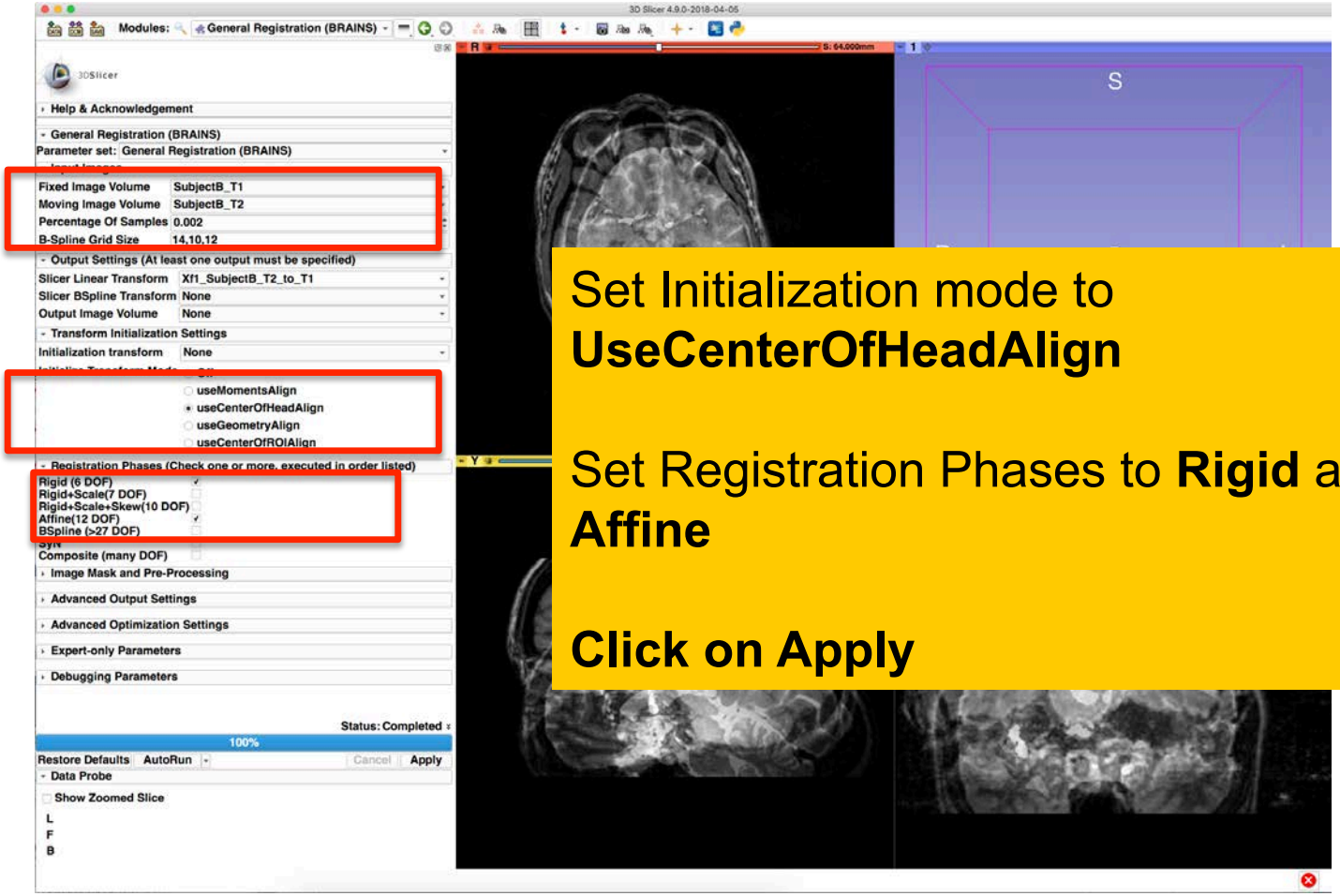
Step 2:

Subject b, T2 to T1 registration

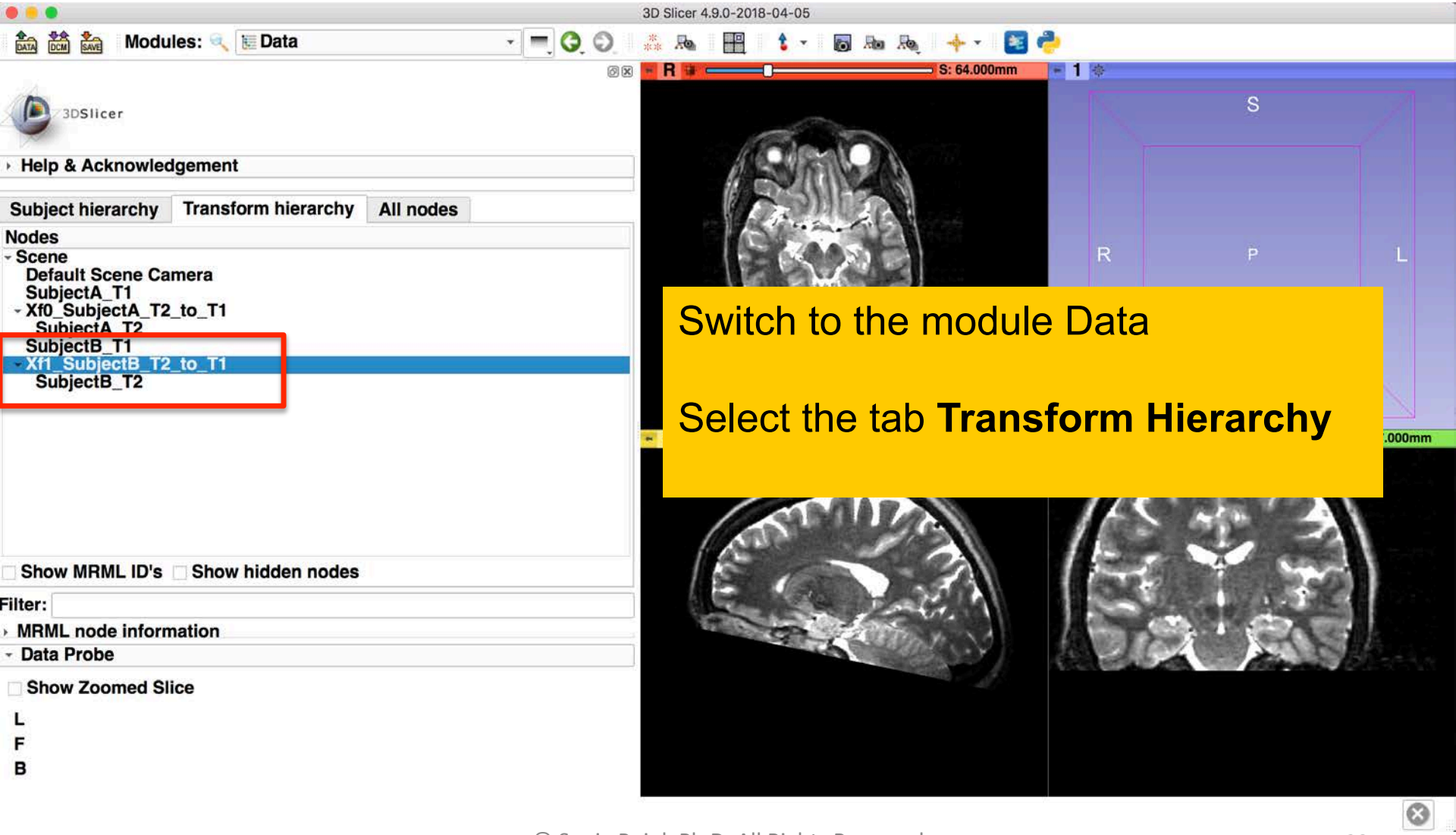
Registration Module



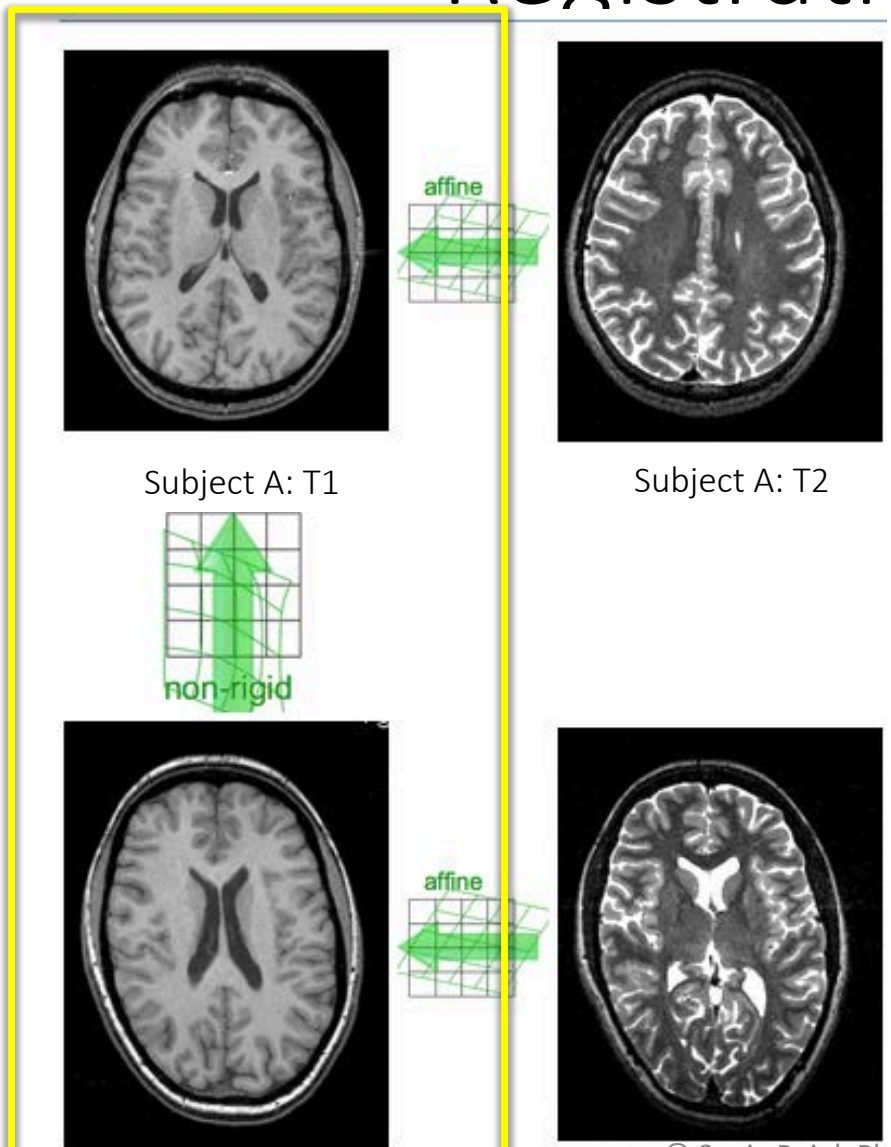
Subject B: Data Registration



Subject B: Data Registration



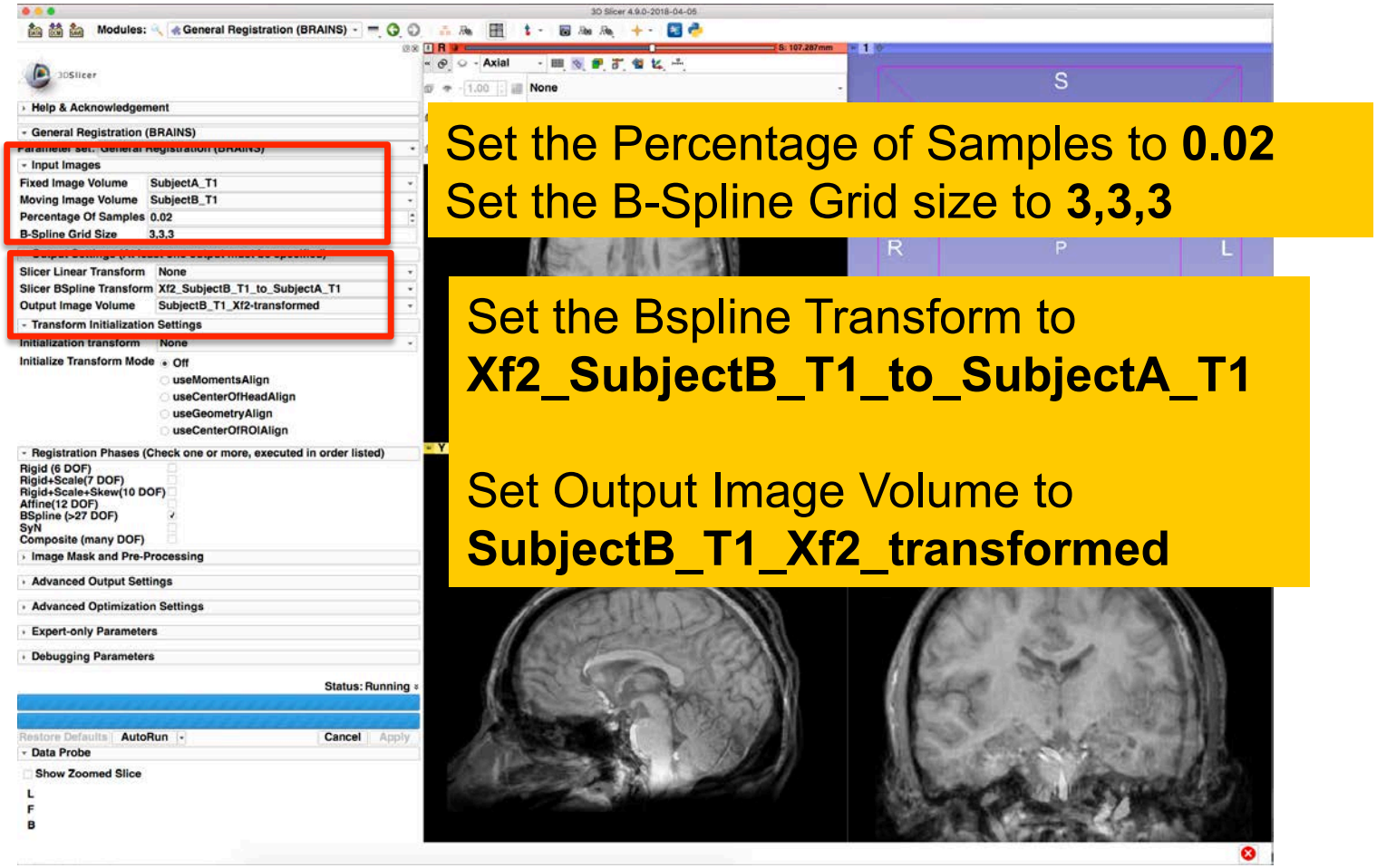
Registration pipeline



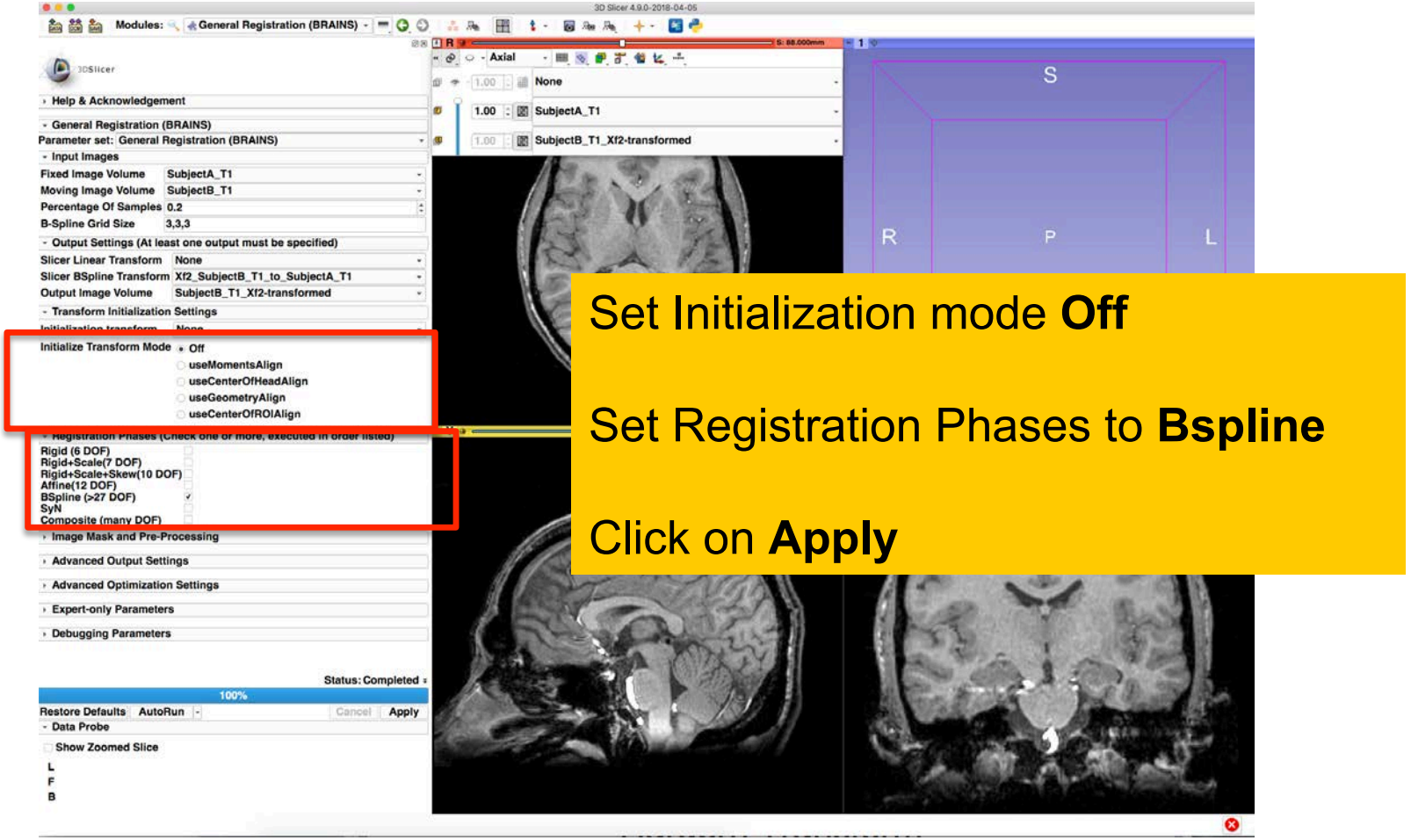
Step 3:

Subject B, T1 to Subject A, T1 registration

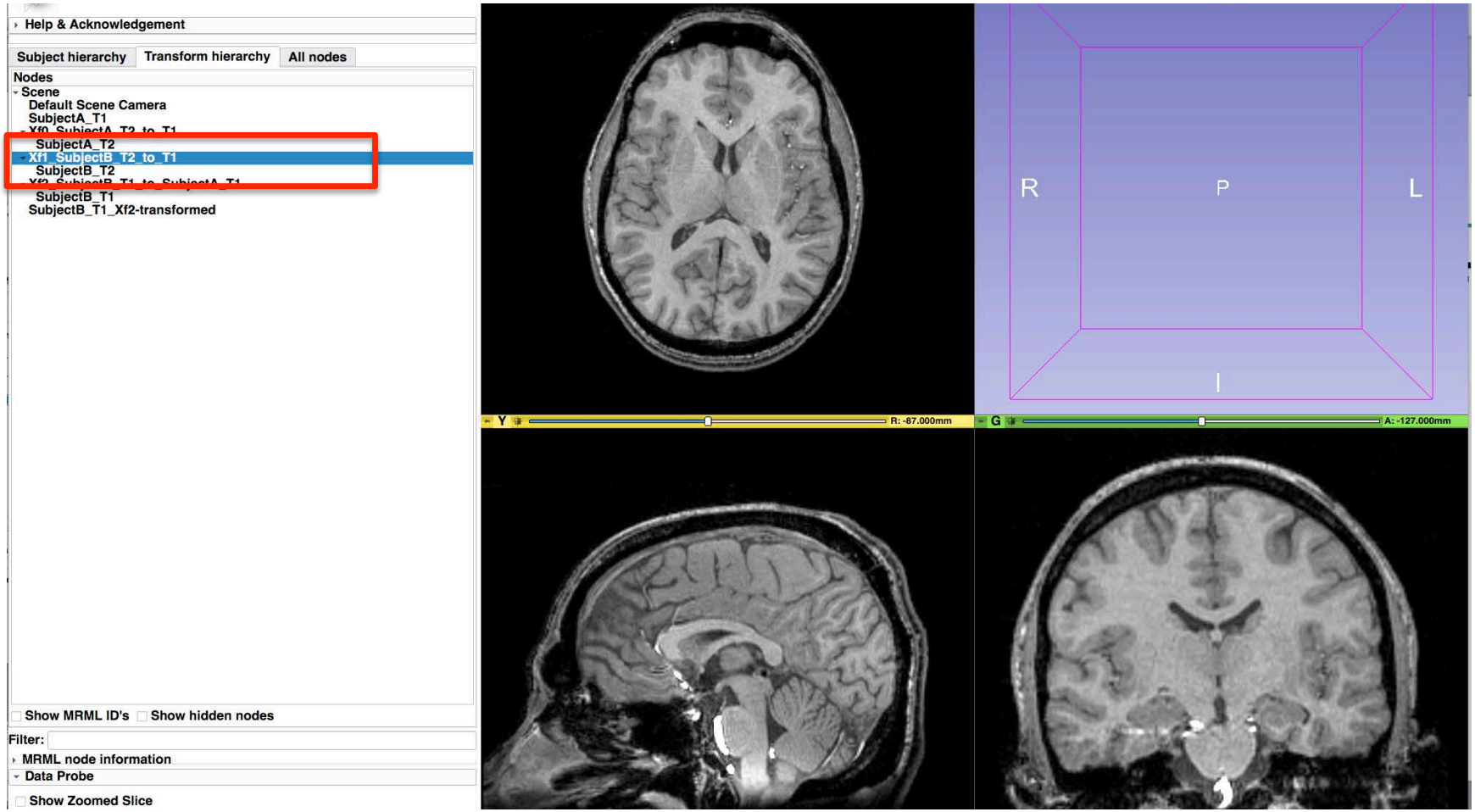
Registration of Subject B to Subject A



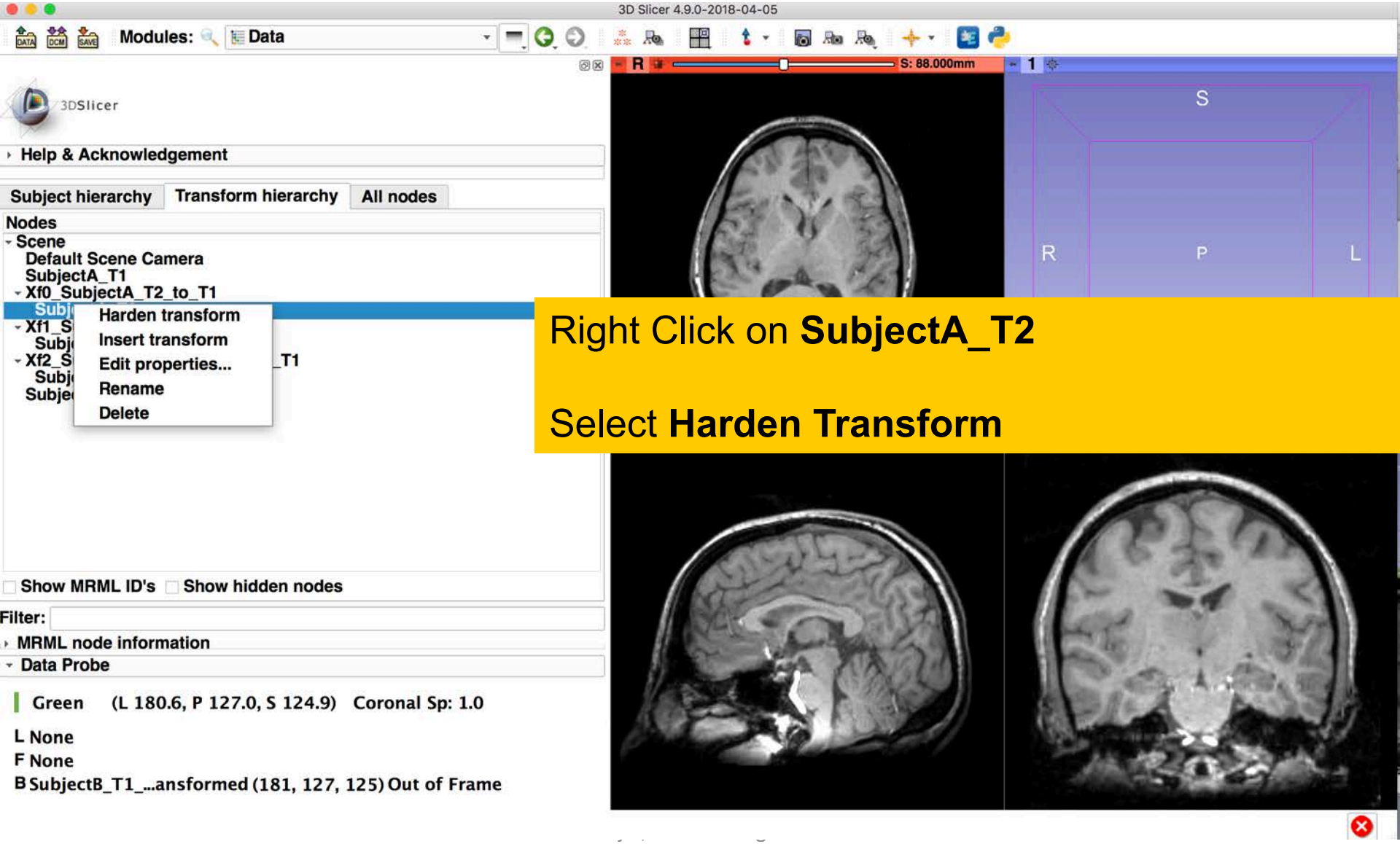
Registration of Subject B to Subject A



Co-registration of Subject B to Subject A



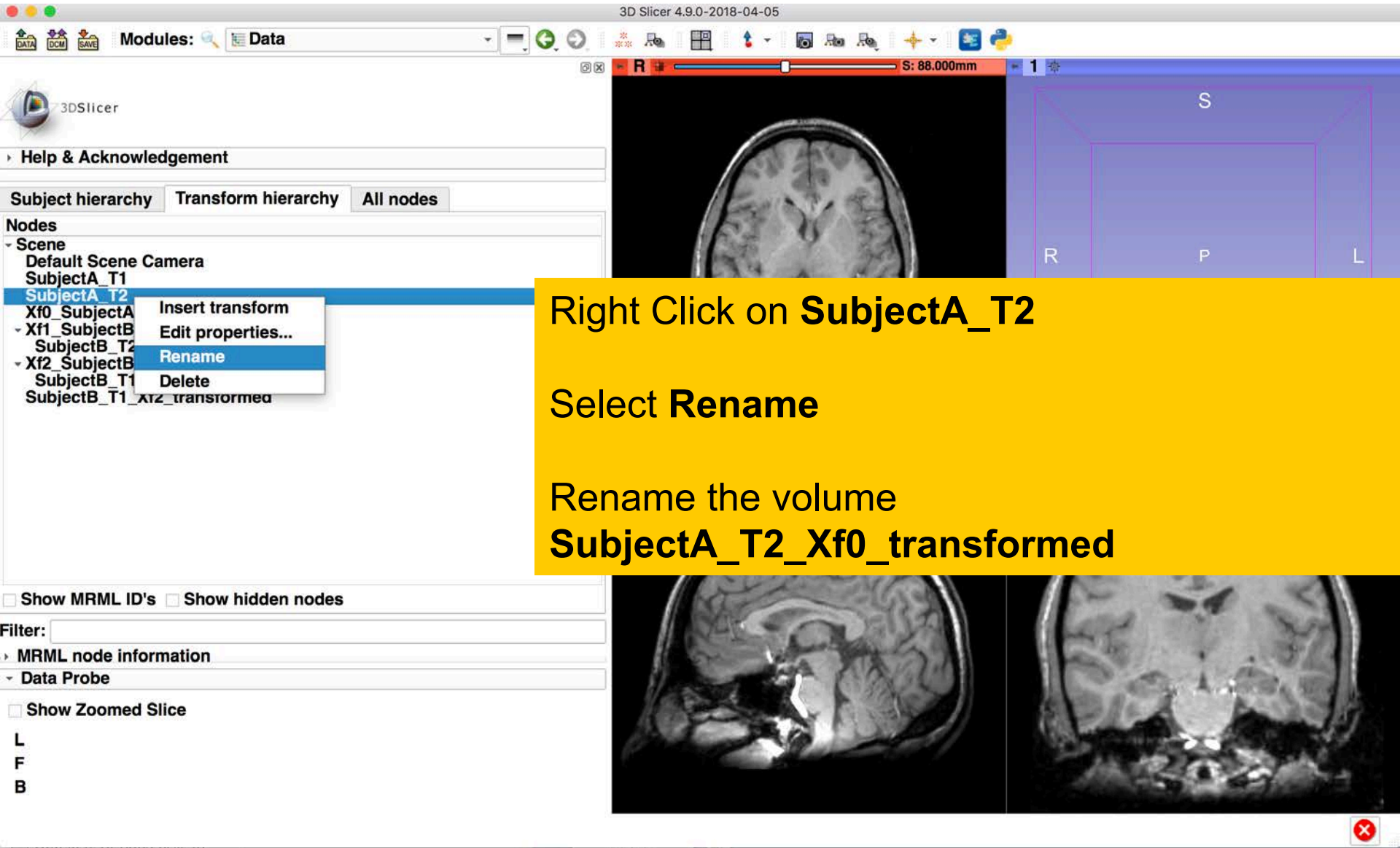
Harden Transform



Right Click on **SubjectA_T2**

Select **Harden Transform**

Harden Transform

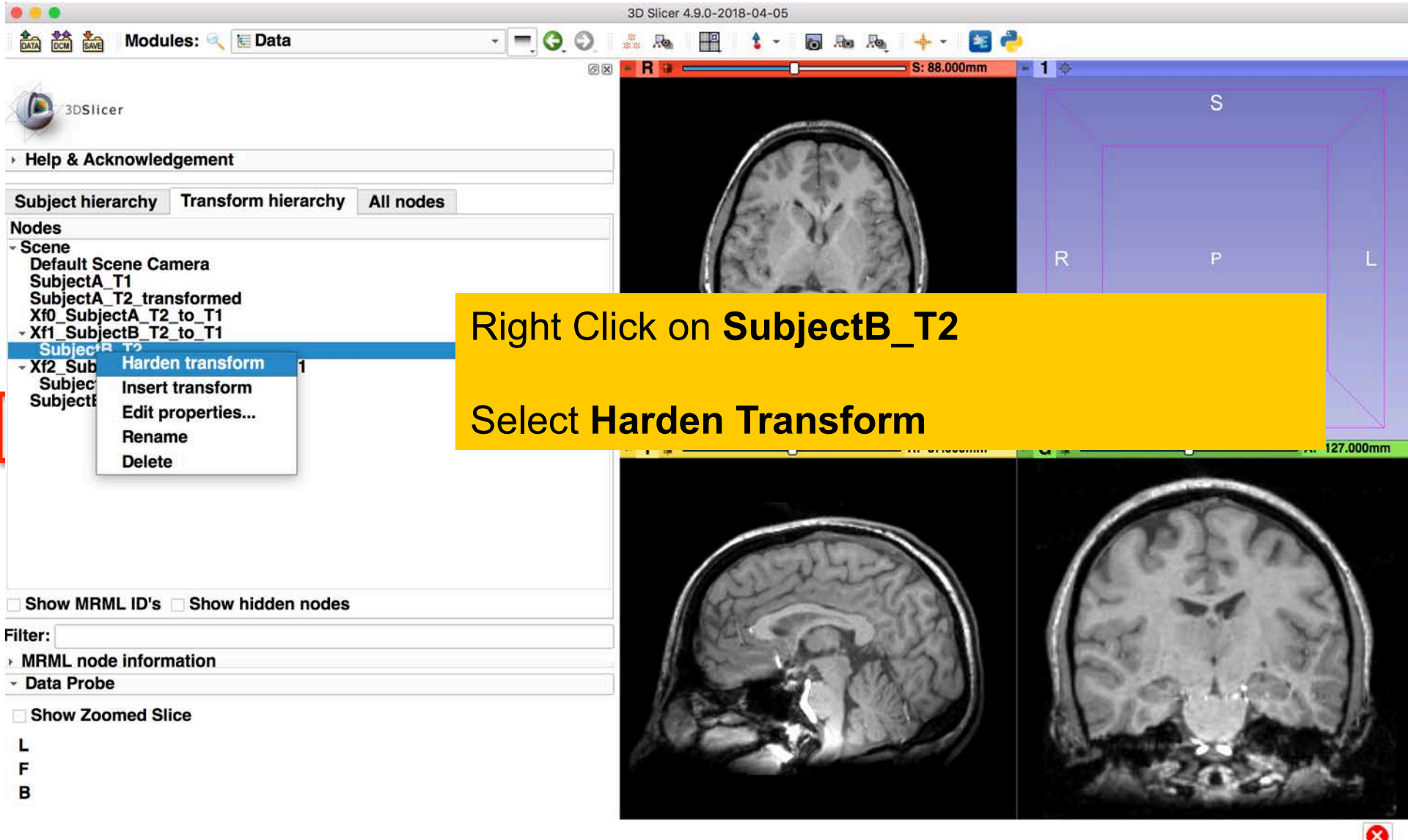


Right Click on **SubjectA_T2**

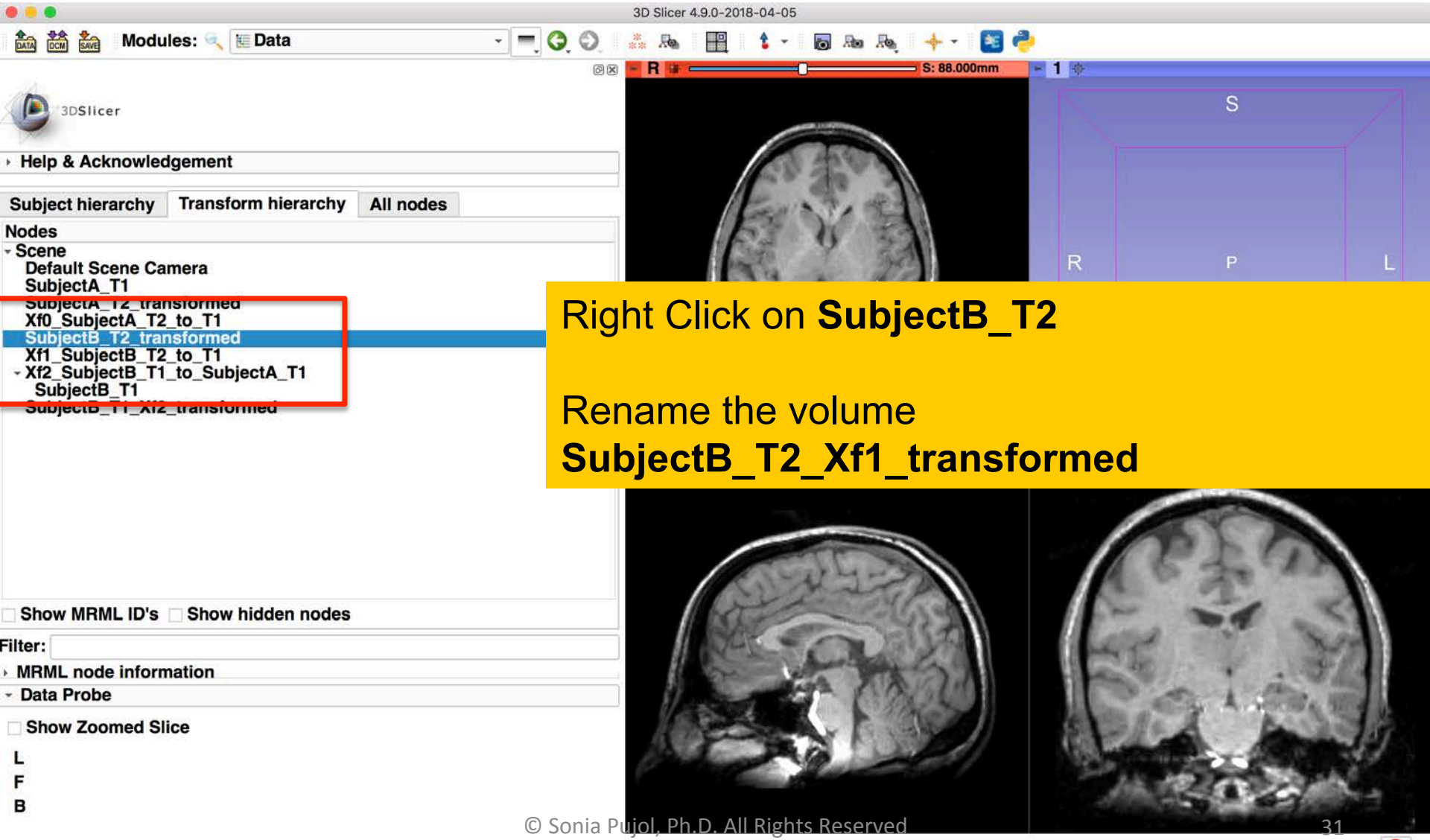
Select **Rename**

Rename the volume
SubjectA_T2_Xf0_transformed

Harden Transform



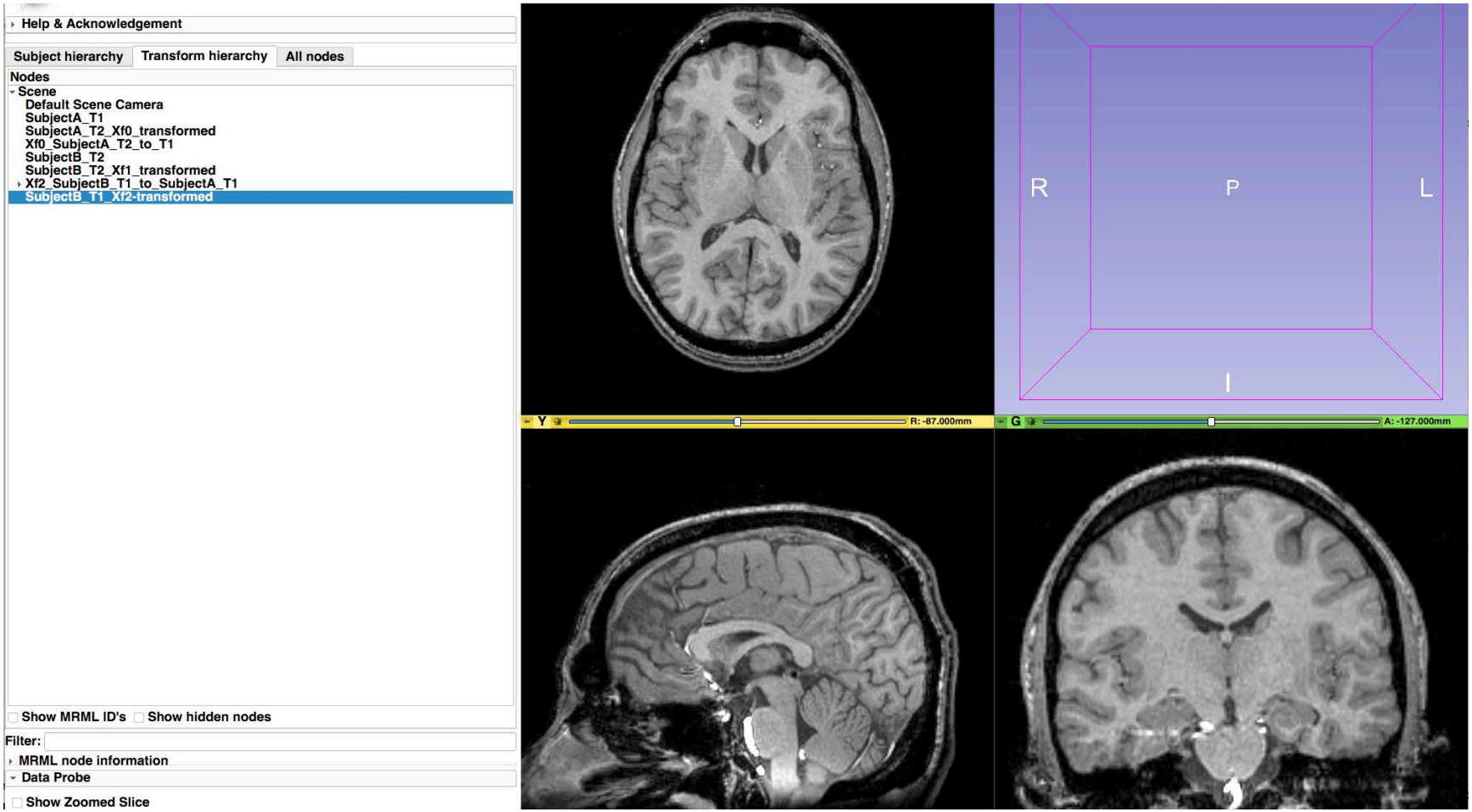
Harden Transform



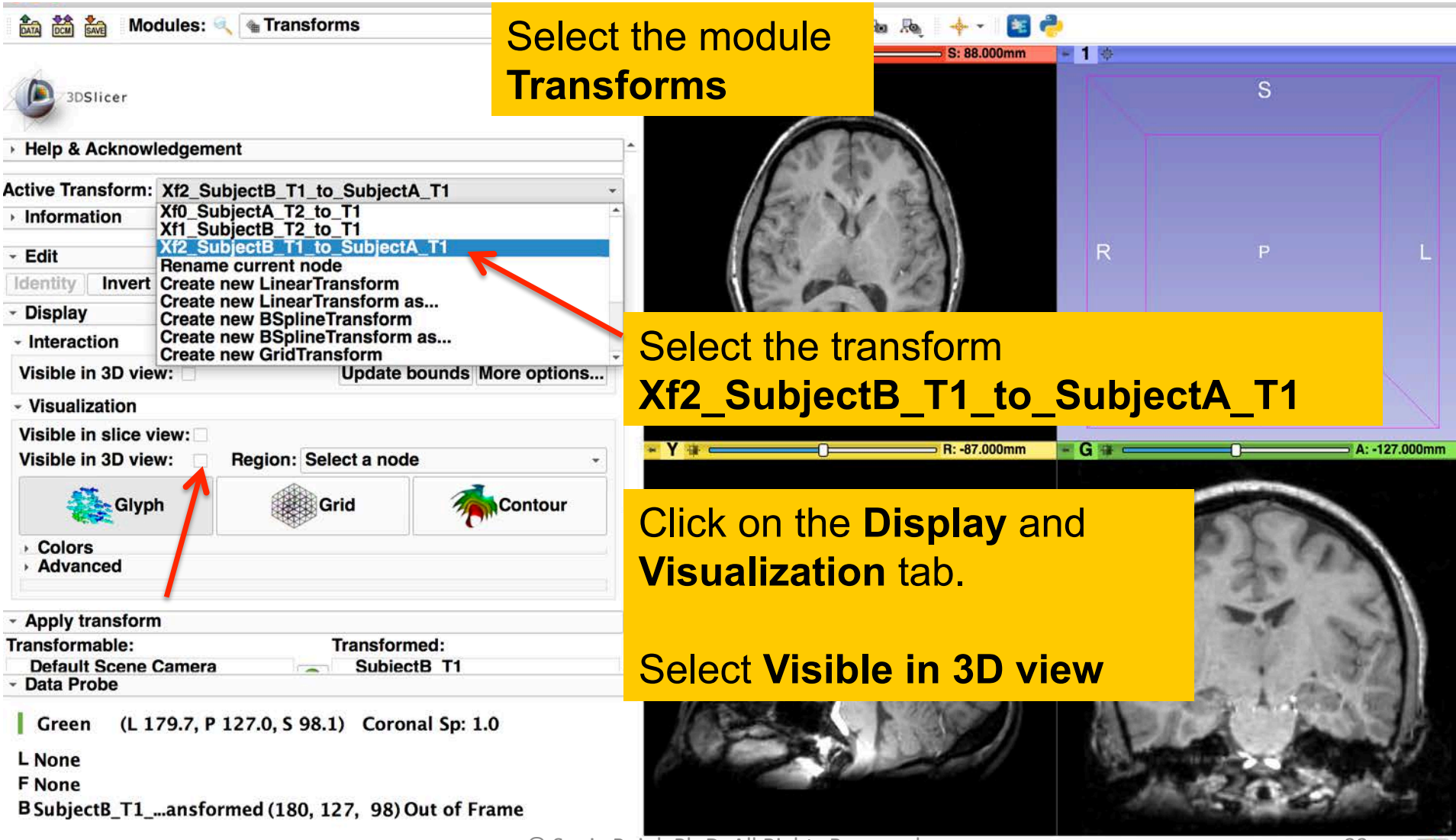
Right Click on **SubjectB_T2**

Rename the volume
SubjectB_T2_Xf1_transformed

Final set of registered volumes



Visualizing the transform



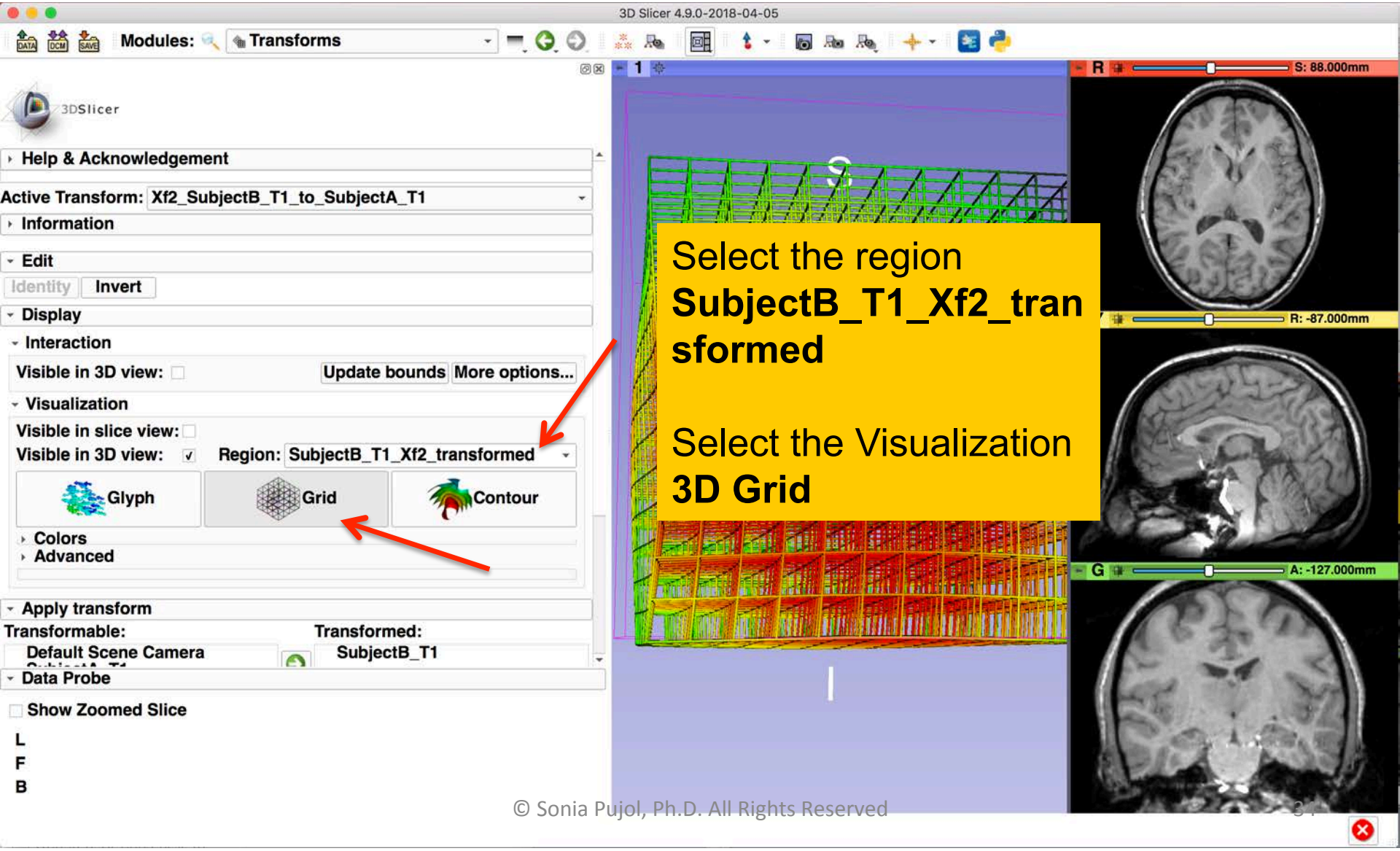
Select the module **Transforms**

Select the transform **Xf2_SubjectB_T1_to_SubjectA_T1**

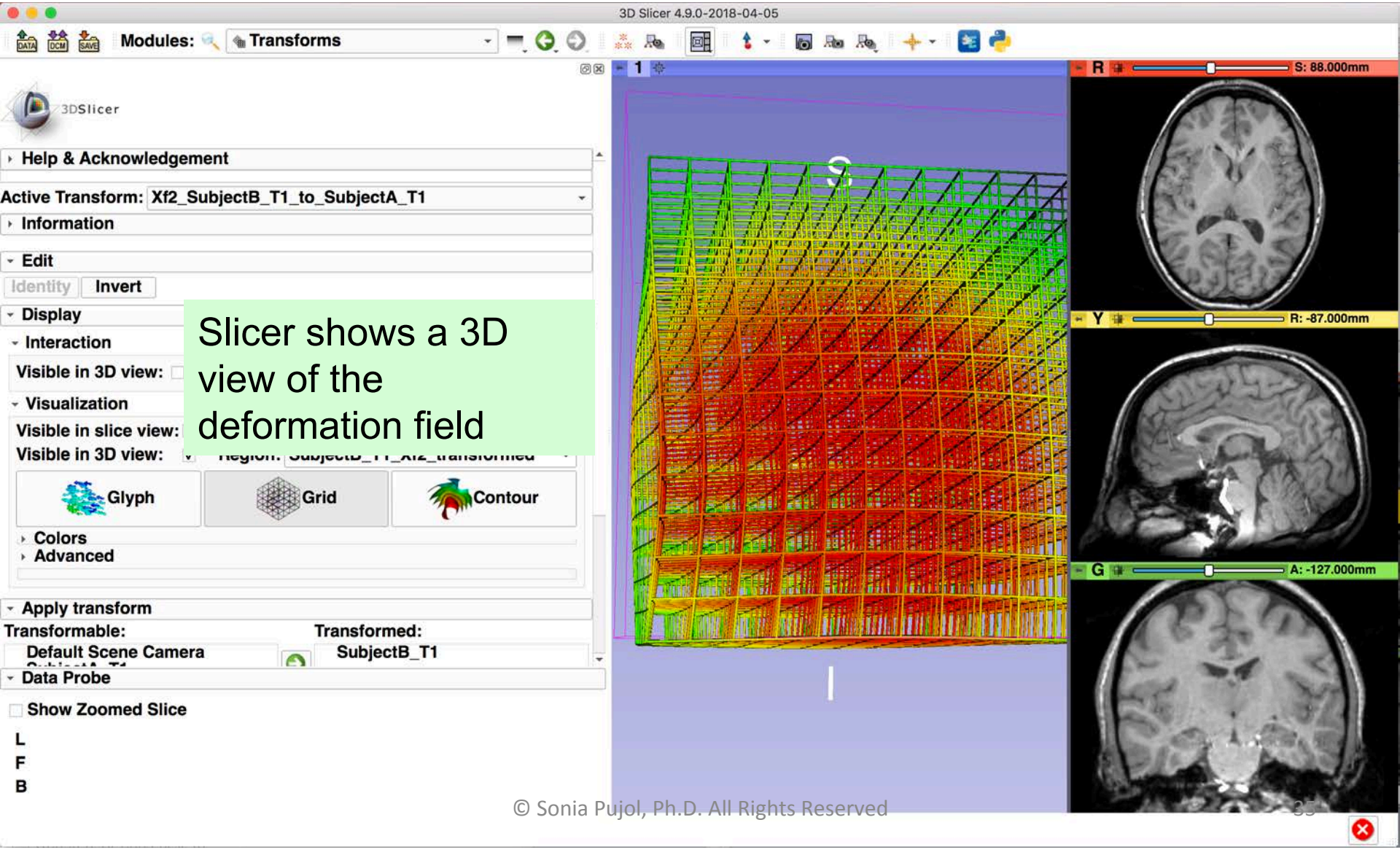
Click on the **Display** and **Visualization** tab.

Select **Visible in 3D view**

Visualizing the transform



Visualizing the transform



Slicer shows a 3D view of the deformation field

Acknowledgments

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  NIH U54EB005149

- Neuroimage Analysis Center (NAC)

  NIH P41EB015902