



# Brain Images

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*Comparing Images*

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Version 1.5

For GIMIAS-1.5

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*The aim of this exercise is to show different visualization and fusion functionalities applied to Neurological images. The predefined workflow that will be loaded in GIMIAS will allow to load images acquired using different modalities (MRI, SPECT, PET, fMRI) and visualize them as overlaid images, compare them using more Views in the same working area, display the desired number of slice and orientation, flip and rotate the images using the multislice view.*

## Download the data

You need **these files** for this tutorial:

1. The folder: ToReorient/
2. The folder: SISCOM/
3. The folder: Epilepsy/fMRI/

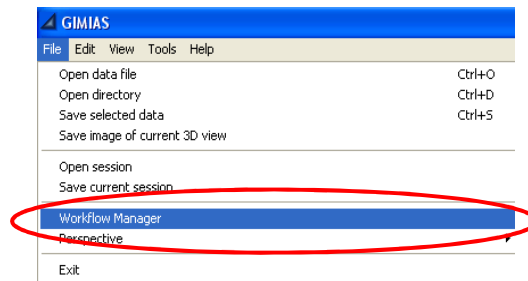
If you installed the Sample Data tutorials, your data is already downloaded in the Data folder of your GMIAS installation. Otherwise you need to download and decompress this file:

<ftp://ftp.gimias.org/data/Tutorials/BrainImagesTutorialData.zip>

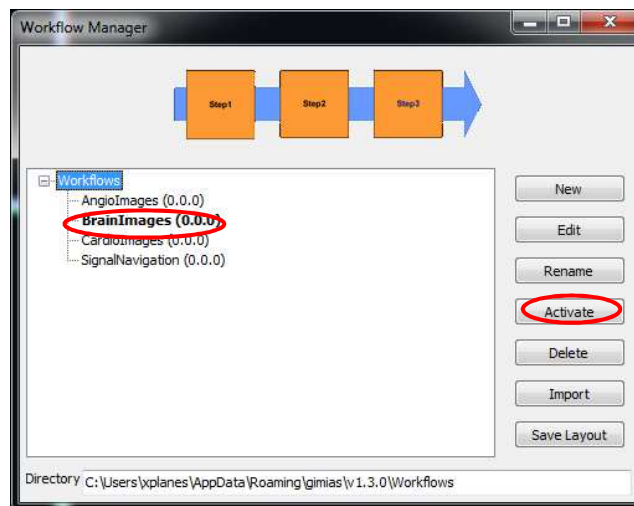
## Activate the Brain Images workflow

Before starting the workflow execution you need to update and activate the BrainImages workflow in GIMIAS.

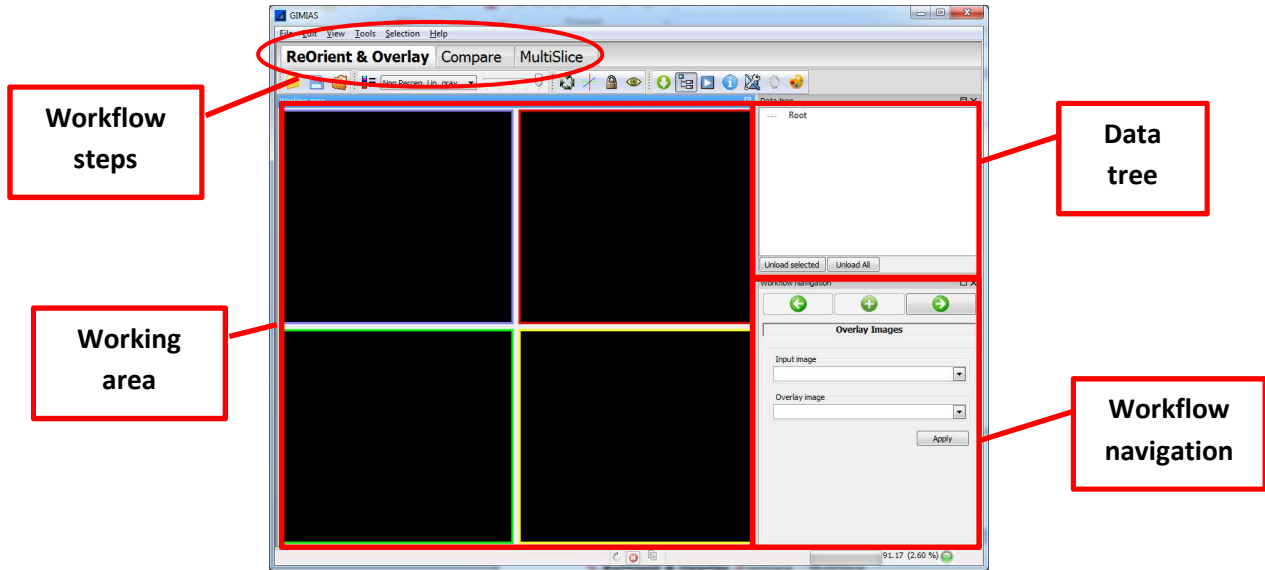
1. Open GIMIAS and from the top menu select File->**Clinical Workflow Manager**.



1. **Activate the workflow:** Select BrainImages workflow and press Activate button



2. GIMIAS will close and open again with the configuration shown in the figure below.

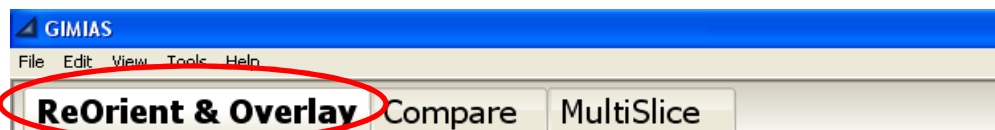


Each tab at the top of the working area corresponds to a workflow step. At the right bottom of the GUI are the processing steps defined for each workflow step.

- **Workflow steps:** these are the main steps of the workflow. For each step, there's a specific working area.
- **Working area:** The main visualization view. The data will be displayed here.
- **Data tree:** All data loaded into memory
- **Workflow navigation:** Allow to navigate through all the workflow steps using the arrows.

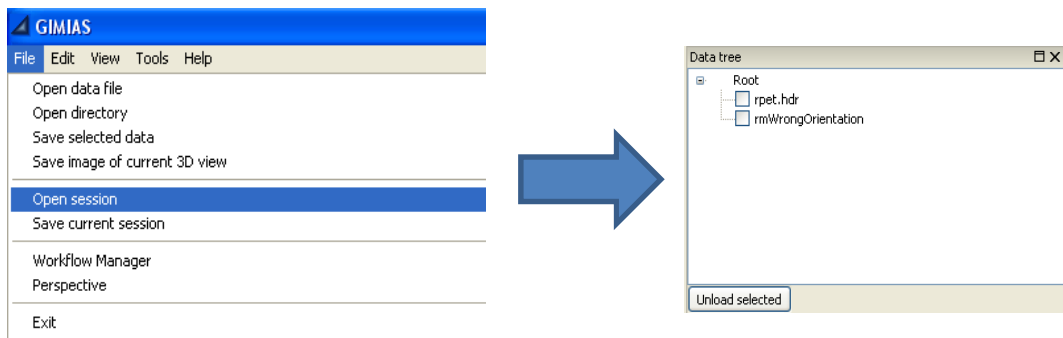
## Step1: ReOrient and Overlay

Open the **ReOrient & Overlay** tab and perform the following steps.



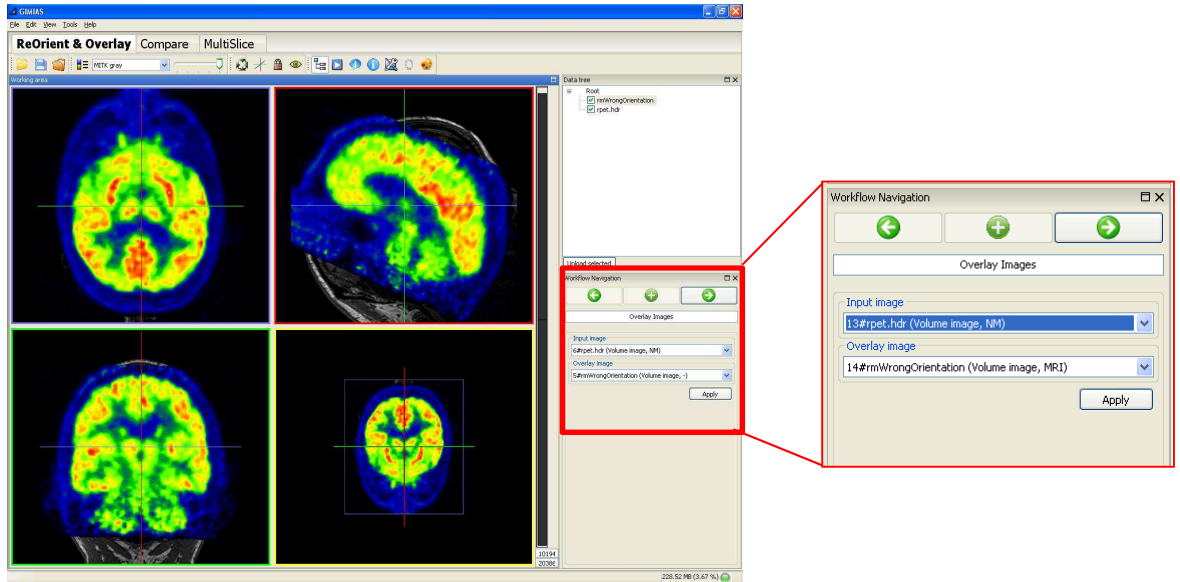
### 1. Re-orient and overlay images

- Load the images you have downloaded in the folder ToReorient. From the top menu select File->Open directory and load the folder ToReorient

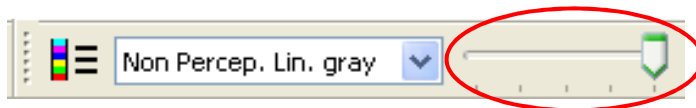


This section contains a PET and a MRI image.

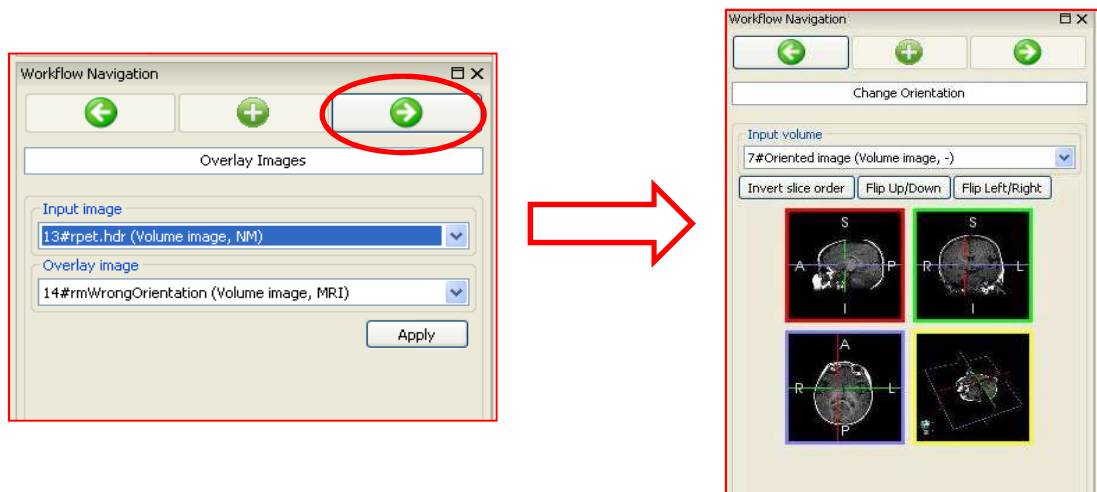
- b. Render both images by checking them in the Data Tree.
- c. Press Ctrl+A to display the annotation cube.
- d. In the Overlay Images tool, set the MRI image as input image and the PET image as overlay image and press Apply.



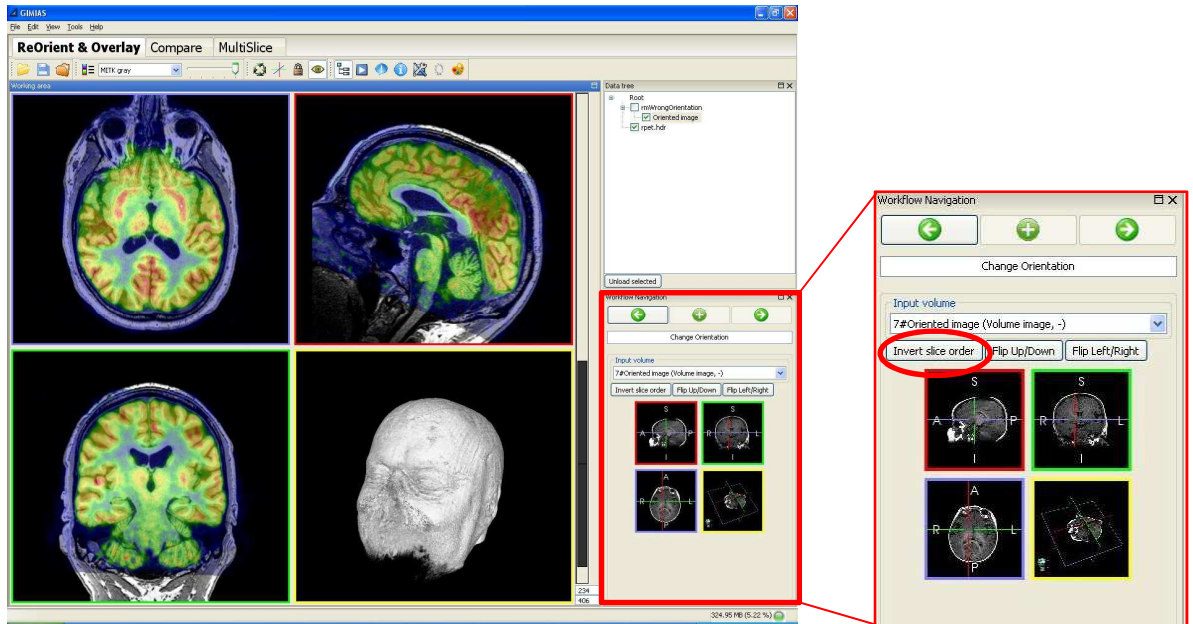
- e. Select the PET image in the Data Tree and use the Opacity bar in the Appearance Toolbar to change its opacity.



- f. Press the right arrow to go to the next processing step.



- g. In the Change Orientation Tool, set the oriented MRI image as input data and press invert slice order.

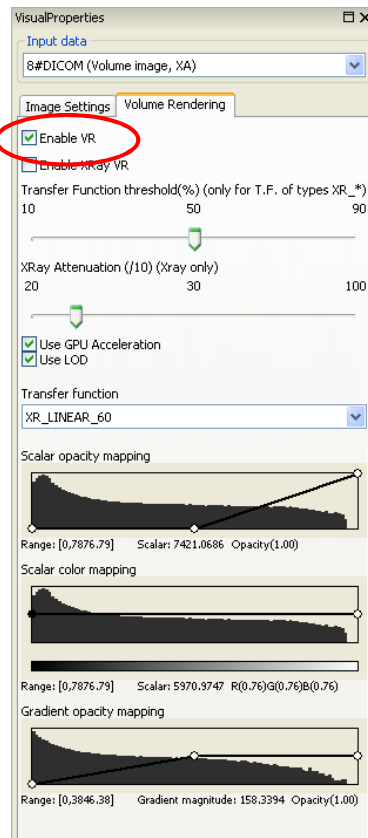


**2. Enable the Volume Rendering of the MRI image.**

- a. Select MRI image as input
- b. In the Windows Toolbar click on the Visual Properties button.



- c. The Visual Properties panel widget is automatically opened in the right side panel and allows changing the image visualization options.



In the Volume Rendering tab, it is possible to apply a volumetric rendering to a volume image and adjust the visualization parameters in order to optimize the rendering effect. **Check the “Enable VR” checkbox** to enable the Volume Rendering of the selected image.

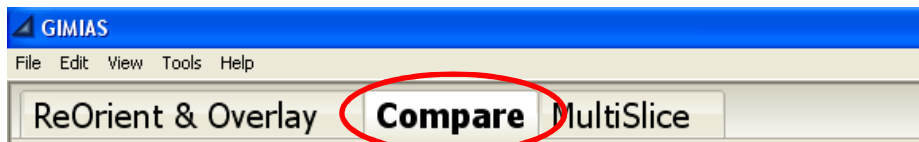
To adjust the visualization of the volume rendering, it is possible to choose the most appropriate transfer function from a list of predefined functions, in order to apply a specific mapping for the scalar opacity, the scalar color and the gradient based opacity.

### 3. Save session

- a. Go to File->Save session and set the name “Session1” for the session. This will save all data you have generated until here and will allow to recover it later.

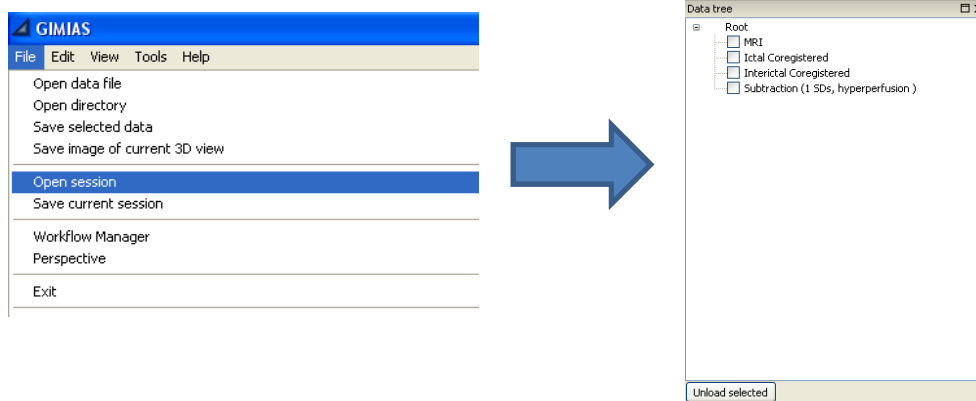
## Step2: Compare Slices

Open the **Compare** tab and perform the following steps.



### 1. Image fusion and comparison

- a. Load a previously saved session. From the top menu select File->Open session and load the xml file of the second session from the folder SISCOM, you downloaded.



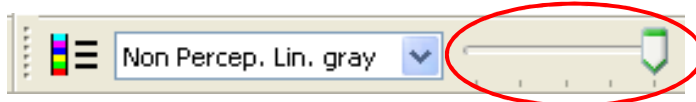
This session contains:

- **MRI\_T1**: MRI image of the brain
- **SPECT\_I\_co**: Ictal (acquired during the epileptic seizure)
- **SPECT\_II\_co**: Interictal (acquired between epileptic seizures)
- **SISCOM\_result**: Subtraction image (normalized difference between Ictal and Inter-ictal studies).

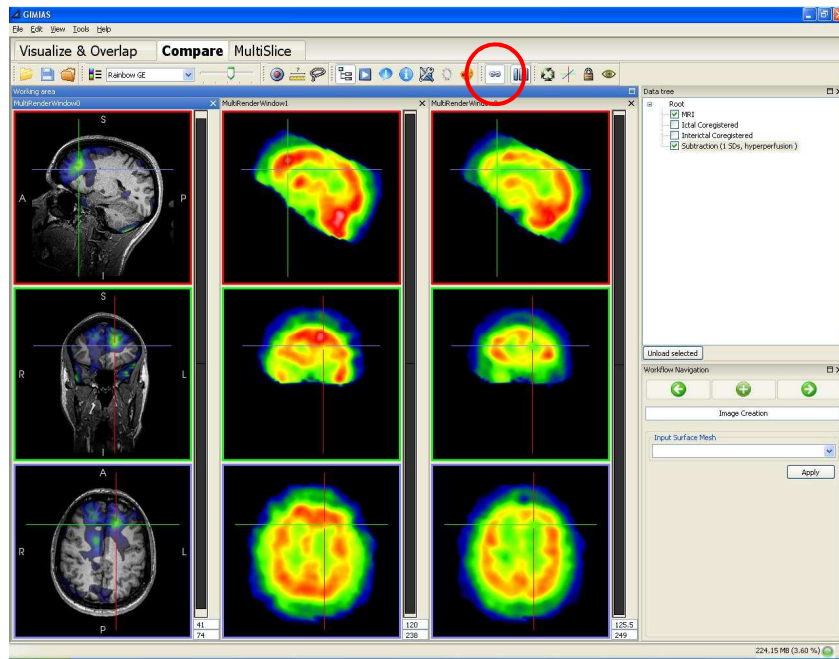
The Compare tab Working Area is set to contain three Views, each showing the axial, sagittal and coronal views of the rendered image.

- b. Select the first Render Window (on the left) and render the MRI image and the Subtraction image

Select the Subtraction image and in the Data Tree and use the Opacity bar in the Appearance Toolbar to change its opacity.



- c. Select the second View (in the middle) and render the Ictal image.
- d. Select the third View (on the right) and render the InterIctal image.
- e. Click on Link Views ( in the MultiRenderWindow Toolbar) and look in the first View for the focus of the epilepsy (yellow/green color) the other views will be automatically updated to the same position.

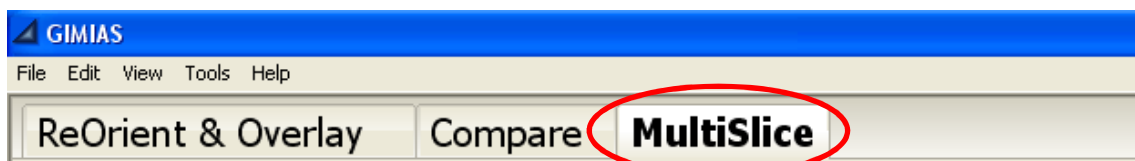


## 2. Save session

- a. Go to File->Save session and set the name "Session2" for the session. This will save all data you have generated until here and will allow to recover it later.

## Step3: MultiSlice View

Open the **MultiSlice** tab and perform the following steps

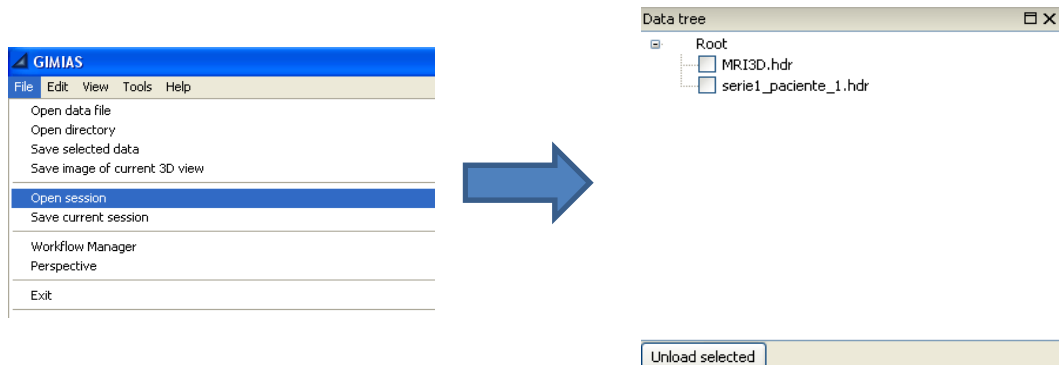


### 1. Fusion of MRI and fMRI images in MultiSlice View

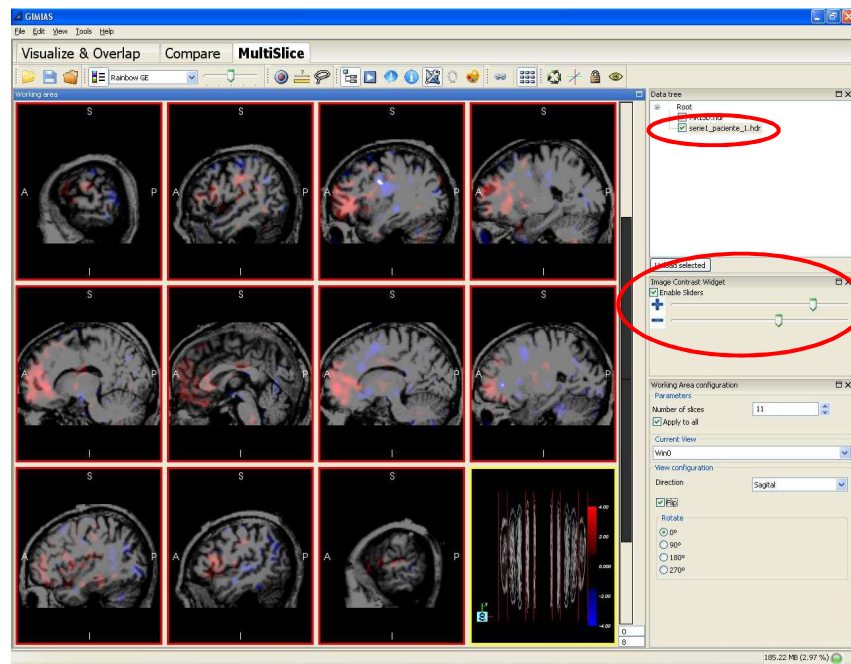
- a. Load the third folder you downloaded "Epilepsy". From the top menu select File-

>Open data file and load the file: Epilepsy\fMRI\MRI3D.hdr

- b. From the top menu select File->Open data file, select the 50 files and press Ok: Epilepsy\fMRI\serie1\_paciente\_1.hdr to Epilepsy\fMRI\serie1\_paciente\_50.hdr



- c. Render the MRI image and the fMRI image of the brain activation
- d. In the image contrast widget, select the activation image “serie1\_paciente” and adjust the lower and upper contrast levels.



- e. Change the Working Area Configuration using the Working Area Configuration tool. This tool allows to set the following options:
  - Number of slices: set the number of slices/planes displayed in the window
  - Apply to all: apply the view configuration settings (direction, rotation, flip) to all views or the current view only.
  - Current View: choose the view/plane to which you want to apply the view configuration settings (direction, rotation, flip).
  - Direction: choose the direction of the selected view(s): Sagittal, Transversal or Frontal.
  - Flip: visualize the mirror-reversal of the selected view(s) across its vertical axis
  - Rotate: choose the rotation angle of the selected view(s)

## 2. Save session

- a. Go to File->Save session and set the name “Session3” for the session. This will save





all data you have generated until here and will allow to recover it later.