

Summary of Neurostat Processed Images Uploaded to LONI University of Utah

The University of Utah Component of the ADNI PET Core will compute 3D stereotactic surface projections (SSP) using the program *Neurostat* as a basis to evaluate imaging-derived measures of progression that correlate with changes in cognition. All PET scans downloaded from LONI are from the post-processed group 4 images, i.e. coregistered dynamic, averaged, standardized image and voxel size and smoothed to uniform resolution of 8mm. Three processed images will be derived from each subject at each timepoint. Descriptions of each of the image types is provided below.

A. Anatomic standardization to Talairach brain atlas (**W** files)

- i The subject PET image is resampled into a Talairach atlas registration using Neurostat **stereo** v 8.0. The output volume image has a resolution of 1.5mm x 1.5mm x 1.5mm and an image grid of 160 pixels x 160 pixels x 96 slices.
- ii All images are converted from ECAT 6 into DICOM format for easy viewing.

B. Peak cerebral metabolic glucose rate (CMRglc) surface projections (**WSFM** files)

- i Surface metabolic glucose activity pixel values are extracted from the individual's PET scan that have been standardized to the Talairach atlas. The maximum pixel value in a perpendicular direction 13.5 mm inward from the cortical surface is assigned to a predetermined surface pixel location. Location of peak pixel values and projection onto surface maps, is conducted using Neurostat functions **ssploc**, **ssplocsub**, and **sspempl**.
- ii The output images are shown as 8 surface projections: right lateral, left lateral, right medial, left medial, superior, inferior, anterior, posterior. The resolution of these 2D projections is 2.25mm x 2.25mm. Images are converted from ECAT 6 into DICOM format for easy viewing.

C. Z-score surface projections (**WZSFM** files)

- i The subject's glucose activity is compared with the normal reference cerebral metabolic activity brain by a Z-score. The Z-score is calculated on a pixel by pixel basis from surface projection CMRglc values. The value of the pixel is defined as:

$$Z\text{-score}(x,y,z) = (\text{Mean_Normal}(x,y,z) - \text{CMRglc_Subject}(x,y,z)) / \text{StDev_Normal}(x,y,z)$$

and thus, the Z-score here, shows the *metabolic reduction* relative to the normal reference data. Neurostat function **sspcomp** and a previously defined set of normal reference CMRglc values are used for this calculation. CMRglc values are normalized to pons in both the individual and the normal reference data.

- ii The output images are shown as 8 surface projections: right lateral, left lateral, right medial, left medial, superior, inferior, anterior, posterior. The resolution of these 2D projections is 2.25mm x 2.25mm. Images are converted from ECAT 6 into DICOM format for easy viewing.