AbstractID: 4795 Title: Sulci Density Map to Aid in the Use of Apparent Diffusion Coefficient for Therapy Evaluation

# Sulci Density Map to Aid in Use of Apparent Diffusion Coefficient for Therapy Evaluation

**Purpose:** To quantify the density and spatial variation of sulci in the human brain so as to more accurately calculate Apparent Diffusion Coefficients (ADCs) for use in radiotherapy evaluation.

**Methods and Materials:** ADCs are calculated for Volumes Of Interest (VOI) using Diffusion Weighted Magnetic Resonance Imaging (DWMRI).

In the brain, the sulci are the narrow fissures separating convolutions and are filled with CerbroSpinal Fluid (CSF). Since CSF is free fluid, a VOI that contains a high density of sulci should, in principal, have a higher ADC

Using ImageJ ( http://rsb.info.nih.gov/ij/ ), we have analyzed sagittal T1 weighted MR images of a number of patients. The images sets were acquired on one of two different GE MRI machines: 1.5T and 3.0T field strength. We have plotted the normalized pixel standard deviation, as a function of distance from a medial point. We have concentrated on the cerebral hemispheres, superior to the corpus callosum so as to focus on sulci and avoid voxel dissimilarities due to variations in other brain anatomy.

**Results:** Relative to the 25% most medial slices, we see a decrease in the normalized standard deviation of pixel intensity of 13.7% ± 5.6% (SD) of the next 25% of the slices. The most lateral 50% of the slices (25% left and right) had about the same normalized standard deviation as the most medial (increase of 1.0% ± 7.1% (SD)). These results are consistent with the fact that near the periphery of each brain hemisphere, there are more sulci.

**Conclusion:** Sulci density, as measured by normalized standard deviation of pixel intensity, has a substantial variation across the hemispheres of the brain. This fact should be considered when assessing variations in ADCs used for radiotherapy evaluation.