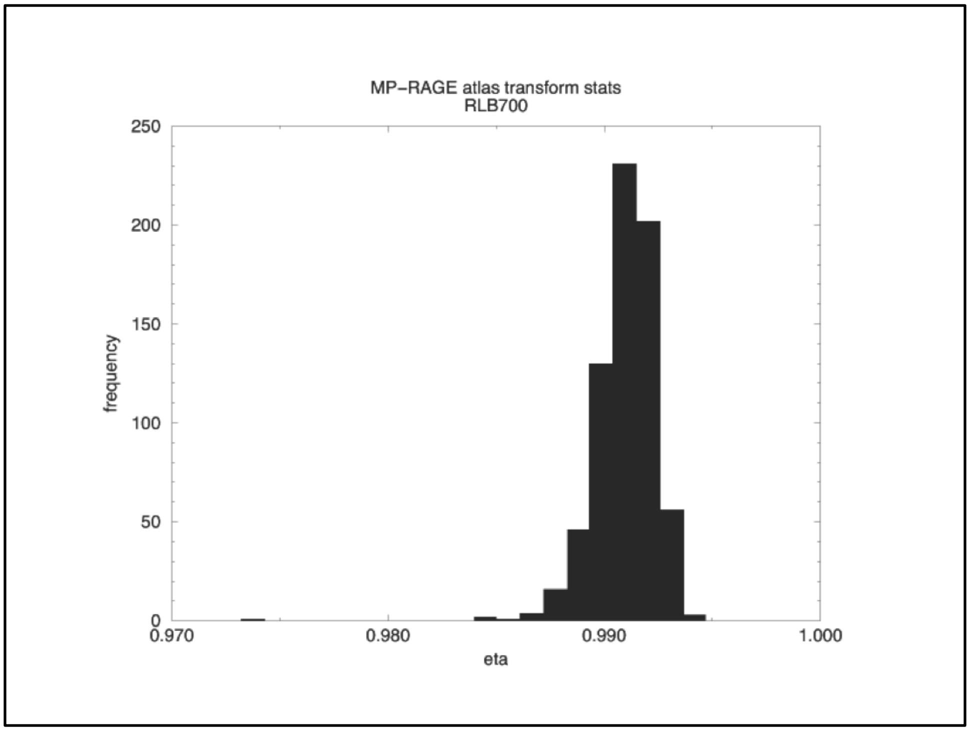
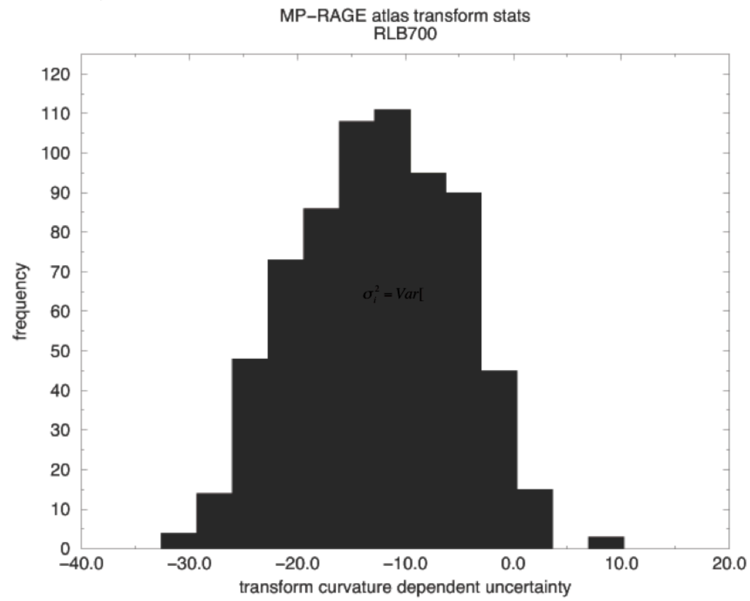
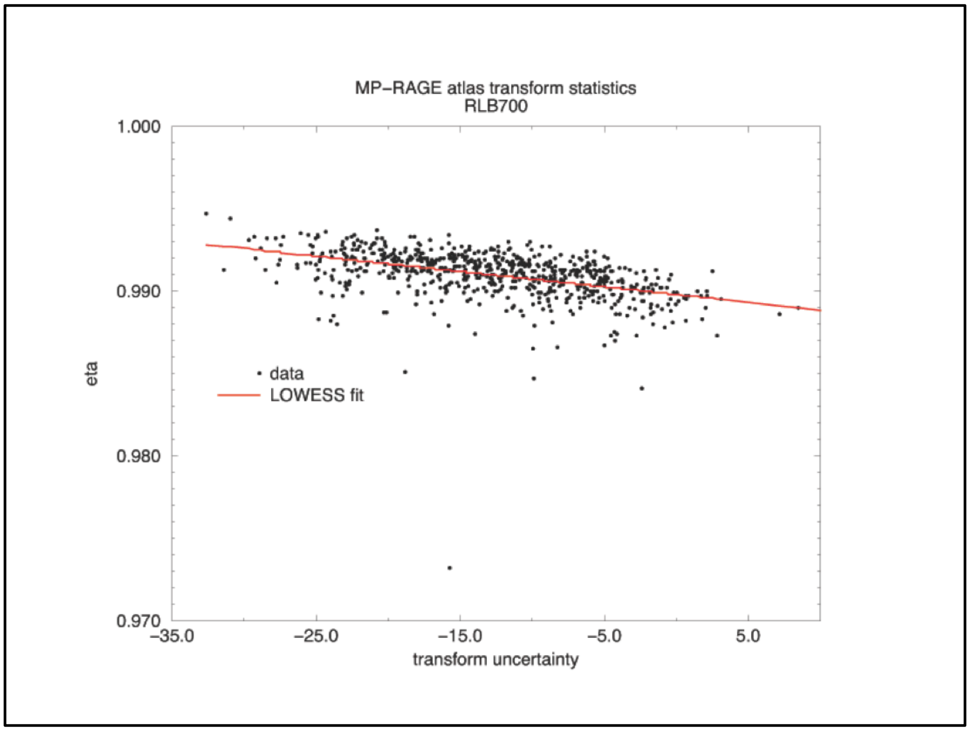


Histogram, compiled over 692 subjects, of MP-RAGE atlas transform voxel similarity measures (eta = spatial Pearson correlation, r, between individual and atlas-representative template image; r is evaluated over a brain mask). Note eta distribution centered about .991 with a substantial left sided tail. Low eta values indicate significant anatomical variations, mostly large ventricles and arachnoid cysts. However, these variations do not de-stabilize atlas transform computation (see next slide). These results were obtained with an atlas-representative template image generated from a sub-sample of the current study population (methods described in Buckner et al., NeuroImage 2004;23:724).

$$\chi = -\sum_i \left[\partial^2\eta / \partial\omega_i^2 - \overline{\left(\partial^2\eta / \partial\omega_i^2 \right)} \right] / \sigma_i, \text{ where } \sigma_i^2 = Var\left[\partial^2\eta / \partial\omega_i^2 \right]$$



Histogram of MP-RAGE atlas transform uncertainty (chi) compiled over 692 subjects. See chi formula at top of slide. eta is the voxel similarity measure (spatial Pearson correlation between individual MP-RAGE image and the atlas-representative template). Omega_i is the ith registration parameter. The summation runs over all parameters (in this case, 12, because the atlas transform is affine). The sum is negated because more sharply defined eta maxima correspond to more secure transforms. The over-bar and Var[] refer to eta curvature mean and variance compiled over a reference population (100 "good" subjects processed with FreeSurfer in 2007). Note the illustrated distribution is approximately normal, i.e., there are no unequivocal outliers. In fact, the MP-RAGE atlas transformation in all 692 subjects was stable (global minimum correctly identified).



eta vs. chi (see previous two slides). Transform certainty is systematically better with "typical" brains, i.e., brains that, after registration with the atlas representative template, are spatially most like the template. However, this systematic effect is modest. Structural anomalies, e.g., large ventricles, do not necessarily de-stabilize atlas registration.