



**Figure S4.** Voxels detected as implausible in a single HCP dataset. Three axial image slices are displayed. The original MK map (a) computed from the original dMRI data shows many voxels with visually implausible low MK values appearing as dark voxels. The detected implausible voxels (b), in red, coincide with the apparent low MK values. Voxels with negative diffusion tensor eigenvalues (c), in green, are a subset of the detected implausible voxels. The original b0 image (d) and the synthetic b0 image used for correction (e) do not show apparent implausible values. Only small differences (synthetic - original) can be observed between the original and synthetic b0 images (f). Also presented are the zero-MK b0 image (g) and the max-MK b0 image (h) that are computed from the MK versus synthetic b0 curves.