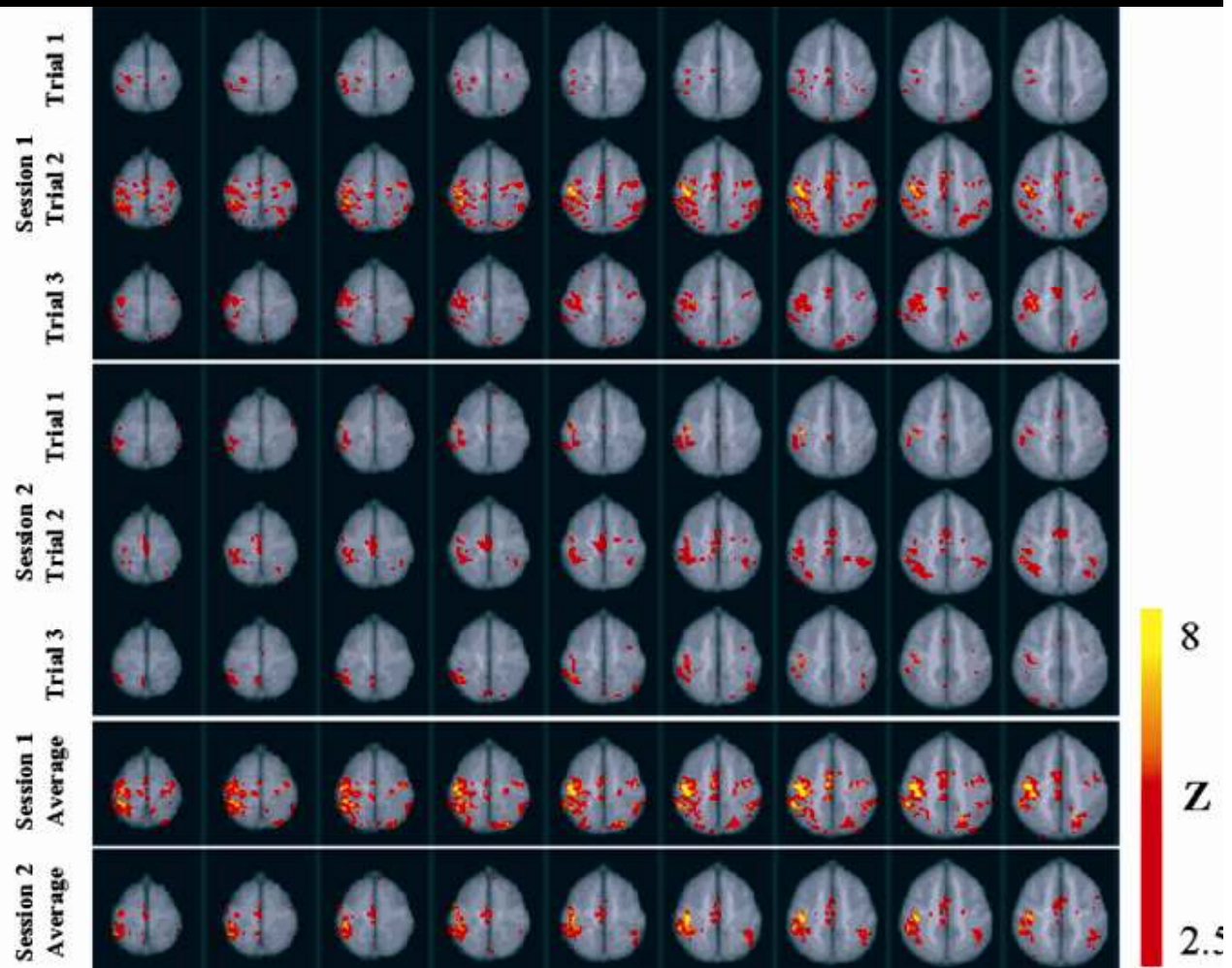


Reproducibility in fMRI

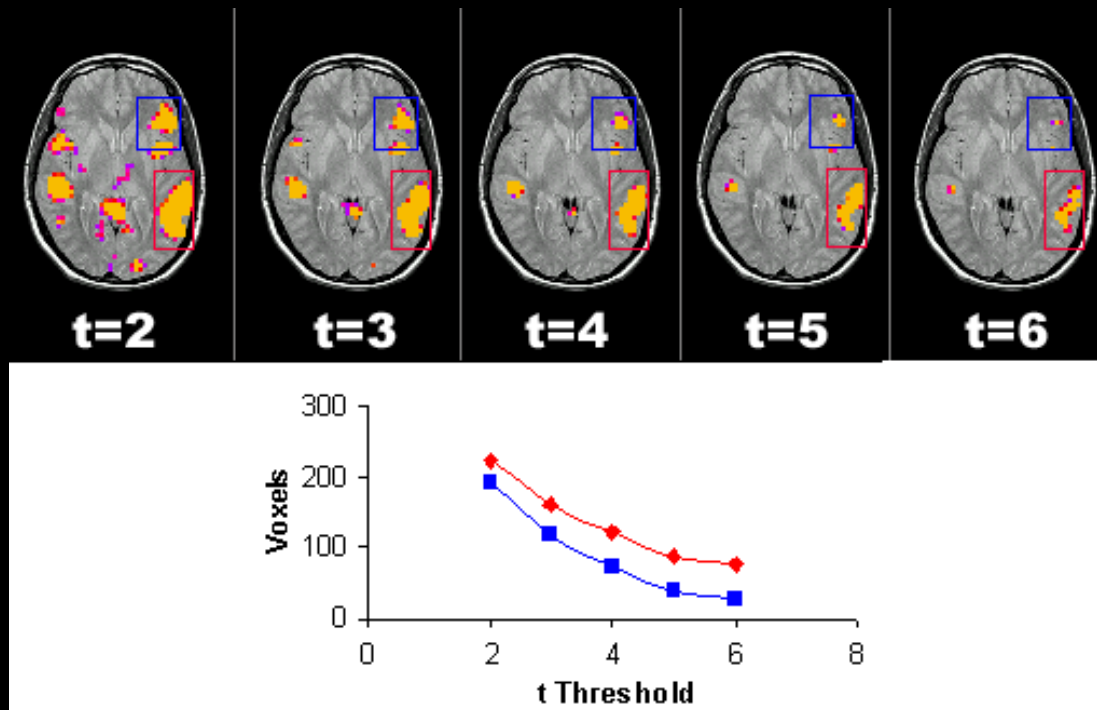
James Voyvodic, Ph.D.
Brain Imaging and Analysis Center
Duke University Medical Center

Liu et al., “Reproducibility of fMRI at 1.5T in a Strictly Controlled Motor Task”, MRM 2004

FIG. 5. fMRI results overlaid onto the MNI standard brain. Each row represents the brain slices selected to show the activation patterns and levels at the sensorimotor cortex and the supplementary motor area. The first three rows are images for the first session and the next three rows for the second session. The functional images were averaged over the subjects. The last two rows are the averaged images over the three trials in each of the two sessions. The color bar represents the z-score values from the *t*-test. Note that the left side of the images corresponds to the left side of the brain.



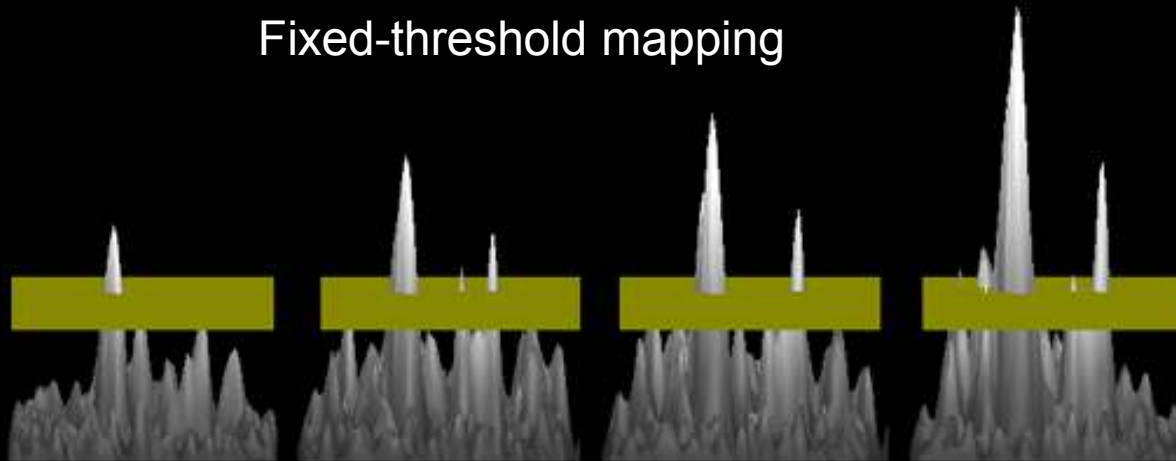
Statistical thresholding can be subjective



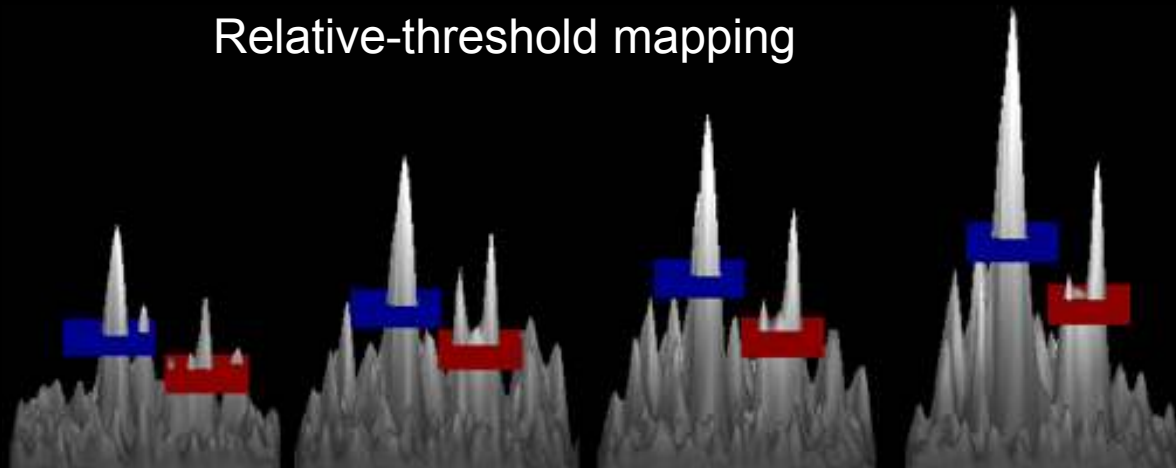
Even a constant pattern of brain activity can result in very different activation maps, depending on statistical threshold

Statistical significance of activation changes as a function of scan time

Fixed-threshold mapping

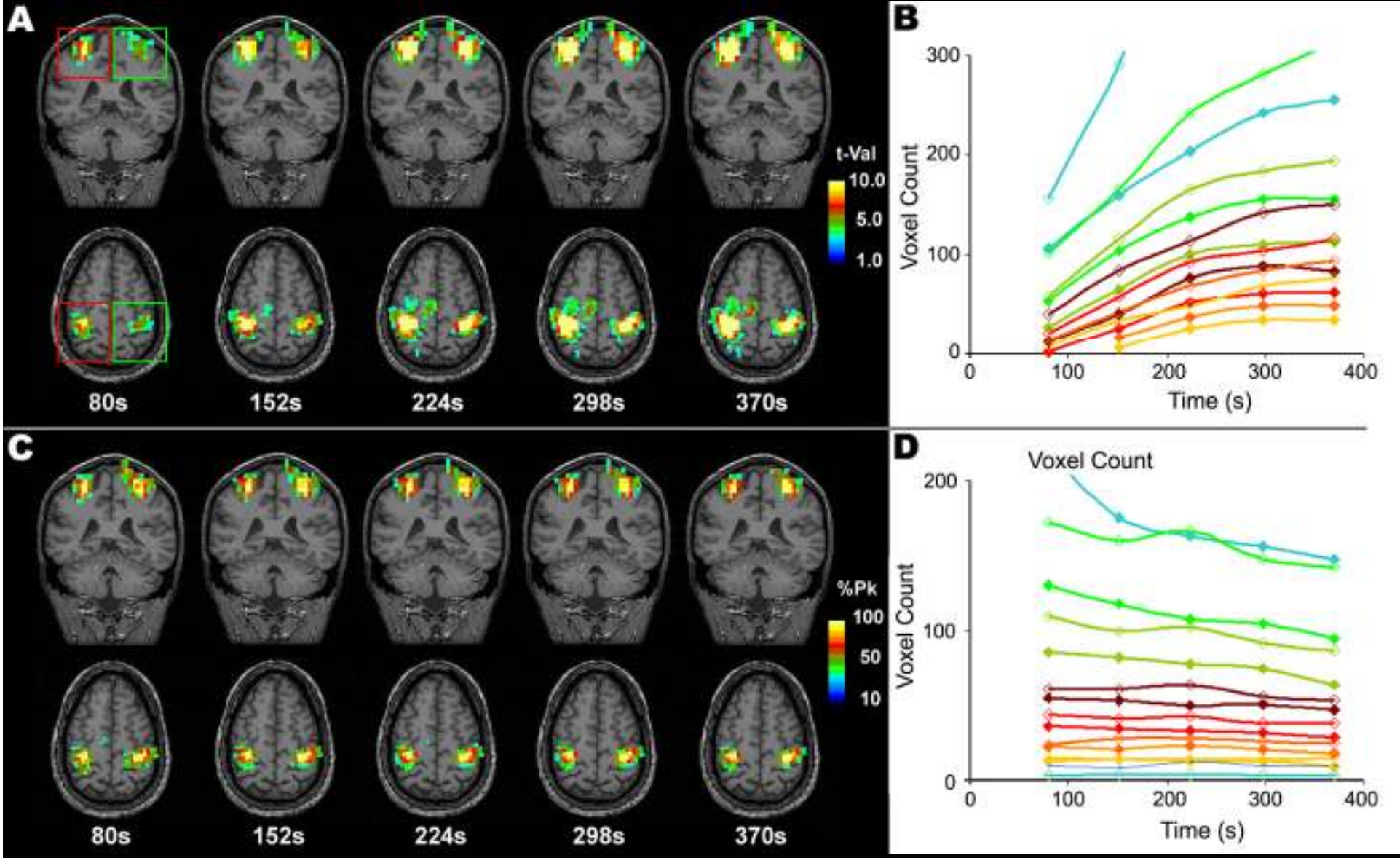


Relative-threshold mapping

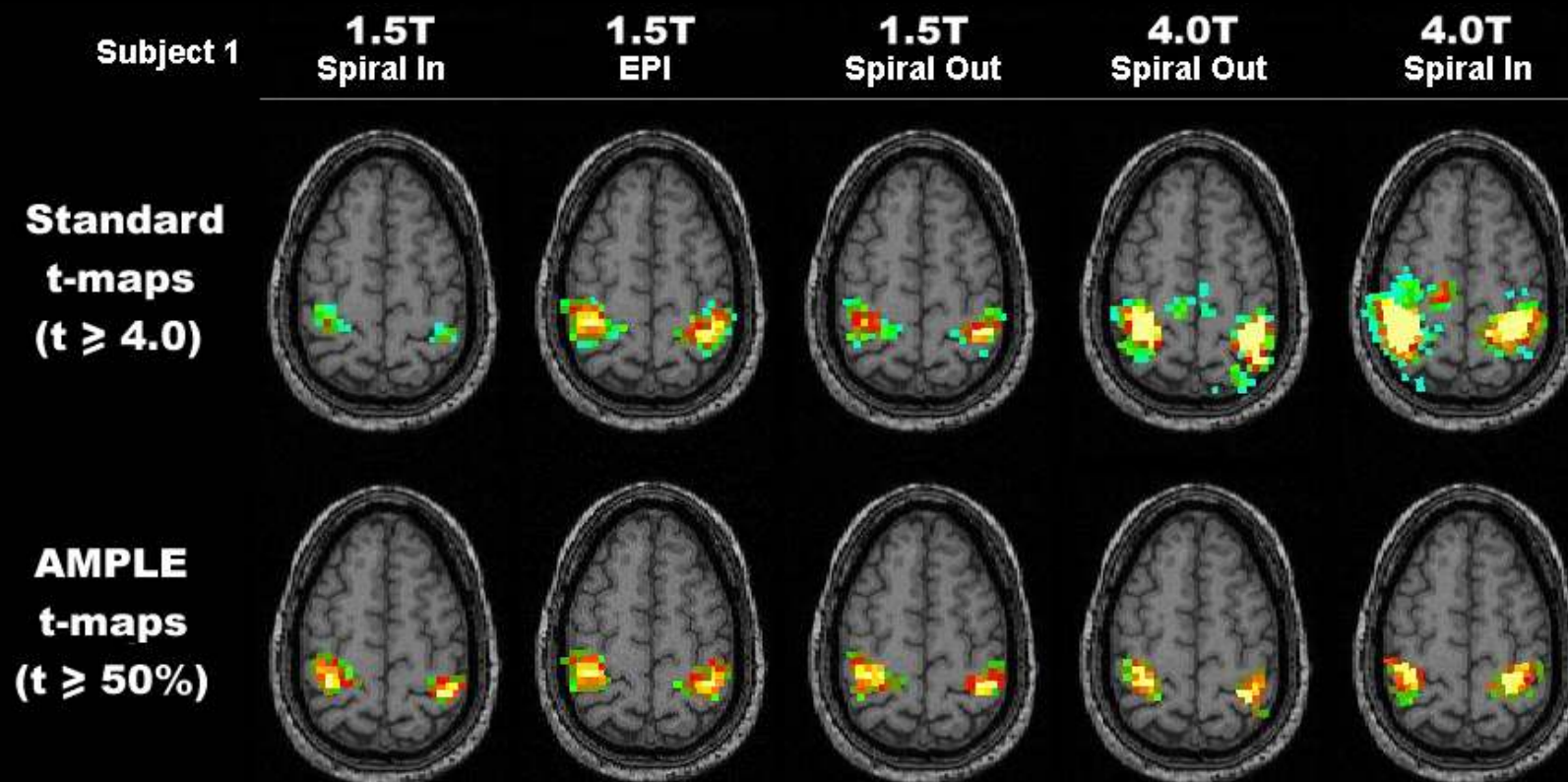


Activation mapping as percentage of local excitation (AMPLE)

Activation mapping as percentage of local excitation (AMPLE)

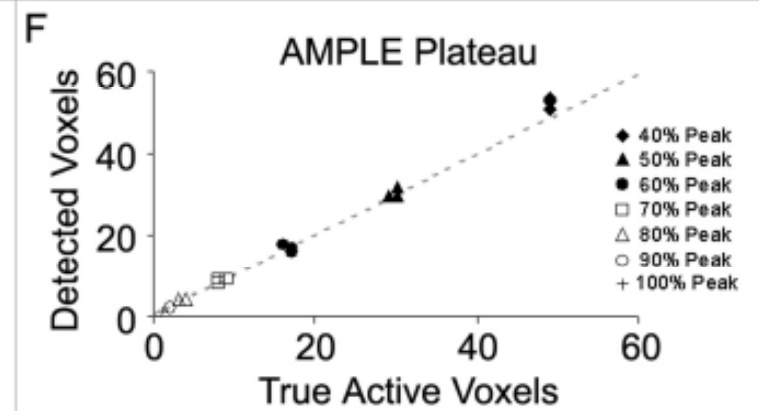
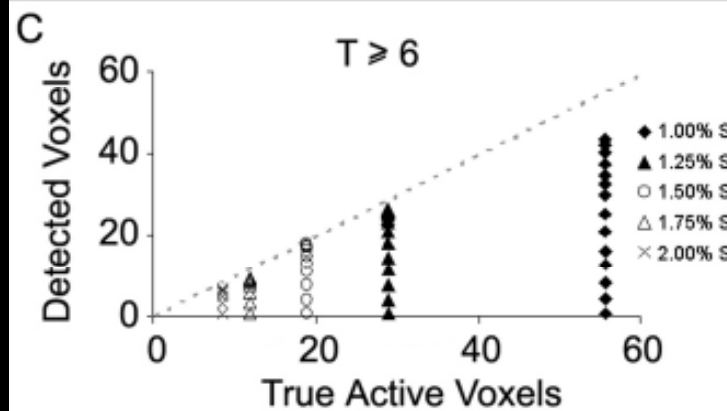
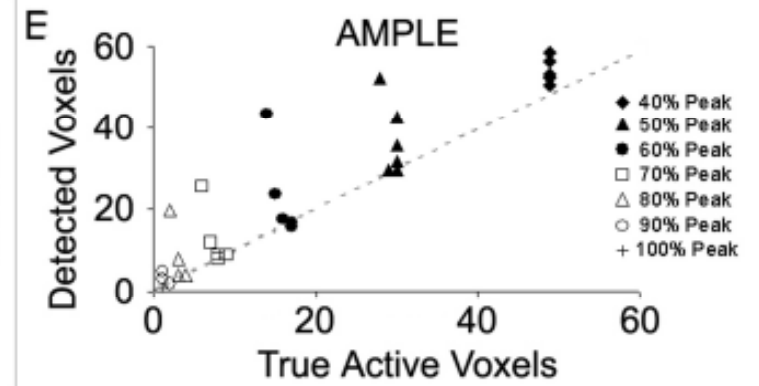
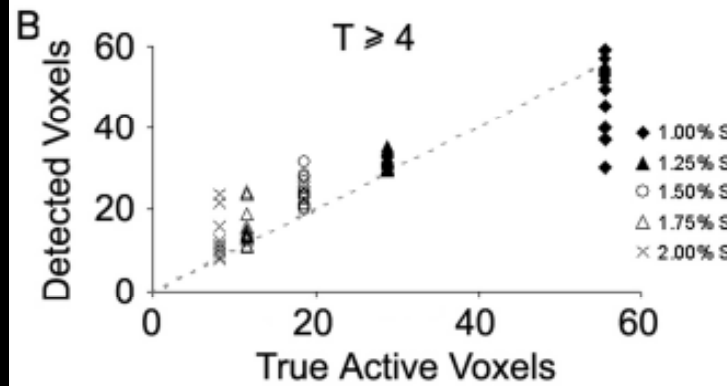
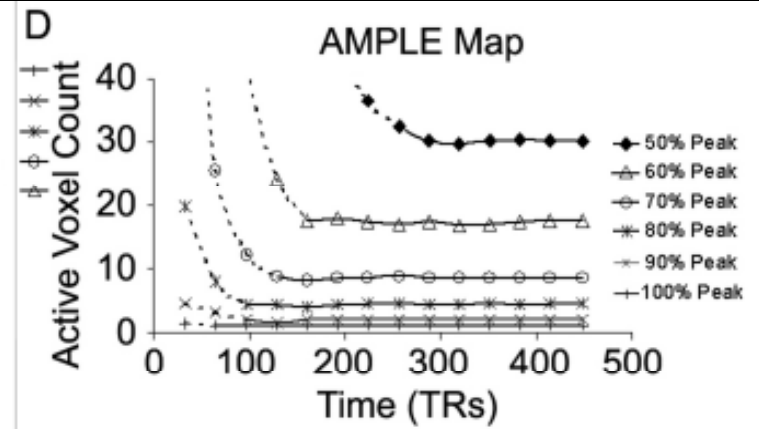
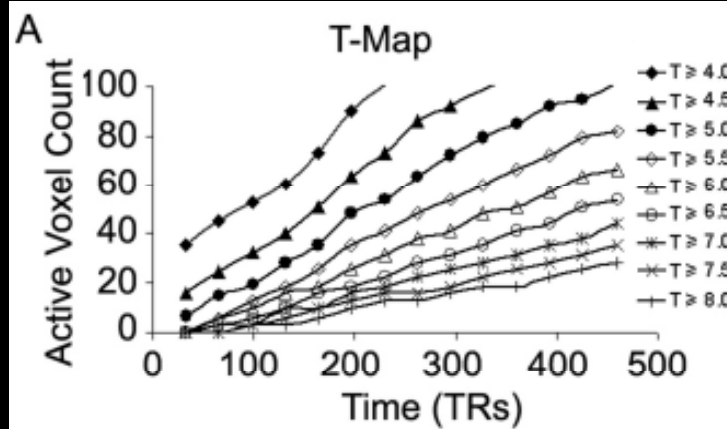
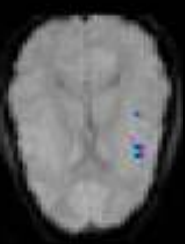
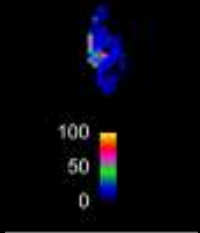
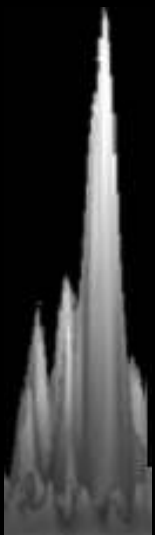


AMPLE maps are consistent across scans or scanners

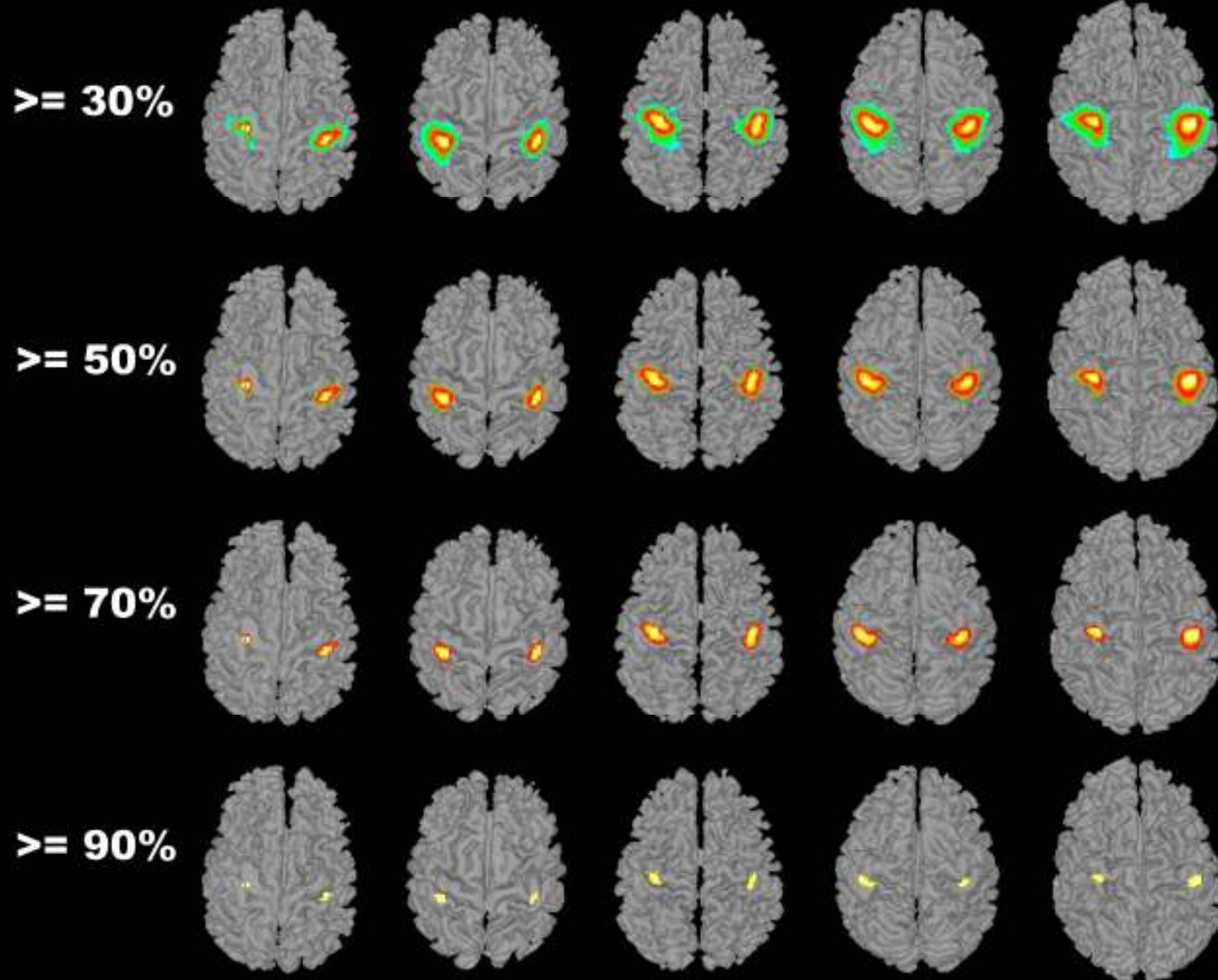


Simulation studies

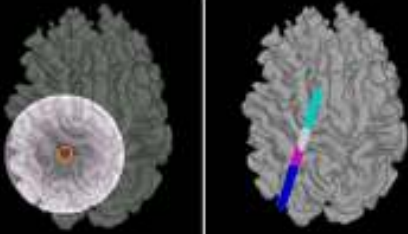
Generate simulated fMRI data with known activity levels



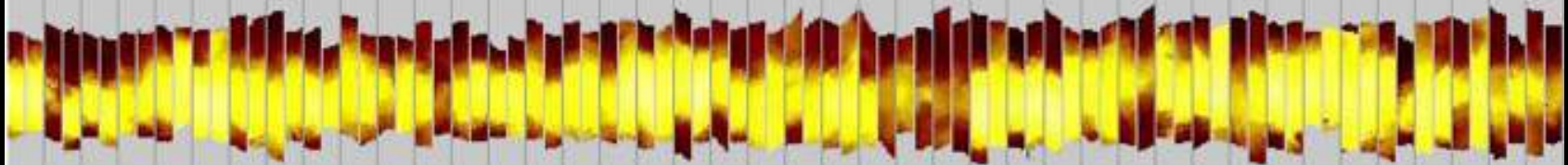
Anatomical spread of active voxels



Central sulcus profiles



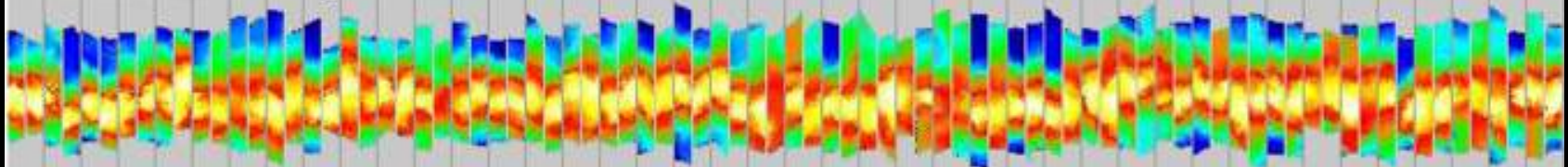
t-values - 2 task cycles



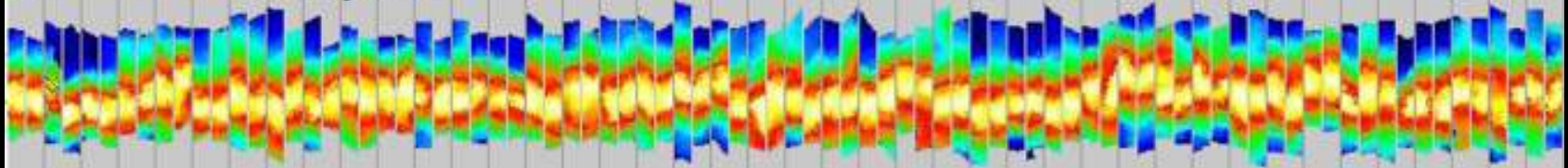
t-values - 10 task cycles



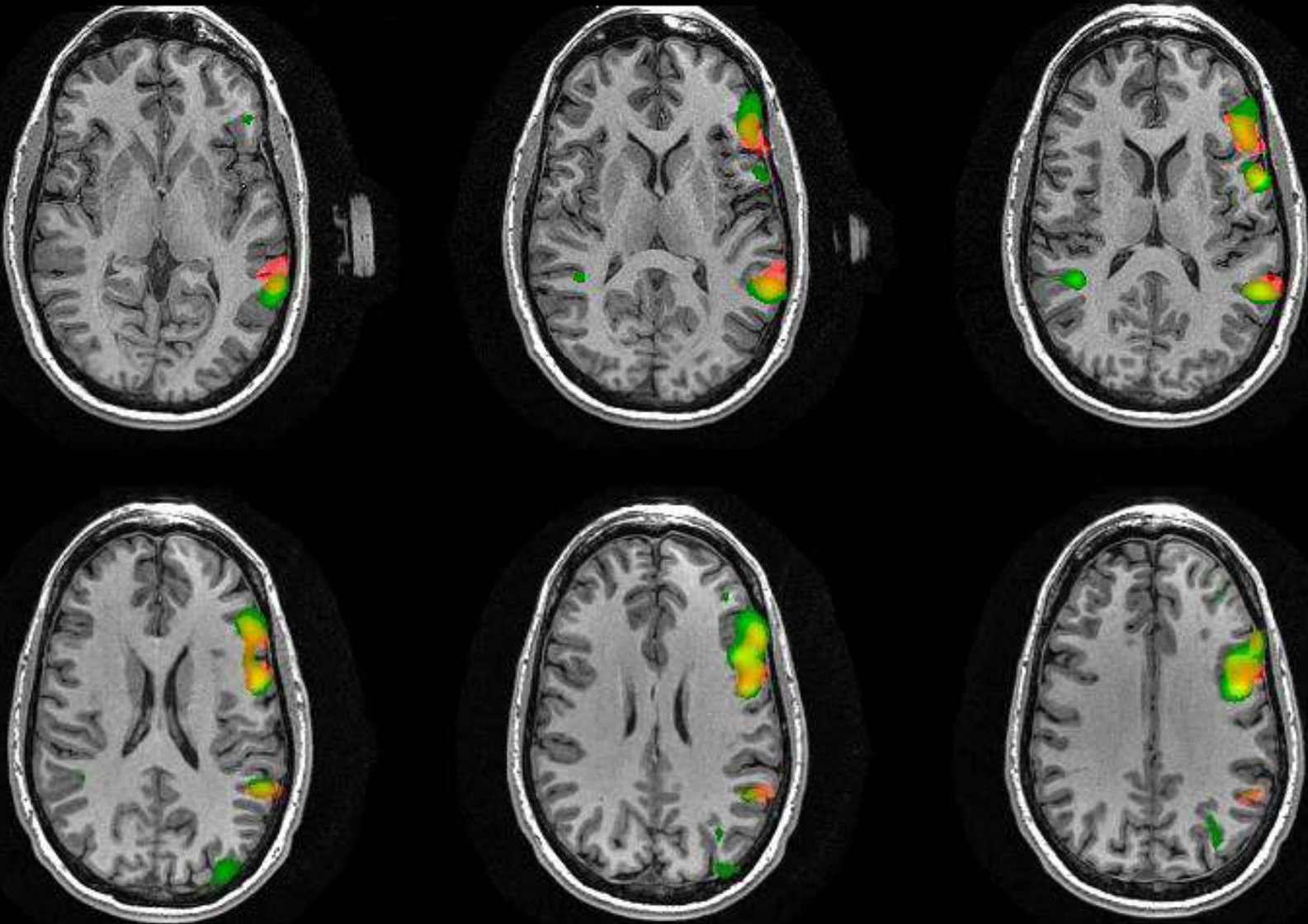
AMPLE - 2 task cycles



AMPLE - 10 task cycles



Volunteer – Repeated language scans 3 months apart (AMPLE)



t-maps



AMPLE

