Appendix B

Figures

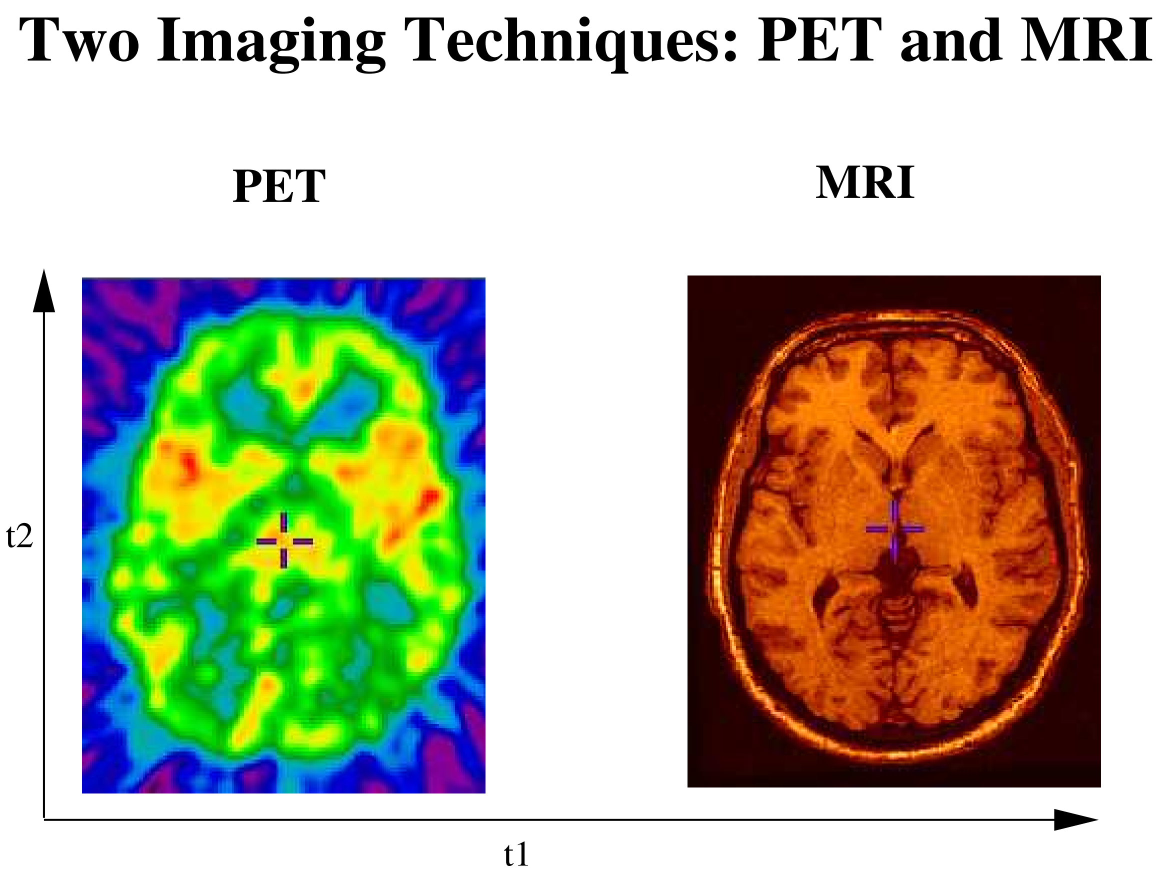

Figure B-1: An illustration of PET and MRI in 2D.

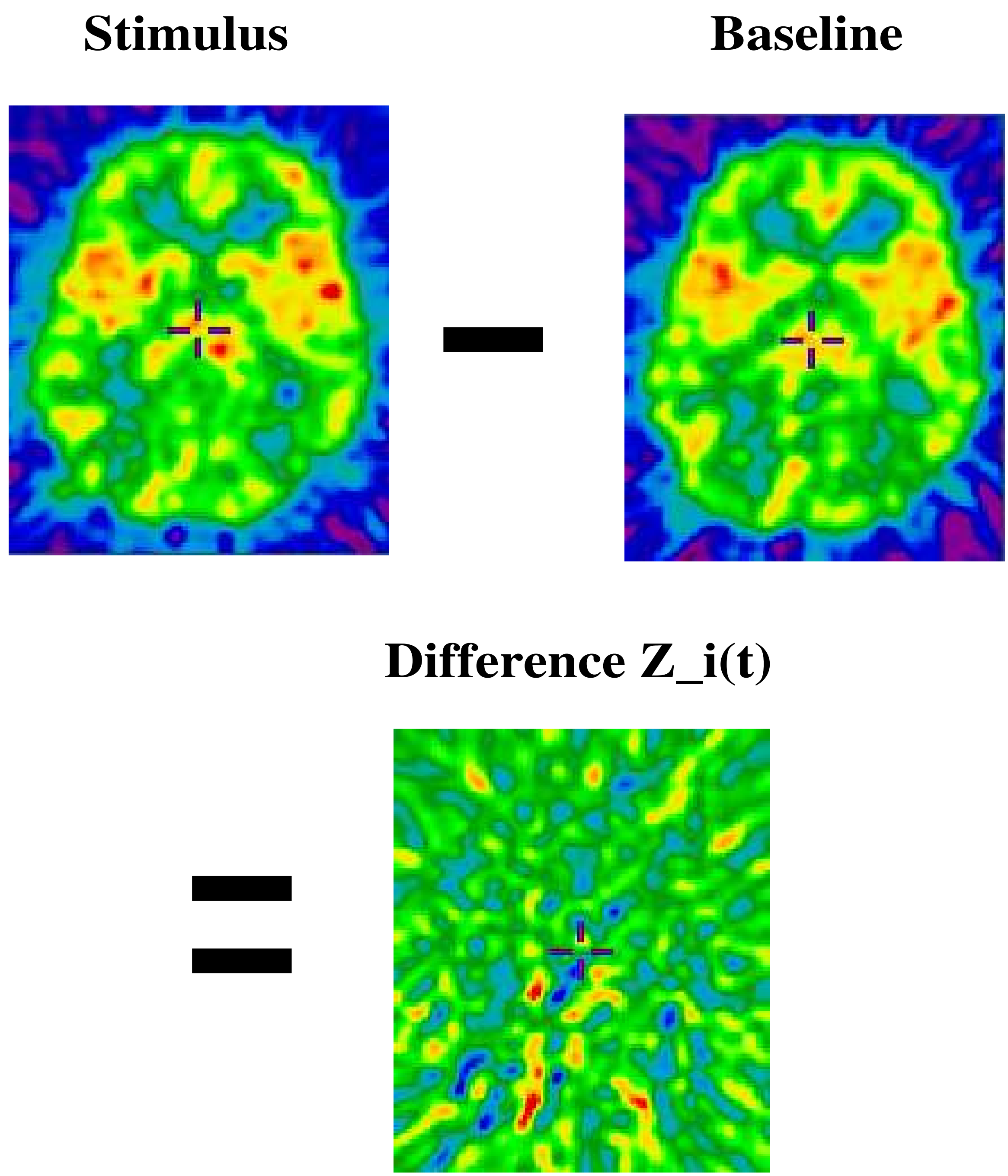

Figure B-2: Brain activity caused by the stimulus (single subject).

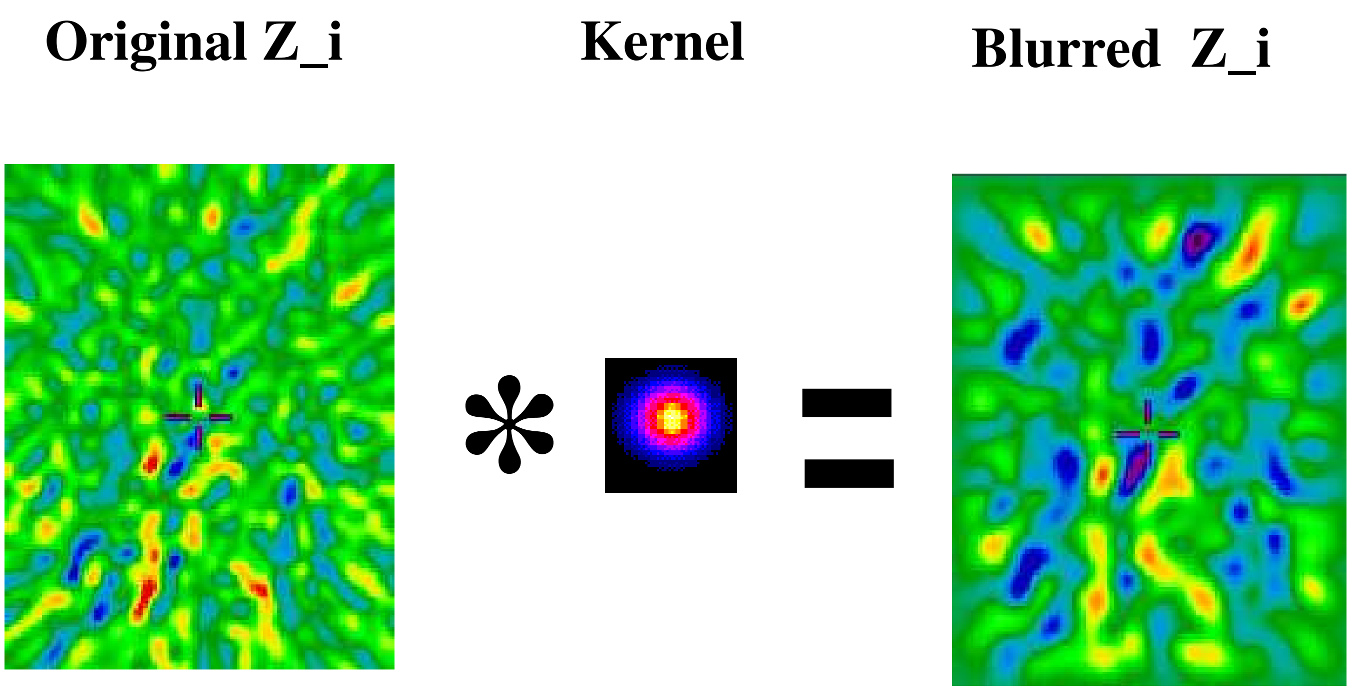

Figure B-3: Gaussian kernel smoothing.

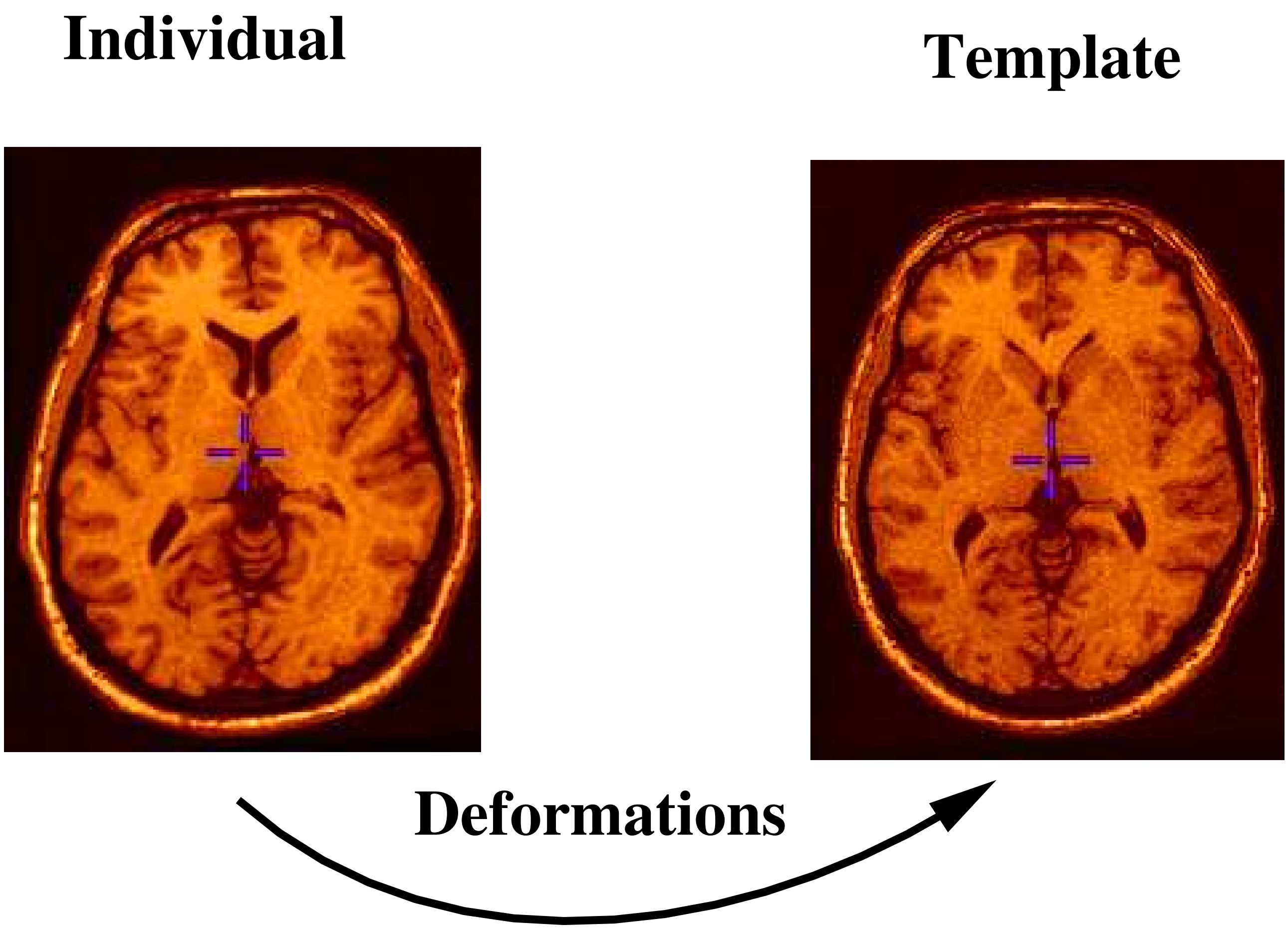

Figure B-4: 3D deformations.

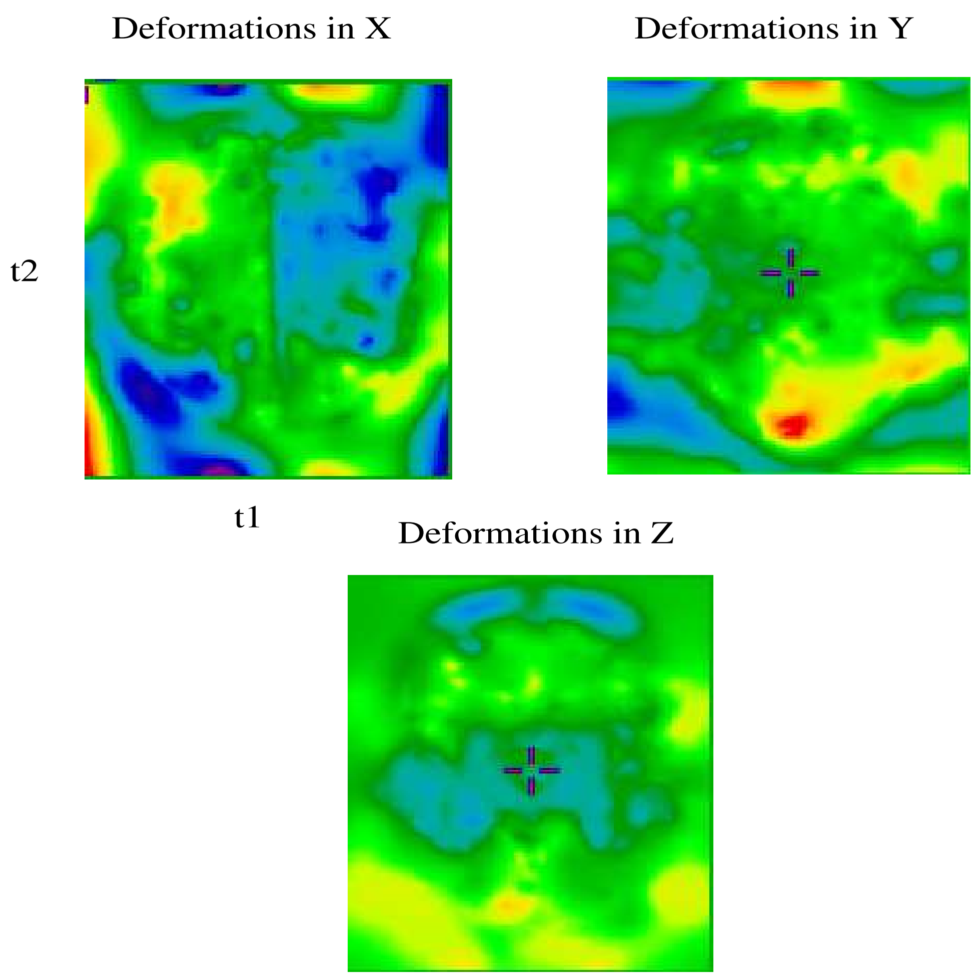

Figure B-5: One slice through the three components of the deformation field $\mathbf{\Delta}_{ij}(\mathbf{t})$.

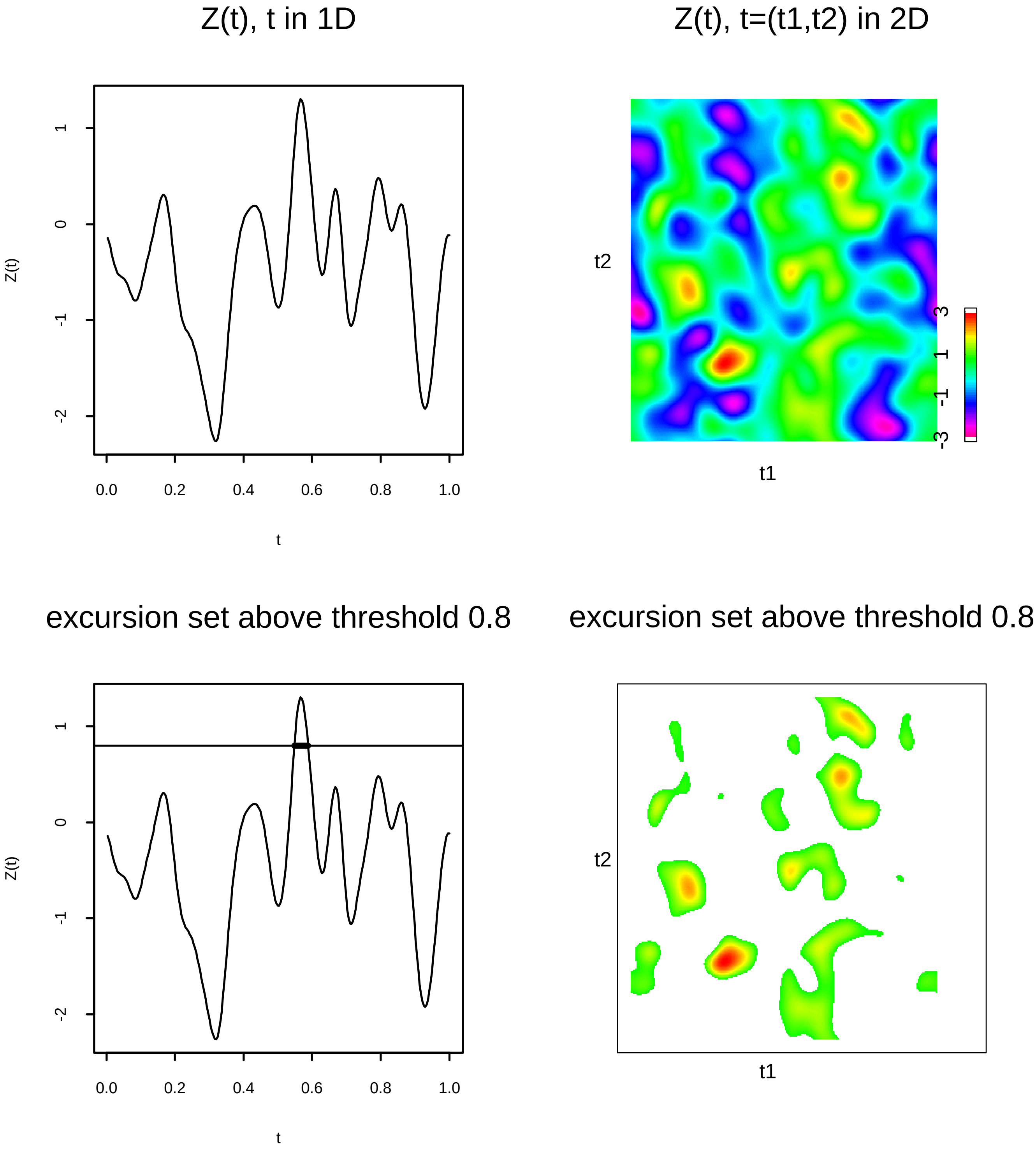

Figure B-6: 1D and 2D simulations of smooth stationary Gaussian fields with mean 0 and variance 1. Top: A simulated Gaussian random field in 1D and 2D. Bottom: Their excursion sets above level 0.8.

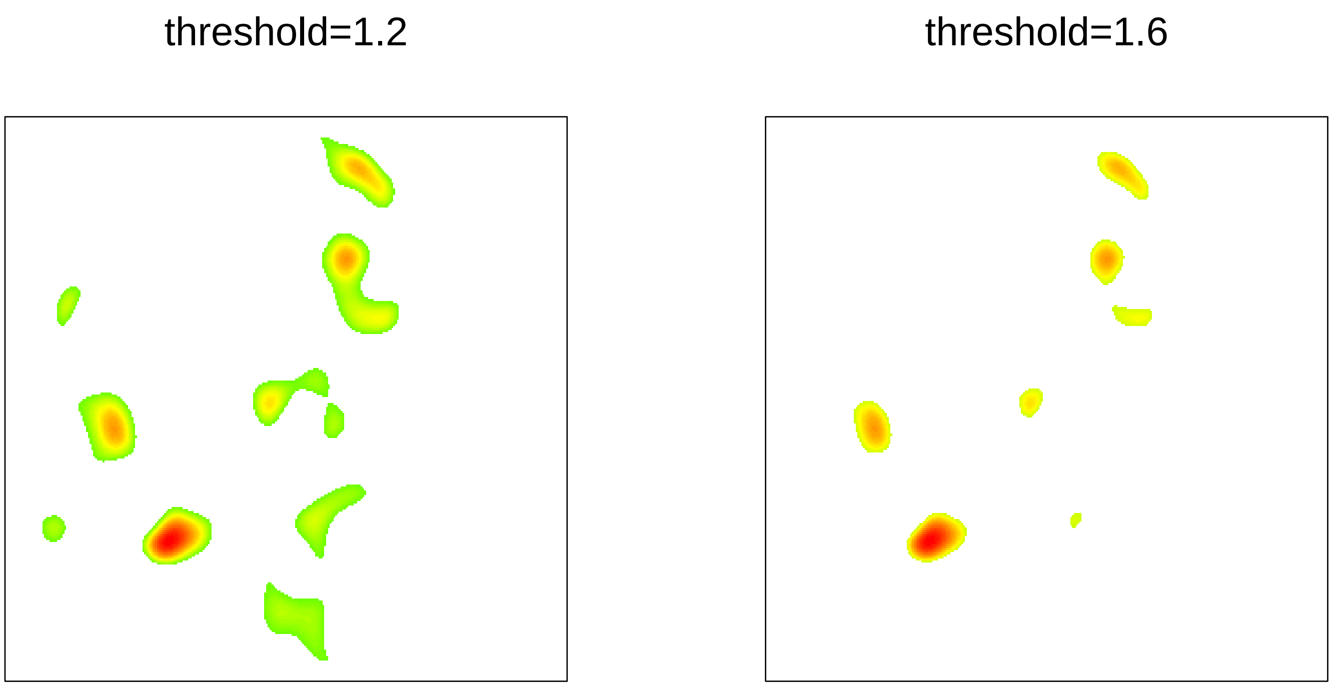

Figure B-7: High level excursion sets of the simulated 2-D Gaussian field shown in Figure B-6. Conclusion: the higher the level is, the more regular the excursion set becomes.

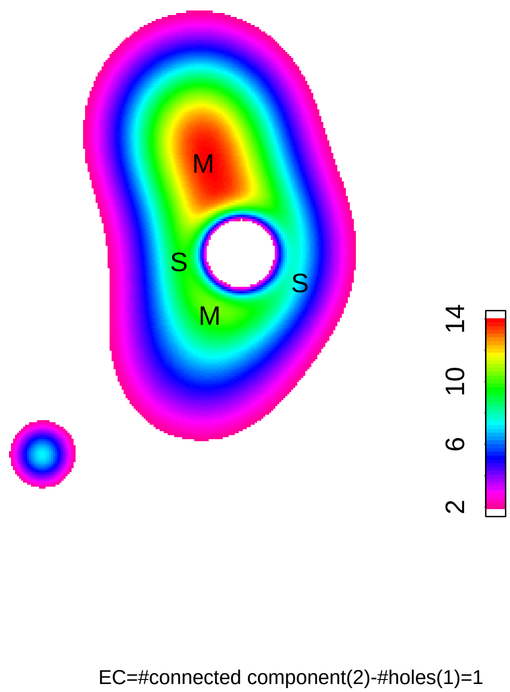

Figure B-8: An illustration of the EC of the set. EC = no. of connected components - no. of holes. The set in the image is actually an excursion set of a function above level 2. The possible locations of local maxima (M) and saddle points (S) are also marked on the graph (note that there are no local minima).

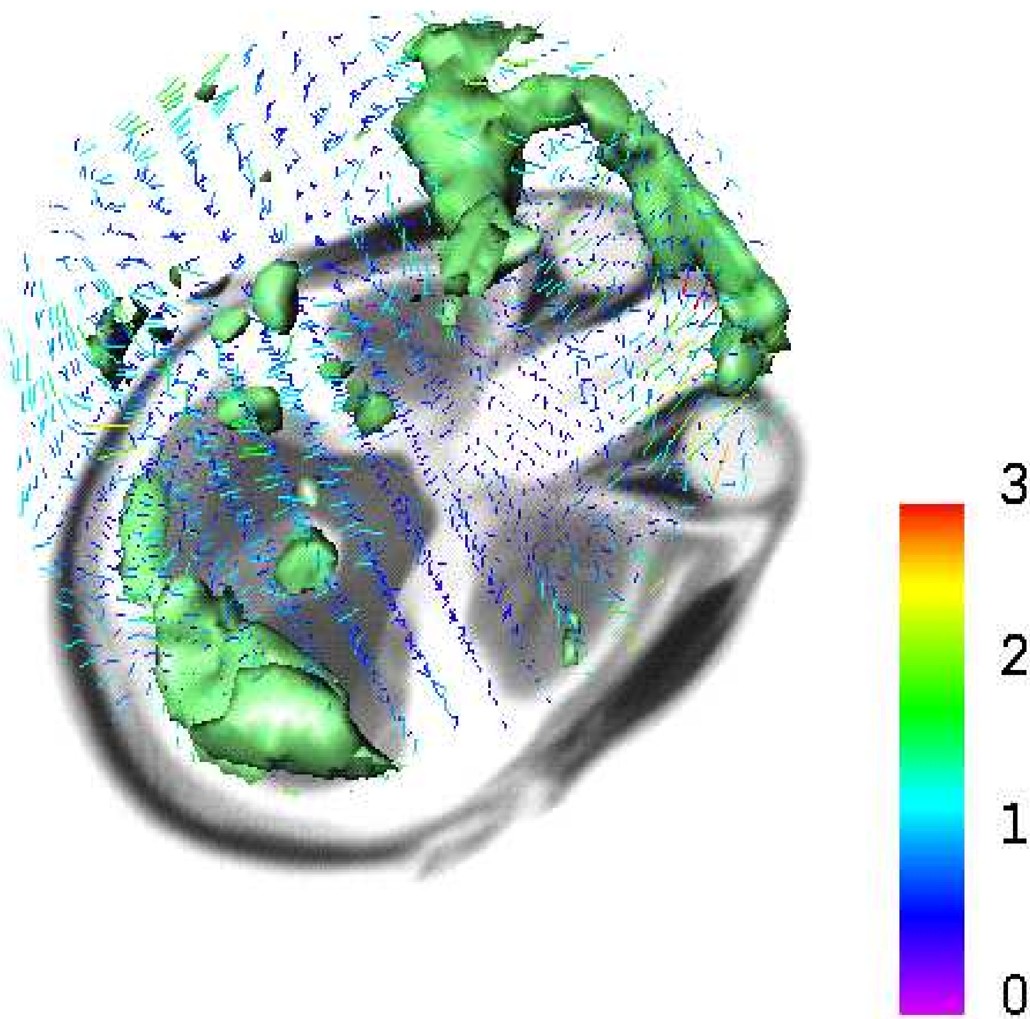

Figure B-9: Structural difference between a group of men (29) and women (23). Green blobs are the excursion set of the Hotelling's T^2 field scaled to an F distribution pointwise (scale factor = 48/3/50) above level 4. The arrows represent the color coded (by the length of the vector) image of the structural difference between the two groups multiplied by 5, $5 \times (\bar{\mathbf{\Delta}}_1(\mathbf{t}) - \bar{\mathbf{\Delta}}_2(\mathbf{t}))$. An MRI slice is also shown for a better perception.

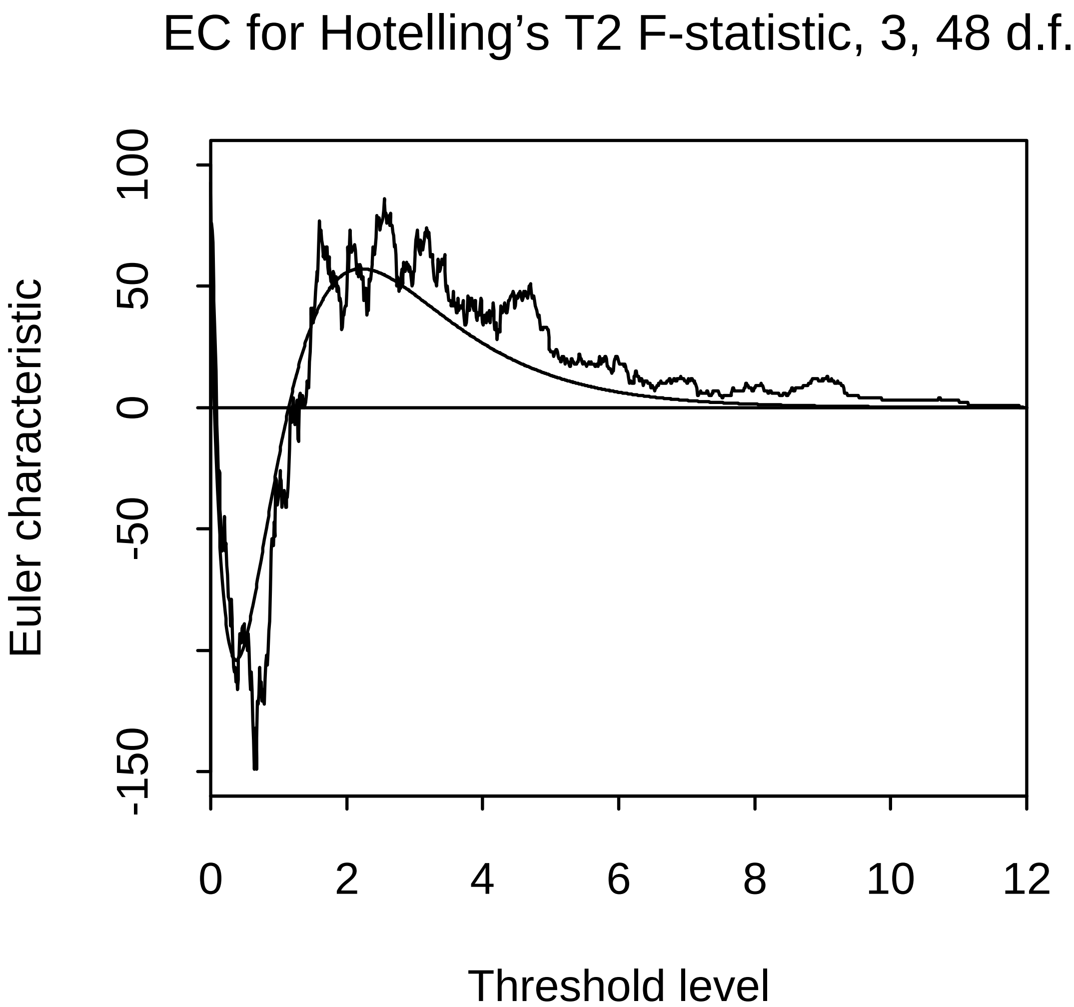

Figure B-10: The expected EC against the observed EC.

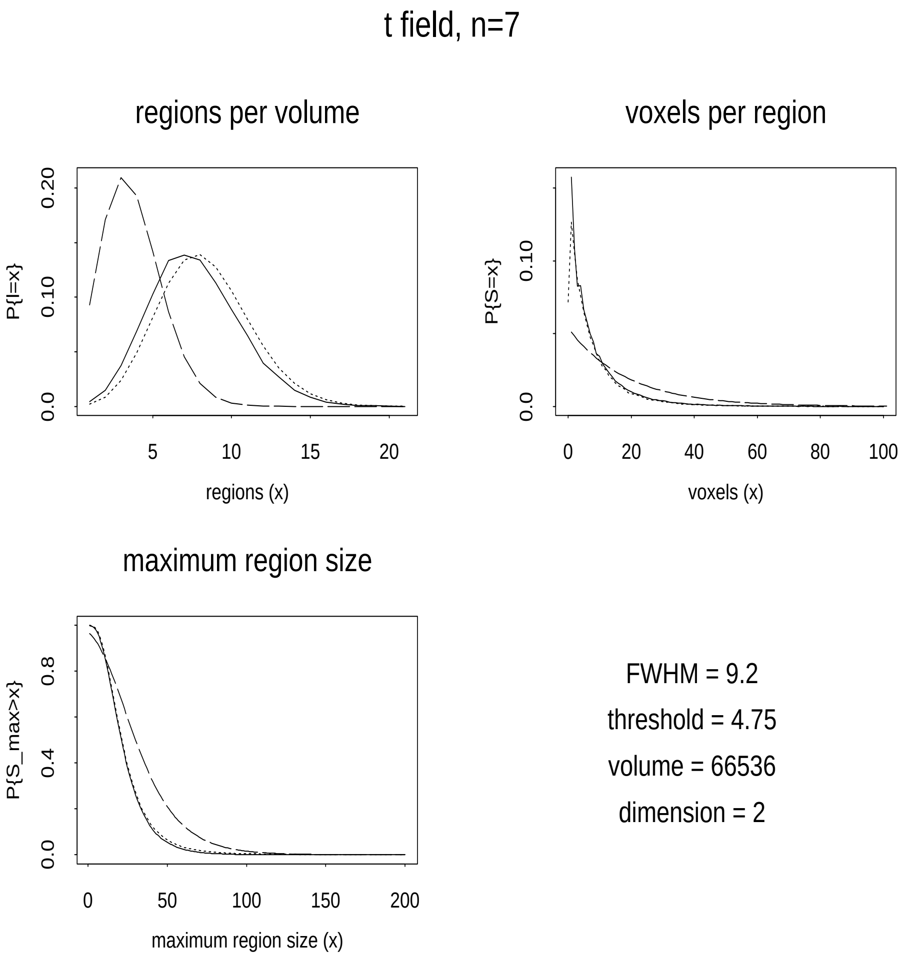

Figure B-11: Validation for the size of connected components of the excursion set above threshold $t = 4.75$ of a t field with $n = 7$.

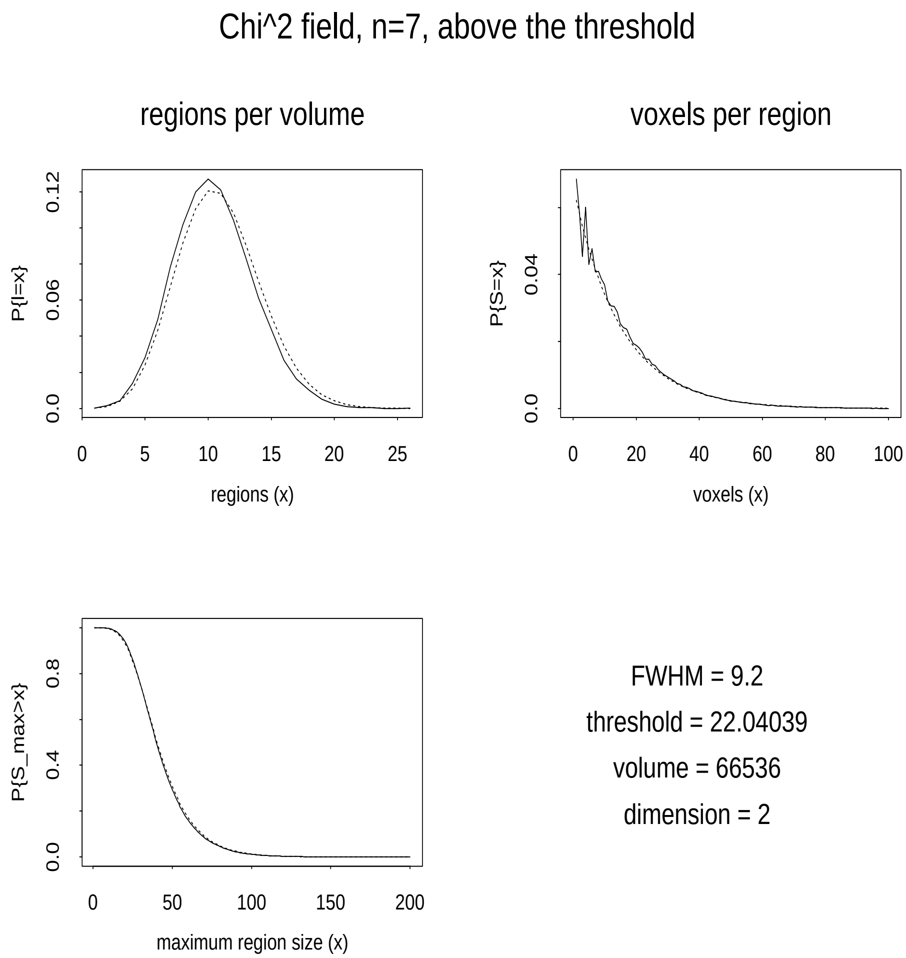

Figure B-12: Validation for the size of connected components of the excursion set above threshold $u = 22.04039$ of a χ^2 field with $n = 7$.

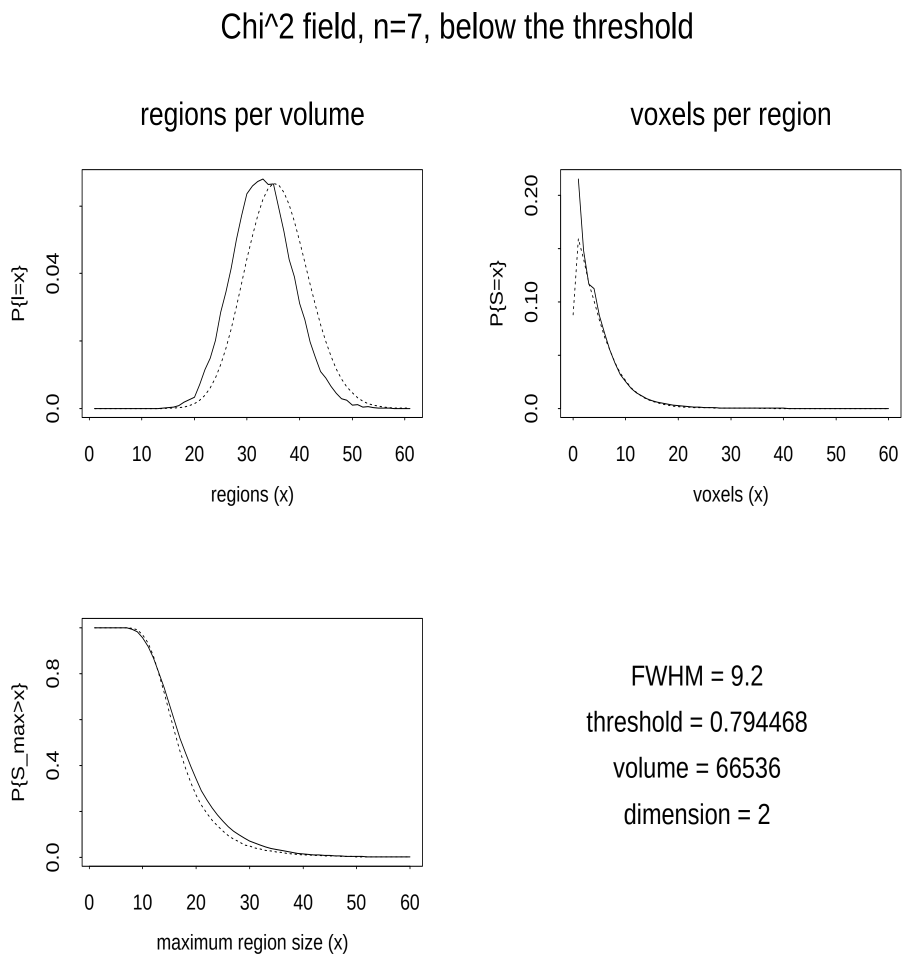

Figure B-13: Validation for the size of connected components of the excursion set below threshold $u = 0.794468$ of a χ^2 field with $n = 7$.

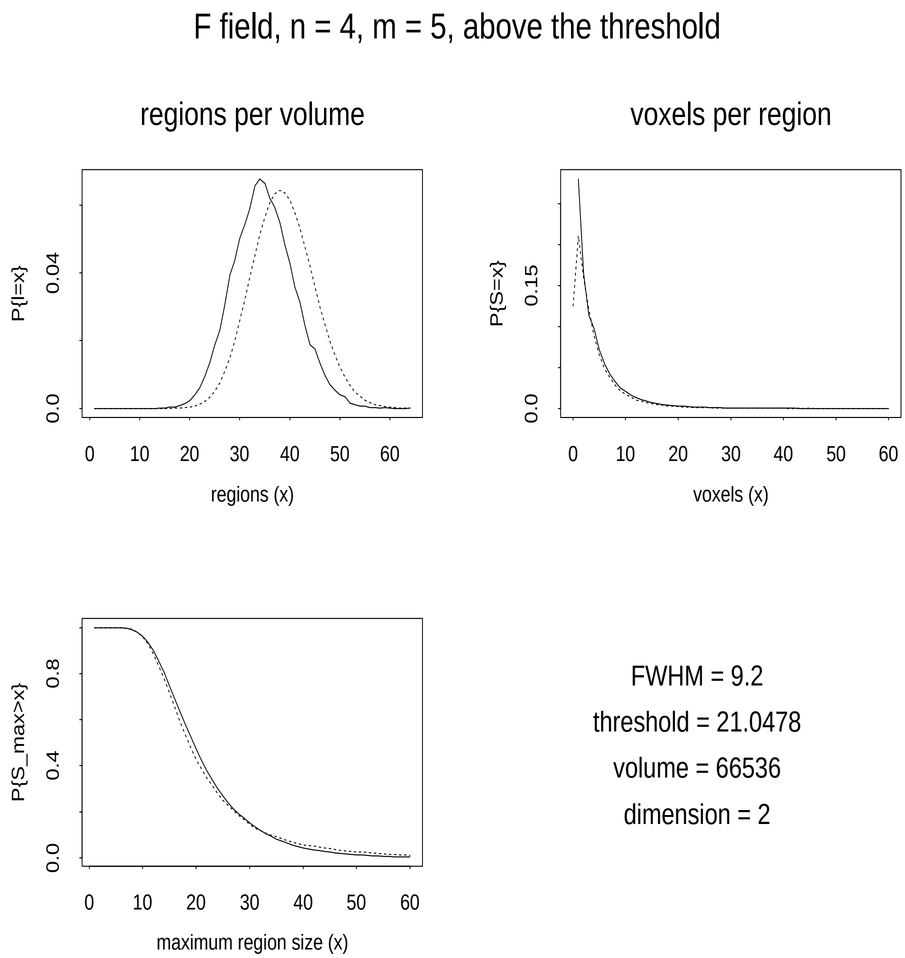

Figure B-14: Validation for the size of connected components of the excursion set above threshold $f = 21.0478$ of an F field with $n = 4, m = 5$.

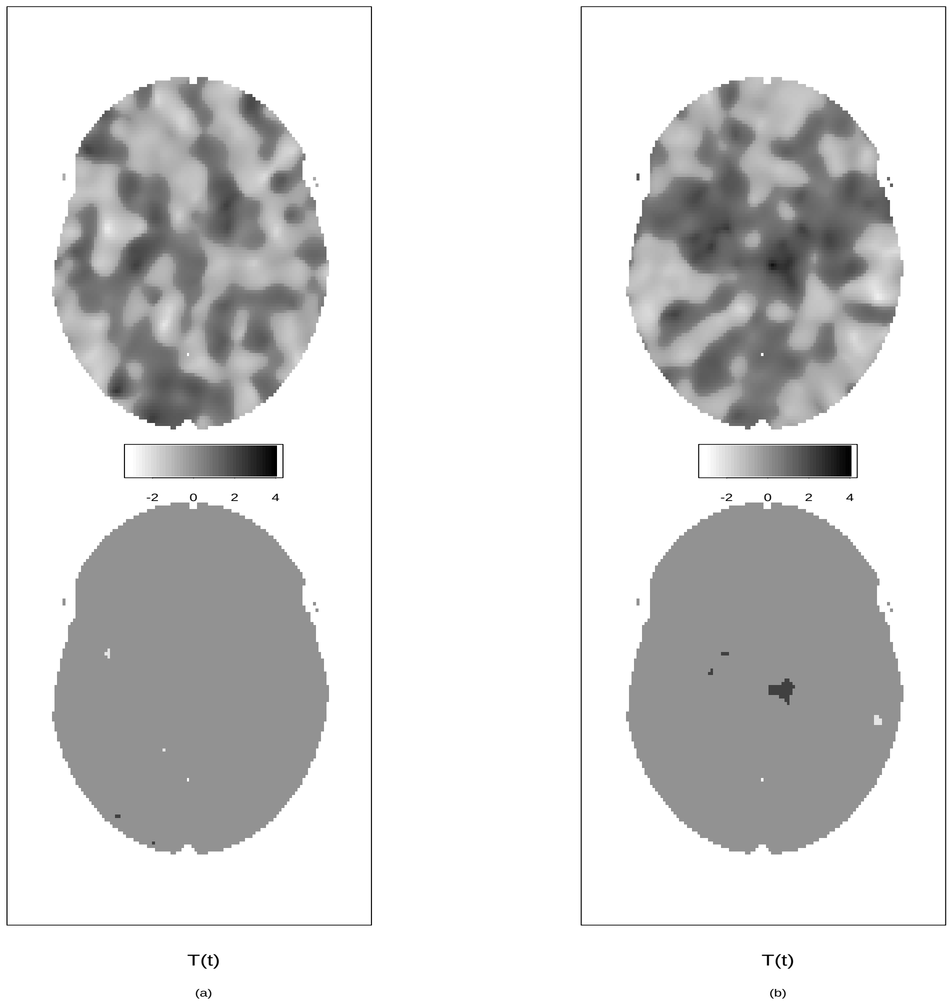

Figure B-15: Horizontal slices through the t random field. (a) Top: the t field generated from $p = 9$ subjects with no heat stimulus ($T(\mathbf{t})$). Bottom: the dark blobs in the image is the excursion set above threshold 5.0 representing areas of possible activation, the white blobs in the image is the excursion set below threshold -5.0 representing areas of possible deactivation. (b) is as for (a), but for the difference between the heat stimulus and baseline.