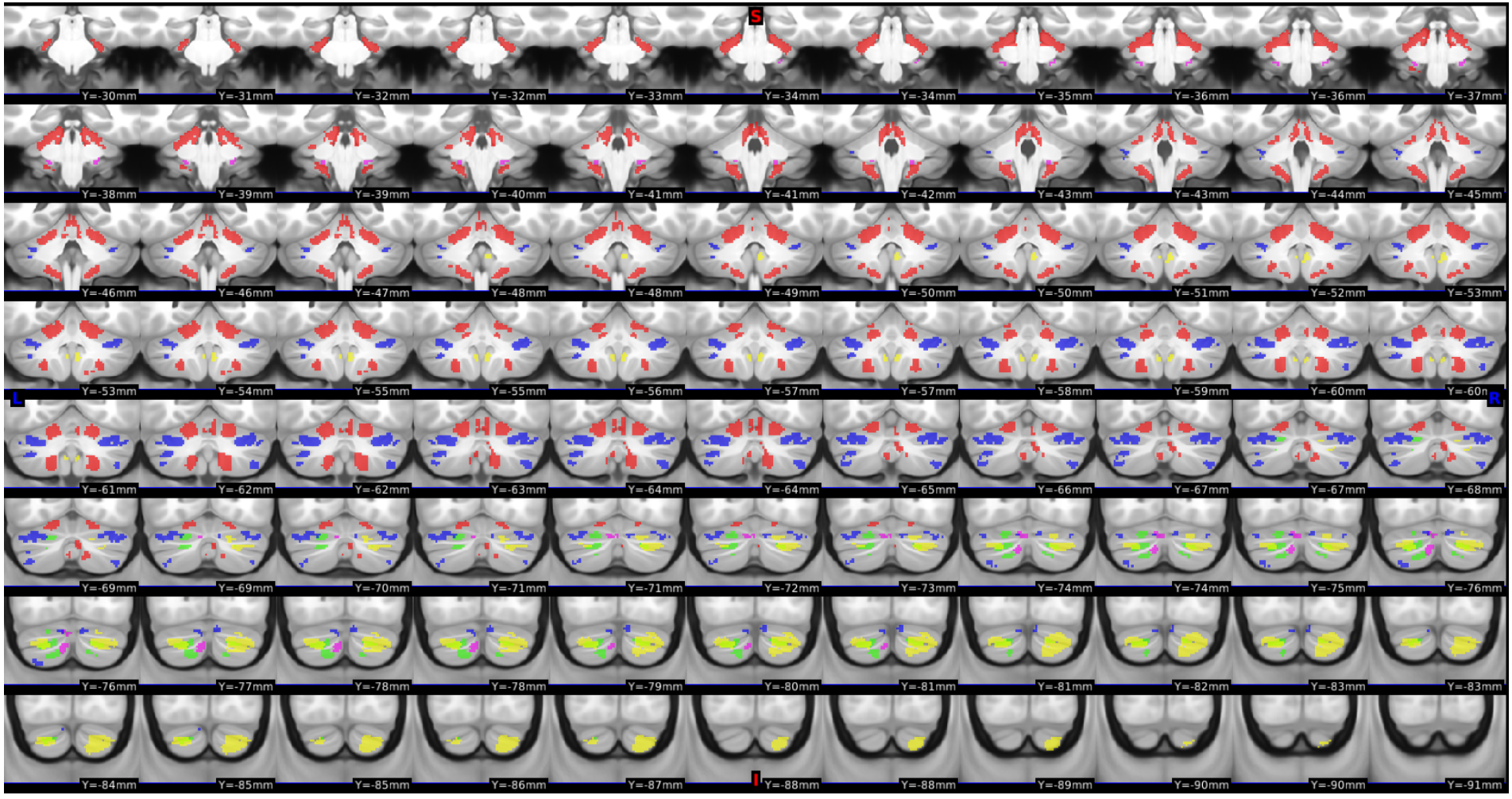
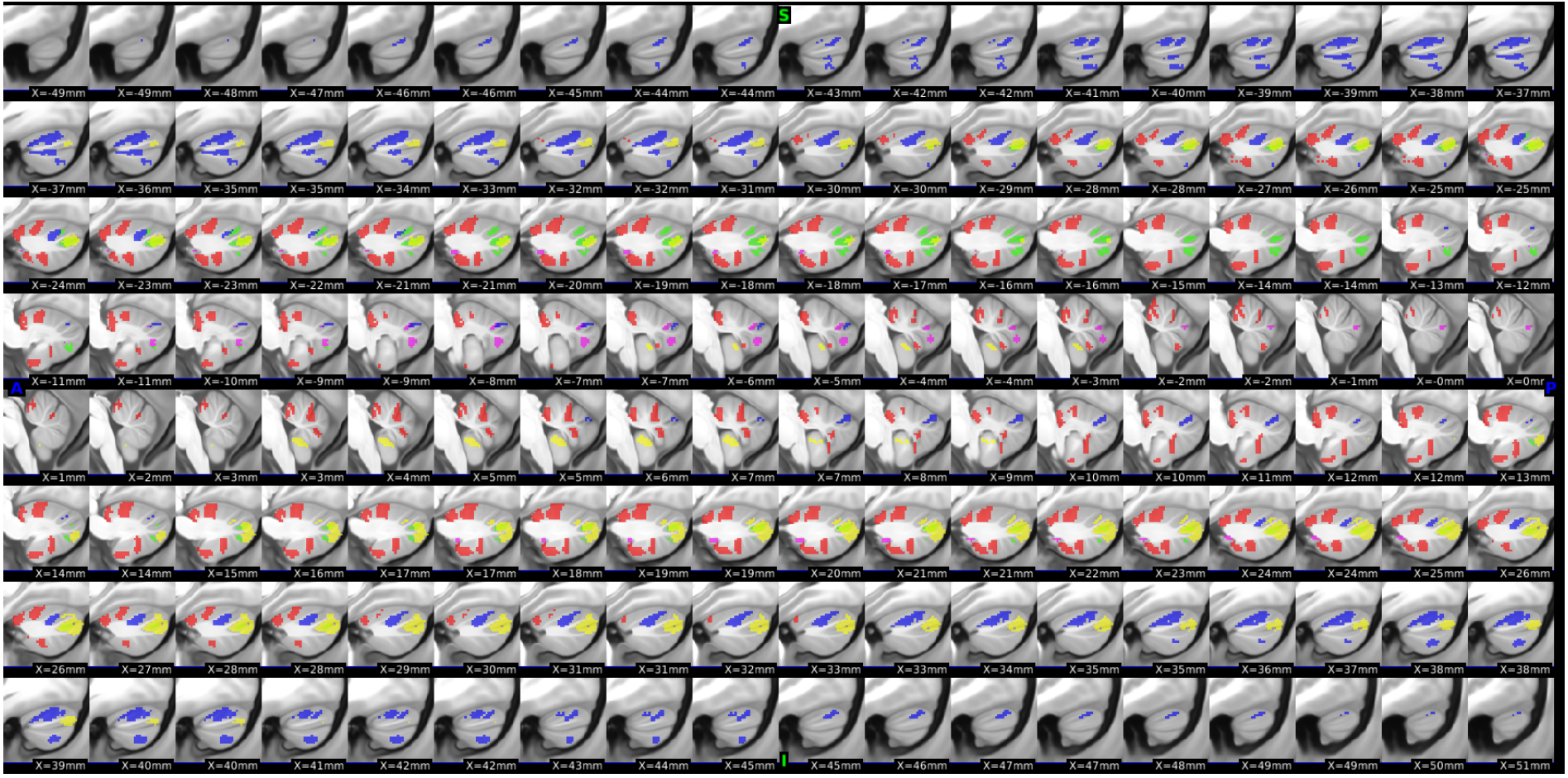


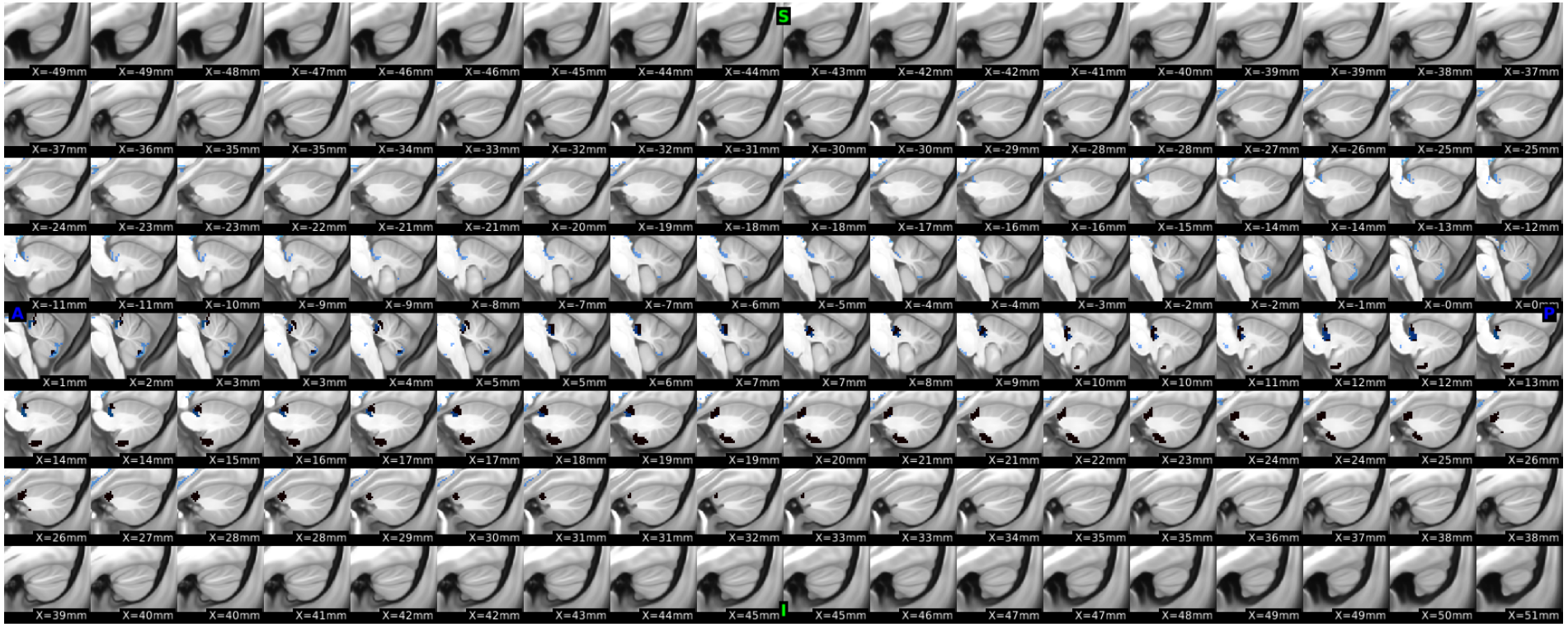
Supplementary Fig. 1

fMRI results, coronal plane. Cerebellar activation for motor (red), working memory (blue), language (yellow), social processing (green) and emotion processing (magenta). Activation maps are thresholded at a voxel-level threshold of d>0.5. Only clusters >100 mm^3 are shown. Left is shown on the left.



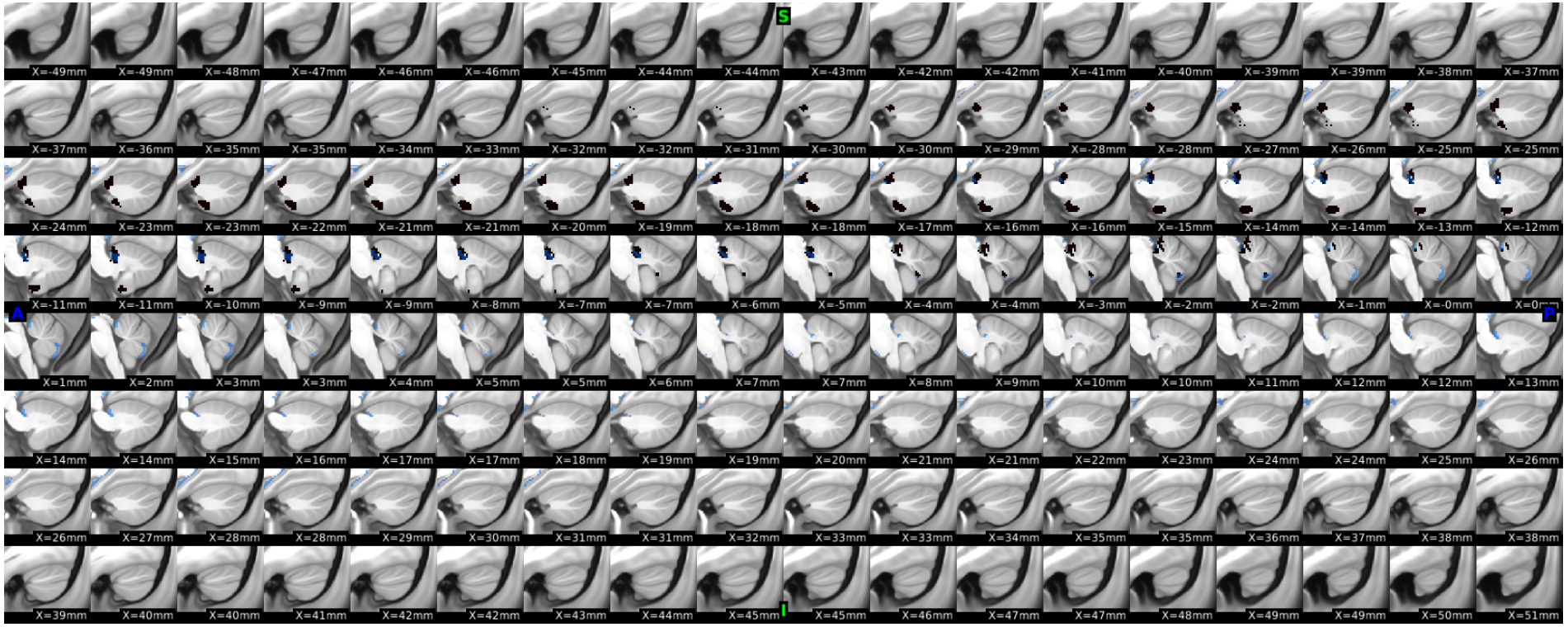
Supplementary Fig. 2

fMRI results, sagittal plane. Cerebellar activation for motor (red), working memory (blue), language (yellow), social processing (green) and emotion processing (magenta). Activation maps are thresholded at a voxel-level threshold of d>0.5. Only clusters >100 mm^3 are shown. Left is shown on the left.



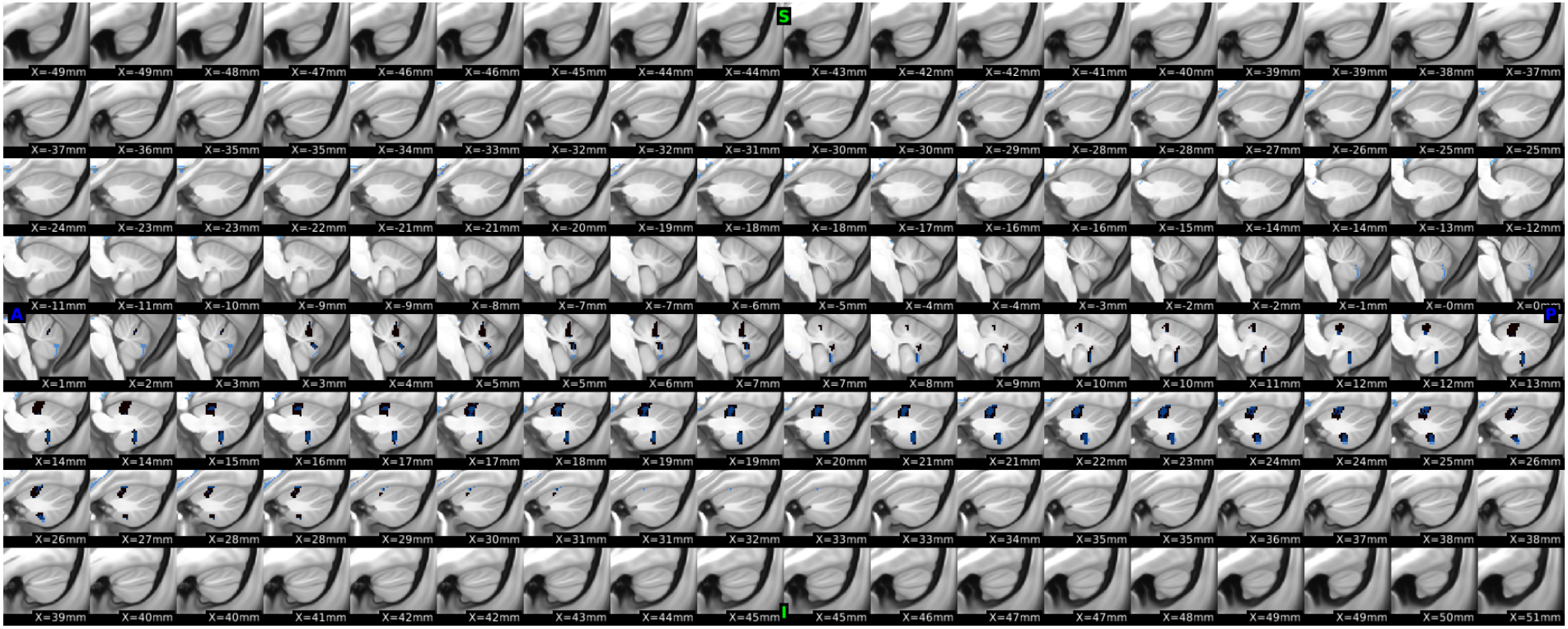
Supplementary Fig. 3

Right foot task activity and resting-state functional connectivity, sagital plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



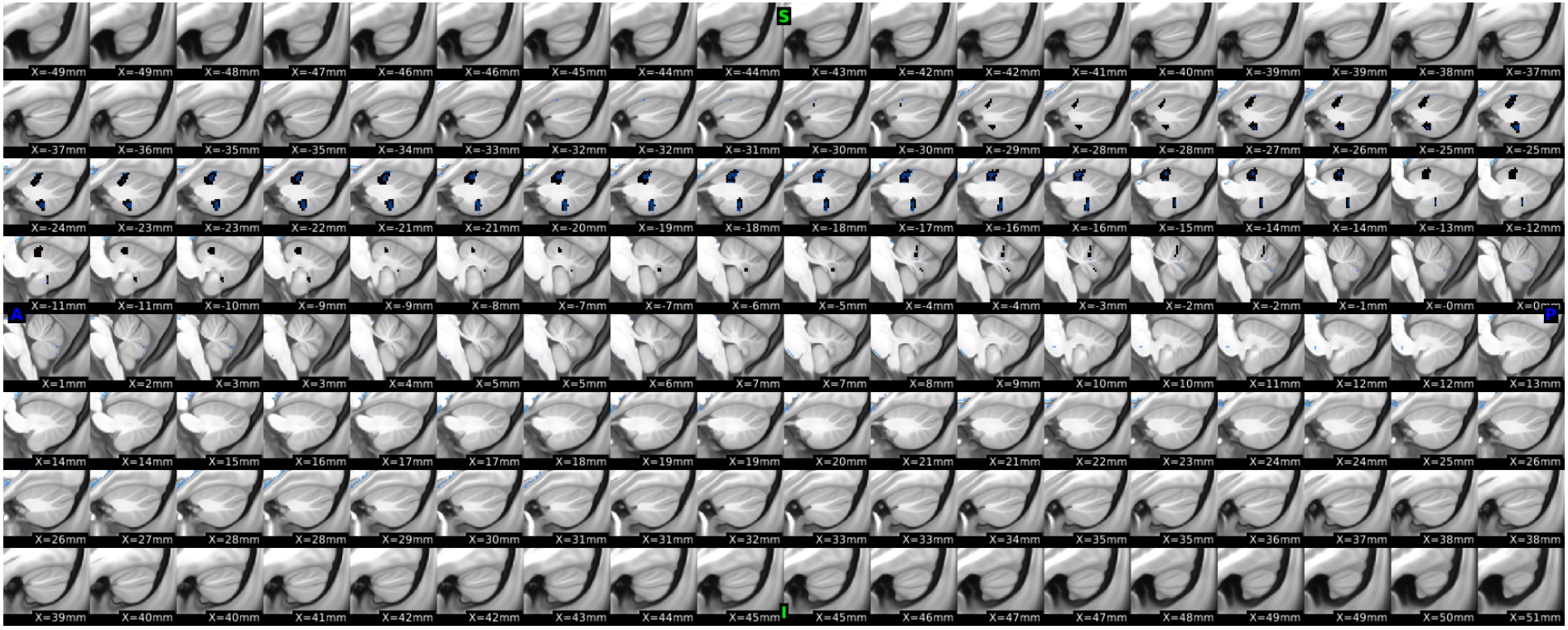
Supplementary Fig. 4

Left foot task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



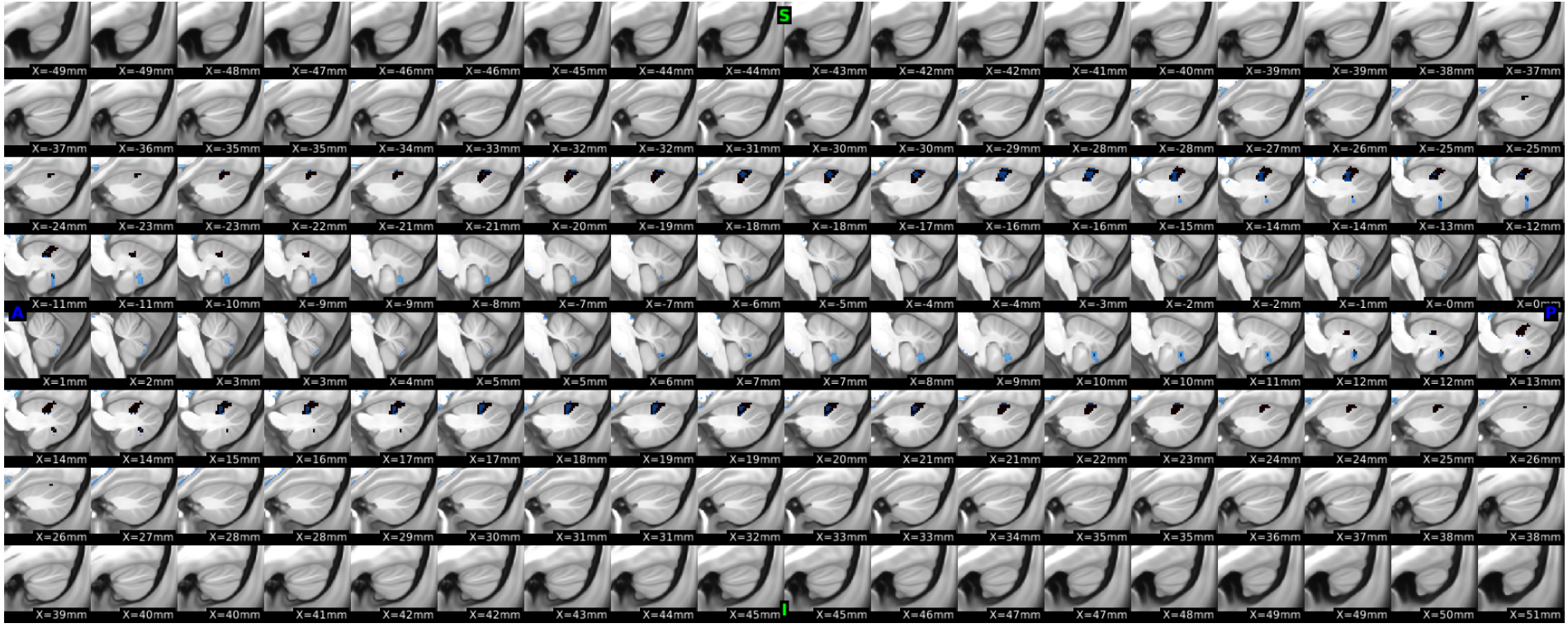
Supplementary Fig. 5

Right hand task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



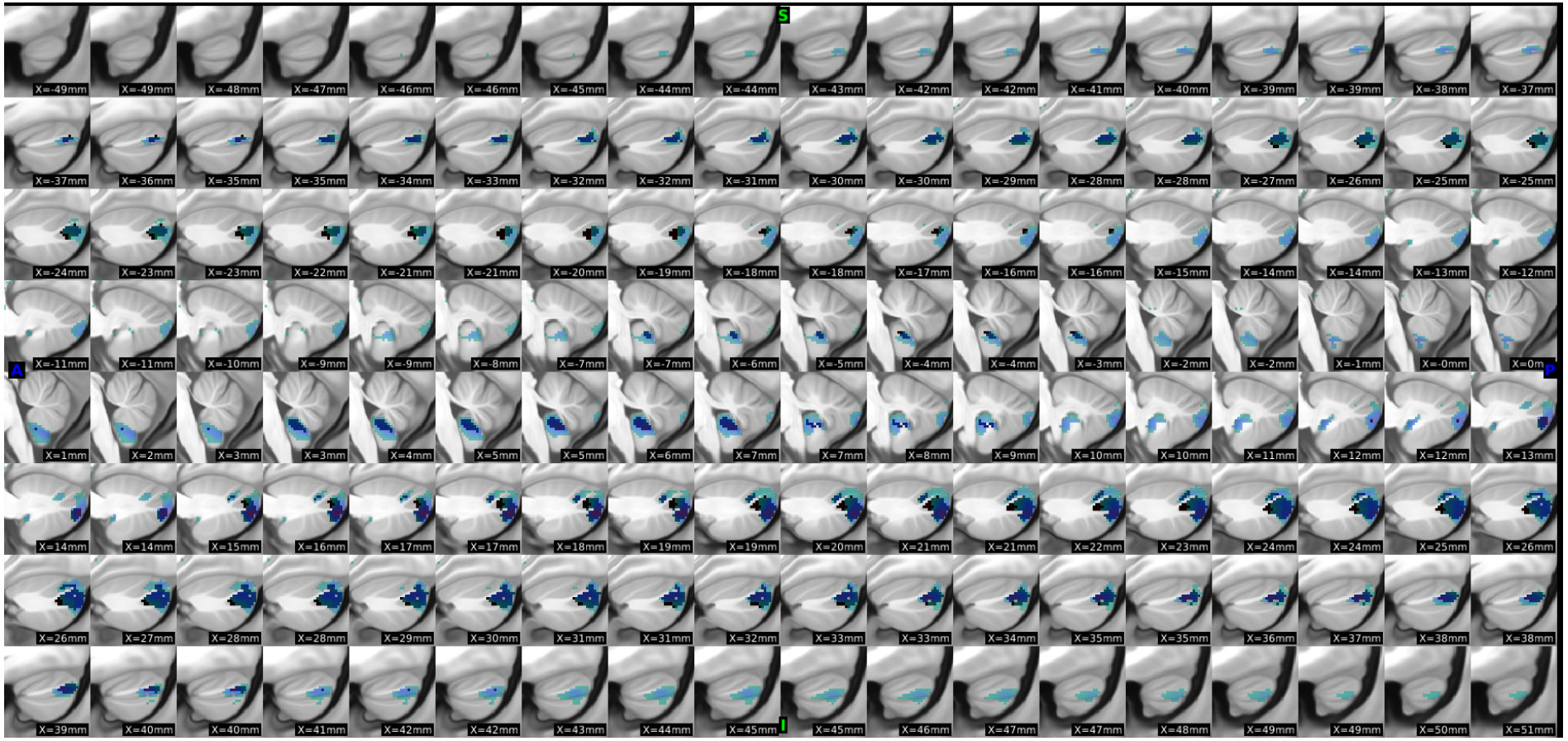
Supplementary Fig. 6

Left hand task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



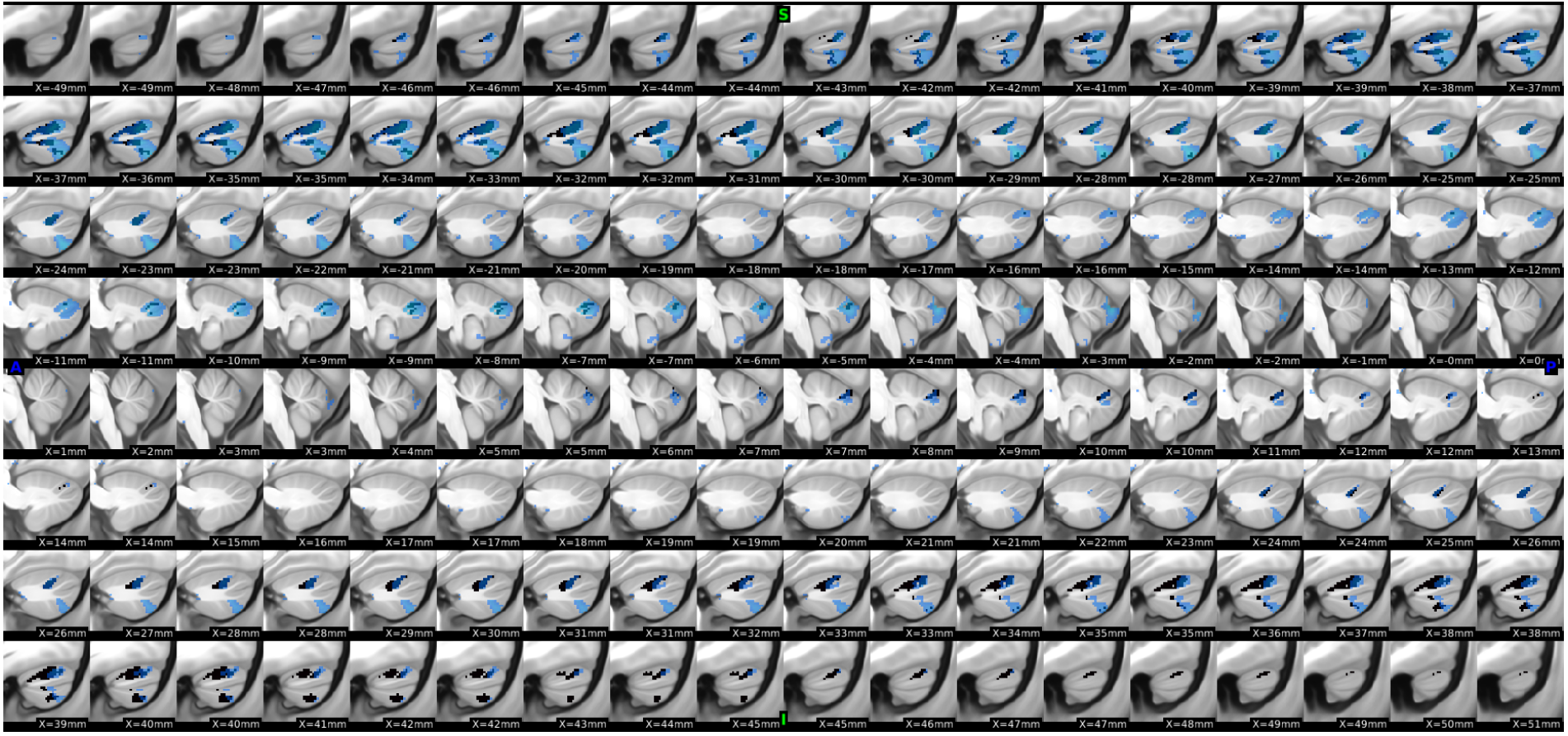
Supplementary Fig. 7

Tongue task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



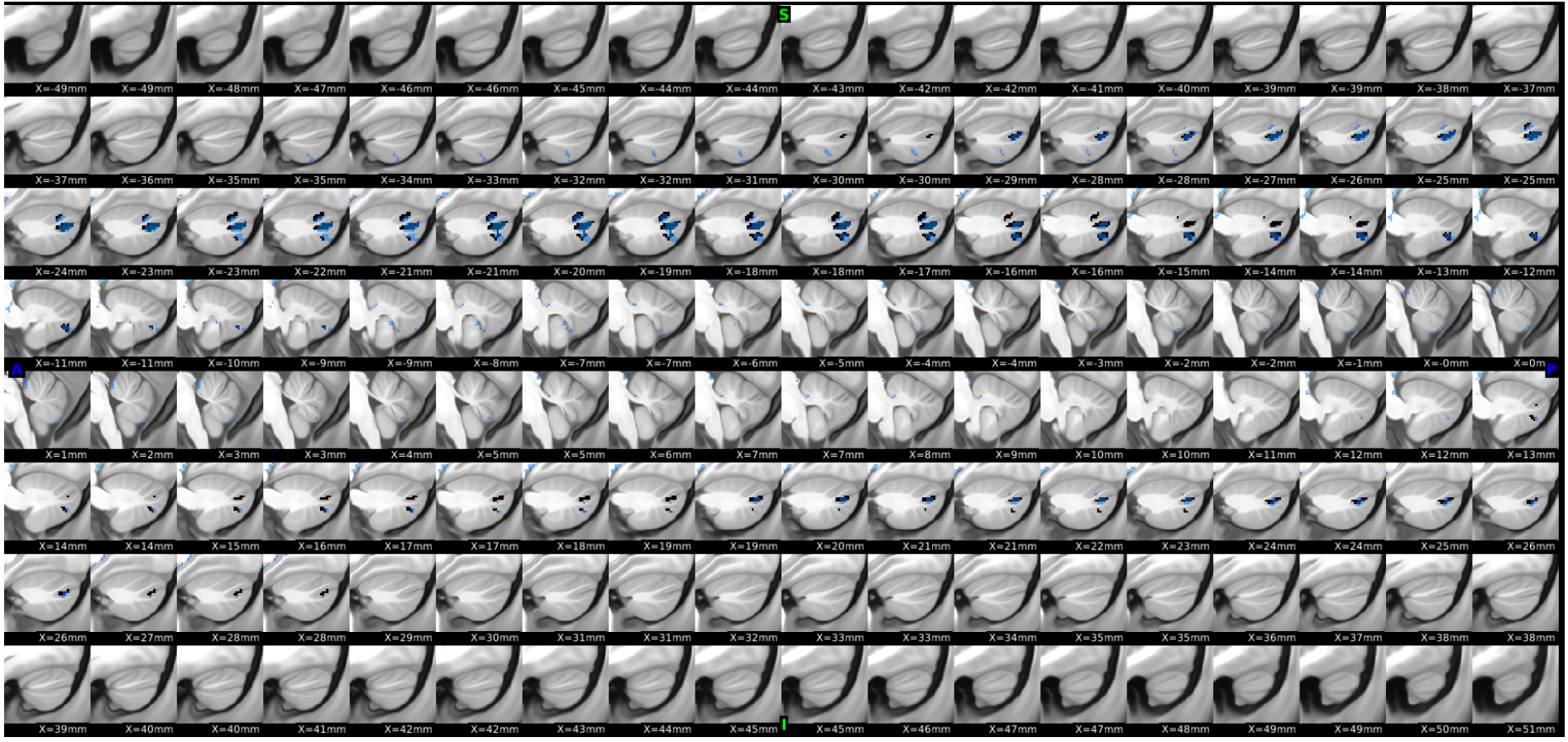
Supplementary Fig. 8

Language processing task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



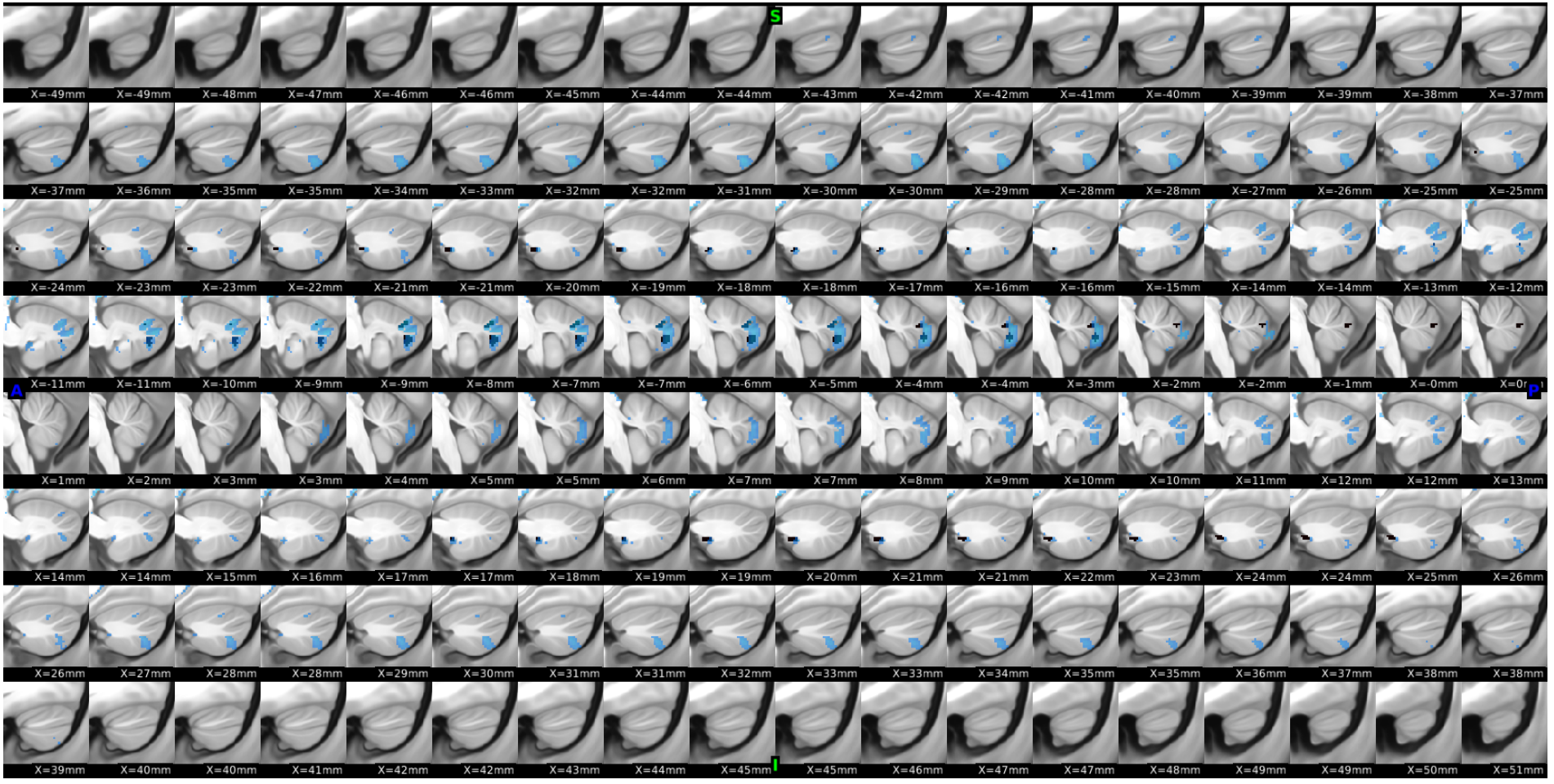
Supplementary Fig. 9

Working memory task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



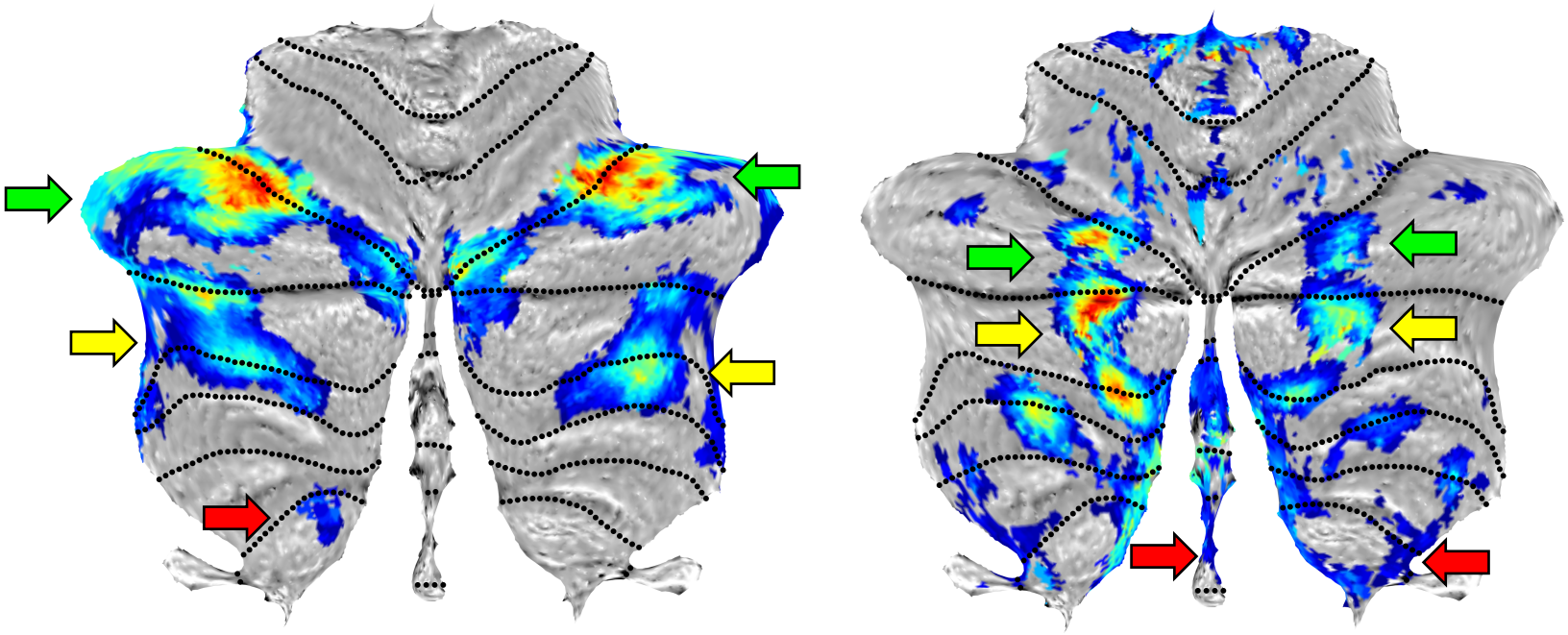
Supplementary Fig. 10

Social processing task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



Supplementary Fig. 11

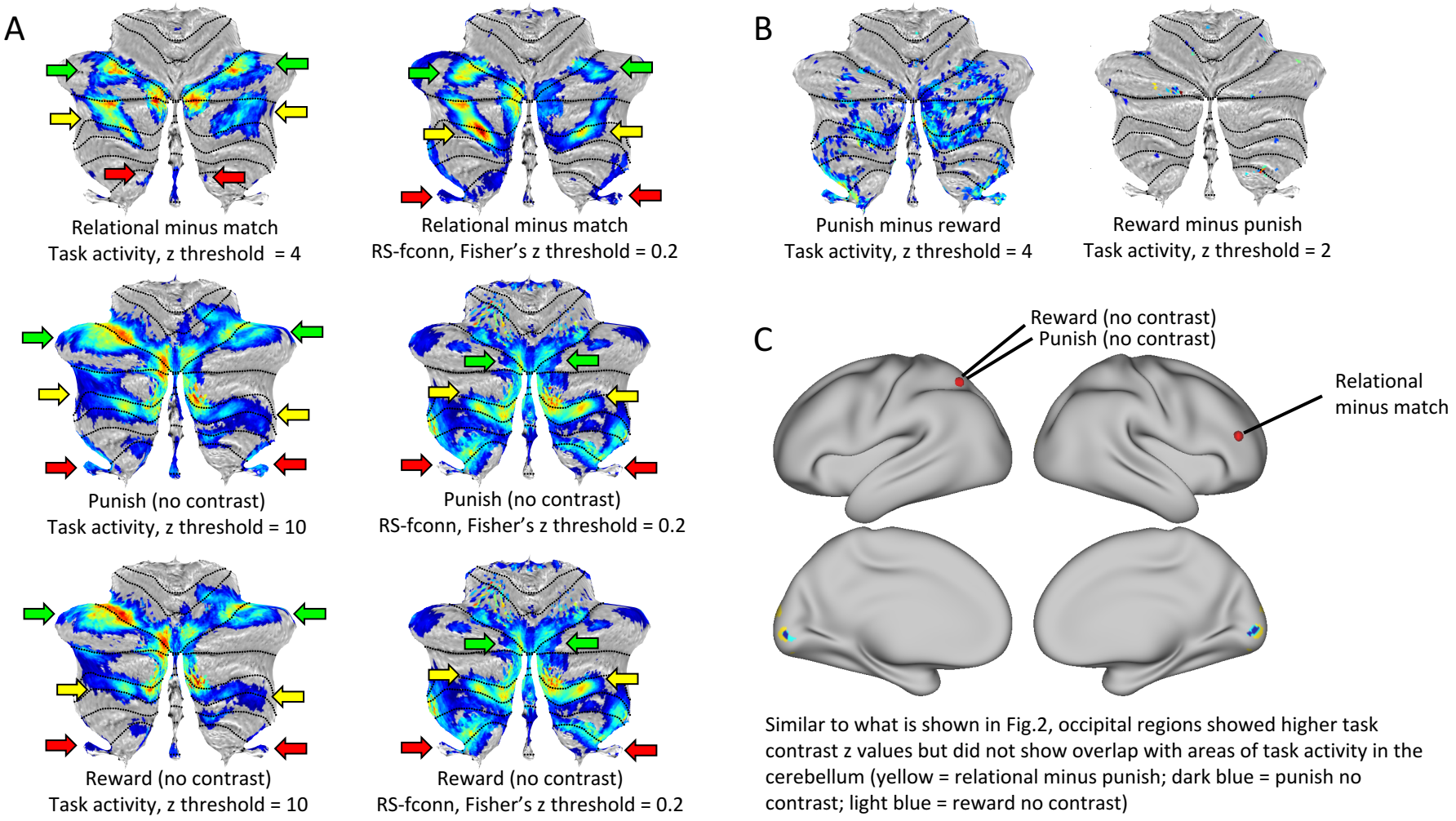
Emotion processing task activity and resting-state functional connectivity, sagittal plane. Key: Black = cerebellar task activation (thresholded at d>0.5 [medium effect size] and cluster size>100mm^3). Blue = resting-state functional connectivity calculated from cerebral cortical seed (thresholded at Fisher's z>0.309, equivalent to r>0.3 [medium effect size]).



Working memory
Task activity
z threshold = 10

Social processing
Resting-state functional connectivity
Fisher's z threshold = 0.2

Supplementary Fig. 12
While working memory task activation and social processing resting-state functional connectivity did not reveal third representation when thresholding based on medium effect size (task activation Cohen's d > 0.5, resting-state functional connectivity Fisher's z > 0.309), both maps revealed engagement of lobules IX/X (third representation) when using lower z map thresholds (as indicated above). As in Fig. 4, green arrows correspond to first nonmotor representation, yellow arrows correspond to second nonmotor representation, and red arrows correspond to third nonmotor representation.



Supplementary Fig. 13. **(A)** While relational minus match, reward minus punish, and punish minus reward task activation maps did not survive effect size threshold d >0.5, lower z map thresholds revealed triple representation of relational minus match. **(B)** Punish minus reward and reward minus punish failed to reveal meaningful cerebellar maps, due to similarity between punish and reward main effects (as shown in A). However, Punish (no contrast) and Reward (no contrast) task maps showed triple representation (shown in A). Relational minus match, Punish (no contrast) and Reward (no contrast) also revealed triple representation in resting-state connectivity. **(C)** Cerebral cortical task activation peaks used as seeds; reward and punish main effect peak are the same. Green arrows = first nonmotor representation, yellow = second nonmotor representation, red = third nonmotor representation. RS-fconn = resting-state functional connectivity.