

Spatially resolved expression of Transposable Elements in disease and somatic tissue with SpatialTE

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SUPPLEMENTARY FILE S1 – SIMULATED EXPERIMENT TO TEST SPATIALTE

Spatial Transcriptomics use a paired-end sequencing layout in which the left read carries information regarding the spatial location, and the molecule identifier, and the second read carries information of the captured transcript. Taking this into account, we selected all the reads belonging to 2 spots of the sample SRR7895713: the 11x5 spot and the 10x10 spot (Figure S1). Then, we randomly selected LINEs and LTRs matching the available number of molecules at each spot. For each randomly selected TE in the respective spot, a random number of reads was generated using the Polyester RNA-Seq read simulator in single-end mode. Overall, for the spot 11x5 a total of 6420 reads were generated, while for the 10x10 spot a total of 9593 reads were generated (Supplementary Tables S1 and S2). Finally, the simulated read file was used as the right read, and the reads belonging to the spatial information of the respective spot (11x5 for LINEs, 10x10 for LTRs) was used as the left read. These files were then used as input for SpatialTE. The advantage of this experiment design is that since the spatial location and molecule info belongs to a real experiment (SRR7895713), we can use the respective H&E image to visually inspect the results of SpatialTE.

The results of this simulated experiment are shown in Figure S2 and Figures S3 and S4.

The images in Figure S2 were generated using the `st_data_plotter` tool, in a similar way as described in the main text (the color palette is now a sequential palette as described in a later comment). This tool allows to plot the total expression from the count file using a regular expression (*.*, Figure S2A and S2B), and belonging to a specific class in the same manner (*.LTR.* and *.LINE.*, Figure S2A' and S2B' respectively). Note that in both cases the TE expression matches the total expression, indicating that SpatialTE is able to correctly assess the spot in which TEs are expressed, and does not incorrectly assigns TEs to other spots.

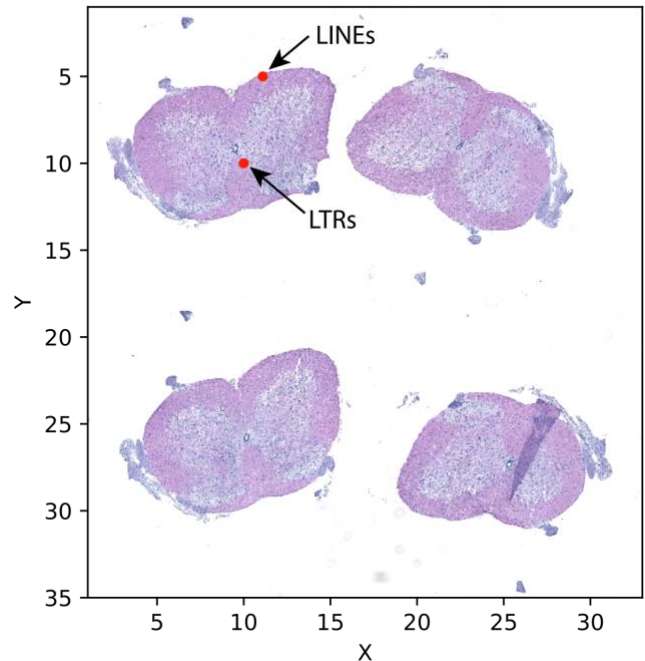
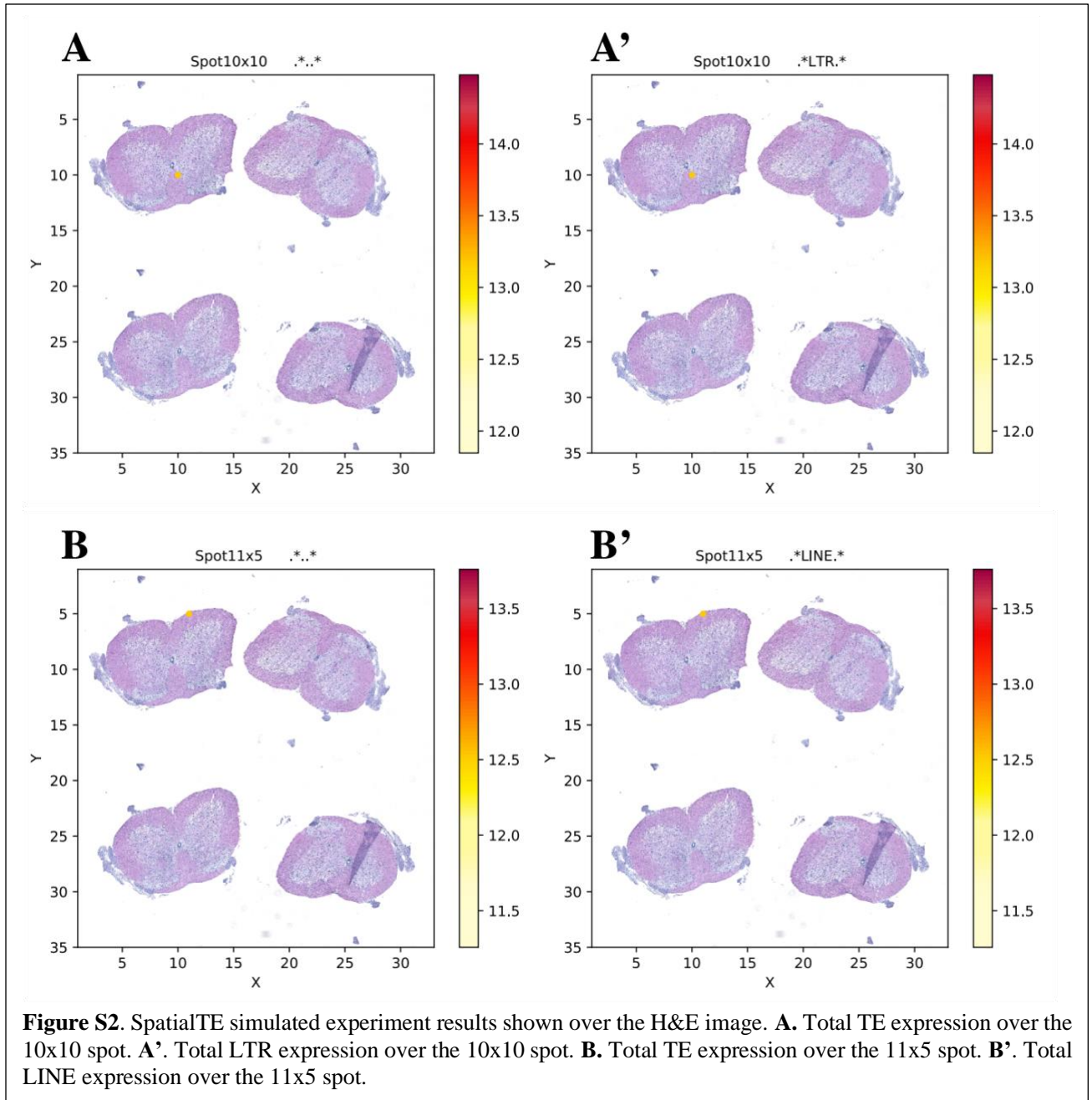
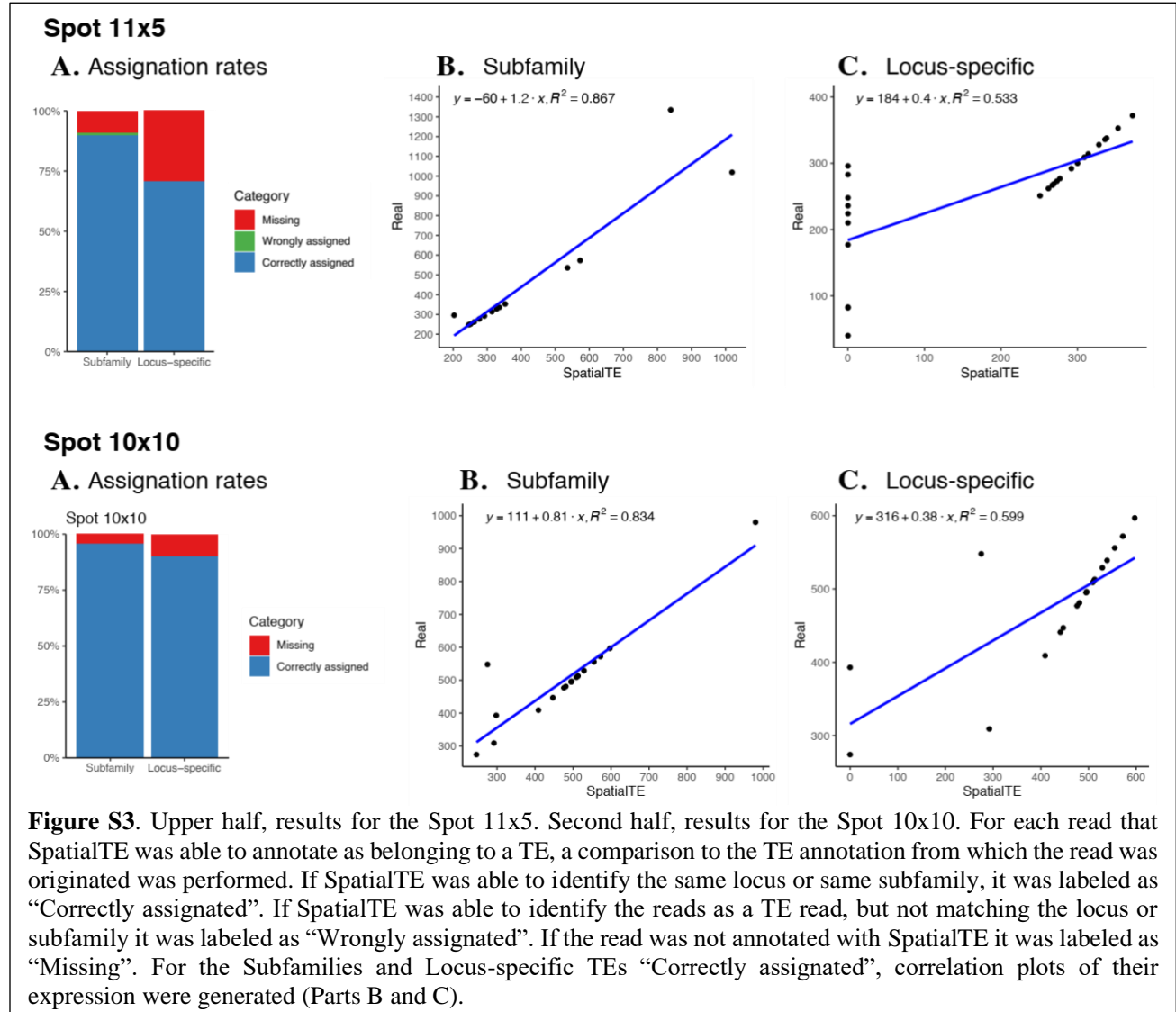


Figure S1. Selected spots for the simulation experiments. TE classes simulated at each spot are indicated.



Next, considering that with our read simulation we know the ground truth of the locus of expression of TEs, we were able to address the second question of how correct are the expression estimates obtained with SpatialTE.



Overall, depending on the class, between 12%-30% of TEs are lost at the locus-specific resolution. This is also reflected in the correlation plots, at $x=0$ where SpatialTE was not able to found an expressed TE with locus resolution. In terms of subfamily expression, the correlations seem to be better (both cases > 0.8), and the proportion of missed reads is lower. In the Spot 11x5 there seem to be over-estimation of one TE subfamily at the expense of an under-estimation of another TE subfamily. Taken collectively, these results indicate that the Subfamily results of SpatialTE seem to be the best, at the cost of losing the locus of expression of TEs.

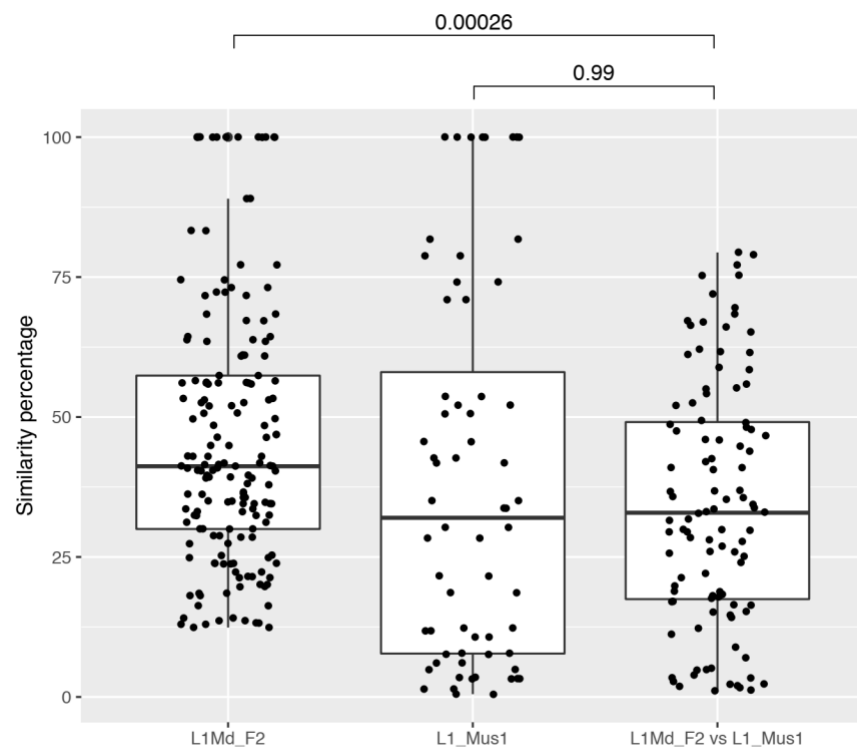


Figure S4. Box plot to show percentages of similarity between the selected subfamilies at the intra- (“L1Md_F2” and “L1_Mus1”) and inter-subfamily levels (“L1Md_F2 vs L1_Mus1”). Brackets indicate comparisons from which statistical significance (numbers above brackets) was calculated.

Supplementary Table S1 - Simulated read counts for the 11x5 Spot.

| TE | Reads |
|---|-------------|
| chr10 119991773 119992127 L1Md_F2:L1:LINE 4.5 + | 82 |
| chr10 122643555 122644004 L1ME2:L1:LINE 29.3 - | 328 |
| chr1 128814179 128814338 L1MA6:L1:LINE 23.7 - | 353 |
| chr1 142519432 142519572 L1Md_F2:L1:LINE 8.0 - | 283 |
| chr1 146813997 146814471 Lx5c:L1:LINE 28.4 - | 277 |
| chr1 159301561 159301825 Lx8b:L1:LINE 26.1 - | 251 |
| chr1 28075710 28075954 L1Md_F2:L1:LINE 4.9 + | 177 |
| chr14 93685636 93685737 L1M2:L1:LINE 26.8 - | 269 |
| chr1 58987162 58987292 L1MC:L1:LINE 26.6 - | 372 |
| chr16 42506889 42507522 L1Md_F2:L1:LINE 6.9 - | 236 |
| chr4 10518435 10518617 L1M2:L1:LINE 21.6 - | 267 |
| chr4 25310509 25311475 L1Md_F2:L1:LINE 5.0 + | 224 |
| chr5 140913677 140913886 L1ME3Cz:L1:LINE 31.2 - | 262 |
| chr6 103285931 103286589 L1Md_F2:L1:LINE 7.0 + | 210 |
| chr6 119261926 119262162 L1M5:L1:LINE 32.6 + | 300 |
| chr6 139097324 139097677 Lx5:L1:LINE 23.1 + | 292 |
| chr6 65808390 65808703 L1MC:L1:LINE 25.5 - | 309 |
| chr7 138933987 138934249 L1M5:L1:LINE 35.2 - | 273 |
| chr8 82339208 82339513 L1MC:L1:LINE 30.0 - | 338 |
| chrX 134866631 134866694 L2a:L2:LINE 32.2 + | 314 |
| chrX 137807584 137808106 L1Md_F2:L1:LINE 3.9 - | 83 |
| chrX 140961311 140961395 L1MB7:L1:LINE 23.1 - | 336 |
| chrX 70180270 70181478 L1_Mur2:L1:LINE 15.7 + | 248 |
| chrX 92293580 92293747 L1_Mus1:L1:LINE 7.7 + | 296 |
| chrY 84310454 84311022 L1Md_F2:L1:LINE 6.7 + | 40 |
| TOTAL | 6420 |

Supplementary Table S2 - Simulated read counts for the 10x10 Spot.

| TE | Reads |
|--|-------------|
| chr10 63424746 63424871 ORR1D2:ERVL-MaLR:LTR 20.6 - | 597 |
| chr10 79560128 79560529 MTC:ERVL-MaLR:LTR 15.8 + | 477 |
| chr1 13914612 13914829 MTEa:ERVL-MaLR:LTR 23.8 + | 441 |
| chr1 161532694 161532892 IAPEz-int:ERVK:LTR 11.0 + | 274 |
| chr11 7116698 7116785 LTR106_Mam:LTR:LTR 22.9 - | 512 |
| chr12 23849084 23850048 ORR1A0-int:ERVL-MaLR:LTR 5.6 - | 393 |
| chr13 28036655 28036746 RLTR51A_Mm:ERVK?:LTR 26.1 - | 495 |
| chr13 34102530 34102729 RLTR11C_MM:ERVK:LTR 14.8 - | 447 |
| chr14 114434392 114434507 RLTR17B_Mm:ERVK:LTR 25.7 - | 309 |
| chr15 87002191 87002483 MLT1F2:ERVL-MaLR:LTR 34.1 - | 496 |
| chr16 21006668 21007173 RLTR16:ERVK:LTR 19.2 + | 556 |
| chr17 65692530 65692641 RLTR20A4:ERVK:LTR 30.6 - | 548 |
| chr17 70734269 70734777 RMER5:ERV1:LTR 26.2 - | 513 |
| chr18 23673509 23673777 MTEa:ERVL-MaLR:LTR 24.2 + | 539 |
| chr18 83695076 83695548 RLTR28:ERVL:LTR 17.8 - | 496 |
| chr19 60181750 60182157 MT2A:ERVL:LTR 28.4 + | 409 |
| chr2 142602043 142602126 MER34:ERV1:LTR 21.7 + | 509 |
| chr2 52133617 52133714 MLT1C:ERVL-MaLR:LTR 28.6 - | 572 |
| chr5 34680657 34680784 MLT1A1:ERVL-MaLR:LTR 29.3 - | 529 |
| chrX 137262589 137262686 MLT1H2:ERVL-MaLR:LTR 29.6 - | 481 |
| TOTAL | 9593 |