

**Thermal discontinuities along a lowland river- the importance of urban areas and lakes**

Arora R, Toffolon M, Tockner K and Venohr M

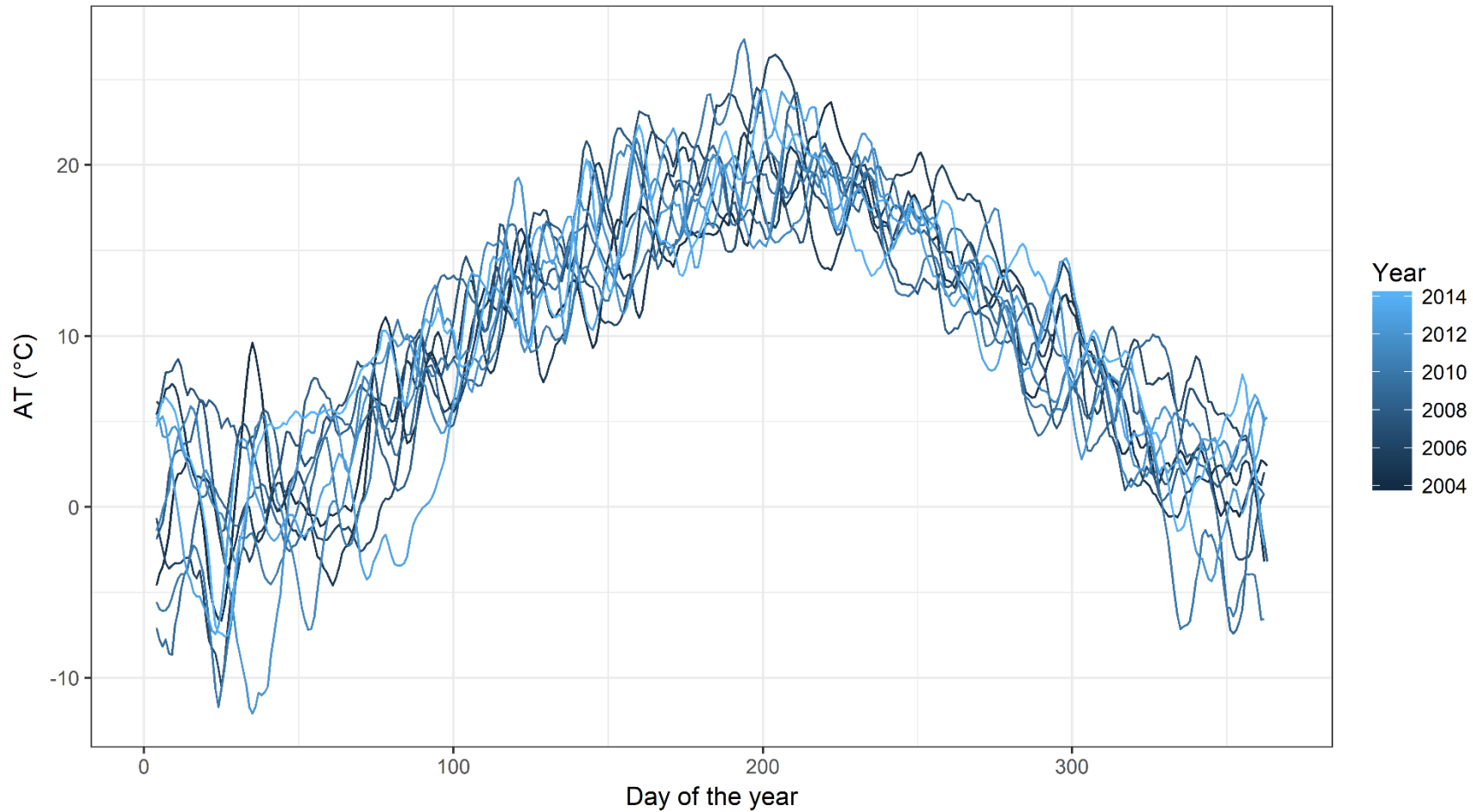


Figure S1 Daily air temperature plotted year-wise from 2004-2014 (7-day moving average) for the station Lindenberg, located in the center of the lower Spree catchment.

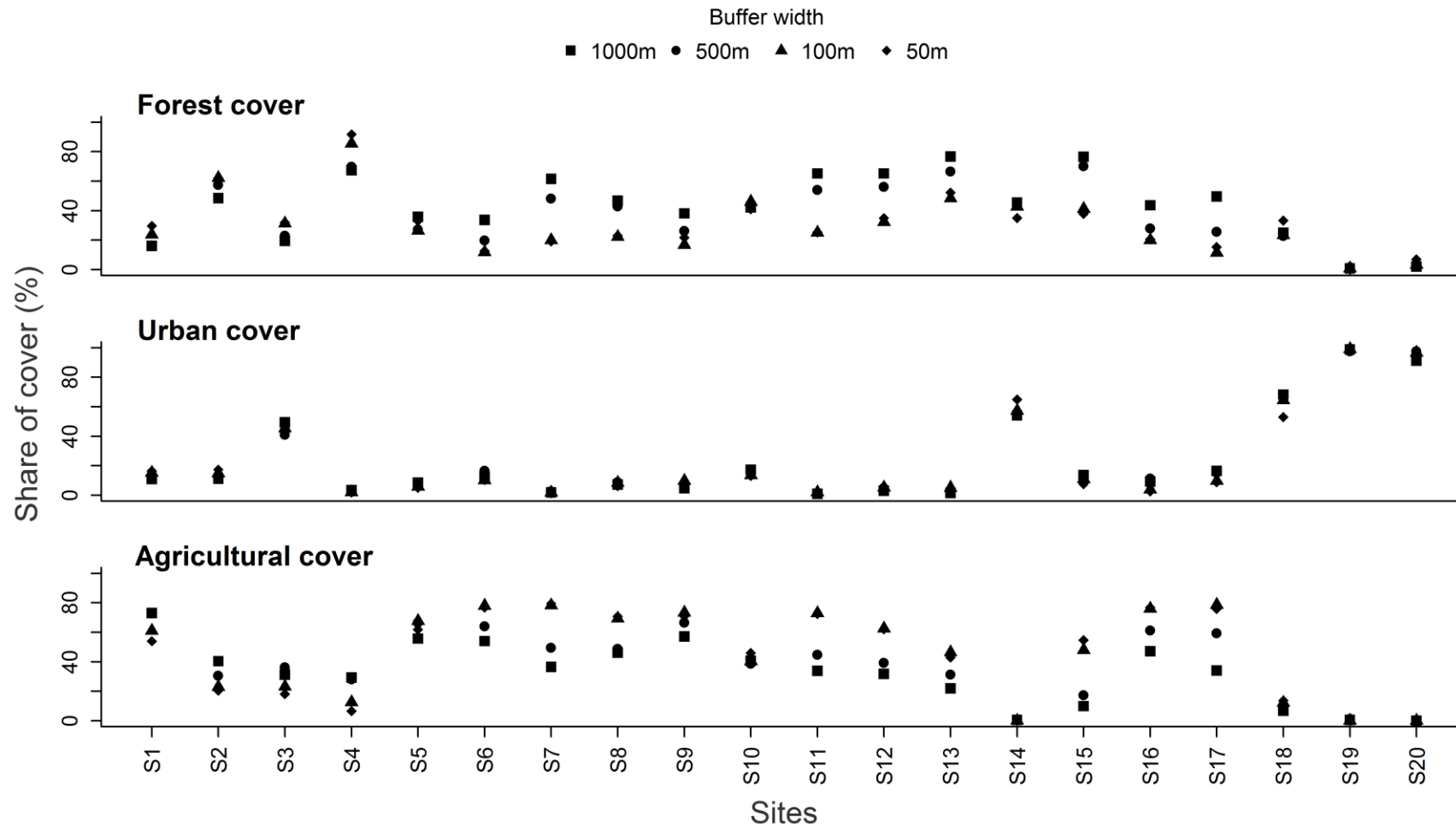


Figure S2 Share of cover of different land use types within 50, 100, 500 and 1000 m buffer widths at all sites on River Spree.

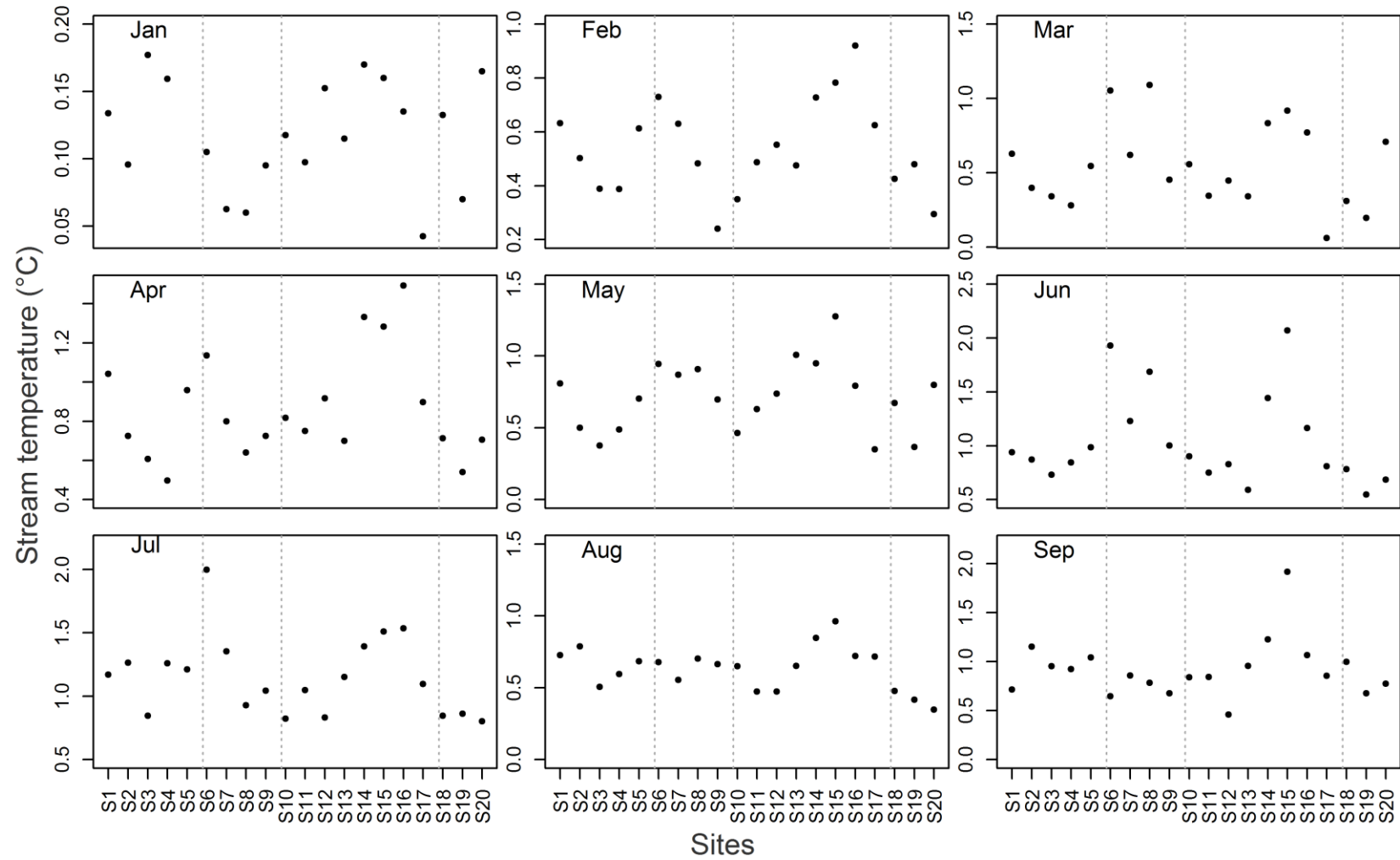


Figure S3 Daily range (maximum-minimum) for the 15<sup>th</sup> day of each month plotted for 20 sites on River Spree for all months.

Table S1 Information on the discharge data used for the analysis.

| <b>Discharge site ID</b> | <b>Site name</b> | <b>Mean discharge over the study period<br/>(<math>\pm</math> Standard Error [S.E.]) [<math>\text{m}^3/\text{s}</math>]</b> | <b>ST Sites considered</b> |
|--------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Q1                       | Fehrow           | 3.9 ( $\pm 0.05$ )                                                                                                          | S1-S2                      |
| Q2                       | Hartmannsdorf    | 14.5 ( $\pm 0.30$ )                                                                                                         | S3-S5                      |
| Q3                       | Leibsch          | 11.9 ( $\pm 0.30$ )                                                                                                         | S6-S9                      |
| Q4                       | Beeskow          | 14.1 ( $\pm 0.30$ )                                                                                                         | S10-S14                    |
| Q5                       | Hohenbinde       | 12.6 ( $\pm 0.10$ )                                                                                                         | S15-S17                    |
| Q6                       | Sophienwerder    | 22.9 ( $\pm 0.60$ )                                                                                                         | S18-S20                    |

Table S2 Calibrated values of parameters obtained from the *air2stream* model for all stream temperature sites along the River Spree.

| Sites | $a_1$<br>[°C day <sup>-1</sup> ] | $a_2$<br>[day <sup>-1</sup> ] | $a_3$<br>[day <sup>-1</sup> ] | $a_4$<br>[°C day <sup>-1</sup> ] | $a_5$<br>[-] |
|-------|----------------------------------|-------------------------------|-------------------------------|----------------------------------|--------------|
| S1    | 1.75                             | 0.30                          | 0.43                          | 1.25                             | 0.53         |
| S2    | 1.21                             | 0.27                          | 0.35                          | 0.86                             | 0.51         |
| S3    | 1.14                             | 0.27                          | 0.34                          | 0.79                             | 0.51         |
| S4    | 0.94                             | 0.22                          | 0.28                          | 0.68                             | 0.51         |
| S5    | 0.88                             | 0.21                          | 0.26                          | 0.65                             | 0.50         |
| S6    | 0.80                             | 0.21                          | 0.25                          | 0.77                             | 0.50         |
| S7    | 0.83                             | 0.21                          | 0.25                          | 0.78                             | 0.50         |
| S8    | 0.76                             | 0.21                          | 0.25                          | 0.75                             | 0.50         |
| S9    | 0.76                             | 0.21                          | 0.25                          | 0.73                             | 0.50         |
| S10   | 0.70                             | 0.17                          | 0.21                          | 0.68                             | 0.50         |
| S11   | 1.10                             | 0.25                          | 0.31                          | 1.09                             | 0.51         |
| S12   | 0.73                             | 0.16                          | 0.20                          | 0.64                             | 0.50         |
| S13   | 0.59                             | 0.16                          | 0.19                          | 0.57                             | 0.49         |
| S14   | 0.64                             | 0.15                          | 0.18                          | 0.59                             | 0.50         |
| S15   | 0.63                             | 0.14                          | 0.17                          | 0.56                             | 0.49         |
| S16   | 0.67                             | 0.14                          | 0.18                          | 0.59                             | 0.50         |
| S17   | 0.56                             | 0.11                          | 0.15                          | 0.40                             | 0.52         |
| S18   | 0.62                             | 0.12                          | 0.15                          | 0.55                             | 0.52         |
| S19   | 0.82                             | 0.12                          | 0.17                          | 0.70                             | 0.53         |
| S20   | 1.44                             | 0.14                          | 0.23                          | 1.17                             | 0.52         |

Table S3. Significant Pearson's correlations ( $\rho$ ) between landscape variables and mean daily STs (n=20) for all sites.

| Landscape variables | % of significant correlations (n=259) | Range of significant $\rho$ values | Mean of significant $\rho$ values (S.E.) |
|---------------------|---------------------------------------|------------------------------------|------------------------------------------|
| F_50                | 37.5                                  | -0.65 to 0.59                      | -0.41 (0.03)                             |
| F_100               | 27.9                                  | -0.64 to 0.61                      | -0.39 (0.04)                             |
| F_500               | 5.4                                   | -0.58 to 0.61                      | -0.27 (0.10)                             |
| F_1000              | 5.8                                   | -0.68 to 0.61                      | -0.26 (0.10)                             |
| A_50                | 7.7                                   | -0.60 to 0.65                      | -0.16 (0.10)                             |
| A_100               | 10.4                                  | -0.62 to 0.67                      | -0.21 (0.10)                             |
| A_500               | 44.4                                  | -0.74 to 0.70                      | -0.33 (0.04)                             |
| A_1000              | 56.4                                  | -0.77 to 0.69                      | -0.37 (0.04)                             |
| U_50                | 33.5                                  | -0.73 to 0.81                      | 0.35 (0.05)                              |
| U_100               | 41.7                                  | -0.77 to 0.83                      | 0.33 (0.05)                              |
| U_500               | 44.4                                  | -0.77 to 0.85                      | 0.37 (0.04)                              |
| U_1000              | 42.4                                  | -0.76 to 0.82                      | 0.33 (0.05)                              |
| Lake distance       | 73.7                                  | -0.90 to 0.85                      | -0.44 (0.04)                             |
| Stream azimuth      | 13.9                                  | -0.79 to 0.56                      | -0.45 (0.05)                             |

Table S4. Basic morphometric and retention information on the three lakes through which the lowland River Spree flows.

| <b>Lake name</b> | <b>Volume (Mio m<sup>3</sup>)</b> | <b>Retention time (months)</b> | <b>Mean depth (m)</b> | <b>Lake area (km<sup>2</sup>)</b> |
|------------------|-----------------------------------|--------------------------------|-----------------------|-----------------------------------|
| Neuendorfer See  | 7.2                               | 0.36                           | 1.9                   | 3.0                               |
| Glower See       | 3.2                               | <0.36                          | 2.6                   | 1.2                               |
| Müggelsee, Gr.   | 36.5                              | 1.44                           | 4.8                   | 7.7                               |

Table S5. R-squared and p-values obtained from application of generalized linear models (glm) between daily discharge and ST values for all sites.

| <b>Sites</b> | <b>R-squared</b> | <b><i>p-value</i></b> |
|--------------|------------------|-----------------------|
| S1           | 0.03             | 0.04                  |
| S2           | 0.07             | 0.02                  |
| S3           | 0.56             | <0.01                 |
| S4           | 0.56             | <0.01                 |
| S5           | 0.56             | <0.01                 |
| S6           | 0.34             | <0.01                 |
| S7           | 0.38             | <0.01                 |
| S8           | 0.38             | <0.01                 |
| S9           | 0.38             | <0.01                 |
| S10          | 0.42             | <0.01                 |
| S11          | 0.42             | <0.01                 |
| S12          | 0.42             | <0.01                 |
| S13          | 0.42             | <0.01                 |
| S14          | 0.42             | <0.01                 |
| S15          | 0.40             | <0.01                 |
| S16          | 0.41             | <0.01                 |
| S17          | 0.40             | <0.01                 |
| S18          | 0.33             | <0.01                 |
| S19          | 0.34             | <0.01                 |
| S20          | 0.35             | <0.01                 |