



*Supplement of*

**Air temperature changes in Wrocław (southwestern Poland) in 1773–1781 based on recently discovered early-instrumental meteorological measurements**

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Table S1. Terms of measurements based on Local Solar Time (LST) for each month of the year

| Term | Jan   | Feb   | Mar   | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Oct   | Nov   | Dec   |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| MOR  | 8:00  | 7:00  | 6:00  | 5:00  | 4:00  | 4:00  | 4:00  | 4:00  | 5:00  | 6:00  | 7:00  | 8:00  |
| MID1 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 | 13:00 |
| MID2 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 | 14:00 |
| EVE1 | 17:00 | 18:00 | 18:00 | 19:00 | 20:00 | 21:00 | 21:00 | 20:00 | 19:00 | 18:00 | 17:00 | 16:00 |
| EVE2 | 18:00 | 19:00 | 19:00 | 20:00 | 21:00 | 22:00 | 22:00 | 21:00 | 20:00 | 19:00 | 18:00 | 17:00 |

Table S2. Mean monthly and annual differences in air temperature (°C) between MDATs calculated according to formulas MDAT2–MDAT15 in comparison to the average calculated using the MDAT1 formula

| Period                               | Jan        | Feb         | Mar         | Apr         | May         | Jun         | Jul         | Aug         | Sep         | Oct         | Nov         | Dec        | Year         |
|--------------------------------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|--------------|
| MDAT2-MDAT1                          | 0.3        | 0.2         | 0.3         | 0.9         | 1.3         | 1.4         | 1.4         | 1.2         | 0.6         | 0.2         | 0.2         | 0.3        | 0.69         |
| MDAT3-MDAT1                          | 0.2        | 0.4         | 0.6         | 1.2         | 1.5         | 1.6         | 1.5         | 1.3         | 1.0         | 0.7         | 0.4         | 0.3        | 0.89         |
| MDAT4-MDAT1                          | 0.2        | 0.6         | 0.9         | 1.5         | 1.5         | 1.5         | 1.5         | 1.6         | 1.3         | 1.0         | 0.6         | 0.3        | 1.04         |
| MDAT5-MDAT1                          | 0.1        | 0.4         | 0.5         | 1.0         | 1.0         | 1.0         | 1.0         | 0.9         | 0.7         | 0.6         | 0.3         | 0.1        | 0.63         |
| MDAT6-MDAT1                          | 0.0        | 0.1         | 0.3         | 0.4         | 0.4         | 0.3         | 0.4         | 0.4         | 0.3         | 0.2         | 0.1         | 0.0        | 0.24         |
| <b>MDAT7-MDAT1</b>                   | <b>0.1</b> | <b>-0.1</b> | <b>-0.2</b> | <b>0.0</b>  | <b>0.2</b>  | <b>0.2</b>  | <b>0.2</b>  | <b>0.0</b>  | <b>-0.2</b> | <b>-0.2</b> | <b>0.0</b>  | <b>0.1</b> | <b>0.01</b>  |
| <b>MDAT8-MDAT1</b>                   | <b>0.0</b> | <b>-0.3</b> | <b>-0.4</b> | <b>-0.4</b> | <b>-0.3</b> | <b>-0.4</b> | <b>-0.4</b> | <b>-0.5</b> | <b>-0.5</b> | <b>-0.5</b> | <b>-0.2</b> | <b>0.0</b> | <b>-0.33</b> |
| <b>MDAT9-MDAT1</b>                   | <b>0.0</b> | <b>-0.1</b> | <b>-0.1</b> | <b>0.0</b>  | <b>0.1</b>  | <b>0.0</b>  | <b>0.0</b>  | <b>0.0</b>  | <b>0.0</b>  | <b>-0.1</b> | <b>-0.1</b> | <b>0.0</b> | <b>-0.03</b> |
| <b>MDAT10-MDAT1</b>                  | <b>0.0</b> | <b>-0.1</b> | <b>-0.1</b> | <b>0.1</b>  | <b>0.1</b>  | <b>0.0</b>  | <b>0.0</b>  | <b>0.0</b>  | <b>-0.1</b> | <b>-0.1</b> | <b>-0.1</b> | <b>0.0</b> | <b>-0.03</b> |
| MDAT11-MDAT1                         | 0.2        | 0.4         | 0.8         | 1.6         | 2.0         | 2.1         | 2.2         | 1.9         | 1.1         | 0.6         | 0.3         | 0.2        | 1.12         |
| MDAT12-MDAT1                         | 0.5        | 0.4         | 0.6         | 0.2         | -0.4        | -0.9        | -1.0        | -0.6        | 0.0         | 0.4         | 0.5         | 0.6        | 0.03         |
| MDAT13-MDAT1                         | 0.5        | 0.4         | 0.6         | 0.2         | -0.4        | -0.9        | -1.0        | -0.5        | 0.0         | 0.4         | 0.5         | 0.5        | 0.03         |
| MDAT14-MDAT1                         | 0.4        | 0.2         | 0.2         | -0.3        | -0.9        | -1.3        | -1.4        | -1.0        | -0.4        | 0.1         | 0.4         | 0.4        | -0.30        |
| MDAT15-MDAT1                         | 0.3        | 0.2         | 0.2         | -0.2        | -0.8        | -1.3        | -1.4        | -1.0        | -0.4        | 0.1         | 0.3         | 0.3        | -0.31        |
| Max bias from all formulas           | 0.5        | 0.6         | 0.9         | 1.6         | 2.0         | 2.1         | 2.2         | 1.9         | 1.3         | 1.0         | 0.6         | 0.6        | 1.28         |
| Mean - all formulas                  | 0.2        | 0.2         | 0.3         | 0.4         | 0.4         | 0.2         | 0.2         | 0.3         | 0.2         | 0.2         | 0.2         | 0.2        | 0.25         |
| <b>Mean bias from formulas 7-10</b>  | <b>0.0</b> | <b>-0.2</b> | <b>-0.2</b> | <b>-0.1</b> | <b>0.0</b>  | <b>-0.1</b> | <b>0.0</b>  | <b>-0.1</b> | <b>-0.2</b> | <b>-0.2</b> | <b>-0.1</b> | <b>0.0</b> | <b>-0.09</b> |
| <b>Max bias from formulas 7-10</b>   | <b>0.1</b> | <b>-0.3</b> | <b>-0.4</b> | <b>-0.4</b> | <b>-0.3</b> | <b>-0.4</b> | <b>-0.4</b> | <b>-0.5</b> | <b>-0.5</b> | <b>-0.5</b> | <b>-0.2</b> | <b>0.1</b> | <b>-0.31</b> |
| <i>Mean bias from formulas 12-15</i> | <i>0.4</i> | <i>0.3</i>  | <i>0.4</i>  | <i>0.0</i>  | <i>-0.6</i> | <i>-1.1</i> | <i>-1.2</i> | <i>-0.8</i> | <i>-0.2</i> | <i>0.2</i>  | <i>0.4</i>  | <i>0.4</i> | <i>-0.20</i> |
| <i>Max bias from formulas 12-15</i>  | <i>0.5</i> | <i>0.4</i>  | <i>0.6</i>  | <i>-0.3</i> | <i>-0.9</i> | <i>-1.3</i> | <i>-1.4</i> | <i>-1.0</i> | <i>-0.4</i> | <i>0.4</i>  | <i>0.5</i>  | <i>0.6</i> | <i>-0.25</i> |

Explanation: MDAT1 =  $(T_1+T_2+T_3, \dots, T_{24})/24$ ; MDAT2 =  $(T_6+T_{12}+T_{18})/3$ ; MDAT3 =  $(T_7+T_{13}+T_{19})/3$ ; MDAT4 =  $(T_8+T_{14}+T_{20})/3$ ; MDAT5 =  $(T_8+T_{14}+2*T_{20})/4$ ; MDAT6 =  $(T_8+T_{14}+2*T_{21})/4$ ; MDAT7 =  $(T_6+T_{12}+2*T_{20})/4$ ; MDAT8 =  $(T_6+T_{12}+2*T_{21})/4$ ; MDAT9 =  $(T_7+T_{12}+2*T_{21})/4$ ; MDAT10 =  $(T_7+T_{13}+2*T_{21})/4$ ; MDAT11 =  $(T_7+T_{13}+2*T_{18})/4$ ; MDAT12 =  $(MOR+MID1+EVE1*2)/4$ ; MDAT13 =  $(MOR+MID2+EVE1*2)/4$ ; MDAT14 =  $(MOR+MID1+EVE2*2)/4$ ; MDAT15 =  $(MOR+MID2+EVE2*2)/4$ .

Table S3. Mean monthly, seasonal and annual air temperature (°C) in Wrocław for three measurement times (morning, midday and evening), daily mean (mean) and highest (tmax) and lowest (tmin) monthly mean, 1773–81

| Period          | J     | F    | M   | A    | M    | J    | J    | A    | S    | O    | N    | D    | DJF  | MAM  | JJA  | SON  | YEAR |
|-----------------|-------|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| morning         | -3.4  | -0.5 | 3.1 | 7.1  | 12.0 | 15.8 | 17.1 | 16.8 | 12.5 | 8.0  | 3.3  | 0.7  | -1.1 | 7.4  | 16.5 | 7.9  | 7.7  |
| midday          | -1.0  | 2.9  | 7.6 | 12.8 | 18.1 | 21.9 | 23.4 | 23.1 | 17.9 | 12.4 | 5.9  | 2.5  | 1.5  | 12.8 | 22.8 | 12.1 | 12.3 |
| evening         | -2.8  | 0.5  | 4.0 | 8.5  | 13.5 | 17.2 | 18.4 | 18.4 | 13.8 | 8.9  | 4.0  | 0.9  | -0.5 | 8.7  | 18.0 | 8.9  | 8.8  |
| tmax            | 2.2   | 7.6  | 9.9 | 15.9 | 21.4 | 24.8 | 24.8 | 26.4 | 20.8 | 15.4 | 7.3  | 5.6  | 3.9  | 15.0 | 25.0 | 13.9 | 13.5 |
| mean            | -2.5  | 0.9  | 4.7 | 9.2  | 14.3 | 18.0 | 19.3 | 19.2 | 14.5 | 9.6  | 4.3  | 1.3  | -0.2 | 9.4  | 18.8 | 9.5  | 9.4  |
| <i>mean LST</i> | -2.9  | 0.6  | 4.3 | 9.2  | 14.9 | 19.1 | 20.5 | 20.0 | 14.7 | 9.4  | 3.9  | 0.9  | -0.6 | 9.5  | 19.8 | 9.3  | 9.5  |
| tmin            | -10.4 | -4.2 | 0.8 | 4.6  | 9.5  | 14.2 | 15.9 | 15.2 | 10.4 | 5.5  | -2.5 | -2.9 | -3.5 | 6.2  | 15.4 | 5.2  | 6.8  |

Explanation: tmax – highest monthly, seasonal and annual value extracted from three measurement times

Tmin – lowest monthly, seasonal and annual value extracted from three measurement times