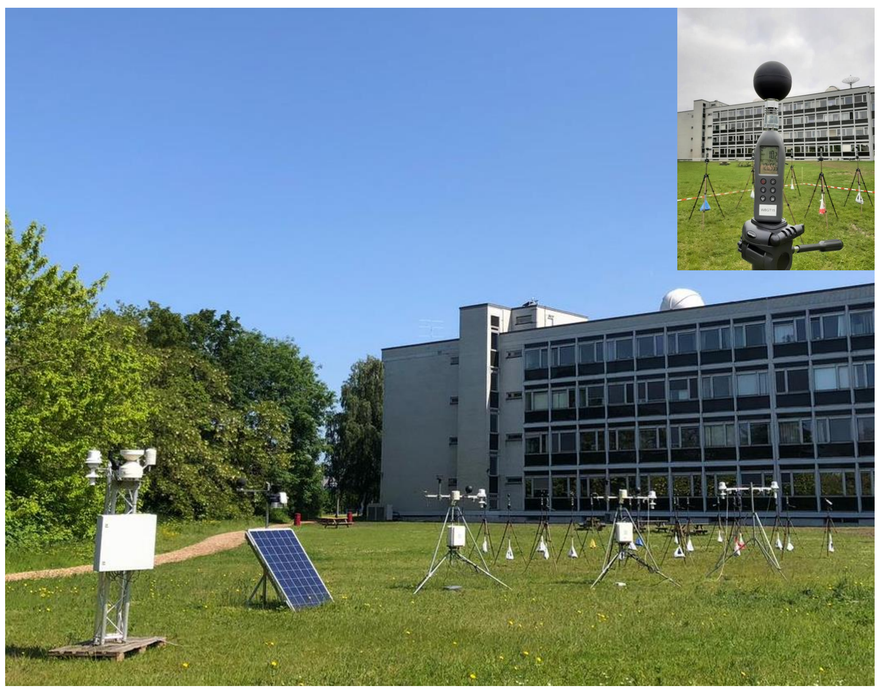
DENSE NETWORK OF WET BULB GLOBE TEMPERATURE OBSERVATIONS TO ASSESS THE EFFECT OF DIVERSE MICRO-ENVIRONMENTS ON HEAT STRESS

Ian Hellebosch, Sara Top, Steven Caluwaerts, Koen De Ridder, Raf Theunissen, Clemens Mensink

Climate change causes more extreme heat, which leads to people suffering more often from heat stress. It is therefore important to assess which measures effectively decrease heat stress and how to adapt urban environments accordingly. To address this question, an observational campaign took place in the urban fringe of Ghent during the summer of 2023, which included a 10-day heat wave (8 June – 17 June).



Observational campaign

- VLINDER station
- MOCCA station
- Campbell stations
- HOBO air temperature sensors
- Portable data loggers (AT-HTS01)

→

- Air temperature
- Wind speed
- Humidity
- Radiation

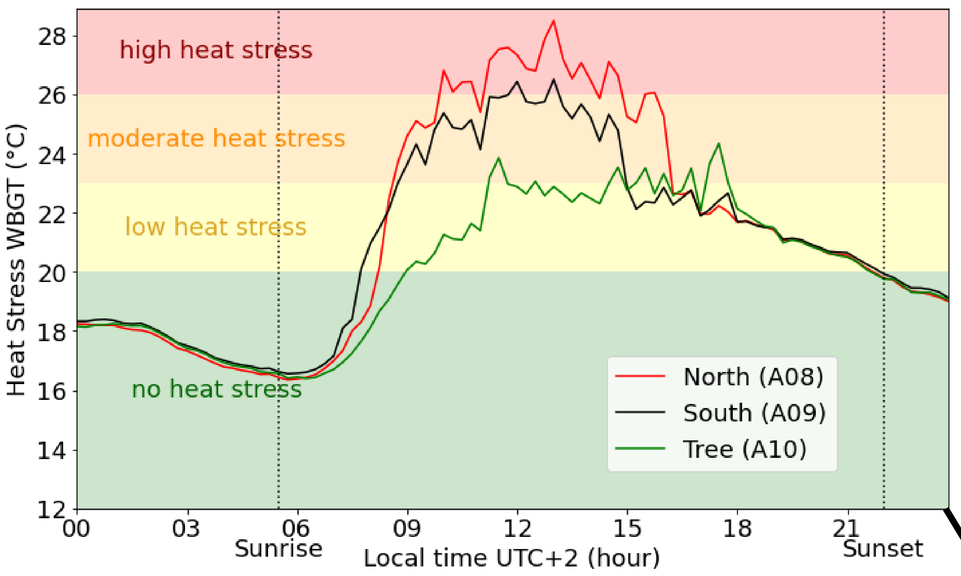
→ Wet Bulb Globe Temperature (WBGT) = heat stress indicator

Calibration measurement (photos): 27 May – 1 June

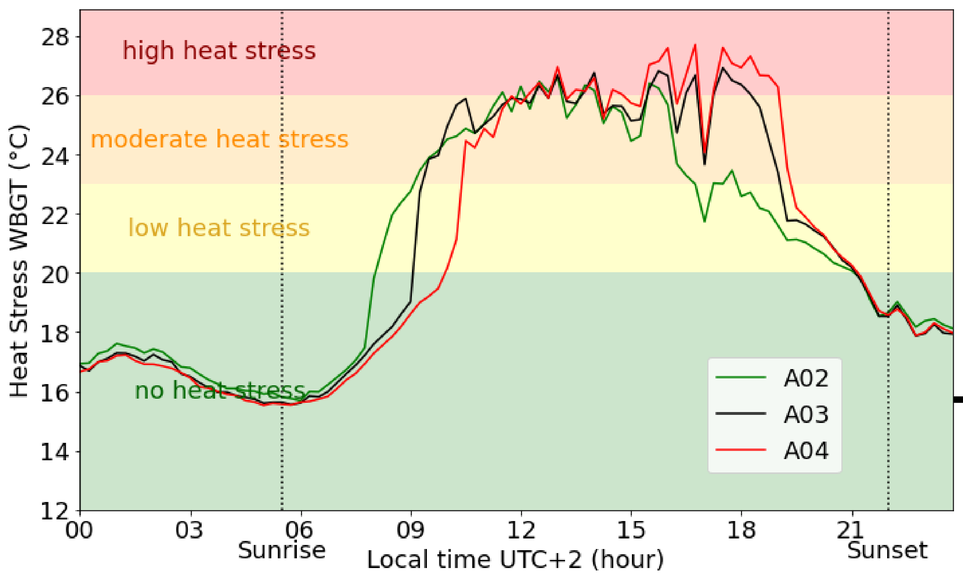
Location specific measurement (map): 9 June – 15 June, special attention for 10 June (graphs)

Infrared images with drone → surface temperature: 14 June

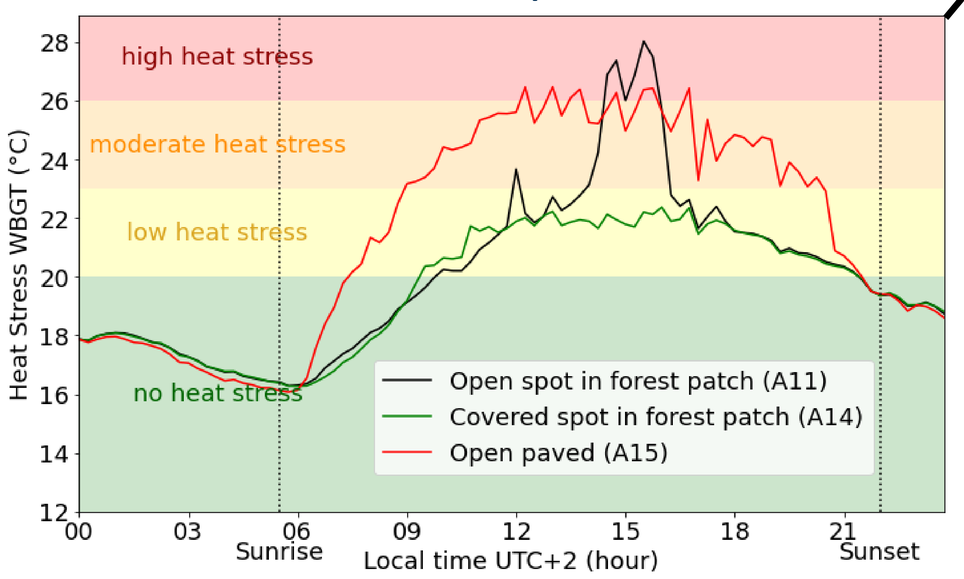
A. Street canyon

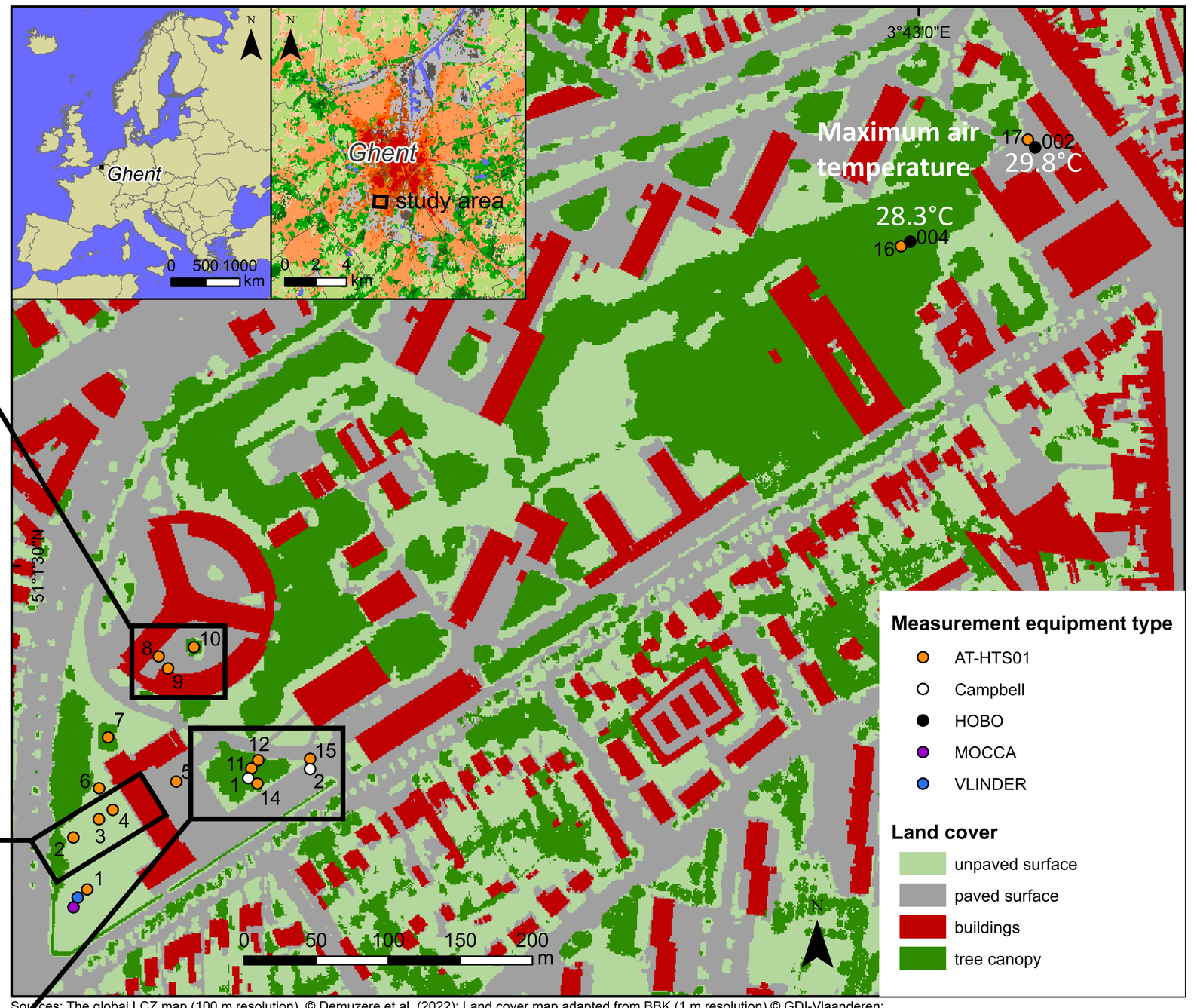


B. Building shade



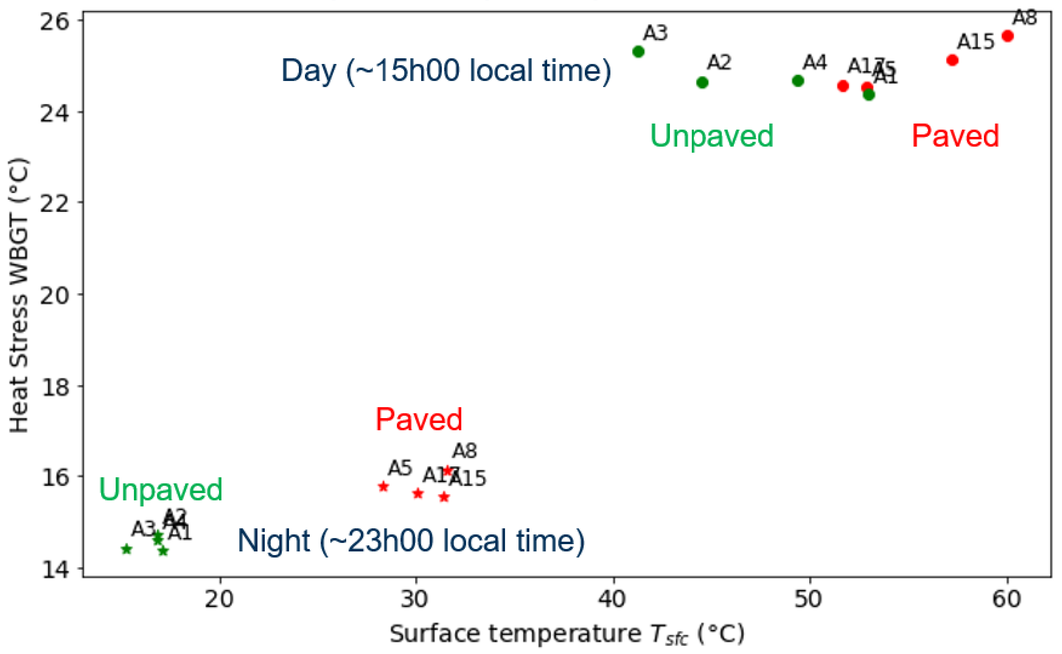
C. Forest patch





Sources: The global LCZ map (100 m resolution), © Demuzere et al. (2022); Land cover map adapted from BBK (1 m resolution) © GDI-Vlaanderen; Administrative boundaries Flanders 2022 © GDI-Vlaanderen; Global administrative boundaries © EuroGeographics;

D. Impact of unpaved/paved on heat stress



Conclusion

The urban forest lowered maximum air temperatures by up to 1.5°C. However, during the day, radiation emerges as the predominant factor explaining heat stress differences – by up to 5°C WBGT – through **shading from buildings or vegetation** (B, C). In east-west oriented street canyons, the north side is more prone to heat stress due to increased direct and indirect (via reflective walls) solar radiation (A). **Strategically placing trees** in the street canyon can optimize their cooling efficiency. Regarding nighttime cooling, **depaving** is recommended to decrease the local urban heat island effect and reduce heat stress (D).

Contact

Ian.Hellebosch@UGent.be