

Characterized by large spatial heterogeneity in surface characteristics, urban areas exhibit large differences in microclimate conditions. Consequently, meteorological variability at this scale has become an important issue surrounding human health and thermal comfort within cities.

However, the monitoring of microscale urban climate is not regularly undertaken by meteorological agencies. In most instances, primary meteorological observations are made under reproducible standard conditions (typically at an airport); but these open field observations tend to be unrepresentative of the intra-urban meteorological conditions. Furthermore, to fully characterize spatio-temporal variability at intra-urban scales, a network of weather stations is required, however, in many cities, implementing a network of stations that represent screen level conditions is not viable, as finding representative and secure station sites, and adequate funding can be hard to achieve.

To overcome this, this work used an alternative and complementary approach of conducting mobile measurements using vehicle-mounted sensors to characterize the microclimatic conditions of select urban neighbourhoods within Toronto. This methodology is specifically advantageous for spatial sampling within the urban canopy layer and allowed us to sample a variety of neighbourhoods under hot summertime conditions. These conditions favoured high human discomfort, contrasts in surface temperatures, and high air temperatures.

Sampling occurred along two pre-determined routes which predominately took place along Yonge St – a major north-south street within the city that traverses a large range of neighbourhoods. Each route incorporated sampling neighbourhoods with contrasting surface characteristics, classified through the use of the Local Climate Zone scheme [1]. In addition, a rural reference and two areas identified by Toronto Public Health (TPH) as being ‘high-risk’ – the Thorncliffe Park and Moss Park neighbourhoods, were also sampled.

Our analysis will answer the following research questions based on measured air temperature, surface temperature, and humidity and a calculated human thermal comfort index, the Wet-Bulb Globe Temperature: 1) Are existing fixed weather stations located within the city adequate at characterizing microclimate conditions? 2) What differences exist between inter-urban neighbourhoods? 3) Do the TPH areas show different microclimate conditions compared to other select urban neighbourhoods? and 4) What is the urban to rural contrast under hot, calm, clear nights?

*References:* [1] I. D. Stewart and T. R. Oke. (2012). “Local climate zones for urban temperature studies,” *Bull. Am. Meteorol. Soc.*, vol. 93, no. 12, pp. 1879–1900.