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The influence of vegetation configuration on outdoor thermal comfort within tropical urban parks

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In major cities, the establishment and management of green spaces are critical for a variety of reasons pertaining to sustainable and resilient cities; green spaces are important natural capital enabling essential ecosystem services within urban areas (such as providing food for freshwater systems, supporting flora and fauna habitats, enabling recreational spaces for residents, and beneficially regulating local climates). In tropical Singapore, parks are popular attractions for both residents and tourists. They are also areas with distinct microclimates significantly cooler than their urban surroundings. The regulation of climate by green spaces – through a combination of evapotranspiration and shading – has often been proposed as an universal approach towards heat island mitigation and improving outdoor thermal comfort (OTC), but inquiry into the significance of green space configuration (i.e. the spatial arrangement and structural characteristics of vegetation within a garden) in OTC improvement remains scant.

In this study, we present initial results from an ongoing field campaign which examines the influence of vegetation configuration (through differences in horizontal green density and vertical canopy characteristics) on measured and perceived OTC data. The campaign is held within two major urban parks in Singapore, namely the Singapore Botanic Gardens (74 ha) and Bishan-Ang Mo Kio Park (62 ha), which are major attractions for both residents and non-residents. We examine how site-specific climate data, obtained through microscale climate measurements , relate to park users' climate sensation and preference votes across six sites of different vegetation configurations. Seasonal differences in the measured and perceived OTC data between Singapore's summer and winter monsoons will also be analysed in conjunction with differences in vegetation configuration. Lastly, we consider and discuss how results and insights from this study can be applied towards effective management of tropical parks and other large urban green spaces sited in the low-latitudes.