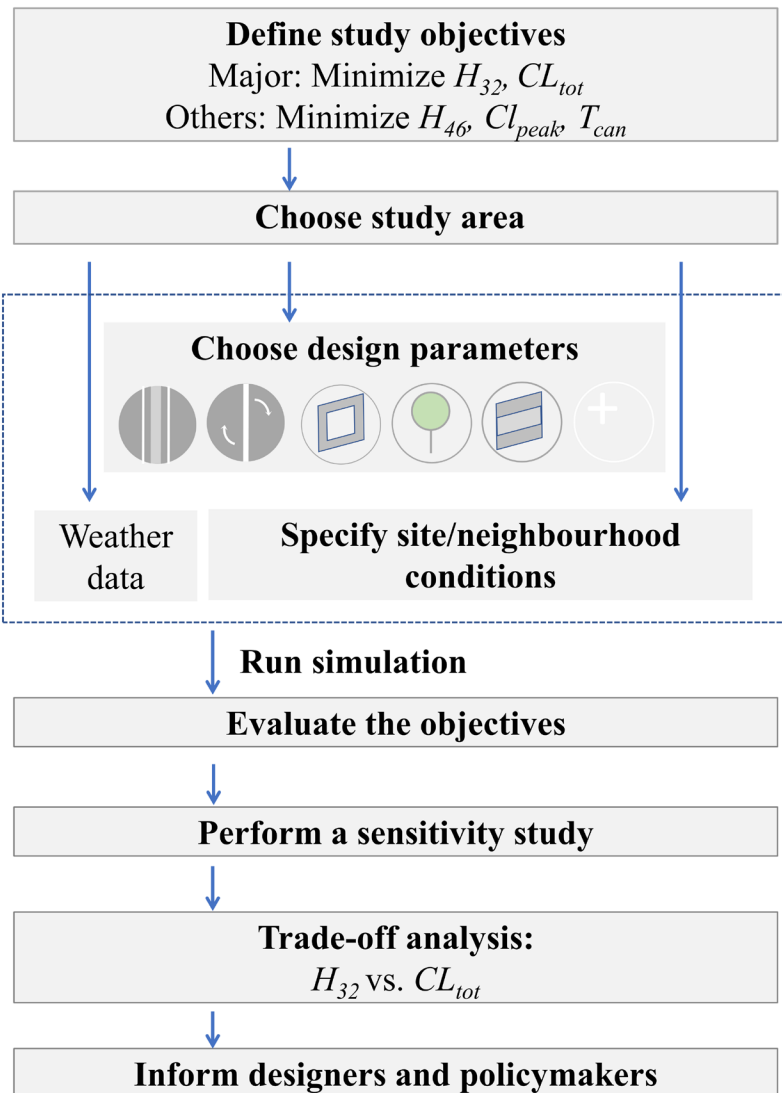


Design guidelines for urban streets to improve thermal comfort and energy efficiency



This study developed a framework of parametric simulation for the design guidance of urban streets to improve outdoor thermal comfort and building energy efficiency. Case studies are conducted at the neighborhood scale for four coastal cities and one inland city. The influence of street and building design parameters has been investigated. Results reveal the conflict between optimizing outdoor thermal comfort and building energy efficiency. Window-to-wall ratio, window type, and street orientation are the most influential parameters. Adjusting these parameters can significantly improve outdoor thermal comfort at the cost of increasing the building cooling load.

Figure 1. Framework of parametric simulations for design guidance on improving summer thermal comfort and building energy efficiency

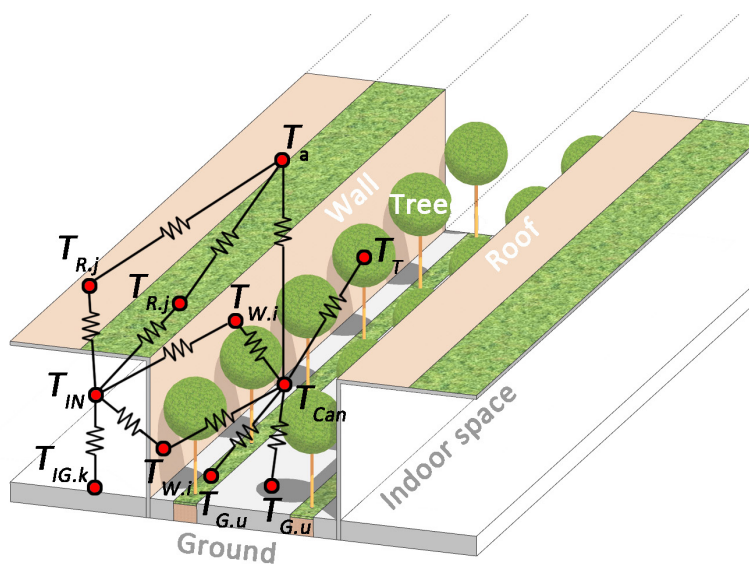


Figure 2. Urban Canopy Model with resistance networks of energy transport

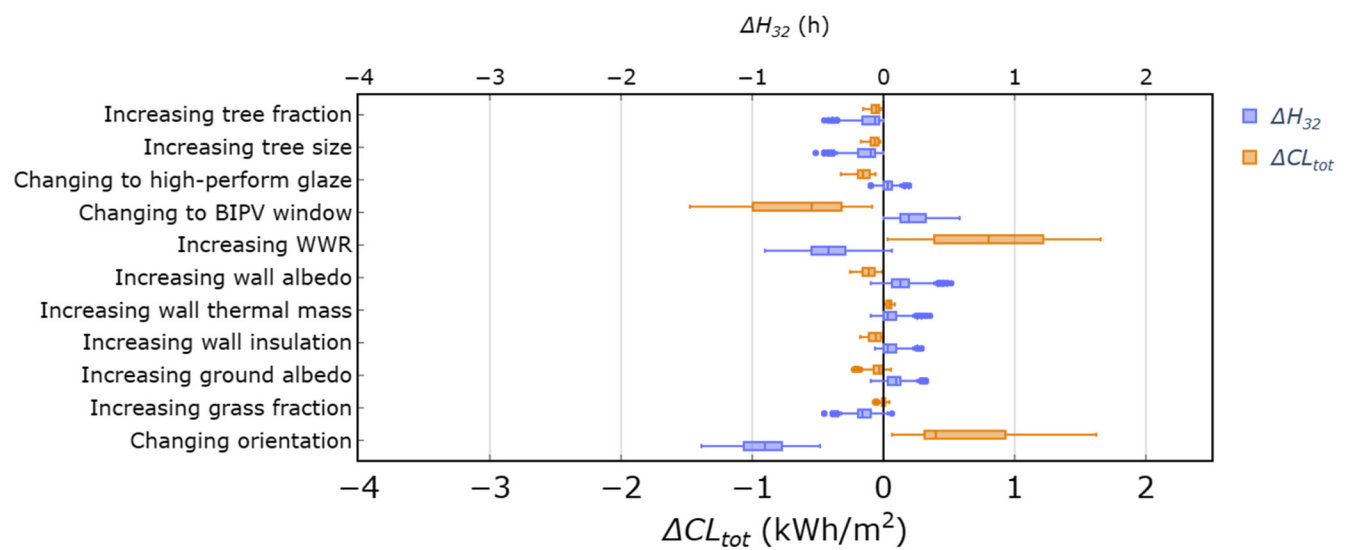


Figure 3. Impact of changing design parameters

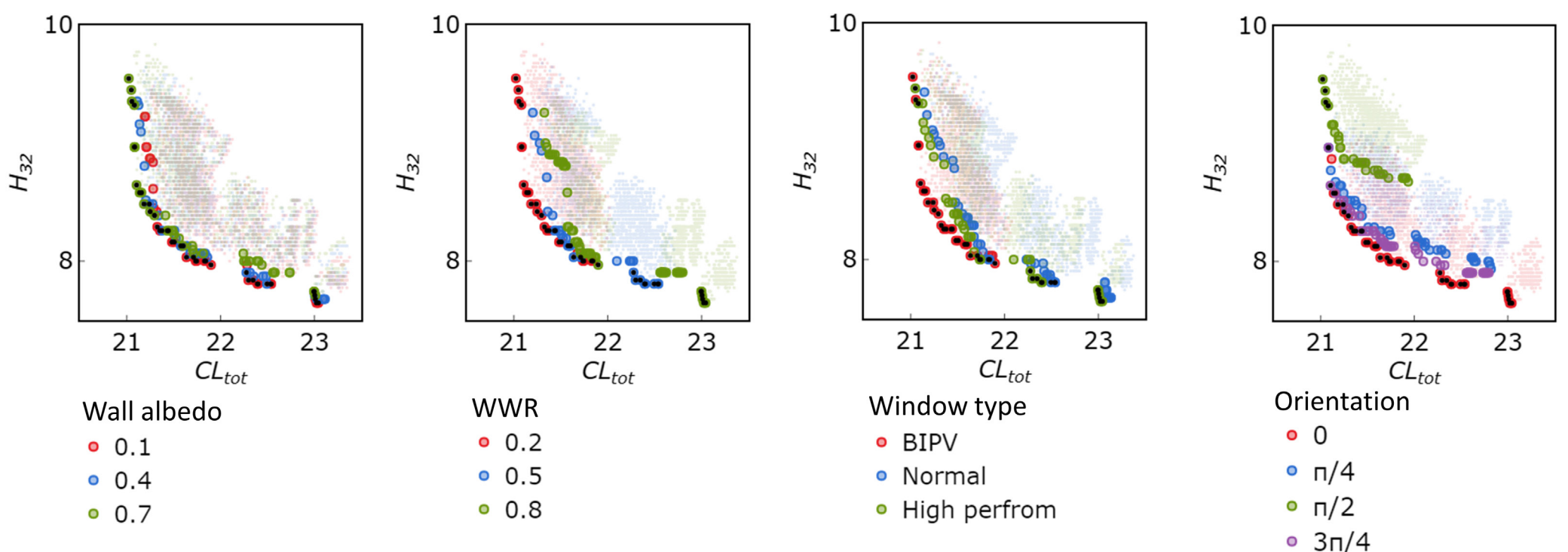


Figure 4. Pareto optimal solution sets (circle) under different availability of (a) wall albedo, (b) WWR, (c) window type, and (d) orientation. The overall Pareto optimal solution sets were indicated by the circle with black fill. The non-optimal solutions are shown as transparent dots with the same color.