Assessment of the impact of climate change on thermal comfort in buildings, taking account of occupant behaviour and the urban context

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ABSTRACT

With climate change, extreme events such as heatwaves are expected to become more intense and frequent. Overheating will increasingly occur indoors, resulting in severe thermal discomfort in summer or increased cooling demands to mitigate this issue. However, this thermal discomfort can be reduced without relying on energy-intensive air-conditioning systems, by implementing adaptation measures to climate change. For example, using adjustable external solar protection and enhancing ventilation by opening windows are effective solutions where occupant behaviour plays a crucial role. However, the effectiveness of these solutions can be compromised by the urban context, which may both restrict occupants' ability to adapt and intensify urban heat island effects.
Through an approach based on in-situ monitoring and modelling, this paper presents a methodology for assessing the impact of climate change on summer thermal comfort in residential buildings, taking into account the occupants and the urban context. The first part focuses on the generation of meteorological files of the future climate on a local scale and incorporating heatwaves. Secondly, thermal comfort indicators are compared with the actual sensations of occupants using data collected in occupied dwellings in Lyon. Occupant behaviour is then modelled using a machine learning approach. Finally, building performance simulations are used to assess the effectiveness of passive strategies for improving summer comfort under different agent profiles.

KEYWORDS

Thermal comfort, Occupant Behaviour, In situ measurement, Agent-Based modelling, Heatwave

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