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Modelling anthropogenic heat emissions from residential buildings: Comparison between Berlin and London

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Heat emissions from buildings in many cities play an important role for the urban surface energy balance (USEB) and the urban micro-climate. Heat generated indoors from human activities (e.g., use of electrical appliances, space heating, metabolic rate) is conducted through the building fabric and affects the USEB through long-wave radiation and turbulent sensible heat flux. The radiative and thermal properties of materials used in the building's structural components (e.g., external walls, roof, windows) determine the storage of heat in the building volume and therefore the rate and timing of heat exchange between indoor and outdoor environments. This also affects the overall indoor thermal comfort.

We use a building energy model (STEBBS – Simplified Thermal Energy Balance for Buildings Scheme) to simulate and compare the anthropogenic heat flux from residential buildings in the city centres of London, UK, and Berlin, Germany, in different seasons. Occupancy schedules and timings of indoor heat gains for STEBBS can be determined from the agent-based model DAVE (Dynamic Anthropogenic actiVities and feedback to Emissions; McGrory et al. – this meeting). Both cities feature a diverse set of building types (determined by common morphological attributes) and a range of typical construction types that are derived from information on building age bands, building regulations and building typologies (EPISCOPE, TABULA). This poster discusses the generation of characteristic and comparable building archetypes for the two cities, considering and discussing differences in morphology markers (e.g., building height, volume, exposed walls), building age, construction materials (e.g., presence or not of wall insulation, roof types) and the typical state of refurbishment / retrofitting of the residential building stock. Seasonal diurnal variations of the building energy balance in terms of energy consumption, turbulent sensible heat flux and net storage heat flux are compared for common building archetypes in the two cities to assess the main controls on the anthropogenic heat emissions into the urban canopy layer.
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