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Integrating Quality Control and Data Gathering in Space-Time Analysis for Temperature Assessment in European Cities

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Urban areas across Europe are facing unprecedented challenges from climate change, further intensified by the emergence of urban heat islands (UHIs). The resulting elevated temperatures within cities have profound implications for public health, energy consumption, and overall urban liveability. Climate adaptation and evidence-based urban planning that are needed to address these pressing issues require a better understanding of urban temperature dynamics. To address this pressing issue, our research aims to bridge a critical gap in our understanding of urban temperature dynamics through a comprehensive space-time analysis focused on 9 European cities. The primary emphasis at this stage is placed on the foundational step: collection, enhancement, and intercomparison of local temperature information. This initiative, which is part of the European COST-Action FAIRNESS (https://www.fairness-ca20108.eu/), is driven by the imperative need for accurate and localized data to inform evidence-based urban planning and climate adaptation strategies, highlighting the urgency and significance of our research.

We collected measurements from nine European cities, namely, Amsterdam, Basel, Bern, Biel, Turku, Rennes, Novi Sad, Birmingham, and Zurich The initial phase of the work involved the collection of raw data from different networks, encompassing varying time periods. The datasets exhibited considerable diversity in formats and temporal resolutions, necessitating meticulous handling. In parallel, metadata relevant to each dataset was collected. The primary step was to standardize all data into a common file format, with the Station Exchange Format (SEF) being the chosen standard. During this formatting process, a version with harmonized time resolution was generated, ensuring coherence across the datasets. Subsequently, a series of automatic quality control procedures were developed to systematically enhance the reliability and precision of the datasets. These procedures were designed to be universally applicable to all stations, promoting consistency in the assessment of temperature data. Additionally, for certain networks, a radiation correction was implemented to further refine the accuracy of the collected information.

Looking ahead, the datasets will be published, offering accessibility to urban planners and other stakeholders. The outcomes of this preliminary phase not only contribute to advancing space-time

analysis in temperature assessment but also establish a robust foundation for subsequent research stages. The significance of this work resonates with urban planners, environmental scientists, and policymakers actively involved in crafting localized strategies for climate-resilient urban planning in European cities.