

Spatio-Temporal Data Management and Enhanced Processing for Urban Heat Island Analysis supported by Digital Elevation Models

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SUMMARY

Reducing heat stress in cities is an emerging goal for both developing and developed regions of the world. Geodesy and earth observation can contribute to find solutions, e.g. by local climate analysis and long-term strategies for city planning. However, to transfer the results to arbitrary cities in a resource-efficient way, first spatio-temporal data management for cities has to be provided as well as enhanced preprocessing of climate data. Furthermore, all available data sources have to be integrated to improve data analysis. In this paper, we propose a workflow which combines data preprocessing, spatio-temporal data management, and analysis with the Urban Multi-scale Environmental Predictor (UMEP) for urban heat island analysis. Digital Elevation Models (DEMs) and OpenStreetMap (OSM) are used as additional data sources to detect errors in building segmentation and thus to improve the segmentation process. In addition, in a first step in projecting changes in heat exposure based on urban planning decisions, a change detection analysis for buildings and vegetation is provided with the help of spatio-temporal DEMs. First results of the workflow are presented based on a case study with data from the city of Karlsruhe, Germany.

Finally, conclusions are drawn from the presented approach, and an outlook is given on future research combining big data management and (manifold) machine learning for urban climate analysis and other environmental applications.

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