Satellite data helps cut city heat

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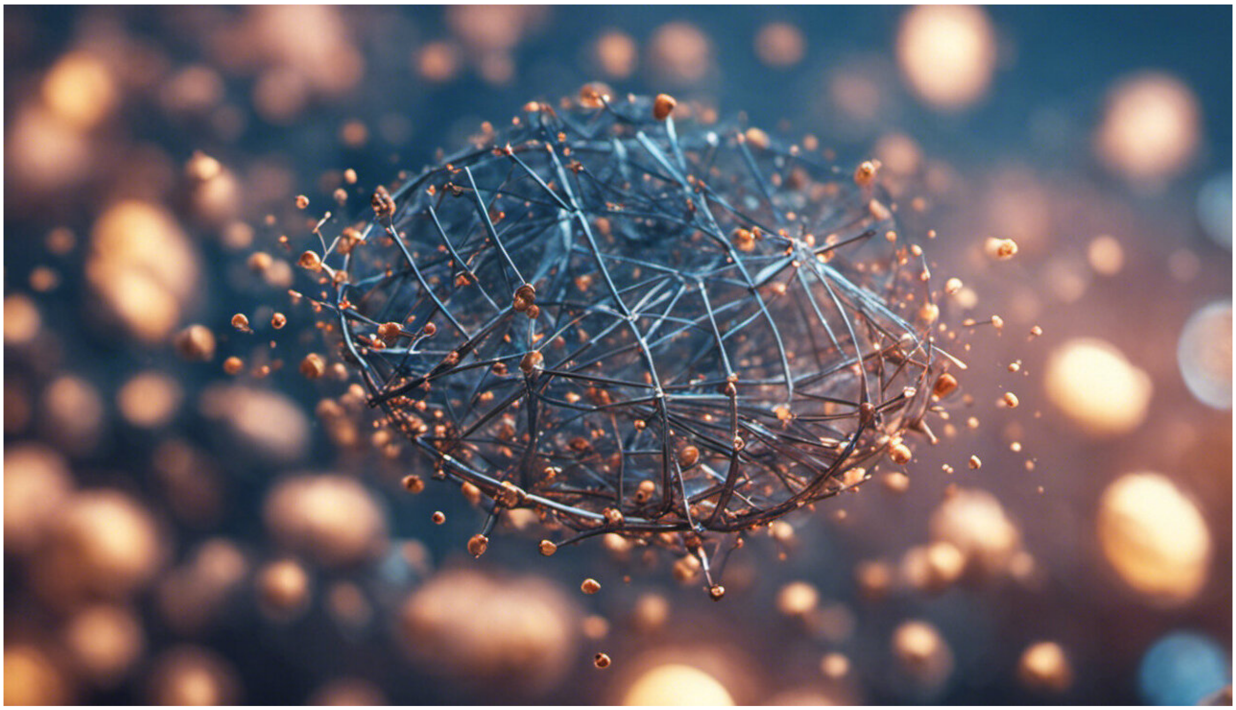

Credit: AI-generated image (disclaimer)

Our cities are becoming hotter due to heat released by human activities. This is exacerbated by heat waves occurring more often due to climate change, altering the energy balance of urban areas and thus affecting the local environment and health of residents.

Cities are much warmer than their surroundings as urban structures absorb and trap more solar and thermal radiation than soils or vegetation.

Moreover, air conditioning systems, traffic emissions and industry add heat to the urban climate, helping create the urban heat island (UHI) effect.

Heat resulting from human activities is known as the anthropogenic heat flux (QF). The EU-funded project URBANFLUXES addressed the challenge of combating heat in cities' by using Earth observation (EO) to identify urban energy budget (UEB) spatial patterns. Both the urban planning and Earth system science communities require spatially disaggregated UEB data, at the local (i.e. neighbourhood / areas larger than the order of 100 m x 100 m) and city scales. However, such information is practically impossible to derive by point in-situ fluxes measurements.

Satellites help identify hot spots

Project partners investigated the suitability of EO for determining UEB, supported by simple meteorological measurements on the ground. Researchers studied the urban climate in three European cities (London, Basel and Heraklion) and calculated the separate contributions of urban structures, air conditioning, green spaces and mobility to urban heat. "The aim was to develop an EO-based methodology, which is easily transferable to any urban area and capable of providing QF benchmark data for different applications," says project coordinator Dr. Nektarios Chrysoulakis.

The main question facing scientists was whether EO can provide reliable estimates of QF during satellite acquisition through retrieval of UEB spatial patterns. The consortium successfully developed a method capable of deriving UEB from current and future EO systems based on data from the Copernicus programme's Sentinels missions.

Thanks to the work conducted by the research team, scientists were able for the first time to use satellite data to determine the energy balance and its time distribution. "We can now estimate accurately at the local scale highly concentrated areas of heat and high levels of anthropogenic heat," says Dr. Chrysoulakis.

Planning for cooler cities

URBANFLUXES will increase the value of EO data for scientific analyses by exploiting the improved data quality, coverage and revisit times of the Copernicus Sentinels. The project will also support strategies relevant to climate change mitigation and adaptation in cities.

Emerging applications like urban planning and local/regional level climate change mitigation and adaptation will benefit from the increased knowledge of the impacts of UEB patterns on the UHI effect, and hence on urban climate. According to Dr. Chrysoulakis: "Planning tools such as urban climatic maps will be enriched with information on UEB patterns. Mapping provides visualisation of assessments of these phenomena to help planners, developers and policy makers make better decisions on the mitigation of and adaptation to urban heat." This will lead to the development of sustainable planning tools and strategies to mitigate these effects, improving thermal comfort and energy efficiency in cities through reduced QF hot spots.

Provided by CORDIS

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