Anthropogenic Heat Flux Estimation from Space: The URBANFLUXES Project


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Abstract

The recently launched Horizon 2020 project URBANFLUXES investigates the potential of EO to retrieve urban energy budget components, focusing on the anthropogenic heat flux. The main challenge of this project is the innovative exploitation of the Copernicus Sentinels synergistic observations to estimate local scale spatiotemporal patterns of the anthropogenic heat emission in cities. These EO-based spatially disaggregated estimations contain valuable information for both the urban planning and the Earth System Science community.

The URBANFLUXES approach

Anthropogenic Heat Flux \((Q_F)\)

\[ Q^* + Q_F = Q_H + Q_E + \Delta Q_S + \Delta Q_A + S \]

where \(\Delta Q_A = Q_{in} - Q_{out}\) and \(S\) represents all other sources and sinks

Preliminary Results

Urban Surface Energy Budget

Sensible Heat Flux \((Q_H)\) – Latent Heat Flux \((Q_E)\)

Adjusted Aerodynamic Resistance Method for EO data


Net all-wave Radiation Flux \((Q^*)\)

Discrete Anisotropic Radiative Transfer (DART) approach


Heat Storage Flux \((\Delta Q_S)\)

Element Surface Temperature Method


The Vision

URBANFLUXES develops an automated EO-based method for estimating urban energy budget components, enabling its integration into operational services. Therefore, it prepares the ground for innovative exploitation of space data in scientific activities (i.e. Earth system modelling) and future and emerging applications (i.e. sustainable urban planning). Its products is expected to support both sustainable planning strategies to improve the quality of life in cities, as well as Earth System scientists to provide more robust climate simulations.

The Consortium

[List of participating institutions]