A novel approach for anthropogenic heat flux estimation from space

N. Chrysoulakis [a, *], T. Esch [b], J.P. Gastellu-Etchegorry [c], C.S.B. Grimmond [d], E. Parlow [e], F. Lindberg [f], F. Del Frate [g], J. Klostermann [h], Z. Mitraka [a]

[a] Foundation for Research and Technology Hellas (FORTH), Institute of Applied and Computational Mathematics, N.Plastira 100, 70013, Heraklion, Greece – zedd2@iacm.forth.gr
[b] German Aerospace Center (DLR), German Remote Sensing Data Center: Land Surface, Oberpfaffenhofen, Munchener Strasse 20, 82234 Wessling, Germany – thomas.esch@dlr.de
[c] Centre d'Etude Spatiale de la Biosphère (CESBIO), Route De Narbonne 118, Toulouse Cedex 9, 31062, France – jean-philippe.gastellu-etchegorry@cesbio.cnes.fr
[d] University of Reading, Departmenet of Meteorology, Ealey Gate RG66BB Reading, UK – c.s.grimmond@reading.ac.uk
[e] University of Basel, Research Group Meteorology, Climatology and Remote Sensing, Klingelbergstrasse 27, CH-4056 Basel, Switzerland – eberhard.parlow@unibas.ch
[f] University of Goeteborgs, Department of Earth Sciences, Guldhedsgatan 5a, 40530 Gothenburg, Sweden – fredrikl@gvc.gu.se
[g] Geo-K s.r.l., Via del Politecnico 1, 00133 Rome, Italy – delfrate@disp.uniroma2.it
[h] Alterra, Droevendaalsesteeg 3, 6700AA Wageningen, Netherlands – judith.klostermann@wur.nl

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ABSTRACT:

While Earth Observation (EO) has made significant advances in the study of urban areas, there are several unanswered science and policy questions to which it could contribute. To this aim the recently launched Horizon 2020 project URBANFLUXES (URBan ANthrpogenic heat FLUX from Earth observation Satellites) investigates the potential of EO to retrieve anthropogenic heat flux, as a key component in the urban energy budget. The anthropogenic heat flux is the heat flux resulting from vehicular emissions, space heating and cooling of buildings, industrial processing and the metabolic heat release by people. Optical, thermal and SAR data from existing satellite sensors are used to improve the accuracy of the radiation balance spatial distribution calculation, using also in-situ reflectance measurements of urban materials are for calibration. EO-based methods are developed for estimating turbulent sensible and latent heat fluxes, as well as urban heat storage flux and anthropogenic heat flux spatial patterns at city scale and local scale by employing an energy budget closure approach. Independent methods and models are engaged to evaluate the derived products and statistical analyses provide uncertainty measures as well. Ultimate goal of the URBANFLUXES is to develop a highly automated method for estimating urban energy budget components to use with Copernicus Sentinel data, enabling its integration into applications and operational services. Thus, URBANFLUXES prepares the ground for further innovative exploitation of European space data in scientific activities (i.e. Earth system modelling and climate change studies in cities) and future and emerging applications (i.e. sustainable urban planning) by exploiting the improved data quality, coverage and revisit times of the Copernicus data. The URBANFLUXES products will therefore have the potential to support both sustainable planning strategies to improve the quality of life in cities, as well as Earth system models to provide more robust climate simulations.

* Corresponding author. This is useful to know for communication with the appropriate person in cases with more than one author.