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LEAD AUTHOR

S. Stagakis (FORTH)

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AUTHORS

C.S.B. Grimmond (University of Reading)

CONTRIBUTORS

C. Feigenwinter (University of Basel), R. Vogt
(University of Basel)

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1 INTRODUCTION

1.1 Purpose of the document

This document is supplement to Deliverable D6.3 of the URBANFLUXES (URBan ANthropogenic heat FLUX from Earth observation Satellites) Project. It describes the database containing all in-situ measurements performed at all case study areas during the project's lifecycle. This database is available at the URBANFLUXES data repository and can be accessed through the online tools of URBANFLUXES.

1.2 Symbol definitions

Q^*, R_n	Net radiation
$L\uparrow$	Upwelling longwave radiation
$L\downarrow$	Downwelling longwave radiation
$K\uparrow$	Reflected shortwave radiation
$K\downarrow$	Incoming shortwave radiation
Q_H	Turbulent sensible heat flux
Q_E	Turbulent latent heat flux

1.3 Document references

[R1] URBANFLUXES Deliverable D1.4 Data Management Plan

2 WIRELESS SENSOR NETWORKS

2.1 Heraklion

In Heraklion the meteorological station network (active since December 2015) has more than 15 stations across the urban area and some reference stations in the rural areas near the city. All stations measure air temperature, relative humidity, wind speed and wind direction and some of them are equipped with sensors for surface (infrared) temperature, solar radiation (shortwave) and precipitation sensors. Data are accessible through the online web-GIS tool on the URBANFLUXES website (Figure 1) where the user can also interact online with the data, comparing the real-time measurements of each station and creating on-the-fly time-series graphs of multiple meteorological parameters and stations. The data are archived in the URBANFLUXES repository and can be openly accessed by the users after registration to the URBANFLUXES website.

Link to data: http://urbanfluxes.eu/data/umsnher/#main_article_title

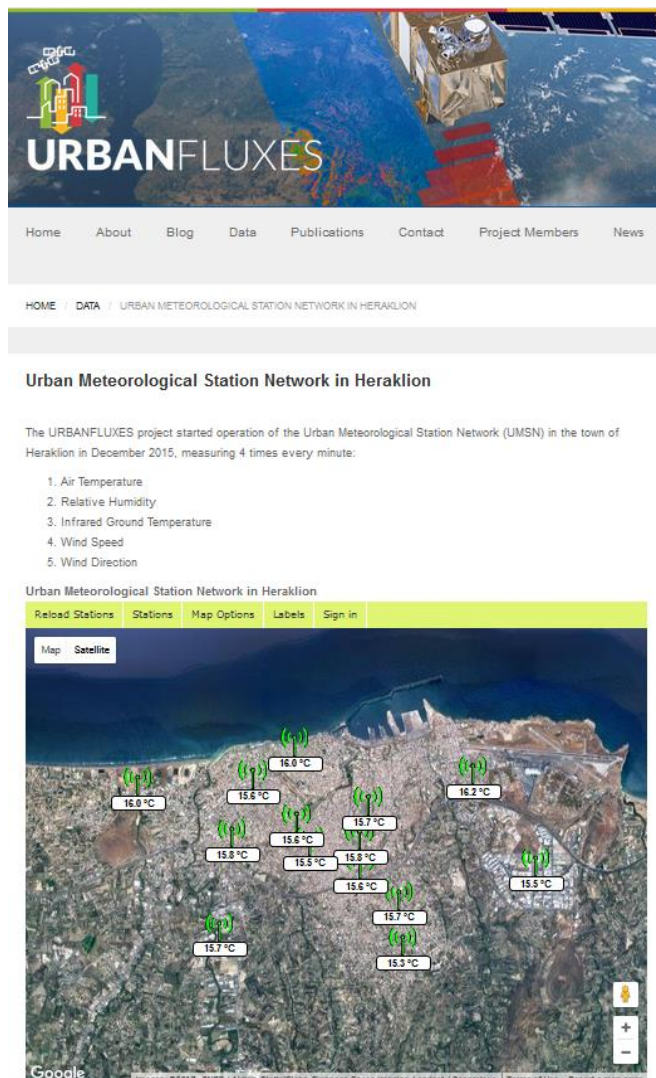


Figure 1: The online tool for real-time visualization and access to the meteorological data of Heraklion sensors network, available through URBANFLUXES website

2.2 Basel

Basel has been equipped with several meteorological stations during URBANFLUXES project. Several other meteorological stations are installed permanently and managed by the University of Basel, the regional air pollution control agency and the Swiss meteorological service MeteoSwiss. All stations measure air temperature, relative humidity, wind speed and wind direction and some of them are equipped with barometric pressure sensors, net radiometers (R_n , $L\uparrow$, $L\downarrow$, $K\uparrow$, $K\downarrow$) and precipitation sensors. Data are accessible through the online web-GIS tool in the URBANFLUXES website (Figure 2) where the user can also interact online with the data, comparing the real-time measurements of each station and creating on-the-fly time-series graphs of multiple meteorological parameters and stations. The data are archived in URBANFLUXES repository and can be openly accessed by the users after registration to the URBANFLUXES website.

Link to data: http://urbanfluxes.eu/data/umsnbasel/#main_article_title

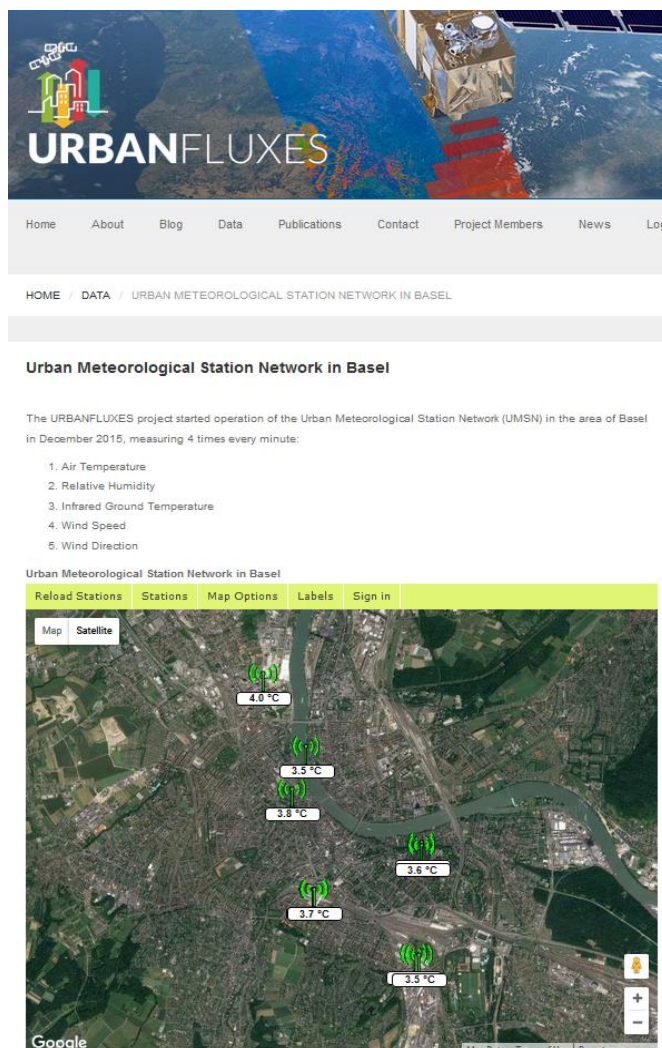


Figure 2: The online tool for real-time visualization and access to the meteorological data of Basel sensors network, available through URBANFLUXES website

2.3 London

London is equipped with several meteorological stations that are gathered in the London Urban Micromet data Archive (LUMA), managed by the University of Reading (UoR). There is also an online tool for plotting the real-time data and there are various meteorological variables available from multiple meteorological stations (Figure 3). Access to the meteorological data is available on-demand after user registration to the LUMA Archive. LUMA also scrapes a wide range of other data in the London area in real time.

Link to data: <http://www.met.reading.ac.uk/micromet/LUMA/Network.html>



Network: Measurement locations

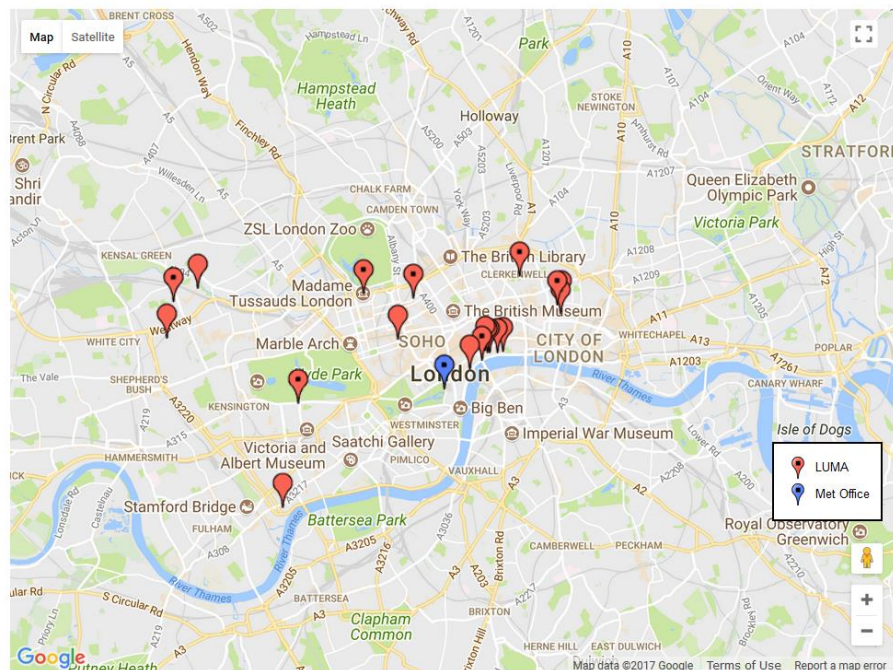


Figure 3: The online tool of London Urban Micromet data Archive (LUMA) designed for real-time visualization and access to the meteorological data of London meteorological stations. Note that not all of these stations were operational during UrbanFluxes.

3 EDDY COVARIANCE AND SCINTILLOMETRY

3.1 Heraklion

During the URBANFLUXES project an eddy covariance (EC) system was installed in central Heraklion (Figure 4). EC systems measure the turbulent latent and sensible heat fluxes (Q_E , Q_H) through the rapid fluctuations of temperature and water vapour measured by 3D sonic anemometers and infrared gas analysers. The Heraklion EC system is connected to the network with real-time transmission of the measurements and the full data archive is collected in the URBANFLUXES repository. The flux measurements can be viewed online by the users through the online tool provided by University of Basel (Figure 5) and the data are accessible to users on-demand.

Link to Eddy covariance measurements: <https://mcr.unibas.ch/dolueg2/index.php?project=heraklion>

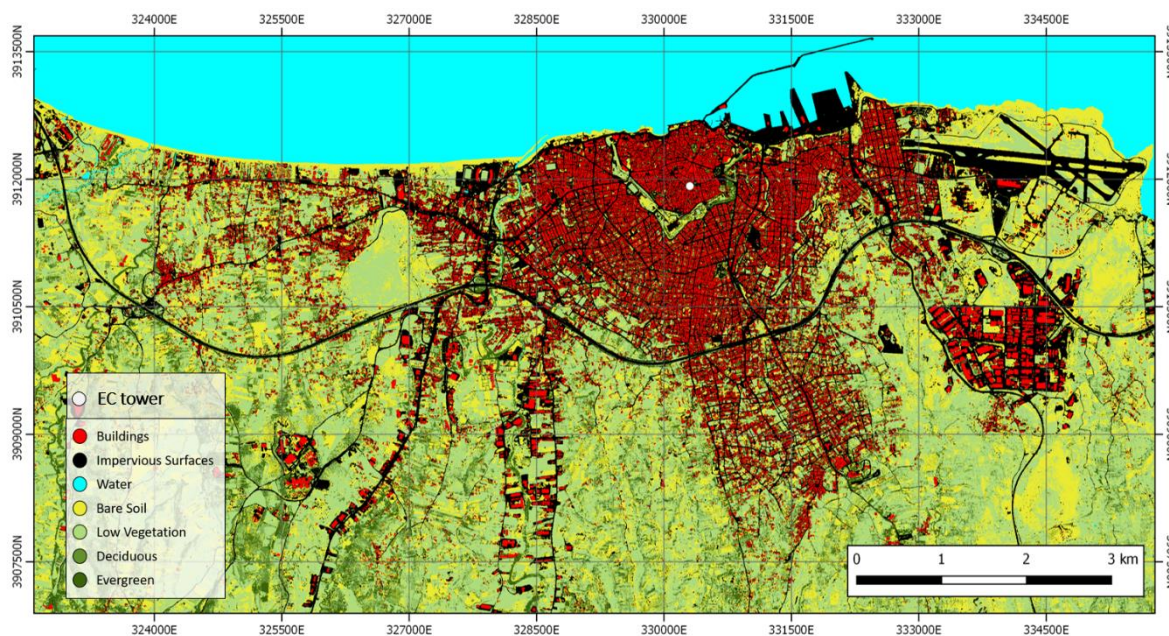


Figure 4: URBANFLUXES Land Cover map of Heraklion with the location of the Eddy covariance tower indicated as a white dot

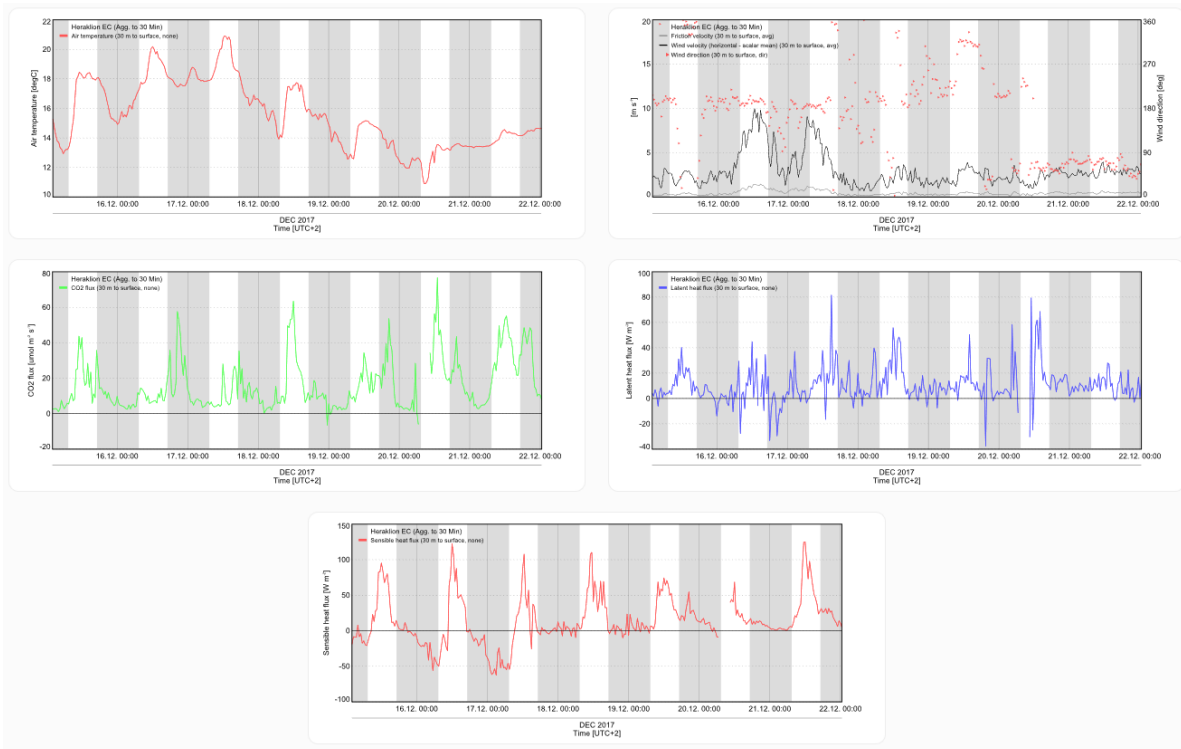


Figure 5: Examples of online real-time graphs of the flux and meteorological measurements by the Eddy Covariance system in Heraklion

3.2 Basel

Basel is equipped with three EC towers. Two are installed in city centre (BKLI and BAES) and one in a rural area (BLER) (Figure 6). The EC towers are connected to the network with real-time transmission of the measurements (Q_H , Q_E , R_n etc) and the full data archive is collected in the URBANFLUXES repository. The flux measurements can be viewed online by the users through the online tool of the University of Basel (Figure 7) and the data are accessible to users on-demand.

Link to EC measurements: <https://mcr.unibas.ch/dolueg2/index.php?project=basel&var=1>

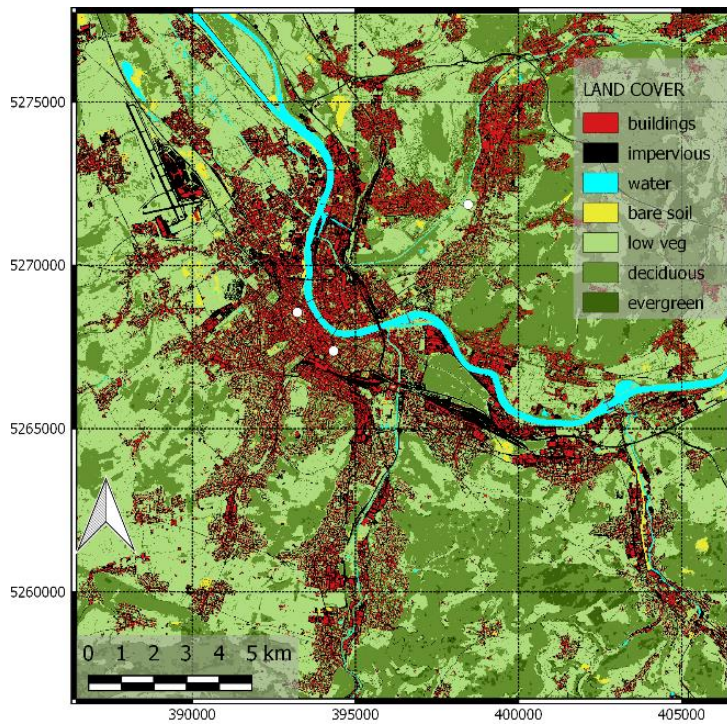


Figure 6: URBANFLUXES Land Cover map of Basel with the locations of the Eddy covariance towers indicated as a white dots

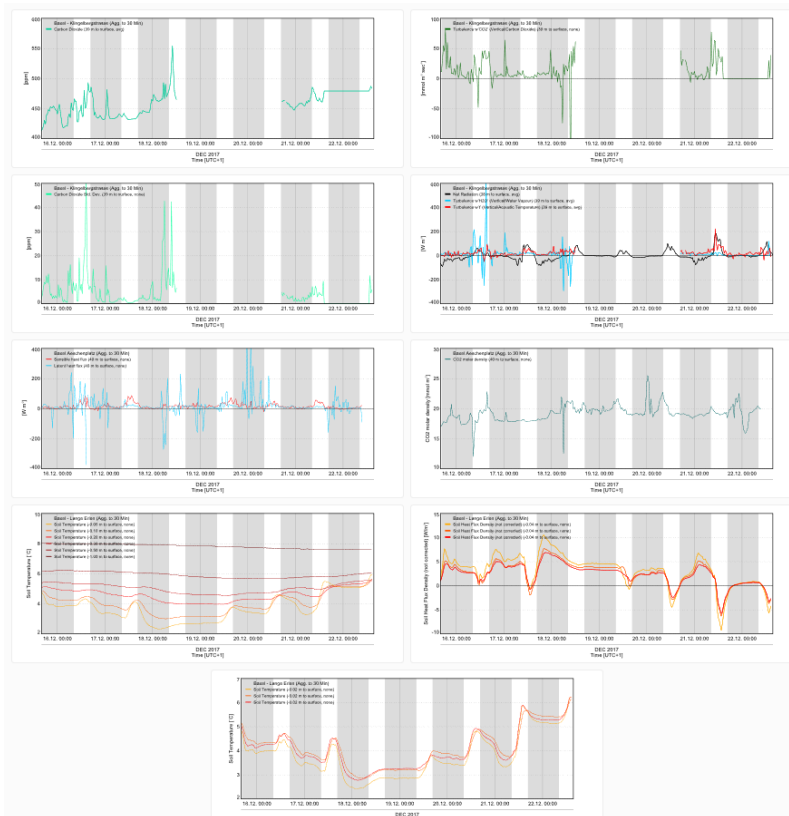


Figure 7: Online real-time graphs of the flux measurements by the Eddy Covariance systems in Basel

3.3 London

London had varying configurations of instruments active during the URBANFLUXES project. This included an EC tower (KSSW) and three scintillometry sites (paths) in city centre. The scintillometer measures variations in light intensity (rather than sound) with a receiver 2-5 km from the transmitter to determine Q_H . Fluxes are calculated in real-time and stored in the London Urban Micromet data Archive (LUMA), managed by the University of Reading (UoR). There is an online tool with plots of the real-time data (Figure 9). Access to the meteorological data are available on-demand after user registration to the LUMA Archive.

Link to data: <http://www.met.reading.ac.uk/micromet/LUMA/Network.html>

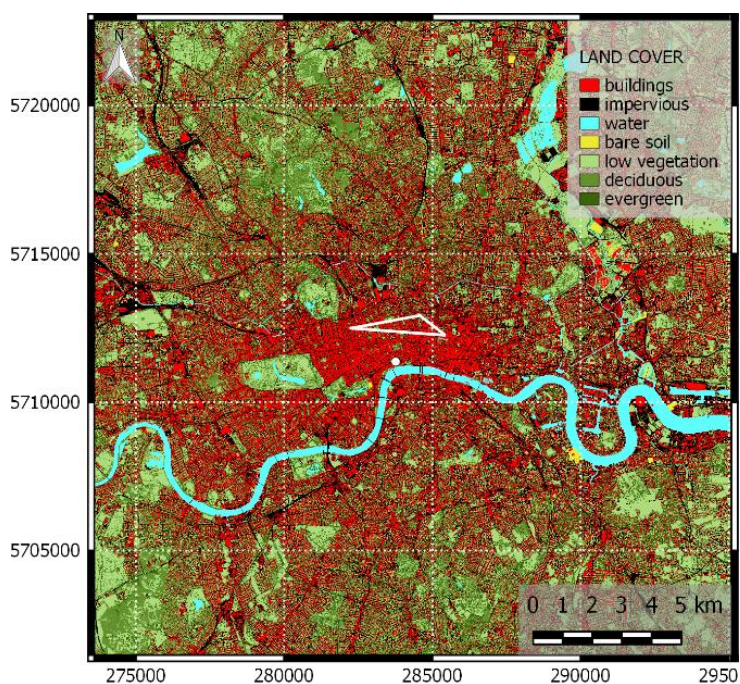
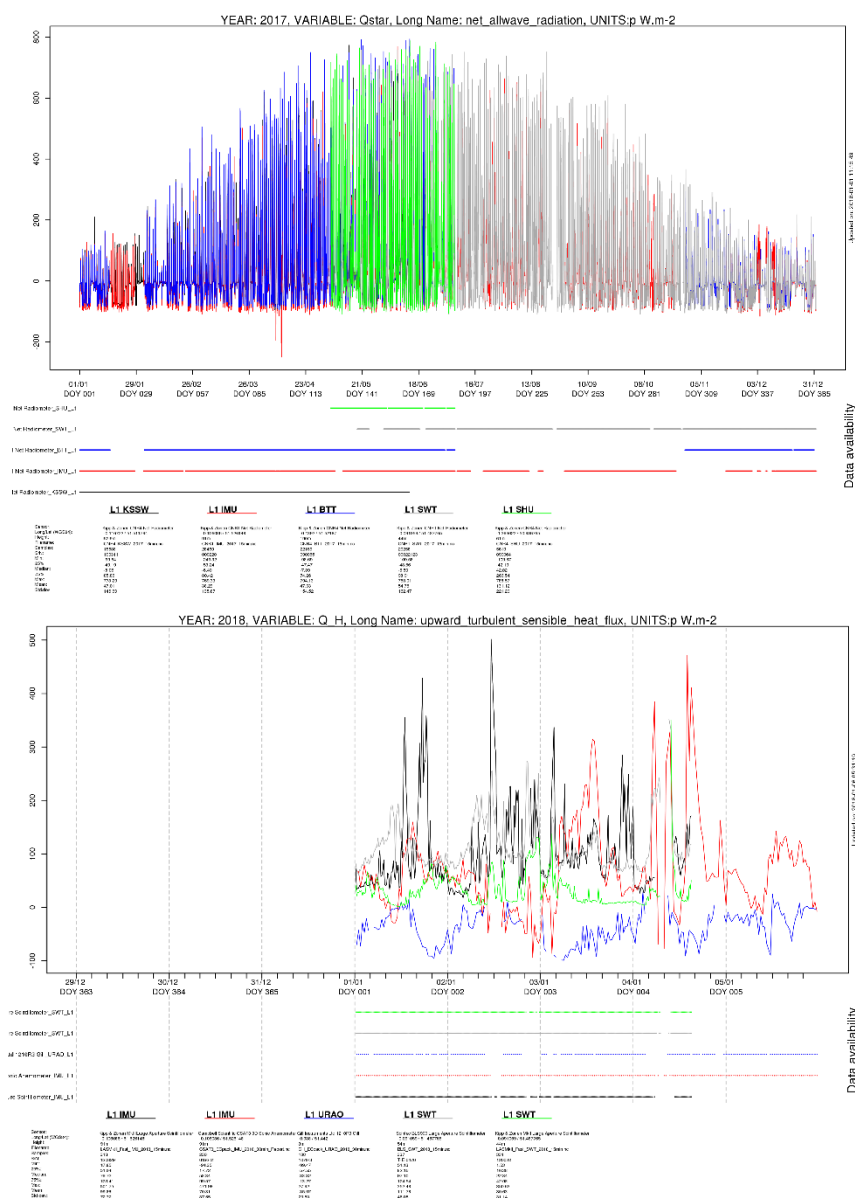


Figure 8: URBANFLUXES Land Cover map of London with the locations of the eddy covariance tower (white dot) and scintillometer paths (white lines).



4 DATA ACCESS

4.1 Data Repository

According to the Grant Agreement and the Consortium agreement, URBANFLUXES participates on a voluntary basis in the **H2020 Pilot on Open Research Data**. Open access to research data refers to the right to access and re-use digital research data under the terms and conditions set out in the Grant

Agreement. Openly accessible research data can typically be accessed, mined, exploited, reproduced and disseminated free of charge for the user. The open access to research data is important to maximize the impact of the project. URBANFLUXES partners have taken reasonable actions, defined in the Consortium Agreement to protect the knowledge resulting from the project, according to their own policy and legitimate interest and in observance of their obligations under the Grant Agreement. According to the Consortium Agreement, the knowledge is the property of the partner carrying out the work leading to that knowledge and is subject to Intellectual Property Rights (IPR). Therefore, the data access is free as long as the users credit URBANFLUXES project and/or the data author for the original creation. To ensure the proper distribution and re-use of URBANFLUXES data products, all datasets in the URBANFLUXES repository are accompanied with metadata files that defines the policy for re-use, access and sharing, along with the original data author and project.

The URBANFLUXES Data Repository is split into two segments:

- i) The Public Data Repository, where URBANFLUXES products become freely available to all after the provision of basic information [R1].
- ii) The Private Data Repository, where raw data, unpublished data, as well as all internal documents will be available to the URBANFLUXES Consortium [R1].

After the publication of the scientific publication presenting the analyses methods to be developed in URBANFLUXES, the respective data and products become available with free access through the URBANFLUXES in the Public Data Repository. Any potential user of these datasets will have free access, following simple registration instructions given in the respective web-page. The user fills in a dedicated form with minimum information (name, email, etc.), similar to which several projects use (JRC, UN, EEA, etc.) and then grant access to these datasets. The users have the possibility to access, mine, exploit, reproduce and disseminate (free of charge) the data, including associated metadata, needed to validate the results presented in scientific publications. As indicated in the respective metadata field of all URBANFLUXES datasets, the data are protected by Intellectual Property Rights. Thus, the users are obliged to refer to the data source (URBANFLUXES: grant agreement No 637519) when reproducing or using the data in articles or reports. By following this procedure, the URBANFLUXES Consortium will monitor the diffusion of these products, as well as the reuse in other projects, publications, supporting in this way new scientific collaborations.

The Private Data Repository, hosted in URBANFLUXES web-server, includes the raw data (satellite images, in-situ archive, vector data from public sources, etc.), the unpublished results but also the data that have been classified as confidential according to the Consortium agreement. Commercial EO imagery and products that are subject access restrictions are also stored in the private data repository. The members of the URBANFLUXES Consortium have access by login with their credentials. Data that are used and produced during the project are also available in the repository, with the respective version numbers. Raw data and products or intermediate datasets are and will remain online for sharing with the partners for further exploitation. Raw data are available to the members of the URBANFLUXES Consortium according to the rules in the Consortium Agreement. Raw case studies measurements data (i.e. Eddy Covariance, scintillometry) and data products that are collected in the private data repository can become accessible to users outside the URBANFLUXES consortium on demand [R1].

5 ACKNOWLEDGEMENTS

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