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► To cite this version:

G. Najjar, J. Colin, P. Kastendeuch, Jérôme Ngao, M. Saudreau, et al.. A three years long fieldwork experiment to monitor the role of vegetation on the urban climate of the city of Strasbourg, France.. ICUC9, Jul 2015, Toulouse, France. , 1 p., 2015. hal-01269041

HAL Id: hal-01269041

<https://hal.science/hal-01269041>

Submitted on 2 Jun 2020

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A three years long fieldwork experiment to monitor the role of vegetation on the urban climate of the city of Strasbourg, France

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The ICube Laboratory (UMR 7357 University of Strasbourg - CNRS), in collaboration with the PIAF Laboratory (UMR 547 INRA) and the local association for atmospheric pollution monitoring (ASPA), as initiated in 2013 a fieldwork experiment to measure and monitor the urban climate of the city of Strasbourg, east of France, with a particular focus on the role of vegetation with respect to micro-climatic conditions suitable of human comfort. This fieldwork experiment is organized around four complementary objectives. At first, a detailed analysis of the spatial and temporal variability of the urban heat island effect is conducted through the deployment of a dense network of twenty-three weather stations in and around the city, monitoring standard parameters such as air temperature and humidity, as well as wind speed and direction. This network also contributes to the INTERREG IV project "Atmo-IDEE". Secondly, to allow for an in-depth analysis of the physical processes behind the UHI, two sites have been equipped with a set of radiometers and eddy correlation sensors to measure the radiative and energy balance. The first site, located in a densely urbanized area, can be considered as mineral and has a large footprint since the sensors are installed 30 meters above ground. The second site is located in an urban park near the city centre, and is equipped with the same set of instruments, here on top of a 20 meters high mast. The later site is used to fulfil the third objective, which is to closely keep track of the contribution of the vegetation to turbulent fluxes measured on top of the urban canopy. To do so, a group of six trees is equipped with sap flow sensors. Simultaneously, other sensors are monitoring the soil temperature and water content at seven levels, as well as the photosynthetically active radiation profile below, inside and on top of a tree. Additionally, the contribution of the soil and grass is measured during intensive observation periods using a closed transpiration chamber. The last objective of this experiment is to measure thermal comfort indices, combining integral radiation measurement methods, black globe thermometers, 38 mm flat globe thermometers and a dense set of twenty weather stations (UBIQUITY network). The entire experimental design is presented together with first results.

Keywords: urban heat island, energy balance, sap flow, urban vegetation