



Cool pavements for adapting Paris to climate change

Charbel Abboud^{1,2}, Sophie Parison¹, Frédéric Filaine¹, Martin Hendel^{1,3}, Laurent Royon¹, and Maïlys Chaniai^{1,2}

¹Université Paris Cité, Institut des Sciences Humaines et Sociales, Laboratoire Interdisciplinaire des Energies de Demain, France

²Ville de Paris, Directions de la Transition Ecologique et du Climat (DTEC) & de la Voirie et des Déplacements (DVD), Paris, France (charbel.abboud@paris.fr)

³Univ Gustave-Eiffel, ESIEE Paris, département SEED, F-93162, Noisy-le-Grand, France

In order to adapt to climate change, cities are studying various urban cooling techniques to improve pedestrian thermal comfort of users during heatwaves including urban greening and cool materials [1,2]. On technique being considered by the City of Paris is cool pavements [3] . To this aim, an experimental test site has been constructed and instrumented to study the thermal and climatic behavior of candidate sidewalk structures.

The experimental demonstrator is located in Bonneuil-sur-Marne near Paris, France. This experimental device consists of 16 samples of various sidewalk structures [4]. Each sample is approximately 4x4m across by 25 cm deep and is composed of several layers following real-world conditions. The samples are instrumented with temperature and heat flow sensors at several depths, with the data recorded every 5 minutes. Additional weather measurements are also conducted onsite to monitor air temperature and humidity, global horizontal short- and longwave irradiance as well as wind speed and direction. This communication is focused on data collected during the summers of 2021 and 2022, specifically temperatures and heat fluxes and the derived surface heat budget of each sample. These data from each structure will be analyzed with respect to their contribution to the degradation of pedestrian thermal comfort as well as to the urban heat island effect in order to inform the city services in their selection of suited sidewalk materials.

Additional testing inside a climate chamber will supplement the demonstrator test site with

complementary
measurements performed in the laboratory.

References:

- [1] H. Akbari, M. Pomerantz, and H. Taha, "Cool surfaces and shade trees to reduce energy use and improve air quality in urban areas," *Sol. Energy*, vol. 70, no. 3, pp. 295–310, Jan. 2001.
- [2] M. Chanial, G. Karam, S. Parison, M. Hendel and L. Royon. (2022). Microclimatic analysis of an experimental cooling watering device (in French).. CIFQ 2022, Paris (France).
- [3] Santamouris, M. (2013). Using cool pavements as a mitigation strategy to fight urban heat island—A review of the actual developments. *Renewable and Sustainable Energy Reviews*, 26, 224-240.
- [4] S. Parison, M. Chanial, F. Filaine and M. Hendel. (2022). Surface heat budget of sixteen pavement samples on an experimental test site in the Parisian region. SURF 2022, Milano (Italy).