High-resolution meteorological modelling of heat waves events over Paris and the Ile-de-France region during the PANAME campaign

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Résumé

In this work, the Meso-NH meteorological research model is used to perform hectometric high-resolution numerical simulations of the heatwaves that occur over Paris and the Ile-de-France region during the summer 2022. These events have been documented during the PANAME2022 intensive observation campaign, with, amongst others, ground observations from permanent meteorological stations network, radiosoundings, automatic low-power lidars and ceilometers.
The model is first validated against the experimental data. Meso-NH shows a good ability to reproduce the ground temperature and the humidity temporal evolution so as the vertical profiles for wind speed and temperature obtained with the radiosoundings. Atmospheric boundary-layer phenomenon like low-level jets that may occur over the city at night are also detected by the model.

The results show that the urban heat island spatial extension is depending on the atmospheric conditions, and that the high-risk exposure areas may differ from one heatwave to another. The model is also able to identify urban parks of different size. Their cooling effects is depending on the atmospheric conditions and differ for the various heatwaves observed during the campaign.

The present results show that high-resolution meteorological models such as Meso-NH appears as a suitable tool to complement observations. This allows to propose an approach combining observation and modelling in order to thoroughly analyse the small-scale physical processes encountered during the heatwaves over Paris region.
The meteorological simulations results are also intended to be used as input data for air quality, indoor thermal comfort and heat exposure models. This is a first step toward the development of a prototype urban forecasting modelling chain at the hectometric scale over the Paris region.

Mots-Clés: urban heat island, Numerical modelling, Paris, heat waves, urban parks

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