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Sensitivity of the high-resolution regional climate model AROME to urban sprawl over Paris region

Léa Corneille¹, Aude Lemonsu², Tiago Machado³, and Vincent Vigié⁴

¹Centre National de Recherches Météorologiques (CNRM), Université de Toulouse, Toulouse, France

(lea.corneille@meteo.fr)

²Centre National de Recherches Météorologiques (CNRM), Université de Toulouse, Toulouse, France

(aude.lemonsu@meteo.fr)

³Centre National de Recherches Météorologiques (CNRM), Université de Toulouse, Toulouse, France

(tiago.machado@meteo.fr)

⁴Centre international de Recherche sur l'Environnement et le Développement (CIRED), Ecole des Ponts ParisTech, Nogent-sur-Marne, France (viguie.cired@gmail.com)

Cities, as cradles of population and economic activities, constitute a crucial issue in the current environmental challenges. Their organisation is enduring major changes and the issues surrounding spatial planning are of growing interest in a context of climate change, since cities are particularly vulnerable to extreme events.

The evaluation of the climate change impacts requires to refine the climate projections provided by global and regional climate models down to a finer spatial scale more adapted to the city study. Besides their fine resolution, these models may include a dedicated surface model to represent explicitly the urban areas and the physical processes involved.

The CP-RCM (Convection-Permitting Regional Climate Model) AROME is coupled to the TEB urban canopy model with an horizontal resolution of 2.5 km, and uses the ECOCLIMAP land use and land cover database to characterise the surface properties. It is applied over the Paris region for a past period, forced by the ERA5 reanalysis, in order to assess local impacts of climate change.

Nonetheless, the land use map, used by the CP-RCM AROME and based on data from the 1990s without evolution in time, can be a limit to the realism of climate simulations. The expansion incurred by cities until the current period is not represented, nor the future dynamics.

This study compares different climate simulations run with past, present and future land use maps over Paris region with the aim to quantify and analyse the impact of land use changes on the regional climate, as well as to explore the consequences in terms of population exposure to high heat conditions.