NEAR-TERM PREDICTION OF URBAN CLIMATE BASED ON URBAN GROWTH SCENARIOS IN THE TOKYO METROPOLITAN AREA

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Abstract

In order to estimate the impact of urbanization in the near-future of 2050's, we operated some numerical downscaling experiments using near-term results of MIROC5-RCP4.5 version as atmospheric boundary conditions and applying some spatially explicit high resolution land use change scenarios as lower boundary conditions. The atmospheric model of NHRCM (NonHydrostatic Regional Climate Model) was used. One way double nesting was operated to the final grid scale of 4km through the middle-sized 20km grid scale experiment. The study area was Tokyo metropolis and its surrounding area, and the targeted season was summer. A single layer urban canopy scheme was coupled to the NHRCM_4km in order to express urban features better.

The high-resolution land use change scenarios were simulated by a newly land use model based on microeconomics[1]. The GIS datasets of the population, incomings, land prices, rental rates, traffic volume, floor area, etc. were input to the model. When the future variations of land prices, fuel prices, highway tolls are set, the land use model can simulate the responses of household budgets and building markets in the future.

In this study, we used three urbanization scenarios of a) status quo, b) dispersed city, and c) compact city derived from the sophisticated land use model. Along with these scenarios, we estimated the parameters for land surface settings of the NHRCM such as urban area fraction, anthropogenic heats, averaged shapes of buildings, and so on.

From a preliminary experiment on a typical clear day, the higher daily mean temperature could be seen at the periphery of Tokyo in the dispersed-city-run, otherwise, the lower daily mean temperature was seen there in the compact-city-run, compared to the status-quo-run respectively. Ten years downscaling from 2051 to 2060 will be done to figure out the climatic changes (not only changes of temperature but also changes of any other meteorological parameter, e.g. wind velocity, precipitation, humidity) over urban area.

[1]Yamagata, Y., H. Seya and K. Nakamichi, 2011: Scenario Analysis of the Future Urban Land Use in the Tokyo Metropolitan Area. *J. Soc. Environ. Sci. Jpn.*, **24**, 169-179 (in Japanese with English abstract).

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