

A Series of Studies for Quantifying the Effects of Measures against the Urban Heat Island Phenomenon within Urban Architectural Spaces

ASHIE, Yasunobu

Head of Environmental and Equipment Standards Division, National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure, Transport and Tourism, The Government of JAPAN

The present study summarizes a series of investigations which quantified the effects of measures against the urban heat island phenomenon. Specifically, the summary concerns: the numerical simulation methods adopted for these investigations, preparation and maintenance of the input data necessary for the computations, the analysis of the thermal characteristics of architectural materials, and evaluations with wind-tunnel experiments. A CFD simulation requires that buildings and other structures be resolved, and when performed on a regional scale, a vast amount of computation is necessary. In the present study, the high-performance supercomputer “Earth Simulator” was applied to an urban environmental issue for the first time, and a large-scale numerical analysis technique was developed to predict the thermal environment with high-resolution from the scale of buildings to the urban scale. This numerical simulation technique has enabled a direct and spatially-continuous analysis of urban architectural spaces in terms of their thermal performance and of the fluid properties of the atmosphere above an urban area. Regional meteorological characteristics and information on the thermal environment acquired from the techniques developed in the present study will be useful for many cities in addition to Tokyo, such as local governments implementing Basic Environmental Plans, and regions in Asia in which rapid urban development has taken place.