

SIMULATION STUDY OF THE INFLUENCE OF DIFFERENT URBAN CANYONS ELEMENT TO THE CANYON THERMAL ENVIRONMENT

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ABSTRACT

Heat island is a big issue for large cities especially located in hot and moist climate in Asian countries. The phenomenon is severer in an urban canyon because of surrounding highrise buildings causing little ventilation and heat dissipation from traffic. The first purpose of this study is to investigate thermal environment of a main street in Osaka by intensive measurement in the summer of 2006. Osaka is the second largest city and suffers from the most severe heat island in Japan. The second purpose is to propose several fundamental renovations and a composite renovation for the improvement of thermal environment in the canyon and verify the efficiency of the measures by CFD simulation. It was found that modifications in the building height along the street and ground surface materials, and increase of quantity of green can improve thermal environment to the level of 2.0 K reduction in SET* in maximum.

KEYWORDS

heat island, CDF simulation, thermal environment, urban canyon, urban renovation

INTRODUCTION

In most large cities heat island effect is developing, (T.J.Williamson and E.Erell 2001) as the result, thermal environment in an urban canyon which is surrounded with wall-like buildings has become very severe in summer time due to man-made heat dissipation from buildings and traffic, paved ground surface and increase of building height. There are many reports which investigate the effect of the quantity of green, shapes of buildings and configuration of the urban canyon on its thermal environment (A.Toriyama 2001), however, most of them just compare the environment in different types of streets but very few try to investigate the environment difference formed by the quantity of green, the configuration of the canyon, etc. in a same street. In addition environment investigation for the streets running east-west can be found much but not much for running south-north streets. Although studies predicting thermal environment improvements by some countermeasures in urban canyons in a measurement basis can also be found, (E.Shaviv, A.Yezioro et al. 2001, K.Takahashi,

H.Yoshida et al. 2003, S.Ito, H.Yoshida et al. 2005) only a few studies aimed to estimate the effectiveness by CFD simulation together with the validation of the simulation accuracy using measurement results in a real canyon. Therefore the purposes of this study are;

- 1) Evaluating the effect of quantity of green and configuration of a canyon on thermal environment in a real main-street in Osaka, Japan.
- 2) Carrying out CFD simulation for the real street and verifying the accuracy of the simulation results by comparing with the measurement results.
- 3) Proposing and evaluating measures to mitigate heat island effect by reducing man-made heat emission, increasing the quantity of green and modifying configuration of the canyon.

MEASUREMENT OF THERMAL ENVIRONMENT IN A REAL CANYON

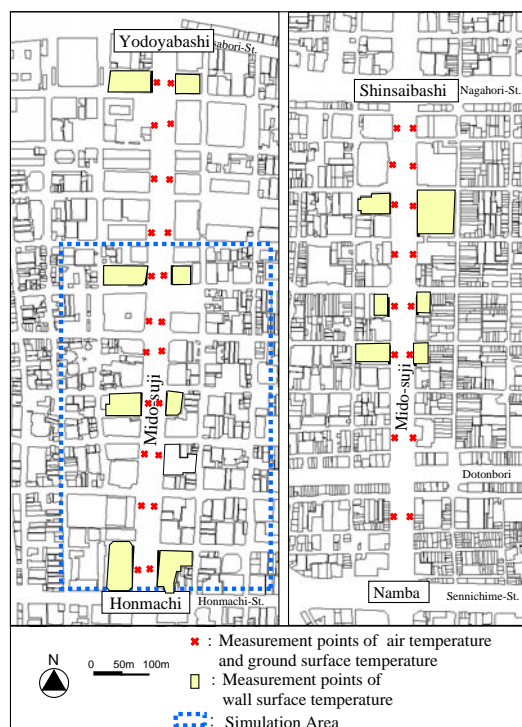


Figure 1 Measurement Points