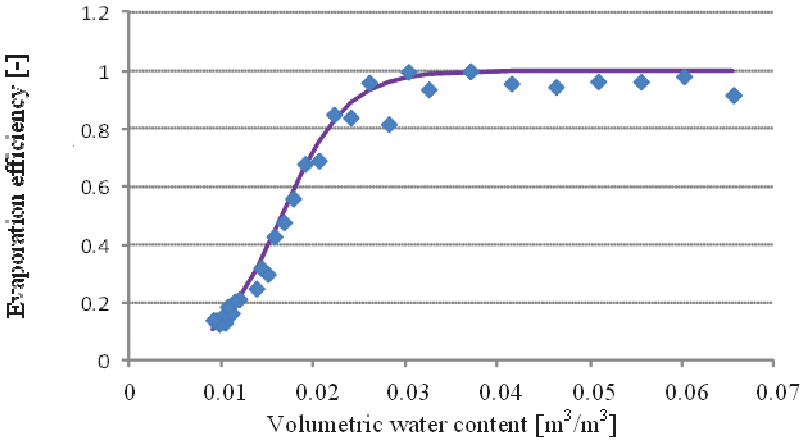
[P2.43]

Development of the transport model of heat and soil moisture into water retentive pavement

A. Kondo*, H. Shimadera, Y. Inoue
Osaka University, Japan

Water retentive pavement (WRP) is expected to mitigate urban heat island by evaporation of water. In this study, the transport model of heat and soil moisture into WRP was developed. The evaporation efficiency was obtained as the function of the volumetric water content from the experiments (see Fig.1). The saturated volumetric water content in WRP used in this study was 0.07. The matric potential was obtained as the function of the volumetric water content from the experiments (see Fig.2). This relationship was expressed by van Genuchten model. The hydraulic conductivity was obtained from Mualem model.

Fig.1 Evaporation efficiency of water retentive pavement



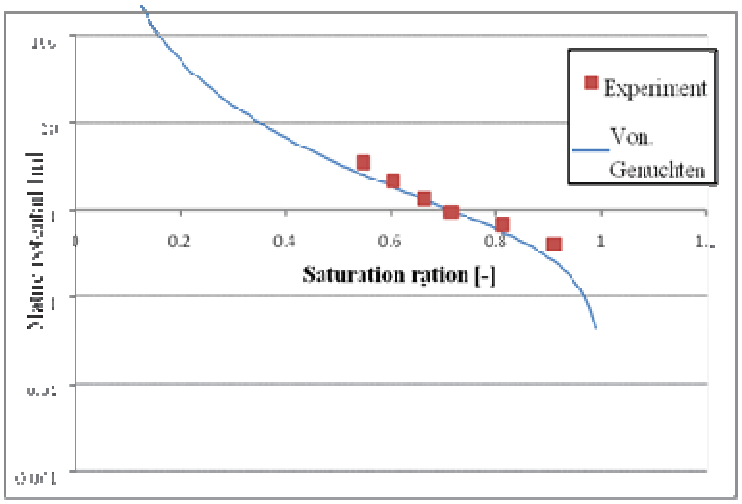


Fig.2 Matric potential of water retentive pavement

In order to confirm the validity of this model, the field experiment was carried out. The location of the experiment was the roof of the building S4 of Suita Campus, Osaka University. The

period of the experiment was 24 hours from noon of 25 September 2010. The surface temperature of WRP and asphalt was measured by thermocouple. At the initial of the experiment, WRP was kept in the saturated volumetric water content. Air temperature, specific humidity, wind speed, downward short wave radiation, downward long wave radiation, and upward long wave radiation were measured simultaneously.

From these measured data, the surface temperature of both WRP and asphalt was calculated (see Fig.3 and Fig.4). The maximum temperature of WRP and asphalt was 36^{O}C and 44^{O}C, respectively. It was obvious for WRP to reduce the surface temperature considerably. The calculated surface temperature of both WRP and asphalt could reasonably capture the measured surface temperature. These results mean that the transport model of heat and soil moisture into WRP was useful to predict the surface temperature of the artificial materials such as WRP and asphalt.

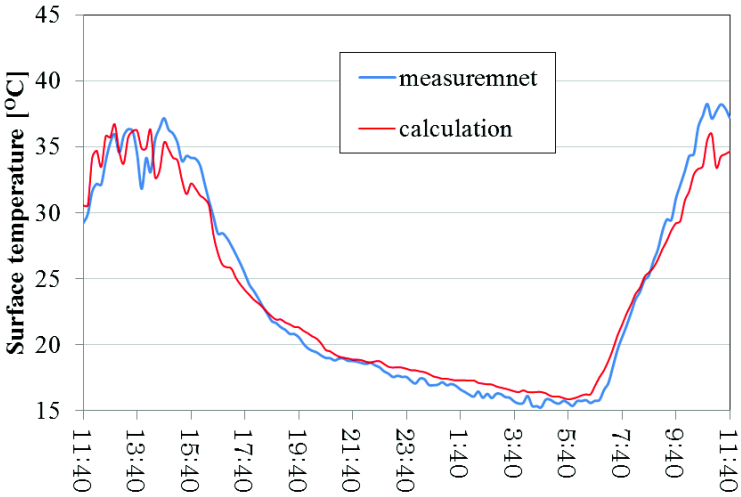


Fig. 3 Diurnal surface temperature of water retrain pavement

Keywords: water retentive pavement, heat island, evaporation efficiency, matric potential