Experimental study of sprinkling water to mitigate urban heat island impact as an application of groundwater use -Part 2-

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Recently, the management and utilization of groundwater in metropolitans is required for the preservation of the groundwater environment or the mitigation of the earthquake damage, since the shallow groundwater level leads to liquefaction and amplifying of the strong ground motion. One of the utilization of groundwater is sprinkling water on the asphalt pavement in summer day. It may mitigate the heat island phenomenon in urbanized area. The objective of this study to estimate the atmospheric temperature decreases due to sprinkling water on the asphalt pavement. According to previous meeting report, the further experimental studies were made on the decrease in temperature by sprinkling.

The site of the experiment locates at a part of the Osaka City University campus and the time was from 12:00, 16th to 16:00, 20th, Sep 2004. One hundred and two thermistors were spread on two vertical net planes (6m in height, 16m in width) crossed to each other. All thermistors without on ground surface were put inside the shelters to avoid the direct rays of the sun. The thermistors on the surface were covered by clay to shield from the sun's rays. Four humidity sensors were equipped in the site to measure humidity changes by sprinkling. The location of sprinkler was deviated two meters from the center of sensor network. The sprinkling time and the interval time were 100 seconds and 20 minutes, respectively. The sprinkling was in circular area of a ten meter in diameter. Four thermistors were distributed at some appropriate points with 1.5m heights as reference. One of the references was located at about 23m apart from the sprinkler as a meteorological reference. The ultraviolet sensor and a vane anemometer also were set at this point.

The atmospheric and pavement temperatures in sprinkling area were observed significantly lower values those at meteorological reference point in the final stage of sprinkling (18:00), on 16th September. The maximum temperature decreases of the pavement surface was 4.3 degrees. The atmospheric temperature at 0.75m, 1.5~3m and 4.5~6m heights decreased about 2.2, 1.2 and 1.0 degrees, respectively. Those ranges of temperature decreases are rather small compared with our previous work conducted in August. The magnitudes of temperature decreases may depend on a temperature of the asphalt pavement surface controlled by the intensity of the sun rays. The surface temperature of sprinkled area was observed to keep lower value through the night until next morning compared with that at the meteorological reference point. This suggests that the sprinkling may affect the temperature distribution even on the next day.

In addition, there was little variation of the degree of humidity between in sprinkling area and the meteorological reference point. This means that the sprinkling may also be valid for mitigation of the effective sultriness in summer.