ACTUAL CONDITIONS OF THERMAL AND WIND ENVIRONMENT IN THE KOFU BASIN

Yoshiki Junimura*, Tadashi Uno*, Hironori Watanabe**
*Yamanashi Institute of Environmental Sciences, Yamanashi, Japan
**Tohoku Institute of Technology, Miyagi, Japan

Abstract

It has been desired to reduce the Urban Heat Island Phenomena. Most of Japanese city have been developed at coastal area. So, many studies have been performed about the cities.
This study is carried out to clarify the urban thermal and wind environment for a few inland cities in Japan. Topography of study area is a basin so it is worried about forming of fierce thermal environment in every summer. Future aim of this study is to make the alarm system for heatstroke.

Key words: thermal and wind environment, field observation, the Kofu basin, heatstroke

1. INTRODUCTION

Kofu city area in Yamanashi prefecture has been developed at inland called the Kofu basin. This prefecture neighbors on Tokyo (Fig. 1). Altitudes of surrounding mountains are about 1,500 to 3,000 m and about 0.6 million people live in around the basin. This area is worried about formation of fierce thermal environment in every summer. Recently, conveyed number for heatstroke has increased as the number imitates a rising trend of urban temperature. So this study is carried out with aim of clarifying thermal and wind environment in the basin.

2. OUTLINE OF OBSERVATIONS

Table 1 shows observations outline. Air temperature, relative humidity, wind velocity and direction were observed in the basin in summer of 2008. Each of thermo recorders was set up in the meteorological monitoring shelter in elementally schools. Observation time interval was 10 minutes. And, anemometers were set up at rooftop of two building to clarify actual conditions of wind environment. Fig. 2 shows distribution of observing points of both observations.

3. RESULTS OF OBSERVATIONS

3.1. Air temperature distributions

Fig. 3 shows examples of air temperature distributions on fierce heat day. Fierce heat day means maximum temperature exceeds 35 centigrade. In early morning, high temperature area had occurred around city center and air temperature difference between city center and suburban area was about 2 to 3 centigrade. In daytime, high temperature area had occurred from city center into south part of city area and maximum temperature of the area

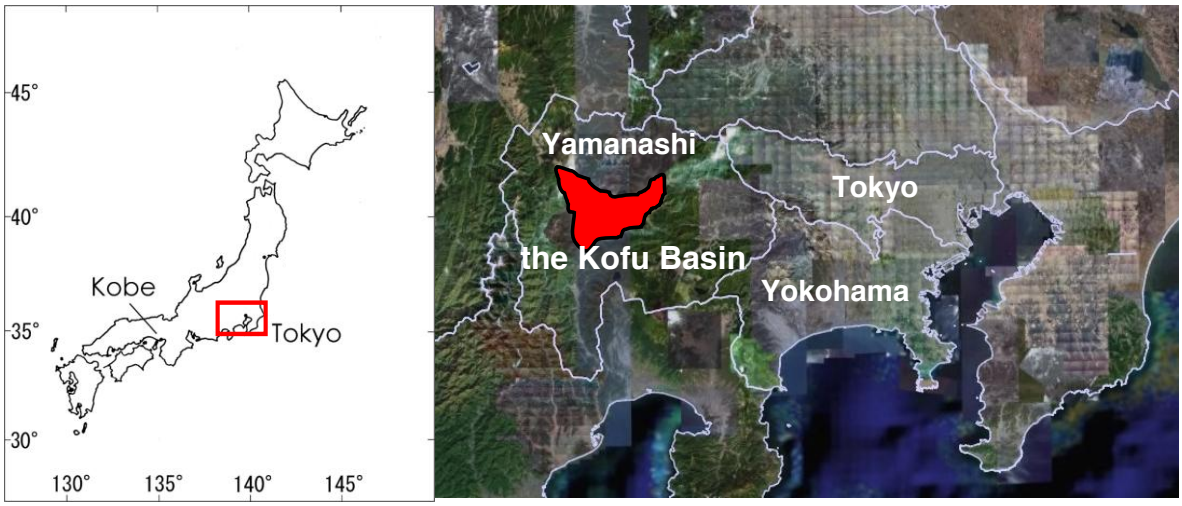


Fig. 1 Observation area

Corresponding Author : Yoshiki JUNIMURA, y-juni@yies.pref.yamanashi.jp
Yamanashi Institute of Environmental Sciences, 5597-1, Kenmarubi, Kamiyoshida, Fujiyoshida, Yamanashi 403-0005, Japan

Table 1 Observation outline

Field		the Kofu basin
Air temperature and relative humidity	Period	July 17 to August 31, 2008
	Instrument	Thermo recorder with temperature and humidity sensor
	Time interval	10 minutes
	Number of points	38 points
Wind velocity and wind direction	Period	July 31 to August 31, 2008
	Instrument	3D supersonic anemometer
	Time interval	0.2 seconds
	Number of points	2 points

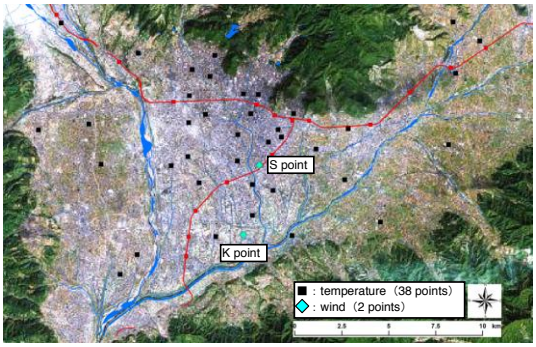
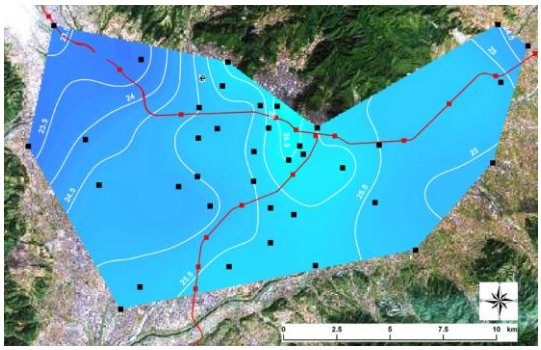
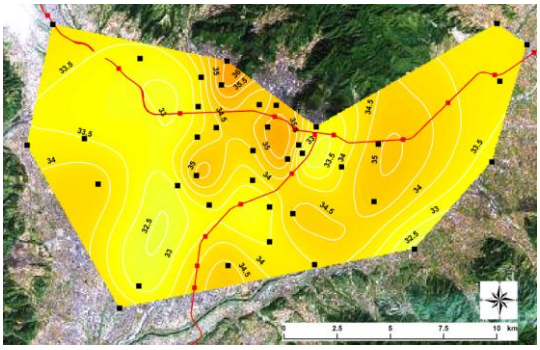


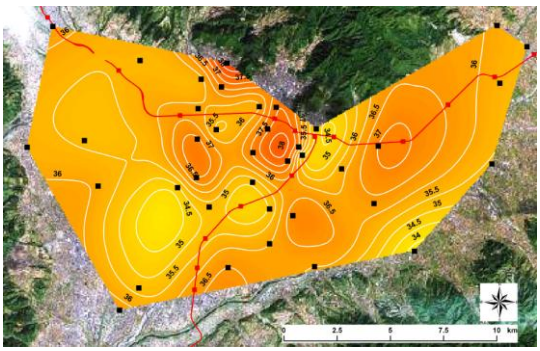
Fig. 2 Distribution of observation points



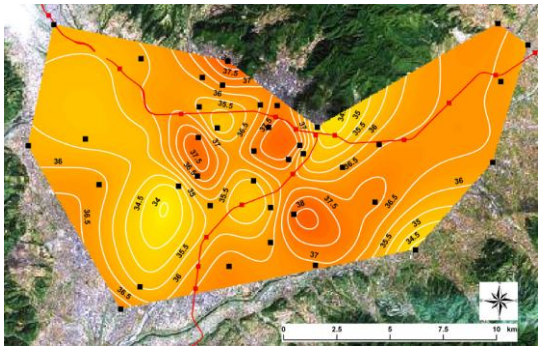
1）5:00



2）12:00

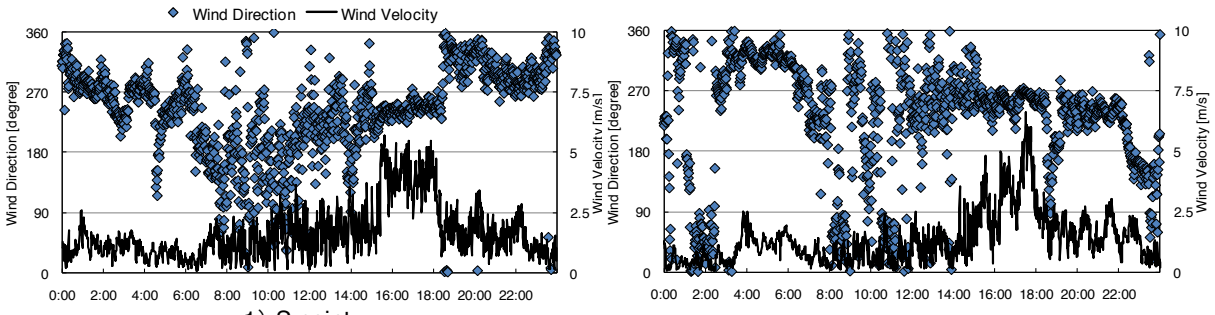


3）14:00



4)15:00

Fig. 3 Examples of air temperature distribution (Aug 8, 2008)



1）S point　　2) K point

Fig. 4 Daily variations of wind direction and velocity (Aug. 8, 2008)

had reached 38 centigrade. Besides shown time in Fig. 3, it has confirmed high temperature area had occurred around city area in long time. That is to say, it is clarified urban heat island phenomenon had occurred in the basin.

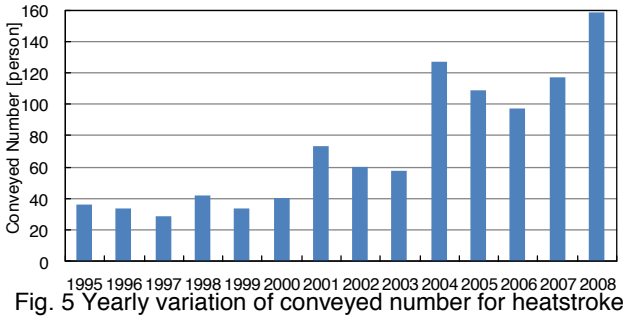


Fig. 5 Yearly variation of conveyed number for heatstroke

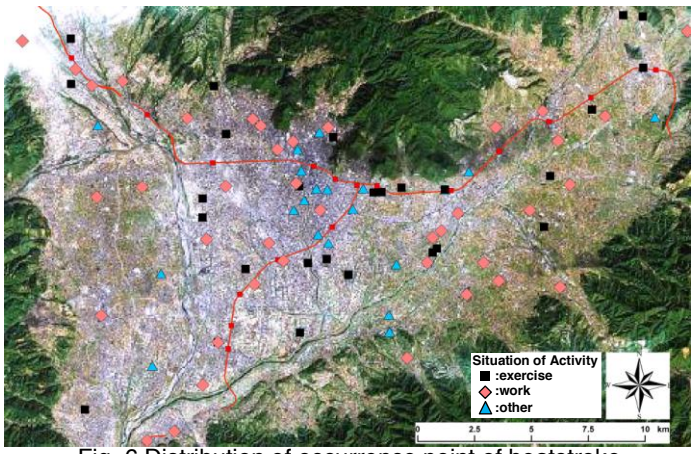


Fig. 6 Distribution of occurrence point of heatstroke

3.2. Wind velocity and direction

Fig. 4 shows daily variations of wind direction and velocity at S and K point (Fig. 2). S point is 3 floor building and K point is 6 floor building. This figure is shown as mean value for 1 minute. At both observation points, main wind direction was not clear from early morning to noon. In afternoon, main wind direction at S point was from southwest to west-southwest and that at K point was from southwest to west. Wind velocity had become larger for 15:00 to 18:00 at both points and the value had shown about 5 to 6 m/s. Meteorological observatory located city center had observed from south to west wind in daytime of fierce heat day, too. Judging from the above, main wind direction on fierce heat day in the basin is analogized from south to west.

4. ACTUAL CONDITION OF HEATSTROKE

Fig. 5 shows yearly variation of conveyed number for heatstroke by ambulances in the basin from 1995 to 2008. Recently, the number has increased from 3 to 4 times compare to the beginning of this period and similar tendency has confirmed in many cities in Japan. It is pointed out urban warming is one of the reasons.
Fig. 6 shows a distribution of occurrence points of heatstroke. One marker shows fundamentally one conveyed person. 167 people were conveyed for heatstroke from April to September in 2008 and about 60 % of the total number had occurred around the basin. There were occurrences of heatstroke in whole area in the basin. From differences of activity situation, most of [exercise] and [other] had occurred around city area. On the other hands, [work] had occurred in whole area in the basin.
High temperature area and occurrence point of heatstroke were not overlapped. According to Fig. 3, temperatures of almost the whole area in the basin had exceeded about 35 centigrade in daytime. That is to say, the reason for the above is fierce thermal environment was formed in the basin

5. CONCLUSIONS

In this paper, air temperature distributions, wind conditions and actual conditions of heatstroke in summer of 2008 were reported. As the results, the followings are obtained.

1) It has confirmed high temperature area had occurred around city area in long time. That is to say, it is clarified heat island phenomenon had occurred in the basin.
2) Main wind direction in daytime on fierce heat day in the basin is analogized from south to west. Wind velocity was large for 15:00 to 18:00 and the value had shown about 5 to 6 m/s.
3) Recently, conveyed number for heatstroke has increased from 3 to 4 times compare to 1995 to 2000.
4) Fierce thermal environment has formed in the basin and there is risk of suffering from heatstroke in whole area.