Actual Conditions Related to Human Adaptation to Heat Using Mobile Phone Location Data

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1. Introduction

Urban heat island countermeasures are being promoted by relevant ministries and agencies in cooperation with each other based on the "Outline of Heat Island Countermeasures" (revised in 2013) and the "Climate Change Adaptation Plan" (2018). In recent years, data-driven city planning has been promoted through the widespread use of measurement devices utilizing new technologies, such as ICT, and the use of big data, AI, etc.

Therefore, the NILIM is engaged in research that utilizes big data on mobile phone location data to grasp urban residents' exposure to heat, and contributes to the study of soft measures (life styles that avoid heat) and the introduction of priority hard measures in appropriate places and time zones where the measures can be more effective.

2. Mobile phone location data big data used

In this research, point-type mobile phone location data were used[1]. This is GPS location information, etc., collected from a specific application which can track the movement history of people on a street-by-street basis. A way correction needs to be devised for the data acquired because it is limited to locations that are easily located by GPS, there is a user bias, and the area around residences, etc., is confidential. The data is however considered suitable for making relative comparisons on outdoor active persons exposed to heat, which is the subject of this research.

3. Relationship between the percentage of pedestrians and the heat stress index (WBGT)

Through the expanded estimation of point-type mobile phone location data based on mobile spatial statistics[2], we calculated the population according to means of transportation, taking into account the travel speed of each user, distance from railroads and roads, GPS accuracy, etc. (**Fig. 1**). We studied the relationship between the percentage of people within a 5-km radius around a major station in Tokyo by means of transportation and WBGT distribution data[3] at 14:00 August 2019 (**Fig. 2**). On holidays, "stay" increased and "walk" decreased as WBGT becomes higher. On the other hand, on weekdays, the slope of both "stay" and "walk" against WBGT is smaller than on weekends. It was estimated that the respondents were forced to travel "on foot" even when WBGT was high, due to the influence of their employment on weekday travel.

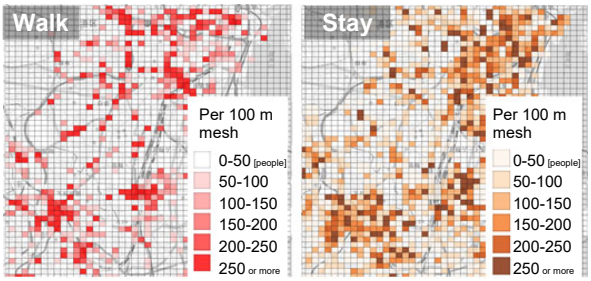

Fig. 1: Estimated population according to means of transportation (example between 14:00 and 15:00)

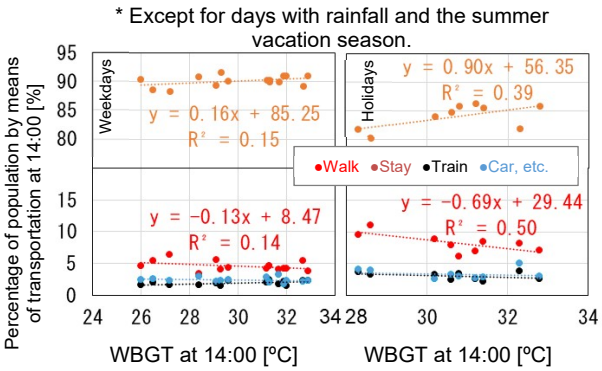

Fig. 2: Relationship between WBGT and the percentage of population by means of transportation

4. Conclusion

We have grasped the actual exposure of people to heat using mobile phone location data. In the future, we will study Heat risk assessment.

☞Citations, etc.

1) Agoop Corp. point-type current population data
2) Registered trademark of NTT DOCOMO, INC.
3) Ministry of the Environment, Japan "Heat Illness Prevention Information
4) This research was funded by the Comprehensive Environmental Research Promotion Fund of the Ministry of the Environment and the Japan Environmental Restoration and Conservation Agency (JPMEERF20212006).