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Nocturnal Local Wind System in Summer
(Continued Study) : Relationship between
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(出版者 / Publisher)

Japan Climatology Seminar

(雑誌名 / Journal or Publication Title)

Japanese progress in climatology / Japanese progress in climatology

(巻 / Volume)

2014

(開始ページ / Start Page)

65

(終了ページ / End Page)

65

(発行年 / Year)

2014-12

Reprinted from *Tenki*. 61-7, pp. 525~540, 2014. [Meteor. Soc. of Japan]

Influence of Urban Heat Island Phenomenon in the Central Tokyo
on Nocturnal Local Wind System in Summer (Continued Study):
Relationship between Stagnation or Passage of Local Wind Front
and Atmospheric Pressure Field in Surroundings

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(Received 3 September 2013; Accepted 26 March 2014)

Abstract

The present study analyzed the relationship between the stagnation or passage of the nocturnal local wind front and the atmospheric pressure field in surroundings. We used the atmospheric pressure data observed at the JMA observatories located in and around the central Tokyo, and that observed by the METROS network which had been installed in the Tokyo wards area. We focused on the period from July to August 2004 which was a hot summer. The results of the present study can be summarized as follows:

- 1) At midnight with weak wind when UHI developed, it was shown that local wind fronts advanced toward the central Tokyo from the inland side. The local wind fronts are grouped into two types from the behavior. One is “stagnation type” of which the front stagnates near the central Tokyo and does not head out to the sea. Another is “passage type” of which the front heads out to the sea as time passes.
- 2) In the case of the stagnation type, the front stagnates near the surface low pressure area in the central Tokyo, and the local wind system which advances from inland side and the southern wind which prevails on Tokyo Bay converges into the central Tokyo.
- 3) On the other hand, in the case of the passage type, the influence of the atmospheric pressure depression in the central Tokyo due to the UHI is weaker than in the case of the stagnation type. The local wind system which advances from inland converges with the southerly weak wind on Tokyo Bay.
- 4) Both types of the fronts were found when the atmospheric pressure gradient in surroundings was small. In this condition, the stagnation type front was found when the atmospheric pressure field in surroundings was higher in southern area. On the other hand, the passage type front was found when that in surroundings was higher in northern area. The present study showed that a minor difference in the atmospheric pressure field in surroundings greatly influenced the behavior of the local wind system and the stagnation or passage of the local wind front.