Formation Mechanisms of the Extreme High Surface Air Temperature of 40.9 deg.C Observed in the Tokyo Metropolitan Area

Yuya Takane[1] and Hiroyuki Kusaka[2]
[1]Graduate school of Life and Environmental Sciences, University of Tsukuba, Japan
[2]Center for Computational Sciences, University of Tsukuba, Japan
(Yuya Takane, s1030239@u.tsukuba.ac.jp)

1. Introduction

The record-breaking high surface air temperature in Japan of 40.9 deg.C was observed on 16 August 2007 at Kumagaya, located in the northern part of the Tokyo metropolitan area. There are still unknown aspects with the mechanisms leading to the formation of the extreme high surface air temperature phenomenon. In this study, we investigate the formation mechanisms of the phenomenon using observational data and the Weather Research and Forcasting (WRF) model (Skamarock *et al.*, 2008) . Several analyses were performed by WRF model; the heat budget analysis on atmospheric column, backward trajectory analysis, lagrangian energy budget analysis along the trajectory, forward tracer analysis, and sensitivity experiment of soil moisture.

2. Results

The results show that the phenomenon was caused by the following factors. (i) Sunshine and lack of precipitation during the preceding 7 days of August 16th, (ii) A lot of sunshine duration on August 16th (although it is not so much as occur record-breaking the phenomenon) , (iii) High temperature in between the 400-1,500 m height atmospheric layer (although it is not so much as occur record-breaking the phenomenon) , (iv) Dynamic foehn phenomenon and foehn-like phenomenon with diabatic heating from ground surface, heated by solar radiation (Fig. 1) , (v) No penetration of sea breeze from the Tokyo Bay (Fig. 1) .

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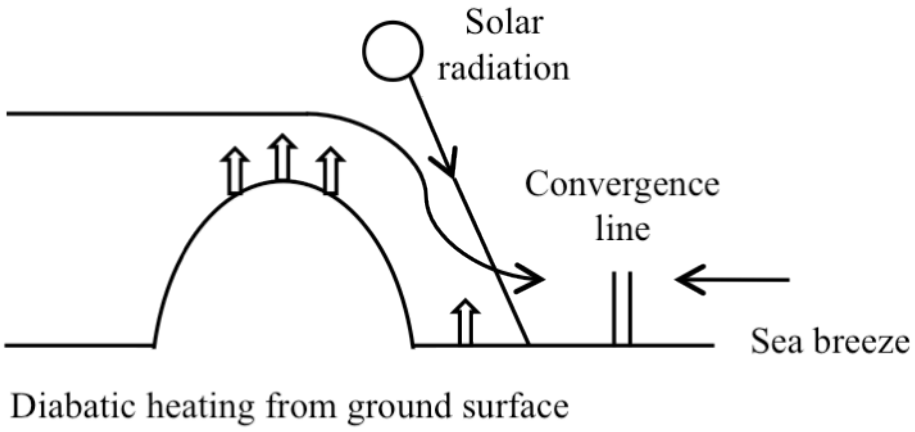

Fig. 1. Pattern diagram of foehn-like phenomenon with diabatic heating from ground surface, heated by solar radiation.

References

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