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Radiosonde observation network in Tokyo metropolitan area

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Severe weathers such as torrential rainfall is one of the serious atmospheric environmental issues in Tokyo metropolitan area. Intent monitoring network is necessary for understanding mechanism and process of severe meteorological events in cities. Furthermore, improvement of urban weather prediction model is also required.

Torrential rainfall in Tokyo metropolitan area is due to the boundary-layer processes such as convergence of sea breeze, large roughness and heat flux in urban area. In this study, we investigate the relationship between the surface forcing in urban area and the spatial variation of the development of atmospheric boundary-layer height based on the radiosonde observation in Tokyo metropolitan area. This is carried out as a part of the Tokyo Metropolitan Area Convection Study for Extreme Weather Resilient Cities (TOMACS) project.

This experiment was conducted from 27 September to 7 October 2011 at some observational points, where are Tsukuba(Aerological Observatory, Japan Meteorological Agency; 36.05^{o}N, 140.12^{o}E), Ukima(Ukima Water Reclamation Cente; 35.80^{o}N, 139.69^{o}E), Koganei(National Institute of Information and Communications Technology; 35.71^{o}N, 139.49^{o}E) and Yokosuka(National Defense Academy of Japan; 35.26^{o}N, 139.72^{o}E). GPS radiosonde (RS-06G, Meisei Electric Co., Ltd) was launched every 3 hours from 9:00 to 21:00.

On 4 October 2011, it was almost fine weather except at Yokosuka, and inflow of the sea breeze was clearly observed below the height of 1 km after 15:00. Potential temperature profiles show that the mixing layer height was developed about 2 km at Tsukuba, 2.5 km at Ukima and from 2 to 2.5 km at Koganei although it was not clearly determined at Yokosuka due to cloud cover.

Among the observation points, the highest mixing layer height was observed at Ukima where is located on the northern part of central Tokyo. When the sea breeze (southerly wind) blows over the land in daytime, the evolution of the atmospheric boundary layer is enhanced by the flow stagnation due to large roughness and by anthropogenic heat supply in central Tokyo.

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