

HSC016-P03

Room: Convention Hall

Time: May 23 17:15-18:45

Heating and cooling sources in Keihanshin region originated by reclamation works on Osaka Bay

Rui Ito^{1*}, Yamane Shozo²

¹Doshisha University, ²Doshisha University

An analysis of surface air temperature at Osaka for the last 100 years shows existence of various trends in the SAT on decadal to multi-decadal time scales. Land-use alteration, growth of buildings, and increase of anthropogenic energy are given as causes of a long-term increasing trend, called urban warming. The other matters relating to urbanization of Osaka may cause decadal trends. An extensive reclamation and landfill have been conducted over the Osaka Bay area since Edo period. In this study, influences of reclamation and landfill works in Osaka Bay on the climate in Keihanshin region have been investigated using the Japan Meteorological Agency Non-Hydrostatic Model (JMA-NHM), which is a regional atmospheric model containing land surface schemes. Numerical experiments are conducted under two different surface conditions, a past coastline case and a present coastline case. A coastline in Edo period estimated from old maps is used as the past coastline, which is around 8-km inland compared to the present coastline. Influences of the works appear at sunrise over the reclaimed land as a positive surface air temperature (SAT) anomaly. The SAT anomaly is subtraction of the SAT calculated in the past coastline case from that in the present coastline case. The positive SAT anomaly is advected inland by the sea breeze and expands over the Keihanshin region to reach the Nara Basin in the evening in summer. The expanding speed of the positive SAT anomaly gives close agreement with the penetrating speed of the sea breeze front, and the positive SAT anomaly is lifted up to about 1 km by the upward motion induced at the sea breeze front. A negative SAT anomaly, on the contrary, appears at sunset over the reclaimed land. The negative SAT anomaly slowly expands inland against the current of the land breeze in the early morning in cold seasons. Though the magnitude of the expanding negative SAT anomaly is small, it is statistically significant at 99.5 % level.

Keywords: urban warming, reclamation, Osaka Bay, sea and land breeze