

Urban heat island circulation

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Abstract Text (within 200 words):

Understanding the urban air flows in calm wind conditions is crucial, as most urban heat wave and severe air pollution episodes occur when wind calmness and inversion coexist, leading to formation of a heat dome or urban heat island circulation (UHIC). UHIC comprises a convergent inflow at the lower atmospheric level, divergent outflow at the upper, and a dome-shaped flow field resulting from entrainment and overshoot at the top. Numerous field studies worldwide have confirmed the existence of UHIC during the day and night in many cities.

Here I shall report three recent preliminary studies in our team. First, a new shape effect for a simple square urban area was identified: a non-uniform flow pattern with four dominant diagonal inflows at the ground level and four dominant side outflows at the upper. This leads to a hypothesis for a polygon city, that the diagonal surface level inflows are stronger than other inflows. Second, the complex merging of multiple heat domes seem to be an important process for the transition from local to regional haze in the Beijing, Tianjin and Hebei (JJJ) region in the 1990s. Thirdly, we report a possible role played by UHIC assisted foehn wind on an extreme heat event in Kowloon in 2016.

KEYWORDS: urban heat dome, dome merging, extreme heat event