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白洋淀水陆下垫面上行星边界层空间变动研究

黄 鹤^{1,2}, 郭振海¹, 游小宝^{1*}

1. 中国科学院大气物理研究所, 北京 100029;
2. 天津市气象科学研究所, 天津 300061

A study of atmospheric boundary layer spatial changes over heterogeneous surface in Baiyangdian area

HUANG He^{1,2}, GUO Zhen-Hai¹, YOU Xiao-Bao^{1*}

1. Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China;
2. Tianjin Meteorology Institute, Tianjin 300061, China

摘要

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摘要 利用三维非静力中尺度模式ARPS,对白洋淀地区水陆非均匀下垫面上大气边界层结构及其变动进行了模拟研究.结果表明,在白洋淀地区陆地大气比湿高于水域的情况发生在白天大部分时间内,是普遍存在的一种现象,该现象首先出现在近地层并向高空延伸,与水陆两种不同的下垫面特征密切相关.由于水陆下垫面的差异,导致水域感热和潜热通量全天较小,变化平稳,而感热和潜热通量较大,且潜热高于感热.水陆两地近地层湍流运动状态存在较大差异,湍流输送在水陆比湿空间变动过程中起到的局地环流同样影响着水陆比湿的空间变动,主要表现在环流上下支对近地层湍流发展以及水汽的垂直输送的影响.陆地主要来源于土壤植被的蒸发蒸腾,而来自水域的仅占很少一部分.

关键词: 中尺度模式 非均匀下垫面 比湿 湍流运动 局地环流

Abstract: A three-dimensional non-hydrostatic meso-scale model ARPS (the Advanced Regional Prediction System) is used to study the atmospheric boundary layer structure over heterogeneous surface in Baiyangdian area. The results showed that, in sunny weak background, the situation that the specific humidity over land is larger than that over lake is universal, and it appears at surface layer first, then extends to the upper atmosphere. Due to different surface characteristics, the sensible and latent fluxes over lake are smaller and stable all day, but over land, both of them are much more in day, and latent flux is much bigger than sensible flux specially. The motion near the round over land is very different from that over lake, so the turbulent transmissions have effect on the spatial changes of specific humidity. The local circulation also has impact on the spatial changes of specific humidity, and the upward and downward movements influence the turbulent development, as well as the vertical transmission of vapor. The vapor over land comes mainly from the evapotranspiration, while a small part comes from the lake.

Keywords: Meso-scale model Heterogeneous surface Specific humidity Turbulent motion Local circulation

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