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一次暴雨过程中重力波参数演变特征的模拟结果

邓少格¹, 钟中^{1,2}, 程胡华^{1*}

1. 解放军理工大学气象学院, 南京 211101;
2. 中国科学院大气物理研究所大气科学和流体力学数值模拟国家重点实验室, 北京 100029

Evolution characteristics of gravity-wave parameters in a simulated rainstorm process

DENG Shao-Ge¹, ZHONG Zhong^{1,2}, CHENG Hu-Hua^{1*}

1. Institute of Meteorology, PLA University of Science and Technology, Nanjing 211101, China;
2. LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China

摘要

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摘要 本文利用中尺度数值模式WRF对2003年7月4—5日淮河流域特大暴雨过程进行了数值模拟, 并利用高时空分辨率模拟结果资料, 提取了暴雨中心区大气重力波频率、周期、水平波长、垂直波长、水平相速和群速等特征参数, 分析了暴雨过程中重力波参数随时间的演变特征. 结果表明, 对此次暴雨强降水过程影响较大的重力波主要是发展的中 α 尺度波和中 β 尺度波, 暴雨后期随着重力波的频散, 周期和水平波长有减小趋势, 频率有增大趋势. 非降水区的重力波参数特征和降水中心区有明显不同, 大气中小振幅的中 α 尺度和中 β 尺度重力波是否发展和暴雨强降水的关系密切.

关键词 暴雨, 数值模拟, 重力波, 波参数

Abstract: A rainstorm process during July 4-5, 2003, in the Huaihe river basin, was simulated by the mesoscale model WRF. Then, the atmospheric gravity wave parameters, such as the frequency, period, horizontal wavelength, vertical wavelength, horizontal phase velocity and group velocity, as well as their evolution characteristics, over the rainstorm area were retrieved by use of the simulation output with higher spatial and temporal resolution. It was shown that the development of meso- α and meso- β scale gravity waves contributed more to the intensified rainfall, and the period and horizontal wavelength exhibited decreasing features while the frequency varied inversely as the dispersion of the gravity waves after the end of the rainfall process. Furthermore, the wave parameters show different features for the rainfall area and rainfall-free area, and the development of rainstorm was closely related to that of the meso- α and meso- β scale gravity waves with small amplitude in the atmosphere.

Keywords Rainstorm, Numerical simulation, Gravity wave, Wave parameters

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