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夏季北极平流层大气基本结构特征

毕云*

中国科学技术大学地球与空间科学学院, 合肥 230026

Basic structure features of the Arctic stratospheric atmosphere in summer

BI Yun*

School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026, China

摘要

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摘要 北极地区(60° N~90° N)平流层纬向风和气压场有明显的季节变化,不同高度层季节变化的时间有差异.北极平流层从冬至夏,季节转换从上向下推进,从夏至冬,季节转换从下向上推进.以20 hPa为例,平均而言,4月上旬以前,北极被极涡控制;4月中旬北极地区高压的势力开始超过低压,5月上旬,北极高压正式建立;7月份达到最强,8月份开始减弱,8月底结束.北极高压中心位置随时间的变化可分为北美型、欧亚型和过渡型三种.平流层下层,气压场和风场的结构与平流层中上层有明显不同,而且南亚高压与北极高压连在一起;从垂直结构看,北极高压从上至下与100 hPa的南亚高压连在一起,高压中心轴线是倾斜的.

关键词: 北极平流层大气 北极高压 南亚高压 极涡

Abstract: The influence of stratospheric process on troposphere is one of the hot scientific issues in the present. However, the changes of the summer stratospheric atmospheric circulation in the Arctic and its impact on troposphere have hardly been studied in China. In this paper, NCEP/NCAR reanalysis data are used to analyze the basic structure characteristics of the summer Arctic stratosphere. Results show that there are significant seasonal changes in both stratospheric zonal wind and pressure in the Arctic area (60° N~90° N); moreover, seasonal changes in different altitudes begin at different times. Seasonal transition from winter to summer in the Arctic stratosphere is progressed from top to bottom, while that reverses (from bottom to top) from summer to winter. To take 20 hPa for an example, averagely, the Arctic region is controlled by the polar vortex before the beginning of April; in the middle third of April, the power of high begins to exceed that of low; then the Arctic high completely establishes in the beginning of May, and it is the strongest in July, begins to weaken in August, and terminates in the end of August. The variations of center position of the Arctic high can be divided into three types: North American pattern, Eurasian pattern, and transitional pattern. The structures of wind and pressure in the lower stratosphere are different from those in the middle and upper stratosphere, and the South Asia high is integrated with the Arctic high in the lower stratosphere; in vertical direction, the Arctic high joints the South Asia high at 100 hPa from top to bottom, and the central axis in high is tilted. This study lays a good foundation for the next analyses which include the intraseasonal, interannual and interdecadal variations of the Arctic high strength and summer stratospheric circulation as well as the impact of summer stratospheric anomalies to troposphere.

Keywords: Arctic stratospheric atmosphere The Arctic high The South Asia high The polar vortex

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About author: 毕云,女,博士,主要从事天气气候变化、中层大气过程研究. E-mail: biyun@ustc.edu.cn

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