冬季旋生合成個案之等熵分析

Isentropic Analysis on A Composite Case of Winter Cyclogenesis

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I. INTRODUCTION

The purpose of this paper is to make use of a compositing case to complement and clarify earlier work of individual case studies on the surface cyclogenesis by analyzing isentropic trajectories. Cases selected for this study are characterized by deep polar air outbreaks into the Gulf of Mexico and the Caribbean from off the North American continent. Cyclogenesis of interest took place downstream of the polar anticyclone. These areas are chosen for present study because they have reasonably good coverage and quality of surface and radiosonde observations. For this reason, results offer some hope for representativeness.

An early work of Palmen and Newton (1951) depicted three dimensional air motion on an isentropic surface for a typical North America polar air outbreaks. Averaged vertical motion computed from isentropic trajectories in their case showed that the strongest descent took place in the lower latitude parts of polar outbreaks. In that study, trajectories were constructed by a procedure in which the kinematic relation was the only constraint. The loose constraint may lead to the inaccuracy of the trajectories and thus the doubtful quantitative results.

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摘要

本文針對四個北美冬季氣旋生成發展的合成個案進行等熵分析。基於能量保守定律及氣塊運動的原則，並在絕熱及無摩擦作用的假定下，于等熵面上分析氣塊的軌跡線以瞭解三度空間的空氣運動，並估計平均垂直速度。更藉此軌跡線以追踪主要地區空氣之來源及去處。

結果顯示在 $\theta = 326°K$ 等熵面上的平均下降速度和解連續方程所得的瞬時下降速度大小相當。但在低壓區則前者

僅後者之半，主要由於絕熱假定所致。低壓生成發展之動能來源由軌跡線顯示，除由該區之可用位能轉換之外，上游西北氣流斜壓區內已存的大量動能的輸入亦占相當重要的份量。