SOME OBSERVED CARACTERISTICS ON SOUTH AMERICAN LOW LEVEL JETS STREAMS

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ABSTRACT

1.INTRODUCTION

The Low Level Jet streams (LLJ) are intense air currents that occur at the principal mountain barrier in the worlds. The study of LLJ that occur at border of Eastern Andes is especially difficult due the lack of radiosonde stations in this region. The South America Low Level Jet Experiment (SALLJEX) in 2003 provided a set of extra observation for study. However, data with high spatial and temporal resolution and the use of a numerical model is necessary for more detailed studies. The objective of this work is to investigate the principal physical characteristics of LLJ using a combination of observed data during SALLJEX experiment and model data.

2.DATA AND METHODOLOGY

Observed data from NOAA P-3 aircraft during the SALLJEX in 2003 were interpolated to regular grid points to obtain cross section of isentropic fields as well as wind and humidity fields. The respective variables were liner interpolated in horizontal direction with a resolution of 5 km and in the vertical direction in terms of logarithmic of pressure with resolution of 2hPa. The original data were obtained through a total of 13 flights from 11th January to 08th February available in SALLJEX website (http://ww.nssl.noaa.gov/ rojects/ acs/ alljex/p3/). Regions of wind confluence or difluence and thermal inversion are examples of thermo-dynamic characteristics observed during low level jet episodes through these data. The Weather Research and Forecasting Model (WRF) with horizontal resolution of 20km and vertical resolution of 25 hPa in low troposphere was used to simulate the same fields obtained through NOAA P-3 data and, at same time, to extend the information from 16th December 2002 to 14th February 2003 with results in each 3 hours. The initial and contour conditions used in WRF model are from an especial NCEP reanalysis which one SALLJEX data experiment were assimilated (Herides et. al. 2007).

3.RESULTS

The mean square errors and bias errors between models and observed data showed a small bias from the model. In general the model tends to present center of Low Level Jet more distant of Andes than observed and also underestimate the maximum of wind speed in 2m/s. On the other hand, the visual comparison between model fields and NOAA-P3 interpolated data shows that the model reproduce the main thermodynamics characteristics observed with reasonable realism. For example, the inclination of isentropic lines in and the shape of meridional wind presented in the cross sections are very similar (see figure 1). In addition to these results, the time evolution of model fields show evidences of a mountain valley circulation superimposed in the low level jet. This circulation is forced by the differential heating between high terrain and adjacent atmosphere, which also can be associated to the theories, presented by Holton (1967) a Beonner and Peagle (1970). However, in the case of low level jet at Eastern Andes, the terrain is very sloped and the interaction between atmosphere and sloping terrain also involves strong adiabatic cooling or heating and gravity waves associated. Other possible factor is the topographic standing waves caused by vorticity conservation of westerly winds crossing the Andes, similar to theories presented by Scorer (1967) and Smith (1984).

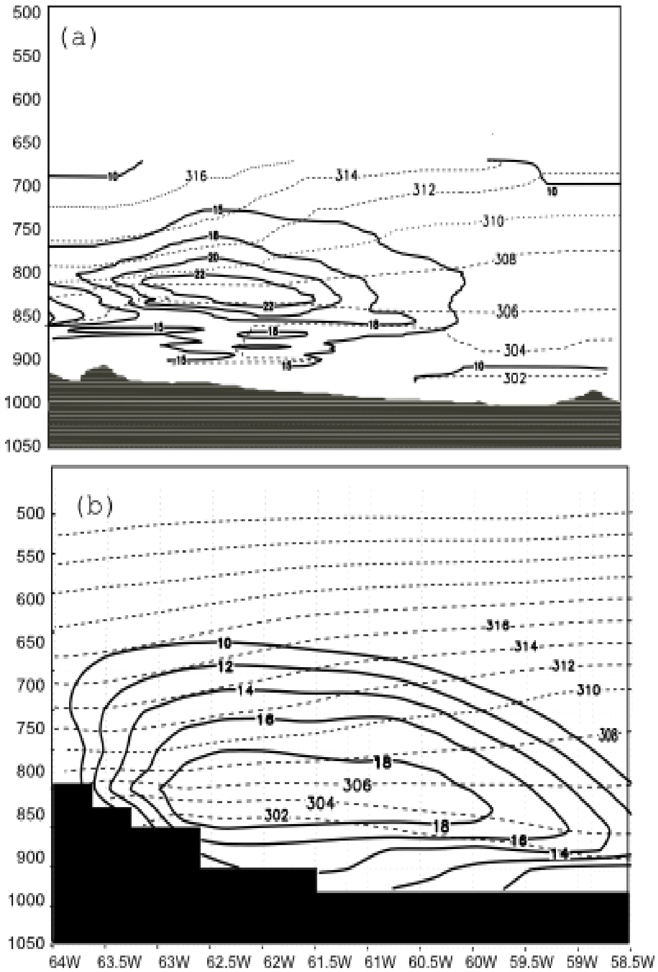

FIGURE 1 - Cross section of Zonal wind (normal to the figure plane) in m/s and isentropic lines (K) on 02 Feb 2003 at 12Z. a) Interpolate from NOAA P-3 aircraft data;) Simulated by WRF mode.

4. FINAL COMMETS

Although some bias errors in the model fields, the results can be considerate realistic for the purpose of this work and show evidence of interaction between the mountain valley circulation and the low level jet. There are other works in which aerial observation were used to study low level jet. For example: for the African Low Level Jet (HART et. al. 1978). However, the use of forecasting model combined with observed data in this present works give the opportunity to observe details of the time evolution of low level jet events in 3 hours intervals.

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