EVALUATION OF THE DYNAMICAL STRUCTURE OF DEEP CONVECTION IN THE TROPICS USING A MESOSCALE MODEL AND HIGH RESOLUTION BACK TRAJECTORIES: HECTOR EVENTS DURING TWP-ICE AND SCOUT-O_3 CAMPAIGNS

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I. INTRODUCTION

One of the purposes of SCOUT campaign was to improve our understanding of the interaction between convection and the tropical tropopause layer. Within the framework of Scout-O_3 project a study on Hector event has been carried out. Hector is a deep convective cell developing on Tiwi Island during the pre-monsoon period.

II. PRESENTATION OF RESEARCH (TIMES NEW ROMAN 10-BOLD CENTRE JUSTIFIED CAPITAL)

In this study two Hector events are investigated: 30 Nov 2005 a multicells event occurred during SCOUT campaign, and a single cell developed on 6 Feb 2006 during the TWP-ICE campaign. The first event was characterized by two cells:

- First cell : Observed maximum height 18.4 Km at approximately 14.30LT; anvil dimension: 120 km length and 50-60 km width at approximately 14.50LT.
- Second cell: small top near the main Hector with the height of 17 Km. Then its altitude increased in the dimensions and became equal altitude of Hector (it was 5-10 km from Hector) at 16.00LT. The nature of cloudiness changed very quickly

The second Hector event was characterized by a cell developed at 16.30 LT because of the interaction of a previous convective cell and the breeze front:

First cell: Observed maximum height 16-18 Km at 14.30-15.00 LT.

Hector developed at 16.30 LT reaching a maximum of 16-18km ending at approximately 19.30LT

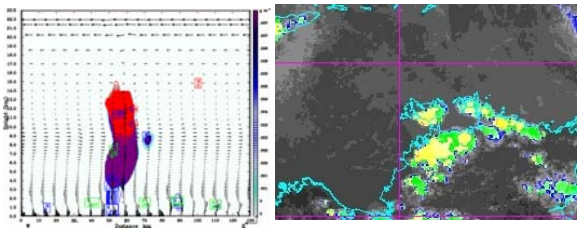

FIG. 1: MM5 Hector at 1430LT and IR SATELLITE GMS-5 at 5.33UTC on Nov 30, 2005.

III. RESULTS AND CONCLUSIONS

The dynamics and thermodynamics of both events have been analyzed, the comparison between MM5 hydrometeors and the TRMM precipitation radar products (available only for Feb 6, 2006) allows for tuning the model: both the convective scheme and the microphysics scheme

- For convective scheme the parameter controlling the flux has to be changed
- For the microphysics the CCN has to be maritime type

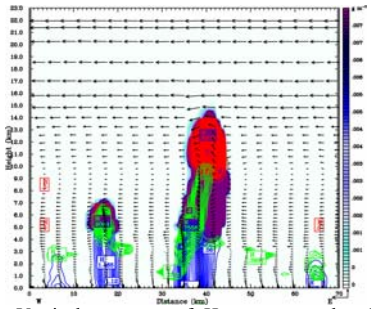

FIG. 2: Vertical structure of Hector as produced by MM5 at 15.30LT on Feb 6, 2006.

The MM5 results show a good agreement with radar reflectivity at the surface and both latent heat and hydrometeors content as recorded by TRMM. Beside the MM5 shortcoming in the timing of maximum development of Hector (1hr earlier) the structure and the precipitation are in good agreement with the observation

The MM5 results for the Hector event of Nov 30, 2005 shows a slightly lower Hector first cell , whereas the second one is very well reproduced, suggesting a stronger triggering acting in this second case. Moreover, the structure and the precipitation produced are in good agreement with observation

Finally, a numerical experiment is performed to the aim of investigating the triggering factor for the two Hector events, which allows for assessing type A for the first event and type B for the second.

For the selected Hector events, lagrangian trajectories will be calculated, using the global trajectory model of the University of L'Aquila Calculation will be performed using both synoptic winds from European Centre for Medium-Range Weather Forecasts - ECMWF (to focus on Tropical Tropopause Layer dynamic over the campaign zone) and mesoscale winds from MM5 outputs (to study in detail Water Vapor Troposphere to Stratosphere Transport and to be used as a base for microphysical calculations).

Wind, pressure, and temperature fields used to calculate trajectories will be taken from ECMWF operational analyses, available on a regular 1.125° by 1.125° grid over 15 standard pressure levels, with a temporal resolution of 6 hours. The MM5 output meteorological fields

will be included in the calculation by time-space nesting the MM5 coarse domain in the ECMWF global field used for the calculation, with a time interval of 1 hour. In this latter case, positions and temperatures of the air parcels are calculated and stored every 90 s.

IV. AKNOWLEDGMENTS

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V. REFERENCES

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