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TYPHOON HUNTER 2001 IN JAPAN

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1. INTRODUCTION

In late July, 2001, we performed a special field experiment for tropical cyclone, TYPHOON HUNTER 2001(TH2001), over the western North Pacific. The experiment is funded by the corporation for Advanced Transport and Technology(CATT).

The main purposes of TH2001 are as follows.

- to get the fine structure of the tropical cyclone
- to improve typhoon forecast by assimilating all Available data
- to demonstrate the feasibility of Aerosonde as one of the platforms for Targeting Observation

During the period of 25-30 July, Aerosonde flew about 50 hours and succeeded to make continuous soundings in the vicinity of Typhoon Toraji(T0108). We present the preliminary result obtained by TH2001.

2. TH2001 Overview

The launching/recovery site was located at Shimoji-jima Airport in Okinawa. Figure 1 shows the GMS IR image of Typhoon Toraji at 01UTC, 29 July with the location of Aerosonde(marked in red closed circle). The nearest distance between Aerosonde and Typhoon Toraji is 390 km and Aerosonde was always located in the north-east quadrant of the typhoon. Fig. 2 is the image from the TRMM Microwave Imageer (TMI) at the similar time

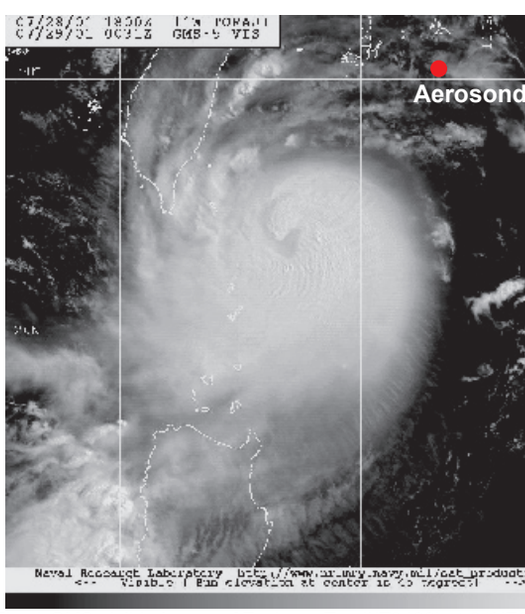

Fig. 1 GMS visible image of Typhoon Toraji(T0108) at 01UTC, 29 July 2002. The position of Aerosonde is marked by rec circle. The picture was taken from http://kauai.nrlmry.navy.mil/sat_products.html.

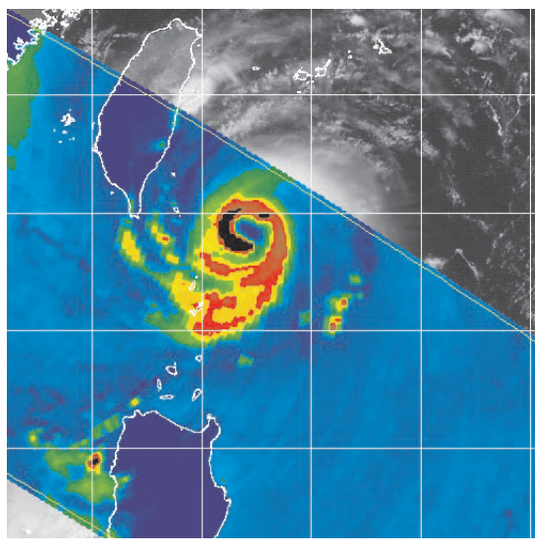

Fig. 2 TRMM Microwave Imager 85GHz H image at 02UTC, 29 July 2002. The picture was taken from http://kauai.nrlmry.navy.mil/sat_products.html.

(02UTC, 29 July) as in Fig. 1. Comparing with Fig. 1 the spiral convective band near the center is very clear in the TMI. The moving direction of Typhoon Toraji is northward and turned north-westward, then landed on Taiwan Island. In this flight Aerosonde flew more than 18 hours, starting from 08UTC, 28 July to 02UTC, 29 July and made vertical soundings between 400 m and 4000 m.

3. Wind Measurement

Fig. 3 shows the time-series of the wind speed, observed by Aerosonde. Totally 10 vertical profiles were obtained during the flight. The strongest wind speed was recorded at 700 m with 21 m/s at 23UTC, 28 July. The gradual increase in time of both the wind speed and the specific humidity(not shown) is noted when the distance between Typhoon Toraji and Aerosonde is getting closer in time. The specific humidity exceeds 20 g/kg in the lower troposphere after 18UTC, 28 July.

Fig. 4 shows the height-radius (the left side is toward the typhoon center) cross section of the tangential and radial wind component , relative to the typhoon motion. The tangential wind is getting stronger approaching to the center and the maximum wind is observed in the low-

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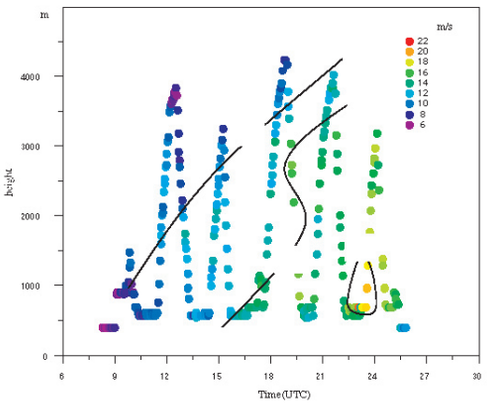

Fig. 3. The time-height section of the wind speed observed by Aerosonde in 28-29 July, 2002.

er troposphere below 1000 m. For the radial wind component we find that up to the range of 500 km the wind is directed to the center, however, away from the range the wind becomes outflow.

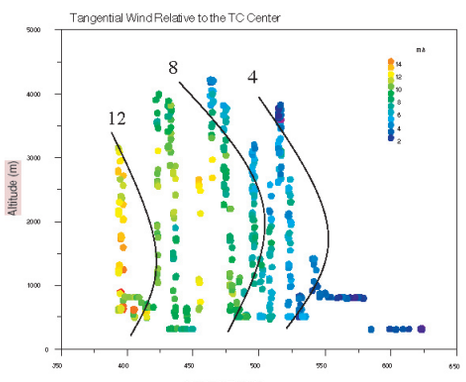

Fig. 4. The distance-height section of the tangential wind relative to the typhoon Toraji. The left side is directed to the center of the typhoon

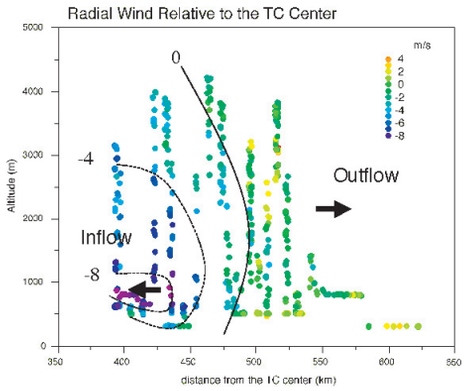

Fig. 5. The same as Fig. 4, except for the radial wind component.

4. Vertical Profile of the Energy

Fig. 6 shows the vertical profile of the moist static energy (h) and dry static energy (s) and the latent heat energy (Lq) during the 10 soundings. We notice that the vertical profile of the dry static energy does not change much, however, the latent heat energy drastically increases in time in all levels, thus, the moist static energy increased significantly in 12 hours from 10 UTC to 22 UTC, 28 July.

6. Summary

The Typhoon Hunter 2001 (TH2001), a special typhoon observation program over the Nansei Islands in Japan, could make a detailed vertical soundings in the vicinity of Typhoon Toraji(T0108). This experiment demonstrated the capability of Aerosonde for the Targeting Observation.

If we can establish more stable communication via satellite over the western Pacific, Aerosonde will make a longer-range typhoon observation in future.

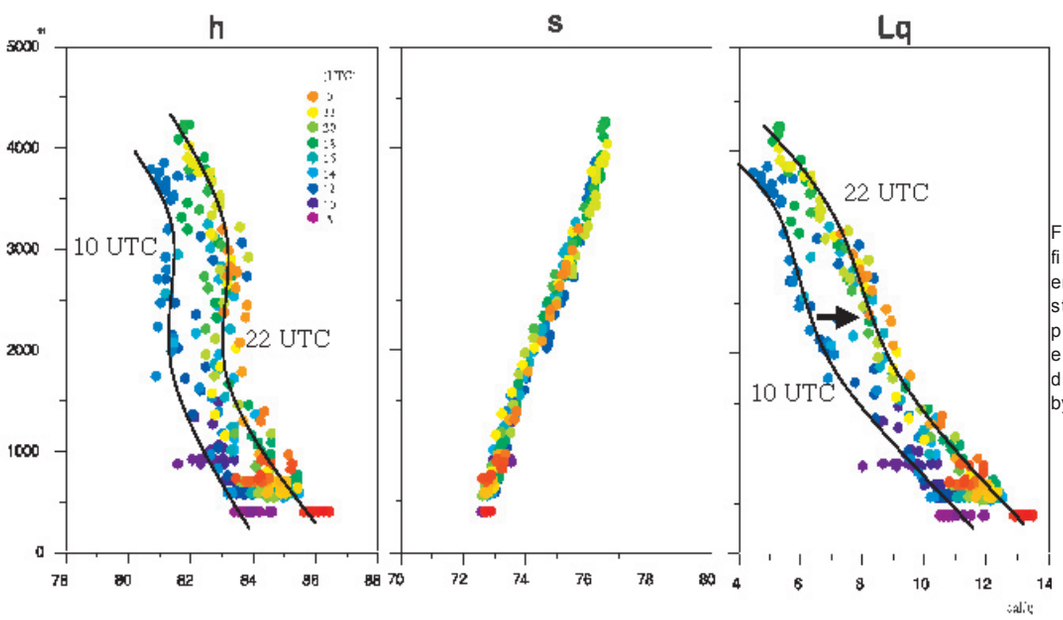

Fig. 6 The vertical profile of the moist static energy(h, left panel), dry static energy(s, middle panel) and latent heat energy(Lq, right panel) during the 10 soundings by Aerosonde.