

A PRELIMINARY STUDY OF TOVS RETRIEVAL IN TAIWAN, R.O.C.

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1. INTRODUCTION

The sounding retrievals from TOVS data of TIROS-N / NOAA series satellites have been studied for many years. Many retrieval methods have been used such as statistical regression, minimum information, iteration, physical. (McMillin et. al., 1973; Smith & Woolf, 1976; Smith et. al., 1979; Smith et. al., 1983.) It had been proved that the sounding retrieval from TOVS data provide useful and valuable meteorological information, especially in data-sparse regions. (Phillips, et. al., 1979).

An HRPT ground station was established at Taiwan, R.O.C., in January 1981. The AVHRR data is used to monitor the typhoon during summer time and the meso-scale convective system during Mei-Yu season in cooperate with the images from Japan's GMS satellite. AVHRR data have also been studied to estimate the sea surface temperature around Taiwan by multi-channel method (Hong et. al., 1985). Due to lack of observation in the West Pacific Ocean, the sounding retrieval from the TOVS data seems to be very helpful for weather analysis of typhoon and meso-scale convective system around Taiwan. TOVS data processing have been studied in the last three years (Yen & Wang, 1986). In the following section some result from TOVS data processing will be presented.

2. TOVS DATA RETRIEVAL

During the past three years, a procedure of preprocess of TOVS data was implemented on PDP-11/70 of the Meteorological Satellite Ground Station of Central Weather Bureau, Republic of China. The procedure include the extraction of TIP data from HRPT data, the extraction of HIRS/2 and MSU data from TIP data, the calibration and navigation of HIRS/2 and MSU data, the preparation of HIRS/2 and MSU data for sounding retrieval, and the brightness temperature image display on the COMTAL Vision One / 20 image processing system. The sounding retrieval by the regression method had also been tried.

In the beginning of this year, we obtained the International TOVS Retrieval Package (ITRP) of VAX version from the Cooperative Institute for Meteorological Satellite Studies. We have made some modification to implement it on our PDP-11/70. This package uses a physical retrieval algorithm to produce temperature and moisture profile from a 3 x 3 array of HIRS

radiances and spatially interpolated MSU observations. The algorithm solves the true profile from an initial guess profile. We use only the latitude and time interpolated profile from ten standard atmosphere as the initial guess profile. The surface data we use are estimated from the initial guess profile and topography. The transmittance is calculated according to the method of Weinreb et. al. (1981).

3. RESULT AND DISCUSSION

After the package being implemented, we selected the data of NOAA-9 in 19Z JUNE 4, 1986 and 18Z JUNE 5, 1986 as an experiment. During that period there were several meso-scale convective system occurred in south China and Taiwan area. Intensive observations from several radiosonde stations had been made those could provide data for concurrent profile comparison.

Figure 1 shows the root mean square difference between the TOVS retrieval temperature profile and radiosonde observational temperature profile within 1.5 degree latitude. The result is quite good at 300mb but with somewhat larger difference near surface and 150mb.

Figure 2 shows the thickness of 1000-500mb of the radiosonde observation from 12Z JUNE 4, 1986 to 00Z JUNE 6, 1986. Figure 3 shows the TOVS retrieval thickness of 1000-500mb at 19Z JUNE 4, 1986 and 18Z JUNE 5, 1986. It is quite well in the East China Sea, but bad in the west of the path and Japan. The cold core in Korea is consistent. The warm ridge is a little stronger in TOVS retrieval. Warm core in the southern China where the meso-scale convective system can also be seen in the TOVS retrieval but more complicate.

4. CONCLUSION

It can be seen from the result that the spatial resolution of TOVS retrieval is better than the conventional data. Although the accuracy of retrieval sounding is not good enough, it could still provide some detail information in the ocean area. There are still many things we can do to improve the retrieval, such as the refinement of initial guess profile, addition of the surface observational data, improvement of the retrieval technique. The improvement in TOVS retrieval will make it possible to have better analysis for meso-scale convective system and typhoon.

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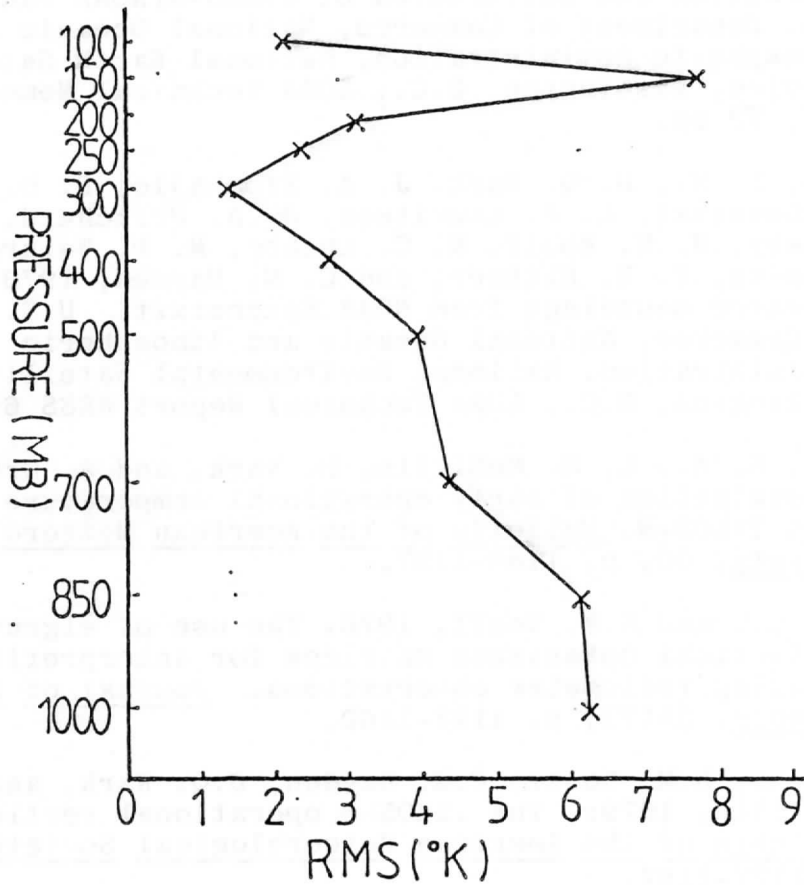


Fig 1. The root mean square difference of TOVS temperature profile and radiosonde temperature profile

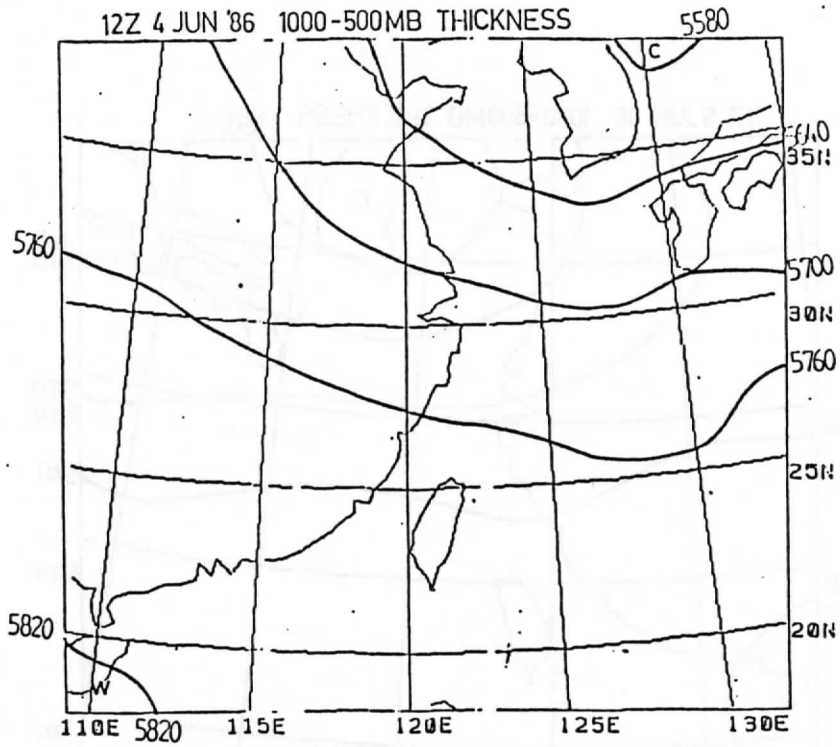


Fig 2 (a). Analysis of 1000-500mb geopotential thickness from radiosonde 12Z JUNE 4, 1986

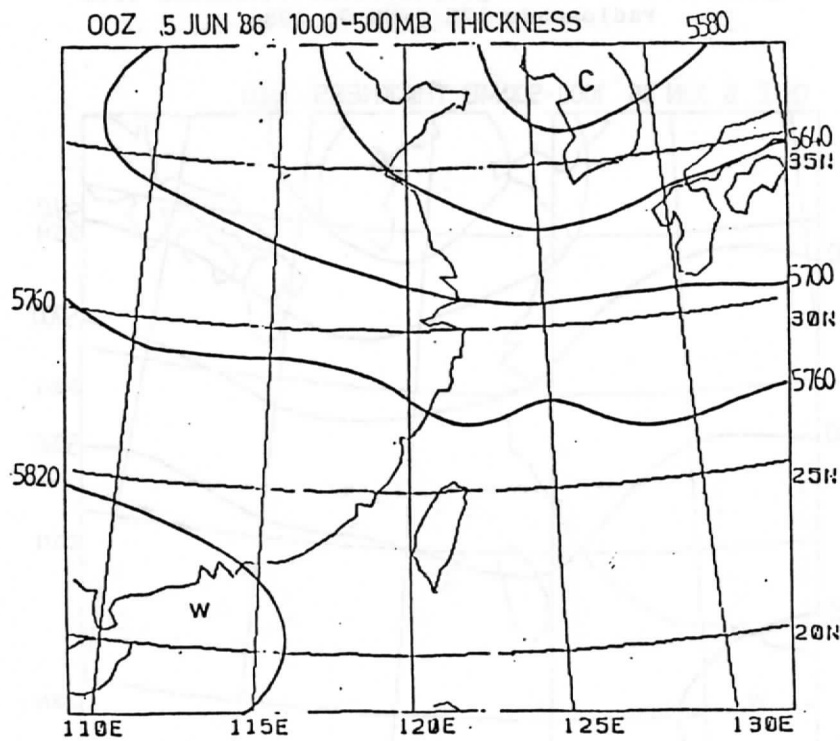


Fig 2 (b). Analysis of 1000-500mb geopotential thickness from radiosonde 00Z JUNE 5, 1986

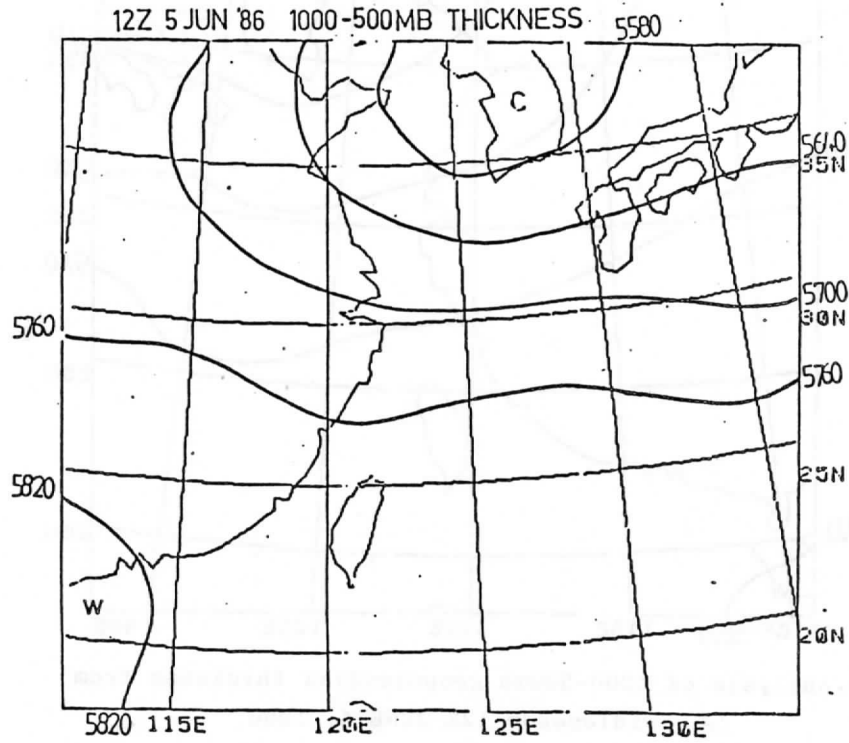


Fig 2 (c). Analysis of 1000-500mb geopotential thickness from radiosonde 12Z JUNE 5, 1986

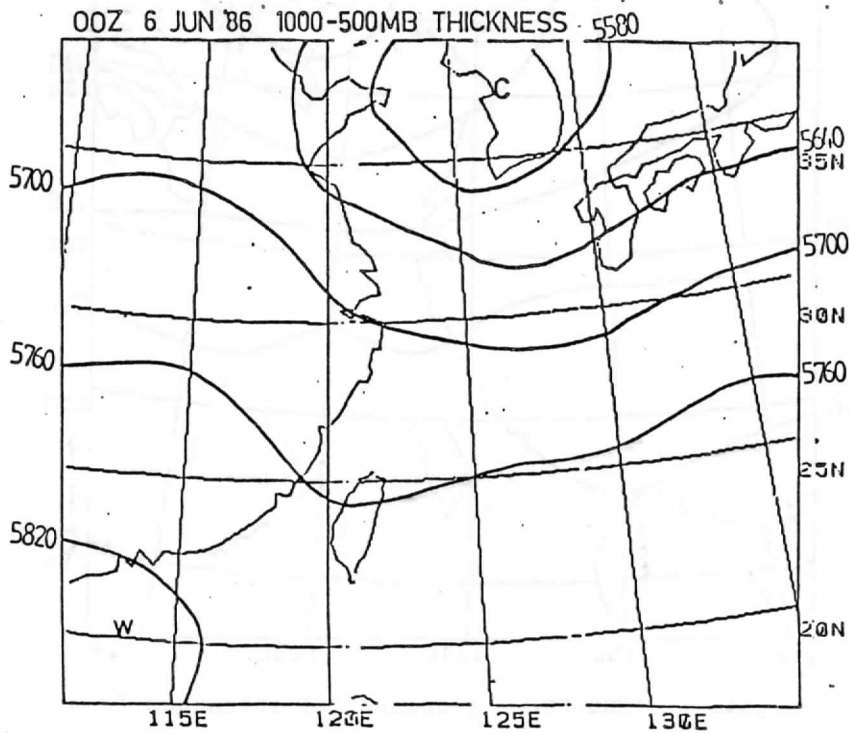


Fig 2 (d). Analysis of 1000-500mb geopotential thickness from radiosonde 00Z JUNE 6, 1986

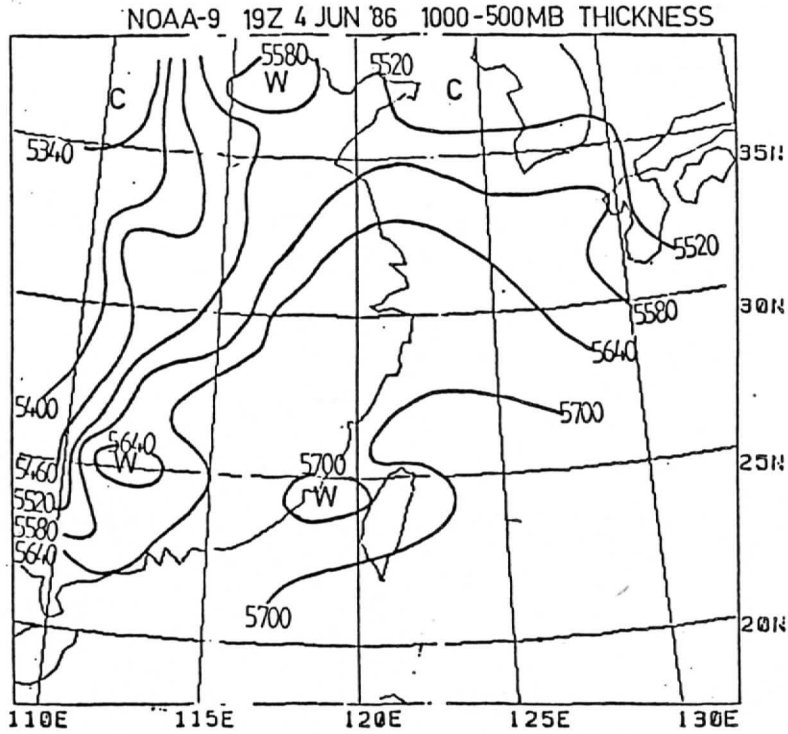


Fig 3 (a). Analysis of 1000-500mb geopotential thickness from TOVS retrieval 19Z JUNE 4, 1986

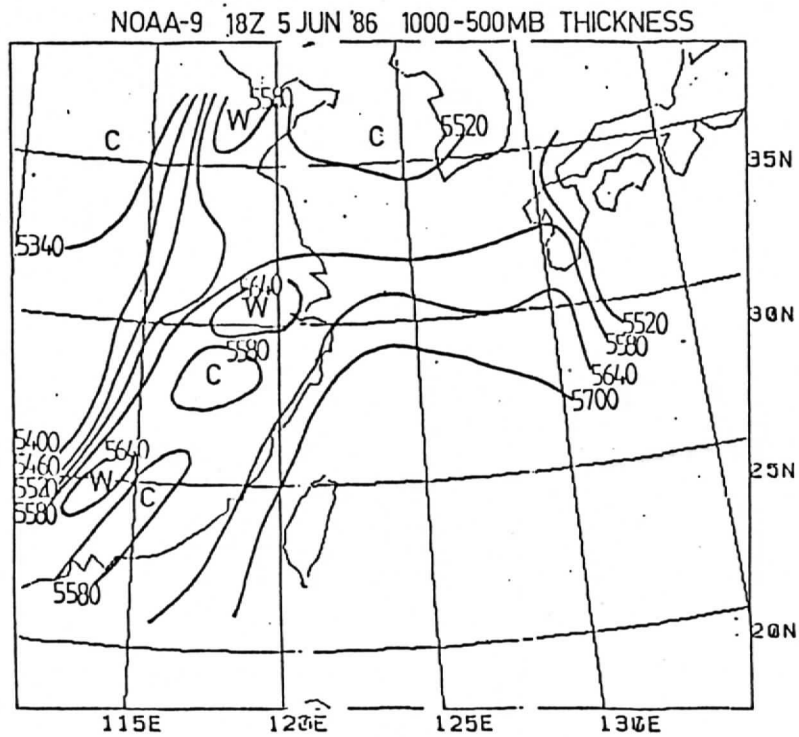


Fig 3 (b). Analysis of 1000-500mb geopotential thickness from TOVS retrieval 18Z JUNE 5, 1986

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