NOTES AND CORRESPONDENCE

Note on Synoptic Situation of AMTEX '75

By K. Ninomiya

*Meteorological Research Institute, Tokyo**(Manuscript received 15, July 1976, in revised form 20, August 1976)*

1. Introduction

Air-Mass Transformation Experiment in 1975 was carried out for 15 days period (14~28 February) over the Kuroshio region (see the aerological station map in Fig. 1). The present note, which gives the gross description on the synoptic situations of AMTEX '75, is written as the introduction for the detailed analyses which will be published later.

Fig. 1 Aerological stations for AMTEX '75.

2. Synoptic situations

The variation of the 1000-mb temperature at Naha (936) and the synoptic situation along 130°E are illustrated in Fig. 2. Fig. 3 shows the vertical time section of wind velocity and mixing ratio at Naha, where the stippled area indicates the inversion layer. A synoptic-scale cyclone developed on 14 February during its passage over the AMTEX area. The temperature rise and the moisture increase on 13 and 14 February are due to the warm and moist air advection prevailing in front of the cyclone. The polar air outbreak began on 15 and the "cold period" continued until 23. The "mixed layer" capped by the inversion was observed throughout the cold period, though the polar air outbreak was some-

Fig. 2 Time change of 1000-mb temperature at Naha (936) and the synoptic situation at 130°E.

what disturbed by the development of cyclones over the northern AMTEX area (on 18 and 20 February). The polar air outbreak was especially intensified after the passage of the cyclone on 21 (i.e., coldest period). The typical situation of "quasi-stationary mixed layer" was found in 16~17 and 21~23 February.

The southerly winds prevailed over the southern AMTEX area after 24, and the last part of the AMTEX '75 (i.e., 25~27) was characterized by the high temperature ("warm period"). The inversion was not observed in the lower troposphere during the warm period. The banded echoes were found within the subtropical air-mass on 25 and weak depression passed over the AMTEX area on 27 February.

3. Heat energy supply from the sea

Fig. 4 shows the variation of the total heat energy (sensible and latent heat) supplied from the sea, ($Q+LM$), which is evaluated from the atmospheric budget calculation over the triangle enclosed by 936, ship K and 918 for the layer below 800 mb. (The data only at standard pressure levels are used for the present calculation.)

Fig. 3 The vertical time section of V and q at Naha (936). The stippled layer indicates the inversion or stable layer.

Fig. 4 Time change of the heat energy supplied from sea evaluated over the triangle 936-K-918.

The amount of $(Q+LM)$ varied according to the variation of the synoptic weather situations. The amount of the supply increased when the polar air outbreak occurred. The largest supply of ~ 1700 ly/day was evaluated in the "coldest period". The amount of $(Q+LM)$ was small ($2\sim 300$ ly/day) during the warm period.

4. Mixed layer and inversion layer

The remarkably developed inversion is observed throughout the cold period of AMTEX '75 (see Fig. 3). The inversion layer distinctly separates the transformed air-mass in the subinversion layer from the untransformed air flow aloft. The pressure height of inversion base is about 800 mb. There are other inversions in the middle and upper tropospheres. Fig. 5 is the N-S cross-section at 00 GMT 16 February. The inversion in

Fig. 5 N-S vertical cross section at 00 GMT 16 February 1975.

the higher levels probably corresponds to the large-scale polar frontal zone, because the upper tropospheric jet stream is associated with the horizontal thermal gradient within this inversion layer.

Fig. 6 shows the horizontal distribution of the height of the mixed layer at 00 GMT 16 February 1975. This is the example of the simple configuration of the mixed layer. The height of the mixed layer gradually increases from the

6. Comparison with AMTEX '74

The situation of AMTEX '75 is compared with that of AMTEX '74 (Ninomiya (1974, 1975), Kondo (1975), Saito (1975), Nitta (1976), Ninomiya and Akiyama (1976)).

As compared with AMTEX '74, AMTEX '75 is characterized by the frequent development or passage of the disturbances of various types. Similarly to AMTEX '74, AMTEX '75 includes two quite different situations, *i.e.*, the "warm period" and "cold period", and the amounts of the heat energy supply from the sea evaluated by the budget calculations in both periods are approximately equal to those in the corresponding periods of AMTEX '74. The features of the air-mass transformation and the mixed layer in AMTEX '75 are somewhat different from those in AMTEX '74. The structure of the mixed layer and the inversion in the cold period of AMTEX '75 is almost similar to that of AMTEX '74, though small-scale undulation of the inversion base is observed in the last stage of the cold period of AMTEX '75. We also find some differences between the synoptic situations of the warm period of AMTEX '74 and AMTEX '75. There was a quasi-stationary inversion layer in the lower troposphere during the earlier half of the warm period of AMTEX '74 (14~17 February 1974), though the low level inversion sometimes vanished in the latter half when the disturbances passed over (18-19 and 20-21 February

1974). On the one hand, the low level inversion layer was not formed during the warm period of AMTEX '75 (25~27 February).

7. Remarks

It is intended in this preliminary note to summarize the situations during AMTEX '75. Brief comparison with AMTEX '74 is also made. The detailed analysis and comparison of both AMTEX '74 and '75 will be necessary for the further understanding of process of the air-mass transformation over the Kuroshio region.

References

- Kondo, J., 1975: Heat balance of the East China Sea for AMTEX '74. AMTEX Report No. 8, 12-15.
- Ninomiya, K., 1974: Note on synoptic situation and heat energy budget during the AMTEX '74. *J. Met. Soc. Japan*, **52**, 452-455.
- , 1975: Large-scale aspects of air-mass transformation over the East China Sea during AMTEX '74. *J. Met. Soc. Japan*, **53**, 285-308.
- Ninomiya, K., and T. Akiyama, 1976: Structure and heat energy budget of mixed layer capped by inversion during the period of polar outbreak over Kuroshio region. *J. Met. Soc. Japan*, **54**, 160-174.
- Nitta, Ts., 1976: Large-scale heat and moisture budget during the air-mass transformation experiment. *J. Met. Soc. Japan*, **54**, 1-14.
- Saito, N., 1975: A synoptic study of the inversion during the AMTEX '74. *Pap. Met. Geophys.*, **26**, 121-147.

AMTEX '75 の総観気象状況

二 宮 洸 三

気象研究所