NUMERICAL STUDY OF A MEI-YU FRONT

Wen-Yih Sun, Wu-Ron Hsu and Jiun-Dar Chern

Department of Earth and Atmospheric Sciences

Purdue University

W. Lafayette, IN, USA

The Purdue mesoscale Model (PMM) has been applied to study the formation and evolution of the Mei-Yu front and the associated low-level jet (LLJ) and rainband during the TAMEX IOP-2 experiment.

The TAMEX IOP-2 started at 06Z May 16; however, at 00Z May 16, the LLJ and moist zone already existed at 850 mb. Using the Purdue mesoscale model with ECMWF's analysis at 00Z May 15 as the initial condition, Hsu and Sun (1994) found that the simulated maximum wind speed increased from 11m/s to 17 m/s at 850 mb during a 24 hours integration. The mixing ratio increased from 10 g/kg to over 14 g/kg along the LLJ near the southern China coast. They are in good agreement with observations.

From the budget equations of heat and momentum, Hsu and Sun (1994) also found that latent heating of the stratiform clouds in lower and mid-level, with a maximum warming located over Fu-gen (to the east of the jet core), was sufficient to create a large u-component acceleration (with 4 m/s over 3 hrs) at 850 mb when the moist air moved northward and turned to the right direction due to the Coriolis force. It may indicate that the coupling between the LLJ and the upper level jet might not be as important as suggested by Tsay and Kau (1989) .

Both observation and model simulations show that the axis of the rainband coincides with the axis of the LLJ, when the front is over the southeast China. However, when the system moves to the ocean, the LLJ moves faster and departs from the cloud band, which forms along the low-level-convergent zone. After 48 hours simulation (on May 18), The simulated cloud band (qi+ql) at 700 mb is in good agreement with the satellite image. We can see that the cloud band extended from the north of Japan to the South China Sea. The strong wind and broad precipitation form around cyclone center near Japan. Over East China Sea, the line convection (i.e., rainband) coincides with the 850 mb trough and weak wind zone, which is behind the LLJ, as discussed before. Cloud associated with the Mesoscale Convective System (MCS) also covered a large area of the South China Sea in both satellite image and model simulation. Hence, the Mei-Yu front can be divided into three segments with distinct properties when it moves into the ocean.