P10.15 STRUCTURE OF MESOSCALE CONVECTIVE SYSTEMS OBSERVED WITH POLARIMETRIC RADAR AND UHF WIND PROFILER DURING THE SOUTH CHINA SEA MONSOON EXPERIMENT (SCSMEX)

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1. Introduction

The NCU ISS(Integrated Sounding System) and the BMRC dual-polarimeric doppler radar were deployed in Dongsha island during May 5 to June 25, 1998 for the SCSMEX. The primary goal of this deployment was to measure the mesoscale structure of convective weather system associated with the onset, maintenance and variability of the monsoon over the South China Sea area. The ISS observations provide a detail kinematic and thermodynamic structure change of the monsoon flow. The polarimetric data of the C-Pol radar is very helpful for the understanding of the stratiform and the convective characteristics, and the cloud physics and dynamics of the convective systems. The purpose of this paper is to present a brief overview of the mesoscale weather systems during SCSMEX and investigate the structure and evolution of mesoscale convective systems observed during the onset phase and post-onset phase of SCSMEX.

2. ISS observations

The ISS deployed in Dong Sha Island consisted of a 915 MHz profiler, a Radio Acoustic temperature Sounding System (RASS), a GPS-based NAVAZD rawinsonde and a surface meteorological station. The 915 MHz profiler radar was used for measurement during non-precipitating period and for precipitating particles study and rainfall estimation during rainy period. The ISS operations revealed clearly the evolution of the mesoscale weather systems during SCSMEX(Fig.1), The low-level flow changed from a easterly to a south westerly during mid-May which is the onset phase of the South China Sea Monsoon(Lau, et al 2000). At the meantime, the Mei-Yu front established along the southern coast of China. The convergent flows associated with Mei-Yu front played a significant role in providing forcing of the weather observed over the northern part of the SCS.

3. Disturbed Period Mesoscale Structure

A wide variety of convective systems were observed during the observational periods with a most active period occuring the onset of the monsoon. Two disturbed phases during SCSMEX were revealed by ISS observations. The first phase with subtropical origin appeared in May15-May20, the second phase with tropical origin occurred in June1-June9.

Two major convective events occurred on May 18 and June 8 will be discussed.(Fig.2, Fig. 3, Fig. 4) For the mid-latitude influence case (May 18th), there were moderate shear at lower level and strong westerly at middle and upper level. It may explain that there were stratiform regions on both the front and rear sides of the convective region. For the tropical influence precipitating event(June 8th) the lower level shear was more stronger. The radar observations at ISS show strong squall line with pressure jump at meso high passing through and weak low following later. Temperature dropped 5 degree as cold pool arrived.

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4. The C-Pol radar analysis

The radar data collected by C-pol has been previewed. Several different types of precipitation systems has been observed. The polarimetric variables have been edited with thresholds method. The prelimary results of May 18th and June 8th were presented here. At 0300 GMT May 18th, a squall line was approaching radar site from southeast direction with speed about 10m/sec. The leading edge convection reached 45 dBZ. By 0350 a stratiform anvil area developed in front of the leading convective area (the bright band located at 5km), the whole system weaken and lost its line shape(Fig. 6). The strong westerly observed by ISS profiler may explain the leading anvil. The condensate hydrometers were brought forward toward east and fell down to form the straitiform region. This stratiform region may cut off the warm and moist relative inflow from the east direction and weaken the whole system. The Zdr and Kdp fields were illustrated in Fig. 7 and 8. Compare the Zdr and Kdp patterns at 2km height, we found the attenuation in Zdr at the southwest direction. From the Kdp field the heavy rain area can be easily identified. In June 8th case, an asymmetric squall line was observed, with much weaker south westerly above, only trailing anvil stratiform region was observed. As a contrast to the May 18th case, the whole system maintained its intensity of the leading edge for more than two hours within the radar range. A weak mesocyclone was observed at the northern area. The Zdr and Kdp fields are consistent with the squall line feature. Integration with the other data will provide further insight of the microphysics and cloud dynamics.

5. Reference

Lau K.M., Y. Ding, J.-T. Wang, R.Johnson, T. Keenan, R.Cifelli, J. Gerlach, O. Thiele, T. Rickenbach, S.-C. Tsay and P.-H. Lin, 2000: A Report of the field Operations and Early Results of the South China Sea Monsoon Experiment (SCSMEX). Bull. Am. Met. Soc

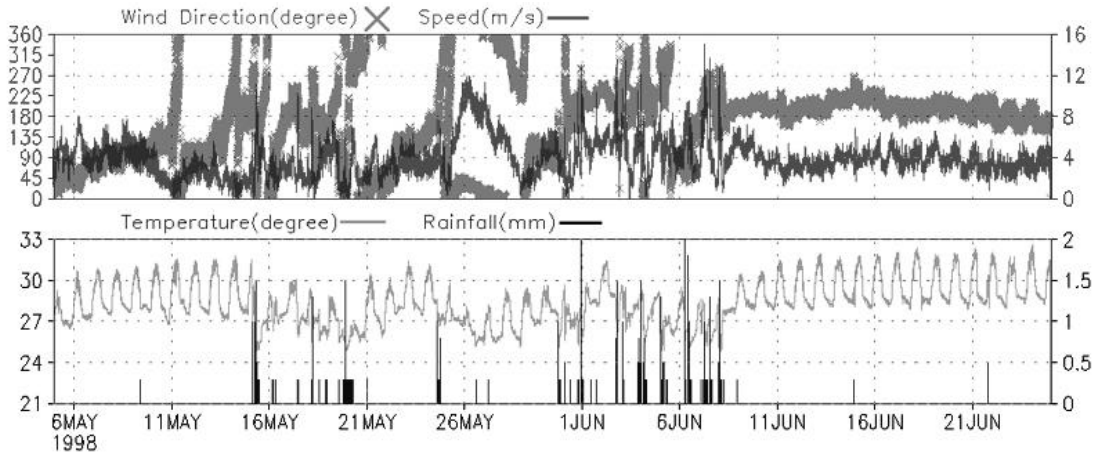

Fig 1. Time series of surface meteorological elements during SCSMEX

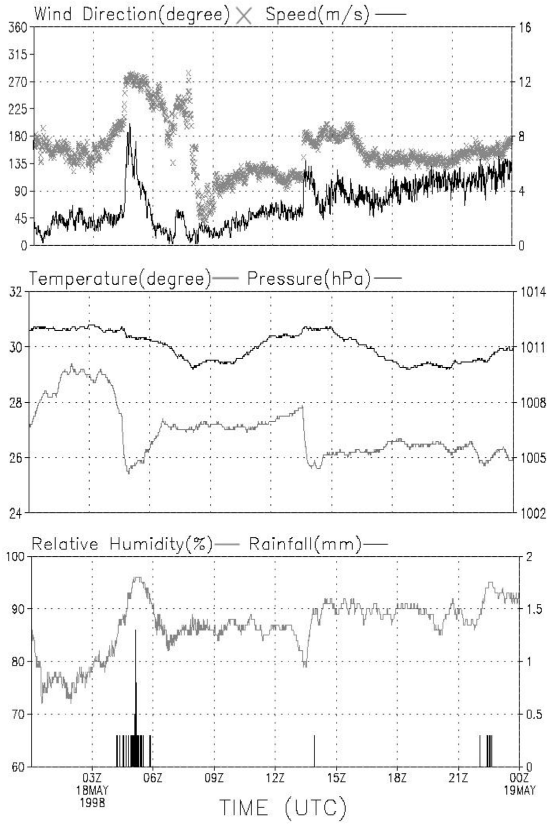

Fig 2. Time series of the surface wind, temp, pressure, relative humidity and rainfall on May 18, 1998

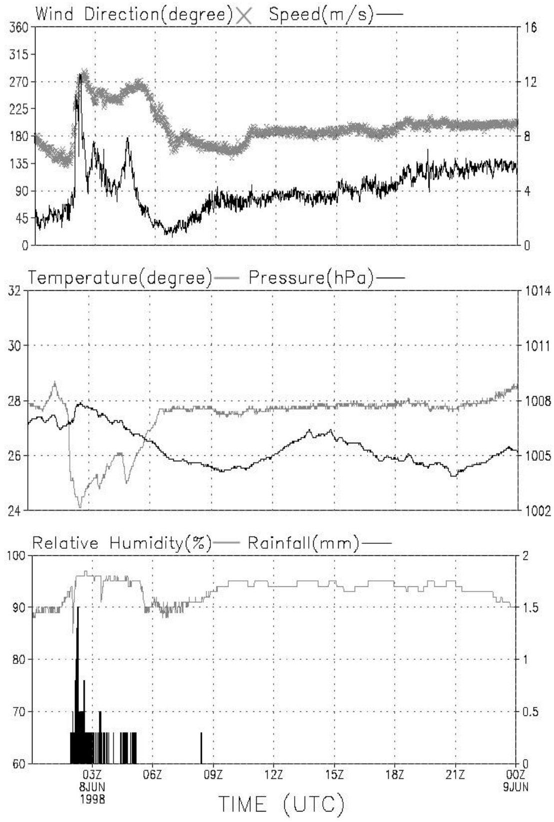

Fig 3. Time series of the surface wind, temp, pressure, relative humidity and rainfall on June 8, 1998

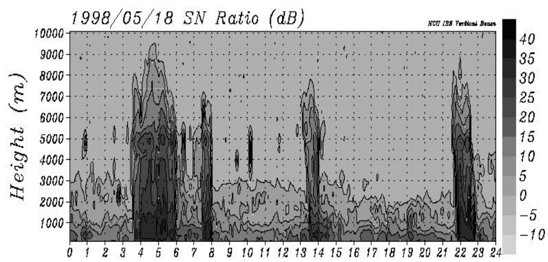

Fig 4. Time series of reflectivity of UHF radar on May 18, 1998

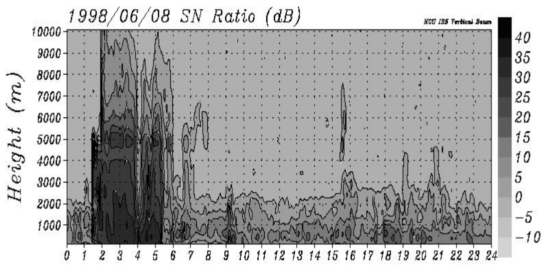

Fig 5. Time series of reflectivity of UHF radar on June 8, 1998

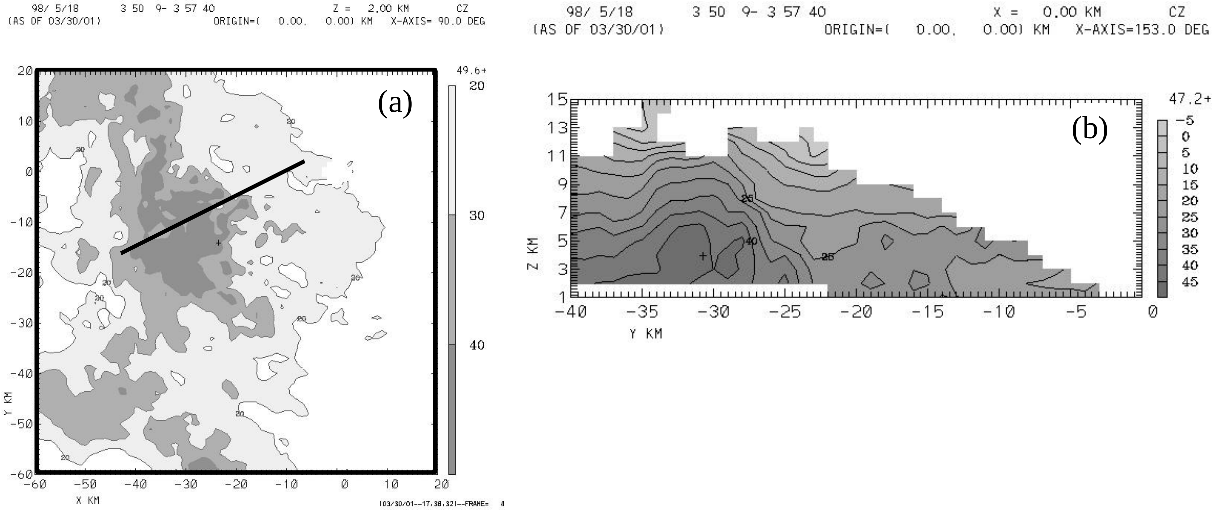

Fig. 6(a) The horizontal reflectivity at 2km height. Contour interval is 10dBZ.
(b) The vertical cross section of reflectivity along the line shown in (a). Contour interval is 5 dBZ.

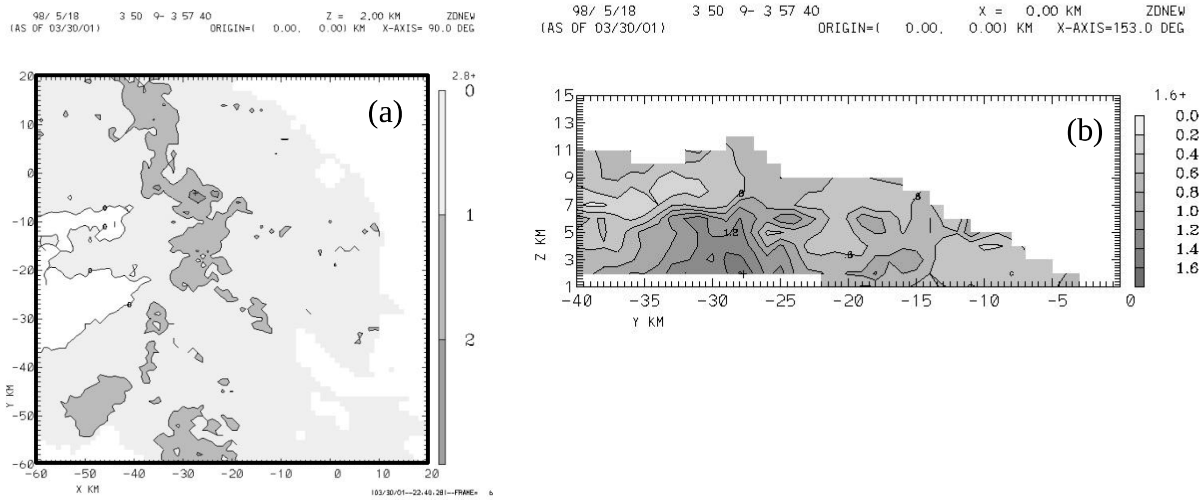

Fig. 7(a) The horizontal differential reflectivity field Zdr at 2km height. Contour interval is1 dB.
(b) The vertical cross section of differential reflectivity Zdr. Contour interval is 0.2dB.

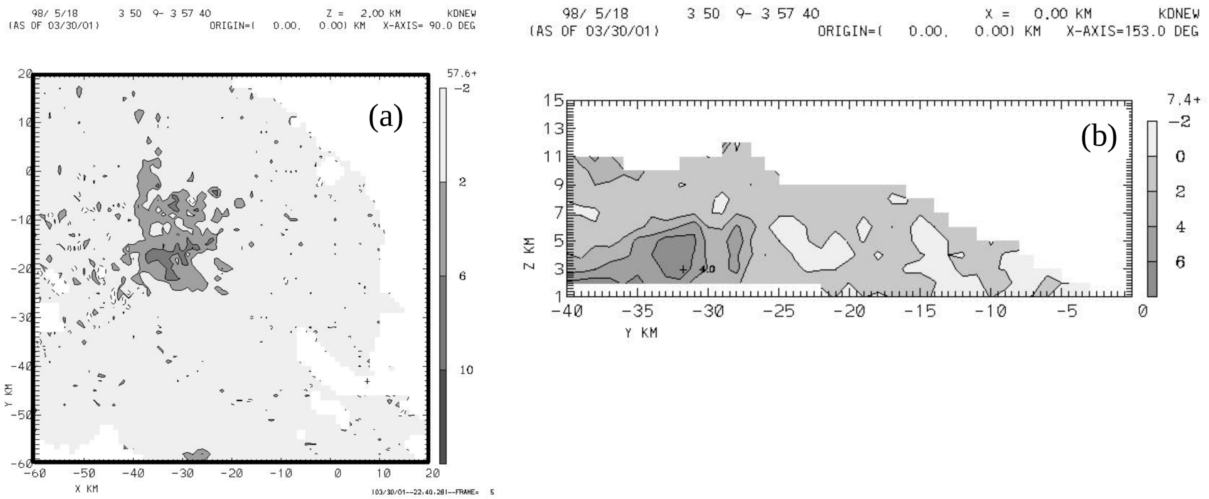

Fig. 8(a) The horizontal specific differential propagation phase shift field Kdp at 2km height. Contour interval is 4deg/km.
(b) The vertical cross section of specific differential propagation phase shift Kdp. Contour interval is 2deg/km.