A Ten-year Climatology of the Summer Monsoon over South China from a Regional Climate Model

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1. Introduction

The summer monsoon over South China (SC) and the South China Sea (SCS) is an important component of the East Asia summer monsoon (Ding and Li 1999; Lau et al. 2000). A regional climate model has been developed at City University of Hong Kong based on a modified version of RegCM2 at the China National Climate Center (Ding et al. 2000). The model (RegCM) has been tested and found to be able to simulate to a large extent the precipitation over SC and the SCS for the months of May and June (Chan et al. 2003). To study the interannual variability of the summer monsoon over these regions, it is necessary to establish a model climatology to serve as a comparison and to remove any systematic model biases.

2. The model and initialization

The model is initialized on April 1 and integrated up to the end of July for the 10 years 1991-2000. Initial and boundary conditions used in this study are from the NCEP/NCAR reanalysis data. Lateral boundary conditions are updated at 6-hourly intervals. The sea surface temperature data are taken from the NCAR weekly optimum interpolation SST version 2 with a 1°latitude × 1°longitude spatial resolution. The model has 16 vertical levels, a 60-km horizontal resolution and a domain size of 125×155 grid points (Fig. 1), and the model top is at 10 hPa.

3. Results

Preliminary analyses suggest that the model is capable of reproducing the major characteristics in the regions of interest. The 500-hPa geopotential heights averaged between May and July 1991-2000 simulated by RegCM show basic features similar to those observed (Fig. 2), including the western Pacific subtropical high and the trough over the Bay of Bengal. The main error is the simulated trough over the Bay of Bengal being too strong than the observed. The model can also simulate the main moisture transport over the Bay of Bengal at 850 hPa (Fig. 3) although the magnitudes over the Bay of Bengal and SC (SCS) are stronger (weaker) than those observed.

The interannual variability of rainfall, wind fields, moisture transport and other parameters relevant to the summer monsoon over SC and the SCS are currently being analyzed.

Acknowledgments. This research is sponsored by the Research Grants Council of the Hong Kong Special Administrative Region of China Grant CityU 2/00C.

References

Chan, J. C. L., Y. Liu, K. C. Chow, Y. Ding, W. K. M. Lau and K. L. Chan, 2003: Design of a regional climate model for the simulation of South China summer monsoon rainfall. *Submitted to J. Meteor. Soc. Japan.*

Ding, Y. H., and C. Y. Li (Eds.), 1999: *Onset and Evolution of the South China Sea Monsoon and Its Interaction with the Ocean*. Chinese Meteorological Press, 422 pp.

Ding, Y., Y. Qian, H. Yan, K. Gao, T. Shen, M. Miao, W. Li, Y. Liu, N. Zhao, L. Yi and X. Shi, 2000: Improvement of a high-resolution regional climate model and its application to numerical simulation of prolonged heavy rainfalls in East Asia. In *Development of Operational Short-term Climate Model Series 2*. Y. Ding, (Ed.), China Meteorological Press, Beijing, 217-231.

Lau, K. M., Y. Ding, J.-T. Wang, R. Johnson, T. Keenan, R. Cifelli, J. Gerlach, O. Thiele, T. Rickenbach, S.-C. Tsay, P.-H. Lin, 2000: A report of the field operations and early results of the South China Sea Monsoon Experiment (SCSMEX). *Bull. Amer. Meteor. Soc.*, **81,** 1261–1270.

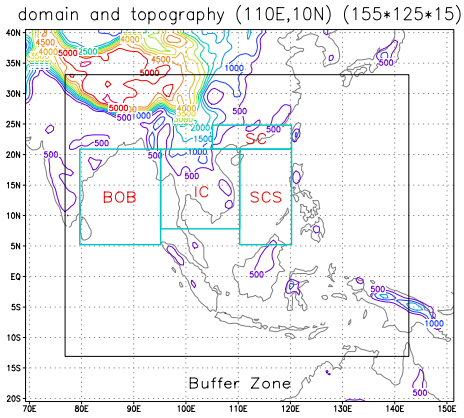

Fig. 1. The model domain and topography (contour interval: 500m).

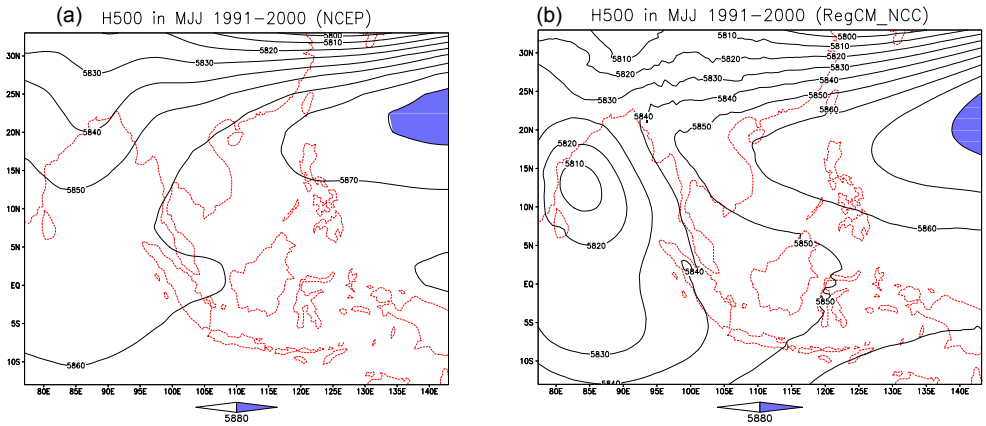

Fig. 2. 500-hPa geopotential heights averaged between May and July 1991-2000 of (a) NCEP reanalysis data and (b) simulated by RegCM. Areas with height > 5880 gpm are shaded.

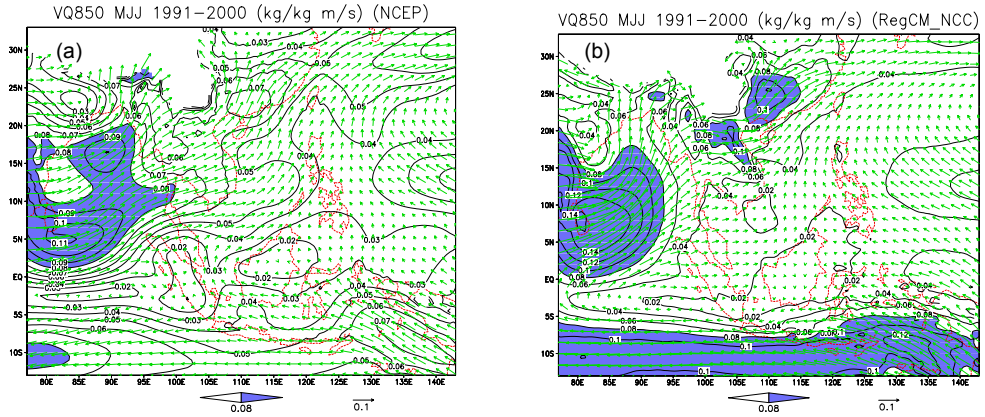

Fig. 3. As in Fig. 2 except for the 850-hPa moisture transport. Areas with moisture transport > 0.08 kg/kg m/s are shaded.