JP1.5 LARGE-SCALE CHARACTERISTICS ASSOCIATED WITH SPRING HEAVY RAIN EVENTS OVER TAIWAN AREA IN THE WARM AND NON-WARM EPISODES

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1. Introduction

Before the Meiyu rainy season of mid-May to mid-June, Taiwan experiences a relatively dry spring particularly over central and southwestern Taiwan (Yen and Chen 2000). The spring rainfall, however, exhibits a large interannual variation such that the occurrence of drought and heavy rain events is not uncommon (Chen et al. 2002). Therefore, a better understanding of this variation becomes one of the most important meteorological issues which is crucial for the management of water resources. In this study, rainfall data at 15 stations in Taiwan and gridded data of meteorological parameters at different mandatory levels from the National Center for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) were used to reveal the characteristics of large-scale circulations associated with spring heavy rain events over Taiwan in the warm and non-warm episodes. Besides, the effect of interdecadal variation on the relationship of spring rainfall and ENSO was also examined.

2. Results and discussion

From the wavelet transform and the correlation analyses for spring rainfall and Nino 3 SST, it is clear that the different regime of interdecadal variation of Pacific ocean occurred in late-1970s exerts significant effect on the relationship between ENSO and spring rainfall in Taiwan. The pronounced positive correlation between cold season Nino3 SST and the following spring rainfall over western Taiwan was only existed since the late–1970s. To investigate why did heavy rain events occur more frequently during the warm episodes (ENSO) as compared to those during the cold and normal episodes, six top daily rainfall events occurred in the warm and non-warm episodes were selected. Composite and anomaly fields reveal that large-scale features were quite different during the heavy rain events for warm and non-warm episode. The anomalous southwesterly flows in the lower troposphere over Taiwan and the northern South China Sea was essential for producing heavy rain event by providing moisture from the tropical area. In the warm episode, these strong southwesterly flows were associated with an anomalous anticyclone over the Philippine Sea (PSAC) and the weaker negative geopotential height anomalies over the eastern China coastal area in the lower troposphere. While in the non-warm episode, much intense negative geopotential height anomalies over the China coastal area was essential for producing strong southwesterly flows in the lower troposphere. The mid-latitude transient baroclinic system with different intensity was important in this aspect as the lower tropospheric frontal trough moved into the area to produce the negative geopotential height anomalies with different strength. Composite fields also showed that the band of maximum moisture flux convergence tended to collocate

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with the band of maximum upward motion along and to the south of the 850 hPa frontal trough. The moisture flux convergence and upward motion were the key factors for generating heavy rain. Besides, much stronger upper-level jet at 200 hPa in the warm episode provided much greater upward motion as compared to that in the non-warm episode. Therefore, it is clear that the intrusion of a weaker mid-latitude frontal system into the eastern China coastal area coupled with an anomalous anticyclone over the Philippine Sea (PSAC) in the lower troposphere was primarily responsible for the spring heavy rain event during the warm episode. While during the non-warm episode, an intrusion of a much stronger mid-latitude frontal system into the China coastal area was necessary to generate spring heavy rain event. This difference is also instrumental for more frequent heavy rainfall events and more rainfall amount observed in the warm episode.

References

Chen, G. T. J., Z.H. Jiang, and M.C. Wu, 2002, Spring heavy rain events in Taiwan during warm episodes and the associated large-scale conditions, (Submitted to *Mon. Wea. Rev*.)

Wang, B., R. G. Wu, and X. H. Fu, 2000: Pacific-East Asian teleconnection: How does ENSO affect East Asian climate?. *J. Climate*, **13**, 1517-1536

Yen, M.C., and T.C.Chen; 2000: Seasonal variation of the rainfall over Taiwan, *Inter. J. Climatol.*, **20**, 803-809.