10A.4 CLIMATE VARIABILITY OF TROPICAL CYCLONE ACTIVITIES IN WESTERN NORTH PACIFI OCEAN

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1. INTRODUCTION

Variability of tropical cyclone (TC) activity is important in determining whether recent changes in TC activity can be related to the global warming issue. Strong interannual signals of tropical cyclone variation are detected in the past two decades, most of these interannual signals are related to ENSO or stratospheric QBO (Gray 1984; Chan 1985, 1995, 2000; Hastings 1990; Evans and Allan 1992; Wang and Chan 2002, et al.). In recent years, some studies found that TC activities over different ocean show multi-decadal variability. Landsea et al.(1996) found there was a downward trend of intense hurricane numbers over the Atlantic basin. Goldenberg et al.(2001) found that hurricane activity over the Atlantic has an oscillation with a period of 40 to 60 years. Chu et al(1999) found an increasing trend during 1966 to 1997. Chan and Shi(1996,2000) examined the data from accurate observations over the western North Pacific and data from historical records of landfall typhoons in Guangdong Province of China, and found the long-term trend of TC activity over western North Pacific ocean. Most of these works examined the variability of TC numbers, the variabilities of other features of TC activity, such as TC genesis location, TC motion, still need to be examined. In this paper, climate variability of TC activities, including TC number, TC genesis location and TC motion, over Northwest Pacific Ocean are analyzed, and characteristics of inter-annual and decadal change are showed.

2. DATA

The data we applied in this work are JTWC Besttrack data. To facilitate climate variance analysis, series of annual TC activity should be formed firstly. By basic statistical analysis, we choose features of several sensible areas to construct time series. From time series graphs, year to year changes are evident. To quantify these changes, variance analysis and wavelet are applied to these series.

3. RESULTS

From results of variance analysis, we obtain that the series of TC number, TC genesis location and TC motion all have two main period sections:3-year to 5-year and 8-year to 12-year. To examine the change frequency at different time, wavelet analysis is applied to these series. From wavelet coefficient pictures, inter-annual variance is evident, and time varying of periods is showed, but long term variances are polluted by inter-annual signals and seem very weak. To visualize the decadal variance, wavelet filter technique is used to remove strong inter-annual signals, and decadal variance around 8-year to 12-year is showed evidently. From our analyzing, we can get several results:

a. Inter-annual variation of tropical cyclone activities over Northwest Pacific Ocean is evident, the main change periods of series are during 2-4 years.
b. By using wavelet filter technique, inter-decadal variation of tropical cyclone activities over Northwest Pacific Ocean is revealed, and characteristic of interannual variation in different phases of inter-decadal variation are quite distinct.
c. Tropical cyclone activity in South China Sea is unique in Northwest Pacific Ocean from wavelet spectrum results.

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