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ANALYSIS OF THE CHARACTERISTICS OF WEST-PACIFIC TYPHOONS AFFECTING THE SEA AREA AROUND THE ISLAND OF TAIWAN

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1 INTRODUCTION

Inflicting hundreds of millions yuan (RMB) worth of economic losses annually, strong winds and torrential rains caused by tropical cyclones are two of the major meteorological disasters exposed in the southeastern coast of China. Much effort has been devoted to the research on the patterns of TC genesis, evolution and variation.

Being to southeast of Chinese mainland, the island of Taiwan is separated from Fujian province by the Taiwan Strait to the west and faces the Pacific Ocean to the east. It is frequently subject to typhoons. In view of it, this work takes waters around the island (20°N – 27°N; 117°E – 125°E) as the domain of computation and runs statistic study of the typhoons moving into it, making landfall on the island and the mainland afterwards. The work attempts to be helpful in the prediction of typhoons by diagnosing if typhoons may make landfall on the island and further on the mainland based on particular patterns found in the waters of interest.

According to the statistics, about 28% of the typhoons affected the waters of the island from 1949 to 1999, 82% of which are from the west Pacific. For this study, the focus is on the monthly, annual and periodic variations, moving velocity, intensity and track of the west Pacific typhoons having impacts on the waters of interest to reveal the storms' climatological patterns over the 51 years.

2 DATA

The data of typhoons used in this work are statistically determined based on the *Yearbook on Tropical Cyclones* edited by the Shanghai Typhoon Institute. Each of the relevant typhoons within the waters of interest is studied statistically in terms of the year / month of genesis, mean moving speed and center pressure, track, source location and details of landfall on the island and mainland.

3 CLASSIFICATION OF WEST PACIFIC TYPHOONS AFFECTING THE WATERS

According to the difference in track, the relevant west Pacific typhoons are divided into four groups of

- 1) westward-going, in which they move steadily westward from waters east of the Philippines and then into the South China Sea before making landfall on the coast of China west of Hong Kong;

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- 2) northwest-going, in which they move steadily westward from waters east of the Philippines and either pass over the island and Taiwan Strait before landing again on the provinces of Fujian or Guangdong (most of them) or go over the Ryukyu Islands before landing on the coast of Jiangsu or Zhejiang.
- 3) turning the direction of track, in which, after forming over waters east of the Philippines, they move northwest and then northeast, following a track of parabola.
- 4) irregular track, in which they go northward, or westward and then northward, or northeastward, or make loops, or along the coast, longitude or latitude.

4 WHAT ASPECTS OF THE STORMS ARE STUDIED AND HOW

For individual months from 1949 to 1999, three cases of typhoons are studied in terms of the frequency with which they affected the island, landed on it or landed on it first and then on the mainland later. For the convenience of comparison, the time series of annual occurrence of these storms are standardized. The interannual variation of northwest-going typhoons and those appearing in July, August and September are studied in detail to derive linear regression coefficients. In order to test whether there is sudden change in track, nine series of the annual, July-August-September and northwest-going storms are studied in terms of occurrence using the Mann-Kendall method. As the wavelet analysis is able to show both periodic characteristics of time series and local features of temporal domains, it is applied in this work to look into the periodic change in the frequency of typhoons. A complex-valued Morlet wavelet is used as the base function of the wavelet transformation. The same method is employed to analyze the interannual and interdecadal periods of the typhoons. As August is the month that sees the most frequent occurrence of west Pacific typhoons, wavelet analysis is also applied to the periodic changes of typhoon frequency in August. Mean moving speed and mean intensity for the west Pacific typhoons are compared between different groups of track.

5 CONCLUDING REMARKS

a. The northwest-going typhoons are mainly the ones that affect the island and mainland while the typhoons that go westward or turn the direction of track seldom affect them.

b. July, August and September are the key months in which the west Pacific typhoons affect the waters of interest. The monthly frequency decreases symmetrically around August. For the key period, 1/3 of the typhoons make landfall on the island and among them 80% make second landfall on the coast of mainland.

c. The frequency of the northwest-going, July-August-September and annual typhoons are all decreasing on the interannual scale, though there are no years witnessing significantly sudden changes in the frequency of typhoon genesis.

d. The west Pacific typhoons are periodically formed on the scales of about 4 – 6 year and 13 – 14 years and the westward-going storms are of obvious periods of 5, 8, 13 and 21 years. August, the month with the most frequency of genesis in the west Pacific typhoons, has periodic changes every 10 and 18 years. Besides, periodic changes occurred every 8 years before 1975 but 6 years after it.

e. The track-turning typhoons are the strongest in intensity and fastest in moving speed. Among all groups of track, typhoons landing on the mainland are stronger and faster than those affecting and landing on the island.

A Letter to Overseas Readers

Dear readers,

It has been 11 years since the first *Journal of Tropical Meteorology* published in December 1995. During the time, a number of readers across the world have been showing great interest in it by either subscription or exchange. Via this English publication, the Chinese meteorologists make their voices heard worldwide, joining you in efforts to explore the truth behind weather and climate changes.

In view of the important bridging role it plays, the journal will stay with you from 2006 onwards with additional content of summaries and a larger size of 21×29.7 cm. The articles and summaries will be printed in double columns. It is hoped that the change will make the journal more efficient as conveyer of information and keep it with the current trend of looking big in Chinese periodicals.

With the journal looking big, we should also think "big" accordingly. It is suggested that you quote everything you think valuable from the journal when you write papers and technical reports of your own. As you can see for yourselves, the Chinese have made important discoveries in the fields you are interested in and many of their conclusions are among the most scientifically unique and incisive. It is quite safe to state that you will be known as better-informed researchers than others, for you cite references by Chinese contributors.

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Best wishes,

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增栏、改版、征稿启事

从 2005 年第 2 期开始,《热带气象学报(英文版)》内容从原来的“论著”一栏增加为“论著”与“概述”两栏。此外,从 2006 年第 1 期开始,本刊将改为大 16 开排版和印刷,页码由原来的 112 页相应地减少至 104 页。本刊热忱欢迎广大读者直接向《热带气象学报(英文版)》投稿(全文),稿件内容宜以热带气象专业为主。不过,英文稿件一经本刊录用,《热带气象学报》将不再发表其中文版本,敬请留意。

《热带气象学报(英文版)》
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