Poster for the Third International Conference on Early Warning

Experiences from the Practices of Reducing Typhoon Disasters in East China

Ming XU
Shanghai Typhoon Institute
Shanghai Meteorological Bureau
166 Puxi Road, Shanghai,China,200030
E-mail: xum@mail.typhoon.gov.cn

Abstract

Located on the west coast of western North Pacific Ocean with low elevation，East China is greatly affected by tropical cyclones. Five strong typhoons hit East China in 2005, and the losses they caused were relatively mild comparing with the hurricane Katrina and historical typhoon disasters. In this paper, the experiences we have got from the practices of reducing and mitigating typhoon disasters in East China are listed from the following two aspects.

(Ⅰ) Science and technology aspect

Typhoon sciences have advanced greatly in the last decade, and with the help of modern engineering achievement, typhoon weather prediction has progressed rapidly recently. Application of modern communication technology guaranteed the fast transmitting and issuing typhoon warning information from warning center to policy-makers and public users. The construction of sea wall all reaches the 50 years- met standard in the region, and it played an important role in 2005 typhoon season.

(Ⅱ) Social and management aspect

Natural disaster prevention system in China is widespread, as an integrated system under the leadership of government head, every part of the system can run coordinately whenever natural disaster happens. The resources and data from different disaster-preventing departments all concentrated at emergent time, it made the fast action possible. Simplified warning signal addition with typhoon advisory made typhoon warning understandable to citizens，and collaboration with media guaranteed the issuing of warning signal timely and broadly. And a disaster prevention net whose end reaches community makes every citizen get accurate information and prompt help.

1. Introduction

Vulnerability to tropical cyclones is becoming more pronounced nowadays because of the fastest population growth in tropical and subtropical coastal regions. Located on the west coast of western North Pacific Ocean with low elevation，East China including Shanghai is greatly affected by tropical cyclones. An effective early warning system is of vital importance for the life protection and sustainable development of East China.

2. Disaster reduction activities of East China's Regional Meteorological Services in 2005 typhoon season

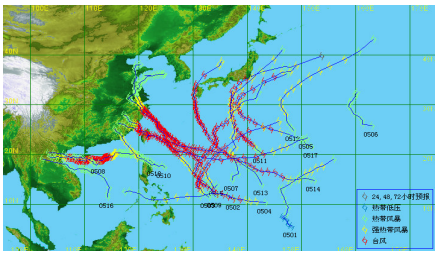

Fig.1 Western North Pacific Ocean Typhoon Tracks in 2005

In 2005, twenty three tropical cyclones formed over western North Pacific Ocean. Eight typhoons landed China, and five strong typhoons hit East China from July 19 to October 2. The losses they have caused are listed in table 1.

Table 1 Disaster information of typhoons in 2005

Typhoon	Disaster population （Unit: million）	Casualty	Evacuated population (Unit: million)	Disaster farmland (Unit: 1000 ha)	Direct economic losses (Unit: 1 trillion RMB Yuan)
Haitang	**10.604**	**6**	**1.982**	**345.2**	**14.09**
Masta	**31.459**	**20**	**2.305**	**2141.0**	**18.01**
Talim	**19.371**	**119**	**1.927**	**1125.1**	**17.07**
Khanum	**13.249**	**16**	**1.299**	**932.9**	**9.95**
Longwang	**4.414**	**122**	**0.623**	**127.3**	**7.8**

Though typhoons influenced East China with strong intensity and high density in 2005 typhoon season, the casualty and economic losses were relatively mild comparing with the hurricane Katrina and historical typhoon disasters. In order to explain this phenomenon, the experiences are analyzed in the section 3.

3. Experiences from the practices of reducing and mitigating typhoon disasters

A natural disaster is a temporary event triggered by natural hazards that overwhelm local response capacity and seriously affect the social and economic development of a region. It is consist of two fundamental aspects, first the natural proper i.e. the destructive power of the event and secondly, the characteristics of social response capacity and consequences. A successful early warning system on natural disasters should deal with these two aspects properly, i.e. to know and predict the natural event accurately and timely, and to guide the response action efficiently and effectively. The experiences we have got from the practices of reducing and mitigating typhoon disasters in East China are listed from these two aspects.

(Ⅰ) Science and technology aspect

Disaster monitoring and prediction is the starting point of an early warning system. Accurate prediction information for typhoon disaster is crucial to disaster preventing action, and the science and technology aspect of typhoon disaster reduction can be concluded in the following four areas:

Firstly, the comprehensive monitoring system both from on-the-ground and outer space has been improved. Because of the intention of improving the techniques of disaster reduction of every level of government in East China, a modernized meteorological observational network is set up. The modern instruments include doppler Radar, satellite receiver, automatic weather station,

wind profiler, GPS receiver, mobile meteorological observatory, etc.

Secondly, scientific and technological knowledge about typhoon disaster reduction is increasing. Typhoon sciences have advanced greatly in the last decade, and with the help of modern engineering achievement, such as satellite engineering, radar engineering and compute engineering, typhoon weather prediction has progressed rapidly recently. The technologies of typhoon data processing and numerical weather prediction have taken great roles in typhoon prediction operation. Figure 2 shows the typhoon track prediction error of Chinese Central Weather Observatory, the prediction skill has improved continuously and stably. In 2005, most of the effects of typhoon disaster reduction can be attributed to the accurate prediction.

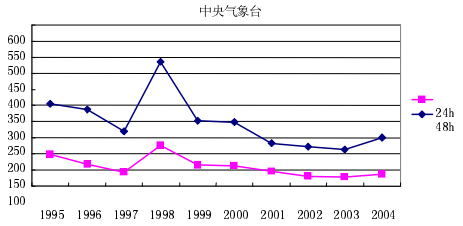

Fig.2 Typhoon track prediction error of CMA in the recent 10 years

Thirdly, application of modern communication technology guaranteed the fast transmitting and issuing typhoon warning information from warning center to policy-makers and public users, and the diversity of issuing means made that information can transmit almost seamless. Other than the traditional information issuing media such as newspaper and broadcast, many new information transmission modes have been applied in the warning signal issuing, they are internet, PDA, MSM, and satellite TV etc. For instance, during the time of typhoon Masta influencing Shanghai, the calling counts of meteorological service telephone 969221 was over 100 thousand in three days, the mobile-phone short messages of meteorological service were sent to 420 thousand users every time, and over 8000 outdoor electronic displayers in the city showed typhoon warning information continuously.

Fourthly, the disaster preventing infrastructure took great effects. Owing to the attention of governments at different levels, typhoon and flood defending infrastructure is relatively complete in East China. The construction of sea wall all reaches the 50 years- met standard in the region, and it played an important role in 2005 typhoon season and avoided the happening of Katrina-like disaster.

(Ⅱ) Social and management aspect

An efficient modern disaster prevention and emergency system is crucial to resist various natural disasters and social crisis. The early warning system in China for natural disasters is widespread, and it includes the monitoring, forecasting and information dissemination of meteorological phenomena, earthquakes, geological factors, forest fires. The early warning of typhoon disaster is processed in this early warning system. The social and management aspect of typhoon disaster reduction can be concluded in the following four areas:

Firstly, end-receiver orientated early warning service system has been built up. As an integrated system under the leadership of government head, every part of the system can run coordinately whenever natural disaster happens. A disaster information-sharing system has been set up, providing a network between the four different levels (central, province, prefecture and county.) The resources and data from different disaster-preventing departments all concentrated at emergent time, and it made the fast action possible.

Secondly preparing work pertaining to typhoon disaster reduction was done well. The preliminary planning system for emergency disaster response was established for different sectors and different level governments. And the preparing for personnel and resources was comparatively complete before the typhoon season. For example, when fishery management department in Zhejiang province received the typhoon warning information before Masta came, they took actions according to their preliminary planning for emergency disaster response, ordered all the boats retreated before the typhoon landed.

Thirdly, a mechanism of cooperation between different departments has been established. For example, meteorological sector cooperated with natural resources sector to develop a landslide prediction system, and this system issued landslide prediction in the flood and typhoon season. This system took good effect in the mountain area in East China in 2005.

Fourthly, public oriented education was done. In East China, simplified warning signal addition with typhoon advisory made typhoon warning understandable to citizens，and collaboration with media guaranteed the issuing of warning signal timely and broadly. And when the typhoon was coming, extra education work would be done. For example, when prediction information of typhoon Khanum was publicized by the Jiangsu meteorological observatory, the article of *how to deal with your life when typhoon was coming* was published on the local newspapers and TV at the same time. This helped the public overcome the critical time and avoid psychological frightening.

4. Conclusion

In conclusion, the mild losses of East China in 2005 typhoon season can be attributed to the coordinated efforts taken by various sectors. Firstly, it can be largely attributed to the accurate prediction made by a continuous observation with latest technology. Secondly, the authorized disaster reduction institution enabled to decide the most efficient mode of evacuation and to set up shelters immediately. Thirdly, cooperation among different departments was crucial in the disaster preventing process.