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TYPHOON PROCESS AND ITS IMPACT ON THE SURFACE CIRCULATION IN THE NORTHERN SOUTH CHINA SEA*

TANG Ling, ZHAN Jie-min, CHEN Yi-zhan
Department of Applied Mechanics and Engineering, Sun Yat-sen University, Guangzhou 510275, China,
E-mail: sunnytl969@163.com
LI Yok-sheung
Department of Civil and Structural Engineering, The Hong Kong Polytechnic University, Hong Kong, China
NIE Yu-hua
South China Sea Branch, State Oceanic Administration, Guangzhou 510300, China

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Abstract: A severe typhoon Utor, occurring between July 3 and 8, 2001, brought heavy rainfall, strong wind and storm surge. Utor was responsible for tremendous destruction and economic losses in Philippines, Taiwan and Guangdong. An air-sea model system (MM5 and Princeton Ocean Model (POM)) was built to simulate meteorological dynamics and ocean circulation in the South China Sea (SCS). In the POM the output of MM5 was used as the input data. With an increased number of vertical levels, a high-resolution planetary boundary layer scheme and updated landuse/vegetation data, the accuracy of computing wind, temperature and other meteorological fields are improved in near surface and upper levels in MM5 simulations. The simulated trajectory and wind speed of Utor are close to the observed results. The simulated distribution of rainfall is accorded well with measured data in the Pearl River Delta (PRD) area. At different meteorological stations in Hong Kong, the wind, temperature and sea surface pressure are well simulated. The simulated ocean surface current and surface temperature fields have an obvious rightward-biased response to the typhoon Utor, and the maximum velocity and the lowest temperature region appear in the 30 km of the right side of the typhoon track. The typhoon Utor could make the water 50m under the surface ocean unwell to surface and the ocean surface temperature decrease by about 2°C.

Key words: mesoscale model MM5, Princeton Ocean Model (POM), air-sea coupling, ocean surface circulation

Introduction

A storm surge is a rise of sea level generated by a low pressure weather system. Storm surges are caused primarily by a drop of the atmospheric pressure and the associated strong winds dragging the sea surface. It belongs to the class of long gravitational wave, with a period ranging from a few hours to several days. Storm surges usually occur in the coastal areas of those countries frequently hit by typhoons in summer and autumn. Less severe storm surges generated by cyclones usually occur in the north coast of Europe, the east coast of the United States and Bohai Bay of China in spring and autumn, sometimes in summer. According to the statistics of the National Maritime Bureau, China, during the 50 years between 1949 and 1998, storm surges with higher than 1 m sea level rise occurred 270 times, more than five times a year on average. Storm surges with higher than 2 m sea level rise occurred 48 times and those with higher than 3 m sea level rise occurred 15 times. Among those storm surge events, great damage and losses were recorded for 112 times. Severe storm surges bring disasters to coastal areas in China, especially in the river estuaries, gulf coast and coastal low lands. The Guangdong coastal area and Pearl River Delta (PRD) region have been hit by storm surges frequently in summer and autumn every year. The areas have dense population and intense economic activities. Taking correct and effective defense measures to minimize the

* **Biography:** TANG Ling (1979-), Male, Ph. D.
Corresponding author: ZHAN Jie-min,
E-mail: cejmzhan@gmail.com