A New Approach to Forecast the Typhoon's Accumulated Rainfall in Taiwan by Using Satellite Data

Chung-Chih Liu Sung-Ching Chi Hsin-Chia Yang
Minghsin University of Science and Technology, Hsin-Chu, Taiwan, ROC
Corresponding author EMAIL: ccliu@must.edu.tw
TEL: 886-953-678639

Abstract

Typhoons are considered to be an extreme weather event that pose a serious threat to the island of Taiwan. Although typhoon forecasting has improved notably over the years, it remains a difficult challenge to make timely and accurate rainfall forecasts, which can help save lives and reduce damage in Taiwan. In this study, The SSM/I rainfall retrieval algorithm (Ferraro and Marks 1995; Ferraro et al.1997) and the original Tropical Rainfall Potential (TRaP) technique (Kidder et al., 2005) were used to forecast the accumulated rainfall distribution of the eight typhoons (shown in Fig.1) during the elapsed time period (shown in Table 1). Meanwhile, TCWB's automatic rain gauge data was utilized in obtaining the observed distribution of each typhoon's accumulated rainfall over Taiwan during the elapsed time period. The averaged observed accumulated rainfall of the eight typhoons was shown in Fig.2. The correlation between TCWB observed accumulated rainfall and corresponding forecast values from SSM/I TRaP technique for each rain gauge station was examined. There are 41 rain gauge stations that had a correlation coefficient larger than 0.8. Under the assumption a proportional relationship exists between the accumulated rainfall of typhoons that hit Taiwan from the east (roughly 23N) with the climatological accumulated rainfall (shown in Fig. 2) and using the 41 stations as reference points, the accumulated rainfall of the remaining TCWB stations can be derived by the analog forecasting technique. The results show that the forecasting in accumulated rainfall was very close to the in situ observations. As the method is considered easy and time-saving, it is highly recommended to relevant weather forecast centers.

Keywords: Accumulated Rainfall, Tropical Rainfall Potential technique, Rainfall Potential Analog Forecasting technique

Reference

Ferraro, R. R., and G. F. Marks, 1995: The development of SSM/I rain-rate retrieval algorithms using ground-based radar measurements. *J. Atmos. Oceanic Technol.,* **12**, 755.

Ferraro, R. R., 1997: SSM/I derived global rainfall estimates for climatological applications. *J. Geophys. Res*., **102**, 16 715–16 735.

Kidder, S. Q., and Coauthors, 2005: The tropical rainfall potential (TraP) technique. Part I: Description and examples. *Wea. Forecasting*, **20**, 456–464.

Table 1. Typhoons cases used in this study for the derivation of climatological accumulated rainfall distribution in Taiwan during the time period from 1998 to 2007.

Typhoon name	Years/Elapsed time period
Otto	1998/17UTC 03 Aug to 01UTC 05 Aug
Billis	2000/05UTC 22 Aug to 02UTC 23 Aug
Toraji	2001/21UTC 28 Jul to 21UTC 30 Jul
Talim	2005/11UTC 31 Aug to 10UTC 01 Sep
Longwong	2005/15UTC 01 Oct to 16UTC 02 Oct
Kaemi	2006/05UTC 24 Jul to 06UTC 25 Jul
Wutip	2007/12UTC 08 Aug to 18UTC 09 Aug
Sepat	2007/10UTC 17 Aug to 22UTC 18 Aug

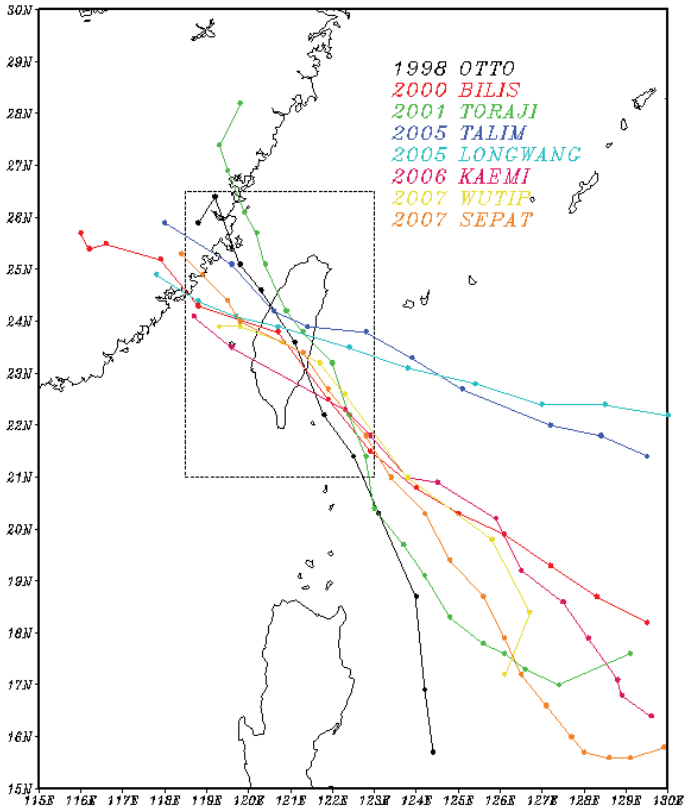

Fig. 1. The experimental area (black rectangle) and the best tracks for typhoons shown in table1.

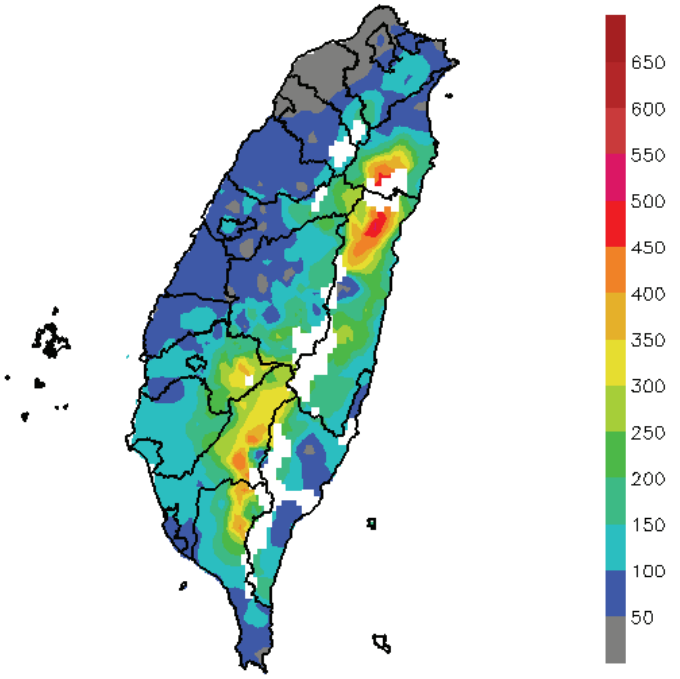

Fig. 2 The average accumulated rainfall distribution of the typhoons listed in Table 1 during the elapsed time period. (unit: mm)