

## **A STATISTICS-BASED AND AN SIMPLE PHYSICS-BASED MODELS TOWARD AN OPERATIONAL AND EARLY FLOOD WARNING SYSTEM**

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### **ABSTRACT**

Life and property losses because of disasters such as flooding are getting dramatic increases for past years. Frequent extreme weather events have even worsened the damages globally. Given sufficient information in advance, disaster preparedness and management can be well-settled. The damages and losses can be mitigated and even prevented. An early disaster warning system, named TAPEX Expert System - Flooding Potential Quick Look System, has been built in 2013 in Pingtung County, Taiwan to provide enough lead times for decision-makers to take prevented measures and execute cautions. Using ensemble quantitative precipitation forecasts, the system could estimate the flood risk at township level and issue possible threat warnings up to 72 hours in advance. The system is a statistics-based model and rapidly provides information to meet the operational needs. However, further detailed information, such as what exact villages instead of townships are flooded, is no doubt a need to speed up the response process. Therefore a simple physics-based model then is developed to identify possible flooding areas downscale to village level. Three villages (out of 33) in Pingtung County and two typhoon events were applied to test the model. The results were presented against those from a complex model and demonstrated promising potential as a valuable reference for better emergency response to alleviate the loss of lives and property in the future operation practice.

**Keywords:** Flood Potential Forecasting; Ensemble Quantitative Precipitation Forecast

### **INTRODUCTION**

Taiwan suffers from floods almost every year and flooding exacts huge economic and social costs. The heavy and rapid rainfall cause floods in urban areas due to insufficient and inefficient drainage system. If flooding potential can be determined in the very early stage, this will facilitate reduction of deaths, injuries, and economic losses. To meet the demand, the Taiwan Typhoon and Flood Research Institute (TTFRI), National Applied Research Laboratories (NARLabs) has employed the technical capabilities of relevant agencies in the successful development of the "TAPEX Expert System - Flooding Potential Quick Look System," which can forecast the probability of flooding in the next 1 to 72 hours at township level when torrential rain is approaching [7]. Since it is a statistics-based model, the computing speed is its advantage to meet the real-time operational need. However, the model provided less