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Very short-term rainfall forecasting by effectively using the ensemble outputs of numerical weather prediction models

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In Taiwan, heavy rainfall brought by typhoons often causes serious disasters and leads to loss of life and property. In order to reduce the impact of these disasters, accurate rainfall forecasts are always important for civil protection authorities to prepare proper measures in advance. In this study, a methodology is proposed for providing very short-term (1- to 6-h ahead) rainfall forecasts in a basin-scale area. The proposed methodology is developed based on the use of analogy reasoning approach to effectively integrate the ensemble precipitation forecasts from a numerical weather prediction system in Taiwan. To demonstrate the potential of the proposed methodology, an application to a basin-scale area (the Choshui River basin located in west-central Taiwan) during five typhoons is conducted. The results indicate that the proposed methodology yields more accurate hourly rainfall forecasts, especially the forecasts with a lead time of 1 to 3 hours. On average, improvement of the Nash-Sutcliffe efficiency coefficient is about 14% due to the effective use of the ensemble forecasts through the proposed methodology. The proposed methodology is expected to be useful for providing accurate very short-term rainfall forecasts during typhoons.