**Remote Sensing Applications \_ Water Resources**

**Application of Remote Sensing and Gauged Precipitation Information for Improving Hourly Typhoon Rainfall Forecasting of WRF**

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This study aims at developing a weighted WRF Ensemble Model (WRFEM) based on remote sensing precipitation information to improve the hourly rainfall forecasting of WRFEM during typhoon events. Based on gauged precipitation information, the weighted WRFEM is further coupled with error correction models developed by Random Forests (RFs) and Support Vector Machine (SVM) respectively for increasing the forecasting accuracy of WRFEM.

The remote sensing information used in this work is QPESUMS radar rainfall and PERSIANN-CCS satellite rainfall. First, this study adopts 5 similarity indexes to evaluate the similarity of spatial distribution between QPESUMS radar rainfall and PERSIANN-CCS satellite rainfall in a region covering Taiwan and its nearby ocean. The results show that QPESUMS radar rainfall and PERSIANN-CCS satellite rainfall have similar and reasonable rainfall spatial estimation. Twenty-one forecasts (i.e., ensemble members) by WRFEM are adopted. The 6-hour-behind rainfall forecasts of each ensemble member are compared with the QPESUMS radar precipitation and PERSIANN-CCS satellite precipitation, respectively, to calculate the weight of each ensemble member by different weighting methods. Eight weighting methods are compared to find the best one for giving the weight to the 6-hour-ahead forecasts of each ensemble member for the weighted ensemble forecasting. The results indicate that the weighting method, rank reciprocal method, is the optimal one which makes the weighted WRFEM perform the best based on QPESUMS radar precipitation. Finally, the forecasts of the weighted WRFEM are corrected by two machine learning methods, RFs and SVM, for enhancing the forecasting performance. The results show that RFs has better correction ability than SVM; the RFs improves the 1~2-hour-ahead forecasting and the underestimation, but for the 3~6-hour-ahead forecasting the improvement is not significant.

**KEYWORDS: WRF, Rainfall Forecasting, Remote Sensing, Random Forests, Support Vector Machine**