



Effects of Cross-Correlation between Ensemble Members on Forecasting Accuracy

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This study was motivated with a hypothesis that the effective number of ensemble members increases as the cross-correlation between the ensemble members increases since existence of the correlation generally indicates loss of information. The effective number of the ensemble members implies a minimum number that can maintain an acceptable accuracy level of ESP in operational hydrology. Therefore, this study investigates effects of cross-correlation between ensemble members as well as the number of ensemble members on accuracy of ESP. To draw a general conclusion, we did not use any hydrologic model but employs output ensembles that are synthetically generated rather than input ensemble. The total number of the generating cases were 60 because we tested 6 cross-correlation values (i.e. 0, 0.1, 0.3, 0.5, 0.7, 0.9) and 10 numbers of ensemble members (3, 5, 7, 9, 12, 15, 20, 30, 50, 100). When inaccurate predictions are conducted, smaller correlation and the larger number of series have proven to be beneficial to ESP. As expected, the simulation results confirmed that the forecasting accuracy increases as the cross-correlation between ensemble members decreases and the effective number of ensemble members increases. This fact is noticeable in case of inadequate forecasts. However, we found that (1) there exists a certain accuracy range where the ensemble correlation does not affect the forecasting accuracy and (2) the higher ensemble correlation with the smaller number of ensemble members is more beneficial to the ESP forecasting accuracy in case of accurate forecasts.